OP2015-06
Appendix 1

FINAL DRAFT

Municipality of Meaford

Master Plan

Water and Wastewater Servicing



April 2015

Tinley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan

Project No. 114106

Prepared for:
Municipality of Meaford

Prepared By:

DRAFT

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May 5, 2015 File No. 114106

Municipality of Meaford
Operations Department
21 Trowbridge Street West
Meaford, Ontario
N4L 1A1

Attn: **Stephen A. Vokes, P.Eng.**
Director of Operations

Ref: **Municipality of Meaford, Water and Wastewater Master Servicing Plan**

Dear Mr. Vokes:

Please find enclosed 3 digital and 5 hard copies of the Master Plan Water and Wastewater Servicing Report

If you have any questions or require further assistance with this matter, please feel free to contact the undersigned.

Yours truly,

AINLEY & ASSOCIATES LIMITED

Gary Scott, M.Sc., P.Eng.

List of Abbreviations

ADD	-	Average Day Demand
ADF	-	Average Daily Flow
ASL	-	Above sea level
BPS	-	Booster pumping station
C of A	-	Certificate of Approval
CBOD	-	Carbonaceous biochemical oxygen demand
CCTV	-	Closed-circuit television
CEAA	-	Canadian Environmental Assessment Agency
CIPP	-	Cured-in-place pipe
Class EA	-	Municipal Class Environmental Assessment
EAAS	-	Extended aeration activated sludge
GIS	-	Geographic Information System
HGL	-	Hydraulic grade line
HRT	-	Hydraulic retention time
I&C	-	Instrumentation and control
I/I	-	Inflow and infiltration
MAA	-	Ministry of Aboriginal Affairs
MCC	-	Machine control centre
MH	-	Manhole
MLSS	-	Mixed liquor suspended solids
MMD	-	Maximum day demand
MOECC	-	Ministry of the Environment and Climate Change
MTO	-	Ministry of Transportation
OCWA	-	Ontario Clean Water Agency
PIC	-	Public information Centre
RAS	-	Return activated sludge
SCADA	-	Supervisory control and data acquisition
SLR	-	Surface loading rate
SOR	-	Surface overflow rate
SPS	-	Sewage pumping station
SRT	-	Solids retention time
SWD	-	Side water depth
TDH	-	Total Dynamic Head
UV	-	Ultraviolet
VFD	-	Variable frequency drive
WAS	-	Waste activated sludge
WTP	-	Water treatment plant
WWTP	-	Wastewater treatment plant

Executive Summary

The Municipality of Meaford retained Ainley Group to prepare a Water and Wastewater Master Plan in accordance with the Municipality's Official Plan and the Class EA procedure. The Master Plan addresses the state of the existing infrastructure and identifies existing and future needs. The preferred solutions are identified as modular designs to allow construction to mimic future growth over the next 30 years. Phases 1 and 2 of the Class EA process for Master Plans were followed to develop the Servicing Master Plan for Meaford.

The study area is defined as the current limits of the Meaford urban settlement area. The area is bounded by Centreville Road to the north, 7th line to the west, Muir Road to the south and Georgian Bay to the east. Existing vacant land within the study area has been zoned as residential, commercial, industrial or institutional. The zoning allows for a better understanding of potential growth to guide the water and wastewater projects. The existing water distribution system infrastructure consists of a WTP, two (2) BPSs, water distribution system and water storage. The existing wastewater system infrastructure consists of a WWTP, five (5) SPSs and a sewage collection system.

Master Planning Process

The Class EA was approved under Ontario's Environmental Assessment Act and identifies the process by which municipal infrastructure projects are to be planned. The process identifies an approved procedure that classifies projects in terms of schedules based on varying environmental impact.

- **Schedule A** – minimal adverse environmental impact
- **Schedule A+** - minimal adverse environmental impact, requires public notification
- **Schedule B** – Potential for some adverse environmental effects, requires mandatory contact with public and review agencies
- **Schedule C** – potential for significant environmental effects, requires mandatory contact with public and review agencies, requires completion of Environmental Study Report

The planning process follows a five (5) step planning process.

- Phase 1 – Problem or Opportunity Definition
- Phase 2 – Identification and Evaluation of Alternative Solutions to Allow a Preferred Solution to be Recommended
- Phase 3 - Evaluation of Alternative Design Concepts for the Implementation of the Preferred Solution
- Phase 4 – Documentation of the Rationale, Planning, Design and Consultation Process
- Phase 5 – Implementation and Monitoring

The master planning process allows for a group of related projects or an overall system to be considered before dealing with each project individually. Master plans are long range plans that follow the Class EA

planning process where at a minimum Phases 1 and 2 must be completed. The Municipality of Meaford has prepared this Master Plan based generally on Approach 2 outlined in the Class EA. The approach allows Schedule B project requirements to be fulfilled at the conclusion of Phase 1 and 2. Select Schedule B projects have been identified that will require additional studies in order to satisfy the Class EA requirements.

The steering committee for the Master Plan was formed by members of the Municipality or Meaford and Ainley Group. The steering committee met on a number of occasions to discuss the project's progress and develop content for the PICs.

Public and agency consultation is mandatory during the master planning process to allow for participation during the development and evaluation of the servicing alternatives. The public and review agencies were contacted with four (4) notices throughout the Class EA process. The four (4) notices were to inform the public of:

- Study Commencement – July 4, 2014
- Phase 1 PIC – September 15, 2014
- Phase 2 PIC – February 26, 2015
- Study Completion – TBD

The comments and input received from the public and review agencies was taken into consideration during the planning process.

Existing Conditions

The Municipality of Meaford is along the shoreline of Georgian Bay and is located in the Grey County. The socio-economic environment is influenced by the waterfront location, however other industries in the Municipality are the aggregate and agricultural industries. In addition to the Georgian Bay shorelines, the Bighead River and the Niagara Escarpment are significant natural features. The Bighead River is an extensive 30 km system known for being home to a variety of fish. The Niagara Escarpment falls outside of the study area and therefore does not affect the master planning process.

Existing Municipal Water System

The Municipal water system consists of the following components:

- **Watermains**
  - The water distribution system is made up of approximately 57,000 m of watermain ranging in size from 50 mm to 400 mm
- **Water storage Reservoirs**
  - There is an in-ground reservoir with a capacity of 2,310 m^3 and an elevated water storage tank with a capacity of 570 m^3.

- **Water Booster Pump Stations**
  - There is the Nelson Street BPS and the St. Vincent Street BPS that help to provide adequate pressure to Pressure Zones 1 and 2 respectively.
- **Water Treatment Plant**
  - The WTP draws water from Georgian Bay and has a rated capacity of 26,848 m^3/ day.

Existing Municipal Wastewater System

The municipal wastewater system consists of the following components:

- **Sewers**
  - The system is comprised of approximately 35,080 m of gravity feed sewer pipe and 2,140 m of forcemain.
- **Wastewater Pumping Stations**
  - The wastewater collection system has five (5) SPSs situated throughout it to convey the sewage to the treatment plant.
- **Wastewater Treatment Plant**
  - The plant is a high rate activated sludge process plant with continuous discharge (after UV disinfection) into Georgian Bay and aerobic digestion with land disposal of bio-solids with a rated capacity of 3,910 m^3/day.

Future Conditions

To understand the future needs of the water and wastewater infrastructure in the Municipality of Meaford, population growth data and land development planning was assessed for full build-out conditions (year 2031). The expected growth in the urban settlement area population is approximately 6,350 people. Based on the population increase, water and wastewater flow projections were made.

The current water demand is 1,460 m^3/day, and is expected to increase 4,040 m^3/day once full build-out is reached. The future demand increase will be used to estimate the following infrastructure upgrades:

- Watermain size
- Water storage capacity expansion
- Additional BPSs or upgrades to existing stations

Currently the ADF in Meaford is 2,600 m^3/day, with an estimated additional 4,040 m^3/day. Full build-out conditions will be used to examine the need for future upgrades including:

- Sewermain size
- Treatment plant expansions
- Additional SPSs or upgrades to existing stations

Problem Identification

Each component of the water and wastewater system was reviewed to identify and define their condition, compliance and performance-related issues that affect existing and future needs. The problems with each component are addressed below:

Water System

Watermains

- 100 mm diameter pipes do not comply with MOECC guidelines.
- Corrosion and tuberculation to cast iron pipes has affected structural integrity and decreased capacity.

Water Storage Reservoir

- When the population exceeds 5,806 people, additional water storage will be needed to comply with MOECC guidelines.
- An additional 1,830 m^3 of storage will be required based on full build-out conditions.

Water Booster Station

- The Nelson Street BPS is not sized adequately to provide fire flow under existing or full build-out conditions.
- The St. Vincent Street BPS has adequate capacity to provide pressure during existing and full build-out conditions.

Water Treatment Plant

- The existing water filtration plant's rated capacity is 26,848 m^3/day during MDD, therefore no expansion is necessary.
- Improve pressure control in the main pressure zone by installing VFDs and modifying the control system.

Wastewater System

Sewers

- CCTV inspection and I/I study has identified the areas of major deficiencies.

Sewage Pumping Stations

- The five (5) SPSs are all in good conditions.
- All SPSs, except for SPS No. 3, have enough capacity for full build-out conditions.
- SPS No. 6 has been proposed in previous planning efforts to service development in the southwest area of urban Meaford.

- All of the components of the WWTP need to be upgraded to meet existing and ultimate peak flow conditions.
- The disinfection capacity is insufficient to meet ultimate ADFs.
- A review of the plant capacity (Ainley Group 2006) determined that the clarifiers are a considerable hydraulic bottleneck.

Alternative Solutions & Evaluation

A list of alternatives was formulated for each project with the Do Nothing and Limit/Manage Growth evaluated for each project. An evaluation was completed to allow for a preferred solution to be obtained. The evaluation criteria are set out in the approved Class EA document based on the nature of the study area, the potential projects and the values of the community. The criteria and appropriate rating were developed for use in the evaluation process. The alternatives for each project are listed below:

General Options

- Do Nothing
- Limit/Manage Growth

Water Distribution

1. Watermain Rehabilitation (Relining)
2. Watermain Replacement

An additional solution combining rehabilitation and replacement was identified. This alternative allows for pipe specific solutions to be identified, resulting in a more cost effective alternative.

Water Storage

1. Elevated Storage Tank
2. Standpipe
3. In-Ground Reservoir Constructed at/above the Minimum Pressure Elevation

These alternatives were screened based on their ability to provide the necessary floating storage. The standpipe alternative did not meet this criterion and was removed from the list shown to the public.

Water Booster Pump Station

1. Construct BPS at the Water Tower Site
2. Construct BPS in the Parking Lot of the Meaford & St. Vincent Community Centre & Arena

Water Treatment Plant

1. Do Nothing
2. Install VFD Pumps

Wastewater Collection

1. Sewermain Rehabilitation (Relining)
2. Sewermain Replacement

Through the evaluation process it was found that a combination of rehabilitation and replacement was an alternative that could allow for a sewermain specific solution. By analyzing each sewer section individually, a more cost effective and problem specific solution results.

Wastewater Pumping

No alternatives were identified; however the following upgrades were suggested.

SPS No. 1

- New Flow Monitor
- SCADA System

SPS No. 2

- Replace Pumps
- SCADA System

SPS No. 3

- Replace Pumps
- SCADA System
- Flow Monitor

SPS No. 4

- Decommission once the primary customer, Knight of Meaford Lumber Factory, no longer requires service

SPS No. 5

- No upgrades needed

SPS No. 6

- No alternatives were examined for the SPS as this project and location have previously been examined in the Report on Sanitary Sewer Collection System Model (2004).

Wastewater Treatment Plant

1. Expand the existing WWTP to meet the ADF and peak flows expected at full build-out while addressing the existing I/I issues.

2. Expand the existing WWTP in 2 phases with the ultimate WWTP able to meet ADF and peak flows at full build-out while addressing the existing I/I issues.
3. Manage peak flows at the WWTP by establishing an equalization storage system while managing ADF through an I/I reduction program. Upgrade the existing WWTP when I/I reduction can no longer support development.
4. Expand the existing WWTP to meet the ADF and peak flows expected at full build-out without addressing the existing I/I issues.
5. Expand the existing WWTP in 2 phases with the ultimate WWTP able to meet ADF and peak flows at full build-out without addressing the existing I/I issues.

These alternatives were screened based on technical feasibility and their ability to solve existing problem. Alternatives 4 and 5 did not resolve the current flow problems and therefore were not considered to be ideal and are not analyzed further. Alternatives 1, 2 and 3 were presented to the public and analyzed in depth to allow for a preferred solution to be identified.

Preferred Solution

A preferred solution was selected for each part of the system based on the evaluation criteria ranking and public consultation. Depending on the situation, the preferred solution may involve a combination of the alternative solutions to best solve the identified problem.

Water Distribution – The preferred solution was to combine the two (2) alternatives and rehabilitate and replace watermains based on their individual needs. Flow testing will be completed to allow for a replacement plan to be developed identifying the need of each watermain section and the timing of its repair/replacement. Additional new watermains have been identified for construction to allow for the new development to be serviced by the distribution network.

Water Storage – The preferred solution is a 2,000 m^3 in-ground reservoir on St. Vincent Street at the south end of the water distribution system. The tank will offer floating storage to the St. Vincent Street Booster Zone with lower operation and maintenance costs than an elevated storage tank. A watermain approximately 1400 m long will need to be constructed to connect the reservoir to the water distribution system.

Water Treatment Plant – To allow for more consistent water pressure in the water distribution system, VDFs will replace the existing pumps at the WTP. No additional plant expansion is necessary as there is surplus capacity.

Wastewater Collection – The preferred solution is to combine both alternatives to allow relining and replacement depending on the sewermains need. Pipe relining should be preferred where the useful service life can be increased by at least 40 years. Other pipe sections that are more damaged should be replaced to increase the lifespan and reduce I/I.

Sewage Pumping Station – No preferred solution was identified for the existing SPSs as they are all in good condition. Upgrades to SPSs No. 1, No. 2 and No. 3 are suggested to help improve performance. A new SPS has been proposed during previous planning initiatives to service the new developments in the southwest of the Meaford urban settlement area. Additional studies are required to allow the Class EA procedure to be followed.

Wastewater Treatment – The preferred solution was Alternative 3 for the expansion of the WWTP which involves establishing the ultimate clarifier and aeration basin tanks at the existing WWTP site to be used for storm retention in the near term.

Proposed Capital Works Program

Proposed capital works programs have been developed for Meaford's water and wastewater systems. Phased strategies have been developed to allow for compliance with MOECC guidelines and to have sufficient capacity for the increasing population. The following projects, shown with their appropriate Class EA schedule, are incorporated into the phased programs.

Project	Class EA Schedule
Water	
Repair/Replacement of Existing Meaford Watermains	A/A+
Establish New Meaford Watermains	A+
Establish New Watermains for Planned Subdivisions	A
In-Ground Storage Reservoir on County Road 7	B*
Water BPS on Water Tower Site	B
Decommission Nelson Street BPS	B
Installation of VFDs at Water Treatment Plant	A
Waste Water	
Relining/Rehabilitation of Existing Meaford Sewermains	A
Establish New Meaford Sewermains	A+
Establish New Sewermains for Planned Subdivisions	A
SPS No. 1 and No. 2 Upgrades	A
SPS No. 3 Upgrades	A+
Construction of SPS No. 6	B*
WWTP Refurbish and Demolition of Old Sludge Storage	A
Upgrade UV Disinfection Channel	A
Storm Equalization Basin Chamber	B
Repurpose Storm Equalization Chamber to Clarifier/Aeration	C
New Headworks Building Construction	C
New Biosolids Works	C
New UV Disinfection Channel	C
Odour Control System	A

*Additional studies will need to be completed at the time of construction to allow the Class EA procedure to be followed.

The costs incurred by the Municipality for the water and wastewater projects are shown below. Some of the projects are partially paid for by development charges. The percentage paid for by the Municipality is indicated in the project name.

Water System Improvement Plan

Project Name	Estimated Cost
Phase 1	
Conduct Flow Testing on Cast Iron Pipes	$ 20,000.00
Develop Rehabilitation and Replacement Plan Based on Flow Testing	$ 10,000.00
Remove and Replace 100mm Cast Iron Pipe – 1000 m per year	$ 2,140,000.00
(54%) SCADA Design for VFD Installation	$ 16,000.00
(54%) Install VFDs at the WTP	$ 54,000.00
(16%) Design New Pressure Zone 2 BPS	$ 13,000.00
(16%) New Pressure Zone 2 BPS Construction	$ 143,000.00
Decommission Nelson Street BPS	$ 10,000.00
Total Phase 1:	**$ 2,406,000.00**
Phase 2	
Remove and Replace 100mm Cast Iron Pipe – 1000 m per year	$ 2,140,000.00
Total Phase 2:	**$ 2,140,000.00**
Phase 3	
Remove and Replace Remaining Cast Iron Pipe – 1250 m per year	$ 2,700,000.00
Total Phase 3:	**$ 2,700,000.00**
Phase 4	
Remove and Replace All 100mm Non-Cast Iron Pipe – 1000 m per year	$ 2,000,000.00
Total Phase 4:	**$ 2,000,000.00**
Total Program:	**$ 9,246,000.00**

Wastewater System Improvement Plan

Project Name		Estimated Cost
Phase 1		
Design New RAS/WAS Pumping and Electrical Improvements	$	150,000.00
WWTP Refurbishment and Demolition of Old Sludge Storage	$	2,550,000.00
Upgrade UV Disinfection Channel (Add Additional Module)	$	50,000.00
Sykes Street, Paul Street, and Ivan Street Reconstruction	$	210,000.00
Develop a Disconnection Program for Illegal Connections	$	N/A
Sewer CCTV and MH Inspections	$	200,000.00
Smoke Testing and Identification of Locations with Illegal Connections	$	160,000.00
Notify Property Owners of Illegal Connections/Disconnection Program	$	N/A
Total Phase 1:	**$**	**3,320,000.00**
Phase 2		
William Street Sewer	$	120,000.00
Susan Street Sewer	$	80,000.00
Repair/Raise Low Lying MH & Install Watertight Covers (assume 50 repairs)	$	370,000.00
Review CCTV Inspection Data and Re-evaluate Rehab Priorities	$	10,000.00
Review Flow Rates and Compare to Historical Flows	$	5,000.00
Implement Disconnection Program (assume 500 connections)	$	750,000.00
1 km of sewermain repairs each year	$	2,000,000.00
Total Phase 2:	**$**	**3,355,000.00**
Phase 3		
Union Street, Farrar Street and Blake Street Sewers	$	225,000.00
Albert Street Sewer	$	100,000.00
(25%) SPS 3 Upgrades Design	$	5,000.00
(25%) SPS 3 Upgrades Construction	$	51,000.00
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 3:	**$**	**2,381,000.00**
Phase 4		
I/I Study Update	$	50,000.00
SPS No. 2 Upgrades Design	$	20,000.00
SPS No. 2 Upgrades Construction	$	200,000.00
SPS 1 No. Upgrades Design	$	22,000.00
SPS 1 No. Upgrades Construction	$	225,000.00
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 4:	**$**	**2,517,000.00**
Phase 5		
Continue System Rehab as Guided by CCTV Inspection and I/I Study	$	TBD
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 5:	**$**	**2,000,000.00**
Phase 6		
(50%) Design a New Headworks Building	$	175,000.00
(50%) New Headworks Building Construction	$	2,375,000.00
(50%) Design Odour Control System	$	175,000.00
(50%) Odour Control System Construction	$	2,550,000.00
Total Phase 6:	**$**	**5,275,000.00**
Total Program:	**$**	**16,828,000.00**

In addition to the municipally funded projects throughout the urban area, there are a number of projects that will be funded by development charges. The water and wastewater projects that are to be partially or fully funded by development charges are shown below. The percentage of the project paid for by the developer is indicated in the project name.

Water Projects Covered by Development Charges

Project Name	Development Charges			
	Pressure Zone 1	Pressure Zone 2	Pressure Zone 3	Total
Coleman Street	-	-	$ 251,000	$ 251,000
Centre Street	-	-	$ 312,500	$ 312,500
Union Street	-	-	$ 340,500	$ 340,500
Muir Street	-	-	$ 741,000	$ 741,000
County Road 7	-	-	$ 830,000	$ 830,000
Construction of New Pipes for New Development	-	-	-	N/A
(46%) SCADA Design for VFD Installation	$ 14,000	-	-	$ 14,000
(46%) Install VFDs at the Water Treatment Plant	$ 46,000	-	-	$ 46,000
New In-Ground Reservoir Design and Construction	$ 794,000	$ 420,000	$1,170,000	$2,384,000
Connecting Pipe to In-Ground Storage to Network	$ 166,000	$ 89,000	$ 245,000	$ 500,000
(84%) Design New Pressure Zone 2 Booster Station	-	$ 67,000	-	$ 67,000
(84%) New Pressure Zone 2 Booster Station Construction	-	$ 757,000	-	$ 757,000
Construction of Pipe for New Developments				TBD
Total	**$1,020,000**	**$1,333,000**	**$3,890,000**	**$6,243,000**

Wastewater Projects Covered by Development Charges

Project Name	Charged Area	Development Charges
Waste Water Treatment Plant		
Future Clarifier and Aeration/ Temporary Equalization Tank Design	Entire Network	$ 220,000.00
Future Clarifier and Aeration/ Temporary Equalization Tank Construction	Entire Network	$ 3,900,000.00
Repurpose Storm Equalization to Clarifiers/Aeration (Effluent Quality Trigger)	Entire Network	$ 2,250,000.00
Design Biosolids Storage Expansion	Entire Network	$ 310,000.00
New Biosolids Works Construction	Entire Network	$ 4,420,000.00
Design New UV Disinfection Channel	Entire Network	$ 200,000.00
New UV Disinfection Construction	Entire Network	$ 2,750,000.00
(50%) Design a New Headworks Building	Entire Network	$ 175,000.00
(50%) New Headworks Building Construction	Entire Network	$ 2,375,000.00
(50%) Design Odour Control System	Entire Network	$ 175,000.00
(50%) Odour Control System Construction	Entire Network	$ 2,550,000.00
Sewage Pumping Stations		
(75%) SPS No. 3 Upgrades Design	Area 3	$ 15,000.00
(75%) SPS No. 3 Upgrades Construction	Area 3	$ 153,750.00
SPS No. 6 Design and Construction	Area 6	TBD
Sewermain		
Centre Street Sewermain	Area 1	$ 600,000.00
Union Street Sewermain	Area 1	$ 400,000.00
Coleman Street Sewermain	Area 6	$ 420,000.00
St. Vincent Street Sewermain	Area 2	$ 370,000.00
Muir Street Sewermain	Area 2	$ 290,000.00
Nelson Street Sewermain	Area 1	$ 310,000.00
Miller Street Sewermain	Area 1	$ 250,000.00
Pearson Street Sewermain	Area 1	$ 140,000.00
Construction of new pipe at intersection of Coleman Street and Muir Street		TBD
Construction of new pipe for Union Street, Coleman Street connection		TBD
Total		**$22,273,750.00**

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Volume 1

Phase 1
Problem Identification

1.0 Background Information

1.1 Terms of Reference and Authorization

The Terms of Reference as outlined in the Request for Proposal issued by the Corporation of the Municipality of Meaford on April 3, 2014 is attached in ***Appendix A.***

1.2 Purpose of Master Plan

The Municipality of Meaford retained Ainley Group to prepare a Water and Wastewater Master Plan for the Urban Settlement Area in accordance with the Municipality's Official Plan. The purpose of the Master Plan is to identify and assess the needs of the water and wastewater systems to effectively service the existing population, any presently un-serviced parcels within the service area and future development areas. The report addresses the state of the current water and wastewater infrastructure, the future projected growth throughout the Urban Settlement Area, and identifies the preferred solution to accommodate full build-out.

A phasing plan is to be identified for each infrastructure project, allowing construction for water and wastewater infrastructure to meet future growth. The phased construction time frame is guided by development over the next 30 years, up to and including 2045.

A Class EA process for Master Plans was followed to develop the Servicing Master Plan for Meaford. During the master planning process, Phases 1 and 2 of the Municipal Class EA process were addressed. The intent of this study was to satisfy the Class EA requirements for the Schedule A, A+, and select Schedule B projects identified within the Master Plan, as well as provide the basis for future Schedule C projects. Analysis of all water and wastewater components was completed to understand where upgrades are necessary to address all servicing needs. Details of the preferred infrastructure projects, identified in the Servicing Master Plan, will be completed in succeeding reports.

Volume 1 of the Water and Wastewater Servicing Report identifies the Master Plan. The Master Plan outlines the master planning process, existing conditions, future conditions, problem identification and identifies the alternatives and preferred solution.

Volume 2 of the Water and Wastewater Servicing Report identifies the Technical Memoranda that were developed throughout the planning process. This project was undertaken based on technical memoranda that were presented at committee meetings. Each of the memoranda identifies the modelling and analysis that was undertaken during the master planning process to obtain the information identified in the Master Plan.

1.3 Study Area

The Study Area is described as the current limits of the Urban Settlement Area shown in Figure 1.

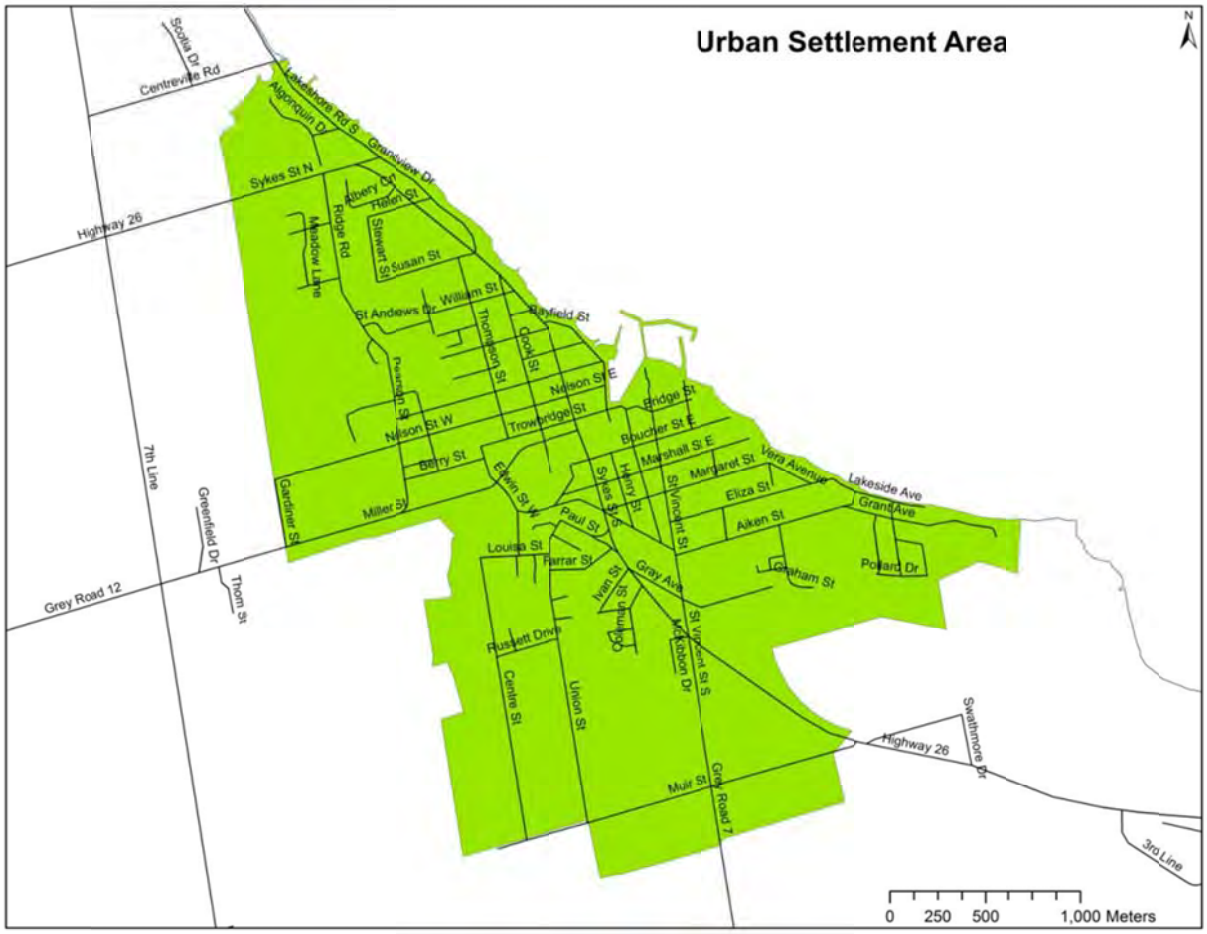


Figure 1 – Study Area for the Meaford Master Plan

The vacant land within the study area has been zoned as residential, commercial, industrial, or institutional under the Municipality's Official Plan. The zoning was used to delineate the potential growth in the Municipality of Meaford and how this growth will affect the water and wastewater systems. The expected increase in sewage flows and water demands from each type of vacant zoned land is shown in Table 1.

Table 1 – Expected Increase in Sewage Flow and Water Demand for Vacant Land in Study Area

Zone	Vacant Area (Ha)	Equivalent Units	ADF Sewage m^3/d	MDD Water m^3/d
Urban Living Area >0.2 Ha	97.8	1427.9	642.5	1028
Urban Living Area <0.2 Ha	9.18	45.9	20.6	33
Urban Living Area with Proposal	23.99	593	266.9	427.2
Highway Commercial	19.52	---	546.6	874.5
Downtown Commercial	1.1	90	67.2	107.6
Industrial	28.54	---	799.1	1,278.6
Special Policy Area 1	5.56	278	280.8	449.2
Special Policy Area 2	3.479	174	175.7	281.1
Total	**189.17**	**2608.8**	**2799.5**	**4,479.2**

Table 1 outlines the total available land left in urban Meaford that can still be developed. The vacant land has been divided into land use based on the land use designations defined in Meaford Official Plan. The number of equivalent units was calculated based on the vacant area of each type of land use. The full build-out sewage flows and water demands were than able to be calculated with total values of 2,799.5 m^3/d and 4,479.2 m^3/d respectively.

1.4 Existing Water System

The existing water distribution system infrastructure consists of a WTP, two (2) BPSs, water distribution system and water storage at the WTP and in an elevated tank.

The Meaford WTP has a rated capacity of 26,848 m^3/day which is more than adequate for the current water usage having an ADD over the past 3 years of only 1,460 m^3/day. The MDD over the past three (3) years was 2,374 m^3/day which is 8.8% of the rated capacity of the WTP and is 18.4% of the design capacity of a single highlift pump (12,890 m^3/day) at the WTP. There is more than adequate capacity to provide the current MDD supply and for substantial growth. The WTP recently underwent control system upgrades in 2013 and the plant is in good condition and is in full compliance with regulations.

The system has two (2) BPS; the St. Vincent Street BPS and the Nelson Street BPS. The St. Vincent Street BPS was constructed in 2010 and remains in good condition. The Nelson Street BPS currently does not provide adequate pressure under all demand conditions and does not comply with MOECC design guidelines.

The water distribution system is in good to fair condition. As expected with any ageing network, older pipes need to be replaced to maintain the integrity of the system. The pipe diameters are generally

adequate for the current service population, however, there is inadequate fire protection in several areas due to undersized pipes.

The total storage within the system is 2,880 m^3 and the required storage based on MOECC design guidelines is 2,166 m^3. This allows for adequate storage for existing demands and required fire flow. The storage is split between clearwell storage at the WTP of 2310 m^3 and the elevated storage tank with a capacity of 570 m^3.

1.5 Existing Wastewater System

The existing wastewater system infrastructure consists of a WWTP, five (5) SPSs and a sewage collection system.

The Meaford WWTP has an ADF over the past three (3) years of 2,600 m^3/day which is below the plant's rated capacity of 3,910 m^3/day. The hydraulic reserve capacity is equivalent to an additional 1,210 residential units as per 2013. The average biological oxygen demand and total suspended solid effluent concentrations represent fairly weak sewage strength, likely due to high stormwater/groundwater I/I rates. The plant discharges into Georgian Bay and meets the current effluent limits. The plant was constructed in 1969 and several components have yet to be updated but require extensive updates. The plant also requires the addition of several processes and an ongoing program for major maintenance due to the age of the equipment and systems. A Class EA for plant expansion in 2007 established new effluent criteria for the plant. Upgrades may be required to meet more stringent nutrient removal requirements.

The sewage collection network is aging and experiencing high levels of I/I resulting in increased network flows. Sewer upgrades have been identified through an I/I study that has been completed in conjunction with the Master Plan. The collection system has five (5) SPSs. All of the SPSs are in good physical condition, but SPSs No. 1, No. 2 and No. 3 could benefit from control system upgrades.

2.0 Summary of Master Planning Process

2.1 Background

The Municipal Class Environmental Assessment (Class EA) approved under Ontario's Environmental Assessment Act in October 2000, as amended in 2007, identifies the process by which municipal infrastructure projects are to be planned. The process identifies an approved procedure designed to protect the environment and provides an effective way of complying with the Environmental Assessment Act. The Class EA applies to infrastructure projects including municipal road, municipal transit, and municipal water and wastewater projects.

The process classifies projects with varying environmental impact in terms of schedules:

Schedule A projects have minimal adverse environmental impact and are limited in scale. These projects include normal or emergency operational and maintenance activities. They are pre-approved and may proceed without formal contact with the public.

Schedule A+ projects are pre-approved, however, require public notification prior to project implementation.

Schedule B projects have the potential for some adverse environmental effects including improvement projects and minor expansions to existing facilities. A screening process is required involving mandatory contact with directly affected public and relevant review agencies.

Schedule C projects have potential for significant environmental effects including the construction of new facilities and major expansions to existing facilities. Due to the adverse environmental impact, Schedule C projects must proceed under the full Class EA planning and documentation procedure and require that an Environmental Study Report be completed.

The planning process follows a five (5) step planning process.

- Phase 1 – Problem or Opportunity Definition
- Phase 2 – Identification and Evaluation of Alternative Solutions to Allow a Preferred Solution to be Recommended
- Phase 3 - Evaluation of Alternative Design Concepts for the Implementation of the Preferred Solution
- Phase 4 – Documentation of the Rationale, Planning, Design and Consultation Process
- Phase 5 – Implementation and Monitoring.

The Class EA Planning and Design Process Flow Chart (Figure 2) provides more detail on each phase of the planning process. The process identifies that due to varying project-specific problems, environmental issues, community issues and solutions, a varying level of project complexity is required. To accommodate this, the Class EA defines the minimum requirements for environmental assessment planning allowing the process to be customizable. A key feature to the Class EA process is early and continuous mandatory consultation with the public and those who may be affected by the undertaking. The consultation allows for the public to be informed about the project and allowed to provide input that will be integrated into the study and decision-making process.

2.2 Master Planning Procedure

The master planning process allows for a group of related projects or an overall system to be considered prior to dealing with each individual project specific issue. Master plans are long range plans that integrate existing and future infrastructure needs with environmental assessment planning principles. The master planning procedure follows the Class EA planning process where at a minimum Phases 1 and 2 must be addressed. Four (4) master planning approaches are outlined in the Class EA, however, it is suggested to adapt the approaches based on the project specific needs.

The Municipality of Meaford has prepared this Master Plan in accordance with the Class EA based generally on Approach #2. Approach #2 involves the preparation of a Master Planning document at the conclusion of Phase 1 and 2 which is sufficient to fulfill the requirements of Schedule B projects. The Municipality of Meaford has identified select Schedule B projects in the Master Plan that will require additional studies in order to provide greater detail on the geotechnical and natural environment of the project site. All Schedule C projects that are identified in the Master Plan will require the completion of Phases 3 and 4.

EXHIBIT A.2 MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

NOTE: *This flow chart is to be read in conjunction with Part A of the Municipal Class EA*

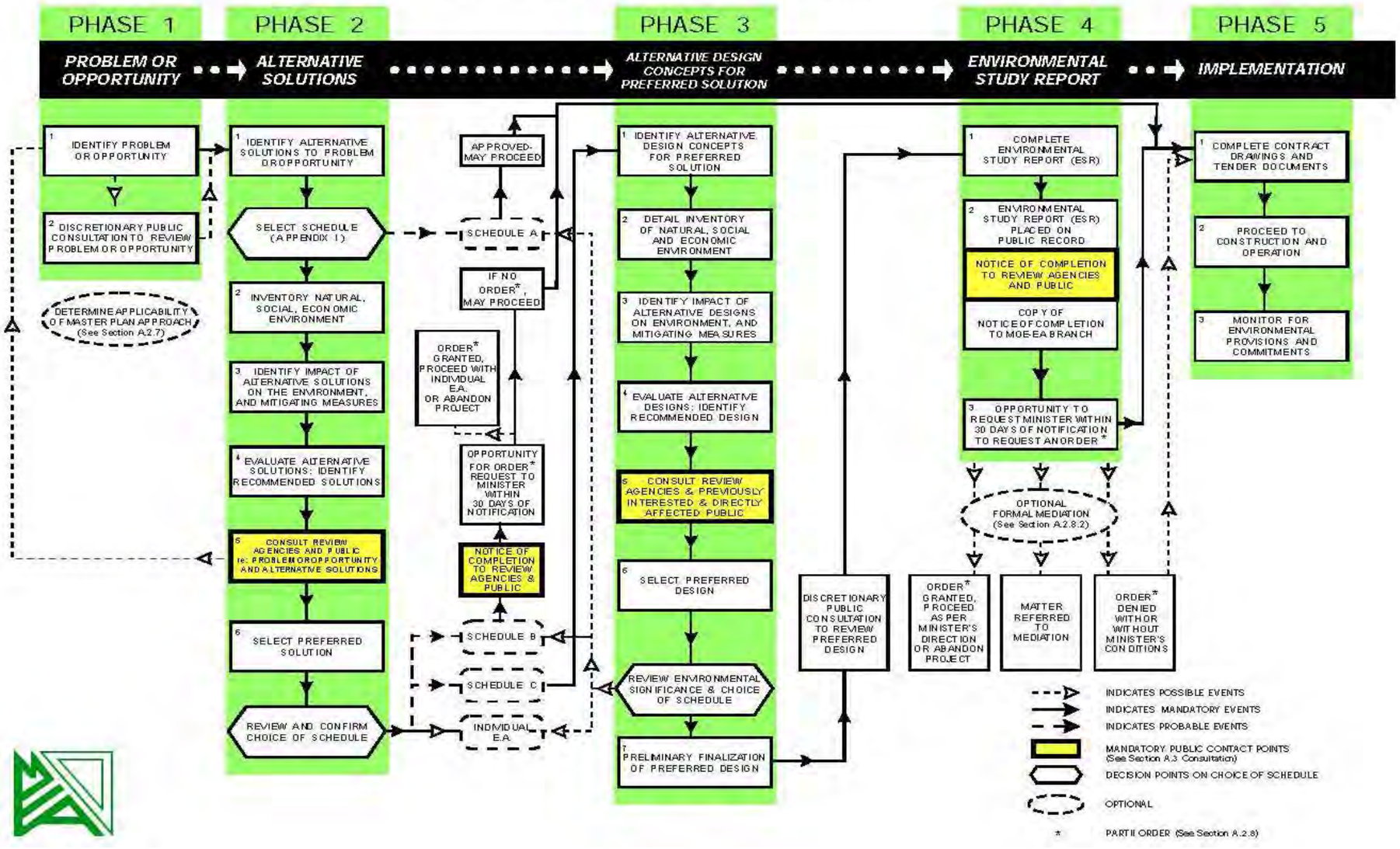


Figure 2 – Class EA Flow Chart Depicting Essential Steps for Each Phase

2.3 Steering Committee and Workshop Meetings

During the study a steering committee was formed of the following members:

- Stephen Vokes (Municipality of Meaford)
- Chris Collyer (Municipality of Meaford)
- Rob Armstrong (Municipality of Meaford)
- Darcy Chapman (Municipality of Meaford)
- Bradey Carbert (Municipality of Meaford)
- Gary Scott (Ainley)
- Simon Glass (Ainley)
- Julia Roest (Ainley)

During the project the Steering Committee met to discuss the master planning process on 5 occasions. Two (2) additional workshop meetings were conducted to develop and discuss content of the PIC boards for Phase 1 and Phase 2 PICs.

2.4 Participation by Public, Review Agencies and Others

Public and agency consultation is mandatory during a master planning process under the requirements of the Class EA process. For this project, public and agency participation was integral to the development and evaluation of the servicing alternatives at different points in the planning process.

The public and review agencies were contacted with four (4) different notices throughout the Class EA process. A notice of commencement was sent out on July 4, 2014 to provide information on the study, process and how to get involved. The second notice was for the Phase 1 PIC which was sent out on August 27, 2014. The Phase 1 PIC took place on September 15, 2014 from 7-9pm at the Meaford Hall. Comments regarding the Phase 1 PIC were received until September 29, 2014. The third notice was send out on February 19, 2015 regarding the Phase 2 PIC which took place on February 26, 2015 from 7-9pm at the Meaford Hall. The Phase 2 PIC identified the water and wastewater alternatives and comments were received until March 12, 2014. The final notice was published on May 13, 2015 in regards to the study completion. The Notices were put in the Meaford Express and copies of the notice were sent out to each of the review agencies separately. A copy of the notices and PIC boards is attached in ***Appendix D***. The comments and input received were taken into consideration during the planning processes following the PICs.

The review agencies that were included in the mailing list are shown in Table 2.

Table 2 – List of Public and Review Agencies

Provincial & Federal Agencies

- Environment Canada - Environmental Protection Operations Division - Ontario Region
- Ministry of Environment and Climate Change - Southwest Region
- Ministry of the Environment - Owen Sound District Office - Drinking Water Management Division
- Canadian Environmental Assessment Agency
- Fisheries & Oceans Canada
- Transport Canada - Ontario Region
- Transport Canada - Marine Safety & Security Ontario Region
- Ontario Clean Water Agency
- Ministries of Tourism - Culture & Sport
- Ministry of Natural Resources - Midhurst District
- Ontario Ministry of Agriculture - Food and Rural Affairs
- Ministry of Transportation - Corridor Management Section, West Region
- Ministry of Municipal Affairs and Housing

Local Government & Other Agencies

- Grey Sauble Conservation Authority
- The Corporation of the County of Grey
- The Town of The Blue Mountains
- Municipality of Grey Highlands
- Township of Chatsworth
- City of Owen Sound
- Township of Georgian Bluffs
- Bruce-Grey Catholic District School Board
- Bluewater District School Board
- Student Transportation Service Consortium of Grey Bruce
- Land Ambulance EMS - Grey County
- Ontario Provincial Police
- Grey County Historical Society
- Grey Bruce Health Services
- Grey Bruce Health Unit
- SCS Consulting Group Ltd.

Aboriginal Consultation

- Ministry of Aboriginal Affairs
- Aboriginal Affairs & Northern Development Canada Consultation Unit
- The Metis Nation of Ontario
- Chiefs of Ontario
- Native Affairs Secretariat
- Metis National Council
- Georgian Bay Metis Council
- Moon River Metis Council
- M'Chigeeng First Nation
- Mississauga's of Scugog Island First Nation
- Mississauga's of the Credit
- Mohawks of Akwesasne
- Mohawks of the Bay of Quinte
- Moose Deer Point
- Saugeen First Nation
- Sheguiandah

- Aamjiwnaang
- Alderville First Nation
- Aundeck-Omni-Kaning
- Beausoleil First Nation
- Chippewas of Georgina Island
- Chippewas of Kettle and Stony Point
- Chippewas of Nawash First Nation
- Chippewas of Rama First Nation
- Chippewas of the Thames First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Six Nations of the Grand River
- Wahta Mohawk
- Walpole Island
- Wasauksing First Nation
- Zhiibaahaasing First Nation
- Saugeen Ojibway nation Environment Office
- Historic Saugeen Metis
- Great Lakes Metis Council
- Chippewas of Rama First Nation
- Hiawatha First nation
- Metis Nation of Ontario

Utilities

- Rogers Communications Inc.
- Powerstream Inc.
- Bell Aliant
- Hydro One
- Enbridge Gas

3.0 Existing Conditions

3.1 General

The Municipality of Meaford is located in Grey County and is bounded by the City of Owen Sound to the west, the Town of Blue Mountains to the east and the Georgian Bay shoreline to the north. The socio-economic environment in Meaford is influenced by the waterfront location with a strong recreational tourist-based economy. Other industries that are also prevalent in the Municipality are the aggregate and agricultural industries.

The study area is defined as the Urban Settlement Area. Meaford hopes to manage and increase growth in this area over the next twenty (20) years. Growth is expected to take place in the waterfront area, downtown and within the older industrial areas and areas designated "Future Urban Expansion" located primarily on the west side of the Meaford Urban Area. The planned growth is within the area serviced by municipal sewer and water services.

3.2 Summary and Background of Reports

A listing of the background documents reviewed in the efforts to complete the Master Plan is contained herein.

Wastewater System Background Information

- 2004 Sanitary Sewer Collection System Model (Ainley Group)
- 2010 Sanitary Sewer Model Update (Ainley Group)
- 2007 Meaford WWTP Class EA Document (EarthTech)
- Meaford Wastewater Treatment Plant Certificate of Approval
- Bighead Pumping Station Certificate of Approval
- 2010, 2013 Sewage Uncommitted Reserve Capacity Reports
- 2006 – 2013 WWTP Annual Reports (OCWA)
- 2006 – 2013 Bighead Pumping Station Annual Reports
- Assimilative Capacity Technical Memorandum (GENIVAR)
- 2006 WWTP Capacity Analysis (Ainley Group)
- 2006 Peer Review of Capacity Analysis (Hydromantis)
- 2008 MOECC Design Guidelines for Sewage Works

Water System Background Information

- Water Treatment Plant Certificate of Approval
- 2009 Ultimate Water Supply & Distribution System Model Update (Ainley Group)
- 2006 – 2013 WTP Annual Reports (OCWA)
- 2008 MOECC Design Guidelines for Drinking Water Works

Planning Information

- 2014 Municipality of Meaford Official Plan
- Meaford Zoning By-Law
- 2008 Grey County Growth Management Strategy Report

3.3 Existing Municipal Water System

3.3.1 General

The existing water system in the Municipality of Meaford consists of approximately 57,500 m of watermain, 2,310 m³ of available clear well storage at the WTP and 570 m³ storage in an elevated storage tank, and two (2) BPSs.

The water distribution system, the WTP, the elevated storage tank and BPSs are owned by the Municipality of Meaford and operated and maintained by the Municipality of Meaford Operations Department.

3.3.2 Watermains

The Meaford water distribution system is made up of 57,500 m of watermain. The watermain ranges in size from 50 mm to 400 mm with some water service connections of 25 mm. Pipe replacements and network expansion has resulted in a significant range in the age of pipes in the Meaford system. The age ranges from newly constructed pipes to pipes approximately 120 years old, with the majority of pipes being constructed between 1945 and 1965. The watermains are constructed from several different materials including asbestos cement, cast iron, ductile iron and PVC as well as copper for the water services.

3.3.3 Water Storage Reservoirs

The water distribution system includes two (2) storage facilities (one (1) in-ground reservoir and one (1) elevated water storage tank). The elevated water storage tank is located in the vicinity of Trowbridge Street and Owen Street having a capacity of 570 m^3. The in-ground storage is located at the WTP with a capacity of 2,310 m^3. The total usable storage volume of the system is 2880 m^3.

Based on MOECC design guidelines, the required storage for the Municipality of Meaford at its current population is 2,166.1 m^3. There is therefore adequate storage supply within the system. It is noted that 80% of available storage (74% of presently required storage) is located at the WTP as pumped storage. This means that the high lift pumps must be capable of meeting 80% of peak hour's demands and 80% of MDD plus fire-flow. Based on the existing population, the high lift pumps must meet 80% of MDD of 26.5 L/s plus 145 L/s or 80% of 171.5 L/s which is 137.2 L/s which is less than the capacity of one (1) pump.

3.3.4 Water Booster Pump Stations

The water distribution system currently has three (3) pressures zones:

- Pressure Zone - 1: Covers the majority of the Municipality of Meaford and is located in the north east end from lake level extending south.

- Pressure Zone - 2 (Nelson Street BPS Pressure Zone): Located in the west end serviced by a BPS on Nelson Street. It is separated from Pressure Zone 1 by gate valves on Pearson Street and Glen Abbey Court and Collingwood Street between Thompson Street and Noble Street
- Pressure Zone - 3 (St. Vincent Street BPS Pressure Zone): Located in the south end serviced by a BPS on St. Vincent Street. It is separated from Pressure Zone 1 by gate valves on Edwin Street, between Lorne Street and Legion Road and on St. Vincent Street South of Aiken Street.

Refer to Figure 3 for a map of the pressure zones and locations of water facilities for the Municipality of Meaford.

Two (2) BPS are in operation to service Pressure Zones 2 and 3. Nelson Street BPS feeds into Pressure Zone 2 and the St. Vincent Street BPS feeds into Pressure Zone 3.

Nelson Street BPS is located in the west end of the system on Nelson Street between Thompson Street and Noble Street. The BPS has one (1) pump with a capacity of 19 L/s at 27 m of TDH. The pump runs continuously to provide zone pressure. The station does not meet fire flow requirements for the pressure zone. The Nelson Street BPS is an older facility without any standby pumping or power supply.

St. Vincent Street BPS is located on St. Vincent Street south of Aikin Street. The BPS has five (5) vertical multi-stage duty pumps each rated at 22 L/s at 37 m TDH and one (1) low flow protection pre-pressurized well tank to help maintain system pressures at low to no flow conditions. The St. Vincent Street BPS was constructed in 2010 and is complete with standby power.

3.3.5 Water Treatment Plant

The WTP that provides potable water to the Urban Settlement Area takes raw water from Georgian Bay. The plant is located at 574 Grandview Drive in the Municipality of Meaford with a rated capacity (MDD) of 26,848 m^3/day (311L/s) comprised of:

- Raw Water intake from Georgian Bay
- A low-lift pumping station with one (1) raw water well equipped with one (1) manually cleaned screen and two (2) low-lift pumps, one (1) duty and one (1) standby, each having a rated capacity of 311 L/s at 16.2 m TDH
- A treatment system consisting of an in-line mixer and polyaluminum chloride feed system for coagulation, a filter system (two (2) filters), a UV disinfection system (primary disinfection) plus gas chlorination for secondary disinfection and protection of the distribution system.
- A clearwell comprising two (2) cells in series with Cell 1 providing storage of 920 m^3 and Cell 2 providing storage of 1,390m^3,for a total treated water storage volume of 2,310m^3
- A high-lift pumping station equipped with three (3) high-lift pumps, two (2) duty and one (1) standby, each having a rated capacity of 149.2 L/s at 76.2 m TDH. A Singer pressure relief valve on the discharge side of the high-lift pump is set to limit the discharge pressure from the WTP to approximately 550 kPa. Under normal operating conditions only one (1) pump operates at a time. The operator chooses the lead pump. Water level in the elevated tank controls the high-lift pumps.

WATER TREATMENT PLANT

NELSON STREET BPS

WATER TOWER

ST. VINCENT STREET BPS

GEORGIAN BAY

MEAFORD HARBOUR

MEAFORD BASIN

PLOT 1=6

25 50 150 250m
50 0 100 200

NOTES

ZONE 1
ZONE 2
ZONE 3

CONTRACT DRAWINGS:
Contractor must verify all dimensions and be responsible for same. Any discrepancies must be reported to the Engineer before commencing work. Drawings are not to be scaled.
Ainley & Associates Limited claims copyright to this drawing and it may not be used for any purpose other than that stipulated in the contract between the owner/client and the Engineer without the express written consent of Ainley & Associates Limited.

NO.	REVISIONS	DATE	INITIAL

Not Valid Unless Signed And Dated

SCALE: 1:6000
DESIGN: N.E.S.
DRAWN: P.C.S.
CHECKED: N.E.S.
DATE: APRIL 2012

MUNICIPALITY OF MEAFORD
WATER SUPPLY AND DISTRIBUTION

EXISTING PRESSURE ZONE BOUNDARIES

Ainley GROUP
CONSULTING ENGINEERS PLANNERS

CONTRACT No.

DWG. 114106-WATER

- A wastewater residual management system consisting of a surge tank with transfer pumps, a treatment clarifier, chemical feed systems to enhance filter backwash wastewater settling and for dechlorination of backwash wastewater and filter to waste water, and two (2) sludge pumps to pump sludge from the treatment clarifier into the sanitary sewer
- Standby power
- The plant appears to be in full compliance with MOECC regulations and does not require upgrades, except ongoing regular maintenance, to service the existing community.

3.4 Existing Municipal Wastewater System

3.4.1 General

In total the Municipality has five (5) SPSs to service the urban area. All flows captured within the system are conveyed to the Meaford WWTP located on Grant Avenue owned by the Municipality and operated by OCWA.

Through the Municipality's effort to catalog the condition of the sewer system by CCTV inspection, several major deficiencies have been identified. Most notably a series of cracks, holes and failed connections were identified along Sykes Street between MH 10750 and MH 10720 North of the Bighead River. To a lesser degree, cracks and breaks have been identified on Trowbridge Street and Boucher Street. Encrustation issues have been identified at numerous locations throughout the sewer network.

3.4.2 Sewers

The majority of the Meaford urban area is serviced by a Municipal sanitary sewer system consisting of a network of gravity sewers and five (5) SPSs. This system comprises approximately 35,080 m of gravity sewer pipe and approximately 2,140 m of forcemain. Based on the existing information from as-built Record Drawings, the majority of the network varies in age from 25-45 years consisting predominantly of pre-cast concrete, asbestos cement and PVC pipe. A major portion of the flows, approximately 80 percent, is directed to a centrally located SPS (SPS No. 1) on the east side of the Bighead River.

3.4.3 Wastewater Pumping Stations

The Meaford wastewater collection system has five (5) catchment areas designated by the five (5) SPSs situated throughout the urban area.

- Area – 1: Located in the south west portion of the sewage collection system that feeds into SPS No. 1 and makes up the largest catchment area in the network.
- Area – 2: Located in the south east portion of the network mostly located east of St Vincent Street. It feeds into SPS No. 2
- Area – 3: Located in the north section of the sewage collection system encompassing everything north of Susan Street. This area feeds into SPS No. 3 which then feeds into area 1.
- Area – 4: Encompasses only the Knight of Meaford Lumber Factory that feeds into SPS No. 4. Area 4 then feeds into area 1.
- Area – 5: Encompasses only the marina and Canadian Coast Guard and Harbour Masters Offices feeding into SPS No. 5. Area 5 then feeds into area 1.

3.4.3.1 Sewage Pumping Station No. 1

SPS No. 1, also known as the Bighead River SPS, is located east of Sykes Street and south of the Bighead River. A double barrel inverted siphon connects the area north of the Bighead River to the SPS. The station was reconstructed in 1991 and consists of a reinforced concrete wet well divided into two (2) compartments by a common wall.

The station is equipped with four (4) 66 kW submersible pumps, three (3) duty and one (1) standby, each rated at 104.6 L/s at a TDH of 25.5 m. The station also includes a below grade reinforced concrete control building structure housing a standby diesel generator, fuel supply, flow meter, all associated piping, heating, ventilation, electrical and control system.

There is a 600 mm diameter overflow pipe with provision for installing chlorination equipment to disinfect any raw sewage overflows to the Bighead River. A 300 mm diameter forcemain connects the Bighead River SPS to the WWTP located at 35 Grant Avenue in the south east end of Meaford.

3.4.3.2 Sewage Pumping Station No. 2

SPS No. 2 was constructed at the WWTP site in 1978 to service the southeast area of Meaford. The station is a wet well/dry well facility equipped with two (2) variable speed 37 kW pumps (Fairbanks Morse model 5414) complete with Benshaw VFD drives. The wet well has a storage capacity of approximately 22 m^3. Flow monitoring at the station is done using an Endress & Hauser magnetic flow meter and a seven (7) day circular chart recorder.

Overflow from SPS No. 2 is directed to the maintenance hatch at the shore of Georgian Bay at the end of Aiken Street. Overflow will only occur following the surcharging of the sewer system and requires manual operation of a gate located on a 450 mm diameter cross line to the existing 600 mm plant outfall line.

3.4.3.3 Sewage Pumping Station No. 3

SPS No. 3 is located on the east side of Sykes Street North directly north of Pete's Creek, approximately 150 m southeast of Grandview Drive. The station services a small residential area at the northwest end of the Urban Municipality. All flow passing through this station is pumped into the gravity sewer that eventually passes through the inverted siphon and into SPS No. 1. The station is equipped with one (1) 12.5 L/s at 9.6 m TDH pump and one (1) 2.2 kW pump rated for 3 L/s.

3.4.3.4 Sewage Pumping Station No. 4

SPS No. 4, located at the east end of Boucher Street, services Stanley Knights Limited. The station is equipped with two (2), 2.2 kW Myers pumps. Flow passing through this station is lifted to the gravity sewer on Boucher Street to flow by gravity to SPS No. 1.

3.4.3.5 Sewage Pumping Station No. 5

SPS No. 5 located on St. Vincent Street services the Canadian Coast Guard and Harbour Masters Offices as well as some washrooms located at the Marina. The station is equipped with two (2), 1.5 kW Myers pumps. Flow passing through this station is lifted to the gravity sewer on St. Vincent Street to flow by gravity to SPS No. 1.

3.4.4 Wastewater Treatment Plant

The Meaford WWTP was constructed in 1969 and started service in 1970. The plant is a high rate activated sludge process plant with continuous discharge (after UV disinfection) into Georgian Bay and aerobic digestion with land disposal of biosolids. The plant has no processes specifically for phosphorous removal. The plant is located in a residential area that can be liable to noise and odour complaints. The plant is rated for an ADF of 3,910 m^3/day comprised of:

- The head works consists of one (1) coarse bar screen with 25 mm bar spacing and one (1) automatic fine bar screen with 3 mm openings. There is also an aeration and secondary clarifier bypass line and odour suppression equipment that can be introduced into the headworks channel on an as-required basis.
- There are two (2) circular aeration tanks, operating in parallel, each with an internal diameter of 10.9 m and SWD of 5.9 m. There is a fine air bubble diffuser system in each of the aeration tanks.
- Two (2) circular secondary clarifiers operate in parallel with an internal diameter of 12.2 m and a SWD of 2.9 m. In each of the clarifiers there is a mechanical rake arm and skimmer blades, hopper, scum trough, scum baffles and weir plates.
- The parshall flume chamber is equipped with continuous level transmitters.
- UV disinfection in two (2) channels, one (1) of which is equipped with independently power UV lamp modules and one (1) channel equipped with weir and isolation gates for future UV lamp modules. There is also a UV bypass pipe and isolation valve.
- The WAS and RAS pumping stations each have two (2) pumps. The WAS pumps discharge into the biosolids treatment facility. The RAS pumps discharge into the headworks.
- The biosolids stabilization and storage facility consists of one (1) two (2) stage aerobic digester complete with the following: two (2) air blowers, three (3) sludge transfer/decanting pumps, one (1) two (2) celled liquid biosolids storage tank and one (1) biosolids transfer building.
- The septage and leachate receiving facility consists of one (1) below grade concrete storage tank with an approximate volume of 80 m^3.
- The Outfall sewer is 600 mm in diameter, extending approximately 450 m into Georgian Bay opposite the end of Aikin Street.

3.5 Natural Environment

Meaford's significant natural features include the Georgian Bay shorelines, the Bighead River and the Niagara Escarpment. The Bighead River is an extensive 30km system with associated tributaries discharging into Georgian Bay. The Bighead River is known to have the following fish species inhabit it; rainbow trout, brown trout, bass, whitefish and Chinook salmon. With this variety of fish, the Bighead River is a popular location for recreational and sport fishing. The Niagara Escarpment is located outside of the boundaries of the Meaford Urban Area so does not fall within the study area of the Master Plan. Additional natural features of Meaford include forests, rolling valleys and wetlands. Several environmentally protected area corridors surrounding the watercourse system are located west of Meaford's WWTP. Directly south of Meaford's WWTP are the shorelines of the old Lake Algonquin.

A map of the various environmental features, located within the Municipality of Meaford, can be found in ***Appendix B*** of Meaford's Official Plan. Additional maps in the Master Plan identify land use and transportation.

4.0 Future Conditions

To fully understand the Municipality of Meaford's water and wastewater infrastructure needs, future conditions were assessed. Full build-out conditions were estimated using population growth data and land development planning, outlined in Meaford's Official Plan. Full build-out is defined as the complete development of all available land within the urban area as described by the Official Plan.

4.1 Population Growth

The Grey County Growth Management Strategy Report completed by Malone Given Parsons Ltd. was submitted to The Corporation of the County of Grey in April 2008. The report provides growth projections for Municipalities within the Grey County. The population projections for the Municipality of Meaford are detailed in Table 3. Population within the municipal area is predicted to increase by approximately 5% every five (5) years until 2021.

Table 3 - Population Growth for the Municipality of Meaford

	2006	2011	2016	2021	2026	2031
Municipality of Meaford	11,400	12,000	12,500	13,100	13,300	13,500

Historically, growth within the Municipality of Meaford has occurred predominantly within the rural areas. Between 2001 and 2006, the number of dwellings in the urban area increased by 104 and the number of dwellings in the rural area increased by 212. This corresponds to a growth allocation of 33% in the urban area and 67% in the rural area. The Growth Management Strategy Report suggests that Municipalities should adopt policies that will encourage growth within the urban area and discourage growth in the rural area. The Municipality of Meaford was assigned a target to achieve 60% of total growth within the urban area.

The Official Plan for the Municipality of Meaford consolidated on May 14th 2014 has adopted several policies to encourage infilling and intensification of the urban area and discourage further development of the surrounding rural area. The Official Plan projects a total increase of 1,100 new households between 2006 and 2026 for a population increase of 1,900. It is the goal of the Municipality to have 990 or 90% of the additional dwellings within the urban area. For the growth within the urban area, a minimum target of 10% or 99 homes are to be established through intensification.

Census data, retrieved from Statistics Canada's website on July 30th, 2014, states that the total population in 2006 for the urban area was 4,686 and increased to 4,992 by 2011, an increase of 306 residents. The population of the Municipality increased from 10,948 in 2006 to 11,100 in 2011, an increase of 152 residents. This suggests that there is a net influx to the urban Municiaplity and a net

efflux from the rural area. It also suggests that the Municipality's recent efforts to promote growth within the urban area have been successful and that achieving the goal of having 90% of new residents settle in the urban area is attainable.

Assuming that the Municipality is able to continue meeting the 90% urban settlement goal, the population within the urban area is projected in Table 4. The projections in Table 4 were made by allocating 90% of the projected population increase for the Municipality to the urban area.

Table 4 - Population Growth for the Urban Area of Meaford

	2006	2011	2016	2021	2026	2031
Meaford Urban Area	4,686*	4,992*	5,442	5,982	6,162	6,342

*Statistics Canada census data.

The Schedule C Class EA for the WWTP completed in 2007 also provided population projections. The report presented a "Low" and "High" forecast for population growth within the municipal area as presented below in Table 5.

Table 5 - 2007 Municipal Class EA Population Forecasts

	2006	2011	2016	2021	2026	2031
Low Forecast	4,811	5,932	7,438	8,944	10,450	11,957
High Forecast	4,883	6,148	8,156	10,164	12,173	14,181

The population growth anticipated under the Grey County Growth Management Strategy is considerably lower than the growth that was projected in 2007 for the Class EA of the WWTP. Based on the current growth over the past 8 years, the forecast from the Grey County report appears to be more in-touch with the actual trends. A comparison of the growth forecasts is presented in Figure 4.

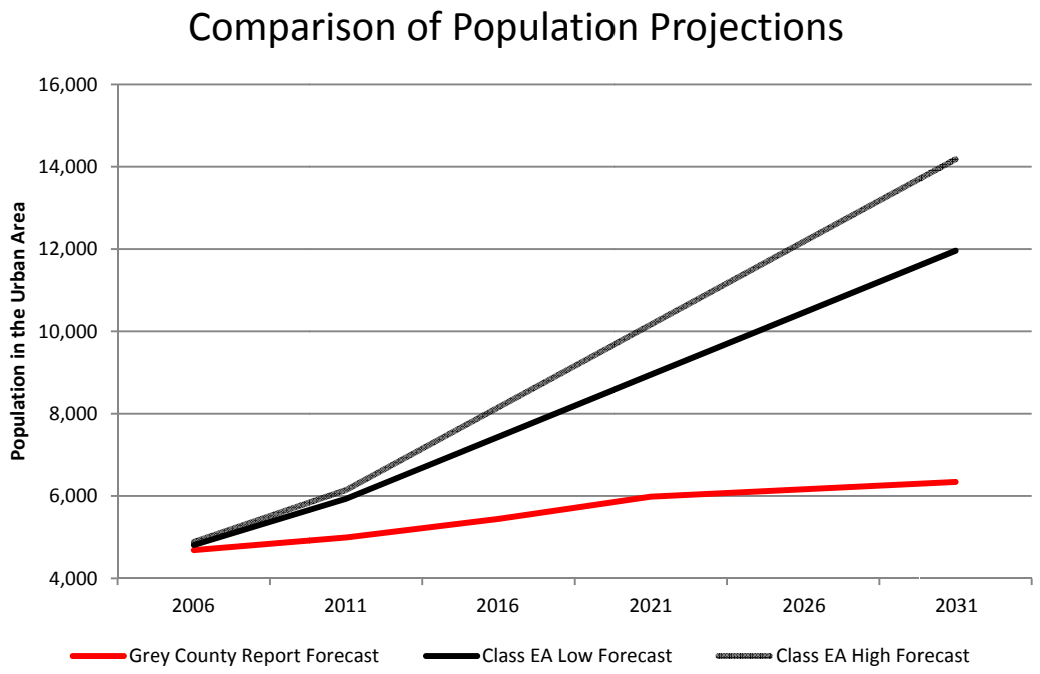


Figure 4 - Comparison of Growth Forecasts

4.2 Water Demand Projections

To determine the necessary water infrastructure needed to adequately service the Municipality of Meaford, it is necessary to first consider the full build-out scenario assuming the development of all vacant land in the urban area in accordance with the Official Plan of the Municipality of Meaford. Based on the current zoning and amount of vacant land, the ultimate water demand was estimated. The additional water use for the urban area is estimated at 4,040 m^3/d upon ultimate build-out which is significantly greater than the current water demand of 1,460 m^3/d. The ultimate build-out flow will be used to estimate the need for upgrading existing infrastructure such as the following:

- Watermain size
- Water storage capacity expansion
- Additional water BPSs or upgrades to existing stations

The water use is expected to increase proportionately with the population of the urban area. The MOECC Design Guidelines suggest that water systems should be based on 450 L/cap/day on the high range. Based on data from other Municipalities in Ontario, the average water use is about 350L/cap/day. The average of the past three (3) years per capita flow rate in the Municipality of Meaford is 287 L/cap/day. The WTP capacity is 26,848 m^3/day which is significantly larger than the daily flow. The water use projection for 2031 show the high, moderate, and water use flow is shown in Figure 5 below.

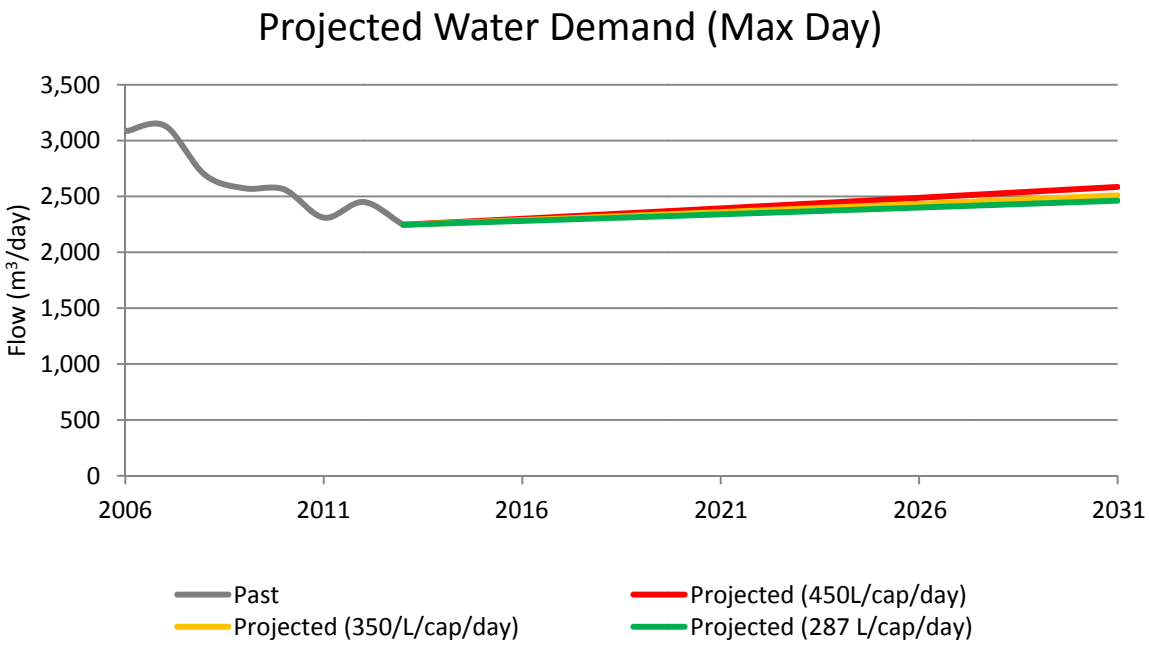


Figure 5 - Water Use Projection for 2031

4.3 Wastewater Flow Projections

Wastewater flows were also projected based on the ultimate build-out using the Official Plan of the Municipality of Meaford. Based on the amount of vacant land and zoning, it is estimated that an additional 4,040m³/d of sewage flow will be produced by the urban area when fully developed. The current ADF is 2,600 m³/d. The ultimate build-out flow will be used to examine the need for upgrades to existing infrastucture such as the following:

- Sewermain size
- Treatment plant expansions
- Additional SPSs or upgrades to existing stations

The sewage flow is expected to increase proportionately with the population of the urban area. The Municipality allots reserve capacity to planned developments on the assumption that the average household has 2.4 persons, each contributing 540 L/day of sewage flows. MOECC design guidelines suggest the design of sewage systems should be based on an average flow rate of 450 L/cap/day. Other Municipalities in Ontario have been able to achieve very low per capita flow rates through a combination of water use reduction strategies and the elimination of I/I issues. A high, moderate and low projection of sewage flow for 2031 is shown in Figure 6 below.

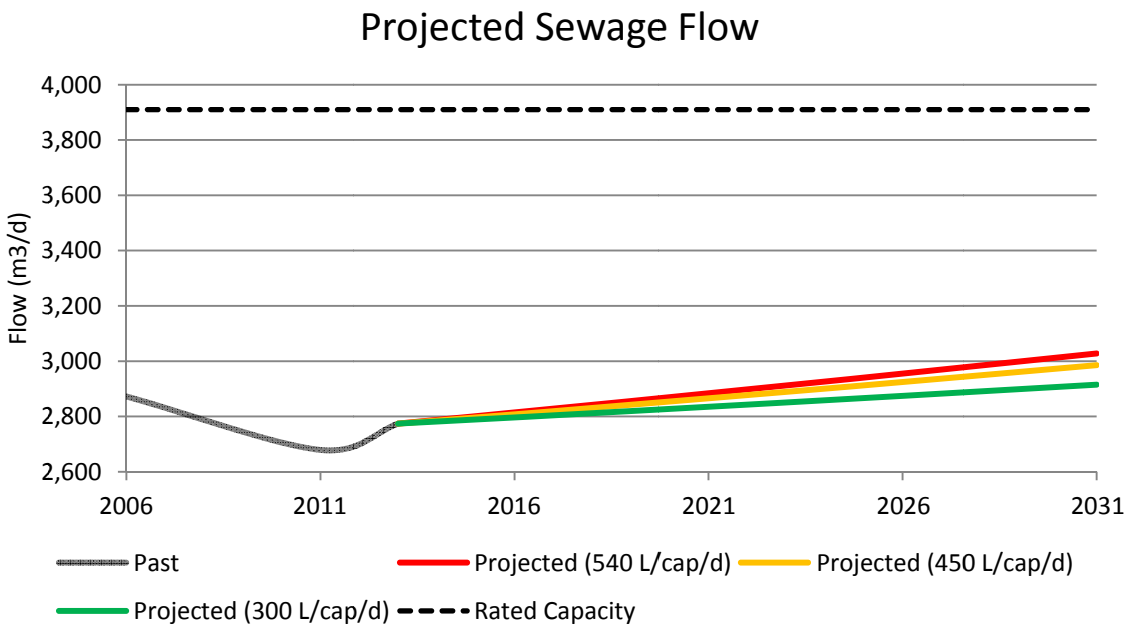


Figure 6 - Sewage Flow Projection to 2031

5.0 Problem Identification

5.1 Problem Statement

The function of the problem statement for the Meaford Master Plan Class EA is to outline the starting point of the undertaking and define the project scope.

Following evaluation of the existing systems and the projected growth based on the Official Plan, the problem statement for the Meaford Master Plan is outlined below.

The Meaford Water and Wastewater systems must continue to meet the needs of the community in the most economical and sustainable manner, in full compliance with regulations, and with minimal impact on the natural environment. As such, the existing systems have been reviewed to identify and define their condition, compliance and performance-related issues that might affect the ability of the systems to meet future needs. As a result, this master servicing study will address:

Water Supply

- The replacement/ rehabilitation of undersized and older watermains to provide adequate pressures and fire flows within the existing community.
- Existing pressure zone boundaries and BPS requirements to provide for replacement of the existing Nelson St. BPS, to meet the needs of growth in the study area and to provide a reliable and secure system.
- Additional watermains to meet the needs of growth in the study area.

- Water storage to meet the needs of growth in the study area and to provide a reliable and secure system.

Wastewater Collection

- The replacement/ rehabilitation of deficient sewermains identified through I/I studies.
- Components of the WWTP are over 45 years old and require upgrading to meet future needs.
- Peak flows to the WWTP exceed the design capacity of some treatment processes.
- Improvements to the plant control systems have the potential to improve plant performance and reduce energy use.
- An addendum to the 2007 Schedule C Class EA will be required to address revised flow projections and to take account of reductions to peak flows as a result of wastewater system improvements.
- Upgrades may be required to meet the revised effluent requirements.

5.2 Water – Capacity of Existing Watermains

The water distribution system in Meaford has a substantial need for watermain rehabilitation and replacement based on the age, size and material of the pipes. The current system experiences both flow and pressure problems. The most significant problem with the network is the existence of 100 mm primarily cast iron watermains. MOECC guidelines state that for systems designed to provide fire protection, the diameter of watermains should be a minimum of 150 mm. Figure 7 shows the system nodes with inadequate fire flow (fire flow less than 38 L/s) during MDD and fire flow conditions. Figure 7 also shows all 100 mm diameter pipes in red.

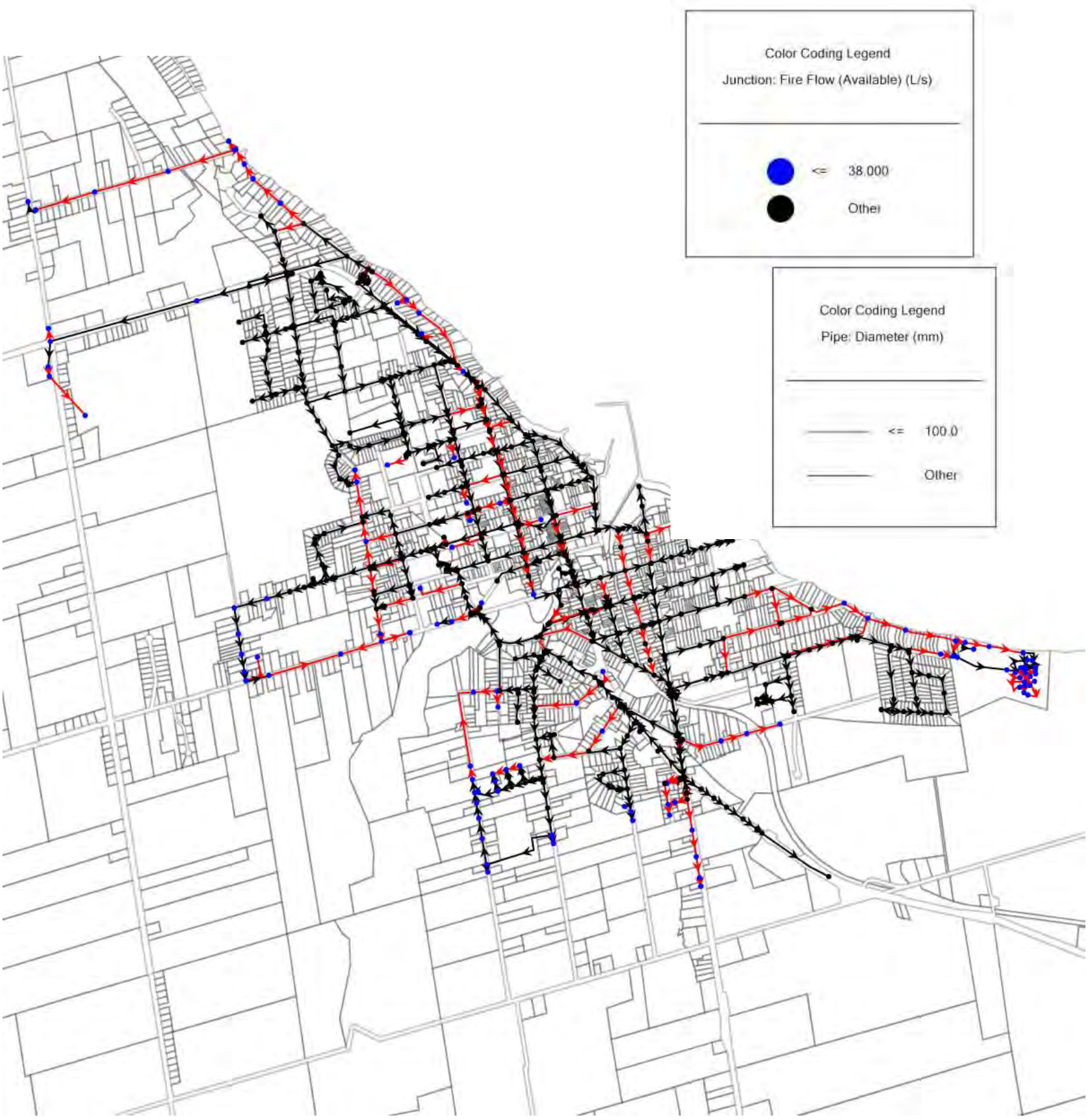


Figure 7 – Identification of 100 mm Diameter Pipes and Nodes with Unacceptable Fire Flow

From Figure 7 it can be seen that inadequate fire flow occurs mainly in areas that are serviced by 100 mm watermain. Replacing these sections of pipe with 150 mm diameter watermain provides adequate fire flow conditions. The replacement of these pipes will also allow compliance with MOECC guidelines.

Additionally, all cast iron pipes in the system are of concern due to their age ranging from 50-100 years. Cast iron watermains are known to experience corrosion and tuberculation which both negatively affect flow and remaining life. Corrosion affects the structural integrity of the pipe increasing the chance of a watermain break. Tuberculation causes a buildup of corrosion material inside the pipe resulting in decreased pipe capacity. To provide improved and more reliable service to the water customers in Meaford, these pipes should be scheduled for repair or replacement within the master plan program.

5.3 Water – Capacity of Existing Water Storage Reservoir

With a current water storage reservoir capacity of 2,880 m^3, the Municipality of Meaford has adequate capacity for the existing population. Based on MOECC storage requirements, the current storage can service a population of 5,806 people. The MOECC outlines the method for obtaining the total treated water storage requirements for a system. With expected growth in the urban area and a full build-out population of approximately 12,000 people, calculations for required storage volume were completed and are shown below. Based on the full build-out population, a fire flow of 209.67 L/s for a duration of 3 hours was used in accordance with MOECC Guidelines. A maximum day factor of 1.6707 (from existing data) was used to calculate the MDD.

Total Treated Water Storage Requirements = A + B + C

Where: A = Fire Storage;
B = Equalization Storage (25% of MDD); and
C = Emergency Storage (25% of A + B)

Table 6 – Treated Water Storage Required Volumes

	Required Volume
A	2,264.40
B	1,503.67
C	942.02
Total Storage	**4,710.09**

Based on full build-out an additional 1,830 m^3 of storage will be required resulting in a total storage volume of 4,710 m^3.

With the majority of the current storage being located at the WTP on the north side of the community, it is suggested that overall system security be considered when locating the additional water storage. The added storage should provide security for peak demands and fire flow across the entire system.

5.4 Water – Capacity of Existing Water Booster Stations

The Meaford water distribution system has two (2) BPS, Nelson Street BPS and St. Vincent Street BPS, to maintain adequate pressure throughout the system. Modelling was completed to analyze system

pressures for the existing demand scenario and for the full build-out scenario. The modelling results show how the BPSs perform under existing and full build-out scenarios. Figures 8 and 9 provide the modelling results during MDD plus fire flow for existing conditions and full build-out conditions respectively.



Figure 8 – Existing Conditions for Available Fire Flow during Maximum Day Demand



Figure 9 – Full Build-Out Conditions for Available Fire Flow during Maximum Day Demand

The system pressures during MDD and fire flow show that the Nelson Street BPS is not sized adequately for full build-out conditions and cannot provide adequate fire flow under existing conditions. This BPS has only one (1) pump with no standby power or additional standby pumps. This is of greater concern, as the Meaford Hospital is located in the Nelson Street Booster Zone and requires adequate pressure to reduce potential consequences. The current BPS is located in the road right of way in a buried chamber with no room for expansion. To increase the system pressures and fire flow in the Nelson Street Booster Zone to an acceptable level, a new BPS needs to be constructed.

The St. Vincent Street BPS was constructed in 2010 and provides adequate pressure to St. Vincent Street Booster Zone during existing and full build-out conditions. This BPS has the necessary duty and standby pumps in place to deal with the planned expansion in the south end of Meaford. Analysis of the existing conditions shows that there are several areas of low pressure in the St. Vincent Street Booster Zone. The low pressure is primarily due to undersized pipes.

The main pressure zone encompasses the majority of urban Meaford including the urban core, and extends from the lake level to approximately the 202 m elevation contour. It is supplied directly from the WTP high lift pumps. Pressure is controlled based on the existing elevated tank which controls the high lift pump cycling. Based on the minimum elevated tank level of 228 m elevation, a static water pressure of only 26 m (265 KPa) is available at the Pressure Zone 2 pressure boundary, which is inadequate to meet the minimum pressure requirement for the pressure zone. The water model shows that properties to the north of Pressure Zone 2 exhibit low pressures and this area extending further north to Highway 26 will see significant development. With the existing pressure zone boundary, it is therefore possible that that the area which generally extends from 200 m elevation to 195 m elevation could exhibit low pressures if the existing HGL, controlled by the elevated tank, and pressure zone boundaries remain.

5.5 Water – Capacity of Existing Water Treatment Plant

Historical flow data at the Meaford WTP was collected from the annual operating reports dating back to 2006. The monthly ADD and MDD over the 8 year span are plotted on Figure 10 below.

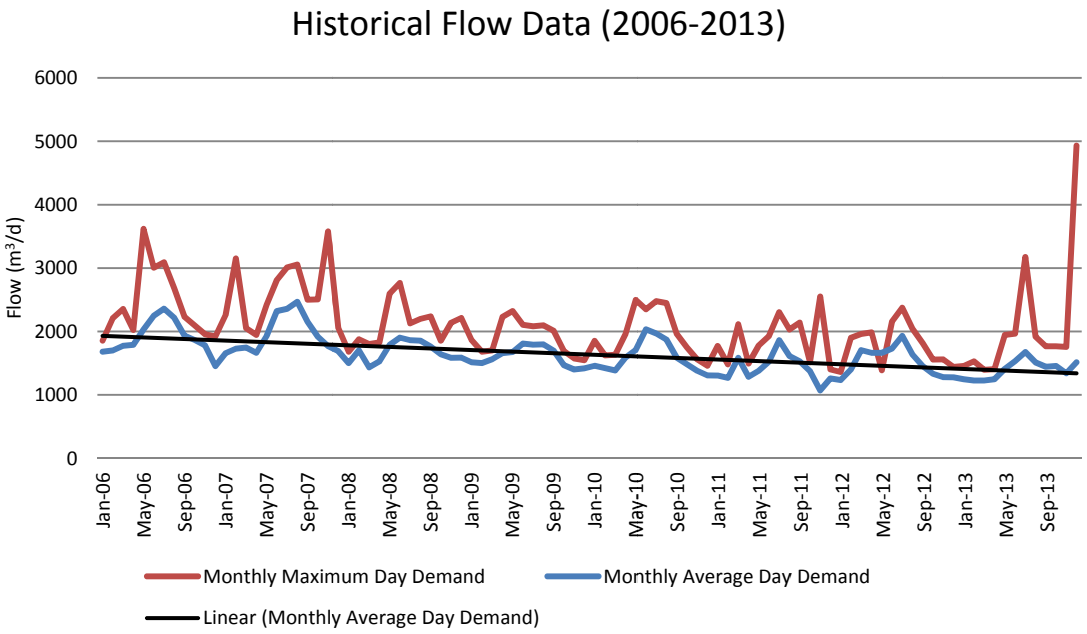


Figure 10 - Historical Flow Data (2006-2013)

Over the 8-year span the historical monthly MDD and monthly ADD are typically higher in the warmer months (May through August). This is mostly due to the warmer and dryer weather increasing outdoor water use for watering lawns/gardens, filling pools etc. There are a few instances where the MDD occurs in the colder months or the MDD is very high compared to the other values. These higher than normal MDD values are typically due to a watermain break that occurs and there is a significant loss of water. These higher than normal MDD values have been confirmed by the Municipality of Meaford to be watermain breaks.

Comparing these peak values to the existing WTP rated capacity of 26,848 m^3/day, during MDD it can be seen that no expansion is necessary. The highest MDD for the past three (3) years is 2,374 m^3/day (467.1 L/cap/day), which is 8.8% of the rated capacity of the WTP and is 16.7% of the design capacity of a single high lift pump at the WTP. Since the plant is required to meet MDD, there is more than adequate capacity for the present system. Even when flows are increased due to watermain breaks, the flow was less than 20% of the WTPs rated capacity.

For the full build-out conditions ultimate flow projections were calculated based on the assumption that all vacant land is developed according to the current zoning and planning densities within the Official Plan. The flow generated from the vacant lands is calculated according to the factors outlined in Table 7 below:

Table 7 - Water Demand

Land Designation	Water Demand
Residential	300 L/cap/day
Commercial	28 m^3/(ha*day)
Industrial	28 m^3/(ha*day)

The Municipality of Meaford's GIS data was used to determine the distribution of the water demand within the water model based on the land designation. The MDD during full build-out is estimated to be 4,040 m^3/day. This is 15% of the rated capacity of the WTP, showing that there is more than adequate capacity even after significant growth in Meaford's urban settlement area.

5.6 Wastewater – Capacity of Existing Sewers

An I/I study on the Meaford Sanitary Sewer System was completed in 2015. The Study has identified that I/I remains a key issue for the Municipality moving forward. Extraneous flows are most prevalent south of the Bighead River between January and March and coincide with snow melting events. Through the Municipality's effort to catalog the condition of the sewer system by CCTV inspection, several major deficiencies have been identified. Most notably a series of cracks, holes and pipe misalignments were identified along Sykes Street south of the Bighead River. To a lesser degree, cracks and breaks have been identified throughout the remainder of the collection network. Encrustation issues have also been identified at numerous locations throughout the sewer network.

5.7 Wastewater – Capacity of Existing Pumping Stations

Examining the existing capacity of the SPSs in the Meaford Wastewater Collection System allows for shortcomings and necessary upgrades to be identified.

5.7.1 Sewage Pumping Station No. 1

As indicated previously, SPS No. 1 is equipped with four (4) (Flygt model CP3300) 66 kW submersible pumps each rated at 104.6 L/s at a TDH of 25.5 m. Two (2) pumps are run by a fixed speed drive and two (2) pumps are run by a variable speed drive. The station is rated with a total firm capacity of 181 L/s against a TDH of 51 m. Peak hour flows to the station have been modeled for ultimate build-out to be 157 L/s, therefore the SPS is sufficient to support growth without any increase in capacity.

The station is in good overall condition and has experienced very few operational issues. One (1) overflow incident occurred at the station in 1992 as the result of an operator error. The flow meter at the station does not provide accurate measurement and needs to be replaced.

5.7.2 Sewage Pumping Station No. 2

The pumps at SPS No. 2 are rated at 148 L/s at a TDH of 18.8 m. Peak hour flows to the station have been modeled for ultimate build-out to be 46 L/s, therefore the station is sufficient to support growth without any increase in capacity.

The SPS is in good overall condition however it suffers from excessive rag collection, causing the pumps to become clogged. When this occurs the pump is unable to function and requires manual assistance to rectify the problem. With an increase in flow during full build-out conditions, it is important to correct this problem as it could become increasingly problematic in the future.

5.7.3 Sewage Pumping Station No. 3

The station was originally oversized and included two (2) 72.5 L/s at 9.5 m TDH pumps. One (1) pump has since been replaced with a 2.2 kW pump rated for 10 L/s. For normal operation the replacement

pump is currently more than sufficient to handle flows at the station. However, ultimate build-out flows are estimated to be 11 L/s ADF and 32 L/s peak day. For ultimate build-out it is recommended that both pumps are replaced by 20 L/s pumps with VFD control be installed at the site.

The station is in good overall condition with no record of operational issues.

5.7.4 Sewage Pumping Station No. 4

SPS No. 4 currently has adequate capacity for both existing conditions and full build-out conditions, requiring no increase in capacity. The pumping station is in good overall condition with no record of operational issues. This SPS currently services only one (1) customer (Knight of Meaford Lumber Factory) which may be shut down in the near future. It is recommended that SPS No. 4 be decommissioned once this occurs with costs for demolition covered by the customer.

5.7.5 Sewage Pumping Station No. 5

SPS No. 5 currently has adequate capacity for both existing conditions and full build-out conditions, requiring no increase in capacity. The SPS is in good overall condition with no record of operational issues.

5.7.6 Future Sewage Pumping Station No. 6

Based on previous planning efforts as far back as 2003, the need for a new SPS (SPS No. 6) has been identified in order to service development in the southwest of the urban area along the future section of Coleman Street. The proposed location for the future SPS is approximately 100 m south of Meaford Creek along Coleman Street. The construction of the station is development based and is not necessary until the construction in the southwest of the urban development area commences. The station will be located within the easement of the road. The new SPS will create a new catchment area which will encompass the future section of Coleman Street.

5.8 Wastewater – Capacity of Existing Wastewater Treatment Plant

The existing WWTP in Meaford does not have the capacity to service the ultimate population. Additionally, a number of minor upgrades are required for the SPSs within the urban area. Ultimate population is defined as the full build-out population for the existing community boundaries.

The Class EA of the existing WWTP was completed in 2007 and outlined the expansion needs of the plant on the basis of an expansion in the urban area to service a total population of 11,500 residents. It was assumed within the 2007 Class EA that the population in the urban area of Meaford would reach 11,500 by 2027. This rate of growth is no longer expected to occur as historical trends have shown that average growth rates are typically around 0.5%/year in the urban area. Based on the historical growth rate, the urban area of Meaford will not reach a population of 11,500 within the next thirty (30) years.

While the rate of growth in the urban area is not expected to occur at such a rapid pace, the suggestions for upgrades and expansion to the existing plant remain valid and are carried forward in the alternatives discussed in this Master Study.

Capacities of the current unit processes at the WWTP are shown in Figure 11.

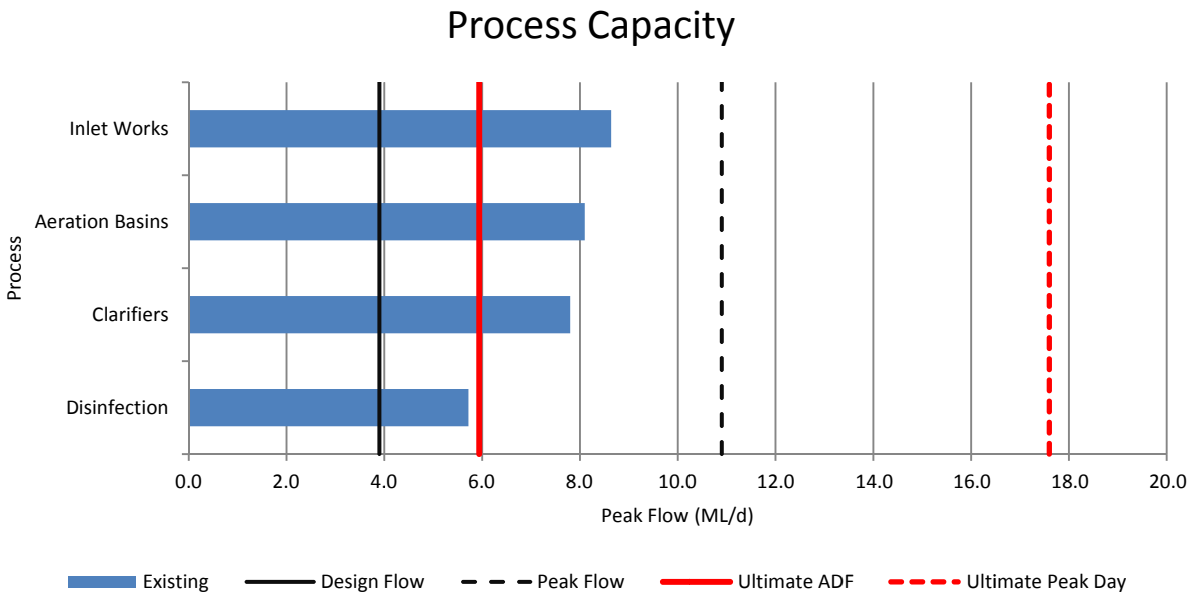


Figure 11 – Existing Unit Process Capacity

As shown in Figure 11, the existing plant does not have enough capacity to meet the needs of the ultimate development in the urban area and upgrades and unit process expansions of the plant are necessary.

Of the five (5) SPSs in the urban area, only SPS No. 3 requires an increase in pumping capacity to service the ultimate population. However, the three (3) major SPSs (SPS No. 1, SPS No. 2, and SPS No. 3) would all benefit from I&C upgrades.

5.8.1 Class EA (2007) Recommendations

In order to accommodate the future flow to the WWTP, an expansion of the facility was recommended and described in the 2007 Class EA. The design basis for the ultimate plant is summarised in Table 8.

Table 8 – 2007 Class EA Design Basis

Ultimate Service Area	
Population	11,500
Per Capita Flow Rate (L/c/d)	515
Total ADF (m^3/d)	6,000
Peaking Factor	3.5
Peak Day Flow (m^3/d)	21,000

The recommended upgrades to the existing process are summarised in Figure 12.

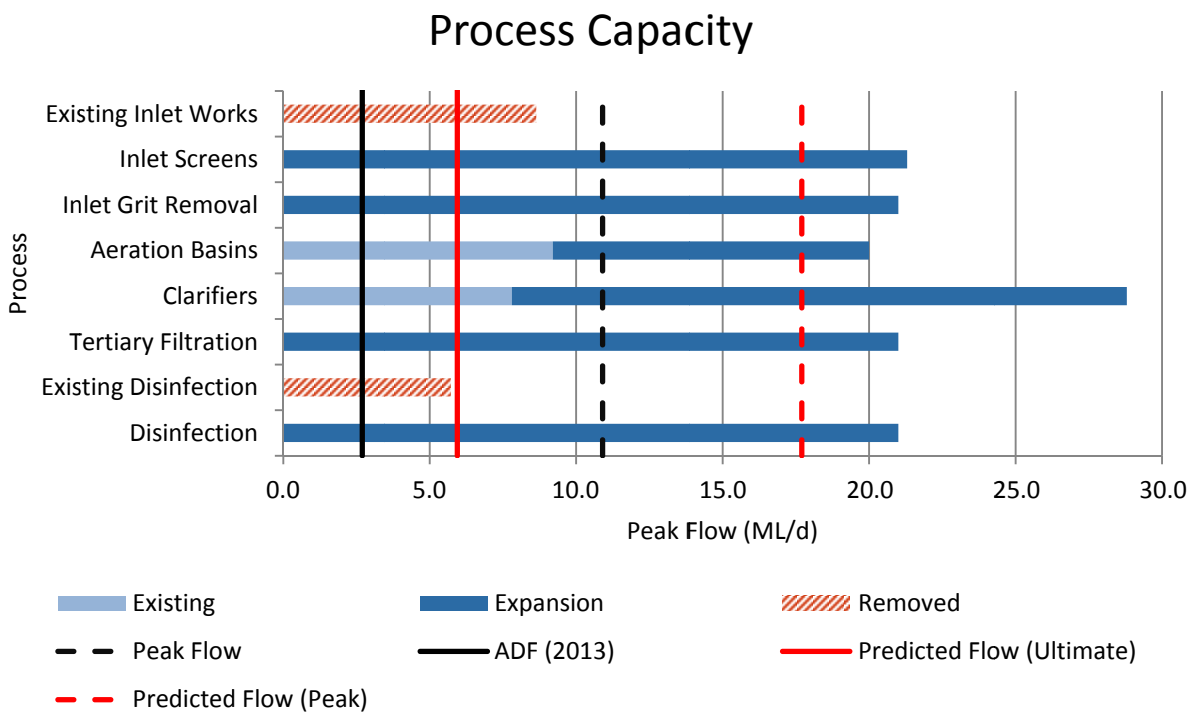


Figure 12 – 2007 Class EA Plant Expansion Plan

The expected effluent limits and design objectives of the 2007 Class EA are summarised in Table 9.

Table 9 – Compliance Limits and Effluent Objectives

Effluent Parameter	Compliance Limit		Effluent Objectives	
	Monthly Avg. (mg/L)	Monthly Loading (kg/d)	Monthly Avg. (mg/L)	Monthly Loading (kg/d)
$CBOD_5$	15	87.4	10	58.3
Total Suspended Solids	15	87.4	10	58.3
Total Phosphorus	0.8	4.7	0.5	2.9
Total Ammonia				
Non-Freeze	3.0	17.5	3.0	17.5
Freeze	5.0	29.1	5.0	29.1
pH	6.0 – 9.5			

A detailed description of each initiative to upgrade the plant and the rationale for the change is listed in Table 10.

Table 10 – Recommended Upgrades of the 2007 Class EA

Initiative:	Rationale:
Derate plant capacity	Achieve aeration basin SRT of 10 days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Derate plant from 3,910 m^3/d to 2,700 m^3/d.
Establish a new influent forcemain.	Existing forcemain has been identified to be undersized.
Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck. The screens are undersized and will be replaced.
Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
Replace steel components of secondary clarifiers.	Units in service for >40 years, which is the expected lifespan of this equipment.
Demolish the abandoned digester.	No longer in use and there is no plan to use in the future.
New Screening facility: Two (2) screens, each 6,300 m^3/d ADF 21,300 m^3/d peak	Replacements to meet expected ADF/Peak flows. Includes 300 m^3/d recycle streams.
New grit removal system Two (2) separators, each 21,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
New secondary treatment Two (2), 714 m^3 rectangular tanks Total SRT 8-10 days	Current capacity is not sufficient to meet the requirements of growth. Additional capacity to meet ADF of 6,000m^3/d in conjunction with existing aeration basins.
New secondary clarifiers Two (2) circular tanks 17.5 m dia, 4.2 m SWD each	Current capacity is not sufficient to meet the requirements of growth. Additional capacity sufficient to meet peak day flow rate of 19,240 m^3/d
New tertiary treatment system Two (2) traveling bridge sand filters each 21,000 m^3/d capacity	Phosphorus removal to meet the anticipated revised effluent limits by MOECC or Federal Government.
New UV disinfection system Two (2) channels, total 6,000 m^3/d ADF 20,000 m^3/d peak Decommission and remove existing UV disinfection.	Current UV System is undersized for the ultimate flow and would also need to be moved to incorporate the tertiary treatment system.
Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.

Initiative:	Rationale:
New odour control system	To be incorporated as a part of the Municipality's odour management strategy to address the historical odour complaints at the site.
New effluent pumping station	As per the requirements of the 2007 Class EA
Remove diffuser caps from outfall	Existing caps are showing signs of damage causing inconsistent release of effluent.
Upgrade electrical supply and distribution. New stand-by power generator	Existing MCC is reaching the end of its useful life and needs to be replaced. Existing generator not sufficient to meet the demands of the expanded plant.

5.8.2 Changes since 2007 Class EA

Since the 2007 Class EA, there have been changes to the projected population growth rate as well as the ultimate flow at the WWTP. This section will outline the revised population and flow projections and the reasoning behind the proposed changes.

In 2007 it was projected that the population in the urban area of Meaford would reach approximately 13,000 by 2031. The historical growth in the area does not match the projection of the Class EA and therefore the population projection was revised. For the purposes of this study it was estimated that the population in the urban area would reach approximately 5,520 by 2031. This revised population estimation is based on a historical average growth rate of 0.5%/year within the urban area. Further, based on an analysis of the total area of vacant and underdeveloped land and the current zoning, the ultimate (full build-out) population in the urban area is 12,000.

The 2007 Class EA provided a projection of ADF and Peak Flow for 2031 of 6,000 m^3/d and 20,000 m^3/d respectively. The flow projection is based on the 2031 population. Flow projections have been since recalculated based on the ultimate population of the urban area and the existing zoning to an ultimate population of 12,000. At the ultimate build-out of the urban area it is projected that the ADF at the WWTP will be 5,950 m^3/d with a peak flow of 17,650 m^3/d. At the current growth rate this is not expected to occur until 2180.

5.8.3 Existing WWTP Issues

The Meaford WWTP has a rated capacity of 3,910 m^3/d, with a peak flow capacity of 11,730 m^3/d, as per the current C of A. A review of the plant capacity by the Ainley Group in 2006 determined that the existing clarifiers are a considerable hydraulic bottleneck, with the surface settling rate limiting the peak flow to 6,874 m^3/d.

A review of the capacity analysis, also completed in 2006, was conducted by Hydromantis Inc. The review concluded that the existing aeration basins are an additional bottleneck on the basis that the plant does not have the capacity for nitrification. The plant was originally designed as a high rate activated sludge process, which is no longer a typical configuration and does not conform to the current design standards for either a conventional activated sludge or EAAS plants. The report states that the WWTP should be designed to operate at a SRT much greater than 10 days at a MLSS concentration of

less than 3500 mg/l. MOECC guidelines for EAAS plants state that the aeration step should have an SRT of fifteen (15) days and a HRT of at least fifteen (15) hours. Based on the MOECC guidelines the plant is most heavily constrained by the fifteen (15) hour HRT which would limit the ADF to 1,650 m^3/d when compared to the SRT constraint which would limit the plant to an ADF of 2,566 m^3/d. As it currently stands it is recommended that the MLSS be kept at 3500 mg/L.

The Hydromantis review identified an additional constraining factor with respect to the clarifiers at the Meaford WWTP. The existing clarifiers are much shallower than recommended by the current MOECC design guidelines. Hydromantis identified that since the clarifiers are shallow there is a much greater potential for solids to over flow the weirs at peak flows particularly as the sludge blanket thickens. In order to prevent solids from leaving the sedimentation basin it is recommended that the RAS rate be kept at 100%. Based on the MOECC design guidelines before 2008, at an ADF of 2600 m^3/d, a RAS rate of 100% with an MLSS of 3500 mg/L the existing clarifiers were limited to a peak flow of 5,316 m^3/d to meet a peak solids loading rate of 120 kg/m^2·d. Since 2008, MOECC has increased the peak solids loading rate to 170 kg/m^2·d which increases the peak flow to 8,656 m^3/d.

The existing screens are not ideally located at the plant. In order to incorporate new process trains into the plant, the headworks will need to be set back from the aeration tank area in order to allow space for flow splitting after screening. The existing screen is also undersized to meet the peak flows at the plant with a peak capacity of 9,842 m^3/d.

The existing disinfection consists of two (2) channels, one (1) equipped with UV lamp modules rated for a peak flow of 5,720 m^3/d and a second channel equipped with weir and isolation channel for future UV lamp modules, with a UV bypass and isolation valve. The existing disinfection is undersized to meet the existing peak flows.

Overall it has been recommended that the plant be derated to an ADF of 2,700 m^3/d with a peak capacity of 8,100 m^3/d.

5.8.4 Changes to the Class EA Recommendations

While the majority of recommendations from the 2007 Class EA remain valid, there are changes to the Class EA that are recommended based on the results of this master plan study.

The Class EA recommended that the plant be upgraded to meet the ADF of 6,000 m^3/d and 20,000 m^3/d peak in one single upgrade. Based on the projected rate of growth and the resulting increase in flow over the next twenty (20) years, a full upgrade of the plant in order to service the ultimate population should not be required in the near term.

As discussed in the 2007 EA, the effluent limit for phosphorus is expected to change as a result of any upgrades to the plant. However, a new limit requiring tertiary filtration is not expected. A survey of plants discharging into Georgian Bay close to Meaford suggests that a phosphorus limit of 1 mg/L would be imposed. An effluent concentration of 1 mg/L phosphorus could be achieved by a single-point alum injection. The changed phosphorus limit will increase the volume of sludge produced. The expected maximum increase in sludge production is 15%. It is anticipated that the plant can handle an ADF of

4420 m^3/d (a 15% increase from current ADF volumes) while still having sufficient capacity to store sludge without a need for expansion, assuming hauling occurs every 6 months.

The influent forcemain was identified as being undersized for the ultimate flows at the WWTP. Based on available information, the influent forcemain has a diameter of 450 mm. A 450 mm forcemain will provide sufficient capacity for the projected peak flows.

Phase 2
Alternative Solutions

6.0 General Alternatives

For the water and wastewater systems in Meaford, deficiencies have been identified that will require future upgrades. In addition, the Meaford Official Plan identifies zoning for growth that will also result in additional water and wastewater facilities. A long list of alternatives was formulated for each component of the system and is evaluated based on established criteria. The following two (2) general alternatives were also identified and are evaluated as applicable to all components of the systems:

- Do nothing
- Limit/manage growth

6.1 Do Nothing

The Master Servicing Study must effectively deal with all aspects of the problem statement. The Do Nothing alternative does not provide any additional capacity for Meaford's Water and Wastewater systems and therefore does not meet the requirements of the Official Plan. Due to the age of most of the existing components, and changing Provincial Regulations, the Municipality will inevitably be required to upgrade most water and wastewater systems in order to remain in compliance and to maintain the health and safety of the citizens of Meaford. The Do Nothing Alternative in these cases is therefore considered not viable and was screened out of the detailed comparative assessment.

6.2 Limit/Manage Growth

Not all of the problems identified with the water and wastewater infrastructure in Meaford are a result of growth, and so limiting growth would not address all of the problems. In addition, placing a limit on growth does not align with the Municipality of Meaford approved Official Plan and because of this the Limit/Manage Growth Alternative was screened out of the detailed comparative assessment.

7.0 Water Distribution Alternatives

As noted in Phase 1 of the project and confirmed through modeling, the existing water distribution system in Meaford requires improvement to correct deficiencies, including: being undersized for existing demand scenarios; being partially plugged due to corrosion products; and due to age. While this section addresses alternatives for watermain renewal, there is no global "preferred alternative" for this aspect of the project. The preferred alternative for each section of watermain will depend on the particular circumstances in that street and watermain condition. The intent of this section is to identify guidelines for determining the preferred solution on each section of watermain. Various watermain renewal options are available. The renewal options evaluated during Phase 2 of the master planning process are:

1. **Watermain Rehabilitation (Relining)**
2. **Watermain Replacement**

The main reasons that deteriorated watermains should be renewed are listed below:

- Preserve water quality

- Prevent structural failure
- Prevent water loss
- Improve hydraulic capacity and pressure

Relining is the most common watermain rehabilitation option available for metal pipes. Watermain relining involves drilling back to pipe metal and using a material such as epoxy or cement mortar to protectively line the inside of the existing pipes. The lining adds a smooth non-structural coating to the interior surface of the pipe which prevents further corrosion and oxidation of the pipe interior and increases the hydraulic capacity of the watermain. The number of service connections, valves, bends and appurtenances will affect the cost of the lining projects. The cost of lining is generally less expensive than replacement, provided the pipe has a reasonable remaining life. The expected service life of the pipe can be extended by 30 to 50 years with lining procedures if the pipe is in good structural condition. For older pipes, typical of the Meaford water system, relining may not be the most economical solution.

Watermain replacement is the other most common watermain renewal alternative and is more applicable when a pipe is closer to the end of its useful life and may fail to provide adequate service and does not have enough structural strength, and becomes prone to failure. In Meaford, one of the main concerns is the amount of undersized watermains and clearly replacement is preferred for these in order to provide adequate service. While initial watermain replacement costs are more expensive than other renewal options, this option extends the useful life by far longer and reduces future maintenance costs. Replaced watermain sizes can be increased to meet demands thereby increasing hydraulic capacity of the watermain. The service life of the watermain will be the full design life of the replacement pipe and ranges from 50 years to 125 years.

8.0 Water Storage Alternatives

There are different types of municipal water storage options available for the Meaford Water Supply System. The two (2) main categories include floating storage and pumped storage. Common types of floating storage are elevated steel or composite steel/concrete tanks as well as ground- based storage such as standpipes where stored water is above the required HGL. Pumped storage consists of a reservoir that can be located in-ground, above ground or partially in-ground where water is stored below the required HGL and still needs to be pumped, usually from an attached BPS. To increase system security, the location of a new storage reservoir is suggested to be in the St. Vincent Street Booster Zone on the south end of the water distribution system, and at the highest elevation. In an emergency this tank could then supply the whole system. The St. Vincent Street BPS already pumps water to the HGL of the pressure zone, therefore the construction of pumped storage would mean a loss of pressure to fill the reservoir and additional energy to re-pump the water. For this reason, only floating storage is considered for the St. Vincent Street Boosted Zone. Three (3) options were evaluated during Phase 2 of the master planning process:

1. **Elevated Storage Tank**
2. **Standpipe**

3. **In-Ground Reservoir Constructed at above the Minimum Pressure Elevation**

Elevated tanks, either as steel or composite tanks, provide storage at or above the required system pressure. Since no additional pumping is required, this storage is considered as a secure water storage option. The most common adopted tank design in Ontario is a composite tank design which includes a steel tank on top of a concrete pedestal. This type of construction has larger initial costs but reduced yearly operational and maintenance costs because of the lack of additional pumping required.

The standpipe design combines the functions of both elevated and pumped storage. A standpipe is a steel or concrete cylinder containing storage that is partially above the required system pressure and partially below this level. The water below the required system pressure is unusable without the addition of a pumping station. Due to the disadvantages associated with this type of water storage, the standpipe design was not considered as a viable option for this project.

In-ground reservoirs constructed of concrete or steel can also provide floating storage, if constructed above the HGL. In-ground concrete storage allows for the ability to have staged construction and is less visible to the public.

For the proposed Meaford water storage expansion project, both elevated tank storage and in-ground storage will be considered, as these types of storage have shown to be the best available options. For the addition of storage within the St. Vincent Street Boosted Zone, floating storage is the most appropriate and economical solution, provided either as an elevated tank or as an in-ground concrete reservoir.

9.0 Water Booster Pumping Station Options

The Nelson Street BPS does not provide adequate hydraulic capacity to Pressure Zone 2 (Nelson Street Boosted Zone). The station does not have standby pumping capacity or standby power. A new BPS should be installed to correct the non-compliance issues and improve the hydraulic capacity within the pressure zone. The hospital is located within the pressure zone; therefore it is imperative that the hydraulic capacity be improved to provide adequate fire flows and pressures for the hospital.

In examining the Nelson Street Pressure Zone, two (2) alternatives have been identified for a new water BPS.

1. **Construct BPS at the Water Tower Site**
2. **Construct BPS in the Parking Lot of the Meaford & St. Vincent Community Centre & Arena**

Alternative 1 is at the existing water tower site. The property is large enough to accommodate a BPS. This property is owned by the Municipality, therefore there will be no land acquisition costs associated with this alternative. One major advantage of this site is that the watermain feeding the tower provides good suction pressure to the BPS under all demand scenarios. Approximately 335m of watermain that would connect to Pressure Zone 2 would need to be upgraded from a 150 mm diameter watermain to a 200 mm diameter watermain to ensure adequate pressures and flows from pump discharge to the

pressure zone. Figure 13 shows location 1 for the proposed BPS. The other advantage of this alternative is that it facilitates changes to the Pressure Zone 1 operation by dedicating the water tower to the Nelson Street Booster Zone.

Alternative 2 is to construct a new BPS in the parking lot of the Meaford & St. Vincent Community Centre & Arena. This property is owned by the Municipality, therefore there will be no land acquisition costs associated with this option. The 150 mm diameter watermain (approximately 240 m) along Collingwood Street would need to be upgraded to a 200mm diameter watermain from the new BPS to Thompson Street to provide adequate water supply to the station. A new 200 mm watermain (approximately 340 m) will have to be installed to connect into the existing watermain at Pressure Zone 2. Figure 14 shows location 2 for the proposed BPS.

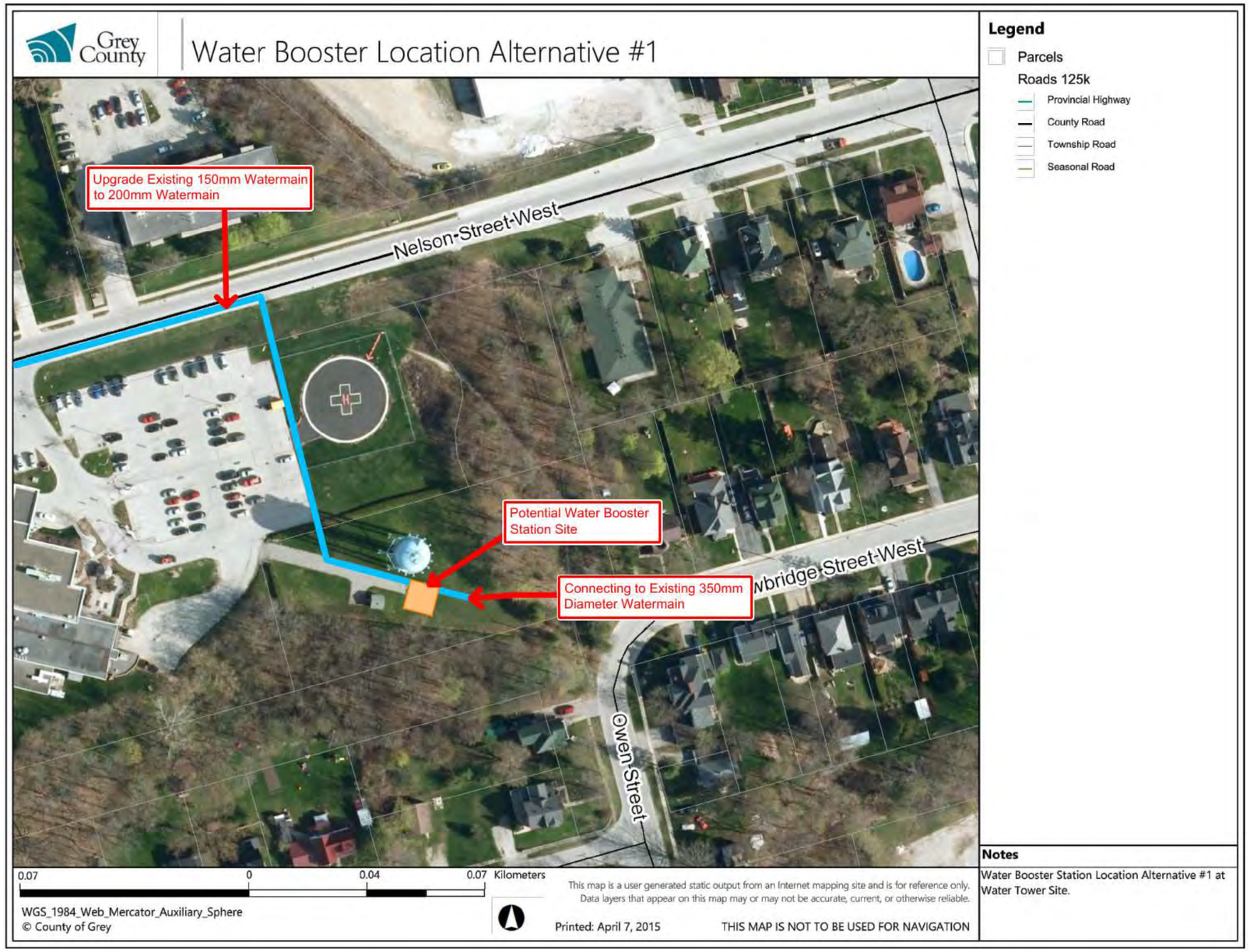


Figure 13 – Booster Pump Station Alternative 1 Location

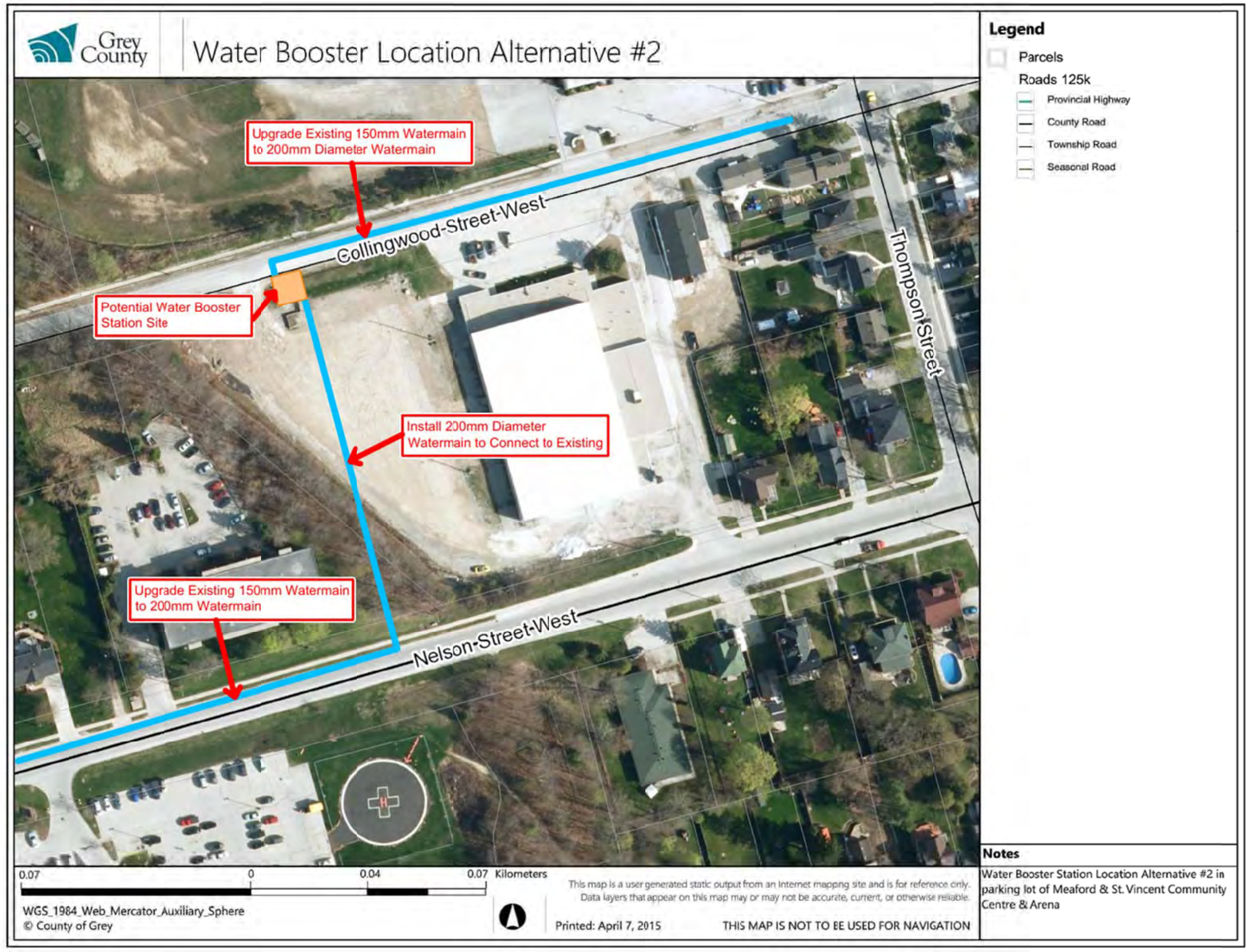


Figure 14 – Booster Pump Station Alternative 2 Location

10.0 Water Treatment Plant Alternatives

The existing WTP is in full compliance with all regulations and can meet the full build-out demand without expansion or upgrade. The only issue to be addressed at the WTP is low pressure in some areas of the main pressure zone controlled by the high lift pumps and elevated tank.

It is noted that when the WTP pumps are in operation, this pressurezone has adequate pressure. To further analyse why this area experiences low pressure, the hydraulic model was run with Pressure Zone 1 being supplied from the elevated tank with no WTP pumps running. This situation likely occurs often as the pumps cycle off and on as the elevated tank fills. Model results based on Pressure Zone 1 supply from just the elevated tank exhibit significant pressure drop across the pressure zone. In the existing area experiencing pressure problems, the pressure drops by 60 – 70 Kpa (8 – 10 psi) when the WTP pumps are switched off and the area is supplied by the elevated tank. Modeling results show that when the minimum HGL in the pressure zone is increased from 232 m ASL (which is the tank full elevation) to 239 m ASL (which is typically the HGL at the WTP from the high lift pumps), all areas of the pressure zone have adequate pressure.

To solve this problem, two (2) alternatives were considered:

- Alternative 1: Expand the Nelson St Booster Zone to encompass all areas experiencing low pressure problems
- Alternative 2: Change operating strategy to operate the high lift pumps continuously

11.0 Wastewater Collection Alternatives

As noted in Phase 1 of the project , through CCTV inspection and reiterated in the I/I Study, the existing sanitary collection system in Meaford requires improvement to correct deficiencies, including: broken and cracked pipes, misaligned joints, being partially plugged due to encrustation; and due to age. While this section addresses alternatives for sewermain renewal, there is no global “preferred alternative” for this aspect of the project. The preferred alternative for each section of sewermain will depend on the particular circumstances for that street and sewermain condition. The intent of this section is to identify guidelines for determining the preferred solution on each section of sewermain. Various sewermain renewal options are available. These renewal options include:

1. **Sewermain Rehabilitation (relining)**
2. **Sewermain Replacement**

The main reasons for renewal of sewermains are to prevent structural failure and to I/I sources.

12.0 Wastewater Pumping Alternatives

The existing SPSs were all identified to be in good condition and have sufficient capacity to handle full build-out conditions. However, several were identified that could allow for improved performance. The following upgrades were identified:

SPS No. 1

- New Flow Monitor
- SCADA System

SPS No. 2

- Replace Pumps
- SCADA System

SPS No. 3

- Replace Pumps
- SCADA System
- Flow Monitor

SPS No. 4

- Decommission once customer no longer requires use of the SPS

SPS No. 5

- No upgrades needed

An additional SPS will be required to service developments in the south end of urban Meaford. SPS No. 6 will require to be constructed in the area shown in Figure 15 and will service developments along future Coleman Street and will be require to be constructed prior to any developments in the area. The need for SPS No. 6 was also identified in the Municipality of Meaford – Report on Sanitary Sewer Collection system Model (2004). SPS No. 6 would be completed within the easement of the road, therefore requiring no land acquisition.

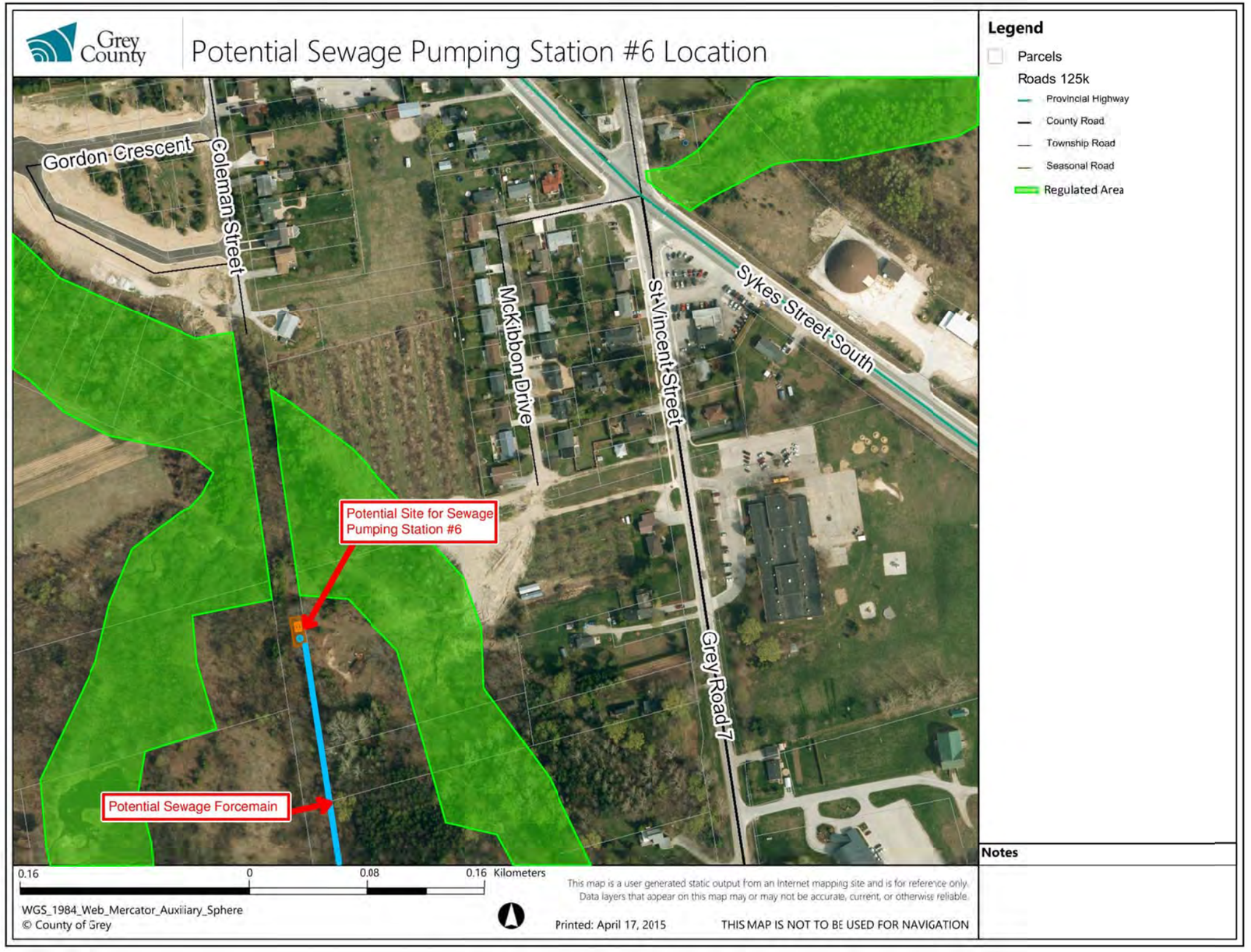


Figure 15 – Potential Location for Sewage Pumping Station #6

13.0 Wastewater Treatment Expansion Alternatives

The problems identified for the Meaford WWTP include:

- Components of the plant exceed 45 years of age and require upgrades to meet future needs.
- Peak flows to the plant exceed the design capacity of some treatment processes.
- Improvements to the plant control systems have the potential to improve plant performance and reduce energy use.
- Upgrades are required to meet the revised effluent requirements.

The primary purpose of any action strategy at the Meaford WWTP is to provide solutions to the identified problems. As such, the presented alternatives each address the components of the plant that have reached the end of their useful life, the issue of peak flows and aim to minimise the energy use of the ultimate system. The main objective is to maintain the effluent quality within the effluent objectives of the plant C of A. Based on the previous studies of the WWTP it may be anticipated that the plant is unable to meet the effluent objectives for nitrification while operating at an ADF in excess of 2,700 m^3/d. Further, studies at the plant have recommended limiting peak flows to the plant to 8,100 m^3/d due to bottlenecks created by the inlet works and clarifiers.

Over 2011-2013 the ADF at the Meaford WWTP was 2,600 m^3/d with a peak flow of 11,780 m^3/d. Assuming the recommended capacity of 2600 m^3/d, the plant is currently operating at 96% of ADF capacity and 145% of peak capacity. Due to the present flows and expected flows from growth, actions are necessary to either resolve process bottlenecks or to manage flows in order to ensure effluent quality is maintained as development occurs. Alternatives include:

1. **Expand the existing WWTP to meet the ADF and peak flows expected at full build-out while addressing the existing I/I issues.**
2. **Expand the existing WWTP in two (2) phases with the ultimate WWTP able to meet ADF and peak flows at full build-out while addressing the existing I/I issues.**
3. **Manage peak flows at the WWTP by establishing an equalization storage system while managing ADF through an I/I reduction program. Upgrade the existing WWTP when I/I reduction can no longer support development.**
4. **Expand the existing WWTP to meet the ADF and peak flows expected at full build-out without addressing the existing I/I issues.**
5. **Expand the existing WWTP in two (2) phases with the ultimate WWTP able to meet ADF and peak flows at full build-out without addressing the existing I/I issues.**

The current configuration of the WWTP is not ideal for the integration of additional process units. The existing headworks feed directly into the aeration basins with no space provided for flow splitting to a new treatment train. In order to expand the WWTP, a new headworks would need to be established upstream of the aeration basins to provide space for a flow splitting chamber. As this is the case, option 1, 2, 4, and 5 would all require that a new headworks building be established as a component of any plant upgrades in order to have sufficient peak capacity even with reduction of I/I.

Equalization storage provides a simple solution for managing the excessive peak flows in the short term without moving ahead with an expansion to the plant. Equalization storage would improve the flexibility of the plant and allow the operators to overcome existing peak flow issues. Establishing a flow equalization system will not provide additional ADF capacity. In order to keep the ADF below the recommended capacity of the plant an I/I reduction program would be needed. The I/I program would be required to reduce extraneous flows at a faster pace than development. Based on the historical growth rates of the urban area and the potential for flow reduction, this is a feasible solution.

Additionally, successfully reducing I/I will provide benefits upstream of the WWTP specifically at the Bighead River syphon. Without reduction of I/I, the syphon will need to be expanded to accommodate peak flows at ultimate build-out.

For the reasons discussed above, the reduction of I/I should remain a priority for the Municipality. As such, options 4 and 5 are not considered to be ideal and are not considered further.

14.0 Evaluation Criteria/Weighting and Ranking

The criteria to be used for evaluation of alternative solutions for water and wastewater projects are set out in the approved Class EA document. Based on the nature of the study area, the potential projects and the values of the community, a suggested criteria listing and weighting has been developed for use in the evaluation process. The criteria and weighting are presented in the Table 11.

Table 11 – Criteria for Evaluation of Alternative Solutions

Criteria	Sub-Criteria	Weighting (%)
Land Use Planning		**15**
Natural Environment		**10**
Social Environment		**20**
	Air Quality, Noise and Vibration	10
	Quality of Life	5
	Community Accessibility	5
Cultural Environment		**10**
	Archaeological	5
	Heritage Features	5
Technical Considerations		**25**
	Performance	5
	Technical Suitability	5
	Phasing	5
	Construction Considerations	5
	Operational Considerations	5
Economic Considerations		**20**
	Capital Cost	10
	Operating Costs	10
Total Weighting		**100**

The Master Planning process will result in the determination of infrastructure needed to sustain the existing community and service growth within the urban area. The evaluation criteria were used to compare viable alternative solutions for the different parts of the water and waste water systems being considered. This allowed for the solutions for all the infrastructure needs to be met on a consistent basis. Each alternative was rated between 1 and 5 on its performance under each criterion, where 1 is poor performance and 5 is exceptional performance. The alternative solutions that score highest based on the ranking system will become the recommended solution from the Master Planning process.

15.0 Evaluation of Water Distribution Alternatives

Both renewal options have their advantages and disadvantages. Table 12 below outlines the advantages and disadvantages of the watermain renewal options:

Table 12 - Advantages & Disadvantages of Watermain Renewal Alternatives

Renewal Type	Advantages	Disadvantages
Rehabilitation	• Traffic interruption and noise are confined to two (2) pits for each section • Hydraulic capacity improved • Minimal excavation/streetscape interference required • Restores corrosion resistance of pipe and extends useful life • Less up-front costs than replacement • Could add 30-50 years to service life if the structural integrity of the existing pipe is good • Construction can be phased	• Bends, tees, valves & fittings cause difficulties and may need to be removed for relining • Bypass line is required to provide water service during cleaning and lining process • Work cannot be effectively performed in the winter, as the bypass line may freeze • Contractors may not be locally available • High mobilization costs; it is not cost effective for small rehabilitation projects • Diameter of the pipe will be reduced • Pipes must be thoroughly cleaned and dried before application of lining • Shorter service life compared to pipe replacement • Does not improve structural integrity of pipe
Replacement	• Watermain size can be increased to accommodate demands • Repair costs will be lower because the new pipe can be expected to have lower break rates compared to older pipes • Hydraulic capacity increased to required amount • Reduced water loss • Pipe material can be chosen to suit the Municipality's needs and soil conditions • Watermain can be replaced with less disruption of water service • Local contractors likely more readily available • Longer service life • Structural integrity of pipe is good • Construction can be coordinated with Municipal improvement plans	• More disruptive to streetscape than alternative of repairing breaks or rehabilitation • All service connections have to be reinstated • Higher initial costs than repair or rehabilitation

15.1 Watermain Renewal Cost Comparison

Based on modeling results, a total of 15,650 m of watermain could be considered for rehabilitation or replacement.

It is estimated that the initial capital costs to replace a watermain are 50% higher than rehabilitation. Based on a simple payback period, it would require an increase in useful life approaching 50 years to make the rehabilitation alternative more cost effective than the replacement alternative.

15.2 Evaluation of Watermain Renewal Alternatives

Table 13 below outlines evaluation of each watermain renewal alternative.

Table 13 – Evaluation of Watermain Renewal Alternatives

Alternatives		**Rehabilitation**		**Replacement**	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	**15**	**5**	**0.75**	**5**	**0.75**
Natural Environment	**10**	**4**	**0.40**	**3**	**0.30**
Social Environment	**20**	**12**	**0.80**	**12**	**0.75**
Air Quality, Noise and Vibration	10	4	0.40	3	0.30
Quality of Life	5	4	0.20	5	0.25
Community Accessibility	5	4	0.20	4	0.20
Cultural Environment	**10**	**8**	**0.40**	**8**	**0.40**
Archaeological	5	3	0.15	3	0.15
Heritage Features	5	5	0.25	5	0.25
Technical Considerations	**25**	**18**	**0.90**	**24**	**1.20**
Performance	5	4	0.20	5	0.25
Technical Suitability	5	4	0.20	5	0.25
Phasing	5	4	0.20	5	0.25
Construction Considerations	5	3	0.15	4	0.20
Operational Considerations	5	3	0.15	5	0.25
Economic Considerations	**20**	**5**	**0.50**	**7**	**0.70**
Capital Cost	10	3	0.30	3	0.30
Operational Cost	10	2	0.20	4	0.40
Total	**100**	**Score:**	**3.75**	**Score:**	**4.10**

16.0 Evaluation of Water Storage Alternatives

Additional storage is required to meet the MOECC guidelines for water storage under full build-out conditions. Currently the system has 2,880 m^3 of storage available between the elevated tank in the vicinity of Trowbridge Street and Owen Street and an in-ground reservoir at the WTP. An additional

1,830 m^3 (approximately 2,000 m^3) will be needed, bringing the total system storage to 4,710 m^3. To increase the system security during MDD and fire flow scenarios, the new storage locations examined for the different alternatives are located away from existing storage, on the south end of the water distribution system.

16.1 In-Ground Storage Alternative

In-ground water storage is a viable option for Meaford and has unique characteristics when compared to other reservoirs. Due to Meaford's landscape, an in-ground reservoir can be located so that it sits at the system's HGL, eliminating the need for additional pumping. This provides a more secure form of water storage. In-ground concrete reservoirs can have staged construction; which reduces the capital and operational costs since a smaller reservoir is initially built. When required, the second phase of the reservoir can be built to meet demand needs. However, due to the small size of the proposed Meaford reservoir this may not be the most economical solution. This type of construction also allows for minimum visual/ aesthetic impact on the surrounding community. No tank painting is required, reducing maintenance costs when compared to elevated water storage. This type of storage requires more land when compared to the elevated tank alternative because of its larger footprint.

The reservoir will have approximate dimensions of 20 m x 20 m x 5 m deep and would consist of two (2) cells. It would be required to be located at the 260 m elevation level which is consistent with the system's HGL and which exists along a ridge to the south east of the pressure zone on each side of County Road 7, some 500 m south of Muir Street. To connect the reservoir to the system, approximately 1,400 m of 400 mm pipe would have to be constructed from Sykes Street to the proposed location. The reservoir would be buried with only a valve chamber and access road visible to the public. It could be accommodated on a 0.5 Ha site approximately 70 m by 70 m.

16.2 Elevated Tank Alternative

Elevated tank storage also provides secure water storage and is easy to operate, similar to in-ground concrete tanks. Additionally, they can be considered as an identifiable landmark for communities and take up less land than the same in-ground storage facility of equal volume. The main disadvantage associated with elevated storage tanks is that they must be repainted on a regular basis (every twenty (20) years) resulting in large maintenance costs. The other main disadvantage is associated with safety in climbing to enter the tank. They can also suffer from ice formation inside the tank. Different styles of elevated tanks exist, ranging from spheroidal shapes with steel shafts such as the Wasaga Water Tower, to composite cylindrical tanks with concrete shafts.

Within the St. Vincent Street Boosted Zone there is vacant land available sufficient to construct an elevated tank. The 2,000 m^3 elevated tank would be constructed at a ground elevation around 215 m, requiring a pedestal/tank approximately 45 m high. The tank would be connected to an existing watermain on Centre Street adjacent the site.

16.3 Advantages and Disadvantages of Storage Alternatives

Both of the two (2) water storage alternatives have advantages and disadvantages which are important in the decision making process. Table 14 outlines the advantages and disadvantages of both elevated storage and in-ground storage.

Table 14 - Advantages vs. Disadvantages of Elevated and In-Ground Storage Options.

Storage Type	Advantages	Disadvantages
Elevated Storage	• Secure Floating Storage • Identifiable landmark to some (subjective) • Requires less land • Low energy costs • Ease of operation	• Unpleasing aesthetics to some (subjective) • Access to storage cell is via a long ladder with climb assist equipment • Storage cell is a confined space • Painting cost
In-Ground Storage	• Secure Floating Storage • No Painting cost • Low energy costs • Ease of operation • Access to storage cell is a shorter ladder • Less visual Impact • Phased construction	• Storage cell is a confined space • Requires more land than elevated storage

16.4 Site Identification of Water Storage Alternatives

Two (2) separate storage sites have been selected for the two (2) different storage options identified. The storage sites suit the type of storage and allow for minimal costs to be incurred. Both sites are located south east of Meaford within the St. Vincent Street Boosted Zone.

16.4.1 In-Ground Reservoir Site Identification

Several criteria were identified in the site selection for the potential in-ground tank. The most significant criteria was that the site have an elevation equal to the system's HGL (260 m) to eliminate the need for pumping. The site also had to be large enough for in-ground storage and have road access. Only one (1) location was able to satisfy all the criteria and is shown in Figure 16. Other sites in the surrounding area at the same elevation do not have road access, making them non-viable locations. The site is located along Grey Road 7, south of Muir Street. The area is residential-zoned land that is currently tree covered with no existing development. To allow this site to be used for an in-ground reservoir, 1,400 m of additional 400 mm watermain will have to be constructed to connect the reservoir to the existing water distribution network which stops at Muir Street.

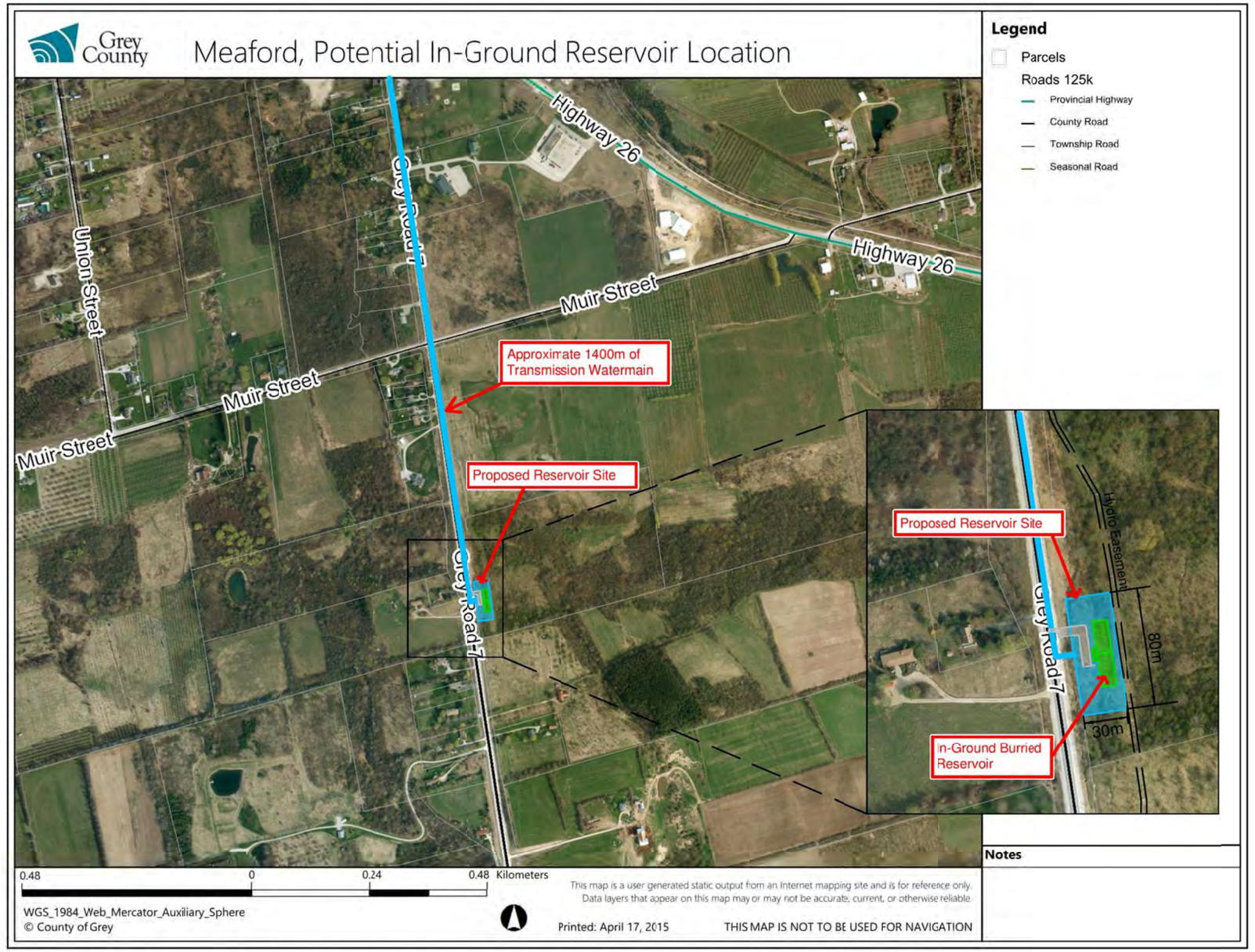


Figure 16 – In-Ground Water Reservoir Location

16.4.2 Elevated Tank Site Identification

The main criterion in selecting a site for the potential elevated water tank was that it be municipally-owned land. This will allow for reduced capital costs. Site elevation was not a concern, as elevated tanks located on land below the HGL still provide secure floating storage. The only site in the St. Vincent Street Boosted Zone that is municipally owned is the old landfill site on Centre Street. This site is located on the west side of Centre Street just north of Russett Drive shown in Figure 17. The site has an elevation of 213.5 m.

Additional sites have been identified as possible water tower locations; however, they are not municipally-owned. Should an elevated tank be the preferred alternative, the Municipality could approach landowners in the Muir Street/Centre Street area should a larger or more prominent site be required. For the purposes of the Master Plan, the former landfill site is used for the elevated tank alternative.

16.1 Cost Comparison of Storage Alternatives

A cost analysis has been completed for the estimated capital costs and operation and maintenance costs over a 50 year life span for both alternatives. The calculation spreadsheets are included in ***Appendix E***.

A summary of the cost comparison is presented in Table 15.

Table 15 - Estimated Cost Comparison of Different Storage Alternatives

	Elevated Storage	In-Ground Storage
Capital Cost	$ 3,150,000	$ 3,191,000
Operation and Maintenance Costs	$ 550,000	$ 550,000
Major Maintenance Costs	$ 1,000,000	$ -
Total Cost	$ 4,700,000	$ 3,991,000
Present Value Cost	$ 3,425,000	$ 3,404,000

[1] All costs represent 2014 values except for the net present value cost which takes into account a discount rate of 4% over the time period analyzed.

The elevated storage alternative results in the lowest capital cost which includes the cost of construction and engineering. Land cost is not incurred as the intended site is already owned by Meaford. The annual operation and maintenance costs are low for the elevated tank since minimal upkeep is necessary and no pumping is required. Large major maintenance costs reflect the frequency and high cost of painting the tank (every twenty (20) years).

The in-ground storage alternative results in similar but slightly higher capital costs which includes the cost of construction, land cost, watermain construction and engineering fees. The higher capital costs are due to the Municipality not owning any land near the HGL and therefore needing to purchase the land. The annual operation and maintenance costs are low since minimal upkeep is necessary and no pumping is required. No major maintenance costs are incurred, greatly reducing the total costs over the 50 year period.



Figure 17 – Elevated Tank Location

16.2 Evaluation of Alternatives

Table 16 below outlines the evaluation for each storage option.

Table 16 – Evaluation of Water Storage Alternatives

Alternatives		Elevated Storage		In-Ground Storage	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	**15**	**5**	**0.75**	**3**	**0.45**
Natural Environment	**10**	**4**	**0.40**	**3**	**0.30**
Social Environment	**20**	**13**	**0.80**	**14**	**0.90**
Air Quality, Noise and Vibration	10	3	0.30	4	0.40
Quality of Life	5	5	0.25	5	0.25
Community Accessibility	5	5	0.25	5	0.25
Cultural Environment	**10**	**7**	**0.35**	**8**	**0.40**
Archaeological	5	4	0.20	4	0.20
Heritage Features	5	3	0.15	4	0.20
Technical Considerations	**25**	**16**	**0.80**	**22**	**1.10**
Performance	5	4	0.20	5	0.25
Technical Suitability	5	4	0.20	5	0.25
Phasing	5	1	0.05	3	0.15
Construction Considerations	5	3	0.15	4	0.20
Operational Considerations	5	4	0.20	5	0.25
Economic Considerations	**20**	**5**	**0.50**	**7**	**0.70**
Capital Cost	10	3	0.30	3	0.30
Operational Cost	10	2	0.20	4	0.40
Total	**100**	**Score:**	**3.60**	**Score:**	**3.85**

17.0 Evaluation of Water Booster Pump Station Alternatives

Both alternatives for the Nelson Street (Pressure Zone 2) water BPS have their advantages and disadvantages. Table 17 below outlines the advantages and disadvantages of the two (2) alternatives:

Table 17 - Advantages & Disadvantages of Water Booster Station Alternatives

Renewal Type	Advantages	Disadvantages
Alternative 1 (Water Tower Site)	• Municipally owned land • Transmission main already exists to the water tower, would only have to connect to the existing watermain • Plenty of space on property for a BPS • Treed lot, BPS would not be visible from the road • Allows the BPS to be integrated with the Pressure Zone 1 operation to facilitate a change in operation strategy	• Discharge watermain will have to be upgraded
Alternative 2 (Meaford Community Centre & Arena Parking Lot)	• Municipally owned land • Plenty of space available for a BPS	• Visible from the road • Both suction and discharge watermain will have to be upgraded

17.1 Cost Comparison of Water Booster Pump Station Alternatives

The cost for Alternative 1 is less expensive compared to Alternative 2, since Alternative 1 would have less watermain that would need to be installed or upgraded. The cost of the water BPS for both alternatives would be relatively the same.

17.2 Evaluation of Alternatives

Table 18 below outlines the evaluation of each alternative.

Table 18 – Evaluation of Water Booster Pump Station Alternatives

Alternatives		Alternative 1		Alternative 2	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	**15**	**5**	**0.75**	**5**	**0.75**
Natural Environment	**10**	**5**	**0.50**	**5**	**0.50**
Social Environment	**20**	**15**	**1.00**	**15**	**1.00**
Air Quality, Noise and Vibration	10	5	0.50	5	0.50
Quality of Life	5	5	0.25	5	0.25
Community Accessibility	5	5	0.25	5	0.25
Cultural Environment	**10**	**8**	**0.40**	**8**	**0.40**
Archaeological	5	3	0.15	3	0.15
Heritage Features	5	5	0.25	5	0.25
Technical Considerations	**25**	**19**	**0.95**	**19**	**0.95**
Performance	5	5	0.25	5	0.25
Technical Suitability	5	5	0.25	5	0.25
Phasing	5	3	0.15	3	0.15
Construction Considerations	5	3	0.15	3	0.15
Operational Considerations	5	3	0.15	3	0.15
Economic Considerations	**20**	**8**	**0.80**	**7**	**0.70**
Capital Cost	10	4	0.40	3	0.3
Operational Cost	10	4	0.40	4	0.4
Total	**100**	**Score:**	**4.40**	**Score:**	**4.30**

18.0 Evaluation of Water Treatment Plant Alternatives

The Meaford WTP requires no expansion for existing and full build-out conditions, as the plant has sufficient capacity. To eliminate pressure problems in the main pressure zone, two (2) alternatives are evaluated:

Alternative 1 would increase the Nelson Street pressure zone boundary and construct a larger Pressure Zone 2 BPS to supply the larger pressure zone. While this alternative would solve the pressure problem for the higher elevations, it would still result in pressure fluctuations for other customers in the main pressure zone as the high lift pumps cycle on and off. It would also mean installation of larger pumps and stand-by power unit in a boosted zone when the existing high lift pumps already have sufficient capacity to meet all peaks in the main pressure zone and also have stand-by power available.

Alternative 2 would increase the HGL of the main pressure zone to 239 m elevation (an increase of 7 m or 10 psi), would lock in the elevated tank and would operate the main pressure zone as a closed pressure zone. This would require installation of VFDs on the high lift pumps and the modification of the

control system to create an even pressure throughout the pressure zone under all demand conditions. While the elevated tank would receive flows from the high lift pumps for filling, it could be dedicated to the supply of the Nelson Street boosted zone, reducing the size of pumps and stand-by power requirement. The elevated tank could also still be available to the main pressure zone under emergency condition.

Based on the substantial improvement to operating quality and economy, as well as the reduced capital cost, Alternative 2 is preferred to Alternative 1.

19.0 Evaluation of Wastewater Collection Alternatives

The recent CCTV inspections and I/I Study has identified deficiencies throughout the Meaford sanitary sewer collections system that require improvements. The deficiencies identified include: broken and cracked pipes, misaligned joints, being partially plugged due to encrustation and due to age. To address these problem areas the preferred alternative for each section of sewermain will depend on the condition of the pipe with no universal preferred alternative for the entire system. The two (2) renewal options identified are sewermain rehabilitation (relining) or sewermain replacement.

19.1 Sewer Rehabilitation Alternative

Trenchless sewer rehabilitation is a commonly used method for the rehabilitation of compromised sewermains. Several methods for trenchless rehabilitation exist and include: pipe bursting, sliplining, and CIPP. Each rehabilitation method can successfully reduce I/I, and both sliplining and pipe bursting provide improved structural integrity equivalent to a fully replaced pipe. CIPP rehabilitation will provide a minor improvement in structural integrity but is not recommended for severely damaged pipes. The number of service connections will affect the cost of the lining projects, as services need to be recut from the new pipe. The cost of lining is generally less expensive than replacement, provided the pipe has a reasonable remaining life. The expected service life of the pipe can be extended by 30 to 50 years with CIPP if the pipe is in good structural condition. Sliplining and pipe busting both provide a full 80-100 year lifecycle. For older pipes, typical of the Meaford water system, CIPP relining may have a higher lifecycle cost. Further, the mobilization costs for rehabilitation methods tend to be much higher than for replacement, making the relining of short pipe sections uneconomical.

19.2 Sewer Replacement Alternative

Sewermain replacement is the other most common sewer renewal alternative. It is more applicable when a pipe is closer to the end of its useful life and may fail to provide adequate service, and does not have enough structural strength and becomes prone to failure. While initial sewermain replacement costs are typically more expensive than other renewal options, this option extends the useful life longer and reduces future maintenance costs. The service life of the sewermain will be the full design life of the replacement pipe and ranges from 80 to 125 years.

19.3 Advantages & Disadvantages of Wastewater Collection Renewal Alternatives

Both renewal options have their advantages and disadvantages. Table 19 below outlines the advantages and disadvantages of the wastewater collection renewal options:

Table 19 - Advantages & Disadvantages of Wastewater Collection Renewal Alternatives

Renewal Type	Advantages	Disadvantages
Rehabilitation	• Traffic interruption and noise are confined to two (2) pits for each section • Hydraulic capacity improved • Minimal excavation/streetscape interference required • Restores corrosion resistance of pipe and extends useful life • Less up-front costs than replacement • Could add 30-50 years to service life if the structural integrity of the existing pipe is good • Construction can be phased • I/I reduction	• Service connections cannot be used for 24 hours in most cases. Construction must be coordinated with residents. • Work cannot be effectively performed in the winter, as the bypass line may freeze • Contractors may not be locally available • High mobilization costs; it is not cost effective for small rehabilitation projects • Shorter service life compared to pipe replacement
Replacement	• Repair costs will be lower because the new pipe can be expected to have lower break rates compared to older pipes • Hydraulic capacity increased • Reduced I/I • Pipe material can be chosen to suit the Municipality's needs and soil conditions • Can be replaced with less disruption of sewer service • Local contractors likely more readily available • Longer service life • Structural integrity of pipe is good • Construction can be coordinated with Municipal improvement plans	• More disruptive to streetscape than alternative of repairing breaks or rehabilitation • All service connections have to be reinstated • Higher initial costs than repair or rehabilitation

19.4 Evaluation of Wastewater Collection Renewal Alternatives

Table 20 outlines evaluation of each sewermain renewal alternative.

Table 20 – Sewermain Evaluation of Alternatives

Alternatives		Rehabilitation		Replacement	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	15	5	0.75	5	0.75
Natural Environment	10	4	0.40	3	0.30
Social Environment	**20**	**12**	**0.80**	**12**	**0.75**
Air Quality, Noise and Vibration	10	4	0.40	3	0.30
Quality of Life	5	4	0.20	5	0.25
Community Accessibility	5	4	0.20	4	0.20
Cultural Environment	**10**	**8**	**0.40**	**8**	**0.40**
Archaeological	5	3	0.15	3	0.15
Heritage Features	5	5	0.25	5	0.25
Technical Considerations	**25**	**18**	**0.90**	**24**	**1.20**
Performance	5	4	0.20	5	0.25
Technical Suitability	5	4	0.20	5	0.25
Phasing	5	4	0.20	5	0.25
Construction Considerations	5	3	0.15	4	0.20
Operational Considerations	5	3	0.15	5	0.25
Economic Considerations	**20**	**5**	**0.05**	**7**	**0.70**
Capital Cost	10	3	0.30	3	0.30
Operational Cost	10	2	0.20	4	0.40
Total	**100**	**Score:**	**3.75**	**Score:**	**4.10**

20.0 Evaluation of Wastewater Pumping Alternatives

No alternative options were identified for SPS as they were identified to all be in good condition and capable of handling full build-out conditions. However, upgrades that will result in improved performance are identified. Identified below are upgrades to SPS No. 1, No. 2 and No. 3 that would improve existing conditions at these sites and help deal with future build-out conditions. SPS No. 4 and No. 5 require no upgrades at this time. SPS No. 4 is to be decommissioned once the Knight of Meaford Lumber Factory shuts down and no longer requires its service. The decommissioning costs are to be incurred by the Knight of Meaford Lumber Factory.

Upgrades recommended at SPS No. 1 are listed in Table 21:

Table 21 – Sewage Pumping Station No. 1 Recommended Upgrades

Upgrade	Cost ($2015)
New Flow Monitor	$ 150,000
SCADA System	$ 75,000

Upgrades recommended at SPS No. 2 are listed in Table 22:

Table 22 – Sewage Pumping Station No. 2 Recommended Upgrades

Upgrade	Cost ($2015)
Replace Pumps	$ 125,000
SCADA System	$ 75,000

Upgrades recommended at SPS No. 3 are listed in Table 23:

Table 23 – Sewage Pumping Station No. 3 Recommended Upgrades

Upgrade	Cost ($2015)
Replace Pumps	$ 80,000
SCADA System	$ 75,000
Flow Monitor	$ 50,000

In order to support full build-out, a new SPS will be required to support development in the Coleman Street area in the southwest of Meaford's urban settlement area. The station will be located at the low point along the future section of Coleman Street with a new forcemain required along Coleman Street towards Muir Street. The timing and completion of the siting of this station will be dependent on development in the area.

The ultimate flows projected at SPS No. 6 are approximately 520 – 610 m^3/d ADF with a peak flow of 1300 – 1600 m^3/d. It is recommended that this station include two (2) 10 L/s pumps (one (1) duty, one (1) standby) to service the ultimate development scenario. The station will discharge into the sewer on Muir Street and sewage will subsequently flow by gravity to the WWTP. Approximately 400 m of forcemain will run from the SPS towards Muir Street. An additional catchment area (area 6) will encompass the properties that are serviced by SPS No. 6

It is estimated that SPS No. 6 and forcemain will cost $750,000.

21.0 Evaluation of Wastewater Treatment Expansion Alternatives

To allow for the current Meaford WWTP to meet the needs of the growing community, five (5) alternatives were developed to address bottlenecks and to manage flows in the system. Out of the five (5) alternatives outlined in Section 13.0, three (3) are evaluated in depth below to allow for a final

alternative to be recommended. The other two (2) alternatives did not resolve the current flow problems and therefore were not considered to be ideal and are not analyzed further.

21.1 Alternative 1 – Full Plant Expansion, Continuing I/I Reduction

A full plant expansion at the Meaford WWTP to service the ultimate population would closely follow the recommendations of the 2007 Class EA. However, between the reduced ultimate population and the continuation of I/I reduction, the ultimate flow is expected to be lower than originally projected. Additionally, since 2007 the MOECC design guidelines for sewage works have been modified. The expected flows at ultimate build-out are summarised in Table 24.

Table 24 – Flow Projections

	ADF (m^3/d)	Peak Day (m^3/d)
2013	2,740	10,870
Ultimate	5,940	17,700
Ultimate with I/I Reduction	5,350	15,600

The process expansions required to meet the ultimate flows are summarised in Figure 18.

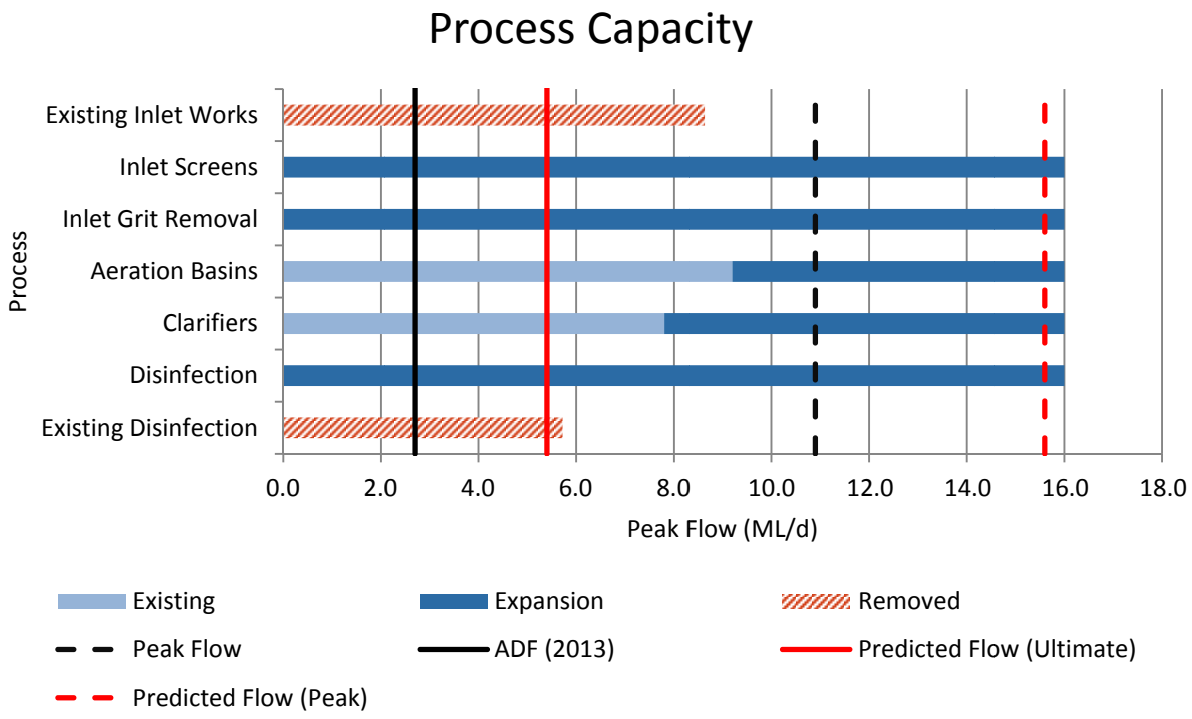


Figure 18 – Ultimate Plant Expansion Process Capacities

As described in the 2007 Class EA, it is recommended that the existing inlet works be decommissioned and a new headworks building be established at the site to house both new inlet screens and a grit removal system. The addition of the grit removal system will alleviate the need to have the aeration basins off line once each year to remove the accumulated sediment.

Based on the current design guidelines for extended aeration plants providing nitrification, the HRT should be ≥ 15 hours and the SRT should be ≥ 15 days at the ADF for the biological step. For an ADF of 5,400 m^3/d the ultimate plant should have a total aeration volume of 3,375 m^3. An additional aeration volume of 2,275 m^3 for aeration is therefore required.

The current design guidelines for secondary clarifiers specifies a maximum SOR of 40 m^3/m^3/d and a peak solids loading rate of 170 kg/m^2/d. At a RAS rate of 100% and a MLSS of 3500 mg/L, the total clarifier area required to meet the ultimate peak flow is 450 m^2. Assuming a SWD of 4.5 m, the total settling volume needed is 2025 m^3. The capacity of the existing clarifiers has been brought into question by the capacity report review by Hydromantis specifically due to the lower SWD than is typically recommended. Considering that the plant has consistently met the effluent limits for nitrification and solids over the past 6 years, while operating at an ADF around 2,700 m^3/d, it is assumed they will continue to be capable of treating this portion of the flow. To treat the remaining 2,700 m^3/d, an additional 230 m^2 of clarifier area is required where the peak solids loading rate is the limiting factor.

As discussed, the existing plant headworks represent a major bottleneck and will need to be replaced. The 2007 Class EA recommended a headworks building that contained screening, grit removal and odour control. This recommendation is carried forward, as grit accumulation in the aeration basins is an ongoing issue at the WWTP.

The existing UV disinfection system consists of two (2) channels, one equipped with UV lamp modules rated for 5,720 m^3/d, and a second channel equipped with weir and isolation channel for future UV lamp modules. While the second channel could be equipped with an additional UV module the peak flow rating would not be sufficient to meet the ultimate demands. In order to meet the ultimate demands it is recommended that a new UV disinfection system be established at the site with a peak flow capacity of 16,000 m^3/d.

The recommendation for tertiary filtration is not carried forward in this option. Based on the anticipated effluent limit phosphorus of 1 mg/L, tertiary filtration is not required. An effluent concentration of 1 mg/L phosphorus can be met and exceeded by using coagulant addition.

Table 25 summarises the recommended upgrades for the facility.

Initiative:	Rationale:
Derate plant capacity	Achieve aeration basin SRT of fifteen (15) days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Derate plant from 3,910 m^3/d to 2,700 m^3/d.
Establish a new influent forcemain.	Existing forcemain has been identified to be undersized.
Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck. The screens are undersized and will be replaced.
Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
Replace steel components of secondary clarifiers.	Units in service for >40 years, which is the expected lifespan of this equipment.
Demolish the abandoned digester.	No longer in use and there is no plan to use in the future.
New Screening facility: Two (2) screens, each 5,400 m^3/d ADF 16,000 m^3/d peak	Replacements to meet expected ADF/Peak flows.
New grit removal system Two (2) seperators, each 16,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
New secondary treatment Two (2), 1,138 m^3 rectangular tanks Total SRT fifteen (15) days	Current capacity is not sufficient to meet the requirements of growth. Additional capacity to meet ADF of 5,400m^3/d in conjunction within existing aeration basins.
New secondary clarifiers Two (2) circular tanks 12.2 m dia, 4.2 m SWD each Three (3), 21 L/s RAS pumps Three (3), 15 L/s WAS pumps	Current capacity is not sufficient to meet the requirements of growth. Additional capacity sufficient to meet peak day flow rate of 16,000 m^3/d in conjunction with existing clarifiers. Refurbishment of RAS/WAS pumping station.
New UV disinfection system Two (2) channels, total 5,400 m^3/d ADF 16,000 m^3/d peak Decommission and remove existing UV disinfection.	Current UV System is undersized for the ultimate flow.
Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
New odour control system	To be incorporated as a part of the Municipality's odour management strategy to address the historical odour

Initiative:	Rationale:
	complaints at the site.
New effluent pumping station	As per the 2007 Class EA requirements.
Remove diffuser caps from outfall	Existing caps are showing signs of damage causing inconsistent release of effluent.
Upgrade electrical supply and distribution.	Existing MCC is reaching the end of its useful life and needs to be replaced.
New stand-by power generator	Existing generator not sufficient to meet the demands of the expanded plant.

In 2007 the estimated capital cost of the plant upgrade was $26.5 million. This estimate included $3 million for tertiary treatment which has been removed. Based on an inflation rate of 2.2% since 2007, the estimated capital cost for this project in 2015 is $28 million.

This alternative will allow for the plant's capacity to be upgraded immediately removing all bottle necks in the system. With all the capital costs up front, future costs will consist of routine maintenance and replacements as needed. The downside to this alternative is the high capital cost to construct a plant that will operate at approximately 50% capacity for the next 15-20 years.

21.2 Alternative 2 – Phased Plant Expansion

The phased plant expansion is based on the recommendations of the 2007 Class EA and aims to provide a plan to expand the plant that will meet the immediate needs of the Municipality while moving towards a plant that will be capable of meeting the ultimate demands. Ideally, a phased plant expansion would occur in equal stages. However, due to the existing layout of the WWTP, a multi-stage expansion is not feasible for some processes. Table 26 provides a summary of the upgrades required to expand the WWTP to meet ultimate demands and provides a suggested order in which the upgrades should be completed.

Table 26 – Revised Upgrades of the 2007 Class EA as a Phased Expansion Plan

Phase:	Initiative:	Rationale:
1	Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
	Replace steel components of secondary clarifiers.	Units in service for >40 years, which is the expected lifespan of this equipment.
	Refurbish RAS/WAS pumping station Three (3), 21 L/s RAS pumps Three (3), 15L/s WAS pumps	RAS/WAS pumping station reaching the end of its useful life.
	Upgrade electrical supply and distribution.	Existing MCC is reaching the end of its useful life and needs to be replaced.
2	Derate plant capacity	Achieve aeration basin SRT of fifteen (15) days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Derate plant from

Phase:	Initiative:	Rationale:
		3,910 m^3/d to 2,700 m^3/d.
	Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck. The screens are undersized and will be replaced.
	Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
	New screens Two (2) screens, each 5,400 m^3/d ADF 16,000 m^3/d peak	Replacements to meet expected ADF/Peak flows.
	New grit removal system Two (2) seperators, each 16,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
	New secondary treatment One (1), 1,138 m^3 rectangular tank Total SRT fifteen (15) days	Current capacity is not sufficient to meet the requirements of growth. Additional capacity to meet ADF of 4,050 m^3/d in conjunction within existing aeration basins.
	New secondary clarifier One (1) circular tank 12.2 m dia, 4.2 m SWD each	Current capacity is not sufficient to meet the requirements of growth. Additional capacity sufficient to meet peak day flow rate of 12,050 m^3/d in conjunction with existing clarifiers.
	Retrofit existing UV channels and provide an additional UV module	Doubles the current disinfection capacity to 11,440 m^3/d.
3	New effluent pumping station	As per the 2007 Class EA requirements.
	Demolish the abandoned digester.	No longer in use and there is no plan to use in the future.
	Remove diffuser caps from outfall.	Existing caps are showing signs of damage causing inconsistent release of effluent.
4	Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
	New odour control system	To be incorporated as a part of the Municipality's odour management strategy to address the historical odour complaints at the site.
5	New secondary treatment One (1), 1,138 m^3 rectangular tank Total SRT fifteen (15) days	Additional capacity to meet ADF of 5,400 m^3/d in conjunction within existing aeration basins.
	New secondary clarifier One (1) circular tank	Additional capacity sufficient to meet peak day flow rate of 16,000 m^3/d in

Phase:	Initiative:	Rationale:
	12.2 m dia, 4.2 m SWD each	conjunction with existing clarifiers.
	New UV disinfection system Two (2) channels, total 5,400 m^3/d ADF 16,000 m^3/d peak Decommission and remove existing UV disinfection.	UV System is undersized for the ultimate flow.
	New stand-by generator	Existing generator not sufficient for expanded plant.

The estimated costs of each phase inclusive of design are summarised in Table 27.

Table 27 – Phased Expansion Cost Estimations

Expansion Phase		Cost (2015 Dollars)
Phase 1	Construction	$2,150,000.00
	Engineering and Contingencies (25%)	$569,750.00
	Total:	$2,719,750.00
Phase 2	Construction	$8,050,000.00
	Engineering and Contingencies (25%)	$2,133,250.00
	Total:	$10,183,250.00
Phase 3	Construction	$2,000,000.00
	Engineering and Contingencies (25%)	$530,000.00
	Total:	$2,530,000.00
Phase 4	Construction	$6,200,000.00
	Engineering and Contingencies (25%)	$1,643,000.00
	Total:	$7,843,000.00
Phase 5	Construction	$5,360,000.00
	Engineering and Contingencies (25%)	$1,420,400.00
	Total:	$6,780,400.00

The plant expansion will be completed in five (5) stages to allow the plant to meet the needs of the growing population. Phase 1 should occur within the next five (5) years based on the remaining useful life of the equipment suggested to be rehabilitated and the current condition. Phase 2 should occur when the plant begins to have difficulty meeting effluent objectives. Phase 3 and Phase 4 are not imperative to the operation of the plant and may occur when convenient for budgeting purposes. The timing of Phase 5, similar to Phase 2, will be dependent upon the ability of the plant to meet effluent objectives. This phased approach will allow the construction phases to follow population growth allowing for the Municipality to change the timeline if the predicted population growth changes. By completing the expansion in stages, the initial capital costs will be reduced with the remaining costs incurred in the future. The Municipality will have more time to come up with the necessary funds to complete the project.

21.3 Alternative 3 - Equalization Storage, I/I Reduction, Future Expansion

Between 2006 and 2014 the greatest flow events at the Meaford WWTP have occurred between December and January as a result of snow melting events. Over this period, the highest daily flow occurred during December 2008 with a max day flow of 13,880 m^3. During January of 2008 the WWTP experienced a peak day flow of 12,508 m^3. Since 2008, the most severe peak day flow occurred on January 30th 2013 with a peak day flow of 11,774 m^3/d. While the flow on this day is only slightly above the C of A rated capacity of the plant, it is well above the plant's recommended re-rated peak capacity of 8,100 m^3/d. The event is shown in Table 28 as recorded in the plant annual report.

Table 28 – Peak Flow Event Summary

Date	ADF (m^3/d)	Peak (m^3/d)	(Capacity – ADF) (m^3/d)	(Peak Capacity – Peak) (m^3/d)
1/28/2013	2,279.00	4,400.00	5821	3700
1/29/2013	6,769.00	7,872.00	1331	228
1/30/2013	11,774.00	15,252.00	-3674	-7152
1/31/2013	7,217.00	12,300.00	883	-4200
02/01/2013	5,653.00	6,890.00	2447	1210
02/02/2013	3,896.00	6,600.00	4204	1500

As seen in Table 29, the plant treated an excess of 3,674 m^3 based on a peak capacity of 8,100 m^3/d. The 2013 peak flow event was caused by a 22 mm rain storm which resulted in rapid melting of the accumulated snowfall. Based on the information provided in the annual report, the peak flow events that occurred during 2008 were also the result of heavy rains causing a rapid snow melt. The rapid melting events have historically occurred over a one (1) to two (2) day period and would therefore be well accommodated by a temporary storage option such as an equalization tank. Due to the short duration of the peak flow events, it would be possible for the stored sewage to be pumped out and treated within the following days. The plant has a need for an expansion of the aeration basins and clarifiers, based on previous reports. It is proposed that the clarifier and aeration tank be constructed at the site to be used as equalization storage in the short term before being modified to operate to their intended manner. An equalization tank for the Meaford WWTP would need to be large enough to temporarily store the flow over and above the peak capacity for an event as described above. The required ultimate clarifier and aeration volume is suitable for the purposes of equalization storage as shown in the following discussion.

In order to accommodate growth and ensure the plant continues to meet the effluent objectives, a plan for reducing I/I will be required to keep the ADF below 2,700 m^3/d. Based on the 2014 I/I Study Report, there is significant opportunity to reduce extraneous flows and reclaim reserve capacity at the plant. During the month of April 2014 an estimated 2,458 m^3/d of flow was determined to be extraneous, which translates to an increase in the yearly ADF of 205 m^3/d. In terms of growth planning, 205 m^3/d of reclaimed capacity through I/I reductions would be sufficient to service an additional eighteen (18) years

of growth in the urban area based on the historical growth rate and an assumed sewage production rate of 450 L/cap/day.

Based on the known extent of extraneous flows and the historical rate of growth in the urban area, equalization storage and I/I reduction would be an effective solution for the plant for the next 15-20 years. Eventually, opportunities for I/I reduction become limited or impractical and a plant upgrade will be required to increase capacity. The existing and projected flow rates for the ultimate population are presented in Table 29.

Table 29 – Flow Projections

	ADF (m^3/d)	Peak Day (m^3/d)
2013	2,740	10,870
Ultimate	5,940	17,700
Ultimate with I/I Reduction	5,350	15,600

It is expected that by continuing with the existing I/I reduction program the Municipality can reduce the ultimate peak day from the 17,700 m^3/d to 15,600 m^3/d.

Based on the current design guidelines for extended aeration plants providing nitrification, the HRT should be ≥ 15 hours and the SRT should be ≥ 15 days at the ADF for the biological step. For an ADF of 5,400 m^3/d, the ultimate plant should have a total aeration volume of 3,375 m^3.

The current design guidelines for secondary clarifiers specifies a maximum SOR of 40 m^3/m^3-d and a peak solids loading rate of 170 kg/m^2-d. At a RAS rate of 100% and a MLSS of 3500 mg/L, the total clarifier area required to meet the ultimate peak flow is 450 m^2. Assuming a SWD of 4.5 m, the total aeration volume needed is 2025 m^3.

While the need for equalization storage is required in the short term, it is anticipated that this need will be eliminated by the reduction of inflow sources and plant expansion. It is recommended that the tankage for the future clarifiers and aeration basins be designed to operate as equalization storage in the short term. This course of action will defer the need for full expansion in the short term and will spread out the investment in the plant over a longer time period. The total additional tank volume needed to treat the ultimate flows is 3,622 m^3, which is very similar to the calculated volume needed for an equalization tank to meet the current needs. The additional space requirements for benching and appurtenances should be taken into account in the design. Design of the tanks for future modification is important for both the reduction of long term capital costs as well as management of space at the site. This aspect of Alternative 3 is integral to its viability in comparison to the other alternatives presented.

When development outpaces the ability of the Municipality to reduce extraneous flows, and a subsequent loss in effluent quality is experienced, the second phase of the program should be initiated and the plant should be expanded to meet the ultimate flows. The process expansions required to service the population at ultimate build-out are summarised in Figure 19.

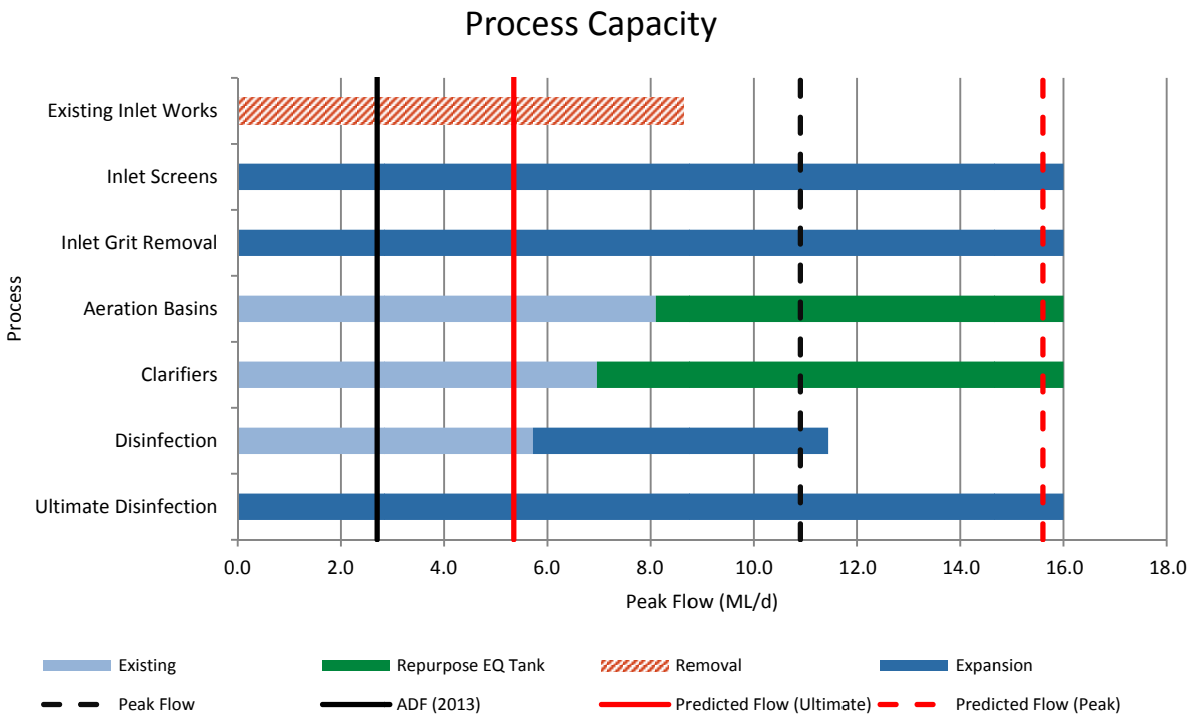


Figure 19 – Equalization Tank and Future Expansion Process Capacities

Given the existing site plan, the best location to construct the proposed tankage is at the southeast corner of the site. Constructing at this location would involve demolishing the abandoned sludge storage tank. The estimated capital cost of the equalization tank construction is $4.13 million, a cost breakdown is presented in Table 30.

Table 30 – Detailed Cost Estimate: Equalization Tank

Category		Cost (2015 Dollars)
General		$250,000.00
Siteworks		$350,000.00
Structural		$1,550,000.00
Civil		$300,000.00
Process Mechanical		$350,000.00
Electrical		$300,000.00
I&C/SCADA		$120,000.00
	Sub Total:	**$3,220,000.00**
Design (7%)		$225,000.00
Construction Admin (8%)		$258,000.00
Permits/ Approvals		$50,000.00
	Sub Total:	**$3,753,000.00**
Contingencies (10%)		$375,000.00
	Total:	$4,128,000.00

Additional costs will be incurred during the I/I reduction project. A number of damaged areas have been identified in the I/I Study which provides a basis to continue reduction of extraneous flow. Additionally, it is suggested that a new by-law should be put in place to ban all sump pump and eavestrough sanitary sewer connections and actions should be taken to enforce the sewer sue restrictions.

As discussed above, it is expected that equalization storage and I/I reduction efforts will provide significant capacity for the Municipality for the next 15-20 years. However, a plant expansion will be required eventually, and a number of refurbishments to the plant are needed in the near-term. The recommended plant upgrades are summarised in Table 31.

Table 31 – Recommended Plant Upgrades

Planning Term:	Initiative:	Rationale:
Short-Term	Commit to the operation of the plant at a decreased capacity	Achieve aeration basin SRT of 15 days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Operate the plant within these parameters.
	Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
	Replace steel components of secondary clarifiers.	Units in service for >40 years, which is the expected lifespan of this equipment.
	Retrofit existing UV channels and provide an additional UV module	Doubles the current disinfection capacity to 11,440 m^3/d.
	Upgrade electrical supply and distribution.	Existing MCC is reaching the end of its useful life and needs to be replaced.
	New stand-by power generator	Existing generator not sufficient to meet the demands of the expanded plant.
	Refurbish RAS/WAS pumping station Three (3), 21 L/s RAS pumps Three (3), 15L/s WAS pumps	RAS/WAS pumping station reaching the end of its useful life.
Medium-Term	Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
	Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck. The screens are undersized and will be replaced.
	New screens Two (2) screens, each 5,400 m^3/d ADF 16,000 m^3/d peak	Replacements to meet expected ADF/Peak flows.

Planning Term:	Initiative:	Rationale:
	New grit removal system Two (2) separators, each 16,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
	Remove diffuser caps from outfall	Existing caps are showing signs of damage causing inconsistent release of effluent.
Long-Term	Repurpose storm tank to Clarifiers/Aeration Basins	Repurposed storm tanks will provide aeration capacity to meet ADF of 5,400m^3/d in conjunction within existing aeration basins and clarifier capacity to meet peak flow of 16,000 m^3/d along with the existing clarifiers.
	New UV disinfection system Two (2) channels, total 5,400 m^3/d ADF 16,000 m^3/d peak Decommission and remove existing UV disinfection.	Current UV System is undersized for the ultimate flow.
	Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
	New odour control system	To be incorporated as a part of the Municipality's odour management strategy to address the historical odour complaints at the site.
	New effluent pumping station	As per the requirements of the 2007 Class EA

This alternative will result in improvements to the entire sanitary collection system with improvements to both the sanitary sewers and the Meaford WWTP. By first focusing on the I/I problem, the upfront capital costs will be reduced. Once the population growth exceeds the I/I reduction, the WWTP improvements can be completed in phases to meet the needs of the growing population. This alternative will allow for a more optimized system. Unexpected peaks in flow will no longer occur during storm events, allowing for more consistent flow through the treatment train.

The capital costs associated with the upgrades described in each planning term are summarised in Table 32 below.

Table 32 – Capital Cost Estimates for Planned Upgrades: Alternative 3

Planning Term		Cost (2015 Dollars)
Short-Term Upgrades	Construction	$2,500,000.00
	Engineering and Contingencies (25%)	$625,000.00
	Total:	$3,125,000.00
Medium-Term Upgrades	Construction	$5,200,000.00
	Engineering and Contingencies (25%)	$1,300,000.00
	Total:	$6,500,000.00
Long-Term Upgrades	Construction	$13,200,000.00
	Engineering and Contingencies (25%)	$3,300,000.00
	Total:	$16,500,000.00

21.4 Evaluation of Alternatives

Table 33 outlines the comparative evaluation of the three (3) alternatives based on the Class EA evaluation criteria.

Table 33 – Evaluation of WWTP Alternatives

Alternatives		**Option 1**		**Option 2**		**Option 3**	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	**15**	**4**	**0.60**	**4**	**0.60**	**5**	**0.75**
Natural Environment	**10**	**5**	**0.50**	**5**	**0.50**	**4**	**0.40**
Social Environment	**20**	**4**	**0.80**	**4**	**0.61**	**4**	**0.70**
Air Quality, Noise and Vibration	10	4	0.40	4	0.40	3	0.30
Quality of Life	5	4	0.20	4	0.01	4	0.20
Community Accessibility	5	4	0.20	4	0.20	4	0.20
Cultural Environment	**10**	**5**	**0.50**	**5**	**0.50**	**5**	**0.50**
Archaeological	5	5	0.25	5	0.25	5	0.25
Heritage Features	5	5	0.25	5	0.25	5	0.25
Technical Considerations	**25**	**3**	**0.75**	**3**	**0.85**	**4**	**0.95**
Performance	5	4	0.20	4	0.20	3	0.15
Technical Suitability	5	4	0.20	4	0.20	4	0.20
Phasing	5	1	0.05	3	0.15	5	0.25
Construction Considerations	5	3	0.15	3	0.15	4	0.20
Operational Considerations	5	3	0.15	3	0.15	3	0.15
Economic Considerations	**20**	**2**	**0.40**	**4**	**0.70**	**5**	**1.00**
Capital Cost	10	2	0.20	4	0.40	5	0.50
Operational Cost	10	2	0.20	3	0.30	5	0.50
Total	**100**	**Score:**	**3.55**	**Score:**	**3.76**	**Score:**	**4.30**

22.0 Preferred Solutions

Alternative solutions were identified for each section of the Municipality of Meaford's water and wastewater systems. Evaluation criteria, focusing on environmental effects, were developed along with weightings for each criteria and a ranking system to allow a preferred solution to be identified. Identified below is the preferred solution for each system component. Selection of the preferred solution also took into consideration input and comments received from the public and review agencies. Depending on the situation, the preferred solution may involve a combination of the alternative solutions to best solve the identified problem.

22.1 Water Distribution

The existing water distribution system is adequate to support development to full build-out but will require pipe repair and replacement of current pipes to meet MOECC guidelines and to combat pipe deterioration. Additionally local development watermains are to be added to the system by developers or by the Municipality to support multiple new developments.

Watermain rehabilitation is the least expensive option to implement on an initial capital cost basis. However, if the structural integrity of the watermain does not support a lengthy increase in useful life, watermain relining is not effective. Relining does not always improve the structural integrity of the watermain; therefore the chance of a watermain break would not change if it is relined. Therefore, it would not be economical to reline a watermain that has poor structural integrity. The disruption from construction is minimal, only the entry and exit pits would have to be dug, which would keep the restoration cost down. The watermain cannot be used during the cleaning and relining process; a bypass line must be used to provide water to all customers. The relining should not be done in colder months, since the bypass line could freeze. The relining can decrease the inside diameter of the pipe; a small diameter pipe would decrease the hydraulic capacity of the pipe. Since many of the pipes within Meaford that should be renewed are 100 mm diameter pipes, making their diameter even smaller would not be beneficial to the water distribution system. One of the main reasons to renew the watermain is to increase the hydraulic capacity within the system. Watermain rehabilitation is a good option for structurally sound watermain and where the size of the watermain does not need to be changed.

Watermain replacement is the more expensive option to implement. There is a large up front capital cost to replace the watermain; however, money is saved in operational costs. These operation cost savings include not repairing watermain breaks, and less unaccounted for water. Replacing watermains allows the Municipality to install the size of watermain to suit the distribution system needs based on future needs and build-out. If the watermain is too small to provide adequate hydraulic capacity then a larger watermain may be installed to improve the hydraulic capacity throughout the system. Watermain replacement is more disruptive than watermain relining. The most common method of watermain replacement is open cut method; this usually involves excavation of up to half the road to install the watermain. This can cause disruption to nearby residents while construction is being completed.

The following is recommended for the Meaford water distribution system upgrade:

- Where there is a need to increase the diameter of the watermain to meet service delivery goals then the watermain should be replaced
- Adequately sized cast iron or ductile iron watermains should be replaced where the useful service life cannot be increased by at least 40 years, if the useful life can be increased by at least 40 years the watermain may be rehabilitated
- Asbestos cement pipes should be replaced rather than repaired where they are structurally inadequate

To determine the replacement strategy for adequately-sized cast iron pipes, flow testing should be completed to understand the condition each pipe is in. This information can be used to develop a replacement plan making sure more critical pipes are replaced first.

The water distribution system expansion and upgrades fall under Schedule A and A+ in the Class EA list of municipal water and wastewater projects. All pipe repair and replacement is Schedule A along with the construction of new pipe for the planned subdivisions. All new pipe being constructed under existing Municipally-owned road falls under Schedule A+. Throughout the master planning process the public was consulted on the reconstruction and expansion projects. Schedule A and A+ projects are pre-approved and all additional requirements have been fulfilled.

22.2 Water Storage

Water storage is adequate to support the existing community and some development. The construction of a 2,000 m^3 in-ground reservoir on St. Vincent Street (County Road 7) is the recommended solution for the expansion of water storage in Meaford, to meet the balance of development up to full build-out. This reservoir will benefit all consumers and new development in urban Meaford. The in-ground solution is slightly more cost effective and received the highest score from the assessment completed, which incorporated the approved Class EA document criteria. The in-ground facility will offer floating storage to the south end of the water distribution system and require very low maintenance costs into the future.

This project falls under Schedule B in the Class EA list of municipal water and wastewater projects. Additional investigations and reports need to be completed with regards to the site's geotechnical characteristics and natural environment, before all requirements have been fulfilled. This can be completed when the in-ground reservoir construction becomes necessary to support development.

22.3 Water Booster Pump Stations

The St. Vincent Street BPS is adequate to support full build-out for the St. Vincent Street Booster Zone. The Nelson Street BPS needs to be renewed to meet the needs of the existing community and growth in the pressure zone. Two (2) locations were identified for this new BPS.

Both locations are viable options for a new BPS. The recommended solution for the location of a new BPS for Pressure Zone 2 is Location 1 at the water tower site. There is adequate space for a new BPS, and the watermain feeding the tower would provide adequate suction pressure to the BPS. There is less

watermain that would need to be installed or upgraded for this alternative; therefore it is the cheaper option.

This project falls under Schedule B in the Class EA list of municipal water and wastewater projects. Through the master planning process, Phases 1 and 2 of the planning process have been completed and all requirements have been fulfilled. The project is located on an existing Municipally-owned site housing the elevated tank.

22.4 Water Treatment Plant

The WTP is adequate to meet the needs of full build-out. An upgrade is recommended to improve pressure control in the main pressure zone by installing VFDs and modifying the control system. The VFD installation at the WTP falls under Schedule A in the Class EA list of municipal water and wastewater projects. The project is pre-approved and can proceed without following the public notification procedure outlined in the Class EA.

22.5 Wastewater Collection

The existing wastewater collection system is adequate to support development to full build-out with only local development sewermains to be completed by developers or by the Municipality where the sewermains support multiple developments. The Master Servicing Study has also identified the need for upgrades to the existing sewermains.

In general, sewermain rehabilitation is less expensive to implement than full replacement on an initial capital cost basis. However, factors such as the length and structural integrity of sewermain being replaced, the traffic conditions within the area and number of service connections must be taken into account.

CIPP relining does not always improve the structural integrity of the sewermain, meaning the chance of a break would not change if it is relined. Therefore, it would not be economical to reline a sewermain that has poor structural integrity. In these cases, if a relining strategy is preferred, either sliplining or pipe bursting would be more appropriate, as structural integrity would be improved. The disruption from construction is minimal, for CIPP the liner is installed from MH to MH. Sliplining and pipe bursting both require only entry and exit pits to be dug. The sewermain cannot be used during the relining process; the rehabilitation must be coordinated with the residents along the section to ensure they are not attempting to use the sewer for a minimum of 24 hours. Both slip lining and CIPP will reduce the internal diameter of the sewer pipe, however it will also decrease the local infiltration rates and reduce the friction factor of the pipe.

Sewermain replacement is the more expensive option to implement. There is a large up front capital cost to replace the sewermain; however, depending on the section being repaired, often pipe replacement has a lower lifecycle cost. The most common method of sewermain replacement is open cut method; this usually involves excavation of up to half the road to install the sewermain. This can cause disruption to nearby residents while construction is being completed, however the sewer service can be maintained throughout construction.

The following is recommended for the Meaford sewer collection system upgrade:

- Pipe relining should be preferred where the useful service life can be increased by at least 40 years.
- Small pipe sections requiring rehabilitation should be replaced due to the high mobilization costs associated with relining.

The wastewater collection system expansion and upgrades fall under Schedule A and A+ in the Class EA list of municipal water and wastewater projects. All sewer repair and replacement is Schedule A along with the construction of new pipe for the planned subdivisions. All new sewers being constructed under existing Municipal-owned road falls under Schedule A+. Throughout the master planning process the public was consulted on the reconstruction and expansion projects. Schedule A and A+ projects are pre-approved and all additional requirements have been fulfilled.

22.6 Sewage Pumping Stations

The existing SPSs are adequate to support development to full build-out condition.

No preferred solutions were identified for the five (5) existing SPSs as they all have enough capacity to handle existing and full build-out conditions. The following upgrades were suggested for SPSs No. 1, No. 2 and No. 3 to help improve performance.

SPS No. 1 – new flow monitor, SCADA system upgrade

SPS No. 2 – replace pumps, SCADA system upgrade

SPS No. 3 – replace pumps, SCADA system upgrade, flow monitor upgrade

SPS No. 4 is to be decommissioned when the customer no longer requires its services and No. 5 require no improvements at this time.

The SPS upgrades fall under Schedule A in the Class EA list of municipal water and wastewater projects. Schedule A projects are pre-approved and therefore the Municipality can proceed with these projects without having to follow the public notification procedures set out in the Class EA.

A sixth SPS has been proposed to support development in the south east area of the community. SPS No. 6 will be necessary to service developments the future Coleman Street.

The SPS upgrades for SPS No. 1 and No. 2 fall under Schedule A and SPS No. 3 falls under Schedule A+ in the Class EA list of municipal water and wastewater projects. These projects are pre-approved, therefore the Municipality can proceed without following the public notification procedure set out in the Class EA. The construction of SPS No. 6 falls under Schedule B in the Class EA list of municipal water and wastewater projects. Construction of this SPS will require additional studies including Environmental Management, Archaeological and Geotechnical studies. These can be undertaken when development proposals are received for the area.

22.7 Wastewater Treatment

Overall, it is recommended that the Municipality adopt Alternative 3 for the expansion of the WWTP which involves establishing the ultimate clarifier and aeration basin tanks at the existing WWTP site to be used for storm retention in the near term. The plant currently experiences significant peak flows which will be effectively managed by establishing equalization storage at the site. It is recommended that the clarifier and aeration basin tankage be designed to be effective as storm retention tanks until they are required in order for the plant to meet effluent objectives. The I/I reduction program is integral to this alternative as it has been identified in previous studies that the existing WWTP may be not be able to meet the C of A effluent limits while operating at an ADF greater than 2,700 m^3/d. The objective of the I/I reduction program will therefore be to reduce extraneous flows at the same pace as development and keep the plant ADF at approximately 2,600 m^3/d. This will allow the plant to essentially be operated as an EAAS plant with a capacity of 2,700 m^3/d and an 8,100 m^3/d peak and maximize the level of treatment.

Depending on the project for the WWTP upgrades, different schedules in the Class EA process must be followed. The WWTP refurbishment and demolition of the old sludge storage, upgrades to the UV disinfection channel and odour control system construction all fall under Schedule A and are therefore pre-approved projects that can proceed without following the public notification procedure set out in the Class EA. The storm equalization basin falls under Schedule B and can proceed following the completion of the Master Plan as the required Class EA procedure in Phases 1 and 2 have been completed. The repurposing of the storm equalization basin, new headworks building, new biosolids works and new UV disinfection all require the Schedule C procedure to be followed. This will require additional phases to be followed allowing the entire Class EA procedure to be completed.

23.0 Public and Review Agency Comments

Public consultation is an important part of the Class EA process, allowing public and review agencies to become informed and comment throughout the process. For the Master Plan, public input and comments were received and incorporated into the planning process. Table 34 outlines the comments that were received throughout the consultation process following the Phase 1 PIC and Phase 2 PIC. Copies of all the correspondence is attached in ***Appendix D***. Member of the public and review agencies that provided comments on the servicing plan received response letters.

NAME & CONTACT INFO	DATE OF CONTACT	REPLY RECEIVED FROM NOTICE NOTES/DATES/ ETC	MAJOR ITEMS OF CONCERN COMMENTS	AAL'S RESPONSE & DATE
Notice of Commencement - July 4, 2014				
Canadian Environmental Assessment Agency	July 4, 2014	July 11, 2014	"If it appears that CEAA 2012 may apply to your proposed project, you must provide the Agency with a description of the proposed project. Please see the link below to the Agency's guide to preparing a project description. Guide to Preparing a Description of a Designated Project http://www.ceaa.gc.ca/63D3D025-2236-49C9-A169-DD89A36DA0E6/Guide_to_Preparing_a_Description_of_a_Designated_Project_under_CEAA_2012.pdf If you believe the project is not subject to a federal environmental assessment, and do not submit a project description, we kindly request that you remove the Agency from your distribution list. If you have questions, please get in touch with our office through the switchboard at 416-952-1576."	No Response required
Chippewas of Rama FN	July 4, 2014	July 14, 2014	Please direct future correspondence to Ms. Sandy-McKenzie, 8 Creswick Court, Barrie, ON, L4M 2J7	No response required
MOECC	July 4, 2014	July 16, 2014	"Based on the information submitted, ministry staff is unable to provide specific matters of ministry interest with this project at this time other than our general legislative mandates around environmental management and protection." The Crown delegated the procedural aspects of consultation to the Municipality and Ainley. The following primary contacts were provided: • Jake Linklater, Officer Coordinator, Saugeen Ojibway Nation Environmental Office, R.R. # 5, Wiarton, ON, N0H 2T0, (519)534-5507, jakelinklater@saugeenojibwaynation.ca • Audrey Erin Holden, Lands and Resources Consultation Coordinator Historic Saugeen Metis, 204 High street, Box 1492 Southampton, ON, N0H 2L0, (519)483-4000, saugeenmetisadmin@bmts.com • James Coture, Great Lakes Metis Council, (519)370-0435, truelyfine14@yahoo.ca • James Wagar, Consultation Assessment Coordinator Lands, Resources and Consultations Metis Nation of Ontario, 222-75 Sherbourne St., Toronto, ON, M5A 2P9, (416)977-9881, jamesw@metisnation.org	No response required

NAME & CONTACT INFO	DATE OF CONTACT	REPLY RECEIVED FROM NOTICE NOTES/DATES/ ETC	MAJOR ITEMS OF CONCERN COMMENTS	AAL'S RESPONSE & DATE
Hiawatha First Nation	July 4, 2014	July 21, 2014	Hiawatha indicated that the project at this time has minimal potential to impact Hiawatha First Nations' rights at this time. They want to continue to be advised of any updates and reserve the right to comment later. They want to be contacted if artifacts are found.	No response required
MTO	July 4, 2014	July 30, 2014	"MTO has an interest in this study as it may have impacts on the Highway 26 corridor. MTO wishes to continue to be on the circulation list and be involved in this study as it proceeds. MTO advises that new or proposed servicing infrastructure should not be placed within the Highway 26 property limits. The study should be evaluating other alternatives other than the Highway 26 corridor."	No response required
Notice of PIC #1 - August 27, 2014				
MAA	August 27, 2014	October 17, 2014	The MAA provided the following contact information: • Chief Roland Monague, Beausoleil First Nation (Christian Island), 11 Ogemaa Miikaan, Christian Island, ON, L6M 0A9, (705)247-2051, (Fax)247-2239, bfnchief@chimnissing.ca • Arlene Chegahno, Chippewas of Nawash Unceded First Nation (Cape Croker), R.R. # 5, 135 Lakeshore Road, Wiarton, ON, N0H 2T0, (519)534-1689, (Fax)534-2130, Reception.admin@nawasha.ca • Chief Veron Roote, Chippewas of Saugeen, R.R. # 1, 6493 Hwy. 21, Southampton, ON, N0H 2L0, (519)797-2781, (Fax)797-2978 • Peter Couture, Interim President, Great Lakes Metis Council, 380 9th street East, Owen Sound, ON, N4K 1P1, (519)370-0435, osareametiscouncil.live.ca • Metis Nation of Ontario Head Office, Metis Consultation Unit, 500 Old St. Patrick Street, Unit D, Ottawa, OM, K1N 9G4, Fax (613)725-4225	No response required
Notice of PIC - February 19, 2015				
MOECC Southwestern Region	February 19, 2015	February 24, 2015	"Bill Armstrong has retired from the Ministry. I will be looking after his files in Bruce and Grey until I retire in April. For this project, would you please send your PIC PowerPoints to me when these documents become public? We circulate these materials internally to acquaint internal staff with the progress of Class EA projects. In the future, all correspondence regarding this project should be send to my	Sent PIC No. 2 boards via email on February 27, 2015.

NAME & CONTACT INFO	DATE OF CONTACT	REPLY RECEIVED FROM NOTICE NOTES/DATES/ ETC	MAJOR ITEMS OF CONCERN COMMENTS	AAL'S RESPONSE & DATE
			attention or to the attention of the "Regional EA Coordinator" in London. Craig Newton, our remaining Coordinator, should be copied on important e-mails."	
MTO	February 19, 2015	February 26, 2015	"MTO still has an interest in this study as it may have impacts on the Highway 26 corridor. Unfortunately MTO staff is unavailable to attend Public Information Centre No. 2 in person. Therefore, would you please provide our office with a copy of the display boards for our review and comment. You can email PDF's of the display boards to me directly. MTO advises that new or proposed servicing infrastructure should not be placed within the Highway 26 property limits. The study should be evaluating other alternatives other than the Highway 26 corridor."	Sent PIC No. 2 boards via email on February 27, 2015.
Grey Sauble Conservation Authority	February 19, 2015	March 4, 2015	Requested any relevant information that their office may require.	Sent PIC No. 2 boards via email on March 9, 2015.
Aundeck-Omni-Kaning First Nation	February 19, 2015	March 5, 2015	Identified that the First nation communities of the Robinson Huron Treaty and/or the Manitoulin Treaty area are affected either directly or indirectly but that further consultation at this time is not required.	No response required
Chippewas of the Thames First Nation	February 19, 2015	March 5, 2015	"In our screening of your correspondence we have identified no concerns with your project or the information that you have presented to us at this time. We feel that due to the scope of your project, we will no longer need to receive regular updates. We ask that if there are any changes to your project that are of a substantive nature that you keep us informed."	No response required
MTO	February 27, 2015	March 10, 2015	"Based on our review of the Public information Centre No. 2 boards, it would appear that the recommended solutions for the Meaford water and Wastewater systems should not have any direct impact to the Highway 26 corridor. However, with that said, MTO advises that should new servicing infrastructure be proposed, the study should evaluate alternatives other than placement within the Highway 26 corridor." The MTO wished to continue to be on the circulation list for this project.	No response required
Grey Sauble Conservation Authority	March 9, 2015	March 10, 2015	"Please notice that some of the proposed work may require permits from our office under Ontario Regulation 151/06 made under the Conservation Authorities Act." They request continued involvement as the Class EA process moves forward	No response required

24.0 General Summary and Requirements

24.1 Proposed Service Area

The proposed service area includes everything within the Meaford urban settlement area. The service area is bounded by Centreville Road to the north, 7th Line to the west, Muir Road to the south and Georgian Bay to the east. The area encompasses the urban centre of Meaford. Undeveloped land within the proposed service area has been zoned as residential, commercial, industrial or institutional, allowing an estimated full build-out population to be estimated. The zoning also provided an accurate understanding of how development will take place in Meaford. This information was used in the development of the projects identified in the Master Plan.

24.2 Proposed Water Distribution and Storage System

Examination of the Meaford water distribution system allowed for the identification of watermains in need of rehabilitation and replacement. Currently the system experiences lowered pressure in areas where there are inadequately sized pipes. The preferred solution outlines that both rehabilitation and replacement of inadequate watermains will allow for the most suitable and most cost effective solution. Flow testing will be conducted on all cast iron watermain to gain knowledge on the existing condition of the pipes and to understand what solution will most effectively improve the current situation. All 100 mm diameter watermain will be replaced to comply with MOECC guidelines, which states that the minimum diameter of watermain is 150 mm. New sections of watermain will be constructed to allow future development in the urban settlement area to be connected to the system.

With an increasing population, more water storage is required by the MOECC guidelines. To increase the systems storage, an in-ground water storage reservoir has been proposed at the south end of the urban settlement area on County Road 7. The reservoir will be 2000 m^3 of floating storage requiring no pumping due to the ground elevation of the reservoir.

The current Nelson Street BPS does not provide adequate fire flow to the Nelson Street Booster Zone and is planned to be decommissioned. To replace this BPS, a new station will be constructed at the water tower location. This new BPS will improve the pressures and fire flows in Pressure Zone 2, which is important because the hospital is located within this pressure zone.

24.3 Proposed Water Supply and Treatment System

Through the master planning process it was identified that the capacity of the existing water treatment system has adequate capacity to provide water to Meaford customers during existing and full build-out conditions.

The master planning process identified the need for VFDs at the WTP to allow for more consistent water pressure throughout the systems diurnal period.

24.4 Proposed Wastewater Collection and Pumping System

Examination of the Meaford wastewater system allowed for the identification of sewermains in need of rehabilitation and replacement. Overall, the system experiences a high level of I/I as identified by the I/I Study. Both rehabilitation and replacement of damaged pipes should be considered on a case-by-case basis to determine the most cost effective methodology for sewer upgrades. Regardless of extraneous flow, the collection system has sufficient capacity to service the ultimate development population, requiring only the extension of trunk mains into new development areas.

SPS No. 1 (Bighead River) and No. 2 (Meaford WWTP) both have sufficient capacity to meet the demands of the ultimate development; I&C upgrades for both SPS No. 1 and No. 2 have been recommended. SPS No. 3 will require pump upgrades in order to service the ultimate development; I&C upgrades have also been recommended for SPS No. 3. No upgrades have been recommended for SPS No. 4 or SPS No. 5. It should be noted that the primary function of SPS No. 4 is to service the Knight of Meaford Lumber Factory which may be shut down in the near future. The Municipality should have this station decommissioned at the time the factory is shut down. The cost of decommissioning will be incurred by Knight of Meaford Lumber Factory.

A future SPS will be required to service the new development areas in the southern portion of the urban area along Coleman Street. A station location has been proposed on Coleman Street in order for sewage to be pumped south to Muir Street and connect into sewage catchment area 2. The new SPS will result in a new catchment area (area 6). Catchment area 6 will encompass the future expansion of Coleman Street.

24.5 Proposed Waste Water Treatment System

The master planning process has reiterated the findings of previous reports that the Meaford WWTP does not have sufficient capacity to meet the demands of the ultimate development. A plan has been developed to ensure the plant has capacity to handle the intense peak flow events that occur during the spring as well as the yearly ADF.

The upgrades required to service the ultimate population include a new headworks facility, additional aeration capacity, additional clarifier capacity, a new disinfection system and an expansion of the bio-solids handling facility. In order to effectively manage peak flows in near term, it is recommended that the Municipality design and construct the future aeration and clarifier tanks to be used as interim peak flow equalization in order to reduce hydraulic overloading at the plant during peak flows. The management of ADFs at the plant will be tied to the ongoing management of I/I that is being undertaken by the Municipality.

The ultimate WWTP will have an ADF capacity of 5,400 m^3/d with a peak flow capacity of 16,000 m^3/d.

24.6 Property Requirements

Meaford will need to acquire land for the in-ground storage reservoir. The proposed location for the in-ground storage reservoir is on Grey Road 7 approximately 500 m south of Muir Road. The site allows the in-ground reservoir to be elevated to the same level as the HGL, eliminating the need for pumps.

The remaining projects will be constructed on land that is currently owned by the Municipality.

24.7 Environmental Impacts and Mitigation Measures

As the planning term for the projects described within the Master Plan are not planned to be completed within the near term, Archaeological Assessments and detailed Environmental Management Plans have not been completed at this time. The results of these assessments will fully describe the environmental mitigation measures necessary for the future projects.

24.8 Permits and Approvals

No permits or approvals will be necessary for any of the projects outlined in this Master Plan.

24.9 Applicable Class EA Schedules

The projects associated with each of the preferred solutions are listed in Table 35 with the applicable Class EA Schedule.

Table 35 – Class EA Schedules

Project	Class EA Schedule
Water	
Repair/Replacement of Existing Meaford Watermains	A/A+
Establish New Meaford Watermains	A+
Establish New Watermains for Planned Subdivisions	A
In-Ground Storage Reservoir on County Road 7	B*
Water BPS on Water Tower Site	B
Decommission Nelson Street BPS	B
Installation of VFDs at Water Treatment Plant	A
Waste Water	
Relining/Rehabilitation of Existing Meaford Sewermains	A
Establish New Meaford Sewermains	A+
Establish New Sewermains for Planned Subdivisions	A
SPS No. 1 and No. 2 Upgrades	A
SPS No. 3 Upgrades	A+
Construction of SPS No. 6	B*
WWTP Refurbish and Demolition of Old Sludge Storage	A
Upgrade UV Disinfection Channel	A
Storm Equalization Basin Chamber	B
Repurpose Storm Equalization Chamber to Clarifier/Aeration	C
New Headworks Building Construction	C
New Biosolids Works	C
New UV Disinfection Channel	C
Odour Control System	A

*Additional studies will need to be completed at the time of construction to allow the Class EA procedure to be followed.

24.10 Summary of Commitments Made during Master Planning Process

Throughout the master planning process, public and review agency consultation resulted in commitments that were carried out during the planning process. MOECC Southwestern Region, MTO, Grey Sauble Conservation Authority, Hiawatha First Nation, Chippewas of the Thames First Nation and Aundeck-Omni-Kaning First Nation all requested to be kept up to date on the details of the project. CEAA and MAA provided contact information of First Nations that could be affected by the project. These First Nations were added to the contact list for all correspondence.

25.0 Proposed Capital Works Program and Costs

25.1 Water System

A phased strategy has been developed for the overall water distribution and treatment system and is presented in Table 36. The phased strategy includes projects that will be covered partially covered by development charges. The percentage paid for by the Municipality is indicated in the project name. A proposed timeline for the suggested work is provided in Figure 20.

Table 36 – Overall Water System Improvement Plan

Project Name	Estimated Cost
Phase 1	
Conduct Flow Testing on Cast Iron Pipes	$ 20,000.00
Develop Rehabilitation and Replacement Plan Based on Flow Testing	$ 10,000.00
Remove and Replace 100mm Cast Iron Pipe – 1000 m per year	$ 2,140,000.00
(54%) SCADA Design for VFD Installation	$ 16,000.00
(54%) Install VFDs at the WTP	$ 54,000.00
(16%) Design New Pressure Zone 2 BPS	$ 13,000.00
(16%) New Pressure Zone 2 BPS Construction	$ 143,000.00
Decommission Nelson Street BPS	$ 10,000.00
Total Phase 1:	**$ 2,406,000.00**
Phase 2	
Remove and Replace 100mm Cast Iron Pipe – 1000 m per year	$ 2,140,000.00
Total Phase 2:	**$ 2,140,000.00**
Phase 3	
Remove and Replace Remaining Cast Iron Pipe – 1250 m per year	$ 2,700,000.00
Total Phase 3:	**$ 2,700,000.00**
Phase 4	
Remove and Replace All 100mm Non-Cast Iron Pipe – 1000 m per year	$ 2,000,000.00
Total Phase 4:	**$ 2,000,000.00**
Total Program:	**$ 9,246,000.00**

The goal of the Improvement Plan Phase 1 is to obtain a baseline of the condition of watermains, improve current pressure issues and to start replacing watermains that do not comply with MOECC guidelines. Flow testing will be completed on the cast iron pipes in the network to see which pipes are in greater need for replacement due to corrosion and tuberculation and which pipes can be improved through rehabilitation measures. A rehabilitation and replacement plan will be developed from the data collected during flow testing. This plan will be used during the rest of Phase 1 as well as Phases 2 and 3 to prioritize pipe rehabilitation and replacement. 1000 m per year of 100 mm diameter cast iron pipe, identified to be replaced by the rehabilitation and replacement plan, will be replaced to improve pressure issues and allow MOECC guideline compliance. The existing pumps at the Water Treatment Plant will be replaced with VFDs to help reduce current pressure issues being experienced by the public. To further improve pressure issues, specifically in the Nelson Street Booster Zone, the existing Nelson Street BPS will be decommissioned and replaced by a new BPS at the water tower site. The importance of the new BPS is that it will allow for adequate fire flow at the Meaford General Hospital.

The main purpose of Phase 2 is to expand Meaford's water storage capacity. To allow for the in-ground reservoir to be constructed, new watermain must be installed along County Road 7 to connect the reservoir to the system. This additional water storage is needed when the population reaches approximately 5,800 people. The watermain and reservoir is development-related and will likely only proceed when overall system storage capacity does not meet MOECC requirements. The remaining 100 mm cast iron pipe will also be removed and replaced during Phase 2. 1000 m will be replaced each year in accordance with the rehabilitation and replacement plan.

The objective of Phase 3 is to remove all remaining cast iron pipe in the water distribution system. The rehabilitation and replacement plan will be used to identify the pipe priority and also whether replacement or relining is the preferred solution. Since these pipes diameters meet MOECC guidelines, pipe rehabilitation can be used for watermains that are still in good condition. 1000 m of pipe will be identified to be replaced/rehabilitated each year.

Phase 4 of the Improvement Plan will be to remove all additional 100 mm watermain that is non-cast iron. This will allow the entire system to be in compliance with MOECC guidelines and help reduce pressure issues caused by inadequately sized pipes.

In addition to the repairs and replacements needed throughout the urban settlement area, there are a number of watermains and water distribution infrastructure that will be required to service future planned developments. The projects that are to be partially or fully funded by development charges are shown in Table #. The demand of existing conditions was compared with full build-out conditions to determine the costs incurred by the municipality verses development with only the development charges shown below. Developer charges have been divided by the 3 hydraulic pressure zones that exist throughout the network. This is because some of the projects only affect certain pressure zones and because the growth in each pressure zone varies.

Table 37 – Water Projects Covered by Development Charges

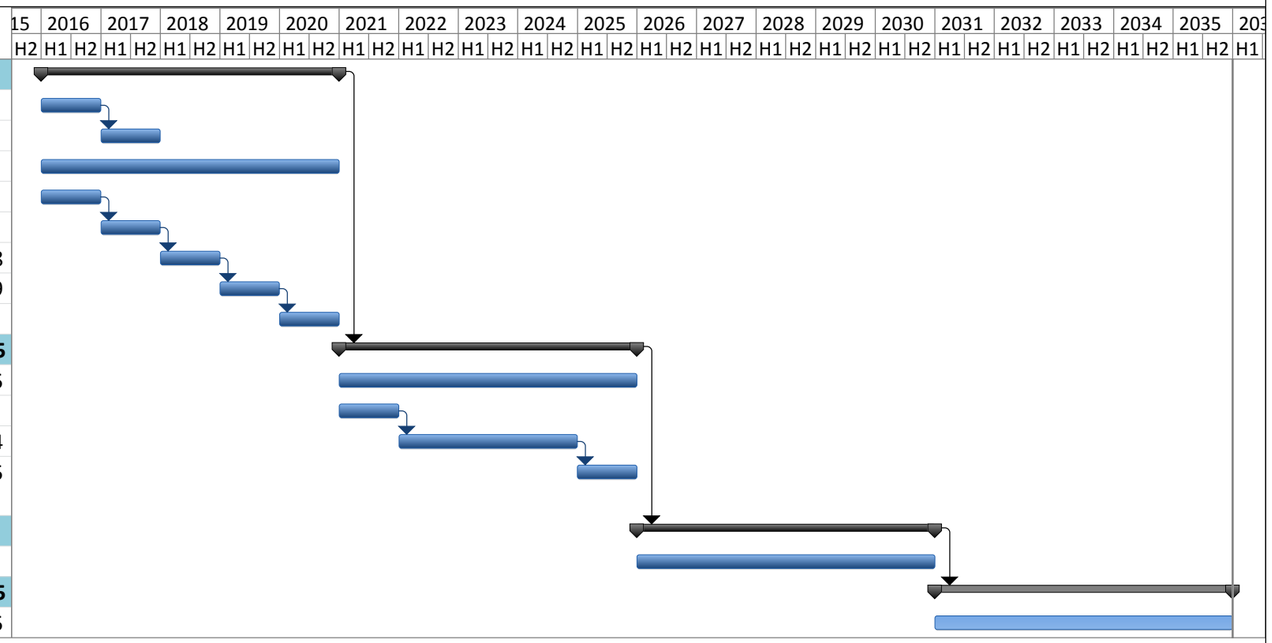
Project Name	Development Charges			
	Pressure Zone 1	Pressure Zone 2	Pressure Zone 3	Total
Coleman Street	-	-	$ 251,000	$ 251,000
Centre Street	-	-	$ 312,500	$ 312,500
Union Street	-	-	$ 340,500	$ 340,500
Muir Street	-	-	$ 741,000	$ 741,000
County Road 7	-	-	$ 830,000	$ 830,000
Construction of New Pipes for New Development	-	-	-	TBD
(46%) SCADA Design for VFD Installation	$ 14,000	-	-	$ 14,000
(46%) Install VFDs at the Water Treatment Plant	$ 46,000	-	-	$ 46,000
New In-Ground Reservoir Design and Construction	$ 794,000	$ 420,000	$1,170,000	$2,384,000
Connecting Pipe to In-Ground Storage to Network	$ 166,000	$ 89,000	$ 245,000	$ 500,000
(84%) Design New Pressure Zone 2 Booster Station	-	$ 67,000	-	$ 67,000
(84%) New Pressure Zone 2 Booster Station Construction	-	$ 757,000	-	$ 757,000
Total	**$1,020,000**	**$1,333,000**	**$3,890,000**	**$6,243,000**

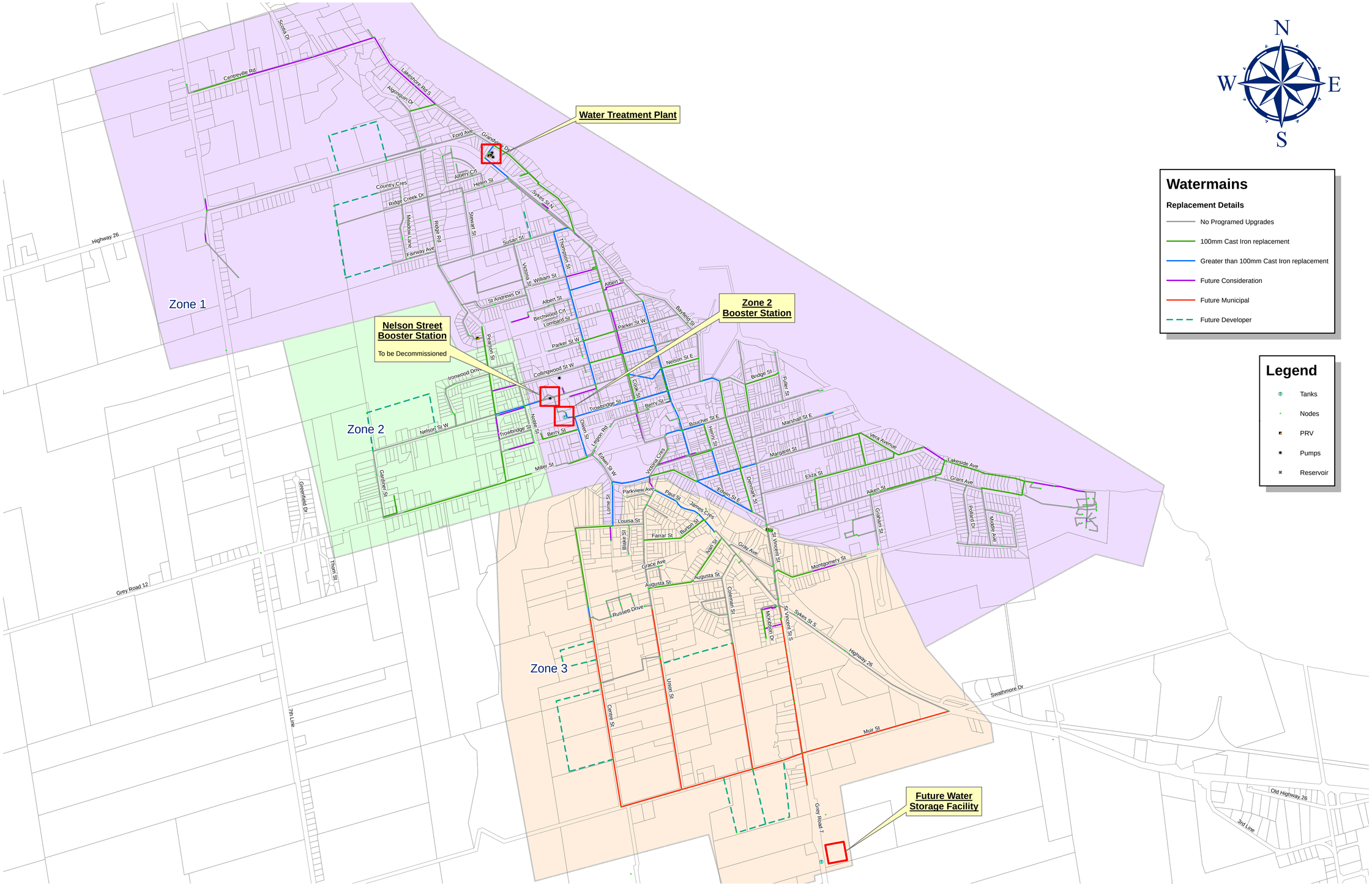
The construction of new pipes for new development includes all construction within new development areas. No cost was given to this item as the pipe size and lengths are currently unknown. These costs will be determined and incurred by the developer.

A proposed timeline for the suggested work is provided in Figure 20. The timeline includes projects that are funded by both the Municipality and development charges. The watermains that are affected by the Improvement Plan are shown in Figure 21.

Figure 20 - Proposed Timeline for Water System Improvement Plan

ID	Task Name	Duration	Start	Finish
1	**Phase 1**	**1305 days**	**Fri 01/01/16**	**Thu 31/12/20**
2	Conduct Flow Testing on Cast Iron Pipes	261 days	Fri 01/01/16	Fri 30/12/16
3	Develop Rehabilitation and Replacement Plan Based on Flow Testing	260 days	Mon 02/01/17	Fri 29/12/17
4	Remove and Replace 100 mm Cast Iron Pipe - 1000 m per year	1305 days	Fri 01/01/16	Thu 31/12/20
5	SCADA Design for VFD Installation	261 days	Fri 01/01/16	Fri 30/12/16
6	Install VFDs at the Water Treatmetn Plant	260 days	Mon 02/01/17	Fri 29/12/17
7	Design New Pressure Zone 2 Booster Station	261 days	Mon 01/01/18	Mon 31/12/18
8	New Pressure Zone 2 Booster Station Construction	260 days	Tue 01/01/19	Mon 30/12/19
9	Decommission Nelson Street Booster Station	262 days	Wed 01/01/20	Thu 31/12/20
10	**Phase 2**	**1304 days**	**Fri 01/01/21**	**Wed 31/12/25**
11	Remove and Replace 100 mm Cast Iron Pipe - 1000 m per year	1304 days	Fri 01/01/21	Wed 31/12/25
12	Construction of New Pipe on County Road 7/St. Vincent Street	261 days	Fri 01/01/21	Fri 31/12/21
13	New In-Ground Water Storage Facility Design and Construction	781 days	Mon 03/01/22	Mon 30/12/24
14	Construction of New Pipe on County Road 7/St. Vincent Street to connect In-Ground Storage to Network	262 days	Tue 31/12/24	Wed 31/12/25
15	**Phase 3**	**1304 days**	**Thu 01/01/26**	**Tue 31/12/30**
16	Remove and Replace 100 mm Cast Iron Pipe - 1000 m per year	1304 days	Thu 01/01/26	Tue 31/12/30
17	**Phase 4**	**1304 days**	**Wed 01/01/31**	**Mon 31/12/35**
18	Remove and Replace All 100 mm Non-Cast Iron Pipe - 1250 m per year	1304 days	Wed 01/01/31	Mon 31/12/35





Meaford Servicing Master Plan - Water Supply System

0 0.25 0.5 1 1.5 2 Kilometers

1:10,000

25.2 Wastewater System

25.2.1 Sewage Collection System – I/I Reduction Program

Maintaining a WWTP ADF below 2,700 m^3/d and ensuring the effluent objectives continue to be met is the primary driver for an I/I reduction program. Based on the 2015 I/I Study Report there is significant opportunity to reduce extraneous flows and reclaim reserve capacity at the plant. During the month of April 2014, an estimated 2,458 m^3/d of flow was determined to be extraneous, which translates to an increase in the yearly ADF of 205 m^3/d. While fully eliminating I/I during the spring melt is not feasible, this point serves to illustrate the extent and severity of extraneous flows in the collection system. In terms of growth planning, 205 m^3/d of reclaimed capacity through I/I reductions would be sufficient to service an additional eighteen (18) years of growth in the urban area based on the historical growth rate and an assumed sewage production rate of 450 L/cap/day.

Figure 22 shows the projected growth rate and the cumulative reduction in I/I required to maintain the plant ADF at 2600 m^3/d. Overall, the yearly requirement to keep up with development is an approximate 20 m^3/d in I/I reduction each year. Additionally, the continuation of I/I reduction will ensure that the sewage flows will not exceed the capacity of the Bighead River syphon.

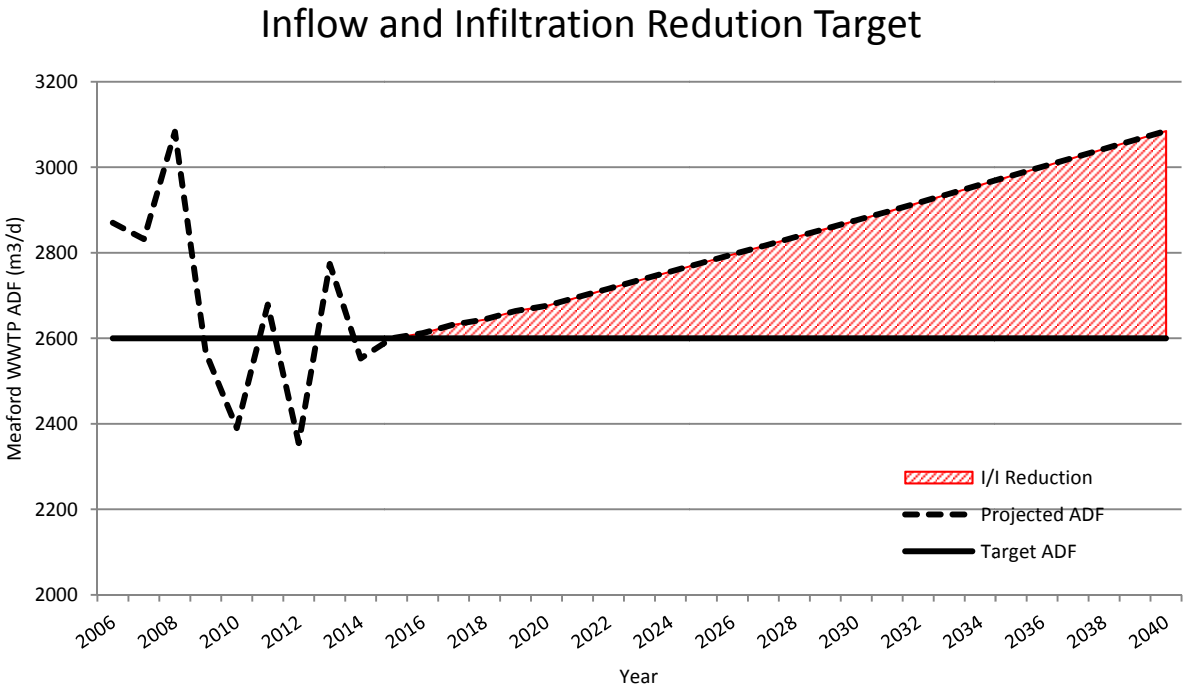


Figure 22 – Inflow and Infiltration Reduction Objective

A phased action plan for reducing I/I is presented in Table 38.

Table 38 – Inflow and Infiltration Reduction Plan

Planning Term:	Initiative:	Description:
1-5 years	Replace Identified Damaged Pipe	• Sykes Street - MH 10750 to MH 10720 (North of Ivan St. to Margaret St.) • Ivan Street – MH 10791 to MH 10760 (from Sykes St. halfway to Victor St.) • William Street – MH 11730 to MH 11680 (from Thompson St. to Cook St.) • Susan Street – MH 32630 to MH 32620 (from Thompson St. halfway to Mary St.)
	Smoke Testing	Complete smoke testing and notify home owners with illegal connections.
	Disconnection Program	Devise a program to disconnect improper sewer connections in the urban area either by incentive or penalty.
	Continue MH and CCTV Inspection	Continue MH inspections and CCTV inspection of pipes in the network that have yet to be inspected
5-10 years	Replace Identified Damaged Pipe	• Farrar St. – MH 11491 to MH 11490 (from Union Street) • Union Street – MH 11490 to MH 11470 (from Farrar to North of Louisa) • Blake Street – MH 11500 to MH 11501 (from Louisa, South on Blake) • Albert Street – MH 11730 to MH 11690 (from Cook St. to West of Thompson)
	Monitor I/I contribution to the WWTP	Monitor and identify the amount if I/I reduction that occurred from the first 5 years of the I/I reduction plan
	Smoke Testing	Complete smoke testing if inflow is still an issue from prohibited connections
	Enact Disconnection Program	Take actions towards disconnecting improper connections that have not been rectified. For example: fine/ increase sewer charges of users who still have prohibited connections. Alternatively, fix the existing issue and charge the sewer user for the cost.
	Identify Additional Pipe Defect Locations	From the continued CCTV inspection, identify additional areas of damaged pipe
10-15 years	I/I Study	Complete an I/I study to determine the impact of reduction program and identify new locations for rehabilitation.

Planning Term:	Initiative:	Description:
	Replace/ Reline Identified Damaged Pipe	Fix areas of damaged sewer pipe that have been identified by the continued CCTV inspection, and confirmed through I/I Study.
15-20 years	Monitor I/I contribution to the WWTP	Monitor and identify the amount if I/I reduction occurred from the first 5 years of the I/I reduction plan.
	Replace/ Reline Identified Damaged Pipe	Fix areas of damaged sewer pipe that have been identified by the continued CCTV inspection, and confirmed through I/I Study.

25.2.2 Wastewater System Overall Plan

A phased strategy for the overall wastewater collection and treatment system is presented below in Table 39. The phased strategy includes projects that will be covered partially covered by development charges. The percentage paid for by the Municipality is indicated in the project name. For project at the WWTP that are new process or process being replaced the costs were split based on the increase in ADF from current conditions to full build-out conditions. Any process at the WWTP being expanded in order to accommodate development will be paid for solely through development charges.

Table 39 – Overall Wastewater System Improvement Plan

Project Name		Estimated Cost
Phase 1		
Design New RAS/WAS Pumping and Electrical Improvements	$	150,000.00
WWTP Refurbishment and Demolition of Old Sludge Storage	$	2,550,000.00
Upgrade UV Disinfection Channel (Add Additional Module)	$	50,000.00
Sykes Street, Paul Street, and Ivan Street Reconstruction	$	210,000.00
Develop a Disconnection Program for Illegal Connections	$	N/A
Sewer CCTV and MH Inspections	$	200,000.00
Smoke Testing and Identification of Locations with Illegal Connections	$	160,000.00
Notify Property Owners of Illegal Connections/Disconnection Program	$	N/A
Total Phase 1:	**$**	**3,320,000.00**
Phase 2		
William Street Sewer	$	120,000.00
Susan Street Sewer	$	80,000.00
Repair/Raise Low Lying MH & Install Watertight Covers (assume 50 repairs)	$	370,000.00
Review CCTV Inspection Data and Re-evaluate Rehab Priorities	$	10,000.00
Review Flow Rates and Compare to Historical Flows	$	5,000.00
Implement Disconnection Program (assume 500 connections)	$	750,000.00
1 km of sewermain repairs each year	$	2,000,000.00
Total Phase 2:	**$**	**3,355,000.00**
Phase 3		
Union Street, Farrar Street and Blake Street Sewers	$	225,000.00
Albert Street Sewer	$	100,000.00
(25%) SPS 3 Upgrades Design	$	5,000.00
(25%) SPS 3 Upgrades Construction	$	51,000.00
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 3:	**$**	**2,381,000.00**
Phase 4		
I/I Study Update	$	50,000.00
SPS No. 2 Upgrades Design	$	20,000.00
SPS No. 2 Upgrades Construction	$	200,000.00
SPS 1 No. Upgrades Design	$	22,000.00
SPS 1 No. Upgrades Construction	$	225,000.00
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 4:	**$**	**2,517,000.00**
Phase 5		
Continue System Rehab as Guided by CCTV Inspection and I/I Study	$	TBD
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 5:	**$**	**2,000,000.00**
Phase 6		
(48%) Design a New Headworks Building	$	168,000.00
(48%) New Headworks Building Construction	$	2,280,000.00
(48%) Design Odour Control System	$	168,000.00
(48%) Odour Control System Construction	$	2,448,000.00
Total Phase 6:	**$**	**5,064,000.00**
Total Program:	**$**	**16,617,000.00**

The goal of the Improvement Plan Phase 1 is to rehabilitate the existing plant and continue I/I reduction efforts. Rehabilitation efforts will extend the useful life of the existing plant. The continued efforts to reduce I/I aim to maintain the ADF of the plant below 2,600 m^3/d and sustain the ability of the plant to meet effluent criteria.

The primary objective of Phase 2 of the Improvement Plan is to establish the future clarifiers and aeration basins at the WWTP site to be used for peak flow management. The continuation of I/I efforts is suggested to continue with an increased effort to have improper sewer connections removed throughout urban Meaford.

With peak flows effectively managed by the interim retention tank, Phase 3 of the Improvement Plan continues to focus on the reduction of I/I to increase reserve capacity at the plant to allow for the continuation of development.

At Phase 4 it is suggested that all of the SPS upgrades be completed. Further, it is suggested that the I/I Study be updated to determine the best course of action with respect to continuing rehabilitation of the sanitary collection system.

Phase 5 of the improvement plan consists of the continuation of I/I reduction efforts.

Phase 6 of the plan is initiated when the WWTP can no longer meet the effluent criteria and is essentially a full plant expansion. At this point the interim storm tanks will be retrofitted to operate as aeration basins and clarifiers to service the full build-out population.

In addition to the repairs and replacements needed throughout the urban area, there are a number of projects that will be required to service the ultimate development. The projects that are to be partially or fully funded by development charges are shown in Table 40. The percentage of the project paid for by the developer is indicated in the project name. Developer charges have been divided by the 6 catchment areas that exist throughout the network. This is because some of the projects only affect certain areas and because the growth in each area varies. The new process or processes being replaced at the WWTP were divided based on the increase from the current ADF to the full build-out ADF. Expansion at the WWTP that is as a result of development will paid for in full by development charges.

Table 40 – Wastewater Projects Covered by Development Charges

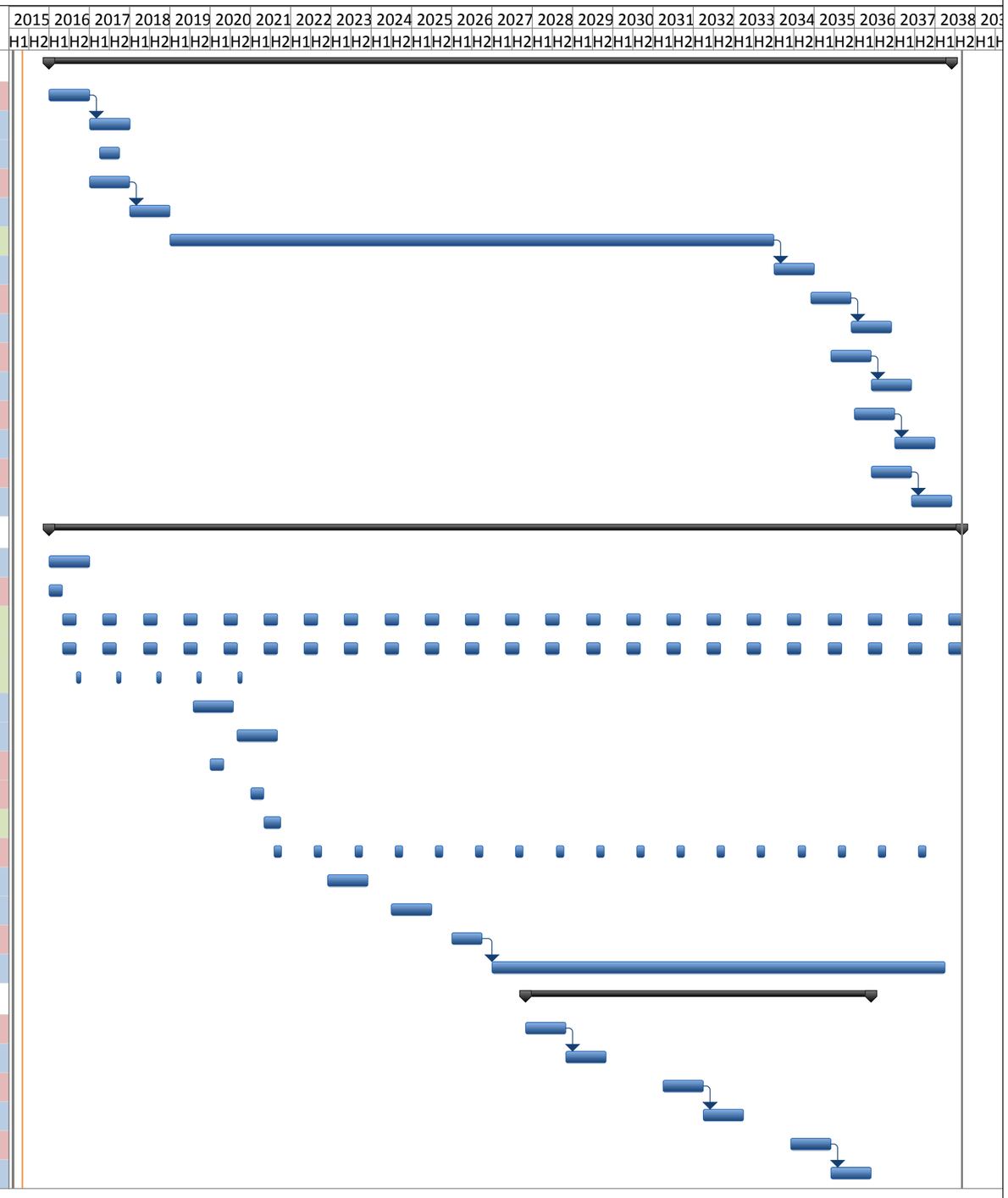
Project Name	Charged Area	Development Charges
Waste Water Treatment Plant		
Future Clarifier and Aeration/ Temporary Equalization Tank Design	Entire Network	$ 220,000.00
Future Clarifier and Aeration/ Temporary Equalization Tank Construction	Entire Network	$ 3,900,000.00
Repurpose Storm Equalization to Clarifiers/Aeration (Effluent Quality Trigger)	Entire Network	$ 2,250,000.00
Design Biosolids Storage Expansion	Entire Network	$ 310,000.00
New Biosolids Works Construction	Entire Network	$ 4,420,000.00
Design New UV Disinfection Channel	Entire Network	$ 200,000.00
New UV Disinfection Construction	Entire Network	$ 2,750,000.00
(52%) Design a New Headworks Building	Entire Network	$ 182,000.00
(52%) New Headworks Building Construction	Entire Network	$ 2,470,000.00
(52%) Design Odour Control System	Entire Network	$ 182,000.00
(52%) Odour Control System Construction	Entire Network	$ 2,652,000.00
Sewage Pumping Stations		
(75%) SPS No. 3 Upgrades Design	Area 3	$ 15,000.00
(75%) SPS No. 3 Upgrades Construction	Area 3	$ 153,750.00
SPS No. 6 Design and Construction	Area 6	$ 750,000.00
Sewermain		
Centre Street Sewermain	Area 1	$ 600,000.00
Union Street Sewermain	Area 1	$ 400,000.00
Coleman Street Sewermain	Area 6	$ 420,000.00
St. Vincent Street Sewermain	Area 2	$ 370,000.00
Muir Street Sewermain	Area 2	$ 290,000.00
Nelson Street Sewermain	Area 1	$ 310,000.00
Miller Street Sewermain	Area 1	$ 250,000.00
Pearson Street Sewermain	Area 1	$ 140,000.00
Construction of new pipe at intersection of Coleman Street and Muir Street		TBD
Total		**$22,484,750.00**

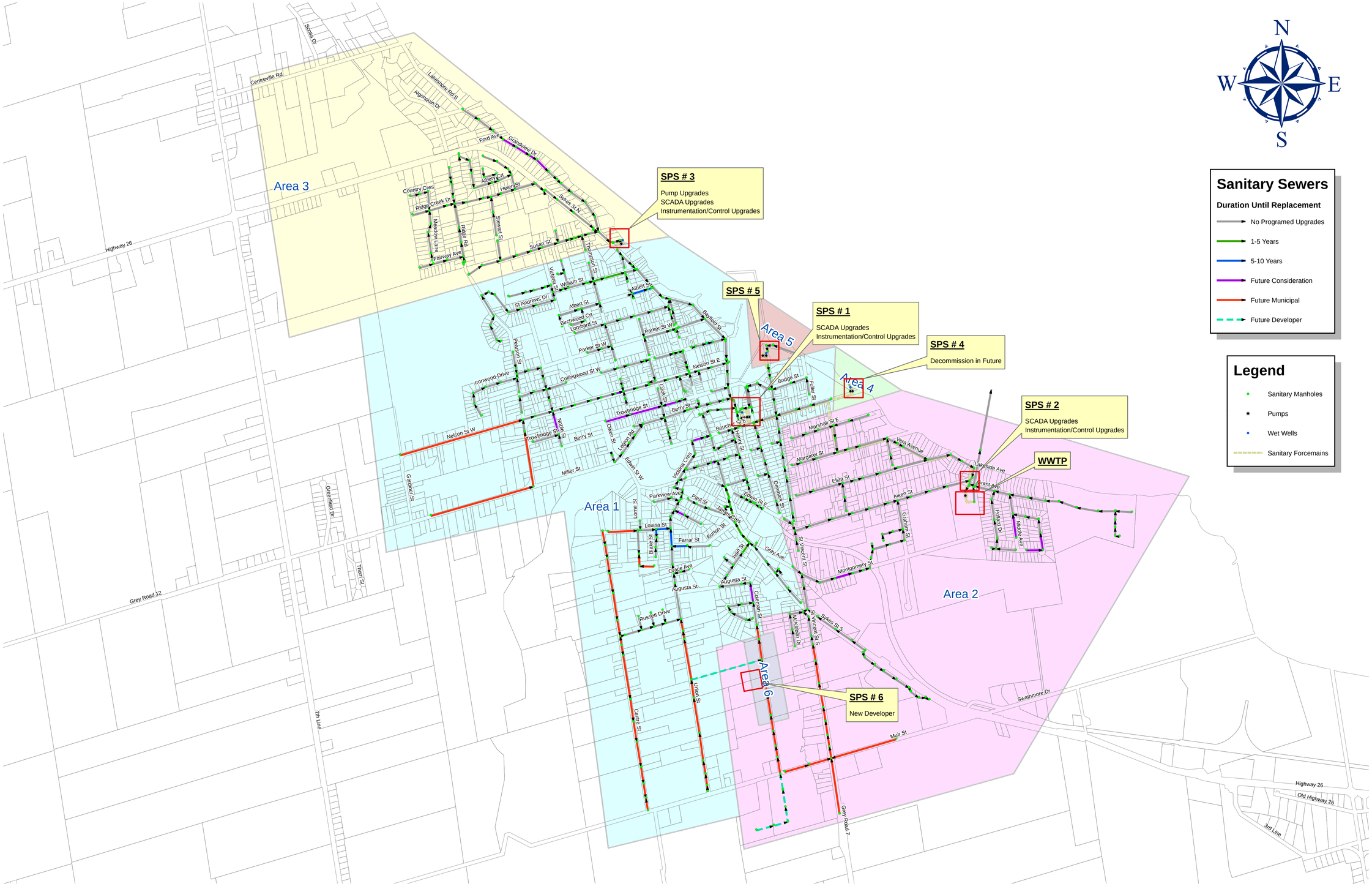
The new pipe to be constructed at the intersection of Coleman Street and Muir Street is for a new development area. The size of and length of sewermain is unknown, therefore an overall cost could not be determined. The developer of this area will be responsible to calculate and incur all costs associated with this new sewermain.

A proposed timeline for the suggested work is provided in Figure 23. The timeline includes projects that are both Municipally funded and funded by developer charges. The sewermains that are affected by the Improvement Plan are shown in Figure 24. The catchment areas are shown on the map including area 6 which will be added to the system once SPS No. 6 is constructed.

Figure 23 - Proposed Timeline for Wastewater System Improvement Plan

ID	Task Name	Duration	Start	Finish
1	**Waste Water Treatment Plant**	**5849 days**	**15-12-31**	**38-06-01**
2	Design New RAS/WAS Pumping and Electrical Improvements	263 days	15-12-31	17-01-02
3	Meaford WWTP Refurbishment and Demolishion of Old Sludge Storage	262 days	17-01-03	18-01-03
4	Upgrade UV Disinfection Channel (Add Additional Module)	130 days	17-04-03	17-09-29
5	Future Clarifier and Aeration/ Temporary Equalization Tank Design	260 days	17-01-02	17-12-29
6	Future Clarifier and Aeration/ Temporary Equalization Tank Construction	261 days	18-01-01	18-12-31
7	Monitor Effluent Quality to Ensure Compliance	3914 days	19-01-01	33-12-30
8	Repurpose Equalization to Clarifiers/Aeration (Effluent Quality Trigger)	261 days	34-01-02	35-01-01
9	Design a New Headworks Building	261 days	34-12-01	35-11-30
10	New Headworks Building Construction	261 days	35-12-03	36-12-01
11	Design Biosolids Storage Expansion	261 days	35-06-01	36-05-30
12	New Biosolids Works Construction	261 days	36-06-02	37-06-01
13	Design New UV Disinfection Channel	261 days	36-01-01	36-12-30
14	New UV Disinfection Construction	261 days	36-12-31	37-12-30
15	Design Odour Control System	261 days	36-06-02	37-06-01
16	Odour Control System Construction	261 days	37-06-02	38-06-01
17	**Sanitary Collection System**	**5915 days**	**16-01-01**	**38-09-02**
18	Sykes Street and Ivan Street Sewer	262 days	16-01-01	17-01-02
19	Develop a Disconnection Program for Illegal Connections	86 days	16-01-01	16-04-29
20	Sewer CCTV and Manhole Inspections	5829 days	16-05-02	38-09-02
44	Smoke Testing and Identification of Locations with Illegal Connections	5829 days	16-05-02	38-09-02
68	Notify Property Owners of Illegal Connections & Disconnection Program	1075 days	16-09-05	20-10-16
74	William Street Sewer	260 days	19-08-01	20-07-29
75	Susan Street Sewer	261 days	20-09-01	21-08-31
76	Review CCTV and Manhole Inspection Data and Identify Rehabilitation Priorities	88 days	20-01-01	20-05-01
77	Review Flow Rates and Compare to Historical Flows	85 days	21-01-04	21-04-30
78	Repair/Raise Low Lying Manholes & Install Watertight Covers Where Appropriate	109 days	21-05-03	21-09-30
79	Impliment Disconnection Program	4225 days	21-08-02	37-10-09
97	Union Street, Farrar Street and Blake Street Sewer	262 days	22-12-01	23-12-01
98	Albert Street Sewer	262 days	24-07-01	25-07-01
99	Inflow and Infiltration Study	195 days	26-01-01	26-09-30
100	Continue Collection System Rehabilitation as Guided by CCTV Inspection and I&I Study	2934 days	27-01-01	38-03-31
101	**Sewage Pumping Stations**	**2240 days**	**27-11-01**	**36-05-30**
102	SPS 3 Upgrades Design	261 days	27-11-01	28-10-30
103	SPS 3 Upgrades Construction	261 days	28-10-31	29-10-30
104	SPS 2 Upgrades Design	261 days	31-04-01	32-03-30
105	SPS 2 Upgrades Construction	261 days	32-03-31	33-03-30
106	SPS 1 Upgrades Design	261 days	34-06-01	35-05-31
107	SPS 1 Upgrades Construction	261 days	35-06-01	36-05-30


2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038
H1 H2 H1 H2 H1 H2



Meaford Servicing Master Plan - Wastewater System

0 0.25 0.5 1 1.5 2 Kilometers

1:10,000

A number of defects have been identified throughout the collection system that are not considered to be critical at this time, however they should be given future consideration for repair and will be reevaluated during Phase 4 of the improvement plan. Table 40 provides a listing of the defects and their locations.

Table 41 – Sanitary Collection System Defects for Future Consideration

Location	Defect
Boucher Street	
MH 132 to MH 131 @ 1 m @ 31.0, 31.6 m	Pipe broken
MH 130 to MH 125 @ 16.9, 21.8, 30.3, 41.9 m	Longitudinal/ Circumferential Cracking
Centennial Street	
MH 11450 to MH 11440 @ 78.1 m	Offset Joint
Coleman Street	
MH 12800 to MH 12790 @ 60.3 m	Circumferential crack
Grandview Drive	
MH 32591 to MH 32600 @ 1.6 m	Intruding connection, Infiltration
MH 32591 to MH 32590 @ 40.1 m	Open Joint
MH 32590 to MH 32580 @ 9.4 m	Broken Pipe at Joint
Margaret Street	
MH 176 to MH 177 @ 49.3 m	Joint Displacement
Marshall Street	
MH 10860 to MH 10850 @ 17.5 m	Hole in sewer (possible repair)
Middle Avenue	
MH 22680 to MH 22670 @ 55.6	Broken Pipe
MH 20360 to MH 22670 @ 39 m	Infiltration
Montgomery Street	
MH 20510 to MH 20500 @ 88.7 m	Infiltration
Nelson Street	
MH 12161 to MH 12150 @ 47.8 m	Infiltration at joint
Noble Street	
MH 12211 to MH 12220 @ 79.3 m	Hole in pipe
Parklane Crescent	
MH 22730 to MH 22740 @ 62.4 m	Infiltration
MH 22730 to MH 22720 @ 57, 82.6 m	Cracking
MH 22700 to MH 22670 @ 19.6 m	Cracking
Trowbridge Street	
MH 12450 to MH 12451 @ 0.4, 2.4 m	Joint Displacement
MH 12460 to MH 12470 @ 103 m	Multiple Cracks
MH 12460 to MH 12450 @ 7.7, 25.7, 93.4, 129.3 m	Multiple Cracks, Broken Pipe
MH 12460 @ 148.3 m	Joint Offset

Appendix – A

Terms of Reference and Authorization

The assignment will include, but will not be limited to, the following tasks:

Task 1: Problem Statement, and Background Review and Analysis (Class EA Phase I)

Through consultation with Municipality staff, the Consultant is to finalize the Problem Statement for inclusion in the Notice of Study Commencement.

The Consultant shall review all available background studies and document/characterize existing conditions in the Study Area including land uses, topography, existing servicing systems, roads and natural features. This Study Area Profile will rely primarily on existing sources. However, fieldwork, as needed, will be completed to provide necessary information to prepare the Study Area Profile.

Based on input from the Steering Committee on population projections and growth areas, the Consultant shall confirm proposed service areas, water demands and wastewater generation rates.

Attend Steering Committee Meeting(s) to review and provide input into:

i. profile of the study area;
ii. study area issues and data collection;
iii. population projections, water demands, wastewater generation rates; and,
iv. initial identification of alternative solutions.

Prepare Progress Report #1 and submit it to the Steering Committee for comment describing the problem statement, background studies and their findings, assumed population and growth areas, Profile of the Study Area, water demands and wastewater generation rates. Progress Report # 1 is to be in a format that can be easily converted to the Master Plan Report.

The Municipality intends to hold a Phase 1 Public Information Centre (PIC) to obtain comment on the Problem Statement, Study Area and the Service Area. The successful consultant is to allow for arranging, holding and attending a Phase 1 PIC. The Consultant shall prepare a letter to all technical agencies and prepare the Notice for the local newspapers advertising the PIC and soliciting comments on the Master Plan.

Task 2: Identification of Alternative Solutions (Class EA Phase II)

The Consultant is to identify servicing alternatives including combinations of alternatives which would address the problem statement and the study objectives. Only reasonable alternatives

and combinations of alternatives which meet the study objectives will be carried forward. The Consultant will provide descriptions and cost estimates for each alternative solution, complete with drawings and other supporting materials for review by the Steering Committee.

In considering the preparation of the Class EA Master Plan, the Municipality is required to fully assess all reasonable alternatives to address the identified problem. As noted previously, with respect to water supply and wastewater treatment options, the Master Plan is to be based on the premise that the Meaford Water Treatment Plant and the Meaford Wastewater Treatment Plant will be used to service areas rather than the establishment of new facilities.

In addition the municipal servicing options, as required by the Class EA process, this Class EA study will assess the following activities within the Study Area as part of the possible alternatives:

- Do Nothing
- Limit Community Growth
- Water Efficiencies
- Reduction of Infiltration and Inflow

The successful consultant will be required to expand on all options to include new pipeline routes, upgrades to existing pump stations, new pump station and water storage facility locations. Consideration is to be given to modular design of all future water and wastewater infrastructure, including pipelines, to allow for coordinated future growth throughout the Municipality. Land requirements for future pump stations and water reservoirs are to be adequately sized to allow for staging of modular designs.

In each of the series of possible solutions, the Master Plan will address the “Do Nothing” alternative to provide a baseline comparison for solutions.

Each respondent to this RFP is to provide with the Qualitative Submission, a preliminary Outline of their Master Plan Document in the form of a Draft Index. This submission will be used in the evaluation of the proposals.

The Project Team will develop social/environmental/technical criteria for the evaluation of alternatives.

As a key part of assessing the viability of proposed alternatives, the Study will identify a series of criteria by which to measure each alternative. These will include, but not be limited to, the following topics:

- **Social Environment**
  - Land Use – compatibility with Official Plan
  - Community cohesiveness
  - Noise and mitigation
  - Construction Impacts and mitigation
  - Heritage
  - Archaeology
  - Agricultural land
  - Quality of Life - Health and Safety

- **Natural Environment**
  - Environmentally sensitive areas
  - Areas of Natural and Scientific Interest (ANSI's)
  - Woodlots
  - Creeks
  - Fisheries
  - Wetlands (including PSW's)
  - Wildlife and Birds
  - Vegetation
  - Air quality
  - Stormwater issues

- **Technical**
  - Ability to satisfy design criteria
  - Capacity
  - Phasing Capabilities
  - Geometrics (vertical and horizontal)
  - Reliability
  - Approvability (Review Agencies)
  - Land Requirements (ease of acquiring)
  - Structural Considerations (Geotechnical)
  - Maintenance and operating needs
  - Architectural considerations (general only based on surrounding development)
  - Utility considerations (hydro supply, etc.)

- **Cost**
  - Capital
  - Operating

Attend Steering Committee meeting(s) to review and provide input into alternatives and combinations of alternatives, and criteria by which alternatives will be evaluated.

Task 3: Evaluation and Selection of Preliminary Preferred Solutions (Class EA

Phase II)

The Consultant shall assess alternatives using the selected evaluation criteria and identify "Recommended" solutions. This will be an iterative evaluation process, including refinement of alternatives, new options and combinations as they arise. A matrix evaluation method may be employed to ensure that each alternative is assessed against the same criteria.

Based on the Profile of the Study Area and selected evaluation criteria, the Consultant is to assess the potential impacts and net effects (after mitigation) of each of the alternative water and wastewater solutions. At this stage, the site location and/or route of each alternative will be presented in sufficient detail so that mitigation methods can be assessed and environmental impacts addressed.

The Consultant shall identify "Recommended" alternatives or combination of alternatives. This identification shall list the advantages and disadvantages of each alternative solution and clearly state the reasons for the selection of the "Recommended" alternatives. This assessment may use a single project-by-project method or take a systems approach.

The Consultant shall attend Steering Committee meeting(s) to review and provide input into:

- The identification of alternatives and combinations of alternatives;
- The evaluation of alternatives;
- The selection of "Recommended" solutions; and
- To present Draft public open house information to the Municipality for review and comment.

The Consultant shall prepare Progress Report #2 and submit it to the Municipality for comment prior to the Phase 2 PIC. Progress Report #2 will include documentation of all alternatives, evaluation criteria, the evaluation of alternatives and the rationale for the selection of the "Recommended" solutions.

Progress Report # 2 is to be in a format that can be easily converted to the Master Plan Report.

Task 4: Public Consultation

The Consultant shall prepare a letter to all technical agencies and put a notice in local newspapers advertising the Phase 2 PIC and soliciting comments on the Master Plan.

The Steering Committee will host a Phase 2 PIC to solicit public comments and suggestions on the following:

- Problem statement;
- Existing conditions/background/Study Area Profile;
- Alternative solutions;
- Evaluation criteria;
- Evaluation of alternative solutions, and
- "Recommended" solutions.

This Phase 2 PIC will be in the form of an open house – drop-in centre.

The Consultant shall prepare Progress Report #3 to document the results of the PIC by compiling a summary of the comments and questions received along with a listing of the Municipality's responses to same. Progress Report #3 is to be in a format that can be easily converted to the Master Plan Report.

Task 5: Prioritizing Preferred Solutions

The successful consultant shall recommend a prioritization list of the recommended projects for Municipality review and approval and for inclusion in the Master Plan Document. The Consultant is to recommend a phasing program for all preferred solutions complete with anticipated completion dates.

Task 6: Master Plan Documentation

The Consultant shall document the results of the study by compiling Progress Reports #1-3 into a single Master Plan document.

The Master Plan will identify all water and wastewater projects required to address the problem statement and satisfy Phases 1 and 2 of the Class EA planning process. The Master Plan Document is to be structured such that each of the service areas has it own sections (water and wastewater). Along with this project listing, the Master Plan will provide detailed information about the following for each project:

- Class EA Schedule
- Proposed facility location and or pipeline route
- Dimensions of property required and preliminary layout of proposed facility
- Brief description of the function of the facility
- Anticipated construction date required
- Prioritization (based on criteria established)
- Capital cost estimate

The Master Plan will also include mitigation measures for the proposed preferred solutions outlining the steps necessary to reduce or eliminate environmental impacts of the proposed projects (e.g., best management practices included in the consideration of the net effects). The Master Plan will also address implementation measures in which all the required permits and approvals are clearly listed for each project (e.g., Certificate of Approval, Permit To Take Water, etc.).

This Master Plan will include results of the Steering Committee, technical agencies and public consultation.

Given the nature of the Class EA process, the outcome of the evaluation cannot be predicted. However, for the purposes of the terms of reference for this project, the Municipality has assumed that most of the projects will be classified as Schedule B Activities under the MEA Class EA Document. Creek crossings may need to be identified as Schedule C Projects, requiring additional Class EA planning. This will depend on the feasibility of using trenchless methods for pipeline installation giving consideration that creek crossings will be Schedule “B” Projects. However, the selected consultant will be required to identify all applicable projects and confirm their associated Class EA Schedules.

A Steering Committee meeting will be held to review and provide input into the draft Master Plan.

The Municipality will review the draft Master Plan and provide comments prior to the finalization of the Report to ensure that it incorporates the comments of the public, technical agencies and Steering Committee. The Consultant shall finalize the Master Plan and provide copies to the Municipality along with an electronic version. For budgeting and scheduling purposes, the following Report Deliverables must be included:

- Progress Report # 1 – one digital and 3 hard copies
- Progress Report # 2 – one digital and 3 hard copies
- Progress Report # 3 – one digital and 3 hard copies
- Draft Master Plan for Municipality review prior to the 2nd PIC – one digital and 3 hard copies (no Appendices)

- Draft Master Plan for MOE review prior to 30 day public review – three digital and 6 hard copies, with all Appendices
- Draft Master Plan for 30-day public review complete with all Appendices and related background Reports – three digital and 5 hard copies (2 for public display)
- Final Master Plan following 30-day public review – three digital and five hard copies complete with all Appendices and related background Reports.

The consultant will make presentations to the Municipality of Meaford Council on three separate occasions to present the Progress Reports.

The Municipality will publish a Notice of Completion for the Schedule B Projects for the required 30-day review period and release the draft Master Plan for review and comment.

The Consultant shall identify a specific number of hours of time for the Project Manager to review and comment on written public or agency questions or comments resulting from the Notice of Completion. No Time is to be budgeted for receiving and addressing any requests for a “Part II Order”.

The Consultant shall identify any Ministry of Transportation requirements with respect to obtaining easements and the installation of proposed infrastructure within the Highway 26 Corridor. The Consultant shall identify and determine the complexity of proposed specific works based on actual communications with MTO representatives on the potential construction methods and MTO requirements based on the complexity of the work. This information is to be included in a separate Clause of the Master Plan.

Appendix - B

Minutes of Meetings

Ainley GROUP CONSULTING ENGINEERS PLANNERS
726-4391

AGENDA

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, ON
Tel: (705) 726-3371 • Fax: (705)
Email: barrie@ainleygroup.com

PROJECT MEETING # 1

PROJECT: Municipality of Meaford
Water and Wastewater Servicing Plan

DATE: June, 18 2014

TIME: 1.00 pm to 4.00 pm

LOCATION: Meaford Operations Centre

Introductions

Engineering Agreement

Project Goals and Objectives

- Discussion on Municipal goals for project

Team Roles

- Consultant
- Municipality
  - Steering Committee
  - Workshop attendees

Communications

- Management
- Data Collection
- Field work

Schedule and Workplan

- Fix Key Dates
  - Council Meetings? (Election?)
  - Steering Committee Meetings
  - Workshops
  - PICs

Public Consultation Program

- Agency Contact List
- First Nations Contact list
- Notice of Commencement
- Agency Letter
- Discussion on Public Contact sequence/PIC formats

Data Collection

- Populations/Growth/Official Plan
- Potential Developments
- WWTP Class EA Amendment

Other Issues

Document6

Ainley GROUP CONSULTING ENGINEERS PLANNERS

MINUTES

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, ON L9Y4J5
Tel: (705) 445-3451 – Fax: (705) 445-0968
Email: collingwood@ainleygroup.com

MINUTES OF PROJECT INITIATION MEETING

PROJECT: Municipality of Meaford
Water and Waste Water Servicing Study
Ainley Project No. 114106

DATE: Wednesday June 18, 2014

LOCATION: Operations Centre – 157859 7th Line - Boardroom

TIME: 1:00 p.m.

PRESENT: Stephen Vokes, Municipality of Meaford
Chris Collyer, Municipality of Meaford
Rob Armstrong, Municipality of Meaford
Darcy Chapman, Municipality of Meaford
Brady Carbert, Municipality of Meaford
Gary Scott, Ainley Group
Reid Mitchell, Ainley Group
Simon Glass, Ainley Group

DISTRIBUTION: All Present

1. Project Documentation

Three copies of the Engineering Agreement have been signed by the Municipality and provided to Ainley. Ainley will sign and return two copies to the Municipality.

Action by Ainley

Ainley has submitted its WSIB Clearance Certificate and Certificates of Insurance.

2. Project Goals and Objectives

The Municipality must reserve adequate funds for future development and expansion of the distribution, collection and treatment systems. A primary objective of the study is to provide a basis to determine adequate development charges to ensure funds are available for required capital projects.

This study will provide descendible costs to ensure all future costs are covered. Although there have been various projects completed to look at future servicing there has never been one comprehensive study linked directly to D.C. charges.

The study will also provide the Municipality with a basis to schedule ongoing maintenance of roadways with repairs or upsizing of pipelines as required minimizing long term costs. The

study will provide for the proper coordination of infrastructure development.

The study is to be confined to build-out of the existing Meaford community and is not to consider developments remote from this community. The plan is to provide a logical growth plan in practical phasing. It is the policy of the Municipality to promote growth.

3. Team Roles

Ainley will be primarily responsible for all aspects of the servicing study. The Municipality will be responsible to support the Ainley team by providing required information for completion of the study.

The Steering Committee will be the primary source of guidance and reviews to Ainley from the Municipality.

Steering Committee Members:

- Stephen Vokes
- Chris Collyer
- Rob Armstrong
- Darcy Chapman
- Brady Carbert

4. Communications

All project communications from Ainley to the Municipality will be distributed to all members of the Steering Committee.

Gary Scott will be the primary source of contact for communications from the Municipality to Ainley, however other team members will be in contact with the Municipality as required.

5. Schedule and Workplan

A preliminary schedule was included in the Ainley proposal. This showed a completion date (after the 30 day review) of March 17, 2014. This is still the target date and will be sufficient to support the D.C. Study.

It is likely that the D.C. Study consultant will be appointed this year and that coordination will take place before the Servicing Study is complete.

Given the delayed start to the project a slightly revised table of key dates were presented and discussed.

The following "Key Dates" were discussed:

- Steering Committee Meeting # 1: Rescheduled from July 30, 2014 to August 13, 2014
- Council Presentation # 1: Cancelled (PIC will be schedules the same day as Council)
- Public Information Centre # 1: Rescheduled from September 17, 2014 to September 8, 2014
- Steering Committee Meeting # 2: Confirmed September 24, 2014
- Steering Committee Meeting # 3: Confirmed October 29, 2014

Generally deliverables will be provided for Steering Committee review and revised following

discussion with the steering committee. Any workshop, PIC's or Council Presentations would follow review by the Steering Committee.

The current schedule provides adequate time for the Municipality to integrate the findings of the study into the changes to the development charges.

It was agreed upon that one Workshop should be replaced with an "Educational Session" for the new Council after the election takes place.

It was agreed that the local developers should be invited to a Workshop to be held before the initiation of Phase 2 of the project. It was suggested that the developers be split into two separate groups based on size. The Municipality will canvas interest among some of the developers and the workshops will be arranged accordingly.

Action by Municipality

6. Public Consultation Program

Copies of the Draft Agency Contact List, First Nations Contact List, Notice of Commencement, and Agency letter were distributed at the meeting to all attendees for review and comment.

Action by Municipality

Ainley suggested that the Notice of Commencement be finalized and issued as soon as possible following review by the Steering Committee.

The Municipality will review and recommend changes to the draft documents and return to Ainley to be finalised.

Action by Municipality

7. Data Collection

Ainley will hold an internal meeting and complete an information gap analysis to determine what documentation is currently available to our team and what is required from the Municipality. The results of this analysis will be provided to the Municipality.

Action by Ainley

A meeting will be held with the planning department to review development/ build-out plans.

8. Next Meeting

The next meeting to be held will be Steering Committee # 1 and will be held at the Operations Centre – 157859 7th Line – Boardroom on August 13, 2014.

Any errors and/or omissions from these Minutes should be reported to the undersigned as soon as possible.

Minutes prepared by:



S. D. Glass, E.I.T..
Ainley & Associates Limited

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Ainley GROUP CONSULTING ENGINEERS PLANNERS
726-4391

AGENDA

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, ON
Tel: (705) 726-3371 • Fax: (705)
Email: barrie@ainleygroup.com

PROJECT MEETING # 2

PROJECT: Municipality of Meaford
Water and Wastewater Servicing Plan

DATE: August, 25 2014

TIME: 1.00 pm to 4.00 pm

LOCATION: Meaford Operations Centre

1. **Progress since Last Meeting**

2. **Overall Status/Ongoing Issues**

3. **PIC No.1**
   - Discussion on Timeline
   - Review of presentation materials

4. **Discussion on Overall System Summary**
   - Water Distribution
   - Storage
   - Treatment
   - Sewage Collection
   - Sewage Pumping Stations
   - WWTP

5. **Activities To Next Committee Meeting**

6. **Other Issues**

Document6

Ainley GROUP CONSULTING ENGINEERS PLANNERS

MINUTES

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, ON L9Y4J5
Tel: (705) 445-3451 – Fax: (705) 445-0968
Email: collingwood@ainleygroup.com

MINUTES OF PROJECT MEETING #2

PROJECT: Municipality of Meaford
Water and Waste Water Servicing Study
Ainley Project No. 114106

DATE: Monday August 25, 2014

LOCATION: Operations Centre – 157859 7th Line - Boardroom

TIME: 1:00 p.m. to 2:45 p.m.

PRESENT: Stephen Vokes, Municipality of Meaford
Chris Collyer, Municipality of Meaford
Rob Armstrong, Municipality of Meaford
Darcy Chapman, Municipality of Meaford
Brady Carbert, Municipality of Meaford
Gary Scott, Ainley Group
Simon Glass, Ainley Group

DISTRIBUTION: All Present

1. Progress Since Last Meeting

The models of the water distribution and waste water collection systems are now up to date with existing infrastructure. Some minor improvements to the models are still being completed but they will be addressed in the near term.

All the required field inspections have been completed.

The majority of the data collection has been completed. At this time Ainley is reviewing the land area of vacant lots available for development and working towards ultimate flow projections.

The six technical memoranda that backup the information to be presented at PIC No.1 are under progress and will be submitted to the municipality by Friday, August 29th.

Action by Ainley

2. Overall Status/ Ongoing Issues

At this point in time Ainley is approximately 2 months behind the schedule provided to the Municipality as a part of the original proposal. Despite the early delays the completion date after the 30 day review period is not expected to change.

3. PIC No.1

An additional meeting to finalise the materials for PIC No.1 was proposed by Ainley.

A meeting was arranged for 1:00 pm on Thursday September 4th at the Operations Centre.

A newspaper advertisement will be prepared by Ainley and will be submitted to the Municipality by August 26th for publication in the Meaford Express. The advertisement will be run on the September 3rd and September 10th issues.

Final materials for PIC No.1 must be submitted by Tuesday September 9th to ensure it can be incorporated in the council meeting minutes.

PIC No.1 will be booked for 7:00 pm on Monday September 15th. The preferred location for the meeting is at the Meaford Town Hall but the final location will be subject to availability.

The current progress on the presentation materials was discussed and feedback was provided by the Steering Committee to Ainley. The suggested changes will be incorporated by Ainley.

Action by Ainley

4. Discussion on the Overall System Summary

The progress on the Technical Memoranda was discussed.

A draft copy of the population growth technical memorandum was distributed at the meeting. The population growth projection based on the Grey County Growth Management Strategy was discussed. The Steering Committee has agreed to review the growth projections and determine if it is valid based on the historical trends. The reviewed document will be returned to Ainley by the end of the day on August 26th.

5. Activities to Next Committee Meeting

A newspaper advertisement for PIC No.1 will be prepared and submitted to the Municipality by Tuesday August 26th to be published in the Meaford Express.

The six technical memoranda will be completed and submitted to the Municipality by Friday August 29th.

Presentation materials will be completed in draft form and submitted to the Municipality ahead of the review meeting scheduled for September 4th.

Action by Ainley

6. Next Meeting

The next meeting to be held will be Steering Committee # 3 and will be held at the Operations Centre – 157859 7th Line – Boardroom on September 4th, 2014.

Any errors and/or omissions from these Minutes should be reported to the undersigned as soon as possible.

Minutes prepared by:



S. D. Glass, E.I.T..
Ainley & Associates Limited

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CONSULTING
ENGINEERS
PLANNERS
726-4391

AGENDA

Ainley & Associates Limited
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PROJECT MEETING # 3

PROJECT: Municipality of Meaford
Water and Wastewater Servicing Plan

DATE: October, 30 2014

TIME: 1.00 pm to 4.00 pm

LOCATION: Meaford Operations Centre

Progress since Last Meeting (Models)

Water Opportunities

Wastewater Opportunities

Where to go from here?

Other Issues

CONSULTING
ENGINEERS
PLANNERS
726-4391

AGENDA

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MINUTES OF PROJECT MEETING # 4

PROJECT: Municipality of Meaford
Water and Wastewater Servicing Plan

DATE: February, 2 2015

TIME: 1.00 pm to 4.00 pm

LOCATION: Meaford Operations Centre

Progress since Last Meeting

Overall Status/Ongoing Issues

Summary of Wastewater Model Results

Summary of Wastewater Alternatives Evaluation

- Overall System Strategy
- Treatment
- Pumping Stations
- Sewage Collection

Wastewater Project Recommendations

Summary of Water Model Results

Summary of Water Alternatives Evaluation

- Overall System Strategy
- Treatment
- Pumping Stations
- Storage
- Distribution

Water Project Recommendations

Project Assignments

- Development Charges
- Developer Cost
- Town Cost

Project Priorities

- Sewage Collection (1-5, 6-10, 11-15, 16-20)
- Water Distribution (1-5, 6-10, 11-15, 16-20)

Suggested Completion Schedule for PIC and Deliverables

Next Committee Meeting

Other Issues

Document6

Ainley GROUP CONSULTING ENGINEERS PLANNERS

MINUTES

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MINUTES OF PROJECT MEETING # 4

PROJECT: Municipality of Meaford
Water and Waste Water Servicing Study
Ainley Project No. 114106

DATE: Monday February 2, 2015

LOCATION: Operations Centre – 157859 7th Line - Boardroom

TIME: 1:00 p.m. to 2:45 p.m.

PRESENT: Stephen Vokes, Municipality of Meaford
Chris Collyer, Municipality of Meaford
Rob Armstrong, Municipality of Meaford
Brady Carbert, Municipality of Meaford
Gary Scott, Ainley Group
Simon Glass, Ainley Group
Julia Roest, Ainley Group

DISTRIBUTION: All Present + Darcy Chapman

1. Progress Since Last Meeting

The models of the water distribution and waste water collection systems are now up to date with existing infrastructure. The trunk main layout for ultimate development is now reflected within the sewer and water models. Both models have been calibrated to existing conditions. The technical memoranda for both the sewer and water model have been distributed to the Municipality for review/comment.

Action by Municipality

The technical memoranda for water system and wastewater system alternatives have been completed in draft and have been distributed to the Municipality for review/comment.

Action by Municipality

The two technical memoranda that backup the information to be presented at PIC No.2 will be updated based on the comments of the Municipality and finalised preceding the public meeting on February 26th, 2015.

Action by Ainley

2. Overall Status/ Ongoing Issues

At this point in time Ainley is approximately 1 month behind the schedule provided to the

Municipality as a part of the original proposal. Despite the delays the completion date after the 30 day review period is not expected to change.
An additional meeting to finalise the materials for PIC No.2 was proposed by Ainley. The follow-up meeting will be held on Tuesday February 17th.

A newspaper advertisement will be prepared by Ainley and will be submitted to the Municipality for review by February 13th. The ad will be run in the Meaford Express on February 19th and February 25th.

Final materials for PIC No.2 must be submitted by Friday February 13th for review by the Municipality preceding the meeting to be held on February 17th.

PIC No.2 will be booked for 7:00 pm on Thursday February 26th. The preferred location for the meeting is at the Meaford Town Hall but the final location will be subject to availability.

Action by Ainley

3. Summary of Wastewater Model Results

The results of the wastewater collection model were discussed.

In order to understand the impact the potential Meaford Highlands development would have on the sanitary collection system, the Municipality would like an understanding of available sewer capacity from the sewer main on Sykes Street at Muir Street to the WWTP. Available capacity is to be calculated for the present day and ultimate build out scenarios.

Action by Ainley

4. Summary of Wastewater Alternatives Evaluation

The progress on the Technical Memoranda was discussed.

A draft copy of the Wastewater Alternatives and Evaluation memorandum was distributed to the Municipality for review and comment.

Action by Municipality

Progress on the draft report will be continued by Ainley and the report will be finalised when comments are received from the Municipality. The municipality identified that the final report recommendations should include a statement to the effect that SPS#4 should be decommissioned in the event that the Knights of Meaford factory on Boucher Street is shut down.

Action by Ainley

5. Wastewater Project Recommendations

The yearly target to be targeting for wastewater projects was discussed. The budget allocated to complete wastewater capital projects is approximately $400,000/year. However the Municipality does not want the planning process to be restricted by the existing budget. A target budget was not agreed upon during the meeting.

Project planning will be completed on the basis of prioritizing high impact projects particularly with respect to I/I reduction.

6. Summary of Water Model Results

The results of the water model were discussed. Following on from discussion at the last

meeting concerning low pressure areas in Zone 1, Ainley had completed further analysis supplying the Zone from the Tank and confirmed that there is an 4 – 12 psi change in pressure across the zone when the pumps at the WTP are cycled off with the largest swing in the NW area. Ainley had looked at two scenarios to correct this. 1 Is to increase the size of the boosted zone through the NW area. 2 Is to operate Zone 1 as a closed zone (as St Vincent area) at a higher pressure.
Since the pressure swings extend over the whole zone, increasing the Nelson Street Zone does not solve the problem for everyone. Based on this Ainley suggested that the best solution is to operate the main zone as a closed pressure system supplied by the WTP pumps 100% of the time. Adding VFD drives will also provide the opportunity to give everyone a constant pressure.
Town confirmed that during the tank repainting the pressure was better with the system running off the WTP pumps and when they switched back to the tank control they again experienced pressure swings. The Town is in agreement to switch to control from the WTP.
The water model will be update to reflect the recommended changes to the Nelson Street boosted zone and the operation of the WTP high lift.

Action by Ainley

7. Summary of Water Alternatives Evaluation

The alternatives for the water distribution system were discussed. The main alternative

Within the technical memorandum two water storage alternatives providing floating storage have been identified. One is an elevated tank and the other an in-ground tank. Although the evaluation is close the in-ground reservoir on 7 th Line South of Muir Street has been identified as the preferred solution on the basis of cost and operational safety as well as aesthetics. The Municipality will approach the property owners at the identified site prior to the PIC.

Action by Municipality

Action by Ainley

8. Water Project Recommendations

The priorities for the water distribution system were discussed and identified as follows:

1) Feeder main from the WTP to the Water Tower
2) Fire flow in the Nelson St. boosted zone
3) Fire flow/ Removal of 4" Cast Iron Pipes throughout the urban area

The priorities identified will be reflected in the Master Plan

Action by Ainley

8. Project Assignments

The assignment of water and wastewater projects to developer charges, developer costs or town costs were discussed. The Municipality preferred to discuss the separation of the projects with Darcy Chapman. Ainley provided a set of maps with future developments included for the Municipality to discuss internally and provide direction to Ainley.

Action by Municipality

9. Next Meeting

The next meeting to be held will be Steering Committee # 5 and will be held at the Operations Centre – 157859 7th Line – Boardroom on February 17th 2015.

Any errors and/or omissions from these Minutes should be reported to the undersigned as soon as possible.

Minutes prepared by:



S. D. Glass, E.I.T..
Ainley & Associates Limited

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AGENDA

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PROJECT MEETING # 5

PROJECT: Municipality of Meaford
Water and Wastewater Servicing Plan

DATE: February, 17 2015

TIME: 1.00 pm to 4.00 pm

LOCATION: Meaford Operations Centre

Progress since Last Meeting

Overall Status/Ongoing Issues

Committee Comments on Draft Wastewater Alternatives Evaluation

- Overall System Strategy
- Treatment
- Pumping Stations
- Sewage Collection

Committee Comments on Draft Water Alternatives Evaluation

- Overall System Strategy
- Treatment
- Pumping Stations
- Storage
- Distribution

Review of Draft PIC Boards

Suggested Completion Schedule for Deliverables

Next Committee Meeting

Other Issues

Document6

AGENDA

Ainley & Associates Limited
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PROJECT MEETING # 6

PROJECT: Municipality of Meaford
Water and Wastewater Servicing Plan

DATE: April 15, 2015

TIME: 1.00 pm to 4.00 pm

LOCATION: Meaford Operations Centre

Progress since Last Meeting

- PIC Completion
- Completion of Draft Servicing Studies

Review of Draft Master Servicing Studies

Review of Drawings

Review of Draft Project Budget Tables

Review of Sites for Schedule B Projects

- SPS Site
- Reservoir Site
- Optioning Land

Draft Notice of Completion

Other Issues

Ainley GROUP CONSULTING ENGINEERS PLANNERS

MINUTES

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MINUTES OF PROJECT # 6

PROJECT: Municipality of Meaford
Water and Waste Water Servicing Plane

DATE: Wednesday April 15, 2015

LOCATION: Meaford Operations Centre – 157859 7th Line - Boardroom

TIME: 1:00 p.m. to 4:00 p.m.

PRESENT: Stephen Vokes, Municipality of Meaford
Chris Collyer, Municipality of Meaford
Darcy Chapman, Municipality of Meaford
Brady Carbert, Municipality of Meaford
Gary Scott, Ainley Group
Simon Glass, Ainley Group
Tori Giangrande. Ainley Group

DISTRIBUTION: All Present

1. Progress Since Last Meeting

PIC No. 2 took place on February 26th, 2015 at Meaford Hall. The information presented at the PIC included background information, problem statement, evaluation criteria, alternative solutions and recommended solutions.

The draft servicing plan has been completed and has been distributed to the municipality for review/comments. The Municipality has begun to review the document and will try to finish reviewing by Friday April 17th, 2015.

Action by Municipality

2. Review of Draft Master Servicing Studies

The municipality has been able to review the first half of the draft master servicing document. No major issues were found in the review thus far. The municipality outlined the comments they have made so far on the document which were the following:

- Include a list of abbreviations and definitions. Make sure to refer to abbreviations by their full name the first time they appear in a document.
- For the number of units left for the WWTP put "as per 2013" into the report. Make sure to highlight

the number of units left for the WWTP in the presentation.

- On page 9 put in "May 12th" as date of Notice of Completion.
- Put units into full form (eg. Kilowatt-hour instead of kWh)
- Review process description of WWTP
- Refer to Meaford as Urban Meaford not Town.
- Bighead river is one word

Additional comments or corrections to the document will be sent to Ainley for review allowing a final copy of the master servicing document to be produced.

Action by Municipality

The municipality identified that the new phosphorus limits will result in increased sludge production and was wondering if additional digester storage is needed. Ainley will check to see if this change will result in a need for additional digester storage.

Action by Municipality

3. Developer Charges

Additional projects were identified as being able to be covered by developer charges for both water and wastewater infrastructure. For water infrastructure the VFD installation, In-Ground Storage Reservoir on County Road 7 and Booster Station on Nelson Street can be partially paid for by developer charges. For the wastewater infrastructure sections of the new wastewater treatment plant and Sewage Pumping Station No. 6 can be paid for by developer charges. SPS No. 4 decommissioning is the responsibility of the developer. The water and wastewater systems will be split into zones and areas, respectively, to allow developer charges to be properly allocated. The developer charges need to include everything to full build-out.

Action by Municipality

4. Review of Drawings

The zones and areas need to be overlaid onto the drawings. There are 3 zones for the water distribution system that have already been developed based on the booster zones. For the wastewater collection system 6 catchment areas are to be developed based on the pumping station collection areas.

Action by Municipality

5. Review of Draft Project Budget Tables

A review of the current budget tables needs to be completed to not include development charges. A separate table should be constructed with a breakdown of the development charges. An average cost per year is not necessary for the Municipality charges. The cost breakdown chart should be put in the report to council and presented as well as placed in the executive summary.

Action by Ainley

6. Review of Sites for Schedule B Projects

Meaford has talked to the owner of the land for the in-ground reservoir. The reservoir will require about half a Ha of land. For the Master Plan Ainley can complete a drawing with a reservoir outline on it.

Action by Ainley

Different options were reviewed for the location and configuration of SPS No. 6. A site visit was conducted after the meeting to assess field conditions. It was decided that SPS No. 6 would only service Coleman Street

with a forcemain along Coleman Street to Muir Street. In the future when development in this area is planned more detailed design can occur for SPS No. 6.

7. Draft Notice of Completion

The draft notice of completion was review by the Municipality. The publish date for the notice will be on May 13th, 2015 the first Wednesday following the council meeting. The second address that the Master Plan will be available at has to be changed to the Meaford Library.

Action by Ainley

Minutes prepared by:

V.E. Giangrande, E.I.T..
Ainley & Associates Limited

Appendix - C

Select Background Reports

Municipality of Meaford

Water Pollution Control Plant
Capacity Analysis

Ainley & Associates Limited
Consulting Engineers and Planners
280 Pretty River Parkway
Collingwood, Ontario
L9Y 4J5

File No. 106067
August, 2006

Municipality of Meaford
Water Pollution Control Plant
Capacity Analysis

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APPENDICES

'A' - Certificate of Approval No. 3697-62MGNC
'B' - WPCP Performance Data (January 2003 to June 2006)
'C' - Manufacturer's Information – Parkson Helisieve Cylindrical Fine Screen
'D' - Aeration Design Calculations
'E' - Clarifier Design Calculations
'F' - Manufacturer's Information – Trojan UV3000 System
'G' - Aerobic Digester and Biosolids Storage Calculations

1.0 INTRODUCTION

The Municipality of Meaford is situated on the south western shore of Georgian Bay between the City of Owen Sound and the Town of The Blue Mountains in Grey County.

The Municipality's Water Pollution Control Plant (WPCP) was constructed in 1969 with the most recent upgrades being completed in 2005. The WPCP is owned by the Municipality and the operated by the Ontario Clean Water Agency (OCWA).

2.0 PURPOSE OF THE ASSIGNMENT

The Municipality of Meaford is investigating options to address capacity issues with respect to their existing Water Pollution Control Plant. The Municipality plans to initiate a Class Environmental Assessment planning process to address capacity concerns. However, in the interim, the Municipality authorized Ainley & Associates to conduct an optimization study of the plant to determine if there is additional capacity available within the existing facility.

The Terms of Reference provide for a two-phase approach. Phase 1 consists of a Capacity Analysis in which each major plant process is evaluated based on establishing additional capacity within the ranges set out in the MOE Design Guidelines. If, through the Capacity Analysis, it is determined that additional capacity may be available or could be made available with minor modifications, a second phase consisting of comprehensive field investigations with the purpose of maximizing the potential re-rated plant capacity would proceed. If the Capacity Analysis determines that additional capacity is not readily available, the assignment concludes at the end of Phase 1.

This report represents the findings of Phase 1, the Capacity Analysis.

3.0 EXISTING WATER POLLUTION CONTROL PLANT CAPACITY

The plant is currently rated at 3,910 m^3/day as per Certificate of Approval No. 3697-62MGNC (Appendix A). The peak flow rate, above which bypasses are allowed, is 11,730 m^3/d.

Average and maximum day flows for the years 2003 to 2006 (June) are summarised as follows:

Year	Average Day Flow (m^3)	Maximum Day Flow (m^3)
2003	2,665	10,524
2004	2,679	13,620
2005	2,651	8,340
2006	3,273	13,381

The performance data for the WPCP for the years 2003 to 2006 (June) is included in Appendix B along with a summary of the average values over the period.

4.0 ANALYSIS OF EXISTING SYSTEM

4.1 General

The existing WPCP was originally constructed in 1969. There have since been minor upgrades and alterations to the equipment within the plant. Major alterations included the construction of new aerobic digesters in the mid 1990's and recent upgrades (2005) as follows:

i) Replaced mechanical aerators with fine pore aeration system within the existing aeration tankage (two tanks) including the construction of a new blower building.

ii) Replaced manually raked coarse bar screen with automatic fine screen within the existing headworks channels including the construction of a building to enclose the screenings discharge waste collection bin.

iii) Installed improved facilities to receive trucked-in waste, consisting of a holding tank, transfer pump and controls to regulate the flow of septage, leachate and holding tank waste into the existing WPCP headworks.

iv) Converted existing chlorine contact tank to accept UV disinfection equipment and converted chlorine solution feed pump to supply headworks screen wash water.

The WPCP was originally designed as a high rate facility with aerobic digestion. However, due to lower actual organic loadings than the original design in combination with new nitrification requirements per the current Certificate of Approval, the plant is currently operating within the typical operating parameters of a conventional activated sludge plant.

The plant components are described in Certificate of Approval No. 3697-62MGNC (Appendix A).

The following reports were reviewed as part of the study.

Town of Meaford
Sewage Treatment Plant Expansion Study
Prepared by: Ainley & Associates Limited — April, 1985

Town of Meaford
Ontario Clean Water Agency Project No. 52-0098-01
Upgrade of Biosolids Treatment/Storage Facility
Design Brief
Prepared by: Ainley & Associates Limited — November, 1995

The Municipality of Meaford
Construction of Various Upgrades to the Meaford
Water Pollution Control Plant
Design Brief
Prepared by: Ainley & Associates Limited February, 2004

4.2 Pre-treatment

The recently installed automatic screen has a rated peak daily flow rate of 9,842 m^3/d. The Certificate of Approval rating for this screen is 100 L/s (8,640 m^3/d). There is also a bypass channel with a manually raked bar screen for flows in excess of 9,842 m^3/d during peak flow events. The flow bypasses the automatic screen into the aeration tanks. A copy of the Manufacturer's information on the automatic screen is attached as Appendix C.

Peak Flow Rate = 9,842 m^3/d (compared with 11,730 m^3/d in the Certificate of Approval)

4.3 Aeration

The original plant design was based on a high rate process. However as mentioned previously, the facility is being operated under conventional activated sludge parameters, and the recent plant upgrades have been based on a conventional activated sludge design. Therefore, in accordance with MOE guidelines, the minimum detention time at the average daily flow is six hours. The existing volume of the aeration tanks is 1101 m^3. As such, the maximum flow to ensure at least six (6) hours retention time would be 4,404 m^3/d. At this flow all other operating conditions can be satisfied under conventional activated sludge process parameters (ie. detention time is the governing restriction). The calculations are included in Appendix D. The following are the parameters associated with this scenario:

Maximum Average Daily Flow	=	4,404 m^3/d
Aeration Volume	=	1,101 m^3
Daily BOD Loading (Historical)	=	103 mg/L
Organic Loading Rate	=	0.41 kg $BOD_5/m^3 \cdot d$
F/Mv	=	0.19 – 0.25 d^{-1}
Detention Time	=	6 h
SRT	=	10.9 d
MLSS (Mixed Liquor Suspended Solids)	=	2,749 – 3,500 mg/L
Air Flow	=	260 L/s

Maximum ADF = 4,404 m^3/d (compared with 3,910 m^3/d in the Certificate of Approval)

4.4 Clarifiers

Considering the existing clarifiers as a Conventional Activated Sludge facility, to remain with MOE Guideline ranges the Peak Surface Settling Rate should not exceed 6,874 m^3/d and the Peak Weir Loading Rate should not exceed 19,218 m^3/d. The solids loading limitation can be satisfied through seasonal operational (RAS and MLSS) adjustments. Therefore the governing restriction is the Surface Settling Rate. The calculations are included in Appendix E.

Peak Flow Rate = 6,872 m^3/d (compared with 11,730 m^3/d in Certificate of Approval)

4.5 Disinfection

UV Disinfection equipment was recently installed. The unit installed is a Trojan UV3001M-1 PTP that, according to Manufacturer's specifications, allows for a peak flow of 5,280 m^3/day. The Manufacturer's information is included in Appendix F.

Peak Flow Rate = 5,280 m^3/d (compared with 11,730 m^3/d in Certificate of Approval)

4.6 Phosphorus Removal

Chemical phosphorus removal facilities are not provided at this plant. Due to the dilute nature of the raw sewage, neither the influent nor the effluent phosphorus concentrations exceed the compliance requirement of 4.0 mg/L.

4.7 Aerobic Digestion

The 1995 expansion of the sludge digestion was designed using historical data considering typical sludge decanting. Based on the MOE Guidelines, by optimizing sludge decanting to increase solids concentrations in the digesters and biosolids storage tank to the high end of the ranges, there may be up to 65% additional capacity available. The design calculations are attached in Appendix G.

Maximum Average Daily Flow Rate = 6,468 m^3/d
(compared with 3,910 m^3/d in the Certificate of Approval)

4.8 Biosolids Storage

The 1995 upgrade also included expanded biosolids storage facilities. Based on MOE Guidelines and subject to optimized decanting such that the solids concentration is increased to 4.5%, the current biosolids storage tank could accommodate the biosolids produced from treated sewage flows of more than twice the plant's current rated capacity. Note that this theoretical capacity is based on numerous assumptions that may not ultimately be achievable. By comparison, based on current sludge haulage from the plant, it appears that approximately 1,800 m^3 per year is hauled for plant flows averaging 2,665 m^3/d. Pro-rating for design capacity, the sludge production would be equivalent to 2,640 m^3 per year, or 1,760 m^3 every eight months (current Provincial requirement for sludge holding capacity). Therefore, the existing 2,286 m^3 sludge storage tank appears to have approximately 30% additional available capacity. This may be a more realistic approximation of the inherent excess capacity.

The design calculations are attached in Appendix H.

Maximum Average Daily Flow Rate = 5,083 m^3/d (based on pro-rating existing sludge haulage rates).

4.9 Miscellaneous

In reviewing process and yard piping, the limiting pipe diameter is the incoming forcemain with a limiting capacity of approximately 12,000 m^3/d at a velocity of 2 m/s. Maximum RAS pump capacity is equal to ADF with 100% redundancy, in accordance with MOE Guidelines.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this theoretical analysis, it is considered that, on balance, there is no additional capacity available within the existing facility due to major hydraulic limitations that have an impact on plant performance during period of high flow.

There is potentially approximately 13% additional capacity available in the aeration process and perhaps even more, since the governing restriction is detention time and field investigations generally find that biological treatment levels can still be maintained even with reduced detention time as long as there is sufficient oxygenation. On the other hand, the basic analysis in this report did not include the potentially significant impact of low-flow but highly concentrated sidestreams such as the decanted supernatent from the digesters and sludge storage tank. Based on the overall findings of this report (that the plant has significant hydraulic limitations), it was not considered warranted to explore these factors in more detail.

There may also be 30% or more additional capacity available in the sludge processing/ storage facilities and if there were no significant restrictions elsewhere, further field investigations would certainly be warranted. However, peak flow capacity is already limited in the headworks, clarifiers and disinfection units. The nitrification requirement in the most recent Certificate of Approval contributes significantly to the clarifier limitations (at high flows).

The Certificate of Approval effluent compliance requirements are based on monthly averages. Hence occasional spikes in loadings and effluent concentrations due to high flows can be compensated for through averaging with other readings throughout the month. However, in our opinion, this "averaging" will be necessary even for the existing rated capacity in order to comply with effluent requirements. It is not recommended that the rated capacity be increased further based on the assumption that monthly averaging might allow an increase in exceedences in individual readings. In fact, in recognition of the plant's limited processing capability at high flows, in the Design Brief for the most recent upgrades at the plant it was recommended that effluent compliance requirements be based on annual, not monthly averages and that the nitrification parameters be objectives only and not compliance requirements at all. The MOE imposed the more stringent requirements as a condition of issuing the Certificate of Approval.

Another caution with the report is that a sewer infiltration/inflow update is being prepared concurrently and that update could have both positive and negative implications on the findings of this report. Any work to reduce extraneous flows will attenuate the peaks at the plant and may even reduce average flows slightly. On the other hand, with less dilution,

the incoming sewage will be of higher strength, which would affect relative loadings versus flows.

Although a more comprehensive field optimization may reveal some economies, it appears clear that, even though the plant appears able to accommodate a modest rated capacity increase with respect to average daily flows, it is already pushing the limits hydraulically and will experience challenges processing peak flows as it approaches its current rated capacity. There is no single specific capacity-limiting bottleneck that, if corrected, will provide substantially increased plant capacity.

Therefore, given the extent of development anticipated in the Municipality in the near future, the "large-scale" nature of the theoretical deficiencies (eg. undersized clarifiers) and potential changes in loading conditions if extraneous flows are reduced significantly, it is recommended that the Municipality proceed directly with planning for expansion of sewage treatment capacity without going through the process of identifying additional capacity through a field optimization study and/or a more detailed process audit (eg. analysis of minor process components such as WAS pumps, chemical addition, pipework, flow meters, instrumentation and SCADA, as well as a more comprehensive review of operating data).

Appendix 'A'

Certificate of Approval No. 3697-62MGNC

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDED CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3697-62MGNC

TWH
AMG

FILE No
L01 L81

The Corporation of the Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario
N4L 1A1

RECEIVED
AUG 05 2004
AINLEY & ASSOC. LTD

Site Location: Meaford Water Pollution Control Plant
35 Grant Avenue
Municipality of Meaford, County of Grey

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Upgrading of the existing water pollution control plant (located at 35 Grant Street) rated at 3,910 m^3/day, s ing the Town of Meaford (NAD 17: UTM 0533879 m E, 4938860 m N), comprising of the following works:

PROPOSED WORKS

Upgrading of the existing headworks, aeration tanks, effluent disinfection system and the construction of new sewage works as follows:

Headworks

- one (1) automatic fine screen with 3 mm openings and design flow rate capacity of 100 L/s complete with screening wash system, conveyor, press zone and discharge to bag system;
- a building containing waste bin for receiving screenings, with approximate dimensions of 3.2 m x 2.8 m, complete with roll up vehicle door, wash water and heating and ventilation system;
- three (3) wash water pumps located in the administration building, installed in series and each pump rated for 45 L/min at 23 m TDH complete with pressure tanks and appurtenances,

together with all associated piping, valves, electrical and mechanical equipment, monitoring and control systems and instrumentation.

Aeration Tanks

Replacement of the existing mechanical aeration system with the installation of fine air bubble diffuser system as follows:

- approximately two hundred and twenty (220) fine pore membrane diffuser discs, each 225 mm diameter, evenly distributed on the bottom of each aeration tank;

- one (1) new building with approximate dimensions of 11.2 m x 6 m, housing blower equipment comprising of three (3) positive displacement blowers equipped with variable speed drives, each rated for 8.04 m^3/min at operating pressure of 65.5 kPa,

and all associated piping, valves, electrical and mechanical equipment, monitoring and control systems and instrumentation.

Septage and Leachate Receiving Facility

Construction of a septage and leachate receiving facility at the existing water pollution control plant as follows:

- one (1) below grade concrete storage tank with approximate total volume of 80 m^3 complete with one (1) discharge/recirculation pump, discharge flow meter and piping to headworks, coarse bubble air diffuser, foul air recovery duct to aeration system and inlet pipe with a basket screen, together with an ultrasonic level transducer and high/low liquid level floats and an automated access control and billing system.

Effluent Disinfection

Replacement of the existing effluent disinfection with an ultraviolet irradiation disinfection system comprising of the following;

- modification of the existing chlorine contact tank to provide two channels, one of which will be equipped with independently powered UV lamp modules rated for 5,720 m^3/day and the other channel will be equipped with weir and isolation gates for future UV lamp modules;

- UV bypass pipe and isolation valve.

EXISTING WORKS

Sanitary Sewage Pumping Station No. 2

A raw sewage pumping station discharging to the headworks at the water pollution control plant consisting of:

- two dry-pit variable speed sewage pumps (one duty and one standby) each rated for 147 L/s
- a 120 kW diesel engine powered generator providing emergency power to the pumping station and the water pollution control plant.
- a 350 mm diameter sanitary sewage forcemain from the pumping station to the WPCP headworks,

together with process piping, flowmeter, valves, structural, ventilation, electrical and control systems and all other appurtenances.

Water Pollution Control Plant

A high-rate activated-sludge water pollution control plant to serving the Municipality of Meaford, rated for an average daily flow of 3,910 m^3/day consisting of:

Headworks

- one (1) coarse bar screen with 25 mm bar spacing located in headworks channel.
- one (1) bypass bar screen with 38 mm bar spacing located in headworks channel (to be replaced with the automatic screen)
- odour suppression equipment consisting of a chemical storage tank and blower and ductwork introduced into the headworks channel on an as-required basis.
- aeration and secondary clarifier bypass line, with inlet located downstream of the screens and controlled by slide gate.

Aeration Tanks

- two (2) circular aeration tanks, operating in parallel, each with an internal diameter of approximately 10.9 m and side water depth of 5.9 m.

- one mechanical mixer in each aeration tank, including draft tube (to be replaced by fine pore aeration equipment).

Secondary Clarifiers

- two (2) circular secondary clarifiers, operating in parallel, each with an internal diameter of approximately 12.2 m and a side water depth of 2.9 m, complete with mechanical rake arm and skimmer blades, hopper, scum trough, scum baffles and weir plates.

Parshall Flume

- one (1) parshall flume chamber equipped with continuous level transmitter.

Chlorine Feed System (system to headworks to remain)

- three (3) positive displacement metering pumps (2 duty, 1 standby), each rated at 9.1 L/hr at a

discharge pressure of 1,035 kPa.
- two (2) 400 L sodium hypochlorite solution storage tanks, and discharge lines connected to headworks for odour and sludge bulking control.

Chlorine Contact Chamber (to be replaced by UV equipment)

- one (1) chlorine contact chamber with approximate dimensions of 9.6 m x 2.4 m x 2.9 m depth complete with baffle walls.

RAS/WAS Pumping Station

- two (2) waste activated sludge/scum pumps (one duty and one standby) each rated for 23 L/s and discharging to the biosolids treatment facility.
- two (2) return activated sludge pumps (one duty and one standby) each rated at 45 L/s and discharging to the headworks.

Biosolids Stabilization and Storage Facility

One (1) two stage aerobic digester with Stage 1 digester tank being approximately 9.5 m x 10 m x 4.35 m depth and Stage 2 digester tank being approximately 4.9 m x 10 m x 4.35 m depth, equipped with coarse bubble diffused aeration system and supernatant decanting facility, complete with the following:

- two (2) air blowers, each rated at 726 L/s at 140 kPa;
- three (3) sludge transfer/decanting pumps, each rated at 23 L/s at 7.5 m TDH;
- one (1) two celled liquid biosolids storage tank, each cell being approximately 18 m x 14.75 m x 4.35 m depth with an effective storage volume of 2,300 m^3, equipped with coarse bubble diffused aeration system and supernatant decanting facility.
- one (1) biosolids transfer building with approximate dimensions of 13 m x 5 m housing the above, including piping, electrical and controls.

Outfall Sewer

A 61.5 m long 600 mm diameter outfall sewer extending approximately 450 m into Georgian Bay opposite the end of Aikin Street.

Miscellaneous Works

Miscellaneous works comprising all related piping, fittings, valves, instrumentation and controls, heating and ventilation, plumbing and drainage, power supply, emergency power, mechanical and electrical equipment, flow measuring devices, effluent water system, yard works and all other items necessary to have a complete and operable water pollution control plant,

all in accordance with the following submitted documents:

1. Application for Approval of Municipal and Private Sewage Works submitted under covering letter dated April 26, 2004 prepared by Ainley and Associates Limited, Consulting Engineers.

2. Report entitled 'Construction of Various Upgrades to the Meaford Water Pollution Control Plant, The Municipality of Meaford, Design Brief' prepared by Ainley and Associates Limited, Consulting Engineers.

3. Tender Specification entitled 'Municipality of Meaford, Water Pollution Control Plant Facility Upgrades' dated December 2003 prepared by Ainley and Associates Limited, Consulting Engineers.

4. Final Plans entitled 'Municipality of Meaford, Water Pollution Control Plant Facility Upgrades' dated January 2004 prepared by Ainley and Associates Limited, Consulting Engineers.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"*Act*" means the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended;

"*Annual Average Concentration*" means the arithmetic mean of the *Monthly Average Concentrations* of a contaminant in the effluent calculated for any particular calendar year;

"*Annual Average Loading*" means the value obtained by multiplying the *Annual Average Concentration* of a contaminant by the *Average Daily Flow* over the same calendar year;

"*Average Daily Flow*" means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

"*By-pass*" means any discharge from the *Works* that does not undergo any treatment before it is discharged to the environment;

"*CBOD5*" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the *Act*, and includes any schedules;

"*Daily Concentration*" means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the *Act*;

"*District Manager*" means the District Manager of the Owen District Office of the Ministry;

"*E. Coli*" refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

"*Geometric Mean Density*" is the nth root of the product of multiplication of the results of n number of samples over the period specified;

"*Individual Waste Loading*" means the loading expressed in kilograms per day and calculated by multiplying the concentration of a parameter in a sample by the total volume of effluent discharged from the works during the day in which the sample is taken;

"*Ministry*" means the Ontario Ministry of the Environment;

"*Monthly Average Concentration*" means the arithmetic mean of all *Daily Concentrations* of a contaminant in the effluent sampled or measured, or both, during a calendar month;

"*Monthly Average Daily Flow*" means the cumulative total sewage flow to the sewage works during a calendar month divided by the number of days during which sewage was flowing to the sewage works that month;

"*Monthly Average Loading*" means the value obtained by multiplying the *Monthly Average Concentration* of a contaminant by the *Monthly Average Daily Flow* over the same calendar month:

"*Owner*" means The Corporation of the Municipality of Meaford and includes its successors and assignees;

"*Peak Flow Rate*" means the maximum rate of sewage flow for which the plant or process unit was designed;

"*Previous Works*" means those portions of the sewage works previously constructed and approved under a certificate of approval;

"*Proposed Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*;

"*Rated Capacity*" means the *Average Daily Flow* for which the *Works* are approved to handle;

"*Regional Director*" means the Regional Director of the Southwestern Region of the Ministry;

"*Substantial Completion*" has the same meaning as "*substantial performance*" in the Construction Lien Act; and

"*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* and includes both *Previous Works* and *Proposed Works*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

(3) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The requirements of this *Certificate* are severable. If any requirement of this *Certificate*, or the application of any requirement of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this certificate shall not be affected thereby.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

(1) The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within 30 days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*;

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Informations Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*;

(2) In the event of any change in ownership of the *Works*, other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Certificate*, and a copy of such notice shall be forwarded to the *District Manager* and the *Director*.

4. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

(1) Upon the *Substantial Completion* of the *Works*, the Owner shall prepare a statement, certified by a Professional Engineer, that the works are constructed in accordance with this *Certificate*, and upon request, shall make the written statement available for inspection by Ministry personnel.

(2) Within one (1) year of the *Substantial Completion* of the *Proposed Works*, a set of as-built drawings showing the works "as constructed" shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the *Works* for the operational life of the *Works*.

5. BY-PASSES

(1) Any *By-pass* of sewage from any portion of the *Works* is prohibited, except where:

(a) the *Peak Flow Rate* would exceed 11,730 cubic metres per day;

(b) it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage;

(c) the *District Manager* agrees that it is necessary for the purpose of carrying out essential maintenance and the *District Manager* has given prior written acknowledgment of the *by-pass*; or

(d) the *Regional Director* has given prior written acknowledgment of the *By-pass*.

(2) The *Owner* shall collect at least one (1) grab sample of the *By-pass* and have it analysed for the parameters outlined in Condition 7 using the protocols in Condition 9.

(3) The *Owner* shall maintain a logbook of all *By-pass* events which shall include, at a minimum, the

time, location, duration, quantity of *By-pass*, the authority for *By-pass* pursuant to subsection (1), and the reasons for the occurrence.

(4) The *Owner* shall, in the event of a *By-pass* event pursuant to subsection (1), disinfect the by-passed effluent prior to it reaching the receiver such that the receiver is not negatively impacted.

6. EFFLUENT OBJECTIVES

(1) The *Owner* shall use best efforts to design, construct and operate the *Works* with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the *Works*.

Table 1 - Effluent Objectives

Effluent Parameter	**Monthly Average Concentration** (milligrams per litre unless otherwise indicated)	**Annual Average Loading** (kilograms per day unless otherwise indicated)
Column 1	Column 2	Column 3
CBOD5	15.0	58.7
Total Suspended Solids	15.0	58.7
Total Phosphorus	2.0	7.8
Total Ammonia Nitrogen Freezing Period* Non-Freezing Period*	 3.0 5.0	 11.7 19.6
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times		

Note: Freezing Period* - October 1 to May 14
Non-Freezing Period* - May 15 to September 30

(2) The *Owner* shall use best efforts to:

(a) maintain the pH of the effluent from the *Works* within the range of 6 to 9.5, inclusive, at all times;

(b) operate the works within the *Rated Capacity* of the *Works*;

(c) ensure that the effluent from the *Works* is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

(3) The *Owner* shall include in all reports submitted in accordance with Conditions 10, a summary of the efforts made and results achieved under this Condition.

7. EFFLUENT LIMITS

(1) The *Owner* shall design and construct the *proposed works* and operate and maintain the *Works* such that the concentrations and waste loadings of the materials named below as effluent parameters are not exceeded in the effluent from the *Works*.

Table 2 - Effluent Limits

Effluent Parameter	**Monthly Average Concentration** (milligrams per litre unless otherwise indicated)	**Annual Average Loading** (kilograms per day unless otherwise indicated)
Column 1	Column 2	Column 3
CBOD5	20.0	78.2
Total Suspended Solids	20.0	78.2
Total Phosphorus	4.0	15.6
Total Ammonia Nitrogen		
Freezing Period*	3.0	11.7
Non-Freezing Period*	5.0	19.6
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times		

Note: Freezing Period* - October 1 to May 14
Non-Freezing Period* - May 15 to September 30

(2) For the purposes of determining compliance with and enforcing subsection (1):

(a) The *Monthly Average Concentration* of a parameter named in Column 1 of subsection (1) shall not exceed the corresponding maximum concentration set out in Column 2 of subsection (1).

(b) The *Annual Average Loading* of a parameter named in Column 1 of subsection (1) shall not exceed the corresponding maximum waste loading set out in Column 3 of subsection (1).

(c) The pH of the effluent shall be maintained within the limits outlined in subsection (1), at all times.

(3) Notwithstanding subsection (1), the *Owner* shall operate and maintain the *Works* such that the effluent is continuously disinfected so that the monthly *Geometric Mean Density* of *E. Coli* does not exceed 200 organisms per 100 millilitres of effluent discharged from the *works*.

(4) The effluent limit set out in subsection (3) shall apply upon *Substantial Completion* of the proposed works.

8. OPERATION AND MAINTENANCE

(1) The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Certificate* are properly operated and

maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this *Certificate* and the *Act* and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the *Works*.

(2) The *Owner* shall prepare an operations manual within six (6) months of *Substantial Completion* of the *Proposed Works*, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the *Works*;

(b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works*;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager*; and

(f) procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

(3) The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works*. Upon request, the *Owner* shall make the manual available to *Ministry* staff.

(4) The *Owner* shall provide for the overall operation of the *Works* with an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility in accordance with Ontario Regulation 435/93.

9. EFFLUENT MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works*, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this *Certificate* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, the following definitions apply:

(a) Daily means once each day;
(b) Weekly means once each week;
(c) Bi-weekly means once every two weeks;
(d) Monthly means once every month;

(3) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analysed for each parameter listed and all results recorded:

Table 3 - Raw Sewage Monitoring		
Parameters	**Sample Type**	**Frequency**
CBOD5	composite	monthly
Total Suspended Solids	composite	monthly
Total Phosphorus	composite	monthly
Total Kjeldahl Nitrogen	composite	monthly
Ammonia Nitrogen	composite	monthly
Nitrite + Nitrate Nitrogen	composite	monthly
Alkalinity, pH	composite	monthly

Table 4 - Effluent Monitoring		
Parameters	**Sample Type**	**Frequency**
CBOD5	composite	weekly
Total Suspended Solids	composite	weekly
Total Phosphorus	composite	weekly
Total Kjeldahl Nitrogen	composite	weekly
Total Ammonia Nitrogen	composite	weekly
Nitrite + Nitrate Nitrogen	composite	weekly
pH	grab	weekly
Escherichia Coli	grab	weekly
Temperature	grab	weekly

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (20th

edition), as amended from time to time by more recently published editions;

(d) the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" (July 1990) and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna" (July 1990), as amended from time to time by more recently published editions; and,

(e) for any parameters not mentioned in the documents referenced in (a) and (b), the written approval of the *District Manager* shall be obtained prior to sampling.

(5) The temperature and pH of the effluent from the *Works* shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).

(6) The measurement frequencies specified in subsection (2) in respect to any parameter are minimum requirements which may, after (6/12/24) months of monitoring in accordance with this Condition, be modified by the *District Manager* in writing from time to time.

(7) The *Owner* shall install and maintain (a) continuous flow measuring device(s), to measure the flowrate of the effluent from the *Works* with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate.

(8) The *Owner* shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Certificate*.

10. REPORTING

(1) One week prior to the start up of the operation of the *Proposed Works*, the *Owner* shall notify the *District Manager* (in writing) of the pending start up date.

(2) Ten (10) days prior to the date of a planned *By-pass* being conducted pursuant to Condition 5 and as soon as possible for an unplanned *By-pass*, the *Owner* shall notify the *District Manager* (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the *By-pass*.

(3) The *Owner* shall report to the *District Manager* or designate, any exceedence of any parameter specified in Condition 7 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

(4) In addition to the obligations under Part X of the Environmental Protection Act, the *Owner* shall, within 10 working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or

any other polluting substance into the environment, submit a full written report of the occurrence to the *District Manager* describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(5) The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.

(6) The *Owner* shall prepare, and submit to the *Director* and the *District Manager* upon request, a performance report, on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the *Works* and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the *Works*;

(b) a description of any operating problems encountered and corrective actions taken;

(c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Works*;

(d) a summary of any effluent quality assurance or control measures undertaken in the reporting period;

(e) a summary of the calibration and maintenance carried out on all effluent monitoring equipment; and

(f) a description of efforts made and results achieved in meeting the Effluent Objectives of Condition 6.

(g) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(h) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(i) a summary of all *By-pass*, spill or abnormal discharge events; and

(j) any other information the *District Manager* requires from time to time.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this *Certificate* the existence of this *Certificate*.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included to ensure that the *Works* are constructed in accordance with the approval and that record drawings of the *Works* "as constructed" are maintained for future references.

5. Condition 5 is included to indicate that by-passes of untreated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to *By-pass* could result in greater injury to the public interest than the *By-pass* itself where a *By-pass* will not violate the approved effluent requirements, or where the *By-pass* can be limited or otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the *Ministry* to take action in an informed manner and will ensure the *Owner* is aware of the extent and frequency of *By-pass* events.

6. Condition 6 is imposed to establish non-enforceable effluent quality objectives which the *Owner* is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs and before the compliance limits of Condition 7 are exceeded..

7. Condition 7 is imposed to ensure that the effluent discharged from the *Works* to Georgian Bay meets the *Ministry*'s effluent quality requirements thus minimizing environmental impact on the receiver and to protect water quality, fish and other aquatic life in the receiving water body.

8. Condition 8 is included to require that the *Works* be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the *Ministry*. Such a manual is an integral part of the operation of the *Works*. Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in

identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the *Owner*'s operation of the work.

9. Condition 9 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works*, on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the design objectives and effluent limits specified in the *Certificate* and that the *Works* does not cause any impairment to the receiving watercourse.

10. Condition 10 is included to provide a performance record for future references, to ensure that the *Ministry* is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Certificate,* so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 1-0003-66-690036, 3-0023-90-006, 3-1691-95-966, 3-0839-98-006, 3-1209-98-006 issued on August 27, 1969, April 10, 1990, February 2, 1996, July 22, 1998, October 22, 1998 respectively.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 23rd day of July, 2004

THIS CERTIFICATE WAS MAILED
ON July 29, 2004
9C
(Signed)

Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

HV/

c: District Manager, MOE Owen Sound District Office
Standards Development Branch, Drinking Water and Wastewater Section
Mark C. Guthrie, P. Eng., Ainley & Associates Limited ✓

Appendix 'B'

WPCP Performance Data
(January 2003 to June 2006)

Ontario Clean Water Agency
Performance Assessment Report - Wastewater Treatment Plant

Printed on: 7/13/2006
d_par_wwt

Municipality: Town of Meaford
Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Wastewater Treatment Plant
Classification: Class 3 Wastewater Collection, Class 2 Wastewater Treatment
Receiver: Georgian Bay

Period: 01/01/2006 to 12/31/2006
Serviced Population: 4,330
Total Design Capacity(m^3/day): 3,910.0
Raw Flow Group Selected: R
Effluent Group Selected: F

	Jan/2006	Feb/2006	Mar/2006	Apr/2006	May/2006	Jun/2006	Jul/2006	Aug/2006	Sep/2006	Oct/2006	Nov/2006	Dec/2006	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
Flow																
Raw: Total Flow(m3/mth)	125,135.0	98,231.0	140,420.0	93,435.0	75,706.0	59,473.0							592,400.0			
Raw: Avg. Day Flow(m3/day)	4,036.6	3,508.3	4,529.7	3,114.5	2,442.1	1,982.4								3,272.9		
Raw: Max. Day Flow(m3/day)	6,631.0	5,793.0	13,381.0	3,973.0	3,455.0	2,678.0									13,381.0	
Eff.: Total Flow(m3/mth)	125,135.0	98,231.0	140,420.0	93,435.0	75,706.0	59,473.0							592,400.0	3,272.9	140,420.0	
Biochemical O2 Demand																
Raw: Avg.CBOD(mg/L)	93.0	60.0	82.0	49.0	170.0	98.0								92.0	170.0	0
Eff.: Avg.CBOD(mg/L)	7.6	5.8	7.0	3.8	3.2	3.3								5.1	7.6	20.0
CBOD Loading(kg/d)	30.68	20.17	31.71	11.68	7.81	6.44								18.08	31.71	78.2
Percent Removal	91.83	90.42	91.46	92.35	98.12	96.68										
Suspended Solids																
Raw: Avg.SS(mg/L)	119.0	66.0	136.0	74.0	396.0	94.0								147.5	396.0	200.0
Eff.: Avg.SS(mg/L)	13.2	10.3	10.3	6.3	5.6	3.8								8.3	13.2	20.0
SS Loading(kg/d)	53.28	35.96	46.43	19.47	13.68	7.43								29.37	53.28	78.2
Percent Removal	88.91	84.47	92.46	91.55	98.59	98.01								92.0		
Phosphorus																
Raw: Avg.PHOS(mg/L)	2.04	1.87	2.18	1.43	3.33	2.76								2.27	3.33	0
Eff.: Avg.PHOS(mg/L)	1.22	1.21	1.14	1.27	1.88	2.01								1.46	2.01	4.0
Phos. Loading(kg/d)	4.94	4.25	5.16	3.96	4.6	3.99								4.48	5.16	15.6
Percent Removal	40.0	35.16	47.71	11.19	43.42	27.61								34.18		
Nitrogen Series																
Raw: Avg.NH3+NH4(mg/L)	15.1	8.4	22.6	8.1	16.1	25.4								15.95	25.4	0
Eff.:Avg.NH3+NH4(mg/L)	3.22	6.13	5.78	2.55	0.58	0.43								3.02	6.13	3.0
NH3+NH4 Loading(kg/d)	13.0	21.49	28.16	7.94	1.42	0.84								11.81	26.16	0
Eff.: Avg.Nitrate-N(mg/L)	7.75	5.69	4.75	7.52	12.2	10.99								8.29	12.2	0
Eff.: Avg.Nitrite-N(mg/L)	0.37	0.29	0.22	0.28	0.27	0.37								0.3	0.37	0
Disinfection																
Eff.: Geo.Mean E.Coli per 100mL	1,518.0	2,005.0	364.0	166.0	< 8.0	< 58.0								< 134.0	< 2,005.0	200.0

Legend:

Rew Group Selected: R - Raw Sewage
Effluent Group Selected: F - Final Effluent

Note: ? Calculation not verifiable. At least one result reported as < and at least one result reported >.
-1 Analysis result less than detectable limit

Ontario Clean Water Agency
Performance Assessment Report - Wastewater Treatment Plant

Printed on: 7/13/2006
d_par_wwt

Municipality: Town of Meaford
Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Wastewater Treatment Plant
Classification: Class 3 Wastewater Collection, Class 2 Wastewater Treatment
Receiver: Georgian Bay

Period: 01/01/2005 to 12/31/2005
Serviced Population: 4,330
Total Design Capacity(m^3/day): 3,910.0
Raw Flow Group Selected: R
Effluent Group Selected: F

	Jan/2005	Feb/2005	Mar/2005	Apr/2005	May/2005	Jun/2005	Jul/2005	Aug/2005	Sep/2005	Oct/2005	Nov/2005	Dec/2005	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
Flow																
Raw: Total Flow(m3/mth)	110,689.0	70,706.0	90,619.0	124,702.0	70,956.0	83,430.0	57,336.0	57,420.0	61,011.0	55,846.0	86,452.0	98,403.0	967,570.0			
Raw: Avg. Day Flow(m3/day)	3,570.6	2,525.2	2,923.2	4,156.7	2,288.9	2,781.0	1,849.5	1,852.3	2,033.7	1,801.5	2,881.7	3,174.3		2,650.9		
Raw: Max. Day Flow(m3/day)	8,199.0	3,940.0	7,457.0	8,340.0	3,186.0	7,144.0	2,745.0	2,947.0	3,739.0	2,109.0	4,441.0	8,182.0			8,340.0	
Eff.: Total Flow(m3/mth)	110,689.0	70,706.0	90,619.0	124,702.0	70,956.0	83,430.0	57,336.0	57,420.0	61,011.0	55,846.0	86,452.0	98,403.0	967,570.0	2,650.9	124,702.0	
Biochemical O2 Demand																
Raw: Avg. BOD(mg/L)	112.0	211.0												161.5	211.0	400.0
Eff.: Avg.Eff. BOD(mg/L)	14.0	24.0												19.0	24.0	20.0
BOD Loading(kg/d)	49.99	60.61												55.3	60.61	
Percent Removal	87.5	88.63												88.06		
Raw: Avg.CBOD(mg/L)		62.0	143.0	43.0	81.0	109.0	112.0	97.0	143.0	93.0	114.0	124.0		101.9	143.0	0
Eff.: Avg.CBOD(mg/L)		5.0	7.0	2.5	3.5	4.8	7.8	6.2	6.3	3.8	4.8	9.3		5.6	9.3	20.0
CBOD Loading(kg/d)		12.63	20.46	10.39	8.01	13.35	14.33	11.48	12.71	6.76	13.83	29.36		13.94	29.36	78.2
Percent Removal		91.94	95.1	94.19	95.68	95.6	93.08	93.61	95.63	95.97	95.79	92.54				
Suspended Solids																
Raw: Avg.SS(mg/L)	161.0	105.0	104.0	54.0	148.0	115.0	174.0	124.0	107.0	142.0	120.0	98.0		119.8	174.0	200.0
Eff.: Avg.SS(mg/L)	7.0	12.3	14.8	6.0	3.8	8.0	11.0	6.4	10.3	6.5	5.8	10.3		8.5	14.8	20.0
SS Loading(kg/d)	24.99	31.14	43.26	24.94	8.58	22.25	20.35	11.85	20.85	11.71	16.71	32.54		22.43	43.26	78.2
Percent Removal	95.65	88.25	85.77	88.89	97.47	93.04	93.68	94.84	90.42	95.42	95.17	89.54		92.35		
Phosphorus																
Raw: Avg.PHOS(mg/L)	2.39	2.16	2.51	0.97	2.03	2.97	3.38	3.78	5.1	3.72	3.24	2.68		2.85	5.1	0
Eff.: Avg.PHOS(mg/L)	1.11	1.28	1.51	1.47	1.33	1.99	2.32	2.44	5.62	2.68	1.56	1.61		2.11	5.62	4.0
Phos. Loading(kg/d)	3.96	3.22	4.4	6.09	3.05	5.53	4.28	4.52	11.43	4.82	4.49	5.1		5.08	11.43	15.6
Percent Removal	53.56	40.9	40.0	-51.03	34.36	33.06	31.51	35.5	-10.25	28.02	51.91	40.02		27.3		
Nitrogen Series																
Raw: Avg.NH3+NH4(mg/L)	16.5	13.45	14.8	7.2	26.8	20.0	24.5	21.2	32.8	19.7	38.9	18.7		20.62	38.9	0
Eff.:Avg.NH3+NH4(mg/L)	7.9	3.67	7.3	5.9	4.6	3.18	4.9	1.44	0.3	1.28	1.42	2.58		3.41	7.9	3.0
NH3+NH4 Loading(kg/d)	28.21	9.26	21.34	24.52	10.53	8.84	9.06	2.67	0.61	2.3	4.09	8.17		10.8	28.21	0
Eff.: Avg.Nitrate-N(mg/L)	4.8	8.91	8.03	5.03	7.92	< 8.56	9.93	15.03	26.25	17.68	9.65	10.28		< 11.36	26.25	0
Eff.: Avg.Nitrite-N(mg/L)	0.18	0.21	< 0.28	0.14	0.34	< 0.57	1.45	1.52	1.52	0.84	1.15	1.22		< 0.84	< 1.52	0

Ontario Clean Water Agency
Performance Assessment Report - Wastewater Treatment Plant

Printed on: 7/13/2006
d_par_wwt

Municipality: Town of Meaford
Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Wastewater Treatment Plant
Classification: Class 3 Wastewater Collection, Class 2 Wastewater Treatment
Receiver: Georgian Bay

Period: 01/01/2005 to 12/31/2005
Serviced Population: 4,330
Total Design Capacity(m^3/day): 3,910.0
Raw Flow Group Selected: R
Effluent Group Selected: F

	Jan/2005	Feb/2005	Mar/2005	Apr/2005	May/2005	Jun/2005	Jul/2005	Aug/2005	Sep/2005	Oct/2005	Nov/2005	Dec/2005	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
Disinfection																
Eff.: Geo.Mean E.Coli per 100mL	583.0	2,044.0	83.0	76.0	110.0	727.0	273.0	384.0	58.0	87.0	192.0	2,164.0		252.0	2,164.0	200.0

Legend:

Raw Group Selected: R - Raw Sewage
Effluent Group Selected: F - Final Effluent

Note: ? Calculation not verifiable. At least one result reported as < and at least one result reported >.
-1 Analysis result less than detectable limit

Ontario Clean Water Agency
Performance Assessment Report - Wastewater Treatment Plant

Printed on: 7/13/2006
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Municipality: Town of Meaford
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Period: 01/01/2004 to 12/31/2004
Serviced Population: 4,330
Total Design Capacity(m³/day): 3,910.0
Raw Flow Group Selected: R
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	Jan/2004	Feb/2004	Mar/2004	Apr/2004	May/2004	Jun/2004	Jul/2004	Aug/2004	Sep/2004	Oct/2004	Nov/2004	Dec/2004	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
Flow																
Raw: Total Flow(m3/mth)	78,918.0	62,633.0	156,646.0	89,859.0	147,382.0	76,115.0	60,369.0	54,760.0	49,129.0	54,803.0	56,173.0	93,815.0	980,602.0			
Raw: Avg. Day Flow(m3/day)	2,545.7	2,159.8	5,053.1	2,995.3	4,754.3	2,537.2	1,947.4	1,766.5	1,637.6	1,767.8	1,872.4	3,026.3		2,679.2		
Raw: Max. Day Flow(m3/day)	4,776.0	3,244.0	13,620.0	5,168.0	13,423.0	3,563.0	3,264.0	2,287.0	2,135.0	2,702.0	2,784.0	9,044.0			13,620.0	
Eff.: Total Flow(m3/mth)	78,918.0	62,633.0	156,646.0	89,859.0	147,382.0	76,115.0	60,369.0	54,760.0	49,129.0	54,803.0	56,173.0	93,815.0	980,602.0	2,679.2	156,646.0	
Biochemical O2 Demand																
Raw: Avg. BOD(mg/L)	58.0	109.0	47.0	66.0	74.0	76.0	126.0	87.0	161.0	95.0	70.0	65.0		86.2	161.0	400.0
Eff.: Avg.Eff. BOD(mg/L)	6.0	15.0	5.0	4.0	3.0	3.0	9.0	3.0	2.0	3.0	6.7	7.0		5.8	15.0	20.0
BOD Loading(kg/d)	15.27	32.4	25.27	11.98	14.26	7.61	17.53	5.3	3.28	5.3	12.5	21.18		14.32	32.4	
Percent Removal	89.66	86.24	89.36	93.94	95.95	96.05	92.86	96.55	98.76	96.84	90.46	89.23		92.99		
Suspended Solids																
Raw: Avg.SS(mg/L)	57.0	134.0	70.0	150.0	90.0	108.0	147.0	90.0	148.0	116.0	134.0	104.0		112.3	150.0	200.0
Eff.: Avg.SS(mg/L)	8.0	7.0	4.0	4.0	2.0	3.0	4.0	3.0	2.0	3.0	3.0	6.0		4.1	8.0	20.0
SS Loading(kg/d)	20.37	15.12	20.21	11.98	9.51	7.61	7.79	5.3	3.28	5.3	5.62	18.16		10.85	20.37	78.2
Percent Removal	85.96	94.78	94.29	97.33	97.78	97.22	97.28	96.67	98.65	97.41	97.76	94.23		95.78		
Phosphorus																
Raw: Avg.PHOS(mg/L)	1.17	2.63	0.7	1.7	1.19	1.96	3.57	3.14	4.87	4.27	3.42	2.05		2.56	4.87	0
Eff.: Avg.PHOS(mg/L)	1.62	1.44	0.59	1.04	1.1	1.26	2.62	2.63	2.55	1.98	2.35	1.33		1.71	2.63	4.0
Phos. Loading(kg/d)	4.12	3.11	2.98	3.12	5.23	3.2	5.1	4.64	4.17	3.49	4.4	4.02		3.97	5.23	15.6
Percent Removal	-38.46	45.25	15.71	38.82	7.56	35.71	26.61	16.4	47.74	53.75	31.29	35.12		26.29		
Nitrogen Series																
Raw: Avg.NH3+NH4(mg/L)	10.8	20.0	4.4	10.0	10.7	9.6	23.3	24.0	28.0	23.7	24.3	11.3		16.68	28.0	0
Eff.:Avg.NH3+NH4(mg/L)	1.7	2.5	2.3	4.6	1.7	2.4	1.8	2.9	2.9	1.3	1.6	6.4		2.68	6.4	3.0
NH3+NH4 Loading(kg/d)	4.33	5.4	11.62	13.78	8.08	6.09	3.51	5.12	4.75	2.3	3.0	19.37		7.28	19.37	0
Eff.: Avg.Nitrate-N(mg/L)	9.67	11.0	5.5	9.2	6.39	6.58	10.9	4.29	10.1	10.1	8.66	2.79		7.93	11.0	0
Eff.: Avg.Nitrite-N(mg/L)	0.28	0.41	0.36	0.28	0.2	0.36	0.56	0.62	0.75	0.42	0.42	0.34		0.42	0.75	0
Disinfection																
Eff.: Geo.Mean E.Coli per 100mL	7,915.0	1,285.0	17,550.0	4,520.0	15,855.0	111.0	727.0	81.0	417.0	4,960.0	30,973.0	87,499.0		3,130.0	87,499.0	200.0

Legend:

Raw Group Selected: R - Raw Sewage
Effluent Group Selected: F - Final Effluent

Note: ? Calculation not verifiable. At least one result reported as < and at least one result reported >.
-1 Analysis result less than detectable limit

Ontario Clean Water Agency
Performance Assessment Report - Wastewater Treatment Plant

Printed on: 7/13/2006
d_par_wwt

Municipality: Town of Meaford
Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Westewater Treatment Plant
Classification: Class 3 Wastewater Collection, Class 2 Wastewater Treatment
Receiver: Georgian Bay

Period: 01/01/2003 to 12/31/2003
Serviced Population: 4,330
Total Design Capacity(m³/day): 3,910.0
Raw Flow Group Selected: R
Effluent Group Selected: F

	Jan/2003	Feb/2003	Mar/2003	Apr/2003	May/2003	Jun/2003	Jul/2003	Aug/2003	Sep/2003	Oct/2003	Nov/2003	Dec/2003	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
Flow																
Raw: Total Flow(m3/mth)	58,342.0	53,080.0	134,429.0	113,600.0	93,908.0	81,242.0	59,547.0	50,467.0	51,037.0	76,910.0	98,286.0	102,024.0	972,872.0			
Raw: Avg. Day Flow(m3/day)	1,882.0	1,895.7	4,336.4	3,786.7	3,029.3	2,708.1	1,920.9	1,628.0	1,701.2	2,481.0	3,276.2	3,291.1		2,665.4		
Raw: Max. Day Flow(m3/day)	2,287.0	2,485.0	10,524.0	5,437.0	5,198.0	4,516.0	2,891.0	2,228.0	2,838.0	4,537.0	5,789.0	5,328.0			10,524.0	
Eff.: Total Flow(m3/mth)	58,342.0	53,080.0	134,429.0	113,600.0	93,908.0	81,242.0	59,547.0	50,467.0	51,037.0	76,910.0	98,286.0	102,024.0	972,872.0	2,665.4	134,429.0	
Biochemical O2 Demand																
Raw: Avg. BOD(mg/L)	170.0	79.0	136.0	60.0	64.0	105.0	107.0	167.0	149.0	101.0	70.0	124.0		111.0	170.0	400.0
Eff.: Avg.Eff. BOD(mg/L)	14.0	12.0	11.0	14.0	10.0	4.0	9.0	14.0	7.0	9.0	7.0	7.0		9.8	14.0	20.0
BOD Loading(kg/d)	26.35	22.75	47.7	53.01	30.29	10.83	17.28	22.78	11.91	22.33	22.93	23.04		25.94	53.01	
Percent Removal	91.76	84.81	91.91	76.67	84.38	96.19	91.59	91.62	95.3	91.09	90.0	94.35		89.97		
Suspended Solids																
Raw: Avg.SS(mg/L)	144.0	172.7	114.7	112.6	93.7	148.6	282.6	324.9	172.7	150.9	106.9	118.7		162.9	324.9	200.0
Eff.: Avg.SS(mg/L)	8.0	4.8	8.7	7.6	7.9	5.4	7.6	4.6	3.8	4.2	4.4	5.9		5.9	8.7	20.0
SS Loading(kg/d)	15.06	9.02	37.81	28.78	23.93	14.62	14.6	7.46	6.43	10.38	14.48	19.42		16.83	37.81	78.2
Percent Removal	94.44	97.24	92.4	93.25	91.57	96.37	97.31	98.59	97.81	97.23	95.86	95.03		95.59		
Phosphorus																
Raw: Avg.PHOS(mg/L)	4.15	3.54	3.72	1.64	1.53	2.61	3.44	5.34	4.2	2.99	1.38	3.67		3.18	5.34	0
Eff.: Avg.PHOS(mg/L)	1.85	2.67	1.39	0.83	0.83	1.72	2.88	2.25	2.35	1.6	1.09	1.25		1.76	2.88	4.0
Phos. Loading(kg/d)	3.48	5.06	6.01	3.14	2.51	4.64	5.52	3.66	3.99	3.96	3.57	4.11		4.14	6.01	15.6
Percent Removal	55.42	24.58	62.77	49.39	45.75	34.29	16.42	57.87	44.17	46.66	21.01	65.94		43.69		
Nitrogen Series																
Raw: Avg.NH3+NH4(mg/L)	24.5	17.6	23.1	11.8	10.2	14.0	22.2	28.1	27.1	16.8	7.1	15.6		18.18	28.1	0
Eff.:Avg.NH3+NH4(mg/L)	1.3	1.0	0.5	4.0	1.9	0.5	2.4	16.7	2.7	1.5	0.2	1.3		2.8	16.7	3.0
NH3+NH4 Loading(kg/d)	2.45	1.9	2.17	15.15	4.54	1.35	4.61	27.18	4.59	3.72	0.66	4.28		6.05	27.19	0
Eff.: Avg.Nitrate-N(mg/L)	22.0	14.6	15.8	7.84	6.35	12.2	6.2	0.21	8.29	4.63	7.5	104.0		17.47	104.0	0
Eff.: Avg.Nitrite-N(mg/L)	0.29	0.14	0.16	0.6	0.38	0.27	0.86	0.62	1.18	0.62	0.25	0.83		0.52	1.18	0
Disinfection																
Eff.: Geo.Mean E.Coli per 100mL	170,000.0	12,700.0	17,000.0	12,800.0	62,000.0	1,051.0	33.0	18.0	34.0	< 4.0	40,944.0	109,087.0		< 1,326.0	< 170,000.0	200.0

Legend:

Raw Group Selected: R - Raw Sewage
Effluent Group Selected: F - Final Effluent

Note: ? Calculation not verifiable. At least one result reported as < and at least one result reported >.
-1 Analysis result less than detectable limit

Ontario Clean Water Agency
Digester Type: AEROBIC
Solids, Nutrients and Metals Concentrations

Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Wastewater Treatment Plant
Period: 01/01/2005 to 12/31/2005

Month	Total Sludge Hauled (m^3)	Avg PHOS. (mg/L)	Avg Total Solid (mg/L)	Avg Ammonia+ Nitrate (mg/L)	Avg Arsenic (mg/L)	Avg Cadmium (mg/L)	Avg Cobalt (mg/L)	Avg Chromium (mg/L)	Avg Copper (mg/L)	Avg Mercury (mg/L)	Avg Molybdenum (mg/L)	Avg Nickel (mg/L)	Avg Lead (mg/L)	Avg Selenium (mg/L)	Avg Zinc (mg/L)
2005															
JAN	0	420	18,400	40.8	< 0.28	0.03	0.09	0.4	9.6	0.03	0.17	0.33	1.6	< 0.37	13.0
FEB															
MAR															
APR	0	310	11,900	82.0	< 0.06	0.01	0.05	0.2	4.9	0.01	0.07	0.16	0.8	< 0.06	6.5
MAY															
JUN	280														
JUL	1,084	430	14,700	26.3	< 0.07	0.02	0.09	0.4	9.6	0.03	0.11	0.99	1.6	< 0.07	25.0
AUG															
SEP															
OCT	679	1,025	45,500	40.9	< 0.30	0.06	0.24	0.9	21.0	0.05	0.30	0.60	4.3	< 0.30	25.0
NOV															
DEC															
Total:	2,043														
AVG.	255	642	27,200	46.2	< 0.18	0.03	0.12	0.5	11.3	0.03	0.16	0.52	2.1	< 0.20	17.4
Max. Permissible Metal Concentrations (mg/kg of Solids):															
Metal Concentrations in Sludge (mg/kg):					6.57	1.17	4.33	17.4	414.5	1.12	5.97	19.12	76.3	7.35	638.8

Metal Concentrations Expressed as mg/kg of Solids

Ontario Clean Water Agency
Digester Type: AEROBIC
Solids, Nutrients and Metals Concentrations

Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Wastewater Treatment Plant
Period: 01/01/2004 to 12/31/2004

Month	Total Sludge Hauled (m^3)	Avg PHOS. (mg/L)	Avg Total Solid (mg/L)	Avg Ammonia+ Nitrate (mg/L)	Avg Arsenic (mg/L)	Avg Cadmium (mg/L)	Avg Cobalt (mg/L)	Avg Chromium (mg/L)	Avg Copper (mg/L)	Avg Mercury (mg/L)	Avg Molybdenum (mg/L)	Avg Nickel (mg/L)	Avg Lead (mg/L)	Avg Selenium (mg/L)	Avg Zinc (mg/L)
2004															
JAN	0	460	19,000	94.7	< 0.28	< 0.02	0.06	0.6	10.0	0.03	0.14	0.34	3.2	< 0.38	12.0
FEB															
MAR															
APR	0	550	21,000	42.8	< 0.32	0.04	0.07	0.5	11.0	0.04	0.13	0.32	2.9	0.42	< 16.0
MAY															
JUN															
JUL	0	590	23,800	29.5	< 0.37	0.06	0.18	1.1	16.0	0.05	0.27	0.59	5.6	< 0.49	24.0
AUG															
SEP	1,662	815	26,700	14.8	< 0.43	0.07	0.21	1.2	20.0	0.07	0.37	0.93	7.2	< 0.57	43.0
OCT															
NOV															
DEC	0	520	14,100	73.8	< 0.21	0.03	0.10	0.4	9.4	0.02	0.16	0.30	1.7	< 0.28	12.0
Total:	1,662														
AVG.	277	625	22,157	< 49.1	< 0.32	< 0.04	0.12	0.8	13.3	0.04	0.21	0.50	4.1	< 0.43	< 21.4

Metal Concentrations Expressed as mg/kg of Solids

Max. Permissible Metal Concentrations (mg/kg of Solids):											
Metal Concentrations in Sludge (mg/kg):	14.53	1.99	5.69	34.7	599.4	1.99	9.66	22.39	185.9	19.32	965.8

Ontario Clean Water Agency
Digester Type: AEROBIC
Solids, Nutrients and Metals Concentrations

Facility: [5605] - Meaford Wastewater Treatment Plant
Works: [110000445] - Meaford Wastewater Treatment Plant
Period: 01/01/2003 to 12/31/2003

Month	Total Sludge Hauled (m^3)	Avg PHOS. (mg/L)	Avg Total Solid (mg/L)	Avg Ammonia+ Nitrate (mg/L)	Avg Arsenic (mg/L)	Avg Cadmium (mg/L)	Avg Cobalt (mg/L)	Avg Chromium (mg/L)	Avg Copper (mg/L)	Avg Mercury (mg/L)	Avg Molybdenum (mg/L)	Avg Nickel (mg/L)	Avg Lead (mg/L)	Avg Selenium (mg/L)	Avg Zinc (mg/L)
2003															
JAN	0	330	14,500	91.2	0.22	0.03	0.05	0.4	8.1	0.02	0.10	0.17	1.6	0.29	9.9
FEB															
MAR															
APR	0	410	17,700	39.3	0.27	0.04	0.09	0.5	9.6	0.02	0.18	0.26	2.5	0.35	10.0
MAY															
JUN															
JUL	0	570	23,600	16.3	0.35	0.06	0.28	0.9	13.0	0.05	0.24	1.10	3.5	0.47	17.0
AUG	0	810	27,000	342.0											
SEP	1,680	780	26,900	183.0	< 0.40	0.07	0.17	1.0	19.0	0.05	< 0.27	0.64	6.2	< 0.54	27.0
OCT															
NOV															
DEC	0	380	15,700	24.8	< 0.24	0.04	0.09	0.5	11.0	0.05	0.12	0.30	2.8	< 0.31	11.0
Total:	1,680														
AVG.	420	547	20,900	116.1	< 0.30	0.05	0.14	0.6	12.1	0.04	< 0.18	0.49	3.3	< 0.39	15.0
Metal Concentrations Expressed as mg/kg of Solids															
Max. Permissible Metal Concentrations (mg/kg of Solids):															
Metal Concentrations in Sludge (mg/kg):					14.16	2.30	6.51	30.7	580.0	1.80	8.71	23.64	158.9	18.76	716.7

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

CLIENT
PROJECT
SUBJECT

FILE No.
SHEET No. OF
DATE
BY CHECKED

Average from 2003 (Jan) → 2006 (June)

Raw Avg Day Flow (m^3/d) = 2752.0

Raw Max Day Flow = 13,620.0

Raw Avg CBOD (mg/L) = 98.4 (Feb 2005 - June 2006

Raw Max CBOD (mg/L) = 170.0

Raw Avg BOD (mg/L) = 103.4 (Jan 2003 → Feb 2005)

Raw Max BOD (mg/L) = 211.0

Avg Eff CBOD (mg/L) = 5.4

Max Eff CBOD (mg/L) = 9.3

Avg Eff BOD (mg/L) = 8.6

Max Eff BOD (mg/L) = 24.0

CBOD loading avg. (kg/d) = 15.4

Max CBOD loading (kg/d) = 29.37

BOD loading avg (kg/d) = 22.84

Max BOD loading (kg/d) = 60.61

Avg CBOD % removal = 94.51% max 98.12% min 90.42%

Avg BOD % removal = 91.68% max 98.76% min 76.67%

Note: In Feb 2005, OCWA began testing for CBOD instead of BODs (as per new CofA). For calculations involving BOD, values prior to Feb 2005 were used.

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

CLIENT Municipality of Meaford
PROJECT
SUBJECT

FILE No.
SHEET No. OF
DATE
BY CHECKED

Raw Avg SS (mg/L) = 133.9

Raw Max SS (mg/L) = 396.0

Eff. Avg SS (mg/L) = 6.47

Eff Max SS (mg/L) = 14.8

SS Loading Avg (kg/d) = 18.5

Max SS Loading (kg/d) = 53.28

Avg SS % Removal = 95.17% max 98.65% min. 84.47%

Appendix 'C'

Manufacturer's Information
Parkson Helisieve Cylindrical Fine Screen

PARKSON CORPORATION

Parkson Corporation
29850 North Skokie Highway
Lake Bluff, IL 60044-1192 USA
Tel: (847) 473-3700
Fax: (847) 473-0477

QUOTE NO. 230575-1A

DATE: November 28, 2003 **PAGE 1 OF 3**

TO: The Corporation of the Municipality of Meaford

REF.: Meaford, ON STP
Helisieve Cylindrical Fine Screen

MAKE ORDER TO:
Parkson Corporation
c/o H2 Flow Equipment Company
470 North Rivermede Road, #7
Concord, ON L4K 3R8
Ph# 905-660-9775
Attn: Michael Albanese

Scope of Supply:

Parkson Corporation is pleased to submit our proposal for the supply of the following equipment:

One (1) Hycor® Helisieve® unit model HLS40045, complete with the following features:

- Design to fit the following installation parameters:

Peak Daily Flow	2.6 MGD
Channel Width	20"
Channel Depth	48"
Solids Discharge Height	36" Above top of channel.

- Shaftless spiral constructed of nominal 0.75" high strength carbon steel.
- Water resistant brush attached to the leading edge of the spiral in the basket area.
- Screen basket with .125" diameter perforations, fabricated of 14gauge type 304L stainless steel.
- Rubber channel seals fastened to the outer edges of the screen basket.
- Transport tube constructed of 11gauge type 304L stainless steel.
- Press zone consisting of a spool piece with attached drain box and spray wash system.
  - Spool piece constructed of 7gauge type 304L stainless steel.
  - Drain section made of type 304L stainless steel with 1/8" perforations.
  - Spray wash system made of ¾" NPT pipe, fittings, solenoid valve.
  - Jacket assembly consisting of a 14gauge type 304L stainless steel outer shell and drainage collection box with attached drainage hose.
- Discharge section made of 11gauge type 304L stainless steel with a type 304L stainless chute, designed to deposit screenings into solids discharge receptacle supplied by others.
- Longopac type bagger system, supplied loose, for mounting on a 300mm diameter chute by others. Supplied with five cassettes each with a standard length of 230 feet.
- Drive system consisting of a 1.5HP (600/3/60), gear reducer and drive shaft that is welded directly to the spiral.
- Pivot stand constructed of a minimum 10 gauge type 304L stainless steel structural members.

PARKSON CORPORATION

Parkson Corporation
29850 North Skokie Highway
Lake Bluff, IL 60044-1192 USA
Tel: (847) 473-3700
Fax: (847) 473-0477

- Freeze protection consisting of heat tracing the conveyance tube, press zone and discharge with heat cable, 1.5" thick foam insulation and protected with .080" thick polyethylene jacket material. **The contractor will be responsible for providing the heat cable, insulation and protective jacket for the wash water supply pipe.** Power will be provided from the Helisieve main control panel.
- The following unit-mounted electrical devices will be furnished:
  - Access door interlock switch.
  - E-stop
  - Solenoid Valve
- Controls furnished in a NEMA 4X 304 stainless steel enclosure.
  - 600/3/60 supply with motor starter, disconnect switch and 120 volt step down transformer.
  - H-O-A switch and E-Stop button.
  - Adjustable current monitor and timers.
  - Indicating lights.
  - Float switch level sensor.
- Corrosion protection consisting of passivation of stainless steel components.
- Services of a factory representative for one (1) day during one (1) trip to the jobsite for installation inspection, start-up supervision and operator training.

Price: All of the above for the sum of $59,792 CDN. DDP Meaford, ON. Purchaser will pay 7% Federal GST, provided Parkson shows proof that GST has been paid on this product at Port of Entry and / or through GST Registration numbers. 8% Ontario PST is not included.

The price quoted is based on an exchange rate of U.S. $1.00/CDN $1.3125, as listed in the Wall Street Journal dated November 26, 2003. Should the exchange rate change as of the date of invoicing such that the contract value changes by more than CDN $500.00, the contract value will be revised up or down accordingly.

Validity: The above price is firm for 45 days from the date of bid. Pricing is based on the schedules stated in this proposal.

Exclusions: state or local taxes, if applicable; interconnecting wiring, wiring and conduit from each unit-mounted electrical device to a terminal box or control panel, piping, anchor bolts, connections, platforms, gratings, railings, solids receptacles, influent gate, installation, installation supervision, or any other auxiliary equipment or service not detailed above.

Specifically Excluded: LIQUIDATED AND CONSEQUENTIAL DAMAGES.

PARKSON CORPORATION

Parkson Corporation
29850 North Skokie Highway
Lake Bluff, IL 60044-1192 USA
Tel: (847) 473-3700
Fax: (847) 473-0477

QUOTE NO.:230575-1A

Owner/Contractor Responsibility:

- Unloading, uncrating and installation. (Note: Installation will, at minimum, require a forklift and possibly a crane/hoist for larger units.)
- Shower water and supply connection.
- Spare parts.
- Water supply heat trace cable and insulation.
- Solids discharge receptacle.
- Electrical connection and interconnecting wiring to or from any of the following listed electrical devices:
  - E-Stop button.
  - Motor.
  - Controls.
  - Level sensor.
  - Interlock switch.

Delivery: Ex-factory, Fourteen (14) Weeks After Final Drawing Approval or Release to Manufacture with Full Freight Allowed to Jobsite.

Terms: 10% with shop drawing approval, 80% net 30 days after delivery, 10% retainage not to exceed 120 days after shipment.

Drawings: Approval drawings will be furnished within 4 weeks of purchase order or Letter of Intent.

Please consult Parkson Corporation or your local representative with any questions.

Warranty - standard, with additional terms attached.

Thank you for your consideration.
Parkson Corporation.

for: Don Kramer
Municipal Inside Sales

Enclosures: Warranty, Terms and Conditions

Appendix 'D'

Aeration Design Calculations

Meaford WPCP
Aeration
File No. 106067
August 2006

Aeration – Conventional Activated Sludge with Nitrification but No Phosphorus Removal

Existing Aeration Volume = 1101 m^3 (from CofA)

From MOE guidelines, the following is suggested:

Organic loading rate	=	0.31 – 0.72 kg $BOD_5/m^3 \cdot d$
$\frac{F}{M_v}$	=	0.05 – 0.25 d^{-1}
M_v/M	=	0.6 (Lesperance)
Minimum Detention Time	=	6 hr
Sludge return rate	=	25 – 100 %
Oxygen demand in typical Municipal sewage @ Standard conditions	=	1.0 kg/kg BOD_5 + 4.6 kg/kg $NH_4 \cdot N$
Solids Retention Time	=	> 4 days @ 20°C; > 10 days @ 5°C
Minimum D.O.	=	2.0 mg/L

Check Maximum ADF for Minimum Detention Time

Minimum Detention at ADF = 6 hr = $\frac{1101 \times 24}{ADF}$

$\therefore$ ADF = $\frac{1101 \times 24}{6}$

= 4,404 m^3/d

Check Solids Retention Time (SRT)

$$SRT = \frac{\text{Aeration Tank Solids}}{\text{Daily WAS + Daily EFF SS}}$$

Historical average Influent BOD_5 = 103 mg/L (F). At an ADF of 4,404 m^3/d, the BOD_5 loading would be 454 kg/d.

Determine aeration tank volatile solids (M_v) range to satisfy nitrification requirements for F = 454 kg/d

Min Mv = $\frac{454}{0.25}$ = 1,816 kg (hence M = Mv/0.6 = 3,027 kg)

Max Mv = $\frac{454}{0.05}$ = 9,080 kg (hence M = Mv/0.6 = 15,133 kg)

$\therefore$ Min MLSS = $\frac{3,027}{1,101}$ = 2.749 kg/m^3 (2,749 mg/L)

$\therefore$ Max MLSS = $\frac{15,133}{1,101}$ = 13.745 kg/m^3 (13,745 mg/L)

In general, optimal performance with respect to maximizing sludge settleability while minimizing loss of suspended solids in the clarifier overflow is achieved by maintaining MLSS in the range of 2,500 to 3,500 mg/L (Water and Wastewater Technology, Hammer & Hammer), or an average of 3,000 mg/L (3.000 kg/m^3). This falls within the MLSS range (and hence MLVSS, M_v and M ranges) calculated above. For an MLSS of 3.000 kg/m^3 the corresponding M (aeration tank solids) for the 1,101 m^3 aeration volume is 3,303 kg.

Assuming the solids retention time (SRT) in the aeration tanks is close to 15 days, the WAS generated from the Meaford plant should be similar to that generated by an extended aeration process. The MOE Guidelines indicate a typical dry solids concentration of 90 grams of dry solids per cubic metre of treated sewage for WAS from the extended aeration process without phosphorus removal (Table 16.1). However, this typical value is based on typical raw sewage with BOD_5 = 170 mg/L; SS = 200 mg/L; TP = 7 mg/L and NH_4-N = 20 mg/L. The comparable values for the Meaford plant are BOD_5 = 103 mg/L; SS = 134 mg/L; TP = 3 mg/L and NH_4-N = 18 mg/L. Therefore assume an prorating factor, K to be applied to account for the more dilute sewage in Meaford, as follows:

K = $\frac{103 + 134 + 3 + 18}{170 + 200 + 7 + 20}$ = 0.65

$\therefore$ Daily WAS = K x 90 g/m^3 x 10^{-3} kg/g x ADF
= 0.65 x 90 x 10^{-3} x 4,404 m^3/d
= 258 kg/d

Daily EFF SS = 10 mg/L x 4,404 m^3/d x 10^{-3} kg.L/mg.m^3
= 44 kg/d

$\therefore$ SRT = $\frac{3,303 \text{ kg}}{258 \text{ kg/d} + 44 \text{ kg/d}}$

= 10.9 d (> 10, hence okay)

Therefore, from the perspective of solids retention time, the aeration process satisfies the requirements for flows in excess of 4,404 m^3/d (up to 4,800 m^3/d).

Check Organic Loading Rate

BOD_5 volumetric loading rate $= \frac{454 \text{ kg } BOD_5/d}{1101 \text{ } m^3}$

$= 0.41 \text{ kg } BOD_5/m^3 \cdot d$ (This is within the typical range of 0.31 – 0.72 kg $BOD_5/m^3 \cdot d$ per MOE Guidelines and hence is acceptable)

Therefore, from the perspective of organic loading rate, the aeration process satisfies the requirements for flows in excess of 4,404 m^3/d (up to 7,690 m^3/d).

Check Fine-Bubble Diffused Air (Biological Process Requirement)

Oxygen Requirement = 1.0 kg O_2/kg BOD_5 applied + 4.6 kg O_2/kg NH_4-N applied

BOD_5 loading @ 4,404 m^3/d = 454 kg/d

NH_4-N loading (18.13 mg/L) @ 4,404 m^3/d = 79.8 kg/d

$\therefore O_2$ req'd $= (1.0 \times 454 \text{ kg/d}) + (4.6 \times 79.8 \text{ kg/d})$

$= 821$ kg/d

A correction factor should be applied (based on WPCF Manual of Practice No. 8). Sanitaire provided a correction factor (AOR/SOR) of 0.33 for its equipment based on ALPHA, BETA, THETA and D.O. factors of 0.40, 0.98, 1.024 and 2.0% respectively.

$\therefore O_2$ req'd $= \frac{821 \text{ kg/d}}{0.33}$

$= 2{,}488$ kg/d

Sanitaire provided a transfer efficiency of 37% for their package.

$\therefore O_2$ req'd $= \frac{2{,}488 \text{ kg/d}}{0.37}$

$= 6{,}724$ kg/d

Based on standard air having 0.3 g of O_2/L:

Air Flow Req'd $= \frac{6{,}724 \text{ kg } O_2/d \times 10^3 \text{ g/kg}}{0.3 \text{ g } O_2/L \times 86{,}400 \text{ s/d}}$

$= 260$ L/s (130 L/s per aeration tank).

There are three existing blowers (1 each per aeration tank plus one shared standby), each with a capacity of 8.04 m^3/min (134 L/s). Therefore there is theoretically enough blower capacity to biologically process average daily flows in excess of 4,404 m^3/d (up to 4,540 m^3/d).

Check Fine-Bubble Diffused Air (Mixing Requirement)

Assuming an air flow rate for mixing of 0.61 L/m^2.s (MOE Guidelines) and given two aeration tanks each 12.9 m in diameter:

$$\text{Air Flow Req'd} = 0.61 \times 2 \times \frac{12.9^2 \times 3.141}{4}$$

$$= 160 \text{ L/s } (< 260 \text{ L/s}; \therefore \text{biological process requirement governs})$$

Conclusion

Based on MOE Guidelines, the aeration process theoretically has sufficient excess capacity to accommodate sewage flows up to 4,404 m^3/d (12.6% more than the current rated capacity of 3,910 m^3/d), with the governing restriction being detention time.

Appendix 'E'

Clarifier Design Calculations

Meaford WPCP
Clarifier
File No. 106067
August 2006

Secondary Clarification – Activated Sludge with Nitrification but No Phosphorus Removal

From MOE Guidelines:

Surface Settling Rate = 0.34 $L/m^2 \cdot s$ @ PF

Weir Loading Rate = 2.9 $L/m \cdot s$ @ PF

Solids Loading = $\leq$120 $kg/m^2 \cdot d$ @ PF (including 100% RAS)

There are two existing clarifiers

Existing Clarifier Diameter = 12.2 m

$\therefore$ Surface area = $\frac{(12.2)^2 \times \pi \times 2}{4}$

= 234 m^2

$\therefore$ Weir length = $12.2 \times \pi \times 2$
= 76.7 m

Check Maximum Peak Flow for Allowable Surface Settling Rate

Peak flow rate = 234 $m^2 \times 0.34$ $L/m^2 \cdot s \times 10^{-3}$ $m^3/L \times 86{,}400$ s/d
= 6,874 m^3/d

Check Maximum Peak Flow for Allowable Weir Loading Rate

Peak flow rate = 2.9 $L/m \cdot s \times 76.7$ m $\times 10^{-3}$ $m^3/L \times 86{,}400$ s/d
= 19,218 m^3/d

Check Maximum Peak Flow for Allowable Solids Loading

Assume a maximum MLSS of 3,500 mg/L (3.500 kg/m^3) and a maximum ADF of 4,404 m^3/d (both as established in the aeration calculations). Per MOE Guidelines RAS = 100% ADF.

Maximum Solids Loading = [Peak flow rate + RAS] x MLSS

$\therefore$ Peak flow rate = $\frac{\text{Maximum Solids Loading} - 100\% \text{ ADF}}{\text{MLSS}}$

$$\therefore \text{Peak flow rate} = \frac{(120\ kg/m^2.d \times 234\ m^2)}{3.500\ kg/m^3} - 4{,}404\ m^3/d$$

$$= 3{,}619\ m^3/d\ (< \text{ADF; NOT ACCEPTABLE})$$

Consider operating at an MLSS of 2750 mg/L (minimum MLSS as established in the aeration calculations) at times of high flows.

$$\therefore \text{Peak flow rate} = \frac{(120\ kg/m^2.d \times 234\ m^2)}{2.750\ kg/m^3} - 4{,}404\ m^3/d$$

$$= 5{,}807\ m^3/d$$

Conclusion

The governing restriction appears to be the solids loading condition. However, the clarifiers could accommodate slightly higher peak flows (up to 8,009 m^3/d) with respect to solids loading by adjusting operations such that a 50% sludge return rate as well as 2,750 mg/L MLSS concentrations are maintained during periods of high flow. Therefore, the peak flow is governed by the surface settling rate, and limited to 6,874 m^3/d. The clarifiers are currently undersized for the peak flows that are experienced at the plant and for the flow rate beyond which bypasses are allowed in the Certificate of Approval.

Appendix 'F'

Manufacturer's Information
Trojan UV3000 System

Trojan Technologies Inc.

UV3000™ PACKAGE TREATMENT PLANT (PTP)
To be installed in Concrete Channel (by others)

In response to your request, we are pleased to provide the following **Package Treatment Plant (UV3000™PTP)** information. Since Trojan introduced the open channel approach to disinfection in 1981, many municipalities and private/commercial treatment plants users have selected ultraviolet as the preferred method for pathogen destruction at their facilities.

All of Trojan's UV systems are modular in design, with each design customized in response to the effluent criteria. This information is based on the use of Trojan Technologies Inc. **Package Treatment Plant.**

Project Name: MEAFORD STP
(Project name, city, state or province)

Trojan Quote No: H2FPTP-052003 REV. 4

Trojan Model: UV3001M-1 PTP

Total Unit(s) Included: 1

Design Criteria:

Current Peak Design Flow:	1,400,000 GPD
Minimum UV Transmission:	65 %
Total Suspended Solids:	30 mg/l (30 day Geometric Average; grab samples)
Max Average Particle Size:	30 microns
Disinfection Limit:	200 per 100 ml, Fecal Coliform, based on a 30-day geometric mean of consecutive daily grab samples

Please refer all inquires and orders to Trojan Manufacturer's Representative:

Contact: **MICHAEL ALBANESE, P.ENG.**

Company: **H2Flow Equipment Inc., 470 North Rivermede Rd. #7, Concord, Ontario LK4 3R8**

Phone: **905-660-9775**

Fax: **905-660-9744**

Date: Nov. 26, 2003

ISO 9001:1994

ULTRAVIOLET MODULES

Each module will consist of 4 UV lamps with their corresponding electronic ballast in an aluminium enclosure mounted on a stainless steel type 316 frame. The electrical wires connecting the lamps and ballasts will be enclosed in the stainless steel frame and not exposed to the effluent.

Each UV module will be provided with a standard 120 Volt plug and weatherproof cable for connection to a receptacle. The cable will be no longer than 10 feet. A total of 10 UV modules (40 UV lamps) will be supplied. Lamp status will be displayed on top of each UV module by watertight LED indicator lights.

Modules will be approximately 68 in long, 20 in high and 2.8 in wide, weighing approximately 38 lbs. Materials of construction will be stainless steel type 316, anodised aluminium, quartz 214, and teflon.

Note: Installation contractor will need to provide ground fault interrupter protection from the power source, or utilize optional Trojan Power Distribution Receptacles specifically designed for this application.

MONITORING SYSTEM

A submersible UV sensor will continuously sense the UV intensity produced in each bank of UV lamp modules. UV intensity in mW/cm^2 will be indicated on a 3 character display. Elapsed time in hours will be indicated on 5 character display. Both displays will utilize 7 segment LEDs and will be visible through the panel door. The Monitoring System will be enclosed in a Type 4X wall mounted panel.

Note: Contractor to supply a separate 120 Volt, single phase, 60 Hz, 5 amps, power supply for each monitoring system.

POWER DISTRIBUTION RECEPTACLE (PDR) Qty 5

Duplex ground fault interrupter receptacle(s), mounted in individual, painted cast aluminium junction boxes complete with a rain shield, to provide power to each UV module.

Note: Contractor to supply appropriate 120 Volt, single phase, 60 Hz circuit to power the PDRs which have a total current draw of approximately 35 amps. Contractor to be responsible for distributing the power from the main 120 Volt feed to the individual PDRs. Responsibility to be all encompassing and in accordance with the local electrical codes.

MAINTENANCE RACK

A maintenance rack of type 304 stainless steel will be included. The rack is designed to facilitate the servicing operation of the UV modules.

ADDITIONAL WEIR FOR BY-PASS CHANNEL

Qty (1) Additional stainless steel weir will be provided for the by-pass channel

SPARE PARTS

	Quantity
UV Lamps	4
Quartz Sleeves	4
Lamp Holder Seals	4

MISCELLANEOUS ITEMS

Each system will be supplied with the following items:

1. **Operator's Kit**

3020 Gore Road, London, Ontario Canada N5V 4T7 Tel: (519) 457-3400 Fax: (519) 457-3030 www.trojanuv.com

REGISTERED ISO 9001:1994

1 pair of rubber gloves
1 face shield
1 UV warning label

2. **Cleaning Agent**
   1 US gallon (4L) jug of Lime-A-Way (In Canada & U.S. only)

3. **O&M Manuals**
   3 Copies

START-UP AND COMMISSIONING (ONE DAY)

Local Trojan Rep [X] Not Included [ ]

NOTES

1. UV Disinfection Equipment specification is available upon request.
2. Trojan Technologies Inc. warrantees all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, which ever comes first. The lamps supplied with the system will be warranted for 12,000 hours of operation.

SELLING PRICE: $ 41,600

(This price includes all equipment listed in the above proposal.)

TERMS & CONDITIONS:

1. Submittals provided within 2 weeks after receipt of purchase order.
2. Equipment delivery within 5-8 weeks from receipt of purchase order and engineer's approval (where applicable).
3. Selling price does not include taxes, which may be applicable.
4. Net 30 days.
5. F.O.B Factory; Freight paid to jobsite.
6. Validity is 90 days from date above

3020 Gore Road, London, Ontario Canada N5V 4T7 Tel: (519) 457-3400 Fax: (519) 457-3030 www.trojanuv.com

ISO 9001:1994

Appendix 'G'

Aerobic Digester and Biosolids Storage Calculations

Meaford WPCP
Aerobic Digester & Biosolids Storage
File No. 106067
August 2006

Aerobic Digester & Biosolids Storage – Activated Sludge with Nitrification but No Phosphorus Removal

Check Digester Sizing Based on Loading

Assume an ADF of 4,404 m^3/d as determined to be the maximum ADF capacity of the aeration tanks.

W.A.S = 258 kg/d (from aeration calculations)

W.A.S. Volatile Solids = 60% (Lesperance)

$\therefore$ W.A.S. Volatile Solids = 0.6 x W.A.S.
= 0.6 x 258
= 155 kg/d

Maximum Loading to 1st Stage Digester = 1600 $g/m^3/d$ Volatile SS (MOE Guidelines p. 16-8)

Volume of 1st Stage Digester = 412 m^3
Volume of 2nd Stage Digester = 212 m^3

Actual loading to 1st Stage Digester = $\frac{155\ kg/d \times 10^3\ g/kg}{412\ m^3}$

= 376 $g/m^3/d$ ($< 1600\ g/m^3/d$, $\therefore$ OK)

Check Digester Sizing Based on Solids Retention Time (SRT)

Total SRT (including aeration tanks) = 45 days (MOE Guidelines)

SRT in Aeration Tank = 10.9 d (see aeration calculations)

SRT in Digester:

The SRT in the aeration tanks is such that the sludge characteristics should be close to that of an extended aeration process. For an extended aeration process with no phosphorus removal (per Table 16.1 of the MOE Guidelines):

Average Dry Solids in Digesters = $\frac{80\ g/m^3 + 90\ g/m^3}{2}$

= 85 g/m^3 (0.085 kg/m^3)

However, as with the aeration calculations, a correction factor (K = 0.65) must be applied due to the dilute nature of the raw sewage.

$\therefore$ Average Dry Solids in Digesters = K x 0.085 kg/m^3 x ADF (m^3/d)
= 0.65 x 0.085 x 4,404
= 243 kg/d

Assume 2% Solids Flow out of Digester with decanting.

$\therefore$ Average Solids flow through Digester = $\frac{\text{Average Dry Solids}}{0.02}$

= $\frac{243 \text{ kg/d} \times 10^{-3} \text{ m}^3/\text{kg}}{0.02}$

= 12.15 m^3/d

$\therefore$ SRT in Digesters = $\frac{\text{Total Volume of Digesters}}{\text{Average Solids Flow through Digesters}}$

= $\frac{624 \text{ m}^3}{12.15 \text{ m}^3/\text{d}}$

= 51.4 d

$\therefore$ Total SRT = 51.4 + 10.9

= 62.3 d

This indicates that there is more than enough digestion capacity for average treated sewage flows of 4,404 m^3/d (which is the current limitation on ADF capacity in the aeration system). Based on the assumption that at least 10 days SRT would be provided in the aeration tanks (in accordance with MOE Guidelines) with any expansion of the aeration capacity, it would be necessary to provide 35 days SRT in the digesters. Based on this criteria, the digesters could accommodate WAS from average treated sewage flows up to 6,468 m^3/d.

Check Biosolids Storage Tank Sizing

Dry Solids in the Biosolids Tank is 80 g/m3 (per MOE Guidelines) multiplied by the 0.65 correction factor, or 52 g/m3 (0.052 kg/m3).

$\therefore$ Dry Solids in Biosolids Storage Tank = 0.052 kg/m^3 x 4,404 m^3/d
= 229 kg/d

Assume 4.5% Solids in the Biosolids Storage Tank with decanting.

$\therefore$ Solids flow through Biosolids Storage Tank $= \frac{\text{Dry Solids}}{0.045}$

$= \frac{229 \text{ kg/d} \times 10^{-3} \text{ m}^3/\text{kg}}{0.045}$

$= 5.1 \text{ m}^3/\text{d}$

The existing biosolids storage tank has a volume of 2,256 m^3, which is sufficient to provide 443 days storage at 5.1 m^3/d compared with the 240-day provincial requirement. Based on the provincial requirement, the biosolids storage tank could accommodate biosolids from average treated sewage flows up to 8,135 m^3/d.

Check Coarse-Bubble Diffused Air Requirement

Per MOE Guidelines the "rule of thumb" air requirement is 0.85 $L/m^3.s$ (litres of air per cubic metre of digester per second) for a diffused air system. Assume 10% of this for the biosolids storage tank to maintain "sweetness" and to keep the sludge from freezing.

Digester Stage 1 $= 412 \text{ m}^3 \times 0.85 \text{ L/m}^3.\text{s}$
$= 350 \text{ L/s}$

Digester Stage 2 $= 212 \text{ m}^3 \times 0.85 \text{ L/m}^3.\text{s}$
$= 180 \text{ L/s}$

Sludge Storage $= 2{,}256 \text{ m}^3 \times 0.85 \text{ L/m}^3.\text{s} \times 20\%$
$= 4551.8 \text{ L/s} \times 0.1$
$= 192 \text{ L/sec}$

Total air required for Digester and Biosolids Storage

Total Air $= 350 + 180 + 192$
$= 722 \text{ L/s}$

Per the Certificate of Approval there are two air blowers, each rated at 726 L/s, ie. in accordance with MOE Guidelines there is sufficient air blower capacity (including redundancy) for the existing digester and biosolids storage tank volumes.

Conclusion

Based on the above calculations it appears there is sufficient spare capacity in the digesters to increase the ADF to 6,468 m^3/d and in the biosolids storage tank to increase the ADF to 8,135 m^3/d, as long as the other process elements in the plant are expanded to these capacities. However, the significant surplus capacities identified are based on the assumptions that the digestion process closely approximates that of an extended aeration process and that decanting is optimized such that sludge concentrations in both the digesters and biosolids storage tank are maintained at about twice the typical levels.

GENIVAR

TECHNICAL MEMORANDUM

Date: July 10, 2012

To: Rakesh Sharma, GENIVAR

Copies:

From: Michelle Albert and Emily Ghosh, GENIVAR

Project No.: OS-08-134-11-OS

Subject: Meaford WWTP Assimilative Capacity Study Update

1. Introduction

The Meaford Wastewater Treatment Plant (WWTP) was constructed in 1969 to service the Municipality of Meaford and to provide treatment for hauled wastes from neighbouring areas. In 2007, a Schedule C Class Environmental Assessment (EA) was completed to address long term wastewater treatment requirements for the Municipality. It was assumed at the time of the Environmental Assessment Environmental Study Report (ESR) that the Municipality's current population would double by 2026, thus doubling the hydraulic capacity of Meaford WWTP. In the ESR, the WWTP's effluent limits and required treatment upgrades were determined based on this assumption. However, since the WWTP is currently operating below its rated capacity and based on the approved developments in Meaford at this time, a 20% increase in population would more likely represent future growth and future capacity requirements.

The objective of this Technical Memorandum is to confirm whether the effluent limits recommended in the 2007 ESR are still suitable for the Meaford WWTP if only a 20% increase to the rated capacity, from 3,910 m^3/d to 4,692 m^3/d, is undertaken.

2. Wastewater Treatment Facility Description

2.1 Description of Facilities

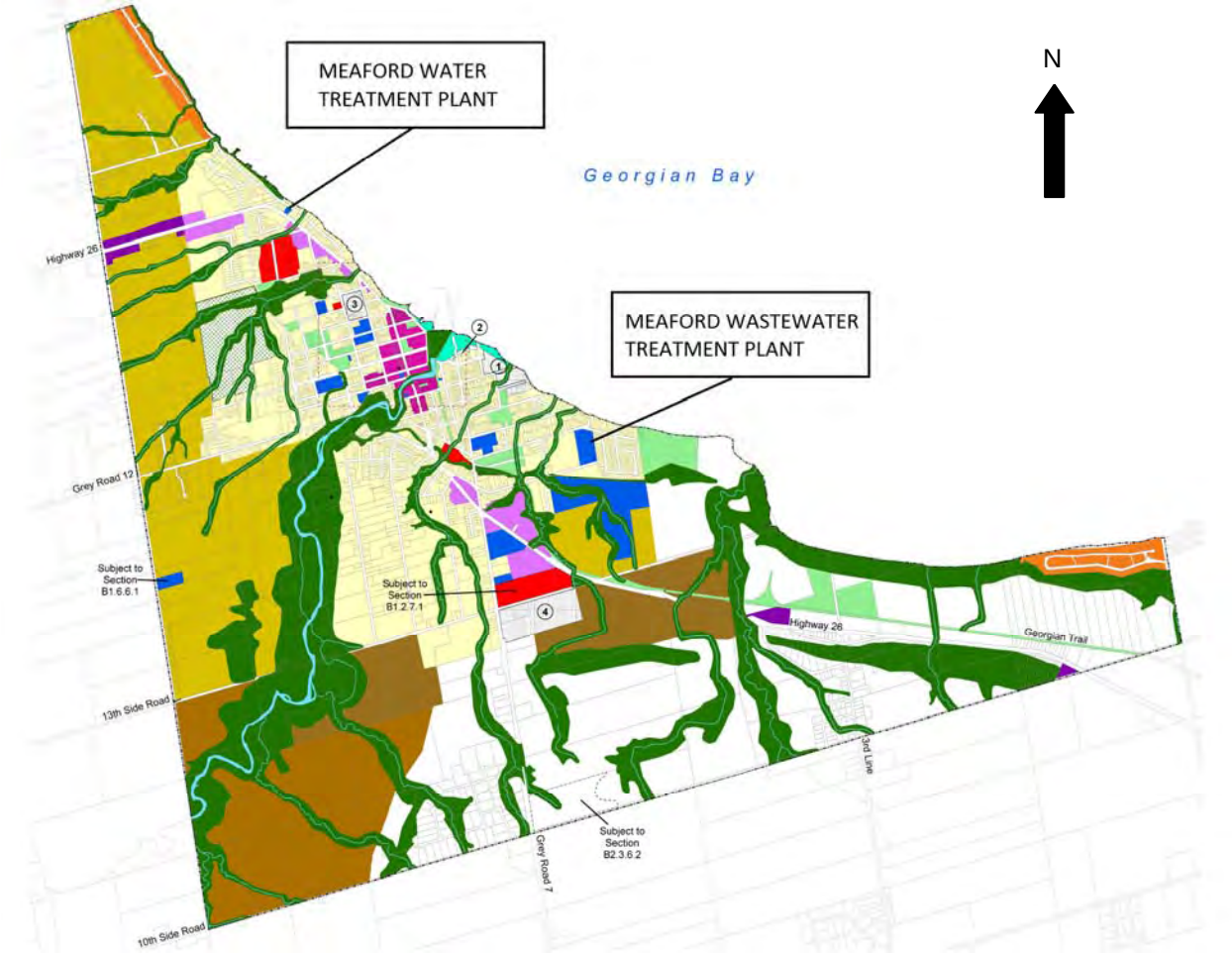
Meaford WWTP is located at 35 Grant Street in the Town of Meaford, as shown on Figure 2-1 on the following page. Meaford WWTP receives raw sewage from four pumping stations in the Meaford service area. The WWTP operates as an activated sludge plant with aerobic sludge stabilization and storage and Ultraviolet (UV) disinfection and is operated by the Ontario Clean Water Agency (OCWA). The key treatment processes and operations include:

- Raw wastewater pumping station
- Preliminary treatment (screening)
- Conventional Activated Sludge System (aeration tanks, secondary clarifiers)
- UV Disinfection System
- Outfall to Georgian Bay
- Aerobic Digestion with land disposal of biosolids

2.2 Wastewater Flows and Plant Treatment Capacity

The Meaford WWTP operates under Certificate of Approval #0440-6A4JXX issued by the Ministry of the Environment (MOE) on March 15, 2005. The current rated capacity of the plant is 3,910 m^3/d, however based on OCWA's 2011 Performance Report, the plant's 2011 annual average daily flow was only 2,679.3 m^3/d which is 68.5% of the design capacity. This was a 12% increase from flows recorded in 2010.

Figure 2-1 Location of Meaford WWTP (Source: *Municipality of Meaford Official Plan – Schedule A-1 Land Use Plan*, 2005)



In light of the current flows to the plant and approved subdivisions planned for the future, it has been estimated that future plant flows will increase by 20% above the current rated capacity of 3,910 m^3/d to 4,692 m^3/d.

In the 2007 ESR, the peaking factor was assumed to be 3.5. Also, based on the 2011 Performance Report, a maximum peak daily flow of 9,505 m3/d was recorded at the plant, which is 3.5 times the plant's annual average daily flow in 2011. Therefore, a peaking factor of 3.5 will also be used for this report.

2.3 Treated Water Effluent Quality as per the 2007 ESR

The current and earlier proposed effluent limit are summarized in Table 2-1.

Table 2-1 Current and Earlier Proposed Effluent Limits

Parameter	Current Effluent Limit (C of A at 3,910 m^3/d)[Note1]		Earlier Proposed Effluent Limit (2007 ESR at 6,000 m^3/d)[Note 2]	
	mg/L	kg/d	mg/L	kg/d
$CBOD_5$	20	78.2	15	90.0
TSS	20	78.2	15	90.0
Total Phosphorus	4	15.6	0.8	4.8
Total Ammonia non-freeze period[Note 3]	3	11.7	3	18.0

Parameter	Current Effluent Limit (C of A at 3,910 m^3/d)[Note1]		Earlier Proposed Effluent Limit (2007 ESR at 6,000 m^3/d)[Note 2]	
	mg/L	kg/d	mg/L	kg/d
freeze period[Note 3]	5	19.6	5	30.0
pH	6.0 – 9.5		6.0 – 9.5	

[Note 1] Certificate of Approval #0440-6A4JXX

[Note 2] Municipality of Meaford Wastewater Treatment Municipal Class Environmental Assessment Environmental Study Report (EarthTech, November 2007) (Values in ESR are incorrect for 6,000 m^3/d, updated values shown)

[Note 3] Non-freeze period from May 15th to September 30th. Freeze Period from October 1st to May 14th.

3. Receiving Water Impact Assessment

The level of impact of wastewater plant effluent on the receiving waters is based on the ability of the receiving waters to assimilate substances. Assimilative capacity is defined as "the limit of a water body to transform and/or incorporate substances (e.g. nutrients) by the ecosystem, to the point that the water quality does not degrade below a predetermined level" (MOEE, 1994a). An assessment of the capacity of the receiving waters (Georgian Bay) to assimilate 5-day biochemical oxygen demand (BOD_5), effluent total suspended solids (TSS), total ammonia and total phosphorous (TP) is discussed in this section.

3.1 Provincial and Federal Guidelines used to Quantify Impacts to Receiving Waters

To quantify the impact of the Meaford WWTP discharges on Georgian Bay was evaluated based on Ministry of Environment Procedure B-1-5 "*Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters"* (MOE 1994a) which includes water quality objectives (called the *Provincial Water Quality Objectives* or PWQOs) for various water quality parameters. Other important guidance and procedural documents utilized includes:

- Recreational Water Quality Guidelines and Aesthetics (CCME, 1998),
- Guidelines for Canadian Recreational Water Quality (Health Canada, 2009),
- Procedure F-5-1 "*Determination of Treatment Requirements for Municipal and Private Sewage Treatment Works Discharging to Surface Waters*",
- "*Derivation of Effluent Criteria for Certificates of MOE"* (MOE, 1992),
- "*Guide for Applying for Approval of Municipal and Private Water and Sewage Works*" (MOE, 2000)
- Canadian Water Quality Guidelines for the Protection of Aquatic Life, Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems (CCME, 2004)

Both federal and provincial regulations were utilized in this assessment and therefore in the situation that a parameter had different federal and provincial criteria, the more stringent criteria were used.

3.2 Objectives of Receiving Water Assessment

The objectives of a receiving water assessment are:

1. to determine the effectiveness of the Meaford WWTP outfall and diffusers
2. to determine the representative background water quality and current velocities of Georgian Bay in the vicinity of the Meaford WWTP outfall;
3. to determine the representative effluent conditions;
4. to conduct an assessment of the assimilative capacity of the Georgian Bay receiving waters based on worst case conditions; and
5. to confirm the effluent limits for the Meaford WWTP

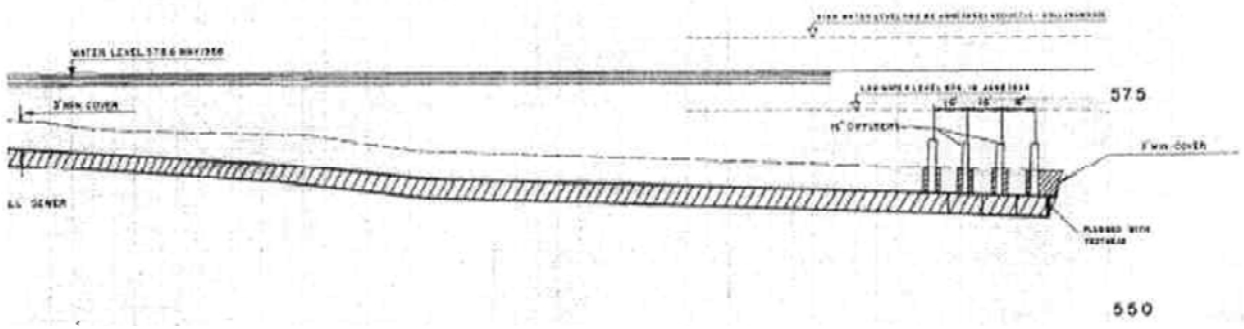
3.3 Previous Receiving Water Assessment at Higher Design Capacity (6,000 m^3/day)

As part of the 2007 EA, a Technical Memorandum called the *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech was completed to address receiving water impacts for future flows of 6,000 m^3/day. For this evaluation, data was gathered for the Meaford WWTP and Georgian Bay for integration into a CORMIX model to assess effluent impacts to the Bay. The background information gathered from the previous study and described in the following section will also be utilized for completing this tech memo. The results of the previous study will also be reviewed.

3.3.1 Meaford WWTP Outfall and Diffusers

The Meaford WWTP outfall consists of a 600 mm diameter concrete pipe and four (4) 450mm diffusers which discharges wastewater effluent into Georgian Bay. The outfall discharge point is located approximately 425 m from the shore and is approximately 3 km from the Meaford Water Treatment Plant Intake. As shown in Figure 3-1 below, the outfall pipe is buried below the lake bed with only the diffusers exposed above the lake bed surface. An underwater visual inspection completed by Watech Services in November 2006 as part of the 2007 EA Study found that the pipe was still under full cover and the diffusers were in good overall condition. However, the diffusers were covered in marine growth and zebra mussels and the caps were damaged or missing. Regular maintenance and removal of the remaining caps was recommended as part of the report.

Figure 3-1 Meaford WWTP Outfall and Diffuser Profile (Source: *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech, July 2007)



Other characteristics of the outfall, diffuser and ports are summarized in Table 3-1 below.

Table 3-1 Meaford WWTP Outfall and Diffuser Details (Source: *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech, July 2007)

Parameter	Value
Outfall Length	450 m
Diffuser Length	15 m
Number of Diffuser Ports	4
Port Diameter	400 mm
Port Distance to the shore	425 m
Port Vertical Angle	90º
Port Discharge Elevation	~0.9 m above lake bed
Lake Depth at Diffuser	3.3m in 2007, 3.7m long-term

Bathymetric data was also reviewed to establish circulation patterns near the outfall discharge ports. The bathymetry of Georgian Bay and local bathymetry near the outfall are shown on Figure 3-2 and Figure 3-3, respectively. As discussed in the 2007 Study and shown in the figures, it is likely that the receiving waters have an unstratified water column at the diffuser ports due to the shallow shelf in that area. Furthermore, the currents will mostly occur in the central part of the Bay, where the shelf is deeper.

Figure 3-2 Bathymetry of Lake Huron and Georgian Bay with Topography (Source: National Oceanic and Atmospheric Administration (NOAA), http://www.ngdc.noaa.gov/mgg/greatlakes/huron.html)
[Blue>130m; Green 70-130m; Yellow 40-70m; Red<40m]

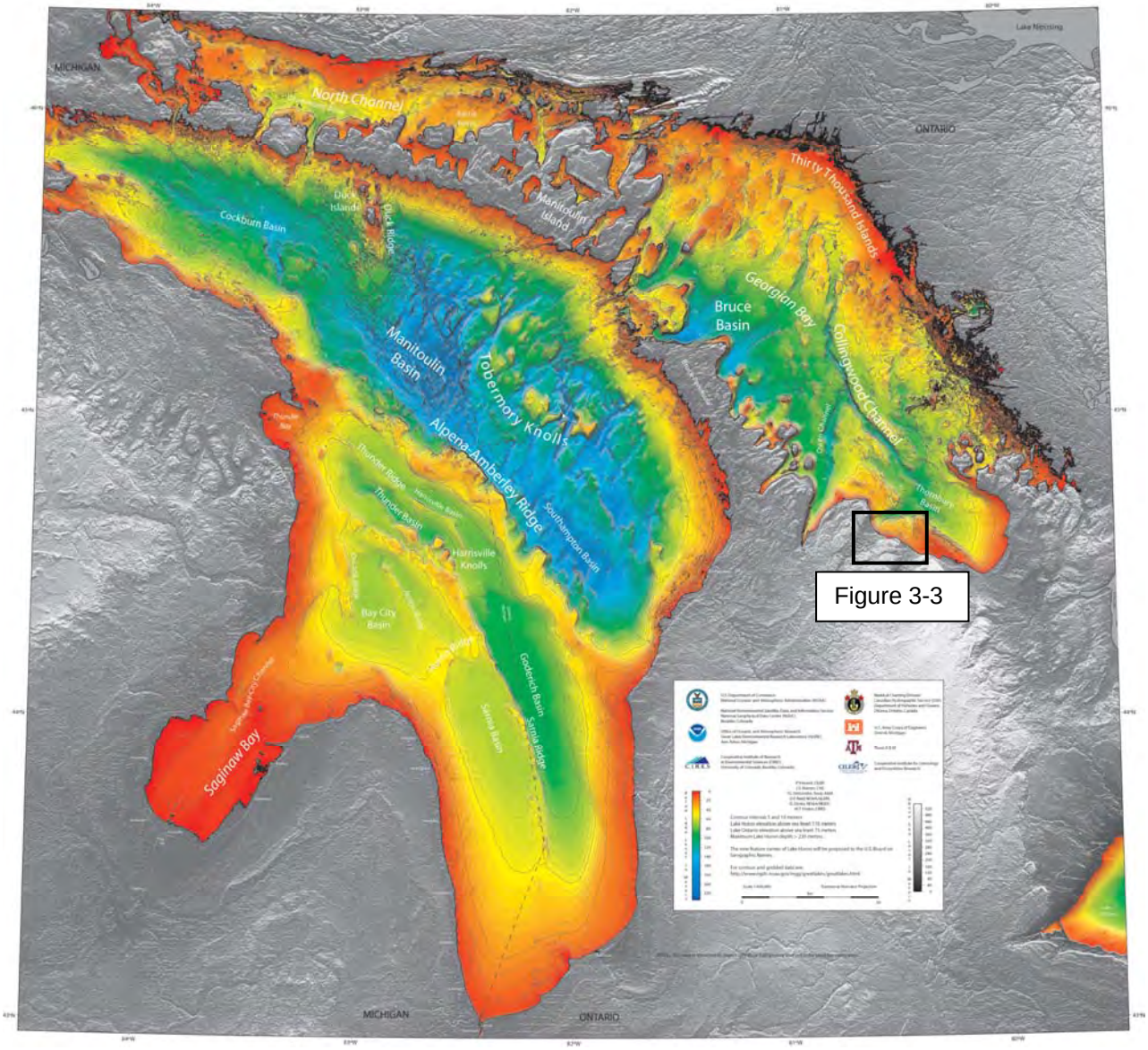
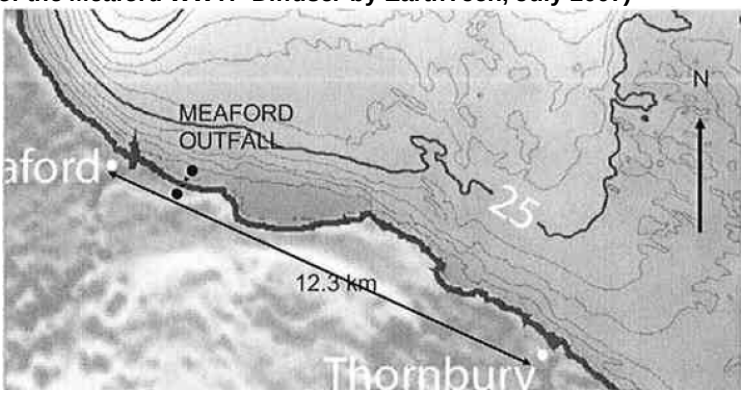


Figure 3-3 Bathymetry at Meaford WWTP Outfall (Source: *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech, July 2007)



3.3.2 Georgian Bay Background Water Quality and Current Conditions

The receiving water – Georgian Bay - ambient conditions and future effluent conditions were identified and used to simulate the impact on the receiving water by using LHOPS-POM and CORMIX modeling software. High background pollutant concentrations, pH levels and temperatures (75th percentile) in the receiving water body were determined in order to assess the suitability of wastewater effluent criteria under worst case conditions.

The ambient data that was reviewed included temperature, pH, and current velocities as summarized in Table 3-2. Ambient temperature values were provided by a 1974 study of Georgian Bay by E.A. Bennett (Department of Fisheries and Oceans) and ambient pH values by the Ministry of the Environment. The results from the LHOPS – POM model were used to estimate current velocities in the vicinity of the Meaford WWTP outlet. All of this data was then incorporated into CORMIX to conduct an assessment of the assimilative capacity of the Georgian Bay receiving waters for a wide range of ambient and effluent conditions.

Table 3-2 Georgian Bay Background Water Quality and Current Conditions

Parameter	Value	Source
Ambient Temperature	Min Temp = 0ºC Max Temp = 19ºC (August)	1974 study of Georgian Bay by E.A. Bennett (Department of Fisheries and Oceans)
Lake Temperature	Summer = 19 to 20ºC Winter = 0 to 4ºC Lake turn over = 4ºC (occurs in November and April)	2007 ESR Assimilative Capacity Study
Lake pH	8.3	2007 Ministry of the Environment Email Correspondence
Current Velocities	Summer currents are long shore with maximum speed of 50 cm/s NNW to SSE or SSE to NNW. Winter currents have a maximum speed of 30 cm/s.	Baird Associates

3.3.3 Meaford WWTP Effluent Water Quality

The Meaford WWTP Effluent Water conditions are summarized in Table 3-3.

Table 3-3 Georgian Bay Background Water Quality and Current Conditions

Parameter	Value	Source
Effluent Temperature	Summer = 22.2ºC Winter = 8 to 11ºC Fall Lake Turnover = 13ºC Spring Lake Turnover = 10ºC	2007 ESR Assimilative Capacity Study
Effluent pH	6.4 to 8.0 (75% Percentile value = 7.6)	2006 Meaford WWTP Operations Data

3.3.4 Determination of Assimilative Capacity of Georgian Bay

Various water quality parameters were assessed under the worst case conditions using CORMIX modeling software. In order to use this software, it was first necessary to determine the dilution ratio at various distances from the outfall and the shore using CORMIX 2 software. The dilution ratios at 100m and 200m are provided in the following table.

Table 3-4 Dilution Ratios (Source: *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech, July 2007)

Parameter	Dilution Ratio

Table 3-4 Dilution Ratios (Source: *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech, July 2007)

Parameter	Dilution Ratio
100m from outfall	70:1 (median dilution) 35:1 (75th percentile dilution)*
200m from shore (or half distance to the shore)	115:1 (median dilution) 70:1 (75th percentile dilution)

*assumed that the dilution ratio will reduce to 18:1 under winter conditions due to ice cover.

All of the parameters were then entered into CORMIX to analyze various scenarios. The study concluded that the water quality objectives set by the MOE were met for all of the key parameters tested and that objectives were met within one half of the distance to shore or 200 m from the outfall. The parameters, their respective objectives and CORMIX modeling results are shown in Table 3-5.

Table 3-5 2007 ESR Modeling Results for 6,000 m^3/d

Parameter	Objective	CORMIX Modeling Parameters / Results
Un-ionized ammonia	20 µg/L (PWQO at edge of near field for protection of aquatic life)	**Parameter (for worst case scenario):** - Max Summer month effluent temperatures - 75%-ile effluent pH - 75%-ile dilution - 75%-ile ambient pH and water temp. **Result:** - <4 µg/L at half distance to shore **(Objective met)**
Total Ammonia	500 µg/L (Great Lakes Water Quality Agreement (GLWQA) Objective at water supply intakes)	**Result:** - <300 µg/L at 100 m from outfall during winter period **(Objective met)**
E.coli	100 counts/100 mL (PWQO for Swimming at the Beach)	**Result:** - Highest in winter at 3 counts per 100 mL at half the distance to shore **(Objective met)**
Total Phosphorus	20 µg/L (Interim PWQO for the control of algae. Objective at the Regulated Mixing Zone; Typically half the distance from the diffuser to the shore)	**Parameter:** - Max Summer/Winter effluent temperatures - 75%-ile effluent pH - 75%-ile ambient pH and water temp. **Result:** - 7 µg/L in the summer **(Objective met)** - 14 µg/L in the winter **(Objective met)**

3.4 Evaluation of the Impact to Georgian Bay by the Newly Predicted Future Flow (4,692 m^3/day)

Presented in Table 3-6 below, are the new proposed effluent criteria (concentrations and loadings), which can be discharged into Georgian Bay from the Meaford WWTP with no adverse environmental impacts on the Bay and/or shoreline. These criteria were based on those proposed in the *Evaluation of Near field Water Quality at the Outfall of the Meaford WWTP Diffuser* by EarthTech in 2007 for 6,000 m^3/d because it is expected that the assimilative capacity model results will not worsen by lowering the effluent flows to 4,692 m^3/d, but will actually improve.

The only exception is the total phosphorus (TP) limit which is proposed to be 1.0 mg/L. As per the Ministry of Environment Guideline F-8 "*Provision and Operation of Phosphorus Removal Facilities at Municipal, Institutional and Private Sewage Treatment Works*" (April 2004), it is required that the majority of municipal wastewater treatment plants in Ontario discharge TP concentrations of a maximum 1.0 mg/L in

their effluent. As shown in the table below, despite the increase in the TP concentration limit, the mass loadings are still lower than what was originally being proposed in the 2007 ESR. This is because the lower discharge volume (4,692 m^3/d) has a lesser impact on the Bay and/or shoreline.

Similarly, the other effluent parameters mass loadings are reduced more than 20% from the previous effluent limits due to the lower flow rate. Since the assimilative capacity study completed in 2007 meets all MOE water quality requirements, it is expected that the proposed effluent criteria for 4,692 m^3/d will also be within the lake's assimilative capacity limit and will satisfy the MOE water quality requirements.

Table 3-6 Effluent Limit Comparison

Parameter	Earlier Proposed Effluent Limit (2007 ESR at 6,000 m^3/d)[Note 1]		Newly Proposed Effluent Limit (at 4,692 m^3/d)		Difference in Mass Loadings	
	mg/L	kg/d	mg/L	kg/d	kg/d	%
$CBOD_5$	15	90.0	15	70.4	-19.6	-28%
TSS	15	90.0	15	70.4	-19.6	-28%
Total Phosphorus	0.8	4.8	1.0	3.7	-1.1	-30%
Total Ammonia						
non-freeze period[Note 2]	3	18.0	3	14.8	-3.2	-22%
freeze period[Note 2]	5	30.0	5	23.5	-6.5	-28%
pH	6.0 – 9.5		6.0 – 9.5			

[Note 1] Municipality of Meaford Wastewater Treatment Municipal Class Environmental Assessment Environmental Study Report (EarthTech, November 2007) (Values in ESR are incorrect for 6,000 m^3/d, updated values shown)

[Note 2] Non-freeze period from May 15th to September 30th. Freeze Period from October 1st to May 14th.

4. Conclusion

In conclusion, based on the findings of this Technical Memorandum which was developed using sound engineering principles, there should not be any adverse water quality impacts to the receiving waters by increasing the effluent flow from Meaford WWTP by 20% and following the effluent limits proposed in Table 3-6.

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20 November 2006

912-01

Robin Dunn, CET, PAdm., M.A.
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, ON
N4L 1A1

Subject: **Peer Review of Capacity Analysis Report for the Meaford WWTP – Final Report**

Dear Mr. Dunn,

Hydromantis is pleased to submit this letter report for the review of the Capacity Analysis completed by Ainley & Associates Limited and dated August 2006. Upon your review of our findings, we would be pleased to answer any questions or clarify any issues that the municipality may have.

The Municipality of Meaford Official Plan projected conservative growth of between 2000 and 4000 persons to the year 2023 (Operation Department Report 2006-02), but recent monitoring showed that the growth may occur more rapidly. The Municipality is aware that it has sufficient water supply capacity, but has insufficient wastewater treatment capacity to sustain the expected growth. Thus, the Municipality embarked on a Capacity Analysis of the existing wastewater treatment plant (WWTP) and recently has invited proposals for the Class EA for the upgrade and expansion of the WWTP.

In this regard, Hydromantis was retained by Meaford to provide a **Peer Review** of the Capacity Analysis provided by Ainley & Associates Limited.

This letter report is the peer review of the Capacity Analysis. The review has focussed on the liquid processing train of the WWTP rather than the sludge train, since the sludge train is a newer process and appears to have excess capacity.

In general, the WWTP is described well in the Capacity Analysis Report and in the Certificate of Approval (C of A) attached to the report. Some treatment and performance data are provided in the report, together with an analysis of unit process loadings, particularly for the biological treatment system including an activated sludge system with aeration and secondary clarification. There is no primary clarification process as usually provided in a conventional activated sludge system.

This report reviews the key calculations and the unit process ratings provided for the liquid train.

Certificate of Approval (3697-62MGNC)

The C of A is the legal document that states treatment requirements at the WWTP in accordance with the Ontario Water Resources Act (*OWRA)*. Several key parameters are stated in the C of A that governs the WWTP until an amended or new C of A is obtained. Some of these are noted below.

1. Type of Wastewater Treatment Plant = *High Rate Activated Sludge*

2. Average Day Design Flow (ADF) = 3910 m^3/day
3. Peak flow to be treated before bypasses occur = 11,730 m^3/day
4. Sanitary sewage pumping capacity = 12,700 m^3/day (147 L/s)
5. Pre-treatment screening peak flow = 8640 m^3/day (100 L/s)
6. UV Disinfection peak capacity = 5720 m^3/day
7. Effluent objectives and effluent limits are stated in the C of A for $CBOD_5$, suspended solids (SS), total phosphorus, total ammonia nitrogen (freezing and non-freezing periods), and pH. Freezing period for nitrification is more stringent (this should be verified with MOE). Our experience is that seasonal ammonia limits are more stringent in warm water conditions and greater un-ionized ammonia concentration at the higher temperature and likely receiver higher pH value. Excessively high un-ionized ammonia can lead to effluent toxicity to aquatic organisms.

Unit Process Criteria Stated in Capacity Analysis Report

The Capacity Analysis report provides a desktop assessment of the process unit capacities of the Meaford WWTP. In particular, the following points summarize the major liquid stream capacities of the plant expressed in the Capacity Analysis report.

1. Pre-treatment design peak flow = 9842 m^3/day
2. Bypass channel rated peak flow = 9842 m^3/day
3. Aeration Tank ADF = 4404 m^3/day to provide 6 hours hydraulic retention time (HRT) in aeration at ADF
4. Secondary Clarifier Peak Capacity = 6874 m^3/day based on peak surface overflow rate (SOR) criteria for nitrifying biological system
5. UV Disinfection peak flow = 5280 m^3/day (manufacturer's specification)

The report clearly states that the plant unit processes do not have the capacity to treat the C of A peak flow value of 11,730 m^3/day, and we concur with this conclusion.

We have additional comments regarding the biological treatment system review as described below.

Aeration Process Criteria

The Capacity Analysis report provides key operational calculations for the aeration tank as summarized in **Table 1**. These are compared to typical design parameters for High Rate, Conventional and Extended Aeration activated sludge systems in **Table 1**. The Meaford WWTP is unique in that it has no primary clarifiers, shorter HRT than an extended aeration WWTP and has a nitrification requirement.

Based on the C of A and **Table 1**, we believe that the aeration process is a major limiting factor for achieving nitrification.

The Capacity Report essentially indicates the unit process as a Conventional Activated Sludge (CAS) process due to the 6-hour HRT; however, the C of A indicates it to be a High Rate Activated Sludge (HRAS) process. In this case we believe the HRAS better describes the situation, particularly for the nitrifying (ammonia removal) mandate in the C of A. Generally, a CAS system would include primary clarification in advance of secondary biological treatment and this is not the case at Meaford.

Table 1. Aeration Process Operational Parameters					
			MOE Guidelines for Nitrification		
Criteria	**Units**	**Capacity Analysis Report**	**High Rate Activated Sludge**	**Conventional Activated Sludge**	**Extended Aeration Activated Sludge**
Organic Loading Rate	kg BOD_5/m^3.day	0.41	C of A indicates the plant is a HRAS; MOE design guidelines do not recommend for nitrification	0.31 to 0.72	0.17 to 0.24
F/M_v	day^{-1}	0.19 to 0.25		0.05 to 0.25	0.05 to 0.15
Detention Time or Hydraulic Retention Time (HRT)	hours	6		6	=15
Solids Retention Time (SRT)	days	10.9 (@ 3000 mg/L MLSS)		> 10 at 5ºC	>15
MLSS	mg/L	2749 to 3500			

As seen in the above table, the Meaford WWTP key operational parameters are within the limits defining the activated sludge portion for a nitrifying CAS; however, there is no advantage obtained from primary clarification for removal of settleable organics and inerts. It is clear from the performance data (Appendix B of Capacity Analysis report) for final effluent that the plant is not always able to meet the ammonia limits under these conditions, despite providing excellent removal of the conventional parameters $CBOD_5$ and SS. Twelve months from January 2003 to March 2006 were out-of-compliance with respect to ammonia plus ammonium nitrogen (if the C of A limits are correct). This occurs even at flows below the design ADF; however, several months are above the C of A ADF.

Many Ontario plants are designed without primary clarifiers that provide nitrification, but these are usually designed as Extended Aeration Activated Sludge (EAAS) with long HRTs. The Meaford WWTP does not meet the design guidelines for this situation. Even for the CAS, Meaford is at the minimum range for F/M_v and SRT.

Thus, we believe the Meaford WWTP is heavily constrained by biological capacity for nitrification. This is demonstrated by the out of compliance ammonia plus ammonium nitrogen observed compared to the C of A limits.

In our opinion, the WWTP should be designed with the ability to operate with SRT >>10 days and MLSS <3500 mg/L which is not likely feasible in the existing plant.

Secondary Clarifier Criteria

The Capacity Analysis report provides key operational calculations for the secondary clarifiers as summarized in **Table 2**. These are compared to typical design parameters for Activated Sludge and Extended Aeration activated sludge systems in **Table 2**.

The Capacity Report clearly states that the secondary clarifiers are limiting at peak flows and up to the peak design flow at which bypasses are allowed according to the C of A. We concur with this conclusion. In fact, we believe that the secondary clarifiers are likely to be more heavily overloaded in terms of SOR and SLR (solids loading rate) than suggested in the Capacity Analysis report.

The Capacity Analysis report defines the SOR as the limiting factor (Appendix E) at a flow of 6874 m^3/day by manipulating the MLSS concentration between 2750 and 3500 mg/L, and the return activated sludge flow rate as low as 50%. The report does state that the SLR is also potentially a constraining factor.

The clarifiers are shallow (2.9 m or ~9feet) compared to most modern secondary clarifiers which are frequently designed with a tank depth of as much as 4.6 m or 15 feet and sometimes deeper. This provides better clarification and some capacity to handle higher solids loading with the buildup of an underflow sludge blanket. The Meaford clarifiers are too shallow to allow this particularly at peak flow, and unlikely to benefit by reduced recycle flow rate because of the buildup of a sludge blanket and its carry-over into the effluent at high flows.

Operationally it would be difficult to reduce the MLSS concentration in a timely fashion with higher flows and then increase it after the passage of high flow. In addition, the higher MLSS is required to enhance nitrification which is a major limiting factor, but other factors also limit nitrification.

Thus, we believe the SLR is more limiting than the SOR at Meaford and likely limits the clarifiers more severely than the Capacity Report states. In our opinion, with the shallow clarifiers, the recycle ratio should be kept near 100%. For nitrification, the MLSS and SRT should be as high as possible. From this standpoint the secondary clarifier hydraulic capacity is likely closer to the lower value of 3619 m^3/day than the 5807 m^3/day value. Under this scenario, the plant is unlikely to perform well at the peak design flow and not to the C of A peak flow before bypass is permitted.

A future combination of aeration expansion and clarifier expansion should be coupled to ensure the correct ratio of these two unit processes is obtained.

From a positive standpoint, the Meaford WWTP did provide nitrification to the required limits in some months and nitrates are evident in the effluent. In many months the nitrification criteria was met. In addition, the effluent SS concentration approached the design limit in a few of the months. However, as flows to the plant increase with community growth, it will continue to be more difficult to achieve nitrification and maintain the solids inventory in the plant.

Table 2. Secondary Clarifier Operational Parameters					
			MOE Design Guidelines		
	Units	**Meaford @ C of A Peak Flow of 11,730 m^3/day**	**Activated Sludge with nitrification**	**Extended Aeration**	**Capacity Report**
Tank Depth	m	2.9	3.6 to 4.6	3.6 to 4.6	no comment made
Surface Overflow Rate (SOR) @ Peak Flow	$L/m^2.s$ ($m^3/m^2.d$)	0.58 (50)	0.34 (29.4)	0.41 (35.4)	6874 m^3/d using 0.34 (29.4)
Solids Loading Rate (SLR) @ Peak Flow	$kg/m^2.day$	241[a]	= 120	= 120	3619 m^3/d[a] 5807 m^3/d[b] 8009 m^3/d[c] using 120 $kg/m^2.day$
Notes:	a. 3500 mg/L & 100% RAS b. 2750 mg/L & 100% RAS c. 2750 mg/L & 50% RAS				

Review of 2006 Process Information

In November 2006, Hydromantis received and reviewed treatment plant operating data for analysis. In cold weather months (January to March) in early 2006, the plant flows were higher than the balance of the year with January and March above the C of A limit. During the cold months, the plant biomass in terms of MLSS (mixed liquor suspended solids) was the lowest ranging from about 1700 mg/L to 2200 mg/L from January through March. This is the most critical period for ammonia removal due to the lower wastewater temperature, and these months had the highest ammonia concentrations. Since ammonia removal is required in winter, the MLSS concentration must be higher; however, the clarification process is likely to limit the ability to raise the MLSS concentration in these winter months. This corroborates the limits commented upon regarding the criteria for F/M_v and SRT earlier in this report. In the 2006 winter period, these key parameters that are indicators of ability to remove ammonia would be at critical levels, i.e. not supportive of ammonia removal.

Ultraviolet Disinfection

Based on the C of A, the manufacturer's specification and the apparent problems that exist with disinfection, it is clear that the system is under-designed for the peak flow condition. We understand that the supplier may be providing perspective on this issue. Two other possible factors are the effect of leachate iron content on UV transmission and potential overtopping of

the system at high flows. We recommend that UV transmissivity and collimated beam tests be performed as a starting point. In addition, iron concentration of effluent during leachate input should be checked.

Digestion and Biosolids Storage

We have done a cursory review of the biosolids management sections and have no comments regarding its capacity per se. One concern regarding odour control would be the degree and timing of decanting the tanks. If aeration is stopped during decanting, potential septic conditions may result in odour emanation.

Options for Optimization of the Existing System

There are few options available for optimizing the existing plant.

1. One element that should be verified is the plant flow metering accuracy, although we have no information to indicate that it is incorrect. It is simply good policy to verify flow measurements, particularly when flows become critical.
2. Most importantly, the seasonal total ammonia criteria for the plant should be verified. More stringent total ammonia limits in winter are unusual, unless specific reasons are indicated. Relaxation of the winter criteria may assist with future optimization. Indications are that a possible error occurred and the seasonal criteria are mistakenly reversed in the C of A (see pages 3 and 4).
3. The potential to make use of the unused old digesters could be considered for day-by-day peak flow shaving. However, this will not assist with seasonally sustained high flows that occur over an extended time period. Peak flow shaving may assist in reduction of the peak flow rates and reduce these peak flow loadings to critical unit processes (see page 2).
4. Coagulant addition could be considered to improve clarification performance during critical periods.

Overall, we recommend that the Municipality wait until initial results of the Class EA underway indicate the likely direction of the work to be done for the long term.

If you have any questions, please contact us without hesitation.

Sincerely,
Hydromantis, Inc.

Joe Stephenson, M.Eng., P.Eng.
Director

cc: David Free, CAO/CFO

Appendix - D

Public Consultation Documentation

(Communication Plan, Correspondence, PICs, Notices)

Agency Contact Information									
Title	**First**	**Last**	**Title**	**Company**	**Address 1**	**Address 2**	**Town**	**PC**	**Telephone**
Provincial & Federal Agencies									
Mr.	Rob	Dobos	Manager, Environmental Assessment Section	Environment Canada - Environmental Protection Operations Division - Ontario Region	867 Lakeshore Road	P.O. Box 5050	Burlington, ON	L7R 4A6	905-336-4953
Mr.	Bob	Aggerholm	Regional Environmental Planner	Southwest Region Ministry of Environment & Climate Change	733 Exeter Road		London, ON	N6E 1L3	519-873-5013
Mr.	Craig	Newton	Coordinator	Southwest Region Ministry of Environment & Climate Change	733 Exeter Road		London, ON	N6E 1L3	
			Regional EA Coordinator	Southwest Region Ministry of Environment & Climate Change	733 Exeter Road		London, ON	N6E 1L3	
Mr.	John	Ritchie	Water Compliance Supervisor	Owen Sound District Office, Drinking Water Management Division, Ministry of the Environment	101 - 17th Street East	3rd Floor	Owen Sound, ON	N4K 0A5	1-519-371-4687
Mr.	Jeremy	Schultz	Project Manager, Ontario Region	Canadian Environmental Assessment Agency	55 St. Clair Avenue East	Suite 907	Toronto, ON	M4T 1M2	416-952-1576
Email only to: **fisheriesprotection@dfo-mpo.gc.ca**				Fisheries & Oceans Canada	e-mail only				1-855-852-8320
Att: Environmental Coordinator (PHE)				Transport Canada - Ontario Region	4900 Yonge Street	4th Floor	Toronto, ON	M2N 6A5	416-952-0485
Ms.	Kelly	Thompson	A/Manager Navigable Waters Protection	Transport Canada Marine Safety & Security Ontario Region	100 Front Street South		Sarnia, ON	N7T 2M4	1-519-383-1863
Mr.	Scott	Craggs	Operations Manager West Highlands Hub	Ontario Clean Water Agency	78 Centennial Road	Unit 6	Orangeville, ON	L9W 1P9	519-941-1938
Mr.	Tom	Chrzan	Director, Regional Services Branch	Ministries of Tourism, Culture & Sport	400 University Avenue	2nd Floor	Toronto, ON	M7A 2R9	416-314-6680
Ms.	Kim	Benner	District Planner	Midhurst District Ministry of Natural Resources	2284 Nursery Road		Midhurst, ON	L0L 1X0	705-725-7534
Ms.	Carol	Neumann	Rural Planner	Ontario Ministry of Agriculture, Food and Rural Affairs	6484 Wellington Rd. 7	Unit 10	Elora, ON	N0B 1S0	519-846-0941
Ms.	Ann	Baldwin	Regional Director	Ministry of Transportation, Corridor Management Section, West Region	659 Exeter Road		London, ON	N6E 1L3	519-873-4335

Mr.	Tyler	Shantz	Planner - Western Region Ontario	Ministry of Municipal Affairs and Housing	659 Exeter Rd. 2nd Floor		London, ON	N6E 1L3	1-800-265-4736
Mr.	Scott	Oliver	Team Lead Western Region Ontario	Ministry of Municipal Affairs and Housing	659 Exeter Rd. 2nd Floor		London, ON	N6E 1L3	1-800-265-4736
Local Government & Other Agencies									
Mr.	Tim	Lanthier	Watershed Planner	Grey Sauble Conservation Authority	237897 Inglis Falls Road	R.R.#4	Owen Sound, ON	N4K 5N6	519-376-3076
Mr.	Lance	Thurston	CAO	The Corporation of the County of Grey	595 - 9th Avenue East		Owen Sound, ON	N4K 3E3	519-376-8998
Mr.	Randy	Scherzer	Director of Planning & Development	The Corporation of the County of Grey	595 - 9th Avenue East		Owen Sound, ON	N4K 3E3	519-372-0219, ext. 1237
Mr.	Reg	Russwurm	Director Engineering & Public Works	The Town of The Blue Mountains	32 Mill Street	P.O. Box 310	Thornbury, ON	N0H 2P0	888-258-6867
Mr.	Jim	Dyment	Interim Head of Planning	The Town of The Blue Mountains	32 Mill Street	P.O. Box 310	Thornbury, ON	N0H 2P0	888-258-6867
Mr.	Chris	Cornfield	Director of Transportation & Environmental Services	Municipality of Grey Highlands	P.O. Box 409		Markdale, ON	N0C 1H0	1-888-342-4059
Mr.	Will	Moore	CAO/Clerk	Township of Chatsworth	R.R. #1,	316837 Highway 6	Chatsworth, ON	N0H 1G0	519-794-3232
Ms.	Ruth	Coursey	CAO	City of Owen Sound	City Hall	808 2nd Avenue East	Owen Sound, ON	N4K 2H4	519-376-1440
Mr.	Murray	Hacket	CAO	Township of Georgian Bluffs	177964 Grey Road 18	R.R.#3	Owen Sound, ON	N4K 5N5	519-376-2729
Mr.	Jim	Aitken	Supervisor of Maintenance	Bruce-Grey Catholic District School Board	799 - 16th Avenue		Hanover, ON	N4N 3A1	519-364-5820
Mr.	Peter	Wilgress		Bluewater District School Board	351 - 1st Avenue North	Box 190	Chesley, ON	N0G 1L0	519-363-2014
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Mr.	Mike	Muir	Director of EMS	Land Ambulance EMS - Grey County	595 - 9th Avenue East		Owen Sound, ON	N4K 3E3	1-800-567-4739
Mr.	Michael	Guilfoyle	Inspector	Ontario Provincial Police	317057 Hwys 6 & 10	P.O. Box 307, R.R.#2	Chatsworth, ON	N0H 1G0	519-794-7827
Mr.	Frank	Bassingthwaite	President	Grey County Historical Society	Box 548		Markdale, ON	N0C 1H0	info@greycountyhs.ca
Mr.	Neil	Havens	Engineering Manager	Grey Bruce Health Services	1800 8th St. E.		Owen Sound, ON	N4K 6M9	519-376-2121
Mr.	Chris	Munn	Director	Grey Bruce Health Unit	101 17th Street East		Owen Sound, ON	N4K 0A5	1-800-263-3456
Dr.	Hazel	Lynn	Chief Medical Officer	Grey Bruce Health Unit	101 17th Street East		Owen Sound, ON	N4K 0A5	1-800-263-3456
Aboriginal Consultation									
Att: Consultation Unit				Ministry of Aboriginal Affairs (MAA)	160 Bloor St. East	9th Floor	Toronto, ON	M7A 2E6	416-326-4757

(AANDC not contacted for this project as project is not on Aboriginal lands)				Aboriginal Affairs & Northern Development Canada Consultation Unit (AANDC-CAU)	5H - 5th Floor		Gatineau, QC	K1A 0H4	819-934-3696
Mr.	Brian	Tucker	Manager of Way of Life Framework	The Metis Nation of Ontario	500 Old St. Patrick St.	Unit 3	Ottawa, ON	K1N 9G4	807-274-1386 (direct) 613-798-1488 (ssecretary)
Att:			Administrative Office	Chiefs of Ontario	111 Peter Street	Suite 804	Toronto, ON	M5V 2H1	
Mr.	Richard	Saunders	Director	Native Affairs Secretariat	720 Bay Street	4th Floor	Toronto, ON	M5G 2K1	
Ms.	Lynette	Davis	Director of Operations	Metis National Council	4-340 MacLaren Street		Ottawa, ON	K2P 0M6	613-232-3216
Mr.	David	Dusome	President	Georgian Bay Metis Council	355 Cranston Crescent	P.O. Box 4	Midland, ON	L4R 4K6	705-526-6335
Mr.	Larry	Duval	President	Moon River Metis Council	P.O. Box 386		Washago, ON	L0K 2B0	705-689-3941
First Nation Communities as per ATRIS Search									
Chief	Christopher	Plain		Aamjiwnaang	978 Tashmoo Avenue		Sarnia, ON	N7T 7H5	519-336-8410
Chief	James Robert	Marsden		Alderville First Nation	P.O. Box 46		Roseneath, ON	K0K 2X0	905-352-2011
Chief	Patsy	Corbiere		Aundeck-Omni-Kaning	R.R. #1, COMP 21		Little Current, ON	P0P 1K0	705-368-2228
Chief	Roland	Monague		Beausoleil First Nation	General Delivery		Cedar Point, ON	L0K 1C0	705-247-2051
Chief	Donna	Big Canoe		Chippewas of Georgina Island	R.R. #2	P.O. Box 13	Sutton West, ON	L0E 1R0	705-437-1337
Chief	Thomas M.	Bressette		Chippewas of Kettle and Stony Point	6247 Indian Lane		Kettle & Stony Point First Nation, ON	N0N 1J1	519-786-2125
Chief	Arlene	Chegahno		Chippewas of Nawash First Nation	R.R. #5		Wiarton, ON	N0H 2T0	519-534-1689
Ms.	Sandy	McKenzie		Chippewas of Rama First Nation	200-5884-Rama Road		Rama, ON	L3V 6H6	705-325-3611
Chief	R.K. (Joe)	Miskokomon		Chippewas of the Thames First Nation	R.R. #1		Muncey, ON	N0L 1Y0	519-289-5555
Chief	Phyllis	Williams		Curve Lake First Nation	General Delivery		Curve Lake, ON	K0L 1R0	705-657-8045
Chief	Gregory Lloyd	Cowie		Hiawatha First Nation	R.R.#2		Keene, ON	K0L 2G0	705-295-4421
Chief	Joe	Hare		M'Chigeeng First Nation	P.O. Box 333	53 Hwy 551	M'Chigeeng, ON	P0P 1G0	705-377-5362
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Mr.	Danny	Stock		Mississauga's of the Credit	P.O. Box 260		Bala, ON	P0C 1A0	705-762-2354
Chief	Maurice Bryan	LaForme		Mississaugas of the Credit	R.R.#6		Hagersville, ON	N0A 1H0	905-768-1133
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Chief	Richard	Shawanda		Sheguiandah	P.O. Box 101		Sheguiandah, ON	P0P 1W0	705-368-2781
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Chief	Phillip Angus	Franks		Wahta Mohawk	P.O. Box 260		Bala, ON	P0C 1A0	705-762-2354
Chief	Burton	Kewayosh, Jr.		Walpole Island	R.R.#3		Wallaceburg, ON	N8A 4K9	519-627-1481
Chief	Warren L.	Tabobondung		Wasauksing First Nation	P.O. Box 250		Parry Sound, ON	P2A 2X4	705-746-2531
Chief	Irene	Kells		Zhiibaahaasing First Nation	36 Sagon		Zhiibaahaasing, ON	P0P 1X0	705-283-3963
Utilities									
Mr.	Tony	Dominguez	System Planner	Rogers Communications Inc.	1 Sperling Drive		Barrie, ON	L4M 6B8	705-737-4660 ext. 6907
Mr.	Todd	Bowman	Supervisor of Capital	Powerstream Inc.	161 Cityview Blvd.		Vaughan, ON	L4H 0A9	905-417-6900 ext.31317
Ms.	Mike	Johnson	Access Network Manager	Bell Aliant	183 Hunter Street West	Floor 2	Peterborough, ON	K9H 2L1	705-876-8759
Ms.	Joanna	MacDarmid	Planning Department	Hydro One	40 Olympic Drive		Dundas, ON	L9H 7P5	905-627-6058
Mr.	Ian	Taylor	Manager of Area Planning & Design	Enbridge Gas	500 Consumers Rd.		North York, ON	M2J 1P8	1-416-758-7927 (direct)
Ms.	Jennifer	Cooper	Field Rep., Customer Connections	Enbridge Gas	municipalnotices@enbridge.com				
Mr.	Jake	Linklater	Office Coordinator	Saugeen Ojibway nation Environment Office	RR #5		Wiarton, ON	N0H 2P0	
Ms.	Audrey	Erin Holden	Lands and Resources Consultation Coordinator	Historic Saugeen Metis	204 High Street	Box 1492	Southhampton, ON	N0H 2L0	
Mr.	James Robert	Coture		Great Lakes Metis Council	trylyline14@yahoo.ca				
Ms.	Karry	Sandy-McKenzie	Coordinator for Williams Treaties First Nations	Chippewas of Rama First Nation	8 Creswick Court		Barrie, ON	L4M 2J7	
Ms.	Diane	Sheridan	Land Resources Consultation Worker	Hiawatha First nation	123 Paudash Street		Hiawatha, ON	K9J 0E6	
Ms.	Julie	Bottos		SCS Consulting Group Ltd.	30 Centurian Drive	Suite 100	Markham, ON	L3R 8B8	
Mr.	Ken	Teasdale	Senior Project Manager	Ministry of Transportation	3659 Exeter Road		London, ON	N6E 1L3	

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July 4, 2014. File #114106

Environmental Protection Operations Division – Ontario Region
Environment Canada
867 Lakeshore Road, P.O. Box 5050
Burlington, ON L7R 4A6

Attn: Mr. Rob Dobos
Manager, Environmental Assessment Section

Re: Municipality of Meaford
Water and Wastewater Servicing Plan
Notice of Study Commencement

Dear Mr. Dobos,

The Municipality of Meaford has retained the services of the Ainley Group to develop a Water and Wastewater Servicing Plan for the Urban Settlement Area of the Municipality. The objective of the study is to develop a comprehensive, long-term water and wastewater servicing strategy for existing and future land use.

This study is being completed in accordance with the Master Plan process (Approach #2) as identified in the Municipal Class Environmental Assessment (Class EA) document (amended 2011) with the intent to satisfy the Class EA requirements for the Schedule A, A+ , and select Schedule B projects identified within the Master Plan as well as to provide the basis for future Schedule C projects.

This notice is to advise you of the commencement of the Master Plan process and to provide you with opportunity to comment on the project. Please refer to the attached copy of the *Notice of Study Commencement* for further details regarding the project. Further correspondence regarding this project will follow in the coming months and you will be notified in advance of a Public Information Centre scheduled for this project.

Should you have any further questions or concerns, please contact the undersigned or Mr. Stephen Vokes, Director of Operations, Municipality of Meaford at 519- 538-1060 or via email at svokes@meaford.ca

Yours truly,

AINLEY & ASSOCIATES LIMITED

Gary Scott, M. Sc., P. Eng.
Project Manager

T:\114106\07-Consultation\Notice of Commence\114106 Meaford SP N of C Agency letter June 2014 DRAFT.doc

The Municipality of Meaford
Water and Wastewater Servicing Plan
NOTICE OF STUDY COMMENCEMENT

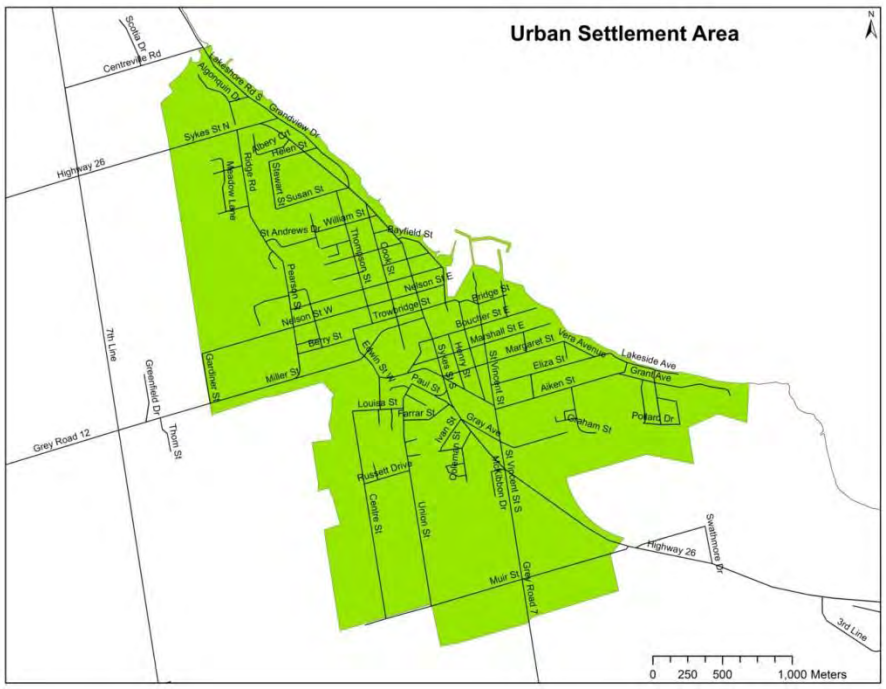
The Study

The Municipality of Meaford is undertaking a Water and Wastewater Servicing Master Plan with the objective of developing a comprehensive, long-term water and wastewater servicing strategy for existing and future land use within the Urban Settlement Area of the Municipality. The process will involve an assessment of the existing servicing infrastructure to identify necessary upgrades and future servicing priorities.

The study area is described as the current limits of the Urban Settlement Area as identified in the Municipality's Official Plan and illustrated in the accompanying key plan.

The Process

This study is being completed in accordance with the Master Plan process as identified in the Municipal Class Environmental Assessment (Class EA) document (amended 2011). It will follow Approach #2 with the intent to fulfill the Class EA requirements for the Schedule A, A+, and select Schedule B projects identified within the Master Plan as well as to provide the basis for future Schedule C projects.



How to Get Involved

As public consultation is a key component of the Class EA process, two Public Information Centres are planned for this project. Advance notice will be provided to allow all interested parties an opportunity to comment. For further information regarding this project, please contact either of the following members of the study team:

Mr. Stephen Vokes
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-1556
svokes@meaford.ca

Mr. Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
scott@ainleygroup.com

This Notice issued July 4, 2014.

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Canadian Environmental Assessment Agency
55 St. Clair Avenue East,
Room 907
Toronto ON M4T 1M2

Agence canadienne d'évaluation environnementale
55, avenue St. Clair Est,
pièce 907
Toronto ON M4T 1M2

July 11, 2014 Sent by mail

Mr. Gary Scott, M.Sc., P.Eng.
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
scott@ainleygroup.com

Dear Mr. Scott:

Re: Information on the Canadian Environmental Assessment Act, 2012

Thank you for your correspondence of July 04, 2014 regarding the Municipality of Meaford Water and Wastewater Servicing Plan.

As part of the Government of Canada's plan for Responsible Resource Development which seeks to modernize the regulatory system for project reviews, the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) came into force on July 6, 2012. CEAA 2012 focuses federal environmental reviews on projects that have the potential to cause significant adverse environmental effects in areas of federal jurisdiction.

The CEAA 2012 applies to projects described in the *Regulations Designating Physical Activities* (the Regulations). Based on the information provided, your project does not appear to be described in the Regulations. **Kindly review the Regulations to confirm applicability to your project.**

If your project is in a federally designated wildlife area or migratory bird sanctuary please check section 1 of the Regulations, which details the designated projects specific to those locations.

For more information on CEAA 2012, please access the following links on the Canadian Environmental Assessment Agency's (the Agency) website:

Overview of CEAA 2012
http://www.ceaa.gc.ca/default.asp?lang=En&n=16254939-1

.../2

Regulations Designating Physical Activities, and
Prescribed Information for a Description of a Designated Project Regulations
http://www.ceaa.gc.ca/default.asp?lang=En&n=9EC7CAD2-1

If it appears that CEAA 2012 may apply to your proposed project, you must provide the Agency with a description of the proposed project. Please see the link below to the Agency's guide to preparing a project description.

Guide to Preparing a Description of a Designated Project
http://www.ceaa.gc.ca/63D3D025-2236-49C9-A169-DD89A36DA0E6/Guide_to_Preparing_a_Description_of_a_Designated_Project_under_CEAA_2012.pdf

If you believe the project is not subject to a federal environmental assessment, and do not submit a project description, **we kindly request that you remove the Agency from your distribution list**. If you have questions, please get in touch with our office through the switchboard at 416-952-1576.

Sincerely,



Anjala Puvananathan
Director, Ontario Region
Canadian Environmental Assessment Agency

11 4106

Chippewas of RAMA First Nation

5884 Rama Road, Suite 200
Rama, Ontario L3V 6H6
T 705.325.3611 F 705.325.0879

A Proud Progressive First Nation Community

OFFICE OF THE CHIEF

July 14, 2014

Ainley & Associates Limited
550 Welham Road
Barrie, ON L4N 8Z7

Attention: Gary Scott, M. Sc., P.Eng., Project Manager

Re: Municipality of Meaford
Water and Wastewater Servicing Plan
Notice of Study Commencement

Dear Mr. Scott:

As a member of the Williams Treaties First Nations, Rama First Nation acknowledges receipt of your letter of July 4, 2014, which was received on July 10, 2014.

A copy of your letter has been forwarded to Karry Sandy-McKenzie, Barrister & Solicitor, Coordinator for Williams Treaties First Nations for further review and response directly to you. Please direct all future correspondence and inquires, with a copy to Rama First Nation, to Ms. Sandy-McKenzie at 8 Creswick Court, Barrie, ON L4M 2J7 or her email address at k.a.sandy-mckenzie@rogers.com. Her telephone number is (705) 792-5087.

We appreciate your taking the time to share this important information with us.

Sincerely,

Sharon Stinson Henry

Chief Sharon Stinson Henry

c: Council, Rama First Nation
Jeff Hewitt, General Counsel
Karry Sandy-McKenzie, Coordinator for Williams Treaties First Nations
Chief Roland Monague, Portfolio Chief for Williams Treaties First Nations

Ministry of the Environment and Climate Change

733 Exeter7 Road
London ON N6E 1L3
Tel': 519 873-5000
Fax: 519 873-5020

Ministère de l'Environnement et de l'Action en matière de changement climatique
733, rue Exeter
London ON N6E 1L3
Tél.: 519 873-5000
Téléc.: 519 873-5020

Ontario

July 16, 2014

Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, On
L9Y 4J4

Dear Mr. Scott:

Re: Water and Wastewater Servicing Plan, Municipality of Meaford
Response to Notice of Commencement

This letter is our response to the Notice of Study Commencement for the above noted project. This response acknowledges that the Municipality of Meaford has indicated that its study is following the master planning process as set out by the MEA Municipal Class Environmental Assessment.

Thank you for the opportunity to comment on this project.

Based on the information submitted, ministry staff is unable to provide specific matters of ministry interest with this project at this time other than our general legislative mandates around environmental management and protection.

Consultation with First Nation and Métis Communities

The Crown has a duty to consult First Nation and Métis communities if there is a potential impact to Aboriginal or treaty rights. As the proponent of this project, you have a responsibility to conduct adequate consultation with First Nation and Métis communities as part of the environmental assessment process. The Crown is therefore, delegating the procedural aspects of consultation to you as outlined in the attached document.

In our experience the First Nations most likely to have an interest in this project and the primary contacts are:

Jake Linklater Office Coordinator Saugeen Ojibway Nation Environment Office R.R. # 5 Wiarton, ON N0H 2T0	Audrey Erin Holden Lands and Resources Consultation Coordinator Historic Saugeen Métis 204 High Street, Box 1492 Southampton, ON N0H 2L0	James Coture Great Lakes Métis Council (519) 370-0435 trulyfine14@yahoo.ca

(519)534-5507 jakelinklater@saugeenojibwaynation.ca	(519) 483-4000 saugeenmetisadmin@bmts.com	James Wagar Consultation Assessment Coordinator Lands, Resources and Consultations Métis Nation of Ontario 222-75 Sherbourne St. Toronto, ON M5A 2P9 (416)977-9881 jamesw@metisnation.org

You must contact the Director, Environmental Approvals Branch if a project may adversely affect an Aboriginal or treaty right, or if a Part II Order or elevation request is anticipated; the Ministry will then determine whether the Crown has a duty to consult. Information and resources to assist you in fulfilling this requirement are provided as an attachment.

If questions arise or if clarification is needed please contact the undersigned at (519) 873-5013 or via email at bill.armstrong@ontario.ca.

Yours truly,

W. Armstrong, M.E.S
Regional Environmental Planner
Southwestern Region

cc J. Vokes, Meaford
J. Ritchie, MOE

HIAWATHA FIRST NATION
123 Paudash Street
Hiawatha On. K9J 0E6

Chief:	**Greg Cowie**
Councillor:	**Brian Cowie**
Councillor:	**Duane Cowie**
Councillor:	**Kirk Edwards**
Councillor:	**Trisha Shearer**
Councillor:	**Art Vowles**

RECEIVED
AUG 05 2014
AINLEY & ASSOCIATES LTD.-B

TO	SEEN
~~JAM~~	
~~RM~~	
~~AEP~~	
~~JS~~	
BCB	

FILE NO.
114-106

July 31, 2014

Ainley Consulting
550 Wellham Road
Barrie, On L4N 8Z7

Dear Mr. Scott:

Thank you for the information you sent to Hiawatha First Nation regarding "the Meaford water and Wastewater Master Plan" project. Hiawatha First Nation appreciates the fact that the municipality and your company recognizes the importance of First Nations Consultation and that your office is conforming to the requirements within the Duty to Consult Process. The correspondence we have received is not considered to be meaningful consultation but rather information sharing.

However, as per the Hiawatha First Nation Consultation Protocol, your proposed project is deemed, having minimal potential to impact Hiawatha First Nations' rights at this time , but would like to be kept apprised of any updates, archaeological findings, and/ or of any environmental impacts, should any occur, please. We reserve the right to comment later, if something further along in the process is deemed to be a potential impact.

We would like to be contacted if artifacts are found and to be sent any archaeological reports as they are completed. We also have trained archaeological liaisons that we require being present at the archaeological sites during the assessments if First Nation artifacts are found.

Although we may not always have representation at all stakeholders meeting, it is our wish to be kept apprised throughout all phases of the project.

We can be contacted at the mailing address above or electronically via email, at the email address below.

In good faith and respect,

Diane Sheridan

Diane Sheridan
Land Resource Consultation Worker
Hiawatha First Nation

dsheridan@hiawathafn.ca
Tele: (705) 295 4421
Fax: (705) 295-4424

BCB
114106

Ministry of Transportation

Engineering Office
Corridor Management Section
West Region

659 Exeter Road
London, Ontario N6E 1L3
Telephone: (519) 873-4596
Facsimile: (519) 873-4228

Ministère des Transports

Bureau du génie
Section de gestion des couloirs routiers
Région de l'Ouest

659, chemin Exeter
London (Ontario) N6E 1L3
Téléphone: (519) 873-4596
Télécopieur: (519) 873-4228

Ontario

July 30, 2014

Mr. Gary Scott, P. Eng.
Project Manager
Ainley & Associates Limited
550 Welham Road
Barrie, ON
L4N 8Z7

Dear Mr. Scott:

RE: Municipality of Meaford
Water and Waste Water Servicing Plan
Notice of Study Commencement

The Ministry of Transportation (MTO) has completed a review of the above-noted Study Commencement Notice and provides the following comments.

MTO has an interest in this study as it may have impacts on the Highway 26 corridor. MTO wishes to continue to be on the circulation list and be involved in this study as it proceeds.

MTO advises that new or proposed servicing infrastructure should not be placed within the Highway 26 property limits. The study should be evaluating other alternatives other than the Highway 26 corridor.

We trust these comments are of assistance. Should you have any questions, please feel free to contact our office.

Yours truly,

Ken Teasdale
Senior Project Manager
Corridor Management Section

Ainley & Associates Limited
550 Welham Road, Barrie, Ontario, L4N 8Z7
Tel: (705) 726-3371 ▪ Fax: (705) 726-4391
E-mail barrie@ainleygroup.com

September 3, 2014. File #114106

Rogers Communications Inc.
1 Sperling Drive
Barrie, ON, L4M 6B8

Attn: Mr. Tony Dominguez
System Planner

Re: Municipality of Meaford
Water and Wastewater Servicing Plan
Notice of Public Information Centre

Dear Mr. Dominguez:

The Municipality of Meaford has retained the services of the Ainley Group to develop a Water and Wastewater Servicing Plan for the Urban Settlement Area of the Municipality. The objective of the study is to develop a comprehensive, long-term water and wastewater servicing strategy for existing and future land use.

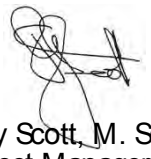
This study is being completed in accordance with the Master Plan process (Approach #2) as identified in the Municipal Class Environmental Assessment (Class EA) document (amended 2011) with the intent to satisfy the Class EA requirements for the Schedule A, A+ , and select Schedule B projects identified within the Master Plan as well as to provide the basis for future Schedule C projects.

This notice is to advise you of an upcoming Public Information Centre scheduled for this project. Please refer to the attached notice for additional details.

Should you have any further questions or concerns, please contact the undersigned or Mr. Stephen Vokes, Director of Operations, Municipality of Meaford at 519- 538-1060 or via email at svokes@meaford.ca

Yours truly,

AINLEY & ASSOCIATES LIMITED



Gary Scott, M. Sc., P. Eng.
Project Manager

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The Municipality of Meaford
Water and Wastewater Servicing Plan
NOTICE OF PHASE 1 PUBLIC INFORMATION CENTRE

The Study
Further to the Notice of Commencement (issued July 4, 2014), the Municipality of Meaford is continuing to undertake the completion of a Water and Wastewater Servicing Master Plan with the objective of developing a comprehensive, long-term water and wastewater servicing strategy for existing and future land use within the Urban Settlement Area of the Municipality. The process involves the assessment of the existing servicing infrastructure to identify necessary upgrades and future servicing priorities.

Problem Statement
The Study will identify specific upgrades/expansions/extensions of the existing wastewater collection and treatment system and the existing water treatment, distribution and storage system that are necessary to meet the needs of growth in the Urban Settlement area of the Municipality of Meaford.

The Process
This study is being completed in accordance with the Master Plan process as identified in the Municipal Class Environmental Assessment (Class EA) document (amended 2011). It will follow Approach #2 with the intent to fulfill the Class EA requirements for the Schedule A, A+, and select Schedule B projects identified within the Master Plan as well as to provide the basis for future Schedule C projects.

Public Information Centre
A Phase 1 Public Information Centre (PIC) is planned to provide further information to the public on the Problem Statement and to receive input and comment from interested persons.

Public Information Centre (PIC)

Time:	Open House: 7:00 pm to 9:00 pm
Date:	Monday, September 15, 2014
Location:	Meaford Hall, South Gallery, 12 Nelson Street East

Public input and comment on the Problem Statement will be incorporated into the planning process. Comments will be received until Monday September 29, 2014. A future Public Information Centre (Phase 2) will be held to present the evaluation of the proposed servicing options. A Notice will be issued prior to the future PIC date.

If you have any comments or questions, or if you would like to be placed on the mailing list to receive project information, please contact the Consultant undertaking the study.

Mr. Stephen Vokes
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-1556
svokes@meaford.ca

Mr. Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
scott@ainleygroup.com

This Notice issued August 27, 2014.

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

1/14/06

Ministry of Aboriginal Affairs

160 Bloor St. East, 9th Floor
Toronto, ON M7A 2E6
Tel: (416) 326-4740
Fax: (416) 325-1066
www.aboriginalaffairs.gov.on.ca

Ministère des Affaires Autochtones

160, rue Bloor Est, 9e étage
Toronto ON M7A 2E6
Tél. : (416) 326-4740
Téléc. : (416) 325-1066
www.aboriginalaffairs.gov.on.ca

Ontario

Reference: EA#258

OCT 17 2014

Mr. Gary Scott, M.Sc., P.Eng.
Ainley & Associates Limited
550 Welham Road
Barrie, ON L4N 8Z7

RECEIVED
OCT 23 2014
AINLEY & ASSOC. LTD.

Re: Municipality of Meaford
Water and Wastewater Servicing Plan
Notice of Study Commencement

Dear Mr. Scott:

Thank you for informing the Ministry of Aboriginal Affairs (MAA) of your project. Please note that MAA treats all letters, emails, general notices, etc. about a project as a request for information about which Aboriginal communities may have rights or interests in the project area.

As a member of the government review team, the Ministry of Aboriginal Affairs (MAA) identifies First Nation and Métis communities who may have the following interests in the area of your project:

- reserves;
- land claims or claims in litigation against Ontario;
- existing or asserted Aboriginal or treaty rights, such as harvesting rights; or
- an interest in the area of the project.

MAA is not the approval or regulatory authority for your project, and receives very limited information about projects in the early stages of their development. In circumstances where a Crown-approved project may negatively impact a claimed Aboriginal or treaty right, the Crown may have a duty to consult the Aboriginal community advancing the claim. The Crown often delegates procedural aspects of its duty to consult to proponents. Please note that the information in this letter should not be relied on as advice about whether the Crown owes a duty to consult in respect of your project, or what consultation may be appropriate. Should you have any questions about your consultation obligations, please contact the appropriate ministry.

You should be aware that many First Nations and/or Métis communities either have or assert rights to hunt and fish in their traditional territories. For First Nations, these territories typically include lands and waters outside of their reserves.

In some instances, project work may impact aboriginal archaeological resources. If any Aboriginal archaeological resources could be impacted by your project, you should contact your regulating or approving Ministry to inquire about whether any additional Aboriginal communities should be contacted. Aboriginal communities with an interest in archaeological resources may include communities who are not presently located in the vicinity of the proposed project.

With respect to your project, and based on the brief materials you have provided, we can advise that the project appears to be located in an area where First Nations may have existing or asserted rights or claims in Ontario's land claims process or litigation, that could be impacted by your project. Contact information is below:

Beausoleil First Nation (Christian Island) 11 Ogemaa Miikaan Christian Island, ON L9M 0A9	Chief Roland Monague (705) 247-2051 (Fax) 247-2239 bfnchief@chimnissing.ca
Chippewas of Nawash Unceded First Nation (Cape Croker) R.R. #5, 135 Lakeshore Road WIARTON, Ontario N0H 2T0	Arlene Chegahno (519) 534-1689 (Fax) 534-2130 Reception.admin@nawash.ca
Chippewas of Saugeen R.R. #1, 6493 Hwy. 21 SOUTHAMPTON, Ontario N0H 2L0	Chief Vernon Roote (519) 797-2781 (Fax) 797-2978

For your information, MAA is aware of Métis communities that have asserted rights near your project. Contact information is below:

Great Lakes Métis Council 380 9th Street East Owen Sound, ON N4K 1P1	Peter Couture, Interim President (519) 370-0435 e-mail: osareametiscouncil@live.ca website: www.greatlakesvoyageurs.com

Please copy any correspondence to Great Lakes Métis Council to the Métis Nation of Ontario. Contact information is below:

Métis Nation of Ontario Head Office 500 Old St. Patrick Street, Unit D Ottawa, Ontario, K1N 9G4	Métis Consultation Unit Fax: (613) 725-4225

The information upon which the above comments are based is subject to change. First Nation or Métis communities can make claims at any time, and other developments can occur that could result in additional communities being affected by or interested in your undertaking.

Through Aboriginal Affairs and Northern Development (AANDC), the Government of Canada sometimes receives claims that Ontario does not receive, or with which Ontario does not become involved. AANDC's Consultation and Accommodation Unit (CAU) established a "single window" to respond to requests for baseline information held by AANDC on established or potential Aboriginal Treaty and rights. To request information from the Ontario Subject Matter Expert send an email to: UCA-CAU@aadnc-aandc.gc.ca.

Additional details about your project or changes to it that suggest impacts beyond what you have provided to date may necessitate further consideration of which Aboriginal communities may be affected by or interested in your undertaking. If you think that further consideration may be required, please bring your inquiry to whatever government body oversees the regulatory process for your project. MAA does not wish to be kept informed of the progress of the project; please be sure to remove MAA from the mailing list.

Yours truly,

Corwin Troje
Manager, Consultation Unit
Aboriginal Relations and Ministry Partnerships Division

WELCOME

MUNICIPALITY OF MEAFORD

MEAFORD - WATER & WASTEWATER SERVICING

CLASS ENVIRONMENTAL ASSESSMENT
PHASE 1 & 2

OPEN HOUSE NO. 1

SEPTEMBER 15, 2014

Background to the Class EA Process

- **Purpose of this Open House**
  - This is the first public contact under the Meaford Water & Wastewater Servicing Study aimed at determining future infrastructure needs for the community.
  - To provide a brief outline of the activities and schedule planned under the Class EA Master Planning process;
  - To inform residents and interested parties of the problem statement for the Phase 1 & 2 Master Planning.
- **Key Principles of the Class EA Process**
  - Consultation with affected parties early in and throughout the process.
  - Consideration of a reasonable range of alternatives.
  - Consideration of effects on all aspects of the environment.
  - Systematic evaluation of alternatives.
  - Documentation of the process to trace how decisions were made.

Background to the Class EA Process

Infrastructure Projects undertaken by a Municipality or by a Developer vary in their environmental impacts and are therefore classified in one of four (4) different Schedules as follows:

Schedule "A"

- generally includes normal or emergency operational and maintenance activities;
- the environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved;

Schedule "A+"

- These projects are pre-approved, however the public is to be advised prior to project implementation. The manner in which the public is advised is to be determined by the proponent;

Schedule "B"

- generally includes improvements and minor expansions to existing facilities where there is the potential for minor adverse environmental impacts and therefore the proponent is required to proceed through a screening process including consultation with those who may be affected;

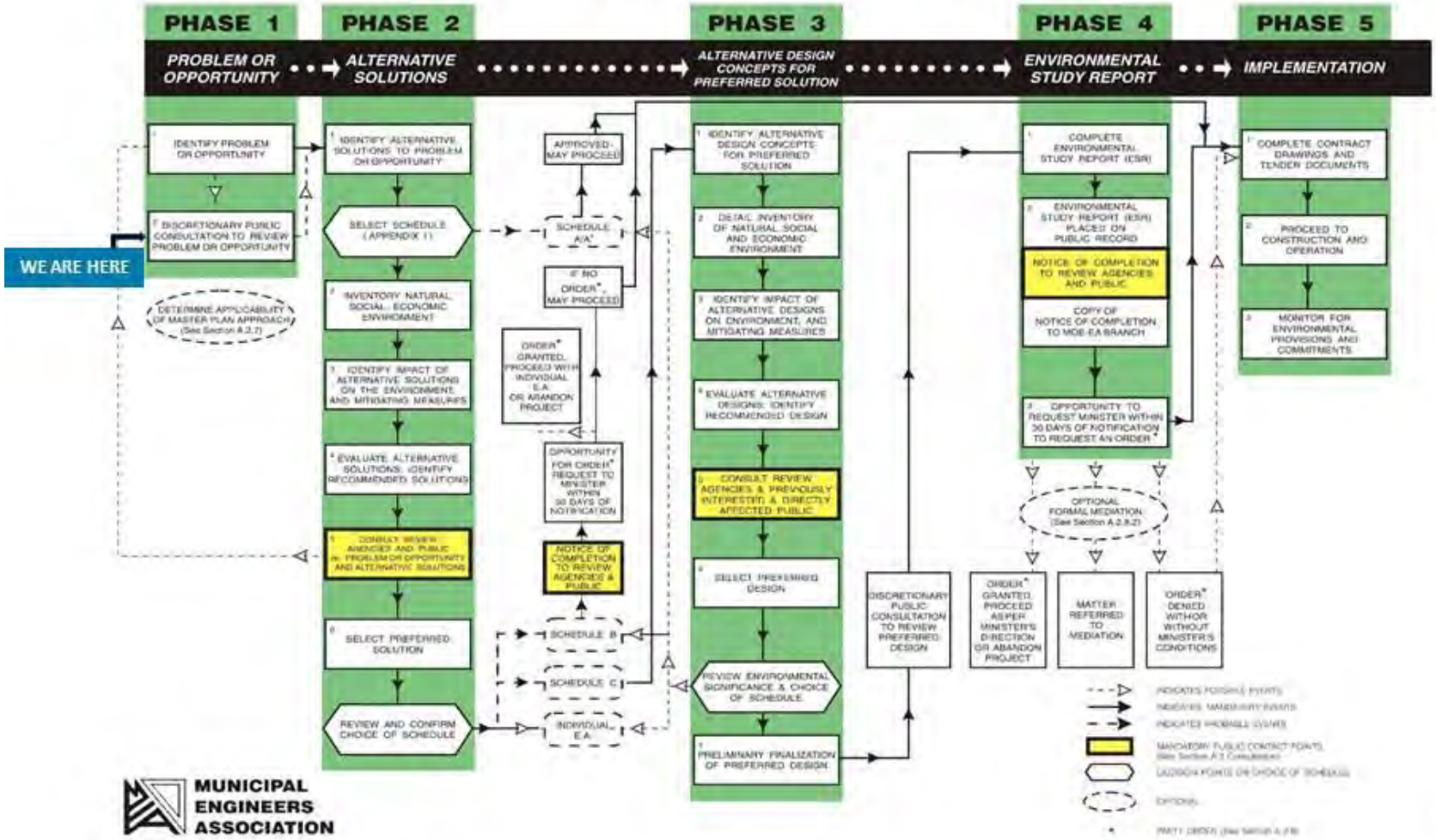
Schedule "C"

- generally includes the construction of new facilities and major expansions to existing facilities and these projects proceed through the full environmental assessment planning process outlined in the Class EA;

Meaford – Water & Wastewater Servicing Class Environmental Assessment (Phase 1 & 2)

EXHIBIT A.2 MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA



MUNICIPAL ENGINEERS ASSOCIATION

Meaford Servicing Master Plan (Phase 1 & 2)

- In June of 2014 Ainley was authorized to proceed with the Meaford Water & Wastewater Servicing Master Plan (Class EA Phase 1 & 2) for the Municipality of Meaford.
- The purpose of this study is to identify water and wastewater solutions for the existing community and to accommodate the future growth as identified in the Grey County Growth Management Strategy and the Municipality's Official Plan.
- A Notice of Study Commencement was published in the local newspapers on July 9th and July 16th and sent to appropriate Review Agencies.
- The urban area to be studied is shown on the adjacent map.
- The study will define problems associated with the existing infrastructure and develop preferred solutions to solve these problems and meet the needs of growth.

Study Area



POPULATION

- Future population projections for Meaford are outlined in the Grey County Growth Management Strategy Report and the Municipality's Official Plan.
- Based on the Growth Report forecast the Municipality is expected to grow at an upper range of 1% per year .
- The Meaford Official Plan encourages growth within the urban area, however, the Grey County forecast may still be considered an upper limit projection.
- Census data from Statistics Canada shows the 2011 urban area population at 4,992 an increase of 306 from the 2006 population representing an increase of 1.3% per year, however, more recently growth has been substantially lower.
- Longer term historical growth in the urban area has remained closer to 0.5% per year.
- For the purpose of this study the population of the study area is expected to grow in line with the longer term historical trends as illustrated on the attached graph.



*2006, 2011 populations based on StatsCan census data. Projected population based on Grey County Growth Management Strategy

Vacant Lands Designation Within Study Area

- Vacant Lands within the study area are zoned as residential, commercial, industrial, or institutional.

Zone	Vacant Area (Ha)	Equivalent Units	ADF Sewage Flow m^3/d	MDD Water Demand m^3/d
Urban Living Area >0.2 Ha	97.8	1427.9	642.5	1028
Urban Living Area <0.2 Ha	9.18	45.9	20.6	33
Urban Living Area with Proposal	23.99	593	266.9	427.2
Highway Commercial	19.52	---	546.6	874.5
Downtown Commercial	1.1	90	67.2	107.6
Industrial	28.54	---	799.1	1,278.6
Special Policy Area 1	5.56	278	280.8	449.2
Special Policy Area 2	3.479	174	175.7	281.1
Total	**189.17**	**2608.8**	**2799.5**	**4,479.2**

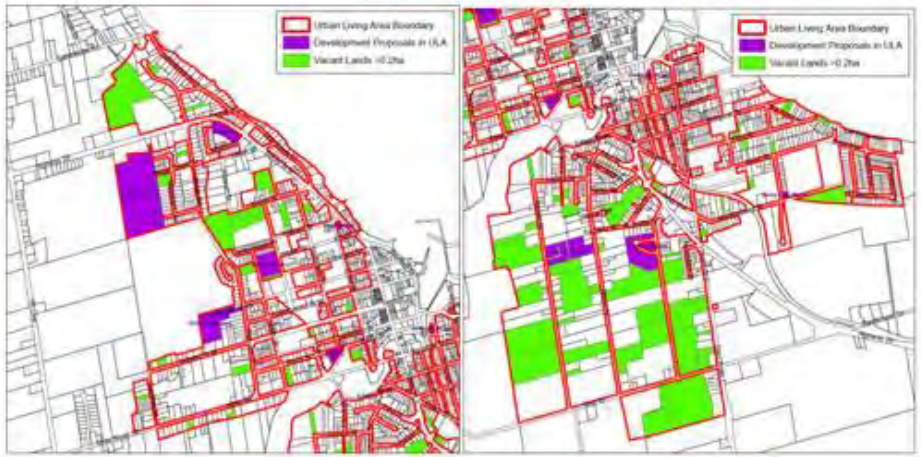
Land Use, Downtown Commercial



Land Use - Institutional



Land Use, Residential

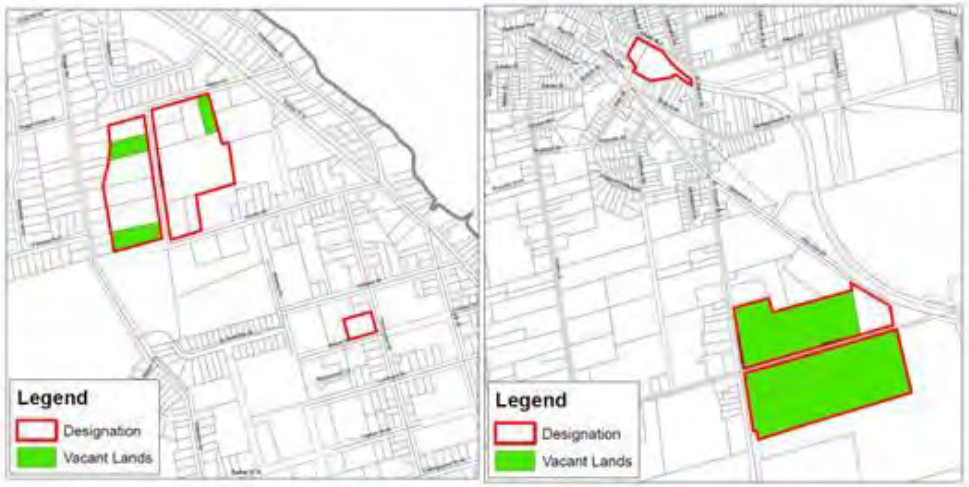


Vacant Lands Designation Within Study Area

Assuming that all vacant land is developed to the planning densities within the Official Plan, the following chart outlines the ultimate design parameters.

Parameter	Unit
Ultimate Additional ADF Sewage Flow	2,800 m3/d
Total ADF Sewage Flow	5,400 m3/d
Ultimate Additional MDD Water Demand	4,480 m3/d
Total MDD Water Demand	6,980 m3/d
Additional Equivalent Population	6,220
Total Equivalent Population	12,000

Land Use, Industrial



Land Use, Highway Commercial



Meaford Master Plan (Phase 1 & 2)

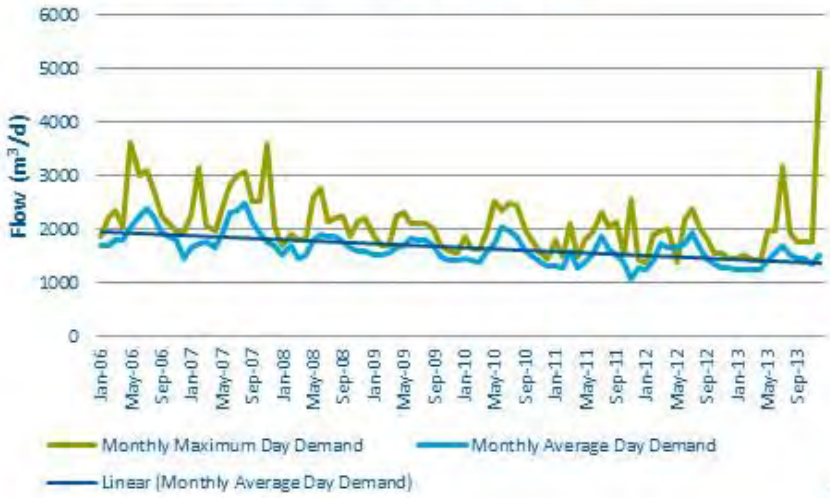
STATE OF WATER SUPPLY INFRASTRUCTURE

- Meaford Water Treatment Plant (WTP) has rated capacity of 26,848 m^3/day
- The Average Day Demand (ADD) over the past 3 years was 1,460 m^3/day
- The Maximum Day Demand (MDD) over the past 3 years was 2,374 m^3/day which is 8.8% of the rated capacity of the WTP and is 18.4% of the design capacity of a single highlift pump (149.2L/s) at the WTP. There is more than adequate capacity to provide the current MDD supply and for substantial growth.
- The WTP is in good condition and is in full compliance with regulations. The plant recently underwent control system upgrades which were completed in 2013.
- The St. Vincent Booster Pump Station was constructed in 2010 and remains in good condition.
- The Nelson Street Booster Pump Station does not comply with MOE design guidelines and does not provide adequate pressures under all demand conditions.
- The total storage within the system is 2,880 m^3 and the required storage based on MOE design guidelines is 2,166 m^3. There is adequate storage for existing demands and fire flow requirements.
- The water distribution system is in good to fair condition. As expected with any aging system, older pipes will have to be replaced to maintain the integrity of the system.
- Meaford water demand has declined gradually over the last 8 years and compares favourably with some of the more efficient municipalities.

Per Capita Water Demand Comparison

Parameter	Municipality	Flow Rate
Average Day Demand	Meaford	272 L/cap/day
	York Region	278 L/cap/day
	Bradford West Gwillumbury	300 L/cap/day
	Kleinburg	347 L/cap/day
	Grey Highlands	350 L/cap/day
	Markham	365 L/cap/day
	Town of New Tecumseth	373L/cap/day
	East Gwillumbury	504 L/cap/day

Historical Flow Data (2006-2013)



Meaford Master Plan (Phase 1 & 2)

STATE OF WASTEWATER TREATMENT INFRASTRUCTURE

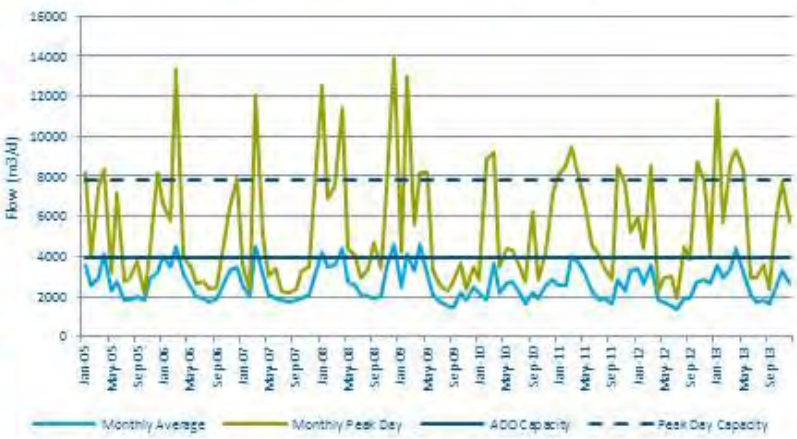
- Meaford Wastewater Treatment Plant has a rated capacity of 3,910 m^3/d.
- The Average Daily Flow (ADF) over the past 3 years was 2,600 m^3/d.
- Hydraulic reserve capacity for the plant is therefore 1,310 m^3/d, equivalent to an additional 1,210 residential units.
- Average Biological Oxygen Demand (BOD) (120 mg/L) and Total Suspended Solids (TSS) (137 mg/L) influent concentrations represent a fairly weak sewage strength, likely due to high stormwater inflow and infiltration levels.
- Peak flows to the plant also reflect a high degree of stormwater inflow and this affects the capacity of specific treatment processes.
- The plant meets the present effluent limits for discharge to Georgian Bay.
- Components of the original plant constructed in 1969 require extensive upgrades including:
  - Secondary clarifier mechanisms
  - Main electrical panel
- The plant has no separate grit removal process.
- The plant has no automated control systems.
- The UV disinfection system requires an additional module for standby capacity.
- The plant will require an ongoing program of major maintenance due to the age of the equipment and systems.
- An EA for plant expansion in 2007 established new effluent criteria for the plant. Upgrades may be required to meet more stringent nutrient removal requirements.

Meaford Master Plan (Phase 1 & 2)

STATE OF WASTEWATER COLLECTION INFRASTRUCTURE

- Sewage Pumping Station 1 near the Big Head River is in good physical condition but would benefit from control system upgrades.
- Sewage Pumping Station 2 at the WWTP is in good physical condition but the station would benefit from control system upgrades.
- Sewage Pumping Station 3 on Sykes Street is in good physical condition but would benefit from control system upgrades.
- Sewage collection network is aging and experiences high levels of inflow and infiltration, Average Daily Flow (ADF) rates are equivalent to 530 L/cap/day.
- Sewer upgrades are being identified through an Inflow and Infiltration Study being completed concurrently with the Master Servicing Study.

Historical Flow Data (2005 - 2013)



Per Capita Flow Rate Comparison

Parameter	Municipality	Flow Rate
Sewage Generation Rate	Town of New Tecumseth	229 L/cap/day
	Bradford West Gwillumbury	370 L/cap/day
	Kleinburg	417 L/cap/day
	Meaford	**530 L/cap/day**

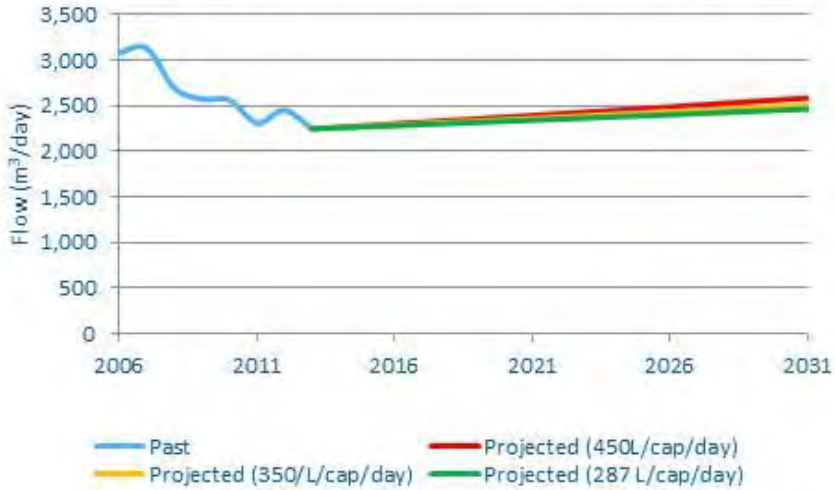
Serviced Population

EXISTING AREA	NUMBER OF UNITS	EQUIVALENT POPULATION
Existing Serviced, Urban Area (Committed)	2,512	5,262
Existing Unserviced (Committed)	254	607
Approved Developments, Urban Area (Committed)	127	305
TOTAL EXISTING HOUSEHOLDS/EQUIVALENT POPULATION	**2,893**	**6,174**

Meaford Master Plan (Phase 1 & 2)

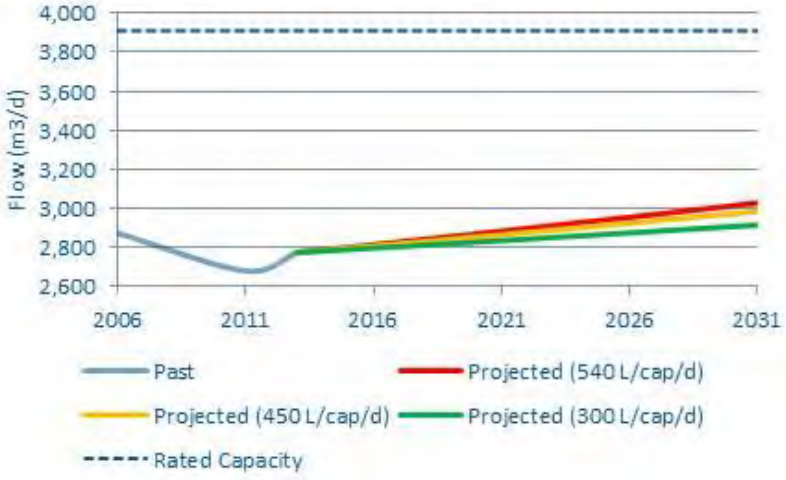
WATER AND WASTEWATER FLOW PROJECTIONS

Projected Water Demand (Max Day)



- The MOE Design Guidelines suggest that water systems should be based on 450 L/cap/day on the high range.
- Based on data from other Municipalities in Ontario, the average water use is about 350L/cap/day
- The average of the past three years per capita flow rate in the Municipality of Meaford is 287 L/cap/day.
- The water treatment plant capacity is 26,848 m³/day, which is significantly larger than the historical demands.

Projected Sewage Flow



- The Municipality presently allots reserve capacity to planned developments on the assumption that the average household has 2.4 persons , each contributing 540 L/day of sewage flows.
- MOE design guidelines suggest the design of sewage systems should be based on an average flow rate of 450 L/cap/day.
- Some Municipalities in Ontario have been able to achieve low per capita flow rates through a combination of water use reduction strategies and the elimination of inflow and infiltration issues.
- Projected sewage flow assumes no inflow and infiltration mitigation takes place.

Meaford Master Plan (Phase 1 & 2)

EVALUATION CRITERIA

The criteria to be used for evaluation of alternative solutions for water and wastewater projects are set out in the approved MEA Class EA document. Based on the nature of the study area, the potential projects and the values of the community, a suggested weighting has been developed for use in the evaluation process. The criteria and weighting are presented in the table below:

The Master Planning process will result in the determination of infrastructure needed to sustain the existing community and service growth within the urban area of Meaford.

The evaluation criteria will be used to compare viable alternative solutions meeting infrastructure needs on a consistent basis.

The Master Planning process will determine the need for improvements to existing infrastructure and/or the need for new infrastructure. Upgrades could include watermain or sewermain replacements, treatment plant expansions or upgrades and pumping station expansions or upgrades. New infrastructure that may be needed includes water storage facilities, water pumping stations, sewage lift stations and/or watermain/sewermain extensions.

The alternative solutions that score highest based on the ranking system will become the recommended preferred solutions from the Master Planning process.

Criteria	Sub-Criteria	Weighting (%)
Land Use Planning		15
Natural Environment		10
Social Environment		20
	Air Quality, Noise and Vibration	10
	Quality of Life	5
	Community Accessibility	5
Cultural Environment		10
	Archaeological	5
	Heritage Features	5
Technical Considerations		25
	Performance	5
	Technical Suitability	5
	Phasing	5
	Construction Considerations	5
	Operational Considerations	5
Economic Considerations		20
	Capital Cost	10
	Operating Costs	10
Total Weighting		100

Meaford Master Plan (Phase 1 & 2)

PROBLEM STATEMENT

The Meaford Water and Wastewater systems must continue to meet the needs of the community in the most economical and sustainable manner, in full compliance with regulations, and with minimal impact on the natural environment. As such, the existing systems have been reviewed to identify and define their condition, compliance and performance-related issues that might affect the ability of the systems to meet future needs. As a result, this master servicing study will address:

Water Supply

- The replacement/ rehabilitation of undersized and older watermains to provide adequate pressures and fire flows within the existing community
- Existing pressure zone boundaries and booster pumping station requirements to provide for replacement of the existing Nelson St. Booster Pumping Station, to meet the needs of growth in the study area and to provide a reliable and secure system.
- Additional watermains to meet the needs of growth in the study area.
- Water storage to meet the needs of growth in the study area and to provide a reliable and secure system.

Wastewater Collection

- The replacement/ rehabilitation of deficient sewermains identified through inflow/infiltration studies
- Components of the Wastewater Treatment plant are over 45 years old and require upgrading to meet future needs
- Peak flows to the Watewater Treatment plant exceed the design capacity of some treatment processes.
- Improvements to the plant control systems have the potential to improve plant performance and reduce energy use.
- An addendum to the 2007 Schedule "C" Class EA will be required to address revised flow projections and to take account of reductions to peak flows as a result of wastewater system improvements
- Upgrades may be required to meet the revised effluent requirements.

Meaford Master Plan (Phase 1 & 2)

WHATS NEXT?

- Comments will be received on the Phase 1 problem statement and taken into consideration in finalising the problem statement.
- During Phase 2 of this Class EA, the existing problems will be further analysed and alternative solutions will be developed.
- Alternatives to meet the needs of growth will also be developed.
- All viable alternatives will be evaluated using the agreed evaluation criteria and preferred solutions will be identified and presented to the public and interested parties in a future Public Information Centre.
- Comments will be received on the recommended preferred solutions and taken into consideration in developing the Master Servicing Plan.
- The Master Servicing Plan will be made available for public comment for a 30-day period.
- Comments received on the Master Servicing Study will be addressed before issuance of the Notice of Completion.

WHAT CAN YOU DO?

- Add your name to the Mailing List and stay Informed
  - Fill out a comment sheet
  - Send your comments to:

Mr. Stephen Vokes
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, ON, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-5599
Email: operations@meaford.ca

Mr. Gary Scott, P.Eng.
Project Manager
Ainley & Associates Limited
280 Pretty River Parkway,
Collingwood, ON, L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
Email: scott@ainleygroup.com

The Municipality of Meaford
Water and Wastewater Servicing Plan
Class Environmental Assessment

PUBLIC INFORMATION CENTRE

September 15, 2014

SIGN IN SHEET – PLEASE PRINT

NAME	ADDRESS	TELEPHONE NO.	E-MAIL ADDRESS

The Municipality of Meaford
Water and Wastewater Servicing Plan
Class Environmental Assessment

Public Information Centre – September 15, 2014
7:00 p.m. to 9:00 p.m. – Meaford Hall, South Gallery, 12 Nelson Street East

COMMENT SHEET

Please print all responses.

NAME OF RESPONDENT:

REPRESENTING (Agency, Municipality, Property Owner, Tenant, etc.):

ADDRESS (Including Postal Code, Telephone Number & Email Address):

COMMENTS (Please use the back of this sheet if necessary)

Do you wish to be informed of additional PICs and the publication of the Notice of Study Completion?

☐ Yes ☐ No

Please submit this comment sheet by September 29, 2014 to:

Mr. Stephen Vokes
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-1556
svokes@meaford.ca

Mr. Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
scott@ainleygroup.com

Ainley & Associates Limited
280 pretty River Parkway, Collingwood, Ontario, L9Y 4J5
Tel: (705) 445-3451 ▪ Fax: (705) 445-0968
E-mail collingwood@ainleygroup.com

February 19, 2015. File #114106

Environment Canada – Environmental Protection Operations Division – Ontario Region
867 Lakeshore Road
P.O. Box 5050
Burlington, ON, L7R 4A6

Attn: Mr. Rob Dobos
Manager, Environmental Assessment Section

Re: Municipality of Meaford
Water and Wastewater Servicing Plan
Notice of Public Information Centre No. 2

Dear Mr. Dobos:

The Municipality of Meaford has retained the services of the Ainley Group to develop a Water and Wastewater Servicing Plan for the Urban Settlement Area of the Municipality. The objective of the study is to develop a comprehensive, long-term water and wastewater servicing strategy for existing and future land use. The Study is being conducted as a Master Plan within the MEA Class EA process.

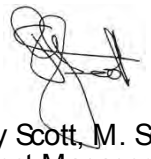
Population growth has been identified in accordance with the Municipality of Meaford's Official Plan. To meet the growth requirements and to address deficiencies within the existing water and wastewater systems, upgrades will be necessary and have been identified during Phase 2 of the study. Alternative solutions for both water and wastewater servicing have been evaluated and recommendations established.

This notice is to advise you of an upcoming Public Information Centre No. 2 scheduled for this project. The evaluation and recommendations for the alternative solutions of each capital project will be presented at the upcoming Public Information Centre No. 2. Please refer to the attached notice for additional details.

Should you have any further questions or concerns, please contact the undersigned or Mr. Stephen Vokes, Director of Operations, Municipality of Meaford at 519- 538-1060 or via email at svokes@meaford.ca

Yours truly,

AINLEY & ASSOCIATES LIMITED



Gary Scott, M. Sc., P. Eng.
Project Manager

The Municipality of Meaford
Water and Wastewater Servicing Plan
NOTICE OF PHASE 2 PUBLIC INFORMATION CENTRE

The Study
Further to the Notice of Commencement (issued July 4, 2014) and the Phase 1 Notice of Public Information Centre (August 27, 2014), the Municipality of Meaford is continuing to undertake the completion of a Water and Wastewater Servicing Master Plan with the objective of developing a comprehensive, long-term water and wastewater servicing strategy for existing and future land use within the Urban Settlement Area of the Municipality. The process involves the assessment of the existing servicing infrastructure to identify necessary upgrades and future servicing priorities.

Problem Statement
The Study will identify specific upgrades/expansions/extensions of the existing wastewater collection and treatment system and the existing water treatment, distribution and storage system that are necessary to upgrade existing infrastructure and to meet the needs of growth in the Urban Settlement area of the Municipality of Meaford.

Alternative Solutions
During Phase 2 of the study, alternative solutions were identified and analyzed for each component of the project to find the most appropriate solution for the Municipality of Meaford including do nothing and limit/ manage growth. Preferred Alternative Solutions have been established for the Meaford Wastewater Treatment and Collection System and for the Meaford Water Supply System.

Public Information Centre
A Phase 2 Public Information Centre (PIC) is planned to present the evaluation of the proposed servicing alternatives and to receive input and comment from interested persons.

Public Information Centre (PIC)

Time:	Open House: 7:00 pm to 9:00 pm
Date:	Thursday, February 26, 2015
Location:	Meaford Hall, South Gallery, 12 Nelson Street East

Public input and comment on the Problem Statement will be incorporated into the planning process. Comments will be received until Thursday March 12, 2015.

If you have any comments or questions, or if you would like to be placed on the mailing list to receive project information, please contact the Consultant undertaking the study.

Mr. Stephen Vokes, P. Eng.
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-1556
svokes@meaford.ca

Mr. Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
scott@ainleygroup.com

This Notice issued February 19, 2015.

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Ministry of Transportation

Engineering Office
Corridor Management Section
West Region

659 Exeter Road
London, Ontario N6E 1L3
Telephone: (519) 873-4596
Facsimile: (519) 873-4228

Ministère des Transports

Bureau du génie
Section de gestion des couloirs routiers
Région de l'Ouest

659, chemin Exeter
London (Ontario) N6E 1L3
Téléphone: (519) 873-4596
Télécopieur: (519) 873-4228

Ontario

February 26, 2015

Mr. Gary Scott, P. Eng.
Project Manager
Ainley & Associates Limited
550 Welham Road
Barrie, ON
L4N 8Z7

Dear Mr. Scott:

RE: Municipality of Meaford
Water and Waste Water Servicing Plan
Notice of Public Information Centre No. 2

The Ministry of Transportation (MTO) is in receipt of your letter dated February 19, 2015, and provides the following comments.

MTO still has an interest in this study as it may have impacts on the Highway 26 corridor. Unfortunately MTO staff is unavailable to attend Public Information Centre No. 2 in person. Therefore, would you please provide our office with a copy of the display boards for our review and comment. You can email PDF's of the display boards to me directly.

MTO advises that new or proposed servicing infrastructure should not be placed within the Highway 26 property limits. The study should be evaluating other alternatives other than the Highway 26 corridor.

MTO wishes to continue to be on the circulation list and be involved in this study as it proceeds.

Should you have any questions, please feel free to contact our office.

Yours truly,

Ken Teasdale
Senior Project Manager
Corridor Management Section
Email: Ken.Teasdale@ontario.ca

CHIPPEWAS OF THE THAMES FIRST NATION

March 5, 2015

Gary Scott, M. Sc., P.Eng
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5

Subject: **The Municipality of Meaford, Water and Wastewater Servicing Plan**
Notice of Phase 2 Public Information Centre

Dear Gary,

We are in receipt of correspondence of the aforementioned project.

In our screening of your correspondence we have identified no concerns with your project or the information that you have presented to us at this time. We feel that due to the scope of your project, we will no longer need to receive regular updates.

We ask that if there are any changes to your project that are of a substantive nature that you keep us informed.

Thank you for notifying Chippewa of the Thames First Nation.

Sincerely,

Fallon Burch
Chippewa of the Thames
Consultation Coordinator

c: Stephen Vokes P.Eng, Director of Operations, Municipality of Meaford

320 Chippewa Road, Muncey, ON N0L 1Y0
Ph: 519-289-5555 Fax: 519-289-2230
info@cottfn.com www.cottfn.com

Ministry of Transportation

Engineering Office
Corridor Management Section
West Region

659 Exeter Road
London, Ontario N6E 1L3
Telephone: (519) 873-4596
Facsimile: (519) 873-4228

Ministère des Transports

Bureau du génie
Section de gestion des couloirs routiers
Région de l'Ouest

659, chemin Exeter
London (Ontario) N6E 1L3
Téléphone: (519) 873-4596
Télécopieur: (519) 873-4228

Ontario

March 10, 2015

Mr. Gary Scott, P. Eng.
Project Manager
Ainley & Associates Limited
550 Welham Road
Barrie, ON
L4N 8Z7

Dear Mr. Scott:

RE: Municipality of Meaford
Water and Waste Water Servicing Plan
Notice of Public Information Centre No. 2

The Ministry of Transportation (MTO) has reviewed the Public Information Centre No. 2 display boards provided via email on February 27, 2015, and provides the following comments.

Based on our review of the Public Information Centre No. 2 display boards, it would appear that the recommended solutions for the Meaford Water and Wastewater systems should not have any direct impact to the Highway 26 corridor. However, with that said, MTO advises that should new servicing infrastructure be proposed, the study should evaluate alternatives other than placement within the Highway 26 corridor.

MTO wishes to continue to be on the circulation list and be involved in this study as it proceeds.

Should you have any questions, please feel free to contact our office.

Yours truly,

Ken Teasdale
Senior Project Manager
Corridor Management Section

Aundeck-Omni-Kaning First Nation
Administration Office
13 Hill St., R.R. #1, Comp 21
Little Current, Ontario P0P 1K0
Phone: (705)-368-2228
Fax: (705) 368-3563

MAR 0 5 2015
AINLEY & ASSOC. LTD.

To	Seen
JGS	
FILE No.	

March 2, 2015

Ainley & Associates Ltd.
Attn: Gary Scott, Project Manager
280 Pretty River Parkway
Collingwood, Ontario L9Y 4J5

Dear Mr. Gary Scott:

Re: Consultation on Water and Wastewater Servicing Plan – Municipality of Meaford

The recent correspondence notifying changes, amendments, alterations and/or modifications to existing physical land and water structures has been received and acknowledged by the Aundeck Omni Kaning First Nation.

The proposed developments are within or will affect First Nation communities of the Robinson Huron Treaty and/or the Manitoulin Treaty area either directly or indirectly which is a matter of concern. As per legislation, the "duty to consult" with First Nations is an imperative rule of law and thank you for observing and respecting the First Nation right to be consulted on these matters.

As part of the "duty to consult", we would like to express our appreciation for your efforts to include the Aundeck Omni Kaning in all correspondence related to this matter. Further interest or need for direct consultation is not required at this time, however, it is still the duty to inform and consult those First Nations who will require or be affected by this proposal.

On behalf of the Chief and Council of the Aundeck Omni Kaning (AOK) First Nation, our sincerest best wishes with your future project and endeavors proposed for future development.

Thank you for your time and consideration in this matter.

Sincerely,

Chief Patsy Corbiere

"Taking Care of Our Future"

WELCOME

MUNICIPALITY OF MEAFORD

MEAFORD - WATER & WASTEWATER SERVICING

CLASS ENVIRONMENTAL ASSESSMENT
PHASE 2

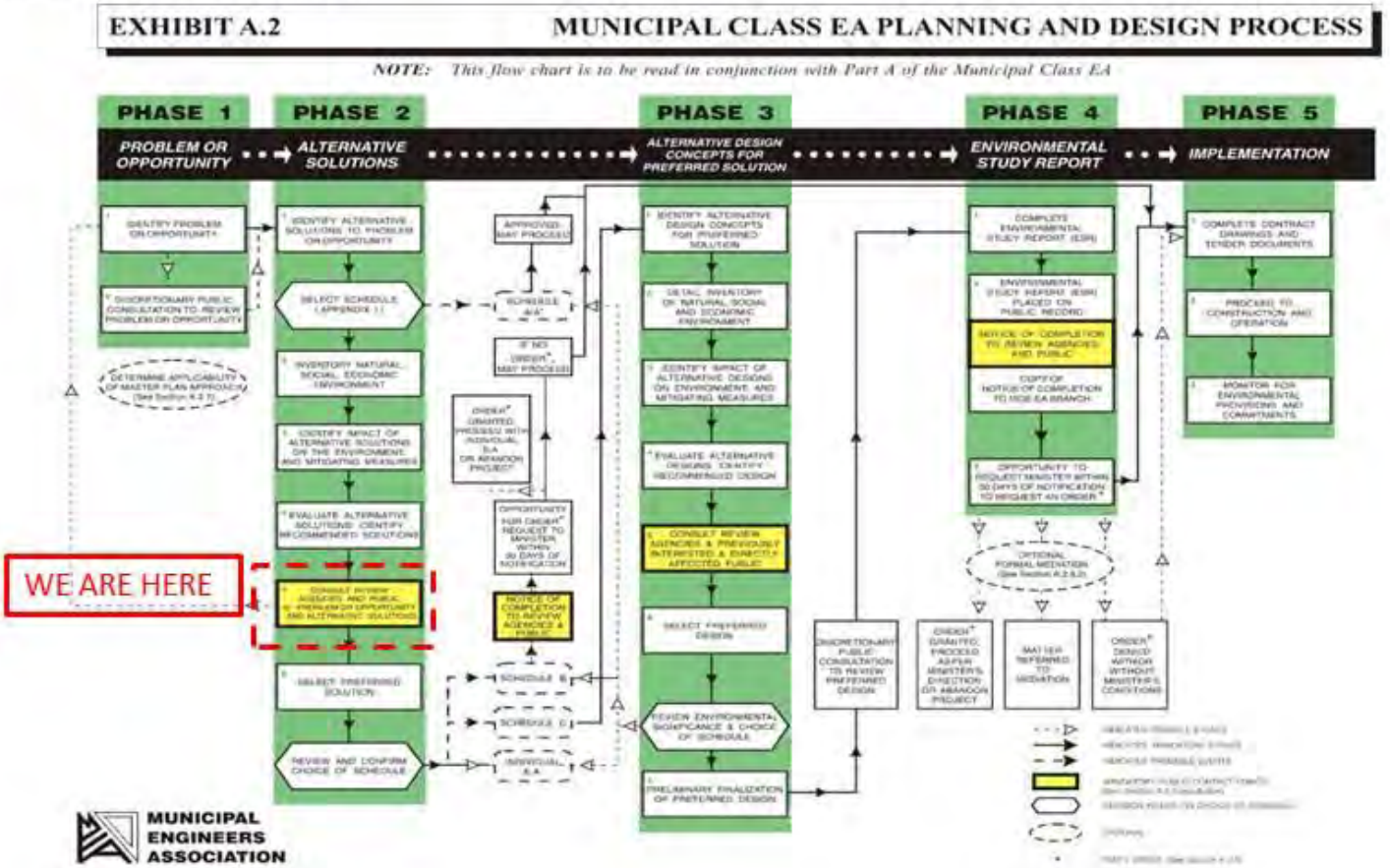
OPEN HOUSE NO. 2

February 26, 2015

Background to the Class EA Process

- Purpose of this Open House
  - This is the second public contact under the Meaford Water & Wastewater Servicing Study aimed at determining future infrastructure needs for the community.
  - To outline and present the recommended solution for each section of the project under the Class EA Master Planning process;
  - To inform residents and interested parties of the Phase 2 Master Planning results.
- Key Principles of the Class EA Process
  - Consultation with affected parties early in and throughout the process.
  - Consideration of a reasonable range of alternatives.
  - Consideration of effects on all aspects of the environment.
  - Systematic evaluation of alternatives.
  - Documentation of the process to trace how decisions were made.

This Project is being planned in accordance with the Municipal Engineer's Association's (MEA) Municipal Class Environmental Assessment (October 2000, as amended in 2007 & 2011) document. The MEA Planning and Design Process Flow Chart is provided for public information. At the present time, the Meaford Water and Wastewater Servicing Class Environmental Assessment is in Phase 2.



Background to the Class EA Process

Infrastructure Projects undertaken by a Municipality or by a Developer vary in their environmental impacts and are therefore classified in one of four (4) different Schedules as follows:

Schedule "A"
- generally includes normal or emergency operational and maintenance activities;
- the environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved;

Schedule "A+"
- These projects are pre-approved, however the public is to be advised prior to project implementation. The manner in which the public is advised is to be determined by the proponent;

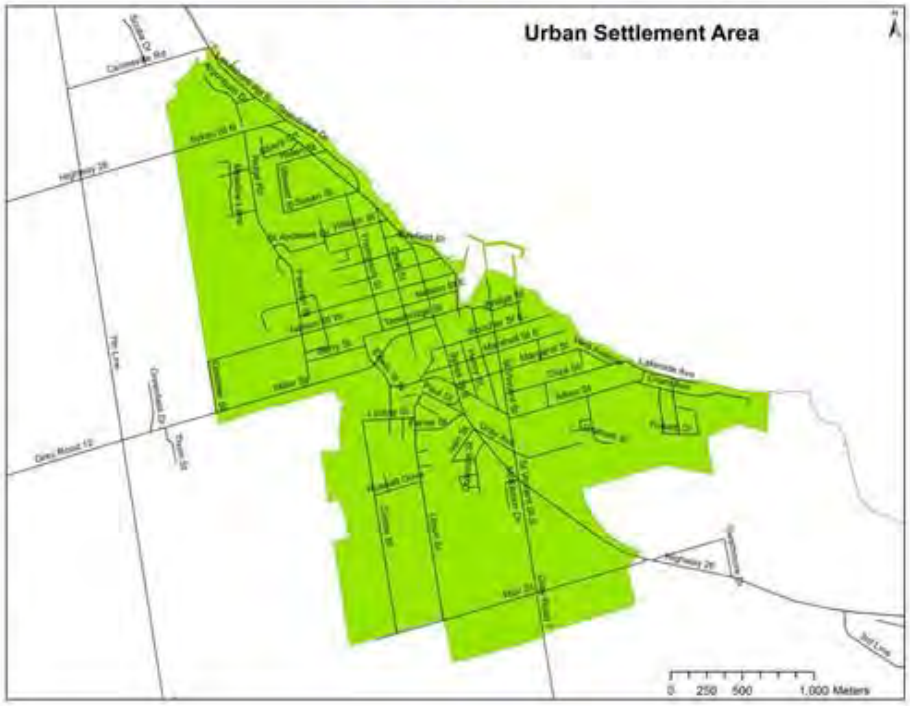
Schedule "B"
- generally includes improvements and minor expansions to existing facilities where there is the potential for minor adverse environmental impacts and therefore the proponent is required to proceed through a screening process including consultation with those who may be affected;

Schedule "C"
- generally includes the construction of new facilities and major expansions to existing facilities and these projects proceed through the full environmental assessment planning process outlined in the Class EA;

Meaford Servicing Master Plan

- In June of 2014 Ainley was authorized to proceed with the Meaford Water & Wastewater Servicing Master Plan (Class EA Phase 1 & 2) for the Municipality of Meaford.
- The purpose of this study is to identify water and wastewater solutions for the existing community and to accommodate the future growth as identified in the Grey County Growth Management Strategy and the Municipality's Official Plan.
- A Notice of Study Commencement was published in the local newspapers on July 9th and July 16th and sent to appropriate Review Agencies.
- The urban area to be studied is shown on the adjacent map.
- The study will define problems associated with the existing infrastructure and develop preferred solutions to solve these problems and meet the needs of growth.

Study Area



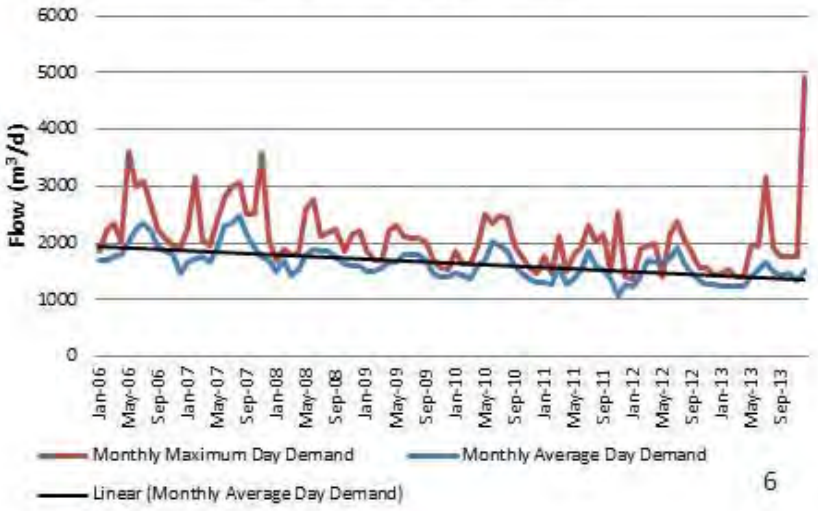
State of Water Supply Infrastructure

- **Meaford Water Treatment Plant (WTP) has rated capacity of 26,848 m^3/day**
- The Average Day Demand (ADD) over the past 3 years was 1,460 m^3/day
- The Maximum Day Demand (MDD) over the past 3 years was 2,374 m^3/day which is 8.8% of the rated capacity of the WTP and is 18.4% of the design capacity of a single highlift pump (149.2L/s) at the WTP. There is more than adequate capacity to provide the current MDD supply and for substantial growth.
- The WTP is in good condition and is in full compliance with regulations. The plant recently underwent control system upgrades which were completed in 2013.
- The St. Vincent Booster Pump Station was constructed in 2010 and remains in good condition and operates as a closed zone with no storage.
- The Nelson Street Booster Pump Station does not comply with MOECC design guidelines and does not provide adequate pressures under all demand conditions.
- The total storage within the system is 2,880 m^3 and the required storage based on MOECC design guidelines is 2,166 m^3. There is adequate storage for existing demands and fire flow requirements.
- The water distribution system is in good to fair condition. As expected with any aging system, older pipes will have to be replaced to maintain the integrity of the system.
- Meaford water demand has declined gradually over the last 8 years and compares favourably with some of the more efficient municipalities.

Per Capita Water Demand Comparison

Parameter	Municipality	Flow Rate
Average Day Demand	**Meaford**	**272 L/cap/day**
	York Region	278 L/cap/day
	Bradford West Gwillumbury	300 L/cap/day
	Kleinburg	347 L/cap/day
	Grey Highlands	350 L/cap/day
	Markham	365 L/cap/day
	Town of New Tecumseth	373L/cap/day
	East Gwillumbury	504 L/cap/day

Historical Flow Data (2006-2013)



State of Wastewater Treatment Infrastructure

- Meaford Wastewater Treatment Plant has a rated capacity of 3,910 m^3/d.
- The Average Daily Flow (ADF) over the past 3 years was 2,600 m^3/d.
- Hydraulic reserve capacity for the plant is therefore 1,310 m^3/d, equivalent to an additional 1,210 residential units.
- Average Biological Oxygen Demand (BOD) (120 mg/L) and Total Suspended Solids (TSS) (137 mg/L) influent concentrations represent a fairly weak sewage strength, likely due to high stormwater inflow and infiltration levels.
- Peak flows to the plant also reflect a high degree of stormwater inflow and this affects the capacity of specific treatment processes.
- The plant meets the present MOECC effluent limits for discharge to Georgian Bay.
- Components of the original plant constructed in 1969 require extensive upgrades including:
  - Secondary clarifier mechanisms
  - Main electrical panel
  - RAS/Was pumping station
  - Stand-by power generation
- The plant has no separate grit removal process.
- The plant has no automated control systems.
- The UV disinfection system requires an additional module for standby capacity.
- The plant will require an ongoing program of major maintenance due to the age of the equipment and systems.
- An EA for plant expansion in 2007 suggested new effluent limits for the plant. Upgrades may be required to meet more stringent nutrient removal requirements.

Problem Statement

The Meaford Water and Wastewater systems must continue to meet the needs of the community in the most economical and sustainable manner, in full compliance with regulations, and with minimal impact on the natural environment. As such, the existing systems have been reviewed to identify and define their condition, compliance and performance-related issues that might affect the ability of the systems to meet future needs. As a result, this master servicing study will address:

Water Supply

- The replacement/ rehabilitation of undersized and older watermains to provide adequate pressures and fire flows within the existing community
- Fluctuating water pressure caused by pump operational controls.
- Existing pressure zone boundaries and booster pumping station requirements to provide for replacement of the existing Nelson St. Booster Pumping Station, to meet the needs of growth in the study area and to provide a reliable and secure system.
- Additional watermains to meet the needs of growth in the study area.
- Water storage to meet the needs of growth in the study area and to provide a reliable and secure system.

Wastewater Collection

- The replacement/ rehabilitation of deficient sewer mains and manholes identified through inflow/infiltration studies
- Components of the Wastewater Treatment plant are over 45 years old and require upgrading to meet future needs
- Peak flows to the Wastewater Treatment plant exceed the design capacity of some treatment processes.
- Improvements to the plant control systems have the potential to improve plant performance and reduce energy use.
- An addendum to the 2007 Schedule "C" Class EA will be required to address revised flow projections and to take account of reductions to peak flows as a result of wastewater system improvements
- Upgrades may be required to meet revised effluent requirements.

Identification of Alternative Solutions

In order to deal effectively with the aspects of the problem statement, a range of practical alternatives solutions was identified for each component of the study, including 'Do Nothing' and 'Limit/Manage Growth'.

- Do Nothing
  - Due to the age of the existing components and changing Provincial Regulations, the Municipality will inevitably be required to upgrade their water and wastewater systems in order to remain in compliance and to maintain the health and safety of the citizens of Meaford. The Do Nothing alternative is therefore considered not viable and was not carried forward to the detailed evaluation stage.
- Limit/Manage Growth
  - Not all of the problems identified are a result of growth and so limiting growth would not address all of the problems. In addition, placing a limit on growth does not align with the Municipality of Meaford approved Official Plan.

Viable alternative solutions for each component were evaluated to identify a recommended preferred solution.

Evaluation Criteria

The criteria to be used for evaluation of alternative solutions for water and wastewater projects are set out in the approved MEA Class EA document. Based on the nature of the study area, the potential projects and the values of the community, a suggested criteria listing and weighting has been developed for use in the evaluation process. The criteria and weighting are presented in the table below:

- The Master Planning process will result in the determination of infrastructure needed to sustain the existing community and service growth within the urban area of Meaford.
- The evaluation criteria was used to compare viable alternative solutions meeting infrastructure needs on a consistent basis.
- Each alternative was rated between 1 and 5 on its performance under each criterion where 1 is poor performance and 5 is exceptional performance.
- The alternative solutions that score highest based on the ranking system will become the recommended solution from the Master Planning process.

Criteria	Sub-Criteria	Weighting (%)
Land Use Planning		15
Natural Environment		10
Social Environment		20
	Air Quality, Noise and Vibration	10
	Quality of Life	5
	Community Accessibility	5
Cultural Environment		10
	Archaeological	5
	Heritage Features	5
Technical Considerations		25
	Performance	5
	Technical Suitability	5
	Phasing	5
	Construction Considerations	5
	Operational Considerations	5
Economic Considerations		20
	Capital Cost	10
	Operating Costs	10
Total Weighting		100

Water System Pressure Control Alternatives

The Nelson Street Booster Station does not comply with MOE regulations and does not meet planned system demands for the zone. In addition water pressures in the main pressure zone fluctuate with pump cycles at the Water Treatment Plant and properties in the higher areas of the zone experience low pressures and intermittent pressures fluctuations up to 10 psi. Alternatives Include:

- Alternative 1 -- Expand the Nelson Street Booster Zone to include the higher areas and keep the same operating strategy controlling pumps from the elevated tank
  - Hydraulic modelling results show this does not solve the problem for the rest of the main zone
  - The cost of the Nelson Street Booster Station would increase substantially
  - In addition, the system does not require additional pumping capacity
- Alternative 2 -- Change the main zone operating strategy to a pumped pressure zone and install variable speed drives on the pumps to maintain even pressure
  - This solution provides an even pressure for all properties throughout the main pressure zone
  - Operating pressure would be higher than supplied from the existing elevated tank
  - The existing tank would be dedicated to supply the Nelson Street Boosted Zone

Alternative 2 is preferred and the best technical and lowest cost solution

Water Distribution Alternative Solutions

1. Watermain rehabilitation
   - Relining of the existing metal pipes will prevent further corrosion and oxidation of pipe interiors
   - This process does not increase the pipes structural integrity
   - Less expensive capital costs ,however, not economical for older pipes
   - Could extend service life by 30- 50 years if pipe is structurally sound
2. Watermain replacement
   - Can replace undersized pipes allowing for increased hydraulic capacity and fire protection
   - Larger capital costs, however, reduced future maintenance costs
   - The useful life of the system will be extended to the life of the new pipe

Water Distribution Recommended Solution

Criteria	Sub-Criteria	Watermain Replacement	Watermain Rehabilitation
Land Use Planning		0.75	0.75
Natural Environment		0.30	0.40
Social Environment			
	Air Quality, Noise and Vibration	0.30	0.40
	Quality of Life	0.25	0.20
	Community Accessibility	0.20	0.20
Cultural Environment			
	Archaeological	0.15	0.15
	Heritage Features	0.25	0.25
Technical Considerations			
	Performance	0.25	0.20
	Technical Suitability	0.25	0.20
	Phasing	0.25	0.20
	Construction Considerations	0.20	0.15
	Operational Considerations	0.25	0.15
Economic Considerations			
	Capital Cost	0.20	0.30
	Operating Cost	0.40	0.20
Total Weighting		4.00	3.75

The following is recommended for the Meaford water distribution system upgrade:

- Where there is a need to increase the diameter of the watermain to meet service delivery goals then the watermain should be replaced.
- Adequately sized cast iron or ductile iron watermains may be rehabilitated where the useful service life can be increased by at least 40 years, otherwise these pipes should be replaced.
- Asbestos cement pipes should be replaced rather than repaired where they are structurally inadequate.

Water Booster Pump Station (BPS) Alternative Solutions

1. BPS located on the water tower site
   - Would be constructed on municipally owned land and would not be visible from the road
   - Less expensive because less water main would be required to be installed or upgraded
   - BPS can be integrated with zone 1 operations
2. BPS located in the Meaford Community Centre & Arena parking lot
   - Would be constructed on municipally owned land but would be visible from the road
   - Both suction and discharge watermains would have to be upgraded





Water BPS Recommended Solution

Criteria	Sub-Criteria	Water Tower Site	Community Centre Site
Land Use Planning		0.75	0.60
Natural Environment		0.50	0.50
Social Environment			
	Air Quality, Noise and Vibration	0.50	0.50
	Quality of Life	0.25	0.25
	Community Accessibility	0.25	0.20
Cultural Environment			
	Archaeological	0.15	0.15
	Heritage Features	0.25	0.25
Technical Considerations			
	Performance	0.25	0.20
	Technical Suitability	0.25	0.25
	Phasing	0.15	0.15
	Construction Considerations	0.15	0.15
	Operational Considerations	0.20	0.15
Economic Considerations			
	Capital Cost	0.40	0.30
	Operating Cost	0.40	0.40
Total Weighting		4.45	4.05

- Both locations for the new booster station are viable.
- The recommended site for a new booster station is at the water tower site.
- The water tower site requires less watermain to be installed and upgraded and therefore is the cheaper option.

Water Storage Alternative Solutions

1. In-ground Storage on County Road 7
   - Due to Meaford's landscape the in-ground storage does not require pumping, allowing for secure floating storage with low energy costs
   - No large maintenance costs associated with in-ground construction
   - Less visual impact but requires more land than elevated storage
2. Elevated Storage on Centre Street
   - Also allows for secure floating storage with low energy costs
   - Requires future re-painting resulting in large maintenance costs
   - Can be used as an identifiable landmark, however, some can find it unpleasing aesthetically





Water Storage Recommended Solution

Criteria	Sub-Criteria	In-Ground Storage	Elevated Storage
Land Use Planning		0.75	0.45
Natural Environment		0.40	0.30
Social Environment			
	Air Quality, Noise and Vibration	0.30	0.40
	Quality of Life	0.25	0.25
	Community Accessibility	0.25	0.25
Cultural Environment			
	Archaeological	0.20	0.20
	Heritage Features	0.15	0.20
Technical Considerations			
	Performance	0.20	0.25
	Technical Suitability	0.20	0.25
	Phasing	0.05	0.15
	Construction Considerations	0.15	0.20
	Operational Considerations	0.20	0.25
Economic Considerations			
	Capital Cost	0.30	0.30
	Operating Cost	0.20	0.40
Total Weighting		3.60	3.85

- The recommended solution is an in-ground tank on County Road 7.
- The in-ground solution is slightly more cost effective and received the highest score from the assessment completed.

Wastewater Treatment Plant Alternative Solutions

1. Full plant expansion
   - Large upfront capital cost
   - Will provide capacity for full build-out immediately with no need for further expansion.
2. Phased plant expansion
   - Reduced upfront capital cost
   - Expansion planned in 5 phases
   - Provides flexibility in timing of expansions to respond to development pressure.
   - Significant costs for future expansions spread out over time.
3. Aeration/ Clarifier tanks and future plant expansion
   - Relatively small upfront capital cost.
   - Tanks used for temporary storage during peak flow events until full expansion is required, immediately alleviating peak flow issues.
   - Average day flow will be actively managed through an inflow and infiltration reduction program.
   - Tanks will be retrofitted to operate as aeration basins and clarifiers in the future, to reduce expansion phase costs.
   - Provides sufficient capacity for 15-20 years before further expansion is required.

Criteria	Sub-Criteria	Full Expansion	Phased Expansion	Equalization Tank
Land Use Planning		0.60	0.60	0.75
Natural Environment		0.50	0.50	0.40
Social Environment				
	Air Quality, Noise and Vibration	0.40	0.40	0.30
	Quality of Life	0.20	0.01	0.20
	Community Accessibility	0.20	0.20	0.20
Cultural Environment				
	Archaeological	0.25	0.25	0.25
	Heritage Features	0.25	0.25	0.25
Technical Considerations				
	Performance	0.20	0.20	0.15
	Technical Suitability	0.20	0.20	0.20
	Phasing	0.05	0.15	0.25
	Construction Considerations	0.15	0.15	0.20
	Operational Considerations	0.15	0.15	0.15
Economic Considerations				
	Capital Cost	0.20	0.40	0.30
	Operating Cost	0.20	0.30	0.30
Total Weighting		3.55	3.76	4.30

- Establishing the tanks for the future aeration and clarifiers to use as peak flow storage in the short term is the recommended solution.
- This solution is cost effective and will defer costs up to 20 years when the future plant expansion is needed.
- Inflow and infiltration reduction will allow the plant to be operated at a lower average daily flow and ensure effluent quality

Wastewater Collection System Alternative Solutions

1. Reduce infiltration
   - Reduce flow from ground water
   - Replace and repair broken pipes
2. Reduce inflow
   - Reduce flow from inappropriate eavestrough and sump connections
3. Reduce both inflow and infiltration
   - Significant flow reduction caused by inflow and infiltration
   - Replace and repair broken pipes

- Inflow and infiltration reduction is essential for the wastewater treatment plant recommended solution.
- By reducing inflow and infiltration there is a large reduction in wastewater treatment plant upgrade costs.
- Without inflow and infiltration reduction the syphon under the Big Head River will have to be expanded.
- A schedule for pipe rehabilitation throughout the urban area is shown in the adjacent table.

Planning Term:	Initiative:	Description:
1-5 years	Replace Identified Damaged Pipes	• Sykes Street • Ivan Street • William Street • Susan Street
	Smoke Testing	Complete smoke testing and notify home owners with illicit connections.
	Disconnection Program	Devise a program to disconnect improper sewer connections in the urban area.
	Continue MH and CCTV Inspection	Continue MH inspections and CCTV inspection of pipes in the network that have yet to be inspected
5-10 years	Replace Identified Damaged Pipe	• Farrar St. • Blake Street • Albert Street
	Monitor I/I contribution to the WWTP	Monitor and identify the amount if I/I reduction that occurred from the first 5 years of the I/I reduction plan
	Smoke Testing	Complete smoke testing if inflow is still and issue from prohibited connections
	Enact Disconnection Program	Take actions towards disconnecting improper connections that have not been rectified. For example: fine/ increase sewer charges of users who still have prohibited connections. Alternatively, fix the existing issue and charge the sewer user for the cost.
	Identify Additional Pipe Defect Locations	From the continued CCTV inspection identify additional areas of damaged pipe
10-15 years	Inflow and Infiltration Study	Complete an inflow and infiltration study to determine the impact of reduction program and identify new locations for rehabilitation.
	Replace/ Reline Identified Damaged Pipe	Fix areas of damaged sewer pipe that have been identified by the continued CCTV inspection and confirmed through I/I Study.
15-20 years	Monitor I/I contribution to the WWTP	Monitor and identify the amount if I/I reduction that occurred from the first 5 years of the I/I reduction plan
	Replace/ Reline Identified Damaged Pipe	Fix areas of damaged sewer pipe that have been identified by the continued CCTV inspection and confirmed through I/I Study.

WHAT CAN YOU DO?

- Fill out a comment sheet
- Send your comments to:

Mr. Stephen Vokes, P.Eng.
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario
N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-5599
Email: operations@meaford.ca

Mr. Gary Scott, M.Sc., P.Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, Ontario
L9Y 4J5
Tel: (705) 445-3451 ext. 147
Fax: (705) 445-0968
Email: scott@ainleygroup.com

The Municipality of Meaford
Water and Wastewater Servicing Plan
Class Environmental Assessment

PUBLIC INFORMATION CENTRE #2
February 26, 2015

SIGN IN SHEET – PLEASE PRINT

NAME	ADDRESS	TELEPHONE NO.	E-MAIL ADDRESS
JEFF Cook	536 GRANDVIEW DR.	519-538-5947.	
Ivan Alderdice	408 Ridge Road	519-538-1400	ivan@meafordgolf.com
Shirley Keaveney	0164 sykes St N.	(519) 538-1091	skeaveney@meaford.ca
Peggy Corson	134 Parklane.	519-538-5104	peggycorson@rogers.com.
Linda Poole	110 Parklane Cres	519-538-2806	dsnpooled@msn.com
D Kennedy	RR#4	519-538-4869	

The Municipality of Meaford
Water and Wastewater Servicing Plan
Class Environmental Assessment

Public Information Centre #2 – February 26, 2015
7:00 p.m. to 9:00 p.m. – Meaford Hall, South Gallery, 12 Nelson Street East

COMMENT SHEET

Please print all responses.

NAME OF RESPONDENT:

REPRESENTING (Agency, Municipality, Property Owner, Tenant, etc.):

ADDRESS (Including Postal Code, Telephone Number & Email Address):

COMMENTS (Please use the back of this sheet if necessary)

Do you wish to be informed of additional PICs and the publication of the Notice of Study Completion?

☐ Yes ☐ No

Please submit this comment sheet by September 29, 2014 to:

Mr. Stephen Vokes, P. Eng.
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-1556
svokes@meaford.ca

Mr. Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
scott@ainleygroup.com

The Municipality of Meaford
Water and Wastewater Servicing Plan
NOTICE OF STUDY COMPLETION

RECOMMENDED MASTER PLAN

Further to the Phase 2 Public Information Centre (PIC) held on February 26, 2015, the Municipality of Meaford has prepared a Master Plan following Phases 1 and 2 of the Municipal Class Environmental Assessment to determine infrastructure requirements (water and wastewater) to service existing and future development areas in accordance with Meaford's Official Plan. Based on study findings to date and comments received from the public and review agencies, the recommended solutions have been developed and are shown on plans in the Master Plan document. The Master Plan identifies the preferred infrastructure that will be needed to maintain service levels to existing customers and to service future growth while minimizing environmental impacts. The main components are listed below. While the Master Plan addresses need and justification for the proposed infrastructure on a broad level, more detailed studies/planning for specific projects listed in the Master Plan will be completed at a later date, in accordance with the Municipal Class Environmental Assessment.

RECOMMENDED PROJECTS

This Notice of Study Completion is issued with respect to the following Schedule A, A$^+$ and Schedule B projects. Schedule C Projects are subject to additional study in accordance with Phases 3 and 4 of the Municipal Class Environmental Assessment. Further notification will be issued with respect to the Schedule C Projects when they proceed to Phases 3 and 4 of the Municipal Class EA planning process.

SCHEDULE A PROJECTS – Pre-approved projects:

- Repair of Existing Meaford Watermains
- Establish New Watermains for Planned Subdivisions
- Installation of VDFs at Water Treatment Plant
- Relining/Rehabilitation of Existing Meaford Sewermains
- Establish New Sewermains for Planned Subdivisions
- Sewage Pumping Stations 1 and 2 Upgrades
- WWTP Refurbish and Demolition of Old Sludge Storage
- Upgrade UV Disinfection Chamber at WWTP
- New Odour Control System at WWTP

SCHEDULE A$^+$ PROJECTS – Pre-approved projects requiring this Notice:

- Replacement of Existing Undersized Meaford Watermains
- Establish New Meaford Watermains on:
  - Muir Street,
  - Centre Street,
  - Union Street,
  - Coleman Street,
  - St. Vincent Street.
- Establish New Meaford Sewermains on:
  - Centre Street,
  - Union Street,
  - Coleman Street,
  - St. Vincent Street,
  - Muir Street,
  - Nelson Street,
  - Miller Street,
  - Lousia Street.
- Sewage Pumping Station 3 Upgrades

SCHEDULE B PROJECTS – Activities which were subject to the Class EA screening process, and subject to this 30 day review period:

- In-Ground Storage Reservoir on County Road 7 and watermain on County Road 7
- Water Booster Pump Station on Water Tower Site
- Decommission Nelson Street Booster Pump Station
- Construction of Sewage Pumping Station 6 and forcemain adjacent Coleman Street
- Construct Storm Equalization Basin at WWTP

SCHEDULE C PROJECTS – Activities which are subject to additional study through Phases 3 and 4 of the Municipal Class EA process based on the solutions outlined in the Master Plan:

- Repurpose Storm Equalization Chamber to Clarifier/Aeration
- New Headworks Building Construction at WWTP
- New Biosolids Works at WWTP
- New UV Disinfection Channel at WWTP

PUBLIC REVIEW

The Master Plan document is available for review for a period of 30 days, at the addresses provided below from Thursday, May 14, 2015 to Friday, June 12, 2015. The Master Plan is also available on the Municipality website. The Master Plan will be reviewed and revised taking into consideration the comments which are received as a result of this Notice. The recommended Master Plan projects will be presented to Council for approval.

Municipal Administrative Building
21 Trowbridge Street West
Meaford, Ontario
Tel: 519-538-1060

Meaford Public Library
15 Trowbridge St. W.
Meaford, Ontario

COMMENTS

The Municipality is interested in receiving any comments that you may have about the projects outlined in the Master Plan. For further information you may contact either the Municipality or the Consultant undertaking the study.

During this 30-day review period, anyone who has any outstanding concerns with one or more of the Schedule B projects listed above that cannot be resolved through discussions with the Municipality of Meaford may request that the Minister of the Environment and Climate Change make an order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which addresses individual environmental assessments. Requests must be submitted to the Minister of the Environment at the Address below. Copies of the Part II Order requests should also be sent to the Study Contacts as listed below. If no request for a Part II Order is received by June 12, 2015, the Municipality of Meaford may proceed to design and construction of the Schedule B projects listed above as set out in the Master Plan.

The Honourable Glen Murray
Minister of the Environment and Climate Change
11th Floor, Ferguson Block
77 Wellesley Street West
Toronto ON M7A 2T5

STUDY CONTACTS

Mr. Stephen Vokes, P. Eng.
Director of Operations
Municipality of Meaford
21 Trowbridge Street West
Meaford, Ontario, N4L 1A1
Tel: (519) 538-1060
Fax: (519) 538-1556
svokes@meaford.ca

Mr. Gary Scott, M. Sc., P. Eng.
Project Manager
Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5
Tel: (705) 445-3451
Fax: (705) 445-0968
scott@ainleygroup.com

This Notice issued April 13, 2015.

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Appendix - E

Cost Estimates

Meaford Water Storage Class EA
2000 m³ Elevated Tank
Present Value Cost Analysis

Discount Rate: 4.00 %

Asset Description	Annual Value in Constant Year 2014 Dollars	Total Value in Constant Year 2014 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1) Capital Cost												
Tank Construction		$ 3,000,000	$ 50,000	$ 500,000	$1,950,000	$ 500,000						
Land Cost		$ -										
Engineering		$ 150,000		$ 75,000	$ 75,000							
Sub-total		$ 3,150,000	$ 50,000	$ 575,000	$2,025,000	$ 500,000	$ -	$ -	$ -	$ -	$ -	$ -
2) O&M Costs												
Hydro	$ 2,000	$ 96,000					$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
DG	$ -	$ -					$ -	$ -	$ -	$ -	$ -	$ -
Site Maintenance	$ 3,000	$ 144,000					$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Equipment Maintenance	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Labour (Inspections)	$ 5,000	$ 240,000					$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Trucks	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Sub-total	$ 11,000	$ 550,000					$ 11,000	$11,000	$11,000	$11,000	$11,000	$11,000
3) Major Maintenance												
Tank Painting or Pump Replacement	$ 500,000	$ 1,000,000										
Sub-total	$ 500,000	$ 1,000,000					$ -	$ -	$ -	$ -	$ -	$ -
Total Costs (Infrastructure and O&M Costs)		$ 4,700,000	$ 50,000	$ 575,000	$2,025,000	$ 500,000	$ 11,000	$11,000	$11,000	$11,000	$11,000	$11,000
PV Costs (Infrastructure and O&M Costs)		**$ 3,425,130**	$ 50,000	$ 552,885	$1,872,226	$ 444,498	$ 9,403	$ 9,041	$ 8,693	$ 8,359	$ 8,038	$ 7,728

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$ 11,000	$11,000	$11,000	$11,000
													$ 500,000			
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 500,000	$ -	$ -	$ -
$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$ 511,000	$11,000	$11,000	$11,000
$ 7,431	$ 7,145	$ 6,871	$ 6,606	$ 6,352	$ 6,108	$ 5,873	$ 5,647	$ 5,430	$ 5,221	$ 5,020	$ 4,827	$ 4,642	$ 207,326	$ 4,291	$ 4,126	$ 3,968

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
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$ 3,815	$ 3,668	$ 3,527	$ 3,392	$ 3,261	$ 3,136	$ 3,015	$ 2,899	$ 2,788	$ 2,680	$ 2,577	$ 2,478	$ 2,383	$ 2,291	$ 2,203	$ 2,118	$ 94,621

2059	2060	2061	2062	2063	2064	2065	2066	2067	2068
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$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
$ 1,959	$ 1,883	$ 1,811	$ 1,741	$ 1,674	$ 1,610	$ 1,548	$ 1,488	$ 1,431	$ 1,376

Meaford Water Storage Class EA
2000 m³ In-Ground Tank
Present Value Cost Analysis

Discount Rate: 4.00 %

Asset Description	Annual Value in Constant Year 2014 Dollars	Total Value in Constant Year 2014 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1) Capital Cost												
Tank Construction		$ 2,250,000	$150,000	$500,000	$1,100,000	$500,000						
Land Cost		$ 100,000	$100,000									
Engineering		$ 337,500		$293,774	$ 293,774							
Watermain		$ 503,500				$503,500						
Sub-total		$ 3,191,000	$250,000	$793,774	$1,393,774	$1,003,500	$ -	$ -	$ -	$ -	$ -	$ -
2) O&M Costs												
Hydro	$ 2,000	$ 96,000					$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
DG	$ -	$ -					$ -	$ -	$ -	$ -	$ -	$ -
Site Maintenance	$ 3,000	$ 144,000					$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Equipment Maintenance	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Labour (Inspections)	$ 5,000	$ 240,000					$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Trucks	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Sub-total	$ 11,000	$ 550,000					$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
3) Major Maintenance												
Tank Painting or Pump Replacement	$ -	$ -										
Sub-total	$ -	$ -										
Total Costs (Infrastructure and O&M Costs)		$ 3,991,047	$250,000	$ 793,774	$1,393,774	$1,003,500	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
PV Costs (Infrastructure and O&M Costs)		**$ 3,404,047**	$250,000	$ 763,244	$1,288,622	$ 892,108	$ 9,403	$ 9,041	$ 8,693	$ 8,359	$ 8,038	$ 7,728

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
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$ 7,431	$ 7,145	$ 6,871	$ 6,606	$ 6,352	$ 6,108	$ 5,873	$ 5,647	$ 5,430	$ 5,221	$ 5,020	$ 4,827	$ 4,642	$ 4,463	$ 4,291	$ 4,126	$ 3,968

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
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$ 3,815	$ 3,668	$ 3,527	$ 3,392	$ 3,261	$ 3,136	$ 3,015	$ 2,899	$ 2,788	$ 2,680	$ 2,577	$ 2,478	$ 2,383	$ 2,291	$ 2,203	$ 2,118	$ 2,037

2059	2060	2061	2062	2063	2064	2065	2066	2067	2068
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$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
$ 1,959	$ 1,883	$ 1,811	$ 1,741	$ 1,674	$ 1,610	$ 1,548	$ 1,488	$ 1,431	$ 1,376

FINAL DRAFT

Municipality of Meaford
Master Plan
Water and Wastewater Servicing
Volume 2 of 2



April 2015

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan

Project No. 114106

Prepared for:
Municipality of Meaford

Prepared By:

DRAFT

_____

Gary Scott, P.Eng.

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Municipality of Meaford

Water and Wastewater Servicing

Master Plan

Technical Memorandum

Population Growth

August 2014

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Population Growth

Project No. 114106

Prepared for:
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The Grey County Growth Management Strategy Report completed by Malone Given Parsons Ltd. was submitted to The Corporation of the County of Grey in April 2008. The report provides growth projections for municipalities within the Grey County. The population projections for the Municipality of Meaford are detailed in Table 1. Population within the municipal area is predicted to increase by approximately 5% every 5 years until 2021.

Table 1 - Population Growth for the Municipality of Meaford

	2006	2011	2016	2021	2026	2031
Municipality of Meaford	11,400	12,000	12,500	13,100	13,300	13,500

Historically, growth within the Municipality of Meaford has occurred predominantly within the rural areas. Between 2001 and 2006 the number of dwellings in the urban area increased by 104 and the number of dwellings in the rural increased by 212. This corresponds to a growth allocation of 33% in the urban area and 67% in the rural area. The Growth Management Strategy Report suggests that Municipalities should adopt policies that will encourage growth within the urban area and discourage growth in the rural area. The Municipality of Meaford was assigned a target to achieve 60% of total growth within the urban area.

The Official Plan for the Municipality of Meaford consolidated on May 14th 2014 has adopted several policies to encourage infilling and intensification of the urban area and discourage further development of the surrounding rural area. The Official Plan projects a total increase of 1,100 new households between 2006 and 2026 for a population increase of 1,900. It is the goal of the Municipality to have 990 or 90% of the additional dwellings within the urban area. For the growth within the urban area a minimum target of 10% or 99 homes are to be established through intensification.

Census data, retrieved from Statistics Canada's website on July 30th, 2014 states that the total population in 2006 for the urban area was 4,686 and increased to 4,992 by 2011, an increase of 306 residents. The population of the municipality increased from 10,948 in 2006 to 11,100 in 2011, an increase of 152 residents. This suggests that there is a net influx to the town and a net efflux from the rural area. It also suggests that the Municipalities recent efforts to promote growth within the urban area have been successful and that achieving the goal of having 90% of new residents settle in the urban area is attainable.

Assuming that the Municipality is able to continue meeting the 90% urban settlement, goal the population within the urban area is projected in Table 2. The projections in Table 2 were made by allocating 90% of the projected population increase for the Municipality to the urban area.

Table 2 - Population Growth for the Urban Area of Meaford

	2006	2011	2016	2021	2026	2031
Meaford Urban Area	4,686*	4,992*	5,442	5,982	6,162	6,342

*Statistics Canada census data.

The Schedule "C" Class EA for the WWTP completed in 2007 also provided population projections. The report presented a "Low" and "High" forecast for population growth within the municipal area as presented below.

Table 3 - 2007 Municipal Class EA Population Forecasts

	2006	2011	2016	2021	2026	2031
Low Forecast	4,811	5,932	7,438	8,944	10,450	11,957
High Forecast	4,883	6,148	8,156	10,164	12,173	14,181

The population growth anticipated under the Grey County Growth Management Strategy is considerably lower than the growth that was projected in 2007 for the Class EA of the WWTP. Based on the current growth over the past 8 years the forecast from the Grey County report appears to be more in-touch with the actual trends. A comparison of the growth forecasts is presented in Figure 1.

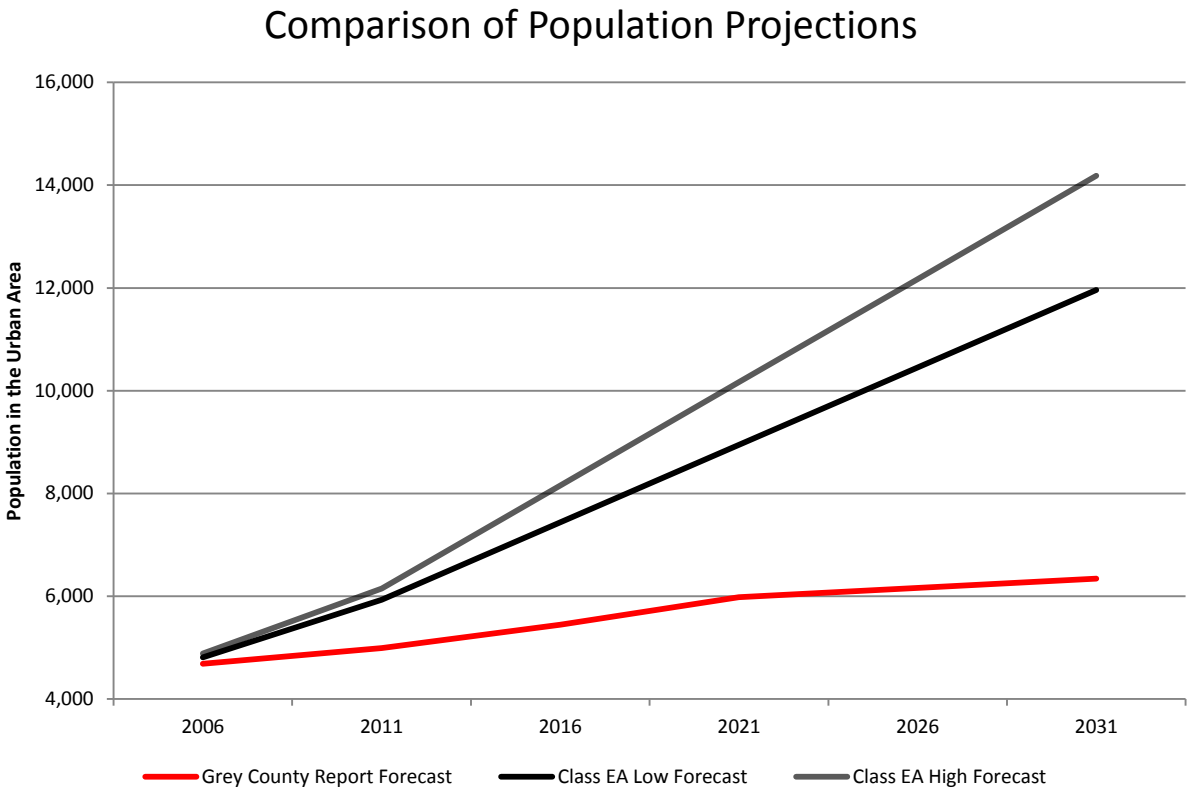


Figure 1- Comparison of Growth Forecasts

Municipality of Meaford

Water and Wastewater Servicing Master Plan
Existing Conditions – Technical Memorandum

August 2014

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Existing Conditions – Technical Memorandum

Project No. 114106

Prepared for:
Municipality of Meaford

Prepared By:

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Appendix A – Existing Pressure Zone Boundaries
Appendix B – Pressure Contour Map at Peak Hour
Appendix C – Available Fire Flow Contour Map
Appendix D – Available Fire Flow Colour Coded Map

1.0 Introduction

At the request of the Municipality of Meaford, the Ainley Group in undertaking a study to identify and assess options to extend/expand the existing municipal water distribution and wastewater collection systems to service future development, in advance of a 2015 Development Charge Study.

This objective will be achieved through a phased construction approach linking the magnitude of major capital projects such as treatment plant upgrades and reservoir expansions to imminent development needs, while at the same time ensuring land requirements and pipelines are sized sufficiently for ultimate growth.

The purpose of this Technical Memorandum is to summarize the state of the existing water distribution system. The existing hydraulic model based on WaterCAD software has been updated to WaterGEMS and the model has been updated to reflect end of 2013 status.

2.0 Existing Water Distribution System

The existing water system in the Municipality of Meaford consists of approximately 57,500m of watermain, 2,310m3 of available clear well storage at the Water Treatment Plant and 570m3 storage in an elevated storage tank, and two booster pump stations.

The water distribution system, the Water Treatment Plant, the elevated storage tank and booster pump stations are owned by the Municipality of Meaford and operated and maintained by the Municipality of Meaford Operations Department.

2.1 Pressure Zones

The water distribution system currently has three pressures zones:

- Zone - 1: Covers the majority of the Municipality of Meaford and is located in the north east end from lake level extending south.
- Zone - 2 (Nelson Street BPS Pressure Zone): Located in the west end serviced by a booster pumping station on Nelson Street. It is separated from Zone - 1 by gate vales on Pearson Street and Glen Abbey Court and Collingwood Street between Thompson Street and Noble Street
- Zone - 3 (St. Vincent Street BPS Pressure Zone): Located in the south end serviced by a booster pumping station on St. Vincent Street. It is separated from Zone - 1 by gate valves on Edwin Street, between Lorne Street and Legion Road and on St. Vincent Street South of Aiken Street.

Refer to ***Appendix A*** for a map of the pressure zones and locations of water facilities for the Municipality of Meaford

2.2 Water Treatment Plant

The water treatment plant is located at 574 Grandview Drive in the Municipality of Meaford with a rated capacity (MDD) of 26,848 m^3/day (311L/s) comprised of:

- Raw Water intake from Georgian Bay
- A low-lift pumping station with one raw water well equipped with one manually cleaned screen and two low-lift pumps, one duty and one standby, each having a rated capacity of 311 L/s at 16.2 m TDH
- A treatment system consisting of an in-line mixer and polyaluminum chloride feed system for coagulation, a filter system (two filters), a UV disinfection system (primary disinfection) plus gas chlorination for secondary disinfection and protection of the distribution system.
- A clearwell comprising two cells in series with Cell 1 providing storage of 920 m^3 and Cell 2 providing storage of 1,390m^3,for a total treated water storage volume of 2,310m^3
- A high-lift pumping station equipped with three high-lift pumps, two duty and one standby, each having a rated capacity of 149.2 L/s at 76.2 m TDH. A Singer pressure relief valve on the discharge side of the high-lift pump is set to limit the discharge pressure from the water treatment plant to approximately 550 kPa. Under normal operating conditions only one pump operates at a time. The operator chooses the lead pump. Water level in the elevated tank controls the high-lift pumps.
- A wastewater residual management system consisting of a surge tank with transfer pumps, a treatment clarifier, chemical feed systems to enhance filter backwash wastewater settling and for dechlorination of backwash wastewater and filter to waste water, and two sludge pumps to pump sludge from the treatment clarifier into the sanitary sewer
- Standby power
- The plant appears to be in full compliance with MOE regulations and does not require upgrades, except ongoing regular maintenance, to service the existing community.

2.3 Nelson Street Booster Pump Station

Nelson Street Booster Pump Station is located in the west end of system on Nelson Street between Thompson Street and Noble Street. The pump station has one pump with a capacity of 19 L/s at 27 m of TDH. The pump runs continuously to provide zone pressure. The station does not meet fireflow requirements for the pressure zone.

The Nelson Street Booster Pump Station is an older facility without any standby pumping or power supply, and the Municipality should consider eventually replacing it in the future to protect the integrity of the zone it services.

2.4 St. Vincent Street Booster Pump Station

St. Vincent Street Booster Pump Station is located on St. Vincent Street south of Aikin Street. The pump station has five vertical multi-stage duty pumps each rated at 22 L/s at 37 m TDH and one low flow protection pre-pressurized well tank to help maintain system pressures at low to no flow conditions.

The St. Vincent BPS was constructed in 2010. This pump station does not appear to require any upgrades to service the existing system.

2.5 Storage

An elevated water storage tank is located in the vicinity of Trowbridge Street and Owen Street. The capacity of this tank is 570 m^3 and together with the in-ground storage at the water treatment plant, the total system storage is 2880 m^3. The elevated storage tank is in the process of being repainted.

Based on MOE design guidelines, the required storage for the Municipality of Meaford at its current population is 2,166.1 m^3. There is therefore adequate storage supply within the system. It is noted that 80% of available storage (74% of presently required storage) is located at the WTP as pumped storage. This means that the high lift pumps must be capable of meeting 80% of peak hour's demands and 80% of maximum day plus fireflow demands. Based on the existing population, the high lift pumps must meet 80% of MDD of 26.5 L/s plus 145 L/s or 80% of 171.5 L/s which is 137.2 L/s.

3.0 Assessment of Existing Water Demand

3.1 Historical Demands

Historical flow data at the Meaford Water Treatment Plant was collected from the annual operating reports dating back to 2006. The monthly average day demand and maximum day demand over the 8 year span are plotted on Figure 1 below.

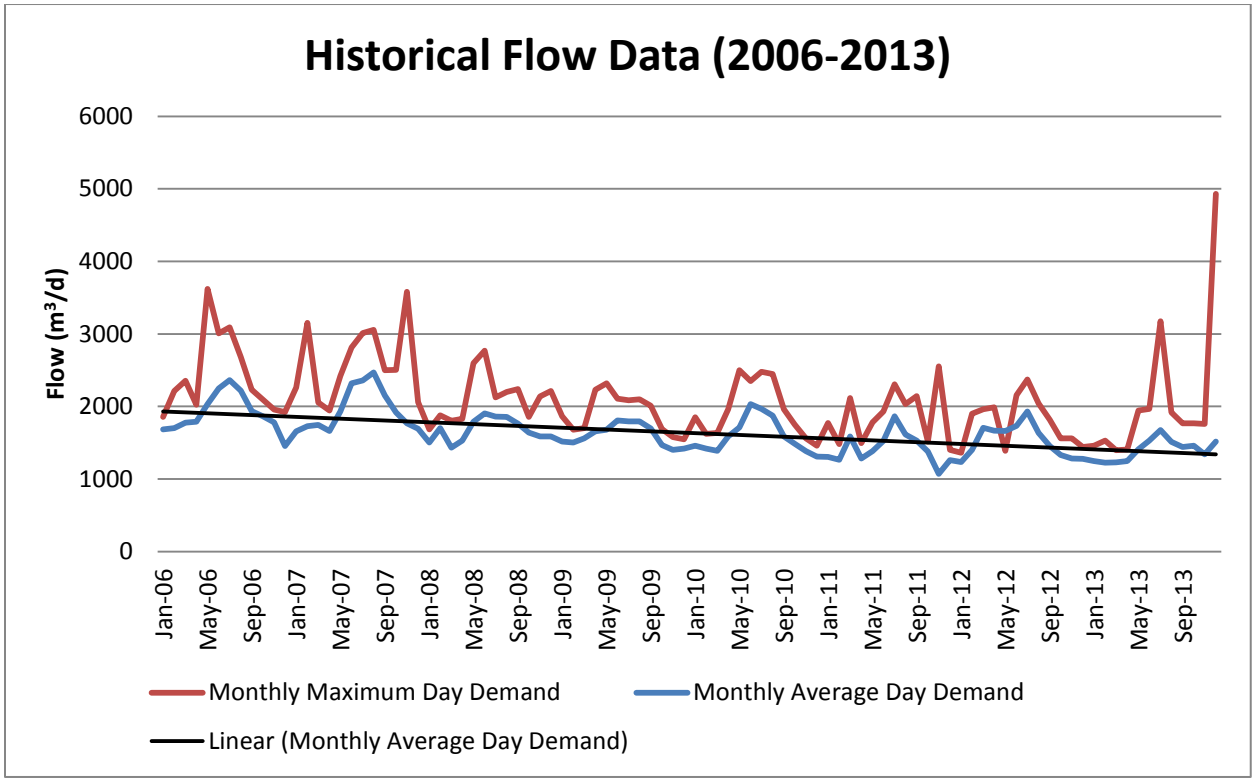


Figure 2: Historical Flow Data (2006-2013)

Over the 8-year span the historical monthly maximum day demand and monthly average day demand are typically higher in the warmer months (May through August). This is mostly due to the warmer and dryer weather increasing outdoor water use for watering lawns/gardens, filling pools etc. There are a few instances where the MDD occurs in the colder months or the MDD is very high compared to the other values. These higher than normal MDD values are typically due to a watermain break that occurs and there is a significant loss of water. These higher than normal MDD values have been confirmed by the Municipality of Meaford to be watermain breaks. As to not skew the hydraulic model data, the higher than normal MDD values were not inputted into the hydraulic model.

The total water demand each year was plotted over the same 8 year span in Figure 2.

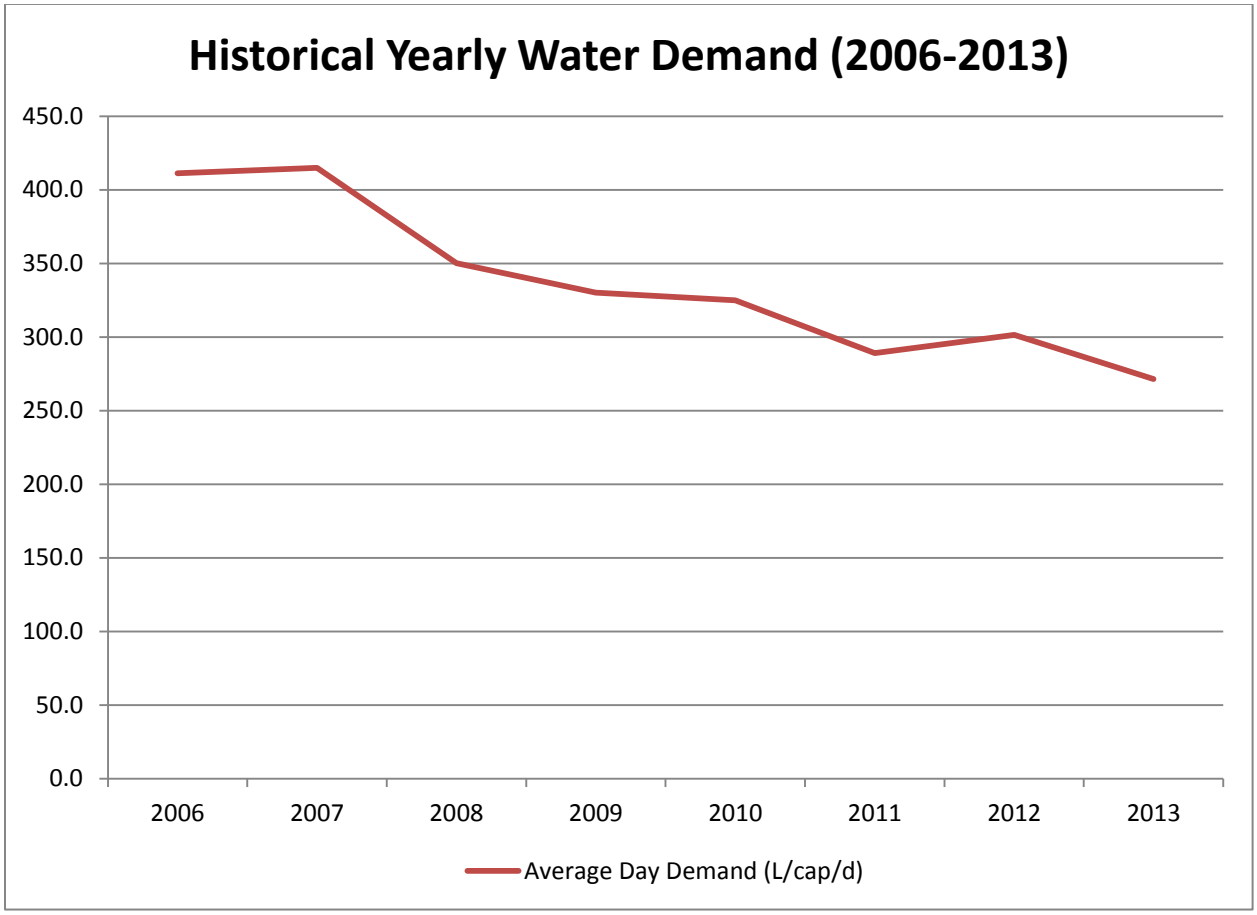


Figure 3: Historical Yearly Water Demand (2006-2013)

The total water demand over the past 8 years illustrates that the water demand is decreasing over time. This is likely due to several factors. These factors include decrease in population, decrease in large consumption users such as factories, upgrade of old leaky watermains, and implementation of lower water consumption strategies such as low flow fixtures. Per capita water demand has now fallen to under 300 L/cap/day which represents a reasonably conservative demand level for the community.

The percentage of unaccounted for water is graphed in Figure 3 overleaf.

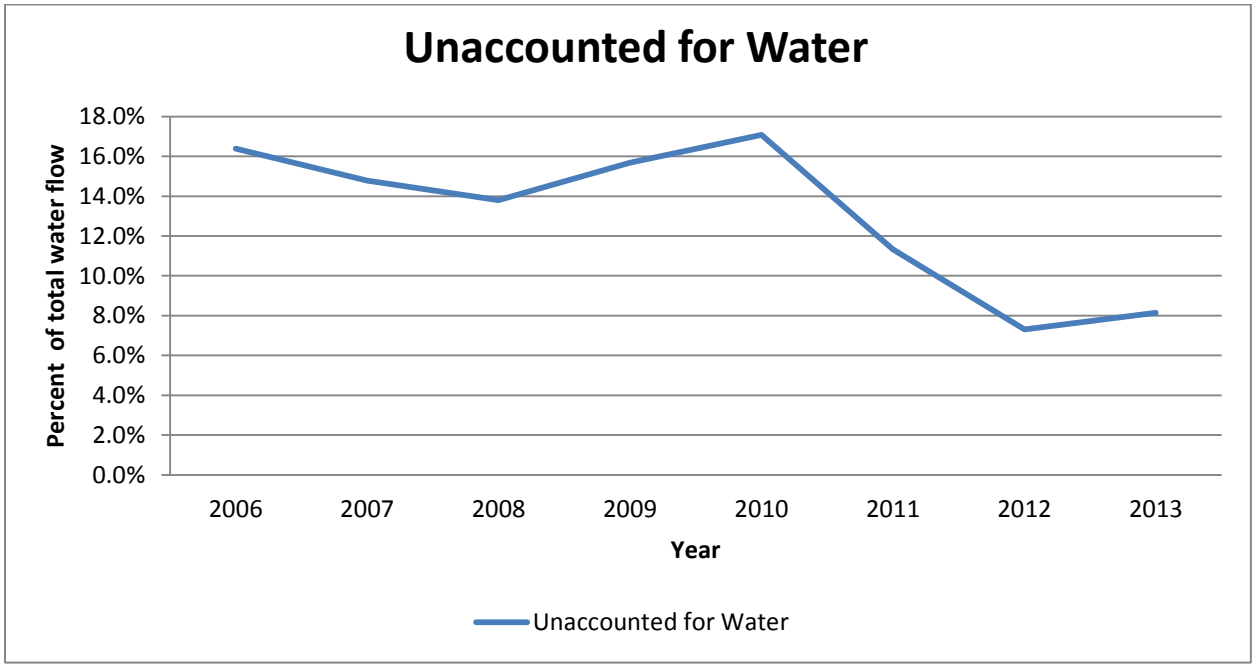


Figure 4: Unaccounted for Water

The percentage of unaccounted for water has dropped over the past 8 years to approximately 8%, which is half of what the percentage was in 2006. This drop of unaccounted for water is most likely due to upgrades to old watermain and water services that may have been leaking. Unaccounted for water at 8%, indicates that the water distribution system is in reasonable condition in terms of leakage.

3.2 Water Demands

The Municipality of Meaford provided recent, historical water information as follows:

Table 4: Historical Water Demand Information (2006-2013)

Year	Population	Total Demand for the Year (m^3/year)	Total Demand for Year (L/cap/year)	Average Day Demand (m^3/day)	Average Day Demand (L/cap/d)	Maximum Day Demand (m^3/day)	Maximum Day Demand (L/cap/day)	Max Day Factor
2006	4686	703,521	150,133	1927	411.3	3620	772.5	1.88
2007	4717	714,361	151,444	1957	414.9	3057*	648.1	1.56
2008	4808	614,541	127,816	1684	350.2	2767	575.5	1.64
2009	4869	586,890	120,536	1608	330.2	2321	476.7	1.44
2010	4930	584,588	118,578	1602	324.9	2498	506.7	1.56
2011	4992	526,851	105,539	1443	289.1	2304*	461.5	1.60
2012	5082	559,023	110,001	1532	301.4	2374	467.1	1.55
2013	5172	512,440	99,080	1404	271.5	2048*	396.0	1.46

* In 2007, 2011, 2013 there were some Maximum Daily Demands that exceeded the listed MDD, however the Municipality of Meaford advised that the higher MDDs were a result of watermain breaks, and thus not the true MDD.

The existing hydraulic model was updated using the latest demand profiles. The average day demand (ADD) model scenario is based on average of the 2011-2013 ADDs which is 1,460 m^3.

The maximum day demand (MDD) model scenario is based on the highest MDD for the years 2011-2013 which is 2,374 m^3. MOE procedure D-5-1 states that the MOE Regional Director will determine the use of 3 vs 5 years of records to establish maximum day demands. This indicates that the MOE may require the Owner of the system to use the MOE Design Guidelines to determine theoretical water demands if there is insufficient or doubtful historical information. For the purpose of this study, it is considered that there is adequate, reliable historical information that can be used to determine the water demands.

The highest MDD for the past three years is 2,374 m^3/day (467.1 L/cap/day), which is 8.8% of the rated capacity of the Water Treatment Plant and is 16.7% of the design capacity of a single high lift pump at the Water Treatment Plant. Since the plant is required to meet MDD, there is more than adequate capacity for the present system.

Using the 2006 and 2011 census data, the population for each intermediate year was interpolated. It was estimated that the population increased by approximately 60 persons per year from 2006 to 2011. After 2011 it is estimated that the population increases by 90 persons per year based on County growth targets. In Table 1 below the estimated population for each year is shown.

The average day water supply declined from 411 L/cap/day in 2006 to 272 L/cap/day in 2013. Comparing to other municipalities, Meaford's flow rate (L/cap/day) is lower than the municipalities listed in Table 2 below. This level of supply is indicative of a water efficient community.

Table 5: Per Capita Flow Comparison

Parameter	Municipality	Flow Rate (L/cap/day)
Average Day Demand	Town of New Tecumseth	373
	York Region	278
	Bradford West Gwillumbury	300
	Kleinburg	347
	Grey Highlands	350
	East Gwillumbury	504
	Markham	365
	Meaford	**272**

3.3 Demand Analysis

The Municipality of Meaford provided Water Statistics for 2006-2013, as listed in Table 3 below. The statistics included:

- Total Water pumped at the Water Treatment Plant
- Watermain Flushing
- Watermain Breaks / Leaks
- Total Bulk Water Sales for the Year
- Backwash, Analyzer (Cl_2) and turbidimeter
- Municipal Owned Swimming Pool (Blue Dolphin Pool)
- Unaccounted Water for the Year.

Table 6: Water Distribution Statistics (2006-2013)

	Population	Total Water Pumped at WTP (m^3/year)	Total Metered Water consumption for the Year (m^3/year)	Total Average Metered Consumption for Year (L/cap/day)	Flushing (m^3/year)	Watermain Breaks / Leaks (m^3/year)	Total Bulk Water Sales for the Year (m^3/year)	Backwash, analyzer(Cl_2) and turbidimeter (m^3/year)	Other Water usage (swimming pool, construction, tower offline) (m^3/year)	Unaccounted Water for the Year (m^3/year)
2006	4686	703,521	537,295	314.1	5,219	17,580	28,089	*	*	115,338
2007	4717	714,361	551,802	320.5	2,308	6,715	28,405	14,817	4,732	105,582
2008	4808	614,541	490,254	279.4	3,041	2,790	15,962	17,673	*	84,821
2009	4869	586,890	449,435	252.9	8,073	5,275	13,224	18,821	*	92,062
2010	4930	584,588	442,551	245.9	4,561	1,723	15,961	16,987	2,961	99,844
2011	4992	526,851	427,720	234.7	5,507	6,264	12,004	15,092	611	59,653
2012	5082	559,023	442,485	238.5	9,555	39,388	10,812	15,292	611.5	40,879
2013	5172	512,440	424,395	224.8	13,401	9,371	7,611	15,337	611.5	41,714

* Data was not provided for this item in the Annual Water Treatment Plant Report

3.4 Total Metered Water Consumption

The users with demands of greater than 1000 m^3/year were identified in the previous report in 2010. For this analysis the demand for the large users remains the same as the last report. They are assigned to specific nodes throughout the model. The large demand users were based on the meter flow data received from the Municipality of Meaford in 2010.

3.5 Flushing

The demands for flushing were distributed equally between three nodes identified when the model was originally created in 2004. The nodes are located at the peripheries of the system, at the north end of the distribution system (west end of Centreville Road), at the west end of the distribution system (west end of Miller Street) and at the south end of the system (south end of County Road 7).

3.6 Watermain Breaks/Leaks

The demand for watermain breaks/leaks was distributed evenly across the system as this is based on the assumption that breaks can occur anywhere in the system.

3.7 Total Bulk Water Sales

The demand for total bulk water sales was placed at a node at the water treatment plant, where bulk water sales are made.

3.8 Backwash, Analyzer (Cl_2) and Turbidimeter

The demand for water used at the water treatment plant for back washing and for the analyzer (Cl2) and the turbidimeter was placed at a node at the water treatment plant.

3.9 Swimming Pool

The demand for the water used at the swimming pool was placed at a node near the swimming pool which is located at 57 Richmond Street.

3.10 Unaccounted Water

The demand for unaccounted for water for the year was distributed evenly across the system. The most likely source of the unaccounted for water is from water losses in older, leaky pipes and water services. Since the total unaccounted for water is within acceptable limits, it is reasonable to expect that distributing the unaccounted for water demand evenly across the system would be the most accurate way to represent the actual system.

4.0 Existing System Operation

The existing water system model was last updated in 2010 using WaterCAD. As part of this project, this model has been updated to December 2013 using the WaterGEMS computer model. The model was updated to December 2013 conditions to review the existing pressures within the distribution system under average day demand (ADD), maximum day demand (MDD), peak hour (PH) and maximum day demand plus available fire flow (MDD + FF) and determine if there are any system deficiencies.

Pipe friction factors (C-factors) for existing piping within the system are based on C-factor testing that was completed by A1 Hydrant in 2003.

4.1 Average Day Demand

Under the above noted conditions and average day demand with one high lift pump operating at the water treatment plant, one pump at St. Vincent Street Booster Pump Station and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 282 kPa to 581 kPa

Zone - 2: 490 kPa to 602 kPa

Zone - 3: 398 kPa to 614 kPa

The Ministry of the Environment Design Guidelines for Drinking Water Systems 2008 recommend a range of 350 – 480 kPa for normal operating pressures (Chapter 10 Distribution System, 10.2 Hydraulic Design, 10.2.2.1 Maximum & Minimum Operating Pressure: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275 kPa and not more than 700 kPa.).

There is an area in the north-west end of Zone-1 along 7th Line near Highway 26 and Centreville Road with pressures that range from 282 kPa to 350 kPa. While this meets the minimum recommended by the MOE Design Guidelines, it is below the range recommended for normal operating conditions.

Pressures in a few small areas of the system range from 550 kPa to 614kPa. Within Zone-1 there is an area along Lakeshore Road and Grandview Drive from Centreville Road to Susan Street with pressures ranging from 550 kPa to 580 kPa.

Within the Zone -2 (Nelson Street BPS Boosted Zone) there is a small area immediately adjacent to the booster pump station with pressures in the range of 600 kPa. Pressures throughout the rest of the zone generally range from 490 kPa to 580 kPa.

Within the Zone -3 (St. Vincent Street BPS boosted zone) there is a small area adjacent to the St. Vincent Street BPS with pressures in the range of 613 kPa. Pressures throughout the rest of the Zone-2 range from 398 kPa to 570 kPa.

Under these conditions, the elevated tank is filling at a rate of approximately 171L/s.

4.2 Maximum Day Demand

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant, one pump at St. Vincent Street Booster Pump Station and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 280 kPa to 578 kPa

Zone - 2: Range from 488 kPa to 600 kPa

Zone - 3: Range from 397 kPa to 614 kPa

The areas of marginally high and marginally low pressures within the distribution system under MDD conditions are generally the same as noted under ADD conditions.

Under these conditions, the elevated tank is filling at a rate of approximately 164 L/s.

4.3 Peak Hour

Under the above noted conditions, and peak hour (PH) demand, with one high lift pump operating at the Water Treatment Plant, one pump at St. Vincent Street Booster Pump Station and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone-1: Range from 275 kPa to 575 kPa

Edwin Street Booster Pump Station Boosted Zone: Range from 375 kPa to 590 kPa

Nelson Street Boosted Zone: Range from 480 kPa to 595 kPa

A contour map showing the pressures under peak hour (PH) demand and the above noted conditions are included in ***Appendix B.***

The areas of marginally high and marginally low pressures within the distribution system under PH conditions are generally the same as noted under ADD conditions.

Under these conditions, the elevated tank is filling at a rate of approximately 154 L/s.

4.4 Maximum Day Demand Plus Fire Flow

Fire flow requirements published in Ministry of Environment (MOE) Design Guidelines for Drinking Water Systems, 2008, Chapter 8 Treated Water Storage, Table 8-1: Fire Flow Requirements apply primarily to determine storage requirements. The purpose of this evaluation is to determine required distribution system improvements. As such, this assessment of system requirements utilizes a minimum fire flow of 38L/s at 140 kPa residual pressure for a single family detached dwelling anywhere within the water distribution system as per MOE guidelines to allow for the fighting of a typical detached single-family dwelling fire. For a community the size of Meaford the MOE require a fireflow of 145 L/s. A minimum pressure of 140 kPa is also required for the system. These recommended values have been used as the limiting system requirements in the WaterGEMS analysis of the demand condition. The WaterGEMS analysis can determine maximum available fire flows based upon this minimum residual and can determine any simulated demand within the modeled system.

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant, the theoretical available fire flows in the system are as follows:

Zone-1: Range from 0.6L/s to 250L/s

Zone -2 (Nelson Street BPS Boosted Zone): Range from 12L/s to 47L/s

Zone-3 (St. Vincent Street BPS Boosted Zone): Range from 1L/s to 44L/s

An available fire flow contour map and a colour coded fire flow sketch showing the theoretical available fire under MDD and the above noted conditions are included in Appendix C and Appendix D respectively.

Within Zone-1 there are a number of areas with inadequate available fire flows. In the north-west end of the system, available fire flows on Lakeshore Road, north of Algonquin Drive, and on Centreville Road range from 5L/s to 15L/s. Available fire flows on Highway 26 west of Algonquin Drive/Ridge Road, and on the Seventh Line, range from 1L/s to 30L/s. In this area, the inadequate fire flows result from a combination of older, small diameter (100 mm and 150 mm) asbestos cement and ductile iron watermains and the requirement for boosted pressure to provide adequate fire flows to the northern portion of the water distribution system.

Available fire flows along Grandview Drive, from south of the Water Filtration Plant to the intersection of Grandview Drive and Sykes Street, are in the range of 16L/s to 33L/s. Inadequate fire flows in this area are a result of older, 100 mm diameter cast iron watermains.

Available fire flows on Thompson Street from Nelson Street to Lombard Street range from 0.9L/s to 1.5L/s and Collingwood Street from Thompson Street to Cook Street range from 34 to 36L/s. Inadequate fire flows in this area are a result of older, 25 to 100 mm diameter cast iron watermains.

Within Memorial Park, a Municipally owned campground, the theoretical available fire flow is in the range of 20L/s. Inadequate fire flows in this area are a result of older, small diameter watermains both in the areas with inadequate fire flows and in the distribution system feeding this area.

There are pockets within the core of the distribution system with inadequate fire flows, as a result of older, small diameter cast iron watermains. The 2003 report did recommend that all cast iron watermain in the distribution system be replaced with minimum 150 mm diameter watermains.

Within Zone 2, Nelson Booster Pump Station boosted zone, a large portion of the zone has inadequate theoretical available fire flows. This is a result of a combination of older, small diameter cast watermains within the zone.

Areas of restricted fire flow include: Nelson Street west of Golf View Estates, Gardiner Street, Miller Street, Pearson Street north of Parker Street and Pearson Street at Collingwood Street. Fire flows range from 12 L/s to 37 L/s in these areas.

Within Zone 3, the St. Vincent Booster Pump Station Boosted zone, several areas within the zone that have inadequate theoretical available fire flows. This is a result of a combination of older and small diameter cast watermains within the zone.

Areas of restricted fire flow include: Louisa Street west of Lorne Street, Dillon Avenue South of Louisa, St. Vincent Street south of Skyes Street, Montgomery Street east of St. Vincent Street and McKibbon Drive. The available fire flows in these areas range from 1 L/s to 37 L/s.

There are several areas where the fire flow is just below the required 38 L/s. These areas have fire flows around 36.00 to 37.95 L/s. These areas include Centre Street between Louisa Street and the Gates of Kent, Farrar Street and Burton Street, Ivan Street, Coleman Street south of Augusta and Union Street South of Augusta Street.

5.0 Review of 2010 Water Model Update Report

A previous report updated the Meaford WaterCAD computer model to December 2010 conditions to identify any existing system deficiencies. Under 2010 conditions, theoretical pressure generally met the minimum recommended by the MOE Design Guidelines except for fireflow conditions. There are a number of areas within the existing distribution system with less than the recommended minimum available fire flow for fighting a typical detached single-family dwelling fire which are mainly a result of older small diameter cast iron watermains. The Edwin Booster Pump Station was replaced in 2010 with a larger capacity station located on St. Vincent Street. With the new booster station on-line, there are significant improvements in available fire flows and a few isolated areas within the zone with restricted fire flows. Ainley Group's 2003 Municipality of Meaford Water Distribution System Computer Modeling and Analysis Report did recommend that all 100 mm diameter cast iron watermain in the distribution system be replaced with minimum 150 mm diameter watermain.

An analysis of a projected intermediate-term planning horizon scenario was completed to confirm the requirements for servicing the identified intermediate-term future developments. Consultation with the Municipality Planning Department was used to develop intermediate future growth projections. All capital works included in the planned capital works in the Municipality of Meaford 2010 Development Charges Study prepared by Hemson Consulting Limited, and in The Municipality of Meaford 2011 – 2020 Capital Forecast, prepared by the Municipality of Meaford and Ainley Group were included in intermediate-term future growth scenario simulations. A review of pressures and available fire flows throughout the distribution system was completed, and it was determined that with these upgrades, there were some areas of the system that did not meet the minimum recommended guidelines for the fighting of a typical detached single-family dwelling fire. Additional recommendations were made for watermain replacements to address available fire flow deficiencies. Within the Nelson Street Booster Pump Station boosted zone the minimum recommended fire flow could be achieved without replacing the booster pump station, however, this does not take into consideration required fire flows for specific areas, such as proposed developments and the hospital. Also, the Nelson Street Booster Pump Station is an older facility and the Municipality should consider eventually replacing it to protect the integrity of the zone it services.

An analysis of a projected long-term planning horizon scenario was completed to confirm the requirements for servicing the identified long-term future developments. Consultation with and direction from The Municipality of Meaford Planning Department was used to develop long-term future growth projections for the Municipality. All recommended works for the intermediate-term growth scenarios were included in the long-term growth scenarios. In addition, the following works were included in the simulations:

- A proposed reservoir to service the St. Vincent Street Booster Pump Station Boosted Zone
- A booster pump station to service the proposed development located on the 3rd line, south of Highway 26 (Lots 9 & 10 Concession 2).

With the recommended upgrades in place, theoretical pressures and available fire flows generally are within MOE Design Guidelines. There are some isolated areas that are marginally higher or lower than the MOE recommended range for normal operating conditions. These areas are, however, within the MOE recommended maximum and minimum pressures. These pressures are generally directly related to elevation.

Ainley Group's 2003 Municipality of Meaford Water Distribution System Computer Modelling and Analysis report did recommend that the Nelson Street booster pump station would need to be replaced to provide adequate pressures and fire flows to the expanded service-zone. However, future growth projections at the time anticipated more development to the west and north of the currently serviced zone, between Gardiner Street and The Seventh Line. Current future growth projections for this zone are lower and within the boundaries of the current zone. As noted above, the Nelson Street Booster Pump Station is an older facility and the Municipality should consider eventually replacing it to protect the integrity of the zone it services. Required fire flows for specific areas, such as proposed developments and the hospital should be considered for the design of the upgraded station.

6.0 Defects and Upgrades

6.1 2010 Model Update

Since the time of the 2010 Model Update, the following upgrades were completed:

- The Edwin Booster Pump Station was replaced in 2010 with a larger capacity station located on St. Vincent Street.
- The watermain on Highway 26 East was extended in 2011 from the existing east of St. Vincent Street to Knights Property
- Existing watermain was replaced on Sykes Street in 2012 from Margaret Street to Marshall Street.

From the 2010 report the following recommendations for upgrades were made

- Existing watermain in the area of Grandview Drive, Ford Avenue and Highway 26 is to be upgraded from the water treatment plant to the Seventh Line
- The watermain on Sykes Street North is to be replaced from Susan Street to Helen Street
- The watermain on Miller Street is to be replaced from Gardiner Street to Pearson Street
- The watermain on Pearson Street is to be replaced from Berry Street to Miller Street
- The watermain on 7th Line is the be replaced from Highway 26 to Fire Hydrant #158115
- The watermain on Ivan Street and Augusta Street is the be replaced from Sykes Street to Union Street
- The watermain on Boucher Street East is to be reconstructed from Sykes Street to Denmark Street, from St. Vincent Street to Fuller Street and from Fuller Street to the existing 200mm watermain

- The watermain on Trowbridge Street is the be reconstructed from Sykes Street to Cook Street
- The watermain is to be reconstructed and looped from Legion Road to Berry Street
- Twin watermains are to be constructed on St. Vincent Street from the School to the 12/13th Sideroad. One will be Dedicated feed for the reservoir and one will be the Distribution main
- Existing watermain on Burton Street and Farrar Street is to be upgraded from Union Street to Sykes Street
- The watermain on Paul Street and James Street is to be reconstructed from Edwin Street to Burton Street
- A watermain is to be constructed on the 12/13th Sideroad from St. Vincent Street to Highway 26
- The watermain on Edwin Street is to be reconstructed from Lorne Street to Sykes Street
- The watermain on Bridge Street is to be reconstructed from St. Vincent Street to Fuller Street.

7.0 Conclusions and Recommendations

Overall the existing water distribution system within the Municipality of Meaford performs well. The average day consumption per capita is low compared to other Municipalities. The average day consumption per capita has dropped over the past 8 years. The level of consumption is indicative of a water efficient community. The water system is fairly watertight; the percentage of unaccounted for water is low at about 8%. This percentage has dropped from 16% in 2006 to 8% in 2013. This drop in unaccounted for water is most likely due to upgrades to old watermain and water services that may have been leaking. There are several locations that have inadequate fire flows; this is due to old, small diameter watermains. It is recommended that all cast iron watermain be replaced with minimum 150 diameter watermain.

Based on this evaluation of the existing system, the following works may be required to meet the needs of the system:

- Replacement of the Nelson Street Booster Pump Station
- Replacement or rehabilitation of existing watermains either due to age or size.

Appendix – A

Existing Pressure Zone Boundaries

WATER TREATMENT PLANT

NELSON STREET BPS

WATER TOWER

ST. VINCENT STREET BPS

GEORGIAN BAY

MEAFORD HARBOUR

MEAFORD BASIN

PLOT 1=6

25 50 150 250m
50 0 100 200

NOTES

ZONE 1
ZONE 2
ZONE 3

CONTRACT DRAWINGS:
Contractor must verify all dimensions and be responsible for same. Any discrepancies must be reported to the Engineer before commencing work. Drawings are not to be scaled.
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DESIGN: N.E.S.
DRAWN: P.C.S.
CHECKED: N.E.S.
DATE: APRIL 2012

MUNICIPALITY OF MEAFORD
WATER SUPPLY AND DISTRIBUTION

EXISTING PRESSURE ZONE BOUNDARIES

Ainley GROUP
CONSULTING ENGINEERS PLANNERS

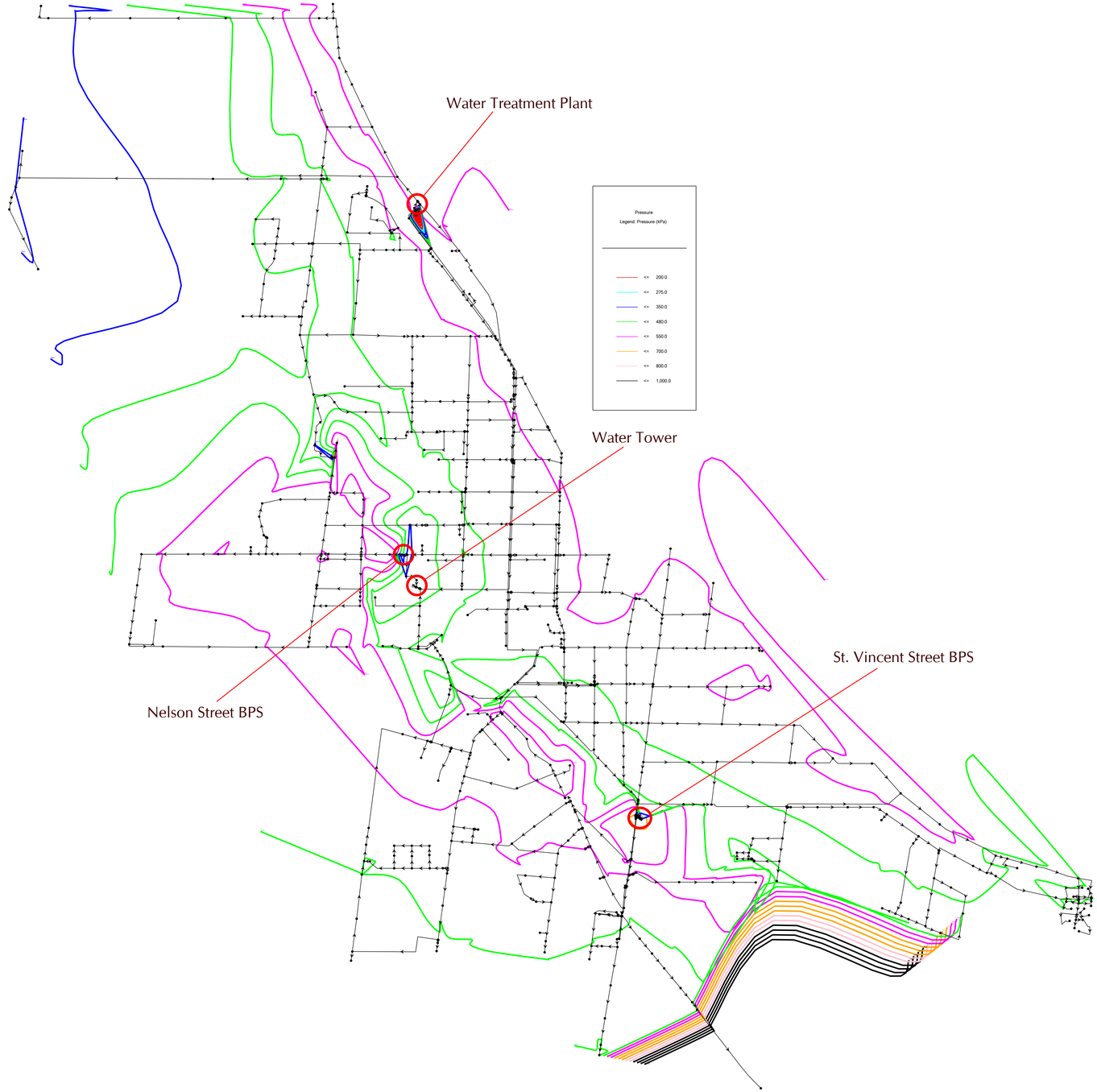
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DWG. 114106-WATER

Appendix - B

Pressure Contour Map at Peak Hour

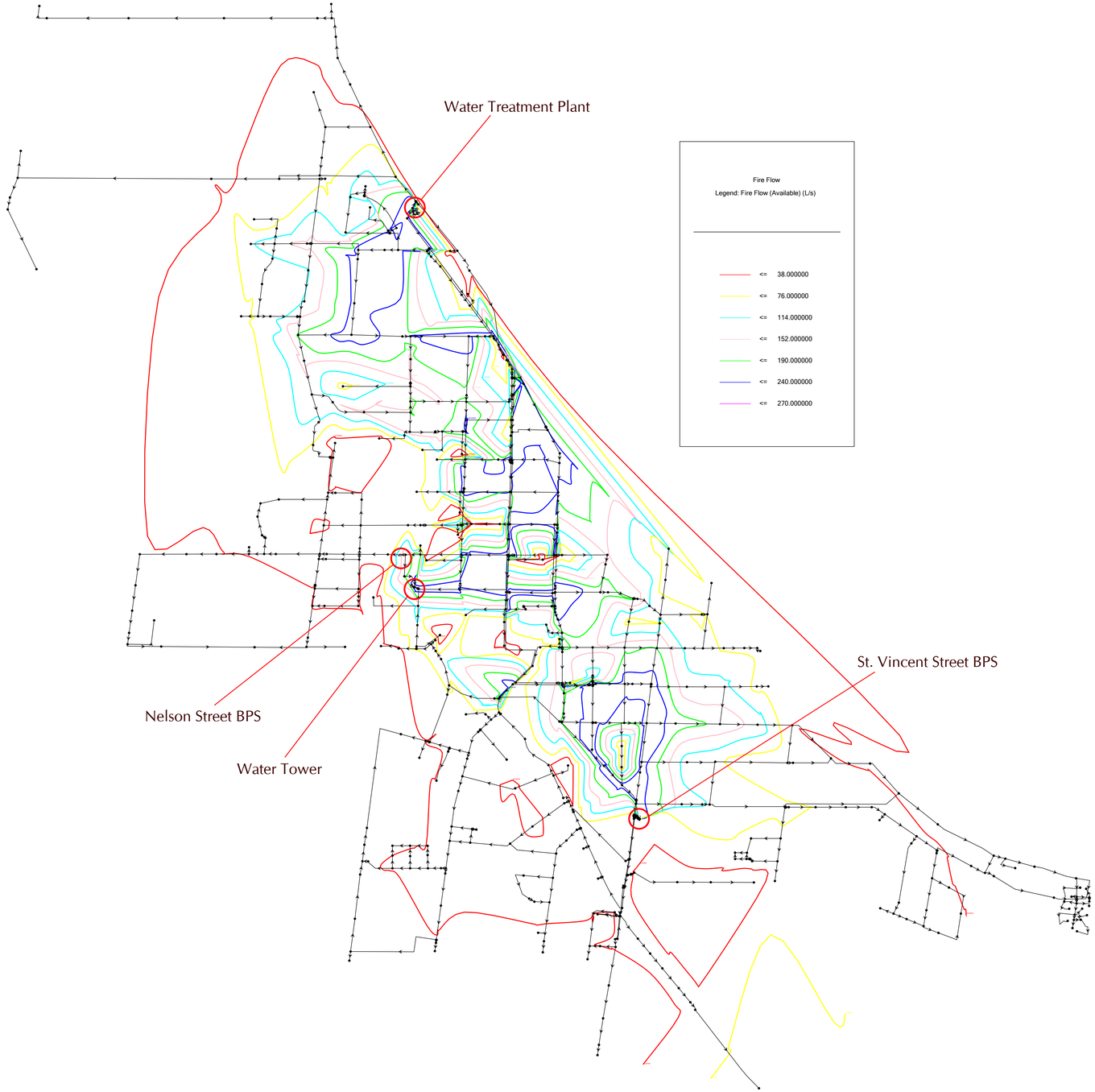
Scenario: Pressures - PH - Updated to 2013 Conditions



Appendix - C

Available Fire Flow Contour Map

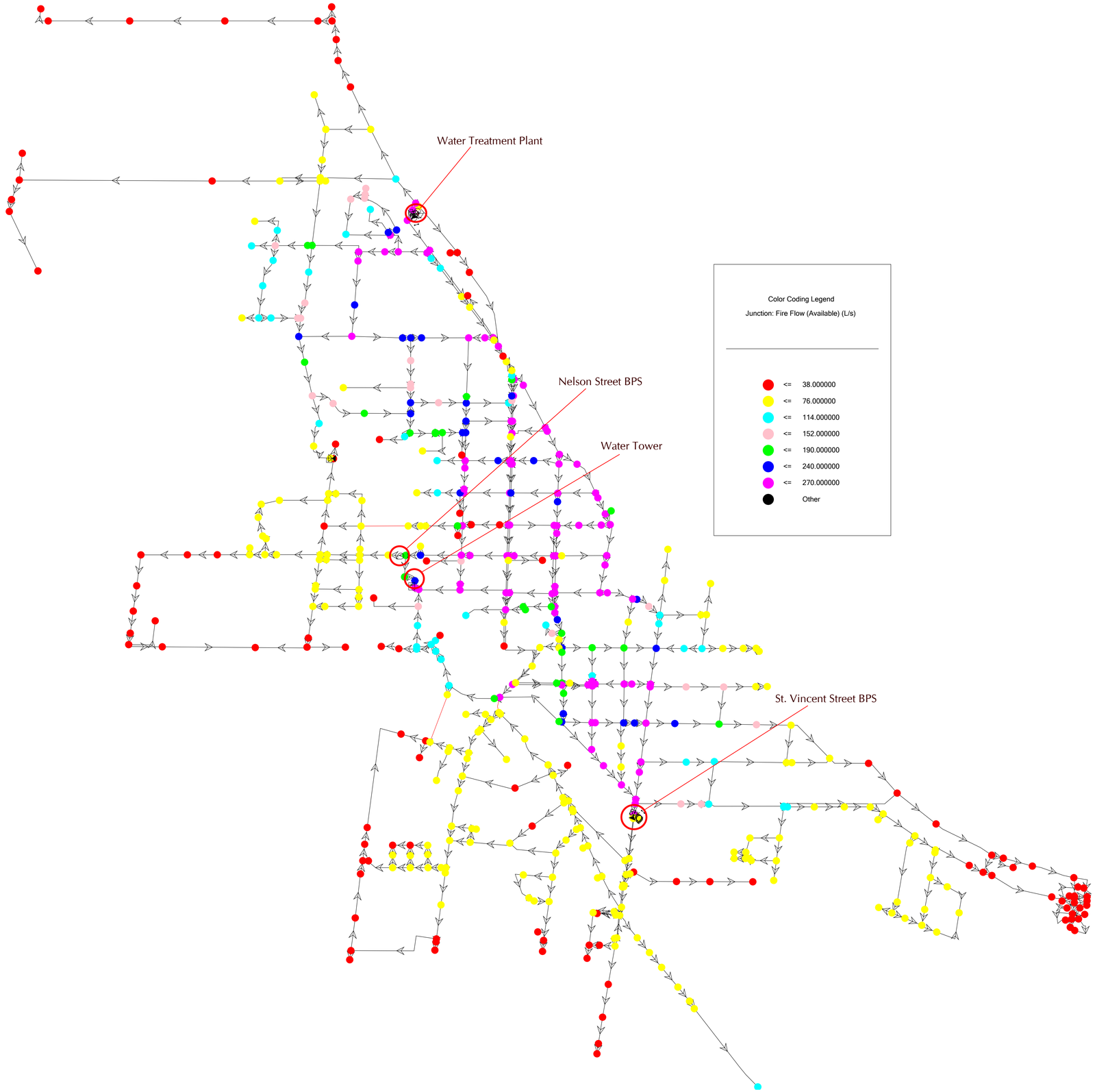
Scenario: Available Fire Flow - MDD+FF - Updated to 2013 Conditions



Appendix - D

Available Fire Flow Colour Coded Map

Scenario: Available Fire Flow - MDD+FF - Updated to 2013 Conditions



Color Coding Legend

Junction: Fire Flow (Available) (L/s)

<=	38.000000
<=	76.000000
<=	114.000000
<=	152.000000
<=	190.000000
<=	240.000000
<=	270.000000
	Other

Municipality of Meaford

Water and Wastewater Servicing Master Plan
Water Model – Technical Memorandum

January 2015

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Water Model – Technical Memorandum

Project No. 114106

Prepared for:
Municipality of Meaford

Prepared By:

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Appendix M – Meaford – Water Distribution – Pipe Materials Map

1.0 Base Model Assumptions

1.1 Large Demand Users Consumption

The users with demands of greater than 1000 m^3/year were identified in the previous report in 2010. For this analysis the demand for the large users remains the same as the last report. They are assigned to specific nodes throughout the model. The large demand users were based on the flow meter data received from the Municipality of Meaford in 2010.

1.2 Flushing

The demands for flushing were distributed equally between three nodes identified when the model was originally created in 2004. The nodes are located at the peripheries of the system, at the north end of the distribution system (west end of Centreville Road), at the west end of the distribution system (west end of Miller Street) and at the south end of the system (south end of County Road 7).

1.3 Watermain Breaks/Leaks

The demand for watermain breaks/leaks was distributed evenly across the system as this is based on the assumption that breaks can occur anywhere in the system.

1.4 Total Bulk Water Sales

The demand for total bulk water sales was placed at a node at the water treatment plant, where bulk water sales occur.

1.5 Backwash, Analyzer (Cl_2) and Turbidimeter

The demand for water used at the water treatment plant for back washing and for the analyzer (Cl_2) and the turbidimeter was placed at a node at the water treatment plant.

1.6 Swimming Pool

The demand for the water used at the swimming pool was placed at a node near the swimming pool which is located at 57 Richmond Street.

1.7 Unaccounted Water

The demand for unaccounted for water for the year was distributed evenly across the system. The most likely source of the unaccounted for water is from water losses in older, leaky pipes and water services. Since the total unaccounted for water is within acceptable limits, it is reasonable to expect that distributing the unaccounted for water demand evenly across the system would be the most accurate way to represent the actual system.

1.8 Residential Water Demand

The residential demand is the demand remaining from the total metered water consumption after the other demands above have been applied. The residential demand is distributed equally across each unit in the model.

1.9 Pressure Zones

The water distribution system currently has three (3) pressures zones:

- Zone - 1: Covers the majority of the Municipality of Meaford and is located in the north east end from lake level extending south.
- Zone - 2 (Nelson Street BPS Pressure Zone): Located in the west end serviced by a booster pumping station on Nelson Street. It is separated from Zone - 1 by gate valves on Pearson Street at Glen Abbey Court and Collingwood Street between Thompson Street and Noble Street.
- Zone - 3 (St. Vincent Street BPS Pressure Zone): Located in the South End serviced by a booster pumping station on St. Vincent Street. It is separated from Zone - 1 by gate valves on Edwin Street, between Lorne Street and Legion Road and the St. Vincent Booster Pump Station.

Refer to ***Appendix A*** for a map of the pressure zones and locations of water facilities for the Municipality of Meaford

2.0 Existing Flow Model

The existing water system model was last updated in 2010 using WaterCAD. As part of this master plan project, this model has been updated to December 2013 using the WaterGEMS computer model. The model was updated to December 2013 conditions to review the existing pressures within the distribution system under average day demand (ADD), maximum day demand (MDD), peak hour (PH) and maximum day demand plus available fire flow (MDD + FF), and determine if there are any system deficiencies.

Pipe friction factors (C-factors) for existing piping within the system are based on C-factor testing that was completed by A1 Hydrant in 2003.

2.1 Existing Flow – Average Day Demand

Under the above noted conditions, and average day demand, with one high lift pump operating at the water treatment plant, one pump at St. Vincent Street Booster Pump Station (run continuously) and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 282 kPa to 581 kPa

Zone - 2: 490 kPa to 602 kPa

Zone - 3: 398 kPa to 614 kPa

The Ministry of the Environment Design Guidelines for Drinking Water Systems 2008 recommend a range of 350 – 480 kPa for normal operating pressures (Chapter 10 Distribution System, 10.2 Hydraulic Design, 10.2.2.1 Maximum & Minimum Operating Pressure: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275 kPa and not more than 700 kPa.).

There is an area in the north-west end of Zone-1 along 7th Line near Highway 26 and Centreville Road with pressures that range from 282 kPa to 350 kPa. While this meets the minimum recommended by the MOE Design Guidelines, it is below the range recommended for normal operating conditions.

Pressures in a few small areas of the system range from 550 kPa to 614kPa. Within Zone-1 there is an area along Lakeshore Road and Grandview Drive from Centreville Road to Susan Street with pressures ranging from 550 kPa to 580 kPa.

Within the Zone -2 (Nelson Street BPS Boosted Zone) there is a small area immediately adjacent to the booster pump station with pressures in the range of 600 kPa. Pressures throughout the rest of the zone generally range from 490 kPa to 580 kPa.

Within the Zone -3 (St. Vincent Street BPS boosted zone) there is a small area adjacent to the St. Vincent Street BPS with pressures in the range of 613 kPa. Pressures throughout the rest of the Zone-3 range from 398 kPa to 570 kPa.

Under these conditions, the elevated tank is filling at a rate of approximately 171L/s.

2.2 Existing Flow – Maximum Day Demand

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant, one pump at St. Vincent Street Booster Pump Station and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 280 kPa to 578 kPa

Zone - 2: Range from 488 kPa to 600 kPa

Zone - 3: Range from 397 kPa to 614 kPa

The areas of marginally high and marginally low pressures within the distribution system under MDD conditions are generally the same as noted under ADD conditions.

Under these conditions, the elevated tank is filling at a rate of approximately 164 L/s.

2.3 Existing Flow – Peak Hour Demand

Under the above noted conditions, and peak hour (PH) demand, with one high lift pump operating at the Water Treatment Plant, one pump at St. Vincent Street Booster Pump Station (run continuously) and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 275 kPa to 575 kPa

Zone - 2: Range from 375 kPa to 590 kPa

Zone - 3: Range from 480 kPa to 595 kPa

A contour map showing the pressures under PH and the above noted conditions are included in ***Appendix B.***

The areas of marginally high and marginally low pressures within the distribution system under PH conditions are generally the same as noted under ADD conditions.

Under these conditions, the elevated tank is filling at a rate of approximately 154 L/s.

2.4 Existing Flow – Maximum Day Demand Plus Fire Flow

Fire flow requirements published in Ministry of Environment (MOE) Design Guidelines for Drinking Water Systems, 2008, Chapter 8 Treated Water Storage, Table 8-1: Fire Flow Requirements apply primarily to determine storage requirements. The purpose of this evaluation is to determine required distribution system improvements. As such, this assessment of system requirements utilizes a minimum fire flow of 38L/s at 140 kPa residual pressure for a single family detached dwelling anywhere within the water distribution system as per MOE guidelines to allow for the fighting of a typical detached single-family dwelling fire. For a community the size of Meaford, the MOE require a fireflow of 145 L/s. A minimum pressure of 140 kPa is also required for the system. These recommended values have been used as the limiting system requirements in the WaterGEMS analysis of the demand condition. The WaterGEMS analysis can determine maximum available fire flows based upon this minimum residual and can determine any simulated demand within the modeled system.

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant, the theoretical available fire flows in the system are as follows:

Zone-1: Range from 0.6L/s to 250L/s

Zone -2 (Nelson Street BPS Boosted Zone): Range from 12L/s to 47L/s

Zone-3 (St. Vincent Street BPS Boosted Zone): Range from 1L/s to 44L/s

An available fire flow contour map and a colour coded fire flow sketch showing the theoretical available fire under MDD and the above noted conditions are included in ***Appendix C*** and ***Appendix D*** respectively.

Within Zone-1 there are a number of areas with inadequate available fire flows. In the north-west end of the system, available fire flows on Lakeshore Road, north of Algonquin Drive, and on Centreville Road range from 5L/s to 15L/s. Available fire flows on Highway 26 west of Algonquin Drive/Ridge Road, and on the Seventh Line, range from 1L/s to 30L/s. In this area, the inadequate fire flows result from a combination of older, small diameter (100 mm and 150 mm) asbestos cement and ductile iron watermains and the requirement for boosted pressure to provide adequate fire flows to the northern portion of the water distribution system.

Available fire flows along Grandview Drive, from south of the Water Filtration Plant to the intersection of Grandview Drive and Sykes Street, are in the range of 16L/s to 33L/s. Inadequate fire flows in this area are a result of older, 100 mm diameter cast iron watermains.

Available fire flows on Thompson Street from Nelson Street to Lombard Street range from 0.9L/s to 1.5L/s and Collingwood Street from Thompson Street to Cook Street range from 34 to 36L/s. Inadequate fire flows in this area are a result of older, 25 to 100 mm diameter cast iron watermains.

Within Memorial Park, a Municipally-owned campground, the theoretical available fire flow is in the range of 20L/s. Inadequate fire flows in this area are a result of older, small diameter watermains both in the areas with inadequate fire flows and in the distribution system feeding this area.

There are pockets within the core of the distribution system with inadequate fire flows, as a result of older, small diameter cast iron watermains and dead ends. The 2003 report did recommend that all cast iron watermain in the distribution system be replaced with minimum 150 mm diameter watermains.

Within Zone 2, Nelson Booster Pump Station Boosted Zone, a large portion of the zone has inadequate theoretical available fire flows. This is a result of a combination of older, small diameter cast ironwatermains within the zone. Areas of restricted fire flow include: Nelson Street west of Golf View Estates, Gardiner Street, Miller Street, Pearson Street north of Parker Street and Pearson Street at Collingwood Street. Fire flows range from 12 L/s to 37 L/s in these areas.

Within Zone 3, the St. Vincent Booster Pump Station Boosted Zone, several areas within the zone have inadequate theoretical available fire flows. This is a result of a combination of older and small diameter cast iron watermains within the zone.

Areas of restricted fire flow include: Louisa Street west of Lorne Street, Dillon Avenue south of Louisa, St. Vincent Street south of Skyes Street, Montgomery Street east of St. Vincent Street, and McKibbon Drive. The available fire flows in these areas range from 1 L/s to 37 L/s.

There are several areas where the fire flow is just below the required 38 L/s. These areas have fire flows around 36 to 38 L/s. These areas include Centre Street between Louisa Street and the Gates of Kent, Farrar Street and Burton Street, Ivan Street, Coleman Street south of Augusta, and Union Street south of Augusta Street.

2.5 Existing Model Conclusions

Overall the existing water distribution system within the Municipality of Meaford performs well. The average day consumption per capita is low compared to other Municipalities. The average day consumption per capita has dropped over the past 8 years. The level of consumption is indicative of a waterefficient community. The water system is fairly watertight; the percentage of unaccounted for water is low at about 8%. This percentage has dropped from 16% in 2006 to 8% in 2013. This drop in unaccounted for water is most likely due to upgrades to old watermain and water services that may have been leaking. There are several locations that have inadequate fire flows; this is due to old, small diameter watermains. It is recommended that all cast iron watermain be replaced with minimum 150 diameter watermain.

Based on this evaluation of the existing system, the following works may be required to meet the needs of the system:

- Replacement of the Nelson Street Booster Pump Station

- Replacement or rehabilitation of existing watermains either due to age or size.

3.0 Ultimate Flow Model

3.1 Water Demands

The ultimate flow projections are based on the assumption that all vacant land is developed according to the current zoning and planning densities within the Official Plan. The flow generated from the vacant lands is calculated according to the factors outlined in Table 1 below:

Table 1: Water Demand

Land Designation	Water Demand
Residential	300 L/cap/day
Commercial	28 m^3/(ha*day)
Industrial	28 m^3/(ha*day)

The Municipality of Meaford's GIS data was used to determine the distribution of the water demand within the water model based on the land designation.

With respect to future development, assumptions were made regarding where developments would be connected to the existing distribution system. Actual full build-out details, including connection details and internal watermain layout and diameter, should be added to the model as they become available.

New distribution pipe was placed into the model along Coleman Street, Union Street, Centre Street, St. Vincent Street and 12/13 Sideroad to provide water to the proposed future developments in that area. New distribution pipe was placed into the model for large proposed future developments. All proposed future developments were included as point demands within the model. For large proposed future developments, the point demands were spread over more than one node.

3.1.1 Residential Water Demand

The residential flow rate was determined using the historical average day demand for the past five years. The average day demand for future residential demand is assumed to be the same average of those values. The average day demand is assumed to be 300 L/cap/day for future residential demands. The five year average is used to best simulate the demand in the future. Table 2 below outlines the data for average day demand for the past five years. The future residential flow rate was applied to all residential units, existing and future.

Table 2: Historical Average Day Demands

Year	Average Day Demand (L/cap/d)
2009	330
2010	325
2011	289
2012	301
2013	271
Future	300

A population density of 2.4 people per unit was used throughout the model. The demand for existing and future residential properties was applied as a unit demand. The future unit residential demand used was 720 L/unit/day (300L/cap/day x 2.4 ppu = 720 L/unit/day). For maximum day demand, the maximum day factor (MDF) used in the ultimate model is 1.6707. This is the MDF from the existing data provided and used in the 2013 existing model.

3.1.2 Commercial Water Demand

The commercial water demand is based on the MOE design guidelines for drinking water systems which indicated a 28 m^3/(ha*day)water demand in the absence of reliable flow data for commercial demands.

3.1.3 Industrial Water Demand

The industrial water demand of 28 m^3/(ha*day) is based on the average industrial water demand used in surrounding similar municipalities.

3.1.4 Other Water Demands

The other demands in the model such as unaccounted for water, watermain breaks, flushing etc. remain the same as the existing model, which was the data provided to us by the Municipality of Meaford.

3.2 Ultimate Flow – Average Day Demand

Under the above noted conditions, and average day demand, with one high lift pump operating at the water treatment plant, one pump at St. Vincent Street Booster Pump Station (runs continuously) and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 273 kPa to 573 kPa

Zone -2 (Nelson Street BPS Boosted Zone): 471 kPa to 587 kPa

Zone-3 (St. Vincent Street BPS Boosted Zone): 267 kPa to 614 kPa

A contour map showing the pressures under ADD and the above noted conditions are included in ***Appendix E.***

The Ministry of the Environment Design Guidelines for Drinking Water Systems 2008 recommend a range of 350 – 480 kPa for normal operating pressures (Chapter 10 Distribution System, 10.2 Hydraulic Design, 10.2.2.1 Maximum & Minimum Operating Pressure: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275 kPa and not more than 700 kPa.).

There is an area in the north-west end of Zone-1 along 7th Line near Highway 26 and Centreville Road with pressures that range from 272 kPa to 350 kPa. While this meets the minimum recommended by the MOE Design Guidelines, it is below the range recommended for normal operating conditions.

Pressures in a few small areas of the system range from 550 kPa to 614 kPa. Within Zone-1 there is an area along Lakeshore Road and Grandview Drive from Centreville Road to the Water Treatment Plant on Grandview with pressures ranging from 550 kPa to 575 kPa.

Within the Zone -2 (Nelson Street BPS Boosted Zone) pressures throughout the zone generally range from 471 kPa to 587kPa.

Within the Zone -3 (St. Vincent Street BPS boosted zone) there is a small area adjacent to the St. Vincent Street BPS and along James Crescent with pressures in the range of 550 kPa to 613 kPa. The area at the south end of Zone-3 along Muir Street has pressures that range from 267kPa to 345 kPa. Pressures throughout the rest of the Zone-3 range from 350 kPa to 550 kPa.

Under these conditions, the elevated tank is filling at a rate of approximately 145L/s.

3.3 Ultimate Flow –Maximum Day Demand

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant, one pump at St. Vincent Street Booster Pump Station (runs continuously) and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone - 1: Range from 260 kPa to 562 kPa

Zone - 2: Range from 432 kPa to 565 kPa

Zone - 3: Range from 260 kPa to 614 kPa

A contour map showing the pressures under MDD and the above noted conditions are included in ***Appendix F.***

There is an area in the north-west end of Zone-1 along 7th Line near Highway 26 and Centreville Road with pressures that range from 260 kPa to 350 kPa. While this meets the minimum recommended by the MOE Design Guidelines, it is below the range recommended for normal operating conditions.

Within Zone-1 there is an area along Lakeshore Road and Grandview Drive from Centreville Road to the Water Treatment Plant on Grandview with pressures ranging from 540 kPa to 555 kPa.

Within the Zone -2 (Nelson Street BPS Boosted Zone) pressures throughout the zone generally range from 432 kPa to 587 kPa.

Within the Zone -3 (St. Vincent Street BPS boosted zone) there is a small area adjacent to the St. Vincent Street BPS and along James Crescent with pressures in the range of 550 kPa to 613 kPa. The area at the South end of Zone-3 along Muir Street has pressures that range from 267 kPa to 345 kPa. Pressures throughout the rest of the Zone-3 range from 350 kPa to 550 kPa.

Under these conditions, the elevated tank is filling at a rate of approximately 114 L/s.

3.4 Ultimate Flow – Peak Hour Demand

3.4.1 Ultimate Flow – Peak Hour Demand – 1 pump on at St. Vincent BPS

Under the above noted conditions, and peak hour (PH) demand, with one high lift pump operating at the Water Treatment Plant, one pump at St. Vincent Street Booster Pump Station and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone-1: Range from 250 kPa to 552 kPa

Zone-2: Range from 340 kPa to 490 kPa

Zone-3: Range from -6.3 kPa to 357 kPa

A contour map showing the pressures under PH and the above noted conditions are included in ***Appendix G.***

There is an area in the north-west end of Zone-1 along 7th Line near Highway 26 and Centreville Road with pressures that range from 250 kPa to 345 kPa. There is also an area along Glen Abbey Court with pressures around 325 kPa to 345 kPa. As well pressures near the Nelson Street Booster Station range from 325 kpa to 340 kPa. While this meets the minimum recommended by the MOE Design Guidelines, it is below the range recommended for normal operating conditions.

Within Zone-1 there is an area along Lakeshore Road and Grandview Drive from Centreville Road to the Water Treatment Plant on Grandview with pressures ranging from 500 kPa to 550 kPa.

Within the Zone -2 Nelson Street BPS Boosted Zone, pressures along Gardiner Street and Miller Street range from 340 kPa to 350 kPa. The pressures throughout the rest of the zone generally range from 375 kPa to 490 kPa.

Within the Zone -3 (St. Vincent Street BPS Boosted Zone) the northern portion of the boosted zone ranges from 200 kPa to 357 kPa. The southern portion of the boosted zone is less than 200 kPa, including some negative pressures in the development south of Muir Street.

The pumps at St. Vincent Booster Pump Station are controlled by pressure. If the pressure is less than 615kPa at the discharge, an additional pump will turn on to meet the 615kPa pressure. At peak hour

demand, the pressure at the discharge is 357 kPa. Since the pressure demand is not being met by the single pump, this causes lower pressures in the system which is not acceptable for MOE design guidelines. However, the discharge pressure is less than 615 kPa, therefore another pump would be on to meet the demand in this situation.

As such, a peak hour scenario was run with two pumps on at St. Vincent Booster Pump Station.

3.4.2 Ultimate Flow – Peak Hour Demand – 2 pumps on at St. Vincent BPS

Under the above noted conditions, and peak hour (PH) demand, with one high lift pump operating at the Water Treatment Plant, two pumps at St. Vincent Street Booster Pump Station and the pump at Nelson Street Booster Pump Station (which runs continuously), the pressures in the system are as follows:

Zone-1: Range from 250 kPa to 552 kPa

Zone-2: Range from 340 kPa to 490 kPa

Zone-3: Range from 250 kPa to 613 k Pa

A contour map showing the pressures under PH and the above noted conditions are included in ***Appendix H.***

There is an area in the north-west end of Zone-1 along 7th Line near Highway 26 and Centreville Road with pressures that range from 250 kPa to 345 kPa. There is also an area along Glen Abbey Court with pressures around 325 kPa to 345 kPa. As well pressures near the Nelson Street Booster Station range from 325 kpa to 340 kPa. While this meets the minimum recommended by the MOE Design Guidelines, it is below the range recommended for normal operating conditions.

Within Zone-1 there is an area along Lakeshore Road and Grandview Drive from Centreville Road to the Water Treatment Plant on Grandview with pressures ranging from 500 kPa to 550 kPa.

Within the Zone -2 (Nelson Street BPS Boosted Zone) pressures along Gardiner Street and Miller Street range from 340 kPa to 350 kPa. The pressures throughout the rest of the zone generally range from 375 kPa to 490 kPa.

Within the Zone -3 (St. Vincent Street BPS Boosted Zone) along the northern portion of the boosted zone, pressures are in the range of 500 kPa to 613 kPa. The area at the south end of Zone-3 along Muir Street has pressures that range from 250 kPa to 330 kPa. Pressures throughout the rest of the Zone-3 range from 350 kPa to 500 kPa.

3.5 Ultimate Flow – Maximum Day Demand Plus Fire Flow

Fire flow requirements published in Ministry of Environment (MOE) Design Guidelines for Drinking Water Systems, 2008, Chapter 8 Treated Water Storage, Table 8-1: Fire Flow Requirements apply primarily to determine storage requirements. The purpose of this evaluation is to determine required distribution system improvements. As such, this assessment of system requirements utilizes a minimum

fire flow of 38L/s at 140 kPa residual pressure for a single family detached dwelling anywhere within the water distribution system as per MOE guidelines to allow for the fighting of a typical detached single-family dwelling fire. For a community the size of Meaford, the MOE require a fireflow of 145 L/s. A minimum pressure of 140 kPa is also required for the system. These recommended values have been used as the limiting system requirements in the WaterGEMS analysis of the demand condition. The WaterGEMS analysis can determine maximum available fire flows based upon this minimum residual and can determine any simulated demand within the modeled system.

3.5.1 Ultimate Flow – Maximum Day Demand Plus Fire Flow – 1 Pump on at St. Vincent BPS

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant and one pump operating at the St. Vincent Booster Pump Station the theoretical available fire flows in the system are as follows:

Zone-1: Range from 0.5L/s to 250L/s

Zone -2 (Nelson Street BPS Boosted Zone): Range from 8.6L/s to 35L/s

Zone-3 (St. Vincent Street BPS Boosted Zone): Range from 1L/s to 9L/s

An available fire flow contour map and a colour coded fire flow sketch showing the theoretical available fire under MDD and the above noted conditions are included in ***Appendix I*** and ***Appendix J*** respectively.

Within Zone-1 there are a number of areas with inadequate available fire flows. In the north-west end of the system, available fire flows on Lakeshore Road, north of Algonquin Drive, and on Centreville Road range from 5L/s to 15L/s. Available fire flows on Highway 26 west of Algonquin Drive/Ridge Road, and on the Seventh Line, range from 1L/s to 30L/s. In this area, the inadequate fire flows result from a combination of older, small diameter (100 mm and 150 mm) asbestos cement and ductile iron watermains and the requirement for boosted pressure to provide adequate fire flows to the northern portion of the water distribution system.

Available fire flows along Grandview Drive, from south of the Water Filtration Plant to the intersection of Grandview Drive and Sykes Street, are in the range of 16L/s to 33L/s. Inadequate fire flows in this area are a result of older, 100 mm diameter cast iron watermains.

Available fire flows on Thompson Street from Nelson Street to Lombard Street range from 0.9L/s to 1.5L/s and Collingwood Street from Thompson Street to Cook Street range from 34 to 36L/s. Inadequate fire flows in this area are a result of older, 25 to 100 mm diameter cast iron watermains.

Within Memorial Park, a Municipally-owned campground, the theoretical available fire flow is in the range of 20L/s. Inadequate fire flows in this area are a result of older, small diameter watermains both in the areas with inadequate fire flows and in the distribution system feeding this area.

There are pockets within the core of the distribution system with inadequate fire flows, as a result of older, small diameter cast iron watermains and dead ends. The 2003 report did recommend that all cast iron watermain in the distribution system be replaced with minimum 150 mm diameter watermains.

Within Zone 2, Nelson Booster Pump Station Boosted Zone, the entire zone has inadequate theoretical available fire flows. This is a result of the Nelson Booster Pump Station not providing adequate flows to the zone and a combination of older, and/or small diameter cast iron watermains within the zone.

Within Zone 3, the St. Vincent Booster Pump Station Boosted Zone, the entire zone has inadequate theoretical available fire flows. This is a result of a combination of inadequate flows coming out of the St. Vincent Booster Pump Station when only one pump is on. Typically, additional pumps turn on to meet the demand. Another scenario with two pumps on at St. Vincent BPS was modeled in Section 3.5.2 below.

3.5.2 Ultimate Flow – Maximum Day Demand Plus Fire Flow – 2 Pumps on at St. Vincent BPS

Under the above noted conditions, and maximum day demand, with one high lift pump operating at the Water Treatment Plant and two pumps operating at the St. Vincent Booster Pump Station the theoretical available fire flows in the system are as follows:

Zone-1: Range from 0.5L/s to 250L/s

Zone -2 (Nelson Street BPS Boosted Zone): Range from 8.6L/s to 35L/s

Zone-3 (St. Vincent Street BPS Boosted Zone): Range from 1L/s to 49L/s

An available fire flow contour map and a colour coded fire flow sketch showing the theoretical available fire under MDD and the above noted conditions are included in ***Appendix K*** and ***Appendix L*** respectively.

Fire flows in Zone 1 and Zone 2 stayed the same as noted in the previous scenario (MDD+FF- One pump on at St. Vincent BPS).

Fire flows within Zone 3 improved by turning on a second pump. Fire flows within the zone generally range from 38 L/s to 49L/s. There are few areas that have fire flows that range from 1to 33L/s; these low fire flows are due to small diameter pipes and dead ends.

4.0 Problem Areas

Through consultation with the Municipality of Meaford and through the water model analysis the following problems have been noted:

- Non-Compliant water booster pump station at Nelson St. Booster Pump Station
- Inadequate fire flows to Zone 2 (Nelson St. BPS Boosted Zone) and concerns about the hospital being fed off the Nelson Street BPS.
- Pressure issues in the north end of Meaford along Centreville Road.

- Constant low pressure in Fairway Crescent
- Pressure issues when the pump at the Water Treatment Plant is off and the system is running off the pressure of the water tower. (Reverse flow occurs)
- Several areas with small diameter and old watermain that cause pressure and flow issues within the water system

4.1 Small and Old Diameter Watermain

There are several areas where the diameter of the watermain is small and old. The old watermain in the Municipality of Meaford is generally made of cast iron. Over time, cast iron pipe is known to experience corrosion and tuberculation which both negatively affect the watermain.

Corrosion is a gradual destruction of materials by chemical reaction with their environment. Corrosion affects the structural integrity of the watermain which could cause the watermain to break from the water pressure or cause leaks in the watermain.

Tuberculation is the development of small mounds of corrosion product on the inside of the cast iron pipe. The buildup of corrosion products roughens the inside of the pipe and increases its resistance to water flow, decreasing the pipe capacity and C-factor. The decreased pipe capacity reduces the fire flow.

The cast iron watermain in Meaford ranges in age from 50 years to over 100 years old. The older watermain would be expected to have been affected more by corrosion and tuberculation.

These old cast iron watermain also are generally 100 mm diameter pipes. MOE Design Guidelines states that for systems designed to provide fire protection, the minimum size watermain should be 150 mm. There are many watermain within Meaford that do not meet the minimum 150 mm watermain size. Increasing the watermain size to the minimum 150 mm should improve the fire flows to that area.

It is suggested that in areas that have cast iron pipes, that flow testing be conducted to determine which areas the pressures and flows are reduced the most. This can determine which watermain should be replaced first. **Table 3** outlines the watermain that are cast iron watermain based on the information in the water model. **Appendix M** outlines a map of the watermain materials within the Meaford water distribution system.

Table 3: Cast Iron Watermain in Meaford Water System

Street	From	To	Watermain Size (mm)	Approximate Length (m)
Zone 1				
Aiken Street	Graham Street	Lakeside Avenue	100	360
Aimee Street	Margaret Street	Eliza Street	100	165
Algonquin Drive	Algonquin Drive	Lakeshore Road	100	140
Berry Street	Owen Street	End	100	170
Boucher Street	Victoria Crescent	Henry Street	250	215
Bridge Street	St. Vincent Street	Fuller Street	100	185
Centreville Road	Scotia Drive	7th Line	100	320

Collingwood Street	Thompson Street	Cook Street	100	185
Collingwood Street	Cook Street	Sykes Street	150	170
Cook Street	Sykes Street	Lombard Street	100	390
Cook Street	Collingwood Street	Berry Street	100	350
Denmark Street	Bridge Street	Edwin Street	100	725
Edwin Street	Lorne Street	Victoria Crescent	150	210
Edwin Street	Victoria Crescent	Henry Street	100	460
Edwin Street	Henry Street	Denmark Street	350	180
Eliza Street	Richmond Street	Lakeside Avenue	100	610
Grandview Drive	WTP	Sykes Street	100	670
Grant Avenue	Middle Avenue	Memorial Campground	100	170
Henry Street	Boucher Street	Marshall Street	100	130
Henry Street	Marshall Street	Margaret Street	350	140
Lakeside Avenue	Aiken Street	Memorial Campground	100	480
Legion Road	Owen Street	70 m West	100	70
Lorne Street	Edwin Street	Louisa Street	150	245
Margaret Street	Edwin Street	St. Vincent Street	150	325
Margaret Street	Vera Street	135m west of Aimee St	100	135
Marshall Street	Sykes Street	Henry Street	100	125
Marshall Street	St. Vincent Street	East End	150	490
Nelson Street	Cook Street	Sykes Street	150	185
Nelson Street	Sykes Street	Bayfield Street	100	195
Owen Street	Trowbridge Street	Legion Road	150	220
Parker Street	Thompson Street	Cook Street	100	185
Richmond Street	Eliza Street	Aiken Street	100	170
Susan Street	Thompson Street	Sykes Street	200	85
Sykes Street	WTP	Helen Street	400	165
Sykes Street	Lombard Street	Collingwood Street	100	240
Sykes Street	Collingwood Street	Berry Street	200	345
Sykes Street	Berry Street	Marshall Street	150	150
Thompson Street	Susan Street	Lombard Street	150	490
Thompson Street	Lombard Street	Nelson Street	300	85
Trowbridge Street	Water Tower (Owen Street)	Cook Street	350	380
Trowbridge Street	Cook Street	Sykes	200	200
Trowbridge Street	Bayfield Street	Denmark Street	250	110
Vera Street	Margaret Street	Eliza Street	100	220
Victoria Crescent	Marshall Street	100 m North East	100	100
Zone 2				
Miller Street	70 East of Gardiner Street	West end	100	760
Miller Street	Gardiner Street	Private Road	100	230
Nelson Street	Nelson Street BPS	Pearson Street	150	270
Pearson Street	Nelson Street	North End	100	400
Pearson Street	Berry Street	Miller Street	100	175
Zone 3				
Augusta Street	Ivan Street	Union Street	100	245
Burton Street	Farrar Street	Sykes Street	100	175
Centre Street	Russett Drive	Lousia Street	100	550
Farrar Street	Union Street	Burton Street	100	220

Ivan Street	Sykes Street	Augusta Street	100	275
Louisa Street	Centre Street	Lorne Street	100	200
McKibbon Drive	McKibbon Drive	End	100	180
Montgomery Street	St. Vincent Street	200 East	100	210
Paul Street	Union Street	Burton Street	150	350
Sykes Street	Burton Street	Ivan Street	200	70
			Total:	**15,650**

As noted in **Table 3** above, there are several areas that have cast iron pipe. The majority of the cast iron pipe is located in the downtown area. This is expected as this would be the oldest part of the town.

Appendix N illustrates the pipe sizes in the Meaford water distribution system. **Table 4** outlines the streets that have 100 mm diameter pipe within the water model. The pipes that are less than 100 mm are generally water services and were not taken into account in the chart.

Table 4: 100 mm Watermain in Meaford Water System

Street	From	To	Material	Approximate Length (m)
Zone 1				
150 Victoria Street			Ductile Iron	100
7th Line	Highway 26	North 100 m	Cast Iron	105
7th Line	100m South of Highway 26	700 m South	Asbestos Cement, Cast Iron	725
Aiken Street	Graham Street	Lakeside Avenue	Cast Iron	360
Aimee Street	Margaret Street	Eliza Street	Cast Iron	165
Albert Street	Cook Street	Sykes Street	Ductile Iron	135
Algonquin Drive	Algonquin Drive	Lakeshore Road	Cast Iron	140
Berry Street	Owen Street	End(west)	Cast Iron	170
Bridge Street	St. Vincent Street	Fuller Street	Cast Iron	185
Centreville Road	Lakeshore Road	7th Line	Asbestos Cement, Cast Iron	755
Collingwood Street	Thompson Street	Cook Street	Cast Iron	185
Cook Street	Sykes Street	End	Cast Iron, Ductile Iron	1040
Denmark Street	Bridge Street	Edwin Street	Cast Iron	725
Edwin Street	Victoria Crescent	Sykes Street	Cast Iron	275
Eliza Street	Richmond Street	Lakeside Avenue	Cast Iron	610
Grandview Drive	WTP	Sykes Street	Cast Iron	670
Grant Avenue	Middle Avenue	Memorial Campground	Cast Iron	170
Henry Street	Boucher Street	Marshall Street	Cast Iron	130
Lakeshore Road	Algonquin Drive	Centreville Road	Asbestos Cement, Ductile Iron	500
Lakeside Avenue	Eliza Street	Memorial Campground	Cast Iron	645
Margaret Street	Vera Street	135 m West	Cast Iron	135

Marshall Street	Vitoria Crescent	Sykes Street	Ductile Iron	190
Marshall Street	Sykes Street	Henry Street	Cast Iron	125
Memorial Campground			Ductile Iron (25mm)	650
Miller Street	Owen Street	70 m West	Cast Iron	70
Nelson Street	Thompson Street	60 m West	Ductile Iron	60
Nelson Street	Sykes Street	Bayfield Street	Cast Iron	195
Richmond Street	Eliza Street	Aiken Street	Cast Iron	170
St. Vincent Street	Bridge Street	Boucher Street	Cast Iron	140
Sykes Street	Nelson Street	Berry Street	Cast Iron	200
Vera Street	Margaret Street	Eliza Street	Cast Iron	220
Victoria Crescent	Marshall Street	100 m Northeast	Cast Iron	100
William Street	Thompson Street	Sykes Street	Ductile Iron	170
Zone 2				
Berry Street	Noble Street	130 m west of Noble	Ductile Iron	130
Collingwood Street	Noble Street	Pearson Street	Ductile Iron	140
Miller Street	70 m East of Gardiner	130 m East of Pearson	Cast Iron	760
Miller Street	Gardiner Street	Private Road	Cast Iron	230
Nelson Street	Noble Street	Pearson Street	Ductile Iron	160
Pearson Street	Berry Street	Miller Street	Cast Iron	175
Pearson Street	Trowbridge Street	Glen Abbey Court	Cast Iron, Ductile Iron	505
Zone 3				
Augusta Street	Union Street	Sykes Street	Cast Iron	245
Burton Street	Farrar Street	Sykes Street	Cast Iron	175
Centre Street	75 m North of Russet Drive	Louisa Street	Cast Iron	480
Dillon Avenue	Louisa Street	End	Ductile Iron	60
Farrar Street	Union Street	Burton Street	Cast Iron	220
Ivan Street	Augusta Street	Sykes Street	Cast Iron	275
McKibbon Street	Sykes Street	End	Ductile Iron, Cast Iron, Copper	280
Montgomery Street	Sykes Street	End	Ductile Iron, Cast Iron	380
St. Vincent Street	200 South of McKibbon Drive	275 m North of Muir Street (12/13 Sideroad)	Ductile Iron, Cast Iron	460
			Total:	**14,890**

As noted in the tables above, there are several pipes that either have small diameters or are cast iron pipes. The table below outlines pipe sections that have both cast iron and small diameter pipe.

Table 5: Pipe Sections with Cast Iron and 100 mm pipe

Street	From	To	Approximate Length (m)
Zone 1			
Aiken Street	Graham Street	Lakeside Avenue	360
Aimee Street	Margaret Street	Eliza Street	165
Algonquin Drive	Algonquin Drive	Lakeshore Road	140
Berry Street	Owen Street	End(west)	170
Bridge Street	St. Vincent Street	Fuller Street	185
Centreville Road	Scotia Drive	7th Line	320
Collingwood Street	Thompson Street	Cook Street	185
Cook Street	Sykes Street	Lombard Street	390
Cook Street	Collingwood Street	Berry Street	350
Denmark Street	Bridge Street	Edwin Street	725
Edwin Street	Victoria Crescent	Margaret Street	275
Eliza Street	Richmond Street	Lakeside Avenue	610
Grandview Drive	WTP	Sykes Street	670
Grant Avenue	Middle Avenue	Memorial Campground	170
Henry Street	Boucher Street	Marshall Street	130
Lakeside Avenue	Eliza Street	Memorial Campground	645
Margaret Street	Vera Street	135 m West of Vera	135
Marshall Street	Sykes Street	Henry Street	125
Miller Street	Owen Street	70 m West	70
Nelson Street	Sykes Street	Bayfield Street	195
Richmond Street	Eliza Street	Aiken Street	170
St. Vincent Street	Bridge Street	Boucher Street	140
Sykes Street	Nelson Street	Berry Street	200
Vera Street	Margaret Street	Eliza Street	220
Victoria Crescent	Marshall Street	100 m Northeast	100
Zone 2			
Miller Street	70 m East of Gardiner	130 m East of Pearson	760
Miller Street	Gardiner Street	Private Road	230
Pearson Street	Berry Street	Miller Street	175
Pearson Street	Nelson Street	End North	505
Zone 3			
Augusta Street	Union Street	Sykes Street	245
Burton Street	Farrar Street	Sykes Street	175
Centre Street	75 m North of Russet Drive	Louisa Street	480
Farrar Street	Union Street	Burton Street	220
Ivan Street	Augusta Street	Sykes Street	275
McKibbon Street	Sykes Street	End	280
Montgomery Street	Sykes Street	End	380
		Total:	**10,570**

The table above outlines the watermain sections that should be considered to be replaced first due to small diameters and cast iron pipe. If the pipes are replaced with larger diameter watermain, it would help with the pressure and fire flow issues within the water system.

5.0 Conclusions

An analysis of a projected ultimate build out scenario was completed to confirm the requirements for servicing the identified long-term future developments. Consultation with, and direction from the Municipality of Meaford Planning Department, was used to develop long-term future growth projections for the Municipality. A review of pressures and available fire flows throughout the distribution system was completed, and there are some areas of the system that did not meet the minimum recommended guidelines for minimum pressures and for the fighting of a typical detached single-family dwelling fire. It should be noted that several of the pressure and fire flow issues occur in the existing model and still persist in the future model. In the future build out scenario, these pressure and fire flow issues are greater and affect more areas. These pressure and fire flow issues are a result of old and small diameter watermain and the non-compliant Nelson Street water booster pump station. If these issues are addressed it should resolve most of the pressure and fire flow problems in the system.

With respect to the Water Treatment Plant and highlift pumps, the future MDD of 7,485.87 m^3/day (86 L/s) is 27.9% of the rated capacity of the Water Treatment Plant and is 58.1% of the design capacity of a single highlift pump at the Water Treatment Plant. The future Peak Hour of 10,885.71 m^3/day (86 L/s) is 40.5% of the rated capacity of the Water Treatment Plant and is 84.4% of the design capacity of a single highlift pump at the Water Treatment Plant. Thus, there is sufficient capacity from the Water Treatment plant to meet the demand.

However, a storage requirement for fire protection is required to meet MOE design guidelines. The existing storage within the Meaford water system is 2,880 m^3. The required storage for the future population of 12,000 is 4,710 m^3. Therefore an additional 1,830 m^3 of storage is required for the future population.

Appendix – A

Existing Pressure Zone Boundaries

WATER TREATMENT PLANT

NELSON STREET BPS

WATER TOWER

ST. VINCENT STREET BPS

GEORGIAN BAY

MEAFORD HARBOUR

MARINA BASIN

CENTREVILLE ROAD

HIGHWAY No. 26

GREY COUNTY RD 12

12 / 13 SIDEROAD

COUNTY ROAD NO. 7

HIGHWAY No. 26

FAIRWAY AVENUE

ALBERT STREET

ST. VINCENT STREET

MEAFORD COMMUNITY SCHOOL

MEAFORD GENERAL HOSPITAL

MEAFORD PUBLIC WORKS BUILDING

MEAFORD / ST. VINCENT COMMUNITY CENTRE

MEAFORD MUSEUM

McCARROL PARK

TOWN HALL

HARBOUR MASTER'S OFFICE

CANADIAN COAST GUARD

LEGION PARK

BEAUTIFUL JOE PARK

WILLIAM CROFT PLAYING FIELD

GEORGIAN BAY SECONDARY SCHOOL

SEWAGE TREATMENT PLANT

MEMORIAL PARK

LAKEVIEW CEMETERY

ST. VINCENT / EUPHRASIA ELEMENTARY SCHOOL

POLICE SERVICES

RAPERS PARK

PETES CREEK

BLOW OFF

PLOT 1=6

25 50 150 250m
50 0 100 200

NOTES

ZONE 1
ZONE 2
ZONE 3

CONTRACT DRAWINGS:
Contractor must verify all dimensions and be responsible for same. Any discrepancies must be reported to the Engineer before commencing work. Drawings are not to be scaled.

Ainley & Associates Limited claims copyright to this drawing and it may not be used for any purpose other than that stipulated in the contract between the owner/client and the Engineer without the express written consent of Ainley & Associates Limited.

NO.	REVISIONS	DATE	INITIAL
1.	ZONE BOUNDARIES	DEC 2014	JMM

Not Valid Unless Signed And Dated

SCALE: 1:6000
DESIGN: N.E.S.
DRAWN: P.C.S.
CHECKED: N.E.S.
DATE: APRIL 2012

MUNICIPALITY OF MEAFORD
WATER SUPPLY AND DISTRIBUTION

EXISTING PRESSURE ZONE BOUNDARIES

Ainley GROUP CONSULTING ENGINEERS PLANNERS

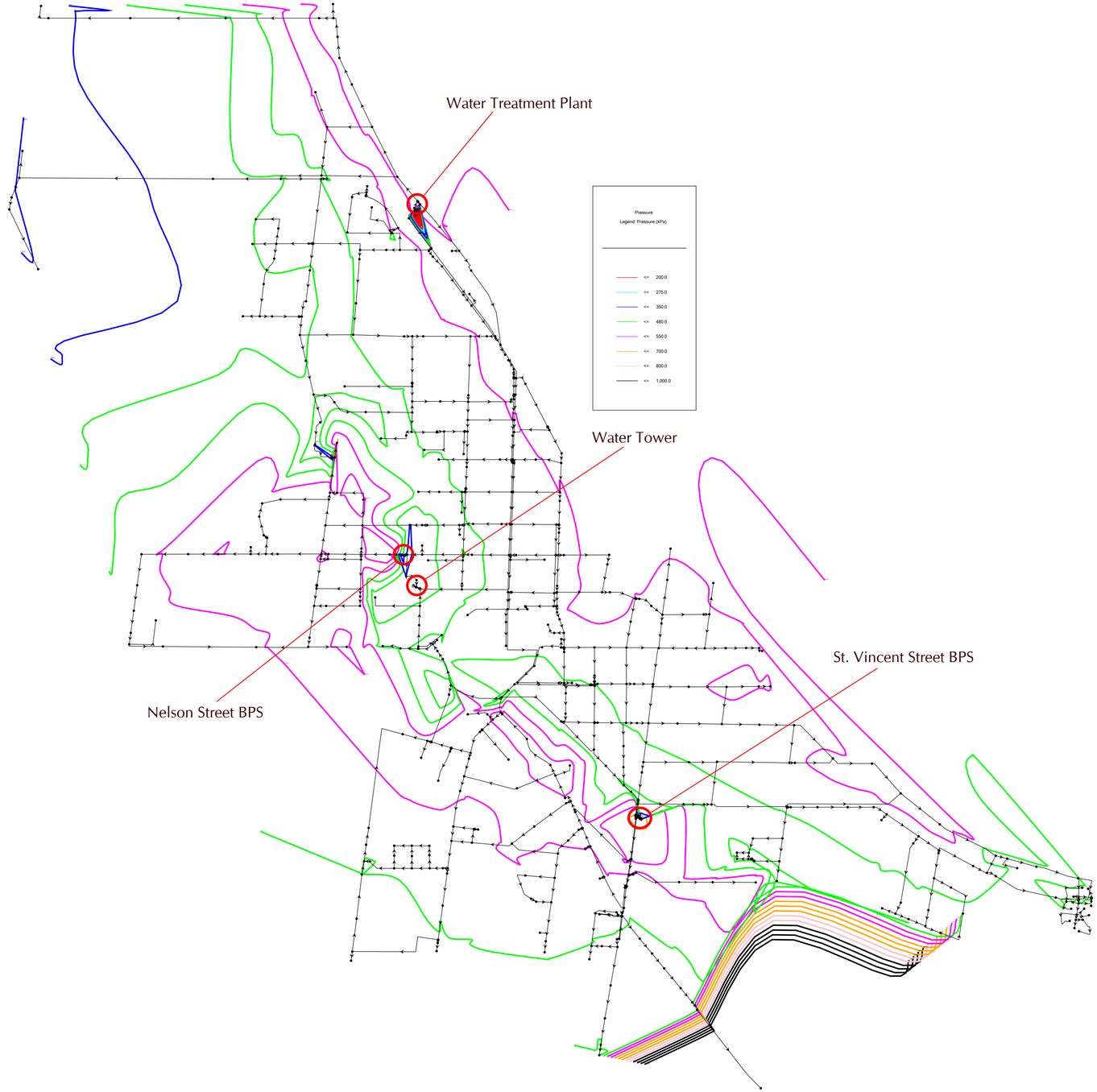
CONTRACT No.

DWG. 114106-WATER

Appendix - B

Existing Conditions – Pressure Contour Map at Peak Hour

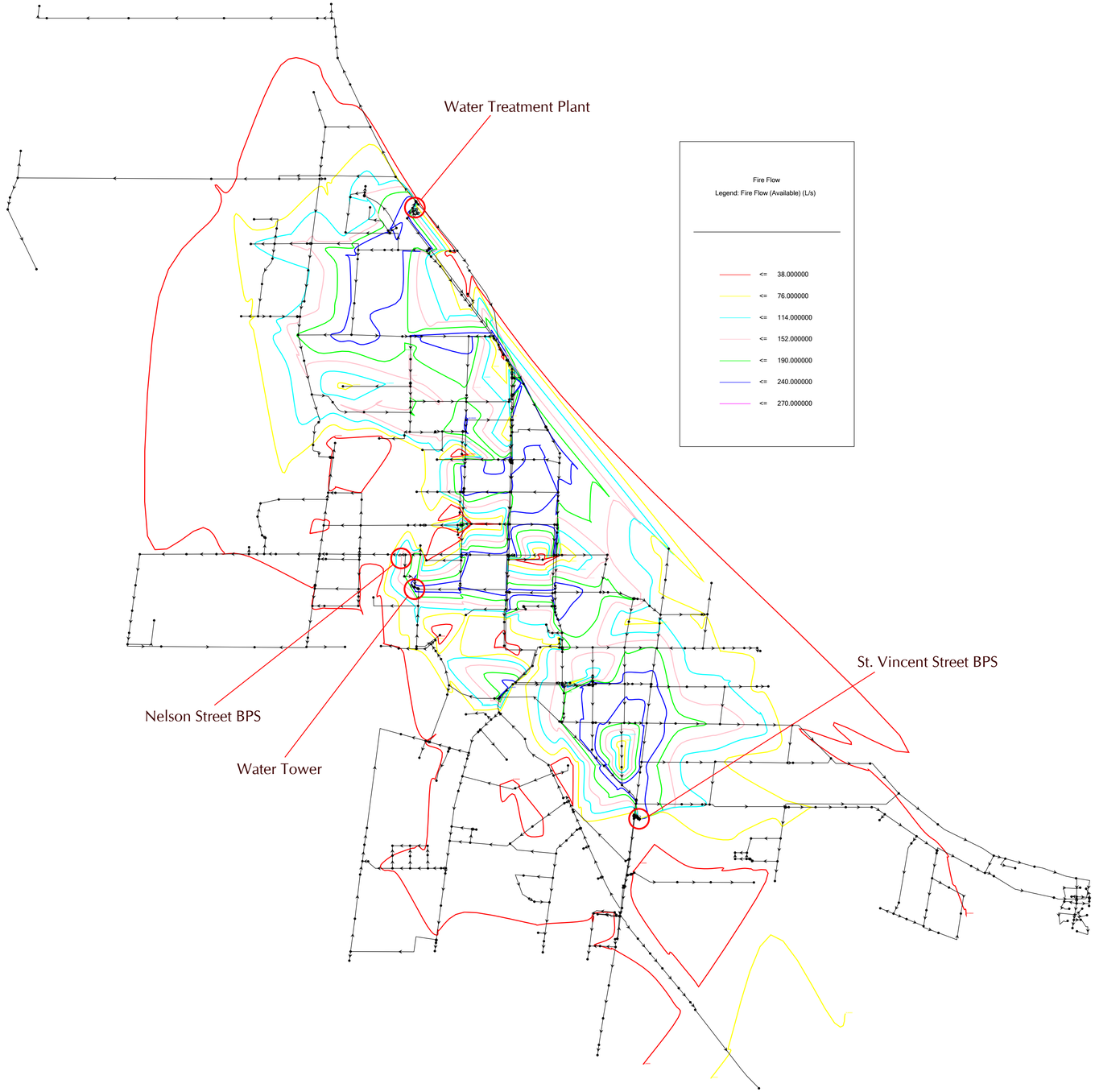
Scenario: Pressures - PH - Updated to 2013 Conditions



Appendix - C

Existing Conditions – Available Fire Flow Contour Map

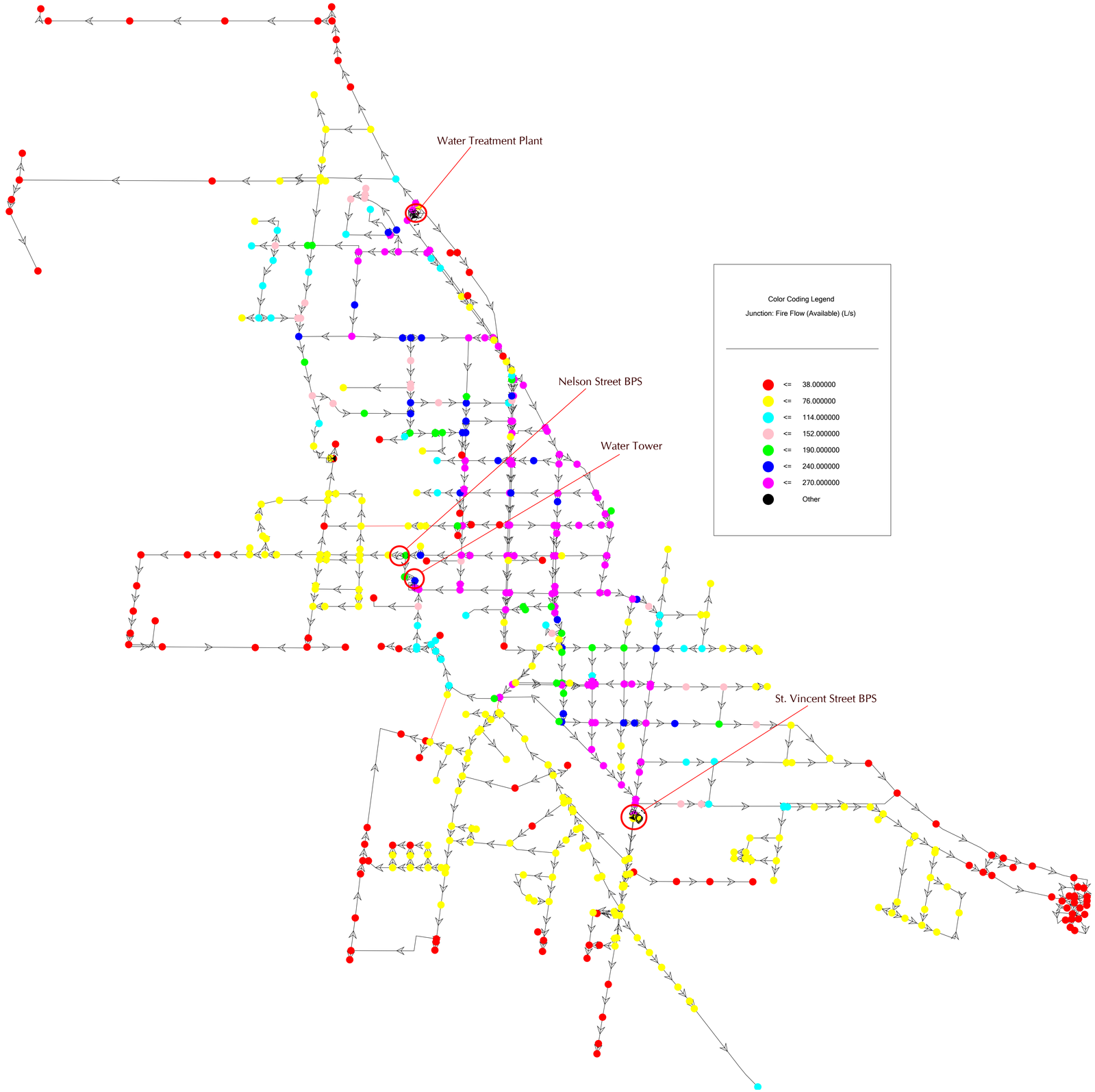
Scenario: Available Fire Flow - MDD+FF - Updated to 2013 Conditions



Appendix - D

Existing Conditions – Available Fire Flow Colour Coded Map

Scenario: Available Fire Flow - MDD+FF - Updated to 2013 Conditions



Color Coding Legend

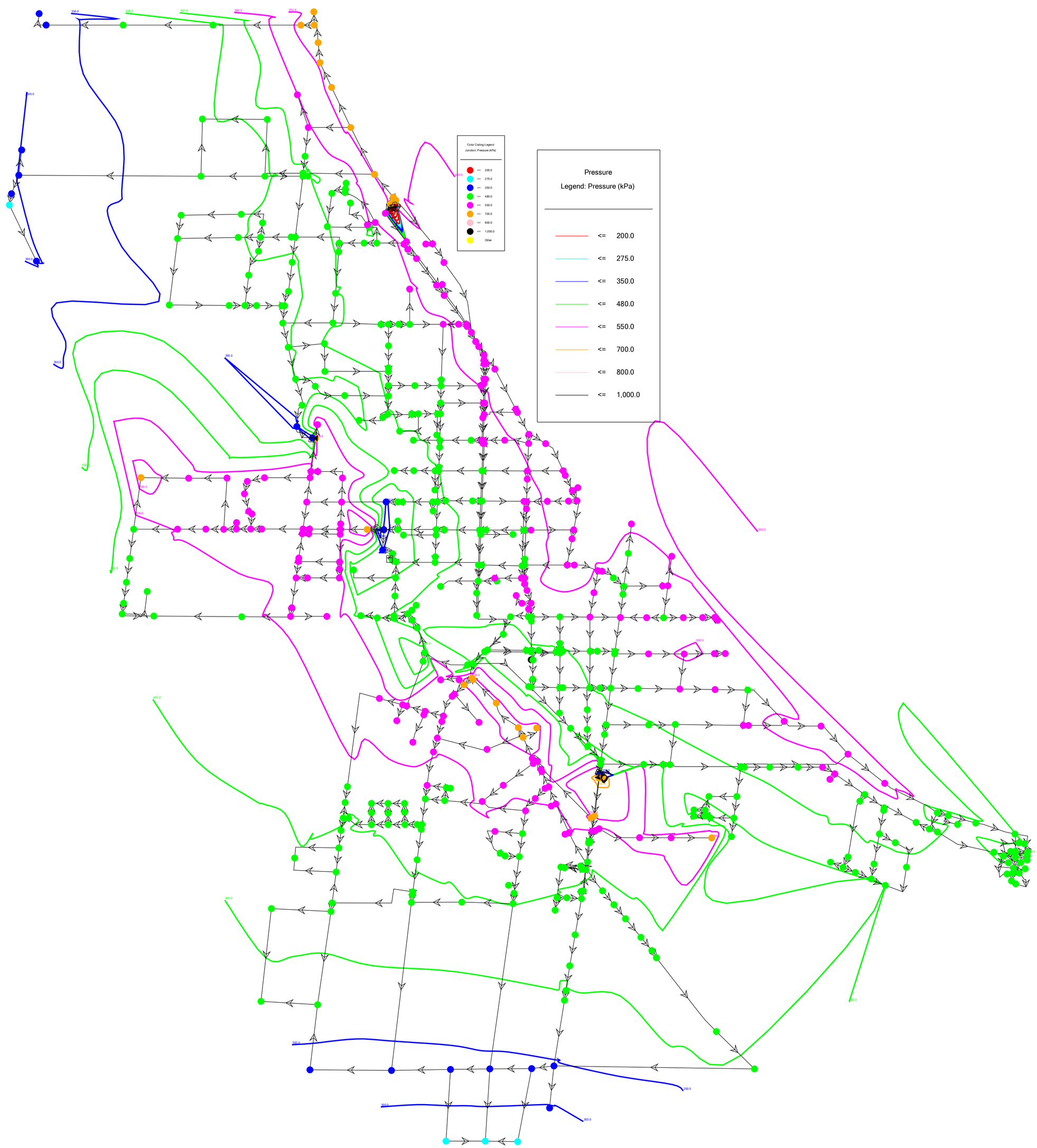
Junction: Fire Flow (Available) (L/s)

<=	38.000000
<=	76.000000
<=	114.000000
<=	152.000000
<=	190.000000
<=	240.000000
<=	270.000000
	Other

Appendix - E

Ultimate Build Out – Pressure Contour Map – ADD

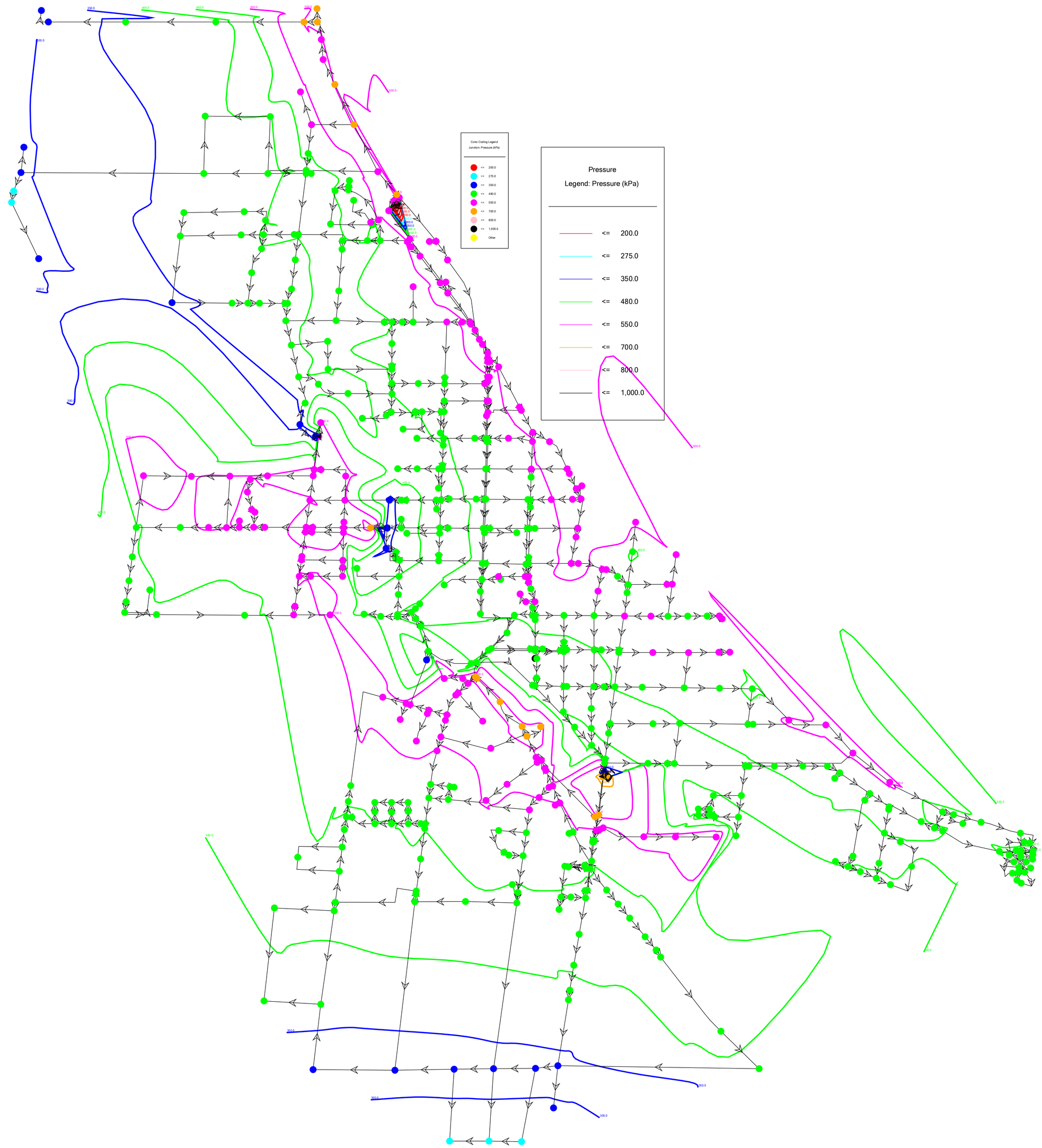
Scenario: Pressures - ADD - Projected Long Term Future



Appendix – F

Ultimate Build Out – Pressure Contour Map – MDD

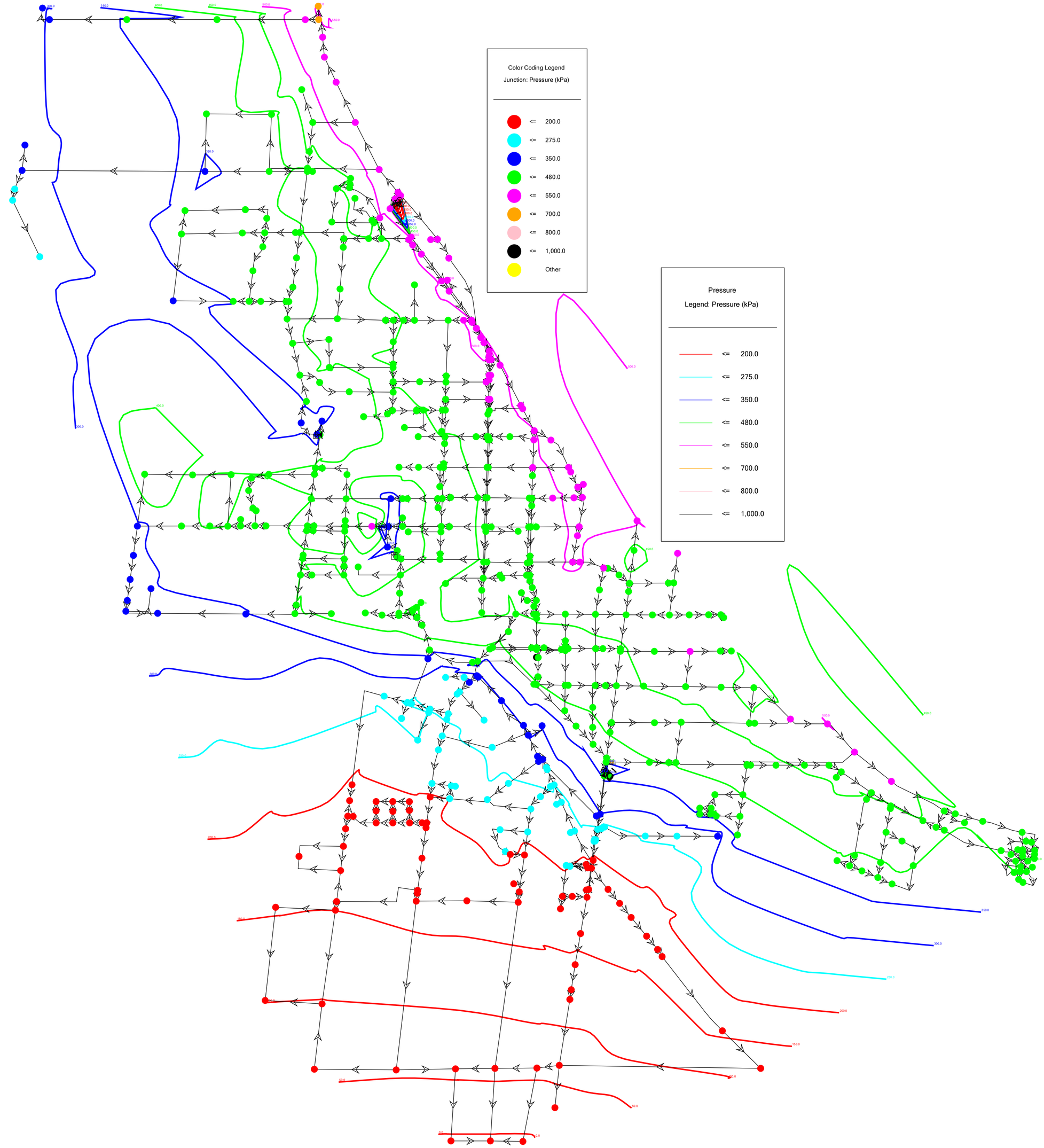
Scenario: Pressures - MDD - Projected Long Term Future Growth Scenario



Appendix - G

Ultimate Build Out – Pressure Contour Map – PH – One Pump at St. Vincent BPS

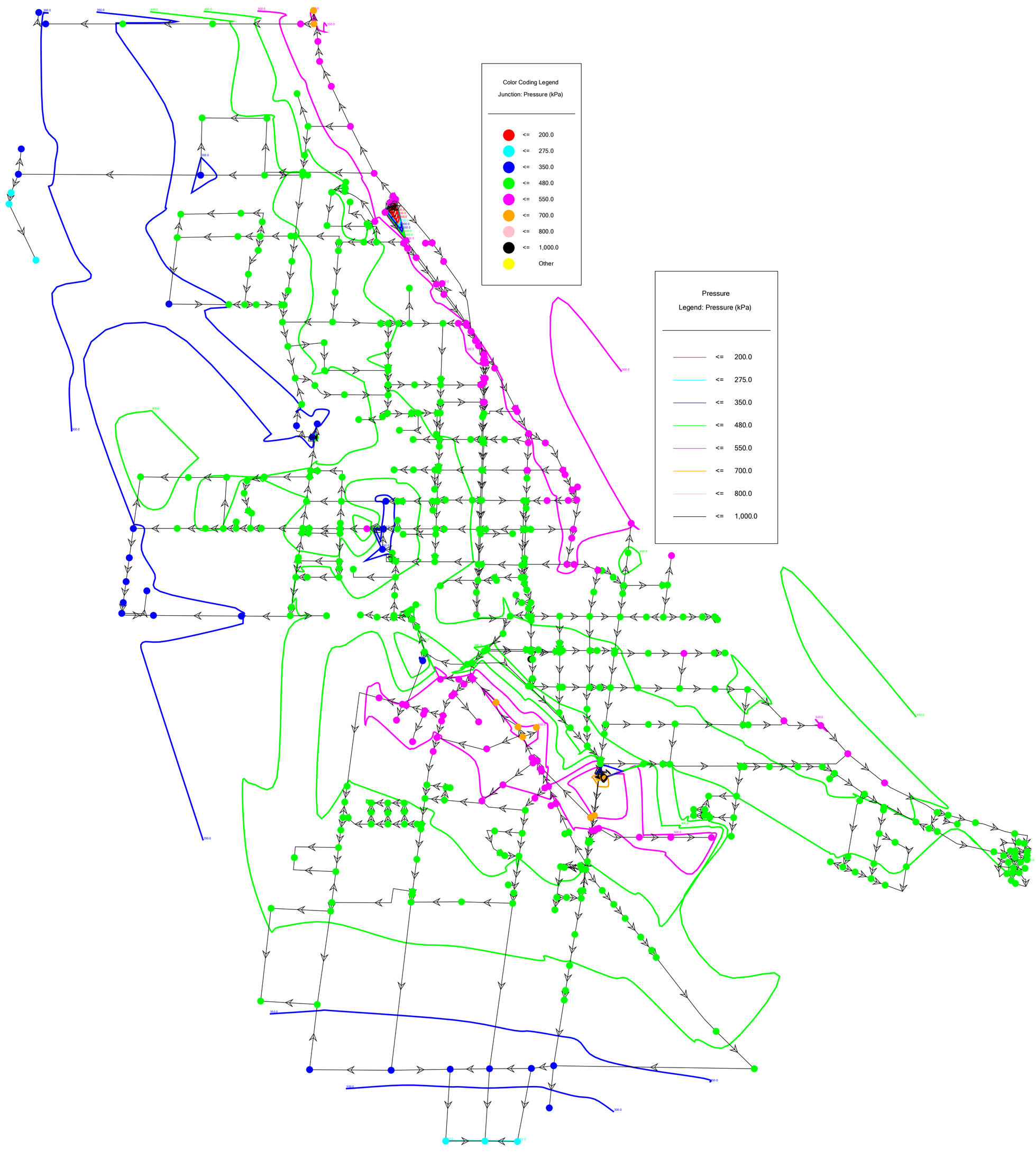
Scenario: Pressures - PH - Projected Long Term Future Growth Scenario



Appendix - H

Ultimate Build Out – Pressure Contour Map – PH – Two Pumps at St. Vincent BPS

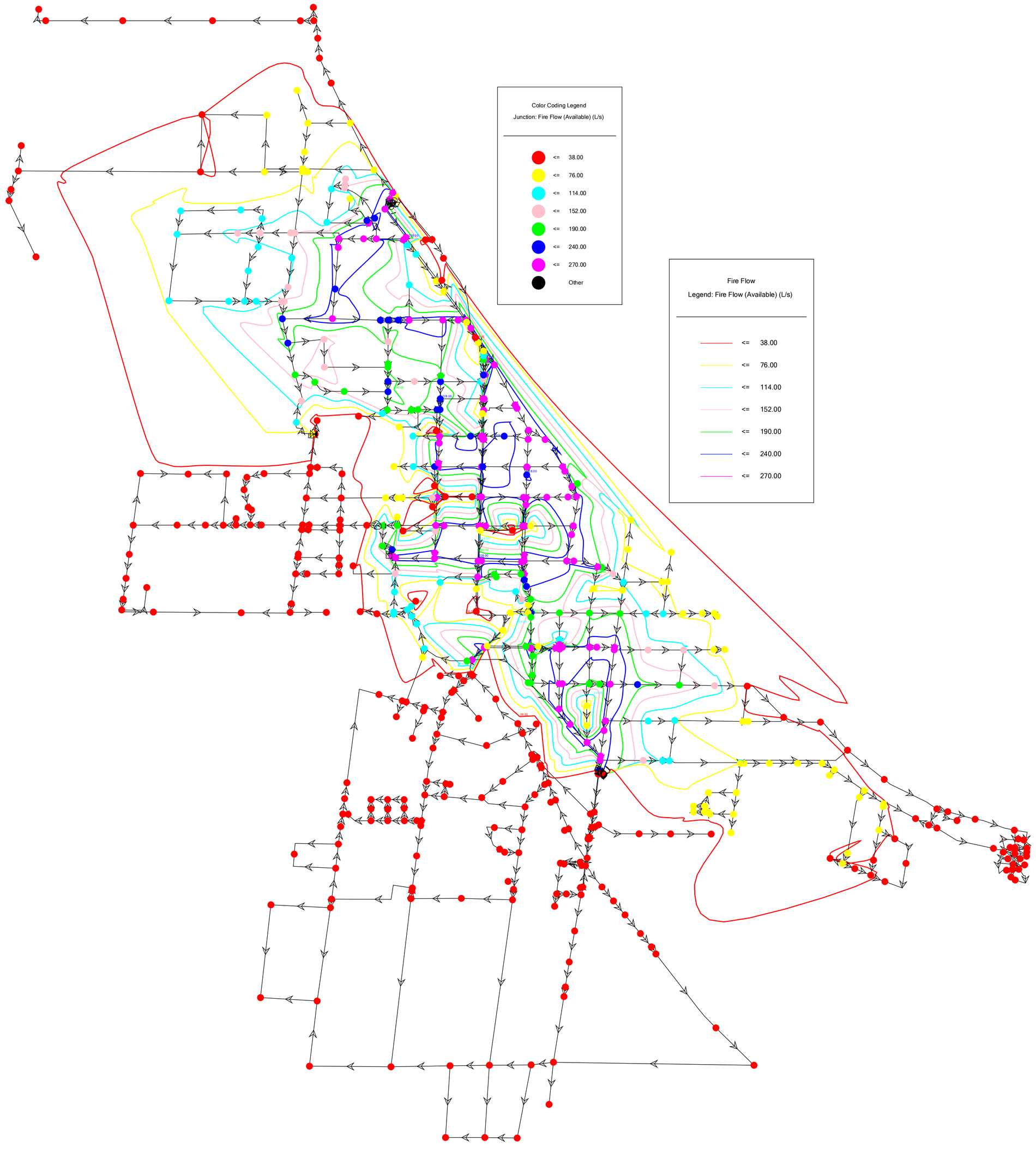
Scenario: Pressures - PH - Projected Long Term Future Growth Scenario



Appendix - I

Ultimate Build Out – Available Fire Flow Contour Map – MDD+FF – One Pump at St. Vincent BPS

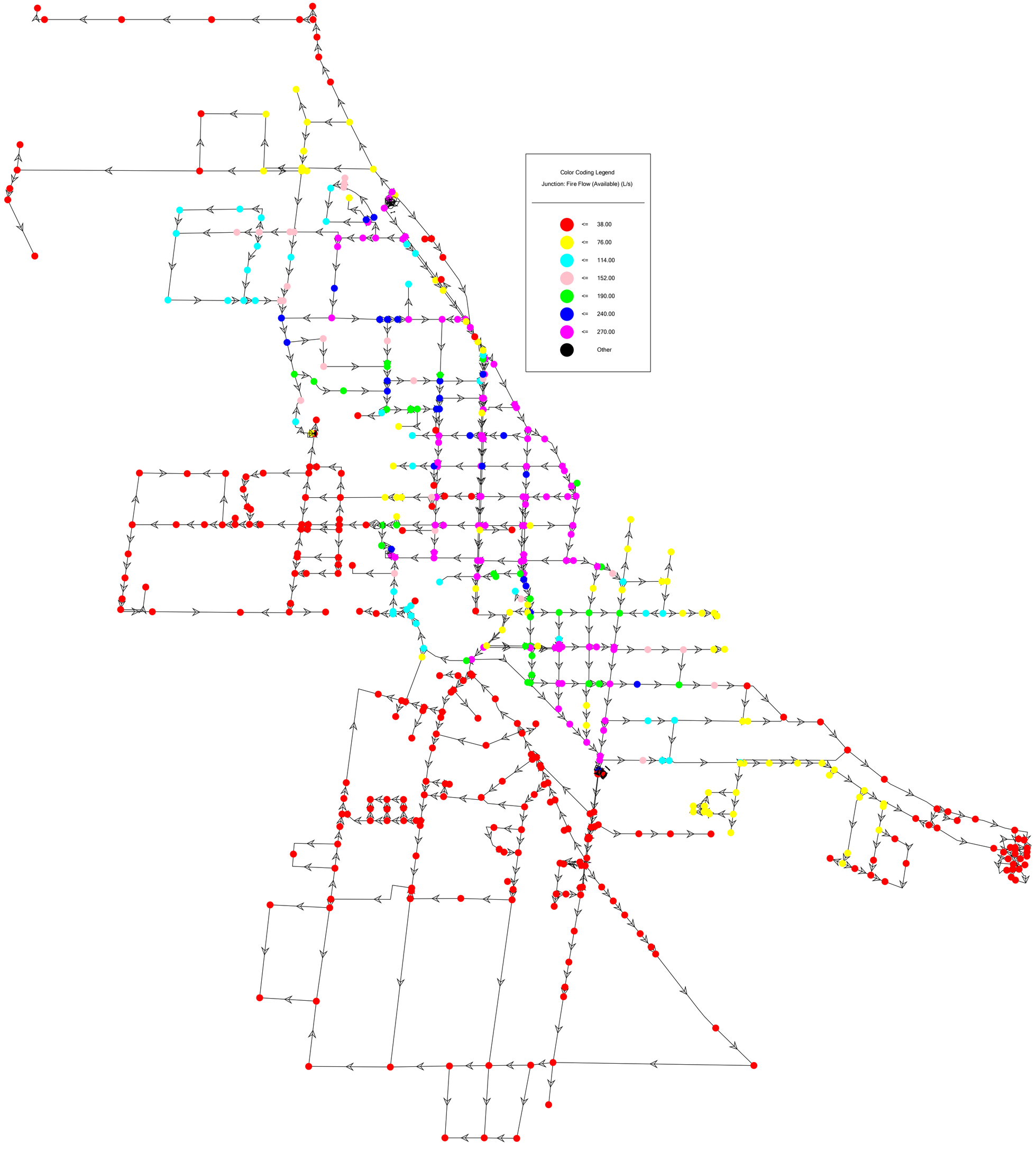
Scenario: Pressures - MDD + FF - Projected Long Term Future Growth



Appendix - J

Ultimate Build Out – Available Fire Flow Colour Coded Map – MDD+FF – One Pump at St. Vincent BPS

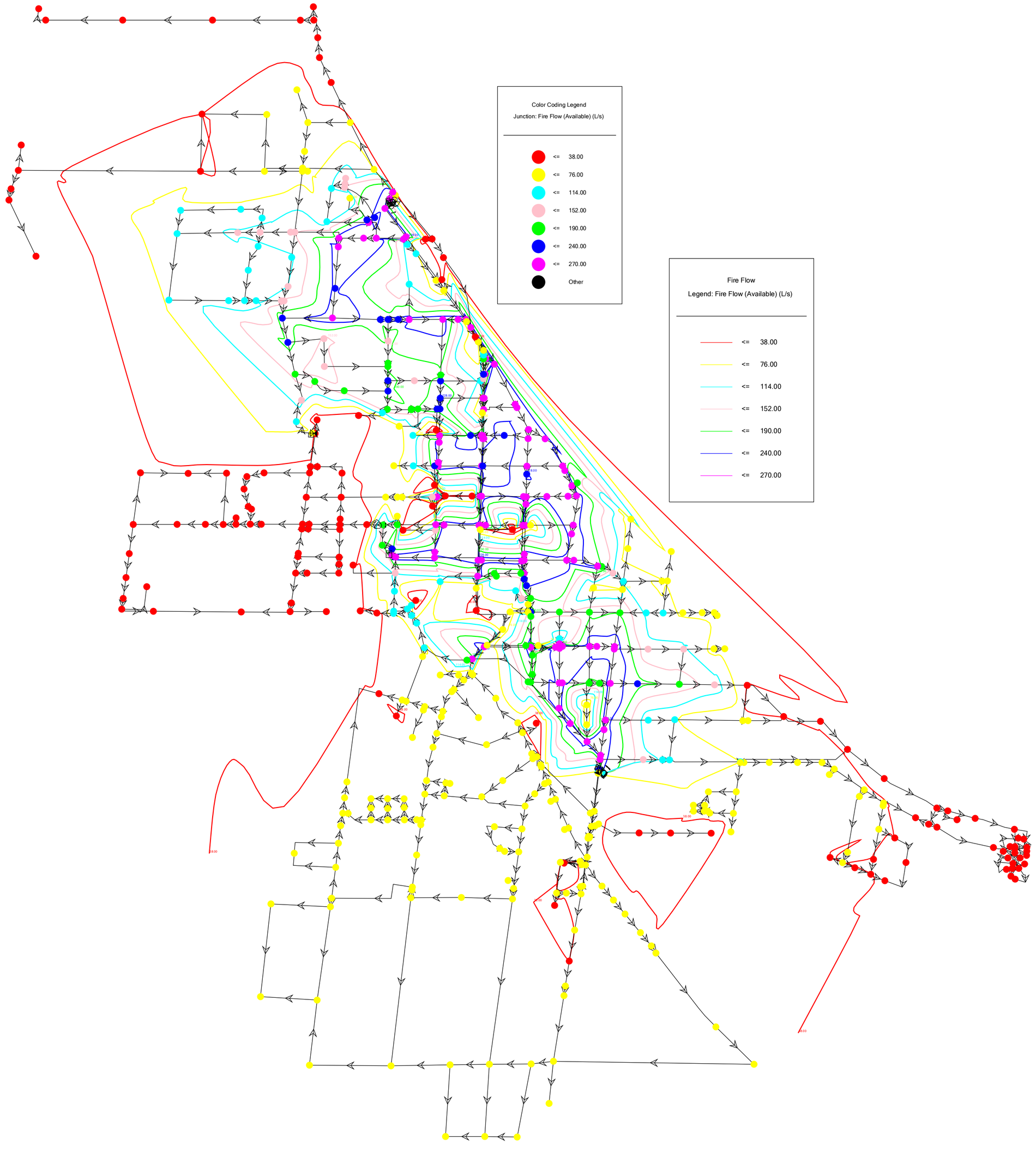
Scenario: Pressures - MDD + FF - Projected Long Term Future Growth



Appendix - K

Ultimate Build Out – Available Fire Flow Contour Map – MDD+FF – Two Pumps at St. Vincent BPS

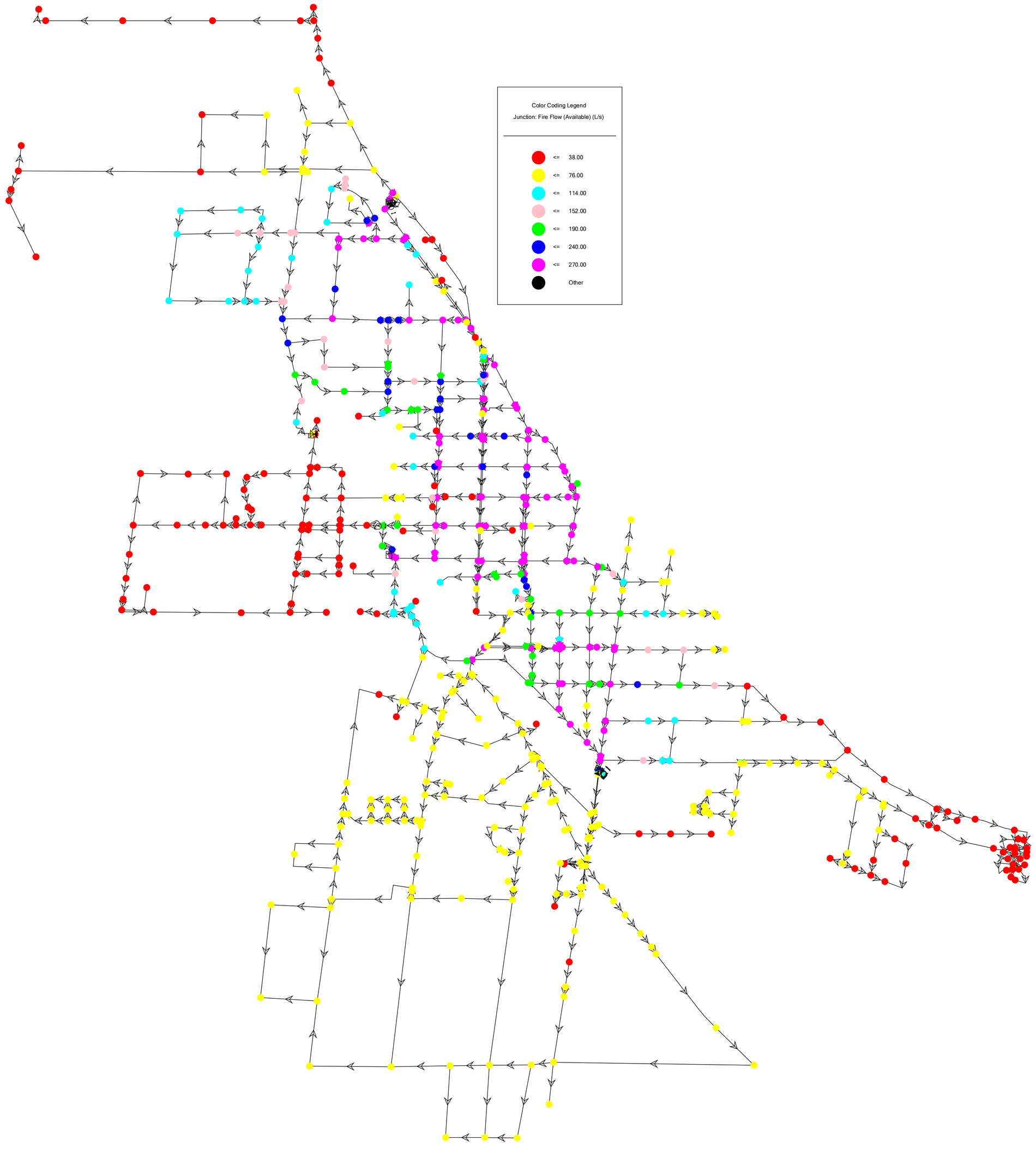
Scenario: Pressures MDD + FF - Project Long Term Future Growth - 2 pumps on at St. Vincent



Appendix - L

Ultimate Build Out – Available Fire Flow Colour Coded Map – MDD+FF – Two Pumps at St. Vincent BPS

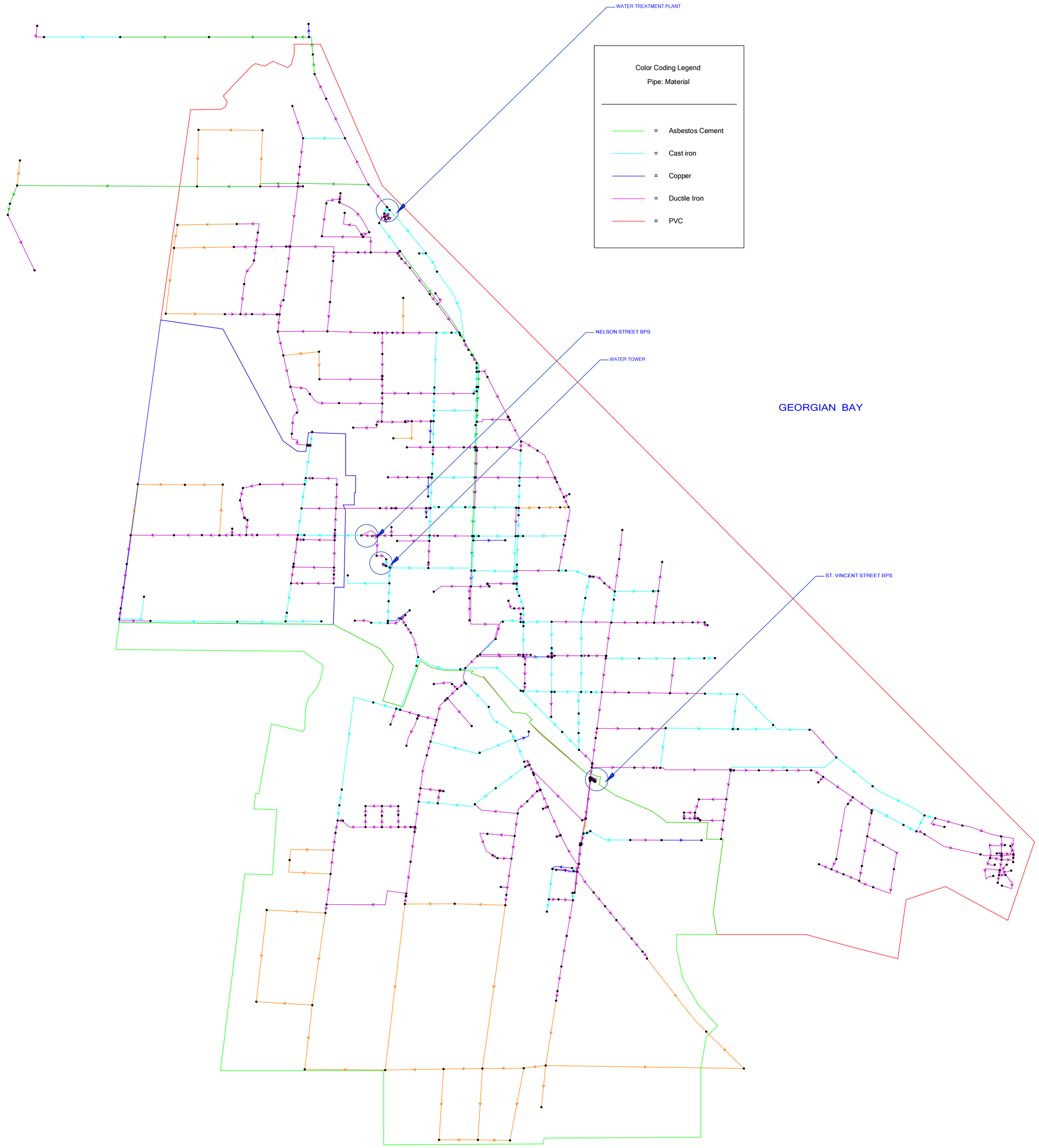
Scenario: Pressures MDD + FF - Project Long Term Future Growth - 2 pumps on at St. Vincent



Appendix - M

Meaford – Water Distribution – Pipe Materials Map

Scenario: Pressures - MDD - Projected Long Term Future Growth Scenario

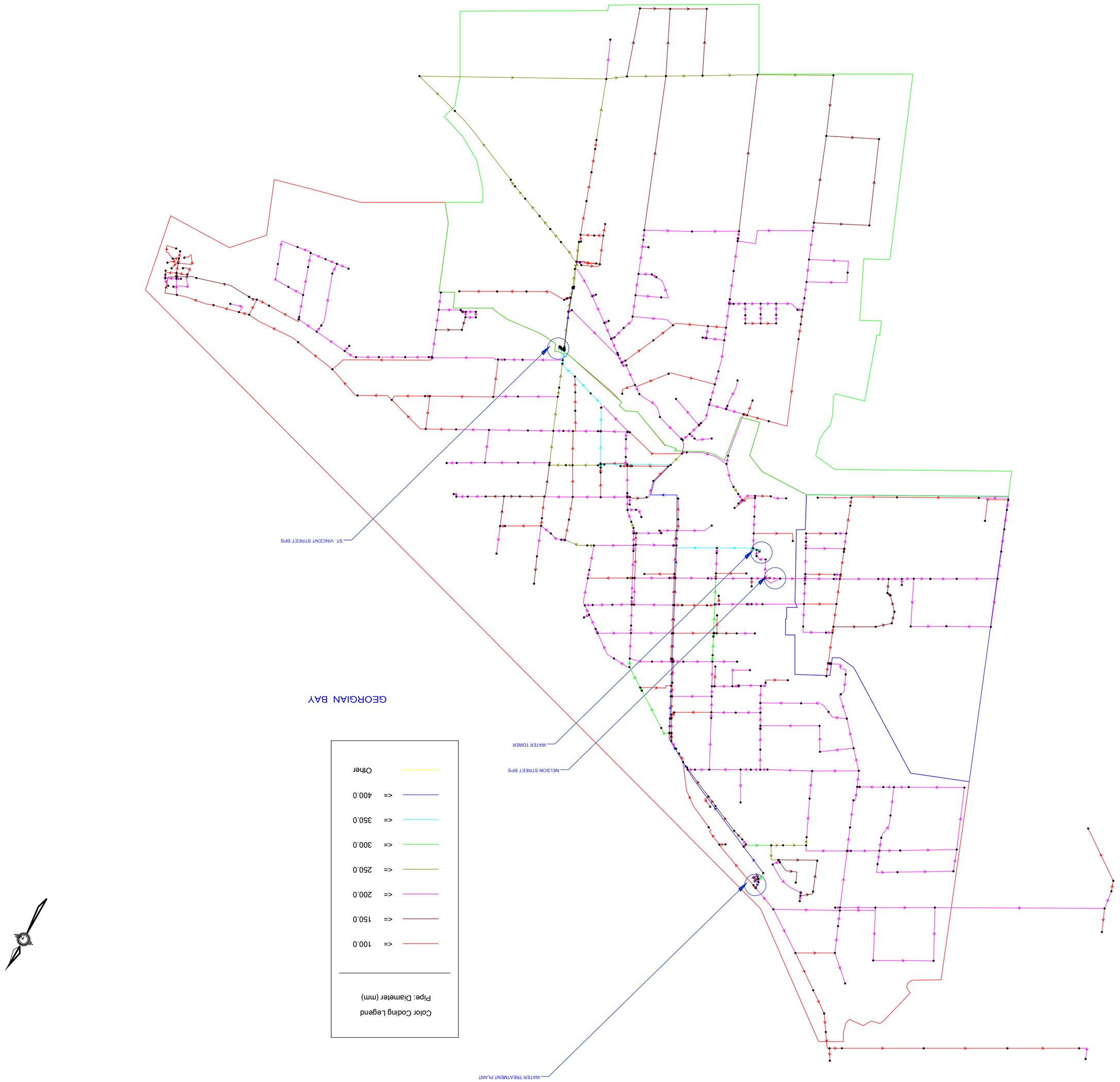


Appendix - N

Meaford – Water Distribution – Pipe Size Map

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666

Scenario: Pressures - MDD - Projected Long Term Future Growth Scenario



Municipality of Meaford

Water and Wastewater Servicing Master Plan
Identification and Evaluation of Alternatives for Water
Technical Memorandum

January 2015

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan Identification and Evaluation of Alternatives for Water– Technical Memorandum

Project No. 114106

Prepared for:
Municipality of Meaford

Prepared By:

_____
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1.0 Introduction

This technical memorandum outlines and evaluates the alternatives required to upgrade and expand the existing Meaford Water System to address problems identified in Phase 1 of this project and to meet the requirements of full build out. In addition to the problem identification, a water hydraulic model has been developed to reflect existing conditions and also to reflect the full build out condition.

2.0 Identification of Alternatives

Alternatives for the following categories have been identified and are discussed in further detail below:

- Watermains
- Water Treatment
- Storage
- Water Booster Pump Stations

2.1 Evaluation Criteria

To assess the alternatives, a criteria assessment table was developed rating each option as best, moderate or worst for the various criteria. No weighting was assigned to any of the criteria. The range of numbers associated with each rating is: worst = 1 and best = 5. The total value was obtained by summing all of the criteria ratings shown in **Table 1**. The evaluation criteria were developed from the approved MEA Class EA document and are being used for the water and wastewater projects.

Table 1: Evaluation Criteria

Criteria	Sub-Criteria	Weighting (%)	Rating (1 to 5) 1=lowest rating 5=highest rating	Total Rating (Weighting X Rating)
Land Use Planning		**15**	5	0.75
Natural Environment		**10**	5	0.5
Social Environment		**20**		
	Air Quality, Noise and Vibration	10	5	0.5
	Quality of Life	5	5	0.25
	Community Accessibility	5	5	0.25
Cultural Environment		**10**		
	Archaeological	5	5	0.25
	Heritage Features	5	5	0.25
Technical Considerations		**25**		
	Performance	5	5	0.25
	Technical Suitability	5	5	0.25
	Phasing	5	5	0.25
	Construction Considerations	5	5	0.25
	Operational Considerations	5	5	0.25
Economic Considerations		**20**		
	Capital Cost	10	5	0.5
	Operating Cost	20	5	0.5
Total		**100**		**5**

3.0 Overview of Alternatives for Watermains

As noted in Phase 1 of the project and confirmed through modeling, the existing water distribution system in Meaford requires improvement to correct deficiencies, including: being undersized for existing demand scenarios; being partially plugged due to corrosion products; and due to age. While this section addresses alternatives for watermain renewal, there is no global “preferred alternative” for this aspect of the project. The preferred alternative for each section of watermain will depend on the particular circumstances in that street and watermain condition. The intent of this section is to identify guidelines for determining the preferred solution on each section of watermain. Various watermain renewal options are available. These renewal options include watermain rehabilitation (relining) or watermain replacement. The main reasons that deteriorated watermains should be renewed are listed below:

- Preserve water quality
- Prevent structure failure
- Prevent water loss
- Improve hydraulic capacity and pressure

Relining is the most common watermain rehabilitation option available for metal pipes. Watermain relining involves drilling back to pipe metal and using a material such as epoxy or cement mortar to

protectively line the inside of the existing pipes. The lining adds a smooth non-structural coating to the interior surface of the pipe which prevents further corrosion and oxidation of the pipe interior and increases the hydraulic capacity of the watermain. The number of service connections, valves, bends and appurtenances will affect the cost of the lining projects. The cost of lining is generally less expensive than replacement, provided the pipe has a reasonable remaining life. The expected service life of the pipe can be extended by 30 to 50 years with lining procedures if the pipe is in good structural condition. For older pipes, typical of the Meaford water system, relining may not be the most economical solution.

Watermain replacement is the other most common watermain renewal alternative and is more applicable when a pipe is closer to the end of its useful life and may fail to provide adequate service and does not have enough structural strength, and becomes prone to failure. In Meaford, one of the main concerns is the amount of undersized watermains and clearly replacement is preferred for these in order to provide adequate service. While initial watermain replacement costs are more expensive than other renewal options, this option extends the useful life by far longer and reduces future maintenance costs. Replaced watermain sizes can be increased to meet demands therefore increasing hydraulic capacity of the watermain. The service life of the watermain will be the full design life of the replacement pipe and ranges from 50 years to 125 years.

3.1 Advantages & Disadvantages of Watermain Renewal Alternatives

Both renewal options have their advantages and disadvantages. **Table 2** below outlines the advantages and disadvantages of the watermain renewal options:

Table 2: Advantages & Disadvantages of Watermain Renewal Alternatives

Renewal Type	Advantages	Disadvantages
Rehabilitation	• Traffic interruption and noise are confined to two pits for each section • Hydraulic capacity improved • Minimal excavation/streetscape interference required • Restores corrosion resistance of pipe and extends useful life • Less up-front costs than replacement • Could add 30-50 years to service life if the structural integrity of the existing pipe is good • Construction can be phased	• Bends, tees, valves & fittings cause difficulties and may need to be removed for relining • Bypass line is required to provide water service during cleaning and lining process • Work cannot be effectively performed in the winter, as the bypass line may freeze • Contractors may not be locally available • High mobilization costs; it is not cost effective for small rehabilitation projects • Diameter of the pipe will be reduced • Pipes must be thoroughly cleaned and dried before application of lining • Shorter service life compared to pipe replacement • Does not improve structural integrity of pipe
Replacement	• Watermain size can be increased to accommodate demands • Repair costs will be lower because the new pipe can be expected to have lower break rates compared to older pipes • Hydraulic capacity increased to required amount • Reduced water loss • Pipe material can be chosen to suit the Municipality's needs and soil conditions • Watermain can be replaced with less disruption of water service • Local contractors likely more readily available • Longer service life • Structural integrity of pipe is good • Construction can be coordinated with Municipal improvement plans	• More disruptive to streetscape than alternative of repairing breaks or rehabilitation • All service connections have to be reinstated • Higher initial costs than repair or rehabilitation

3.2 Watermain Renewal Cost Comparison

Based on modeling results, a total of 15,650 m of watermain could be considered for rehabilitation or replacement.

It is estimated that the initial capital costs to replace a watermain are 50% higher than rehabilitation. Based on a simple payback period, it would require an increase in useful life approaching 50 years to make the rehabilitation alternative more cost effective than the replacement alternative.

3.3 Evaluation of Watermain Renewal Alternatives

Table 3 and **4** below outlines evaluation of each watermain renewal alternative.

Table 3: Watermain Rehabilitation Evaluation

Criteria	Sub-Criteria	Weighting (%)	Rating (1 to 5)	Total Rating
Land Use Planning		**15**	5	0.75
Natural Environment		**10**	4	0.4
Social Environment		**20**		
	Air Quality, Noise and Vibration	10	4	0.4
	Quality of Life	5	4	0.2
	Community Accessibility	5	4	0.2
Cultural Environment		**10**		
	Archaeological	5	3	0.15
	Heritage Features	5	5	0.25
Technical Considerations		**25**		
	Performance	5	4	0.2
	Technical Suitability	5	4	0.2
	Phasing	5	4	0.2
	Construction Considerations	5	3	0.15
	Operational Considerations	5	3	0.15
Economic Considerations		**20**		
	Capital Cost	10	3	0.3
	Operating Cost	10	2	0.2
Total Weighting		**100**		**3.75**

Table 4: Watermain Replacement Evaluation

Criteria	Sub-Criteria	Weighting (%)	Rating (1 to 5)	Total Rating
Land Use Planning		**15**	**5**	0.75
Natural Environment		**10**	**3**	0.3
Social Environment		**20**		
	Air Quality, Noise and Vibration	10	3	0.3
	Quality of Life	5	5	0.25
	Community Accessibility	5	4	0.2
Cultural Environment		**10**		
	Archaeological	5	3	0.15
	Heritage Features	5	5	0.25
Technical Considerations		**25**		
	Performance	5	5	0.25
	Technical Suitability	5	5	0.25
	Phasing	5	5	0.25
	Construction Considerations	5	4	0.2
	Operational Considerations	5	5	0.25
Economic Considerations		**20**		
	Capital Cost	10	3	0.3
	Operating Cost	10	4	0.4
Total Weighting		**100**		**4.1**

3.4 Watermain Renewal Alternative Conclusions and Recommendations

Watermain rehabilitation is the least expensive option to implement on an initial capital cost basis. However, if the structural integrity of the watermain does not support a lengthy increase in useful life, watermain relining is not effective. Relining does not always improve the structural integrity of the watermain; therefore the chance of a watermain break would not change if it is relined. Therefore, it would not be economical to reline a watermain that has poor structural integrity. The disruption from construction is minimal, only the entry and exit pits would have to be dug, which would keep the restoration cost down. The watermain cannot be used during the cleaning and relining process; a bypass line must be used to provide water to all customers. The relining should not be done in colder months, since the bypass line could freeze. The relining can decrease the inside diameter of the pipe; a small diameter pipe would decrease the hydraulic capacity of the pipe. Since many of the pipes within Meaford that should be renewed are 100 mm diameter pipes, making their diameter even smaller would not be beneficial to the water distribution system. One of the main reasons to renew the watermain is to increase the hydraulic capacity within the system. Watermain rehabilitation is a good option for structurally sound watermain and where the size of the watermain does not need to be changed.

Watermain replacement is the more expensive option to implement. There is a large up front capital cost to replace the watermain; however, money is saved in operational costs. These operation cost savings include not repairing watermain breaks, and less unaccounted for water. Replacing watermains allows the Municipality to install the size of watermain to suit the distribution system needs based on future needs and build out. If the watermain is too small to provide adequate hydraulic capacity then a larger watermain may be installed to improve the hydraulic capacity throughout the system. Watermain replacement is more disruptive than watermain relining. The most common method of watermain replacement is open cut method; this usually involves excavation of up to half the road to install the watermain. This can cause disruption to nearby residents while construction is being completed.

The following is recommended for the Meaford water distribution system upgrade:

- Where there is a need to increase the diameter of the watermain to meet service delivery goals then the watermain should be replaced
- Adequately sized cast iron or ductile iron watermains should be replaced where the useful service life cannot be increased by at least 40 years, if the useful life can be increased by at least 40 years the watermain may be rehabilitated
- Asbestos cement pipes should be replaced rather than repaired where they are structurally inadequate

4.0 Overview of Alternatives for Storage

There are different types of municipal water storage options are available for the Meaford Water Supply System. The two main categories include floating storage and pumped storage. Common types of floating storage are elevated steel tanks and standpipes as well as ground- based storage at the required hydraulic grade line. Pumped storage consists of a reservoir that can be located in-ground, above ground or partially in-ground typically, with an attached pumping station. Since the St Vincent Street Booster Pump Station already pumps water to the hydraulic grade line of the zone, the construction of pumped storage would mean a loss of pressure to fill the reservoir and additional energy to re-pump the water. For this reason, only floating storage is considered for the St Vincent Street Boosted Zone.

Elevated tanks, either as steel or composite tanks, provide storage at or above the required system pressure. Since no additional pumping is required, this storage is considered as a secure water storage option. The most common adopted tank design in Ontario is a composite tank design which includes a steel tank on top of a concrete pedestal. This type of construction has larger initial costs but reduced yearly operational and maintenance costs because of the lack of additional pumping required.

The standpipe design combines the functions of both elevated and pumped storage. A standpipe is a steel or concrete cylinder containing storage that is partially above the required system pressure and partially below this level. The water below the required system pressure is unusable without the addition of a pumping station. Due to the disadvantages associated with this type of water storage, the standpipe design was not considered as a viable option for this project.

In-ground reservoirs constructed of concrete or steel can also provide floating storage, if constructed above the minimum pressure elevation. In-ground concrete storage allows for the ability to have staged construction and is less visible to the public.

For the proposed Meaford water storage expansion project, both elevated tank storage and in-ground storage will be considered, as these types of storage have shown to be the best available options. For the addition of storage within the St Vincent Street Boosted Zone, floating storage is the most appropriate and economical solution, provided either as an elevated tank or as an in-ground concrete reservoir.

4.1 Identification of Alternatives

4.1.1 In-Ground Storage Alternative

In-ground water storage is a viable option for Meaford and has unique characteristics when compared to other reservoirs. Due to Meaford's landscape, an in-ground reservoir can be located so that it sits at the system's hydraulic grade line, eliminating the need for additional pumping. This provides a more secure form of water storage. In-ground concrete reservoirs can have staged construction; which reduces the capital and operational costs since a smaller reservoir is initially built. When required the second phase of the reservoir can be built to meet demand needs. However, due to the small size of the proposed Meaford reservoir this may not be the most economical solution. This type of construction also allows for minimum visual/ aesthetic impact on the surrounding community. An example of in-ground construction can be seen in **Figure 1**. No tank painting is required, reducing maintenance costs when compared to elevated water storage. This type of storage requires more land when compared to the elevated tank alternative because of its larger footprint.



Figure 1 – Example of an In-Ground Water Reservoir (Located in Thornbury)

The reservoir will have approximate dimensions of 20 m x 20 m x 5 m deep and would consist of 2 cells. It would be required to be located at the 260 m elevation level which is consistent with the system's hydraulic grade line and which exists along a ridge to the south east of the pressure zone on each side of

County Road 7, some 0.5km south of Muir Street. To connect the reservoir to the system, approximately 1400 m of 400 mm pipe would have to be constructed from Sykes Street to the proposed location.

4.1.2 Elevated Tank Alternative

Elevated tank storage also provides secure water storage and is easy to operate, similar to in-ground concrete tanks. Additionally, they can be considered as an identifiable landmark for communities and take up less land than the same in-ground storage facility of equal volume. The main disadvantage associated with elevated storage tanks is that they must be repainted on a regular basis (every 20 years) resulting in large maintenance costs. The other main disadvantage is associated with safety in climbing to enter the tank. They can also suffer from ice formation inside the tank. Different styles of elevated tanks exist, ranging from spheroidal shapes with steel shafts such as the Wasaga Water Tower, to composite cylindrical tanks with concrete shafts.

Within the St Vincent Street Boosted Zone there is vacant land available sufficient to construct an elevated tank. The 2000 m^3 elevated tank would be constructed at a ground elevation around 215 m, requiring a pedestal/tank approximately 45 m high. The tank would be connected to an existing watermain on Centre Street adjacent the site.

4.2 Advantages and Disadvantages of Storage Alternatives

Both of the two water storage alternatives have advantages and disadvantages which are important in the decision making process. **Table 5** outlines the advantages and disadvantages of both elevated storage and in-ground storage.

Table 5: Advantages vs. Disadvantages of Elevated and In-Ground Storage Options.

Storage Type	Advantages	Disadvantages
Elevated Storage	• Secure Floating Storage • Identifiable landmark to some (subjective) • Requires less land • Low energy costs • Ease of operation	• Unpleasing aesthetics to some (subjective) • Access to storage cell is via a long ladder with climb assist equipment • Storage cell is a confined space • Painting cost
In-Ground Storage	• Secure Floating Storage • No Painting cost • Low energy costs • Ease of operation • Access to storage cell is a shorter ladder • Less visual Impact • Phased construction	• Storage cell is a confined space • Requires more land than elevated storage

4.3 Site Identification of Water Storage Alternatives

Two separate storage sites have been selected for the two different storage options identified. The storage sites suit the type of storage and allow for minimal costs to be incurred. Both sites are located south east of Meaford within the St. Vincent Boosted Zone.

4.3.1 In-Ground Reservoir Site Identification

Several criteria were identified in the site selection for the potential in-ground tank. The most significant criteria was that the site have an elevation equal to the system's hydraulic grade line (260 m) to eliminate the need for pumping. The site also had to be large enough for in-ground storage and have road access. Only one location was able to satisfy all the criteria and is shown in **Appendix A**, *Meaford, Potential In-Ground Reservoir Location*. Other sites in the surrounding area at the same elevation do not have road access, making them non-viable locations. The site is located along Grey Road 7, south of Muir Street. The area is residential-zoned land that is currently tree covered with no existing development. To allow this site to be used for an in-ground reservoir 1400 m of additional 400 mm watermain will have to be constructed to connect the reservoir to the existing water distribution network which stops at Muir Street.

4.3.2 Elevated Tank Site Identification

The main criterion in selecting a site for the potential elevated water tank was that it be municipally-owned land. This will allow for reduced capital costs. Site elevation was not a concern, as elevated tanks located on land below the hydraulic grade level still provide secure floating storage. The only site in the St. Vincent Boosted Zone that is municipally owned is the old landfill site on Centre Street. This site is located on the west side of Centre Street just north of Russett Drive shown in **Appendix B**, *Meaford, Potential Water Tower Location*. The site has an elevation of 213.5 m.

Additional sites have been identified as possible water tower locations; however, they are not municipally-owned. Should an elevated tank be the preferred alternative, the Municipality could approach landowners in the Muir Street/Centre Street area should a larger or more prominent site be required. For the purposes of the Master Plan, the former landfill site is used for the elevated tank alternative.

4.4 Cost Comparison of Storage Alternatives

A cost analysis has been completed for the estimated capital costs and operation and maintenance costs over a 50 year life span for both alternatives. The calculation spreadsheets are included in **Appendix C**.

A summary of the cost comparison is presented in **Table 6**.

Table 6: Estimated Cost Comparison of Different Storage Alternatives

	Elevated Storage	In-Ground Storage
Capital Cost	$ 3,150,000	$ 3,191,000
Operation and Maintenance Costs	$ 550,000	$ 550,000
Major Maintenance Costs	$ 1,000,000	$ -
Total Cost	$ 4,700,000	$ 3,991,000
Present Value Cost	$ 3,425,000	$ 3,404,000

[1] All costs represent 2014 values except for the net present value cost which takes into account a discount rate of 4% over the time period analyzed.

The elevated storage alternative results in the lowest capital cost which includes the cost of construction and engineering. Land cost is not incurred as the intended site is already owned by Meaford. The annual operation and maintenance costs are low for the elevated tank since minimal upkeep is necessary and no pumping is required. Large major maintenance costs reflect the frequency and high cost of painting the tank (every 20 years).

The in-ground storage alternative results in similar but slightly higher capital costs which includes the cost of construction, land cost, watermain construction and engineering fees. The higher capital costs are due to the Municipality not owning any land near the hydraulic grade line and therefore need to purchase the land. The annual operation and maintenance costs are low since minimal upkeep is necessary and no pumping is required. No major maintenance costs are incurred, greatly reducing the total costs over the 50 year period.

4.5 Evaluation of Alternatives

Table 8 below outlines the evaluation for each storage option.

Table 7 – Rating Criteria

Criteria	Weighting (%)	Elevated Storage		In-Ground Storage	
		Rank	Weighted Rank	Rank	Weighted Rank
Land Use Planning	15	5	0.75	3	0.45
Natural Environment	10	4	0.4	3	0.3
Social Environment					
• Air Quality, Noise and Vibrations	10	3	0.3	4	0.4
• Quality of Life	5	5	0.25	5	0.25
• Community Accessibility	5	5	0.25	5	0.25
Cultural Environment					
• Archaeological	5	4	0.2	4	0.2
• Heritage Features	5	3	0.15	4	0.2
Technical Considerations					
• Performance	5	4	0.2	5	0.25
• Technical Suitability	5	4	0.2	5	0.25
• Phasing	5	1	0.05	3	0.15
• Construction Considerations	5	3	0.15	4	0.2
• Operational Considerations	5	4	0.2	5	0.25
Economic Considerations					
• Capital Cost	10	3	0.3	3	0.3
• Operating Costs	10	2	0.2	4	0.4
Weighted Total	**100**	**3.6**		**3.85**	

4.6 Recommendation of Alternatives

The construction of a 2,000 m^3 in-ground tank on St. Vincent Street (County Road 7) is the recommended solution for the expansion of water storage in Meaford. The in-ground solution is slightly more cost effective and received the highest score from the assessment completed, which incorporated the approved MEA Class EA document criteria.

5.0 Overview of Water Booster Pump Station Alternatives

The Nelson Street Booster Pump Station does not provide adequate hydraulic capacity to Zone 2 (Nelson Street Boosted Zone). The station does not have standby pumping capacity or standby power. A new Booster Pump Station should be installed to correct these fundamental non-compliance issues and improve the hydraulic capacity within the zone. The hospital is located within the zone; therefore it is imperative that the hydraulic capacity be improved to provide adequate fire flows and pressures for the hospital.

In examining the Nelson Street Pressure Zone, two alternatives have been identified for a new water booster pump station (BPS).

Alternative 1 is at the water tower site. The property is large enough to accommodate a BPS. This property is owned by the municipality, therefore there will be no land acquisition costs associated with this alternative. One major advantage of this site is that the watermain feeding the tower provides good suction pressure to the pump station under all demand scenarios. Approximately 335m of watermain that would connect to Zone 2 would need to be upgraded from a 150 mm diameter watermain to a 200 mm diameter watermain to ensure adequate pressures and flows from pump discharge to the pressure zone. **Appendix D** shows location # 1 for the proposed booster pump station. The other advantage of this alternative is to facilitate changes to the Zone 1 operation by dedicating the water tower to the Nelson Street Booster Zone.

Alternative 2 is to construct a new booster station in the parking lot of the Meaford & St. Vincent Community Centre & Arena. This property is owned by the municipality, therefore there will be no land acquisition costs associated with this option. The 150 mm diameter watermain (approximately 240 m) along Collingwood Street would need to be upgraded to a 200mm diameter watermain from the new BPS to Thompson Street to provide adequate water supply to the booster station. A new 200 mm watermain (approximately 340 m) will have to be installed to connect into the existing watermain at Zone 2. **Appendix E** shows location #2 for the proposed booster pump station.

5.1 Advantages and Disadvantages of Water Booster Pump Station Alternatives

Both alternatives for the Nelson Street (Zone 2) water booster pump station have their advantages and disadvantages. **Table 8** below outlines the advantages and disadvantages of the two alternatives:

Table 8: Advantages & Disadvantages of Water Booster Station Alternatives

Renewal Type	Advantages	Disadvantages
Alternative 1 (Water Tower Site)	• Municipally owned land • Transmission main already exists to the water tower, would only have to connect to the existing watermain • Plenty of space on property for a BPS • Treed lot, BPS would not be visible from the road • Allows the Booster Station to be integrated with the Zone 1 operation to facilitate a change in operation strategy	• Discharge watermain will have to be upgraded
Alternative 2 (Meaford Community Centre & Arena Parking Lot)	• Municipally owned land • Plenty of space available for a BPS	• Visible from the road • Both suction and discharge watermain will have to be upgraded

5.2 Cost Comparison of Water Booster Pump Station Alternatives

The cost for Alternative # 1 is less expensive compared to Alternative #2, since Alternative # 1 would have less watermain that would need to be installed or upgraded. The cost of the water booster station for both alternatives would be relatively the same.

5.3 Evaluation of Alternatives

Table 9 and **10** below outlines the evaluation of each alternative.

Table 9: Water Booster Pump Station Alternative 1 Evaluation

Criteria	Sub-Criteria	Weighting (%)	Rating (1 to 5)	Total Rating
Land Use Planning		**15**	5	0.75
Natural Environment		**10**	5	0.5
Social Environment		**20**		
	Air Quality, Noise and Vibration	10	5	0.5
	Quality of Life	5	5	0.25
	Community Accessibility	5	5	0.25
Cultural Environment		**10**		
	Archaeological	5	3	0.15
	Heritage Features	5	5	0.25
Technical Considerations		**25**		
	Performance	5	5	0.25
	Technical Suitability	5	5	0.25
	Phasing	5	3	0.15
	Construction Considerations	5	3	0.15
	Operational Considerations	5	3	0.15
Economic Considerations		**20**		
	Capital Cost	10	4	0.4
	Operating Cost	10	4	0.4
Total Weighting		**100**		**4.4**

Table 10: Water Booster Pump Station Alternative 2 Evaluation

Criteria	Sub-Criteria	Weighting (%)	Rating (1 to 5)	Total Rating
Land Use Planning		**15**	5	0.75
Natural Environment		**10**	5	0.5
Social Environment		**20**		
	Air Quality, Noise and Vibration	10	5	0.5
	Quality of Life	5	5	0.25
	Community Accessibility	5	5	0.25
Cultural Environment		**10**		
	Archaeological	5	3	0.15
	Heritage Features	5	5	0.25
Technical Considerations		**25**		
	Performance	5	5	0.25
	Technical Suitability	5	5	0.25
	Phasing	5	3	0.15
	Construction Considerations	5	3	0.15
	Operational Considerations	5	3	0.15
Economic Considerations		**20**		
	Capital Cost	10	3	0.3
	Operating Cost	10	4	0.4
Total Weighting		**100**		**4.3**

5.4 Recommendation of Alternatives

Both locations are viable options for a new water booster station. The recommended solution for the location of a new water booster station for Zone 2 is Location # 1 at the water tower site. There is adequate space for a new booster pump station, and the watermain feeding the tower would provide adequate suction pressure to the BPS. There is less watermain that would need to be installed or upgraded for this alternative; therefore it is the cheaper option.

Appendix - A

Meaford, Potential In-Ground Reservoir Location

Meaford, Potential In-Ground Reservoir Location



Legend

- Parcels
- Roads 125k
  - Provincial Highway
  - County Road
  - Township Road
  - Seasonal Road

Notes

0.57 0 0.28 0.57 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

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Appendix - B

Meaford, Potential Water Tower Location

Meaford, Potential Water Tower Location



Legend

- Parcels
- Roads 125k
  - Provincial Highway
  - County Road
  - Township Road
  - Seasonal Road

Notes

0.28 0 0.14 0.28 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

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Appendix - C

Storage Alternatives Cost Calculation Spreadsheet

Meaford Water Storage Class EA
2000 m³ Elevated Tank
Present Value Cost Analysis

Discount Rate: **4.00** **%**

Asset Description	**Annual Value** in Constant Year 2014 Dollars	**Total Value** in Constant Year 2014 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1) Capital Cost												
Tank Construction		$ 3,000,000	$ 50,000	$ 500,000	$1,950,000	$ 500,000						
Land Cost		$ -										
Engineering		$ 150,000		$ 75,000	$ 75,000							
Sub-total		$ 3,150,000	$ 50,000	$ 575,000	$2,025,000	$ 500,000	$ -	$ -	$ -	$ -	$ -	$ -
2) O&M Costs												
Hydro	$ 2,000	$ 96,000					$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
DG	$ -	$ -					$ -	$ -	$ -	$ -	$ -	$ -
Site Maintenance	$ 3,000	$ 144,000					$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Equipment Maintenance	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Labour (Inspections)	$ 5,000	$ 240,000					$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Trucks	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Sub-total	$ 11,000	$ 550,000					$ 11,000	$11,000	$11,000	$11,000	$11,000	$11,000
3) Major Maintenance												
Tank Painting or Pump Replacement	$ 500,000	$ 1,000,000										
Sub-total	$ 500,000	$ 1,000,000					$ -	$ -	$ -	$ -	$ -	$ -
Total Costs (Infrastructure and O&M Costs)		$ 4,700,000	$ 50,000	$ 575,000	$2,025,000	$ 500,000	$ 11,000	$11,000	$11,000	$11,000	$11,000	$11,000
PV Costs (Infrastructure and O&M Costs)		**$ 3,425,130**	$ 50,000	$ 552,885	$1,872,226	$ 444,498	$ 9,403	$ 9,041	$ 8,693	$ 8,359	$ 8,038	$ 7,728

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$ 11,000	$11,000	$11,000	$11,000
													$ 500,000			
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 500,000	$ -	$ -	$ -
$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$ 511,000	$11,000	$11,000	$11,000
$ 7,431	$ 7,145	$ 6,871	$ 6,606	$ 6,352	$ 6,108	$ 5,873	$ 5,647	$ 5,430	$ 5,221	$ 5,020	$ 4,827	$ 4,642	$ 207,326	$ 4,291	$ 4,126	$ 3,968

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
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$ 3,815	$ 3,668	$ 3,527	$ 3,392	$ 3,261	$ 3,136	$ 3,015	$ 2,899	$ 2,788	$ 2,680	$ 2,577	$ 2,478	$ 2,383	$ 2,291	$ 2,203	$ 2,118	$ 94,621

2059	2060	2061	2062	2063	2064	2065	2066	2067	2068
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$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
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$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
$ 1,959	$ 1,883	$ 1,811	$ 1,741	$ 1,674	$ 1,610	$ 1,548	$ 1,488	$ 1,431	$ 1,376

Meaford Water Storage Class EA
2000 m³ In-Ground Tank
Present Value Cost Analysis

Discount Rate: **4.00** **%**

Asset Description	**Annual Value** in Constant Year 2014 Dollars	**Total Value** in Constant Year 2014 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1) Capital Cost												
Tank Construction		$ 2,250,000	$150,000	$500,000	$1,100,000	$500,000						
Land Cost		$ 100,000	$100,000									
Engineering		$ 337,500		$293,774	$ 293,774							
Watermain		$ 503,500				$503,500						
Sub-total		$ 3,191,000	$250,000	$793,774	$1,393,774	$1,003,500	$ -	$ -	$ -	$ -	$ -	$ -
2) O&M Costs												
Hydro	$ 2,000	$ 96,000					$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
DG	$ -	$ -					$ -	$ -	$ -	$ -	$ -	$ -
Site Maintenance	$ 3,000	$ 144,000					$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Equipment Maintenance	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Labour (Inspections)	$ 5,000	$ 240,000					$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Trucks	$ 500	$ 24,000					$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Sub-total	$ 11,000	$ 550,000					$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
3) Major Maintenance												
Tank Painting or Pump Replacement	$ -	$ -										
Sub-total	$ -	$ -										
Total Costs (Infrastructure and O&M Costs)		$ 3,991,047	$250,000	$ 793,774	$1,393,774	$1,003,500	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
PV Costs (Infrastructure and O&M Costs)		**$ 3,404,047**	$250,000	$ 763,244	$1,288,622	$ 892,108	$ 9,403	$ 9,041	$ 8,693	$ 8,359	$ 8,038	$ 7,728

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
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$ 7,431	$ 7,145	$ 6,871	$ 6,606	$ 6,352	$ 6,108	$ 5,873	$ 5,647	$ 5,430	$ 5,221	$ 5,020	$ 4,827	$ 4,642	$ 4,463	$ 4,291	$ 4,126	$ 3,968

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
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$ 3,815	$ 3,668	$ 3,527	$ 3,392	$ 3,261	$ 3,136	$ 3,015	$ 2,899	$ 2,788	$ 2,680	$ 2,577	$ 2,478	$ 2,383	$ 2,291	$ 2,203	$ 2,118	$ 2,037

2059	2060	2061	2062	2063	2064	2065	2066	2067	2068
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$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
$ 1,959	$ 1,883	$ 1,811	$ 1,741	$ 1,674	$ 1,610	$ 1,548	$ 1,488	$ 1,431	$ 1,376

Appendix - D

Water Booster Station Location # 1

Water Booster Location Alternative #1



Legend

- Parcels
- Roads 125k
  - Provincial Highway
  - County Road
  - Township Road
  - Seasonal Road

Notes

Water Booster Station Location Alternative #1 at Water Tower Site

0.08 0 0.04 0.08 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

© County of Grey

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Printed: January 30, 2015

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix - E

Water Booster Station Location # 2

Water Booster Location Alternative #2



Legend

- Parcels
- Roads 125k
  - Provincial Highway
  - County Road
  - Township Road
  - Seasonal Road

Notes

Water Booster Station Location Alternative #2 in parking lot of Meaford & St. Vincent Community Centre & Arena

0.08 0 0.04 0.08 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

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Printed: January 30, 2015

THIS MAP IS NOT TO BE USED FOR NAVIGATION

The Municipality of Meaford
Water and Wastewater Servicing Master Plan

Technical Memorandum
Sanitary Collection System
Background Information

October 2014

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Technical Memorandum – Sanitary Collection System Background Information

Project No. 114106

Prepared for:
Municipality of Meaford

Prepared By:

_____
Gary Scott, M.Sc., P.Eng.

Ainley Group
280 Pretty River Parkway
Collingwood, ON L9Y 4J5

Phone: (705) 445 – 3451
Fax: (705) 445 – 0968
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1.0 Introduction

At the request of the Municipality of Meaford, the Ainley Group in undertaking a study to identify and assess options to extend/expand the existing municipal water distribution and wastewater collection systems to service future development, in advance of a 2015 Development Charge Study.

This objective will be achieved through a phased construction approach linking the magnitude of major capital projects such as treatment plant upgrades and reservoir expansions to imminent development needs, while at the same time ensuring land requirements and pipelines are sized sufficiently for ultimate growth.

The purpose of this Technical Memorandum is to summarize the state of the existing wastewater collection infrastructure.

1.1 Review of Sewer Modeling Reports

A review of the two previous reports on Meaford's sanitary sewer collection system model prepared by Ainley Group in 2004 and 2010 provided valuable background information.

The areas of structurally deficient sanitary sewers and many point sources of extraneous flows were identified through a Sewer Needs Study conducted by the Ontario Ministry of the Environment prior to 2004. Following that, a list of the deficiencies and a proposed schedule for their correction were presented in Ainley's 2004 report.

Correction of these deficiencies resulted in a reduction in average flow. In turn, this allowed for continued growth in the area during the design, approval and completion of Meaford's Sewage Treatment Plant Expansion.

Ainley's 2010 report identified several catch basins and storm sewer connections to the sanitary sewers to be removed as high priority objectives. Additionally, the 2010 report provided recommendations for an ongoing maintenance program including:

1. Flushing of the entire sanitary sewer system on an annual basis,
2. Inspecting all maintenance holes on an annual basis in conjunction with the flushing program,
3. Annual CCTV inspection of approximately 10 % of the sanitary sewer system, such that every sewer is inspected every 10 years, and
4. CCTV inspections of new sewers at the developer's expense to ensure proper construction prior to assumption by the Municipality.

The Municipality has adopted the recommended maintenance program and has had success with the CCTV inspection program. Several major issues have been identified within the wastewater collection system as a result of the inspections.

1.2 Sewer Use By-Law

By-Law No. 54-78, passed on January 2, 1979, regulates the use of the sanitary sewage collection system.

The by-law provides for the control of sanitary sewage quality, permits and fees for service connections and specifications for materials and construction of service connections.

The by-law prohibits the discharge of "storm water, water from drainage of roofs or land, or from a watercourse, of uncontaminated water; except that which may be discharged into a combined sewer;" into the sanitary sewage collection system.

2.0 Existing Sewage Collection System

2.1 General

The majority of the Meaford urban area is serviced by a municipal sanitary sewer system consisting of a network of gravity sewers and five sanitary sewage-pumping stations. This system comprises approximately 35,080 m of gravity sewer pipe and approximately 2,140 m of forcemain. Based on the existing information from as-built Record Drawings, the majority of the network varies in age from 25-45 years consisting predominantly of pre-cast concrete, asbestos cement and PVC pipe. A major portion of the flows, approximately 80 percent, is directed to a centrally located main pumping station (SPS No. 1) on the east side of the Bighead River.

In total the Municipality has 5 sewage pumping stations to service the urban area. All flows captured within the system are conveyed to the Meaford Waste Water Treatment Plant located on Grant Avenue owned by the Municipality and operated by OCWA.

Through the Municipality's effort to catalog the condition of the sewer system by CCTV inspection, several major deficiencies have been identified. Most notably a series of cracks, holes and failed connections were identified along Sykes Street between MH 10750 and MH 10720 North of the Bighead River. To a lesser degree, cracks and breaks have been identified on Trowbridge Street and Boucher Street. Encrustation issues have been identified at numerous locations throughout the sewer network.

An overall plan of the sanitary sewer collection system and pump station locations is included in Appendix B.

2.2 Sewage Pumping Station No. 1

Sewage Pumping Station No. 1, also known as the Bighead River Pumping Station, is located east of Sykes Street and South of the Bighead River. A double barrel inverted siphon connects the area north of the Bighead River to the pump station. The station was reconstructed in 1991 and consists of a reinforced concrete wet well divided into two compartments by a common wall.

The station is equipped with four (Flygt model CP3300) 66 kW submersible pumps, three duty and one standby, each rated at 104.6 L/s at a TDH of 25.5 m. Two pumps are run by a fixed speed drive and two pumps are run by a variable speed drive. The station is rated with a total firm capacity of 181 L/s against a total dynamic head (TDH) of 51 m.

The station also includes a below grade reinforced concrete control building structure housing a standby diesel generator, fuel supply, flow meter, all associated piping, heating, ventilation, electrical and control system.

There is a 600 mm diameter overflow pipe with provision for installing chlorination equipment to disinfect any raw sewage overflows to the Bighead River. A 300 mm diameter forcemain connects the Bighead River pumping station to the WPCP located on Grant Avenue in the south east end of Meaford.

The station is in good overall condition and has experienced very few operational issues. One overflow incident occurred at the station in 1992 as the result of an operator error. The flow meter at the station does not provide accurate measurement and needs to be replaced. The station would benefit from the incorporation of a SCADA system.

2.3 Sewage Pumping Station No. 2

Sewage Pumping Station No. 2 was constructed at the Water Pollution Control Plant site in 1978 to service the southeast area of Meaford. The station is a wet well/dry well facility equipped with two variable speed 37 kW pumps (Fairbanks Morse model 5414) complete with Benshaw VFD drives. The pumps are rated at 148 L/s at a TDH of 18.8 m. The wet well has a storage capacity of approximately 22 m^3.

Flow monitoring at the station is done using a Endress & Hauser magnetic flow meter and a seven day circular chart recorder.

Overflow from SPS No. 2 is directed to the maintenance hatch at the shore of Georgian Bay at the end of Aiken Street. Overflow will only occur following the surcharging of the sewer system and requires manual operation of a gate located on a 450 mm diameter cross line to the existing 600 mm plant outfall line.

The station is in good overall condition however it suffers from excessive rag collection causing the pumps to become clogged. The station would benefit from a switch to submersible grinder style pumps. Additionally, the station would benefit from the incorporation of a SCADA system.

2.4 Sewage Pumping Station No. 3

Sewage Pumping Station No. 3 is located on the east side of Sykes Street directly north of Pete's Creek, approximately 150 m southeast of Grandview Drive. The station services a small residential area at the north west end of the town. All flow passing through this station is pumped into the gravity sewer that eventually passes through the inverted siphon and into SPS 1.

The station was originally oversized and included two 72.5L/s @ 9.5m TDH pumps. One pump has since been replaced with a 2.2 kW pump rated for 3 L/s. For normal operation the replacement pump is more than sufficient to handle flows at the station.

The station is in good overall condition but would benefit from a SCADA and instrumentation upgrade.

2.5 Sewage Pumping Station No. 4

SPS No. 4, located at the east end of Boucher Street, services Stanley Knights Limited. The station is equipped with two, 2.2 kW Myers pumps. Flow passing through this station is lifted to the gravity sewer on Boucher street to flow by gravity to SPS 1.

2.6 Sewage Pumping Station No. 5

SPS No. 5 located on St. Vincent Street services the Canadian Coast Guard and Harbour Masters Offices as well as some washrooms located at the Marina. The station is equipped with two, 1.5 kW Myers pumps. Flow passing through this station is lifted to the gravity sewer on St. Vincent street to flow by gravity to SPS 1.

3.0 Assessment of Sewerage System

3.1 Historical Flows

Historical Flow data at the Meaford Waste Water Treatment Plant was collected from the annual operating reports dating back to 2005. The monthly average flows and monthly peak flows over the 8-year span are plotted on Figure 1.

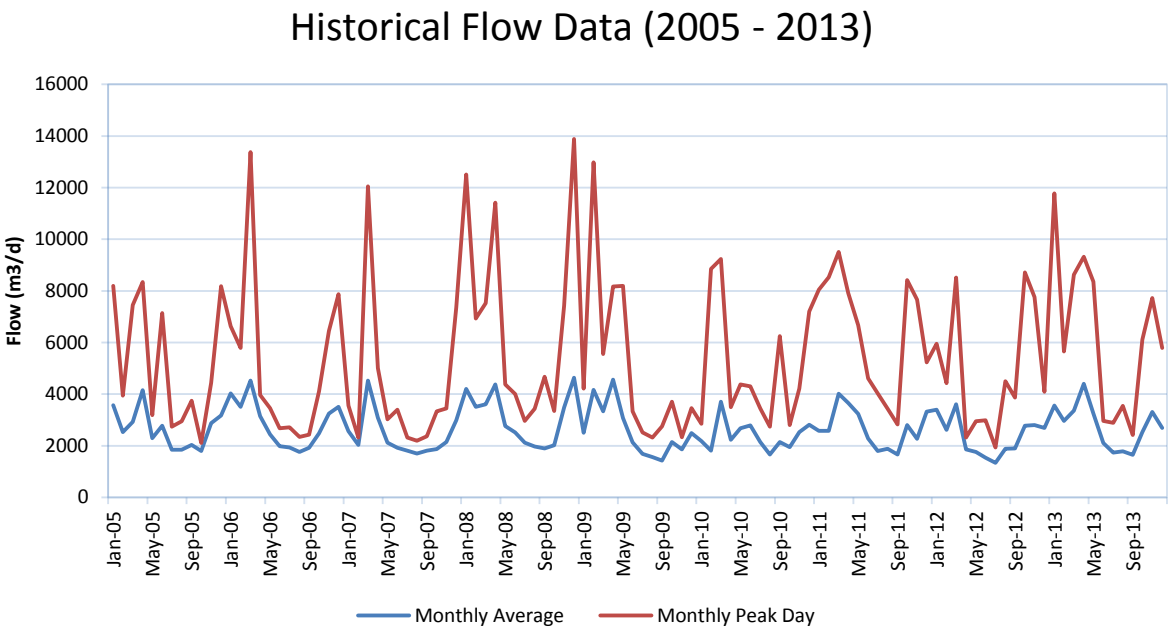


Figure 1 - Historical WWTP Flow Data 2005-2013

Over the 8-year span the historical flows are consistently low during the three month span between July and September with the most dramatic peaks occurring between February and April; Figure 2 depicts the flows averaged by month providing a more clear representation of the typical flow cycle. From 2005 to 2013 there is a very gradual trend of increasing peak flows while the average flow has decreased slightly over the same span.

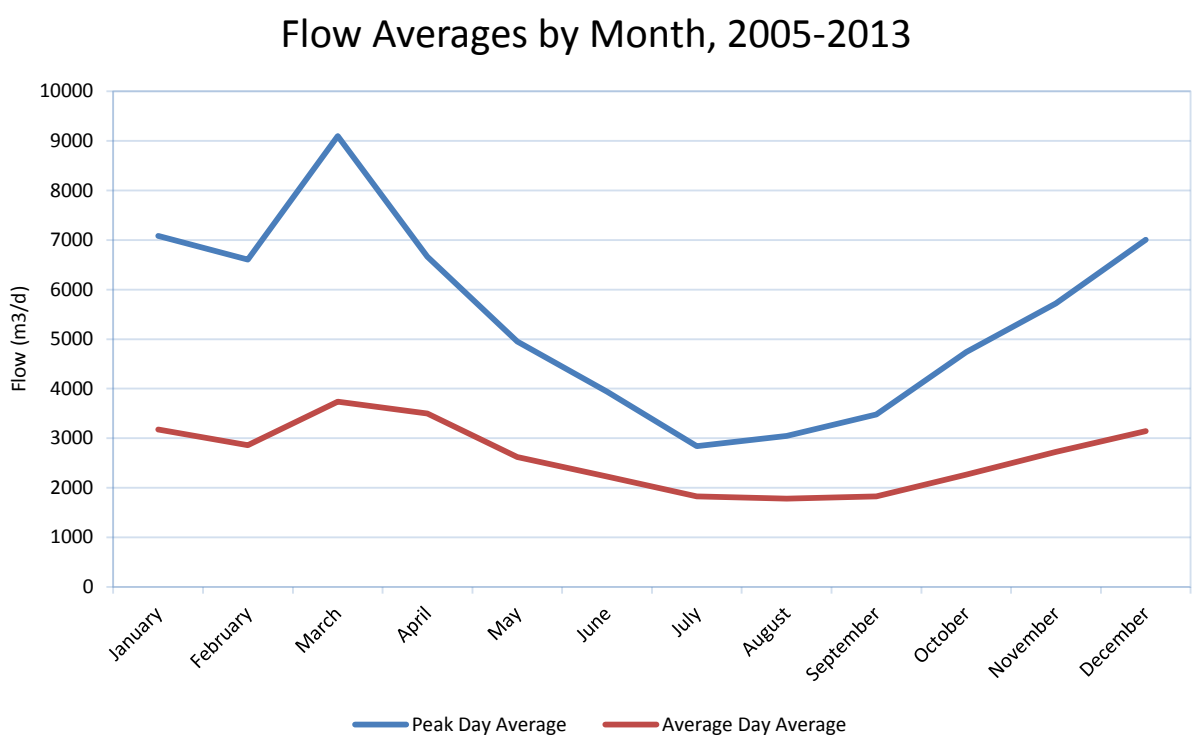


Figure 2 - WWTP Flow Averaged by Month 2005-2013

The high peak flows during the spring and low peak flows during the summer are indicative of inflow and infiltration issues. However, the extent and location of these issues cannot be accurately deduced from average daily flow data.

Using Statistics Canada census data and the population projections from the Grey County Growth Management Plan the flow rates from 2005-2013 were calculated as flow per capita per day and plotted in Figure 3. The sewer design guidelines from the MOE state that the average daily domestic flow (exclusive of extraneous flows) should be between 225 and 450 L/(cap·d).

Between 2005 and 2013 there has been a slight decrease in the average flow per capita. In 2005 the flow at the sewage treatment plant was 563 L/cap/day on average compared to 530.3 L/cap/day in 2013. Over the 8-year span the maximum flow reached 2820 L/cap/day and there were a total of 5 events which caused flows to reach over 2500 L/cap/day. After 2010 the intensity of the peak flows was diminished, likely due to efforts by the Municipality to remove inflow sources.

Overall there are significant improvements that can be made to the existing sewer system. The sewer system is aging and will require upgrades regardless of Inflow and Infiltration issues. These upgrades should be made a priority to reduce the loading and increase the useful life of the WWTP.

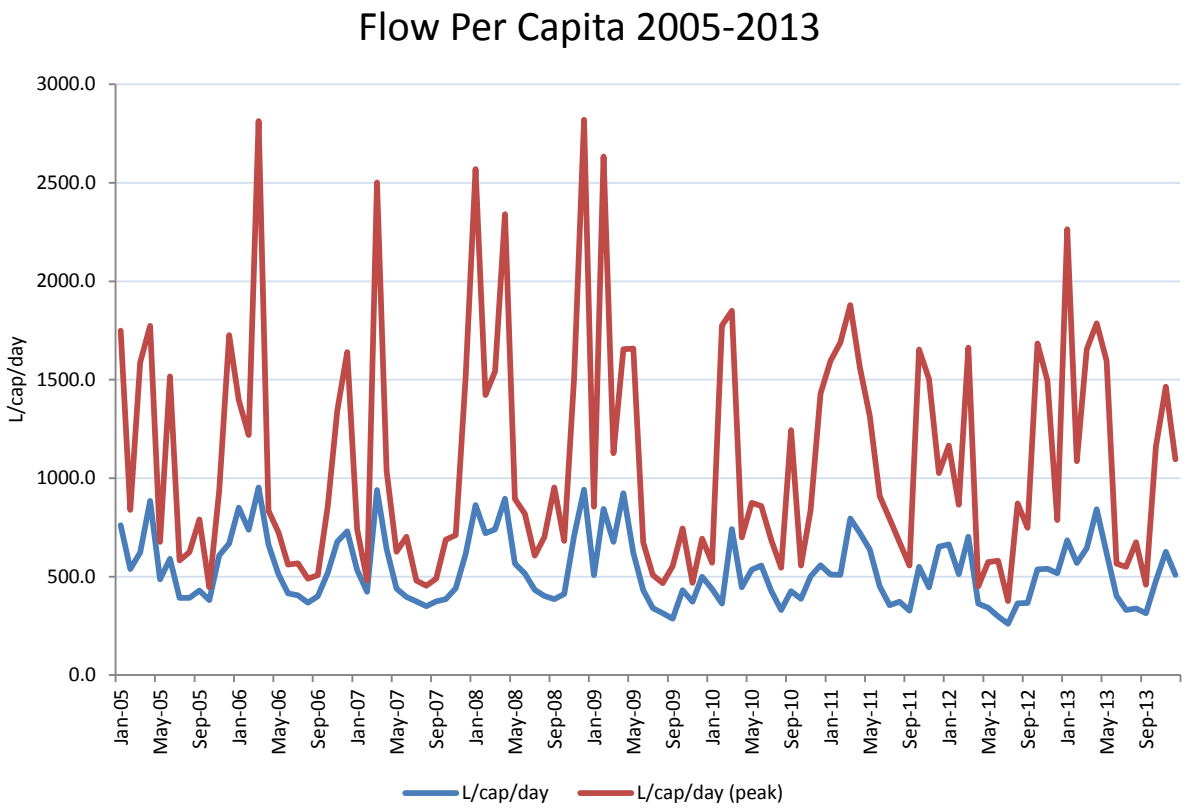


Figure 3 - WWTP Flow Presented as Flow Per Capita

3.2 Flow Analysis

A flow analysis of various system drainage areas was undertaken by the Ainley Group to determine sections with significant extraneous flows. Pumping station service areas and key maintenance hole service areas within the Municipality have been used to define system drainage areas. A method has to be established by which the sewage flow can be broken down into three primary components as follows:

1) Domestic Flow
2) Inflow
3) Infiltration

In March 2014, the Ainley Group was retained to complete an assessment of Inflow and Infiltration of the wastewater collection system. The inflow and infiltration study is ongoing but has provided some useful preliminary data. Ultrasonic flow monitoring devices were placed in manholes 12362, 11541, 11280, and 11950. Flows from the four monitoring stations converge at SPS 1 and represent the total flow entering the station with the exception of a small collection line that runs 1 block north on Denmark Street and 1 block east on Trowbridge Street.

Flow measurements taken between May 15th and June 15th are presented in Figure 4. The ultrasonic flow measuring devices used in the study take flow mesurements at 5 second intervals but the data has been averaged over 30 minute time steps. The time span presented in Figure 4 represents the lowest flow levels recorded at the site and are taken as being representative of Dry-Weather flows.

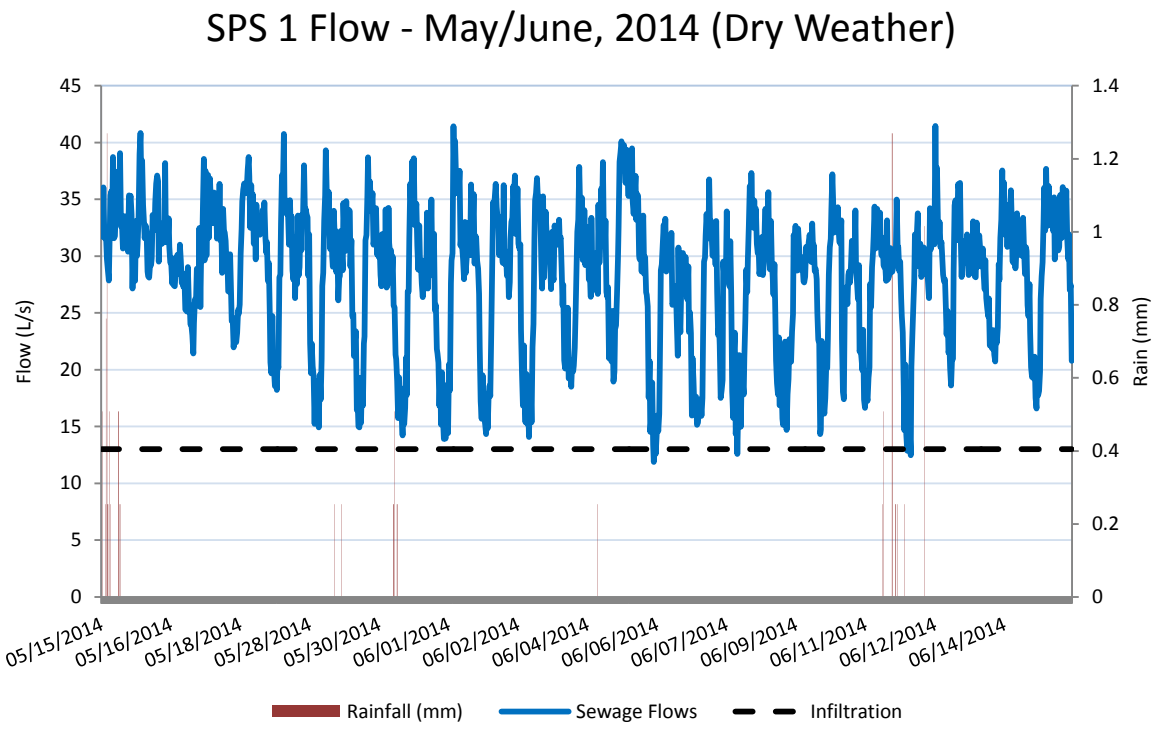


Figure 4 - Dry Weather Flow Data, Infiltration Analysis

The infiltration rate was determined using the methodology from "Infiltration/Inflow Control/Reduction for Wastewater Collection Systems – A Best Practice by the National Guide to Sustainable Municipal Infrastructure". The minimum flow rate during the analysed time span is considered to represent a time of zero domestic flow. All flow contributed by infiltration is therefore represented graphically by the area below the lowest point on the diurnal curve or below the hashed line. Using this method the Dry-Weather Infiltration Rate was estimated to be 13 L/s.

Flow measurements taken during the month of April are presented in Figure 5. The time span presented in Figure 5 covers a period with high levels of recorded precipitation at the site and are taken as representative of Wet-Weather flows.

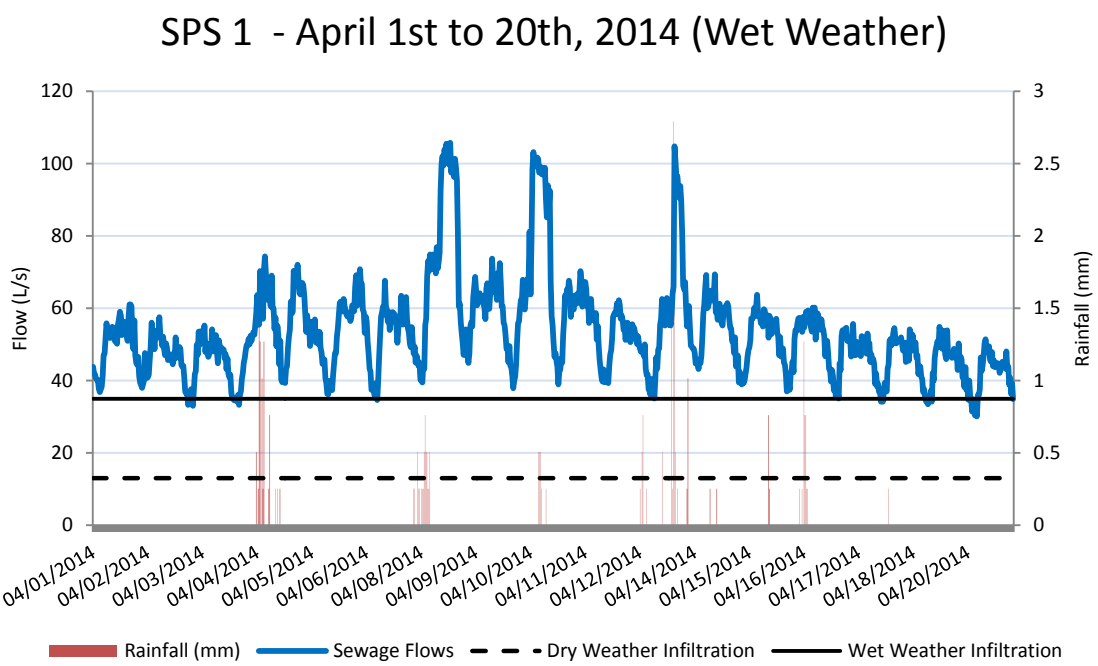


Figure 5 - Wet Weather Flow Data, Infiltration Analysis

The average sewage flow during the period presented in Figure 5 was 53.6 L/s. The Wet Weather Infiltration rate, estimated by the same means as the Dry Weather Infiltration Rate, was estimated to be 35 L/s. It is assumed that the domestic flows remained constant between the May/June time period and April. This is a conservative assumption as water use rates generally increase in warmer months. Under this assumption the inflow during this time period averaged out to be 3.6 L/s. From Figure 5 it is clear that there are 3 main inflow events that occurred on the 8th, 10th and 13th of the month. Flows during these events exceeded 100 L/s with 50% of the total flow being attributed to inflow sources.

Through flow analysis of data collected over April 2014 it was found that approximately 72% of the total sewage flow is extraneous during periods of wet weather. In comparison, approximately 46% of the flow during the dry weather period was extraneous. The estimated flow sources for both dry and wet weather are presented in Table 1.

Table 1 - Dry and Wet Weather Flow Sources

	Dry Weather	Wet Weather
Average Flow	28 L/s	53.6 L/s
Domestic Flow	15 L/s	15 L/s
Inflow	0 L/s	3.6 L/s
Infiltration	13 L/s	35 L/s

Based on the preliminary results of the inflow and infiltration study it is apparent that there is significant opportunity for improvement of the sewer network to reduce the average daily flows experienced at the WWTP. An infiltration rate of 13 L/s corresponds with a daily flow of 1,123 m^3/d, nearly one third of the capacity of the treatment plant.

3.3 Field Investigation

Following the recommendations of the 2004 and 2010 sewer model reports, the Municipality has begun a CCTV inspection program for the sanitary sewers. Through the field investigations a number of sewer defects have been identified ranging from encrustation around pipe joints to broken and misaligned pipes.

A number of problematic pipes within the Municipality have been identified through the CCTV inspection program. A few of the most severely damaged pipes are located along the following streets:

- Sykes Street
- Trowbridge Street
- Boucher Street
- William Street

For a more detailed list of the pipe defects identified with CCTV inspection please see the "Meaford Inflow and Infiltration Study – Background Information Report" that is included in Appendix A.

From previous investigations it is also known that the clay sewer pipe along St. Vincent Street has a negative grade and has a potential for issues. The siphon under the Big Head River is known to experience inflow during peak storm flows. Additionally the roof drains from the buildings along Sykes Street remain connected to the sanitary sewer resulting in dramatic peak flows during storm events.

4.0 Hydraulic Analysis

In 2004 a computer generated hydraulic model of the sewer collection system was produced using a software product known as SewerCAD as supplied by Haestad Methods of Waterbury Connecticut. Record Drawings and information provided by the operator (OCWA) were used as the basis for the model. The model was updated in 2010 to include all recent development.

For the purpose of the Water and Wastewater Servicing Study the SewerCAD model was imported to an up-to-date sewer modeling software known as SewerGEMS supplied by Haestad Methods. The model has been updated to reflect the current sewer network.

The model of the existing system will be used as a basis for modeling the ultimate sewer system based on full build out of the urban settlement area. The results of modeling the ultimate system will be the basis for determining the needs of the sewer system in the short term and allow for proper planning of development.

5.0 Approvals

5.1 Environmental Assessment

The Environmental Assessment Act applies to all sewage works. Repairs to, and rehabilitation of existing sewers are classified as Schedule 'A' in the Class Environmental Assessment process. Schedule 'A' works are exempt from the EA process and may proceed at the Municipality's convenience.

5.2 MOE Certificate of Approval

A Ministry of the Environment Certificate of Approval is required for all new sewage works and must be obtained prior to commencing work. Currently, an MOE Certificate of Approval is not required for the rehabilitation of sewers and maintenance hatches unless there is a change in the hydraulic capacity.

6.0 Planned Upgrades

The following section provides a list of planned projects within the urban area of Meaford that include upgrades to sanitary sewers. The preliminary cost estimates are presented in 2014 dollars. The projects and the cost estimates are listed in Table 2.

Table 2 - Preliminary Cost Estimates of Planned Upgrades

Project Name	Meters of sewer	Cost Estimate ($2014)
Gray Avenue Reconstruction	340	763,900
Boucher Street Reconstruction	268	869,000
Trowbridge Street Reconstruction	100	832,000
Legion/Berry Street Reconstruction	400	869,000
Grey Road 7 South Reconstruction	700	1,754,000
Burton/Farrar Street Reconstruction	350	829,700
Edwin Street Reconstruction	300	1,058,000
Union Street Reconstruction	300	2,261,000

The Municipality of Meaford
Water and Wastewater Servicing Master Plan

Technical Memorandum
Meaford Water Pollution Control Plant
Background Information

October 2014

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Technical Memorandum - Meaford Water Pollution Control Plant Background Information

Project No. 114106

Prepared for:
Municipality of Meaford

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1.0 Introduction

The Municipality of Meaford initiated the 2014 water and wastewater servicing plan study with the main objective of identifying and assessing options to extend / expand the existing municipal water distribution and wastewater collection systems to service future development in the advance of the development of a 2015 Development Charge Study.

This Technical Memorandum (TM) provides a summary of the review and analysis work completed to date assessing the existing and future capacity requirements of the Meaford Water Pollution Control Plant (WPCP).

The objectives of the TM include:

- Provide a background for the Meaford WPCP, including a review of previously completed studies
- A review of the existing plant's condition and capacity, including an analysis of historical performance data to assess the plant's ability to meet present and future treatment requirements
- Identification and establishment of capacity and performance limitation to meeting current and future servicing requirements (study problem/opportunity statement)

2.0 Background

The Meaford WPCP was constructed in 1969 and started service in 1970. The plant is a high rate activated sludge process plant with continuous discharge (after UV disinfection) into Georgian Bay and aerobic digestion with land disposal of bio-solids. The plant has no processes specifically for phosphorous removal. The plant is located in a residential area that can be liable to noise and odour complaints.

Since 1969, the plant has undergone a number of upgrades and modification including:

- New Aerobic Digester and Storage tanks for better treatment and additional storage capacity (1996)
- Mechanical Aerators replaced with the more efficient fine bubble Aeration System (2005)
- Chlorination replaced with UV Disinfection (2005)
- Fine Screen with an auger and bagging systems at the Inlet Works (2005)
- Septage Receiving station added (2005).

2.1 Previous Studies

2.1.1 Municipality Meaford Wastewater Treatment Class EA (2007)

The Schedule C Class EA addressed requirements to meet growth needs, new MOE standards and odour concerns. The study's planned urban area population forecasts were from 4,500 to 10,450 in 2026

The preferred solution was to expand and optimize the existing plant from 3.92ML/d to 6ML/d average day flow (ADF) capacity, with purchase of adjacent property. The preferred technology with an estimated cost of $26.5 million included:

- Tertiary treatment – Continuous sand filtration
- Bio-solids management – Aerobic digestion
- Odour control - Wet / Chemical Scrubber

2.1.2 Alternative for Plant Upgrades Study (2010)

Following completion of the 2007 Class EA recommendations, based on funding concerns for the preferred solution, the Municipality decided to examine the implementation of interim plant upgrades that would increase the WWTP capacity by approximately 20% enough to provide servicing for next 10 years.

The 2010 Study investigated feasible alternatives to expand plant capacity by approximately 20% and identify other upgrade options for:

- A planned population increase to 6,852 (revised from the original increase to 11,500)
- Capacity increase to 4.692 ML/d (54.31 L/s), ADF
- Peak flow of 16.4 ML/d (190 L/s) at a Peak Factor of 3.5

This increase would allow servicing of 604 Units at 1.296m3/d/Unit (3pp at 432 l/c/d)

The study considered five Treatment Processes: Extended Aeration Activated Sludge Process (EAAS); Sequencing Batch Reactor (SBR) process; Fixed Activated Sludge Treatment (FAST); Moving Bed Bio-filter Reactor (MBBR); Membrane Bioreactor (MBR) Process. Four of the five options (EAAS, SBR, FAST, and MBBR) were reviewed in detail. All options required construction of Headworks with Grit Chambers, Odour Control & Screens and include Digester expansion. Additionally all options included costs for an expansion of the air blower building, an additional UV disinfection reactor, chemical treatment for the removal of phosphorus, new sludge and scum scrapers, new diesel generator set, geotube system for biosolids handling and restoration of the existing abandoned old sludge holding tank.

Since all four processes had a similar cost estimate (approximately $9.5 million), the study recommended more detailed review, analysis and preliminary design to narrow down the best options. An Addendum to the Class EA will also be required.

2.1.3 Uncommitted Reserve Capacity Report (2013)

According to the Uncommitted Reserve Capacity Report of 2013, the number of Equivalent Units serviced as of December 2013 was 2,446, giving an Equivalent Serviced Population of 5,869 (2,446 units x 2.4pp/unit)

The 2011 – 2013 average daily flow (ADF) was 2,599.9m3/d and the 3 year average per capita flow was 443 l/c/d. The 2013 ADF was 71% of hydraulic capacity of 3,910m3/d, and the 3 year ADF was 66% of the capacity. The Peaking Factor for 2013 was 3.

The report assumed a design capacity of 3,910 m3/d, giving the hydraulic reserve capacity of 1,310.01m3/d. The planned future average per capita flow was set at 540 l/c/d, giving a flow per unit rate of 1.296 m3. The Number of Unconnected Approved Lots was 434 Units, giving an Uncommitted Hydraulic Reserve Capacity of 748 [1,310.01 – (434 x1.296)] or 577 units that can be serviced or an Equivalent Serviced Population of 1,384.

3.0 Condition of Existing Plant

3.1 Existing Plant Process and Treatment Units

3.1.1 Field Inspection Exercise

The current condition of WPCP was established based on physical and visual inspection, review of reports and staff interviews. A field visit to the plant was conducted on August 7, 2014. The purpose of the site visits was to assess the condition of the plant processes and treatment units. Operation staff were interviewed to get a better understanding of the conditions and to establish conditions of those components that could not be visually inspected.

3.1.2 Raw Sewage Pumping Station

2 Dry-pit Variable Speed sewage pumps each rated at 147 l/s, with a 350mm forcemain to the Headworks.

Condition and Upgrade Considerations:

- New (replacement) Standby Generator Set of 120 Kw under construction (2014). It will provide power to all the plant except the Digesters
- Old MCC (of 1978) upgraded with VFDs in 2008
- 2, 50HP pumps (Dry Well Submersible): Problems are encountered with rags even with a coarse screen in place. This may require submersible grinder pumps.
- No SCADA

3.1.3 Headworks

Includes a Course Bar Screen (25mm spacing), Fine Screen (3mm spacing) installed in 2005, Odour suppression equipment (chemical storage tank, blower and duct work) and Aeration and Clarifier Bypass

line. In addition, Wash Water Pumps (45 l/s @ 23 TDH) located in the administration building and a Chlorine feed system consisting of 3 positive displacement metering pumps each rated at 9.1 L/s at 1,035 Kpa, Two (2), 400L Sodium Hypochlorite Solution storage tanks with lines connected to Headworks for odour and sludge bulking control.

Condition and Upgrade Considerations:

- No grit removal
- Wash Water Pumps are not working

3.1.4 Aeration Tanks 1 and 2

Two (2) circular tanks each with an internal diameter of 10.9m and a side water depth of 5.9m (total volume of 1100m3), with a Fine Air Bubble Diffuser system installed in 2005. Located at the bottom of each tank are 220 evenly distributed 225mm diameter fine pore membrane diffuser discs.

Condition and Upgrade Considerations:

- Consideration should be given to replacing diffusers
- Structures are in reasonable condition requiring minor repairs
- Consideration is being given to DO control

3.1.5 WAS / RAS Pump Station

Two (2) Waste Activated Sludge/Scum pumps at 23 L/s and discharging to the Bio-Solids Treatment facility and Two (2) Return Activated Sludge pumps at 45 L/s and discharging to the Headworks.

Condition and Upgrade Considerations:

- Flooding has occurred in the Pump Room
- The main MCC (of 1971) represents a bottleneck and requires replacement likely in a new MCC/Electrical room
- WAS pumps were installed in 1996
- One of the RAS pumps was replaced in 2009 the other is the original

3.1.6 Secondary Clarifiers 1 and 2

Two (2) Circular Clarifiers each with internal diameter of approximately 12.2m and a side water depth of 2.9m (total volume of 678m3), each with a mechanical rake arm, skimmer blades, hopper, scum trough, scum baffles and weir plates.

Condition and Upgrade Considerations:

- One of the Rex Drive Units failed July 10, 2014. Failure caused by corrosion of the overload alarm

- At OCWA request, a field Service Inspection was carried out in July 2014 and the following noted: Rake Arms in poor condition (metal fatigue) with rake resting on tank floor; Squeegees in poor condition and pushed up to the point that they are even with the bottom of the rake blades; Feed Well, Centre Cage, Center Column, Scum box & supports, Weirs & Baffles are all in poor condition; Skimmer arm rubber wiper missing (Bracket and Skimmer arm need to be adjusted
- It is recommended that all below water clarifier mechanisms be replaced completely. In addition, all Weirs & Baffle plates should be replaced.
- Structures are in good condition requiring minor repairs

3.1.7 UV Disinfection and Flume Chamber

In 2005 the chlorine contact chamber was converted to UV and the system now consists of two (2) Channels, one equipped with UV lamp modules rated for 5,720m3/d and a second channel equipped with weir and isolation channel for future UV lamp modules, with a UV Bypass and Isolation Valve.

A Parshall Flume Chamber with continuous level transmitter is also provided.

Condition and Upgrade Considerations:

- An additional UV lamp module is required for backup
- Consideration should be given to enclosing the UV in a covered building space
- An effluent wash water system with 3 grundfos pumps, works off the effluent chamber, however, the system does not appear to be able to maintain prime and is not used.

3.1.8 Administration Building

The Administration Building has adequate space for laboratory, staff facilities and offices. Workshop and storage space is somewhat limited, though adequate

3.1.9 Bio-Solids Treatment and Storage

One (1), 2-Stage Aerobic Digester (with a total volume of 625m3); tank dimensions of Stage 1 are 9.5mx10mx4.35m and Stage 2 are 4.9mx10mx4.35m. .

One (1) 2-Celled Liquids Bio-Solids Storage tank, each cell dimensions of 18mx14.75mx4.35m with an effective volume of 2,300m3 equipped with a coarse bubble diffused aeration system.

System includes 2 Air Blowers each rated at 726 L/s at 140 Kpa, 3 Sludge Transfer / Decanting pumps each rated at 26L/s at 7.5 TDH and a Bio-Solids Transfer Building.

An older disused aerobic digester structure remains on the site

The 2007 Class EA concluded that the existing Digester and Storage capacity exceeded actual requirements. The 2010 Study recommended expansion of the Bio-solids treatment and storage system. The tank is emptied in the fall of each year and has always had sufficient capacity.

Condition and Upgrade Considerations:

- The facility was constructed in1996 and appears to be in reasonable condition
- Odour complaints are no longer a problem (The 2007 Class EA mentioned that there are some limited odour complaints associated with operating the facility)
- It is suggested the old digester be demolished

3.1.10 Septage Receiving Station

This consists of an 80m3 Chamber with one (1) 7.5Hp Vaughan pump, flow meter and piping to the headworks and includes a course bubble diffused aeration system with an air recovery duct and a basket screen as well as a billing system.

The system received leachate from an Owen Sound landfill and this arrangement is due to end when the Owen Sound WWTP is upgraded. Leachate is also received from the Meaford landfill as well as a small volume of septage from local haulers.

Condition and Upgrade Considerations:

- The Hogwash automatic billing system is not working and a fixed charge is applied for use of this system.

3.1.11 Blower Building

This was constructed in 2005, and houses 3 positive displacement blowers each with variable speed drives rated at 8.04m3/min at 65.5 Kpa.

Condition and Upgrade Considerations:

- The HVAC system is undersized for the building

3.1.12 Outfall

The existing outfall is 600mm in diameter, extending 450m into the Georgian Bay and 61.5m to shoreline. The outfall has a capacity of 50 ML/d enough for continued use up to beyond 2031. Minor repairs will be required

3.2 Plant Capacity

The capacity of the WPCP as per current Certificate of Authorization is 3,910 m3/day. Previous reviews and studies identified hydraulic limitations to treatment processes including the influent forcemain, Screening, Secondary Treatment and UV Disinfection. The reviews made recommendations to de-rate existing plant capacity and reduce the current capacity to 2,700m3/day due to inadequate sizes of the Aeration Tanks and Clarifiers. The reviews were based on current criteria of achieving a solids retention time (SRT) of 10 days in the Aeration Tanks with a Peak Factor of 3. Exceeding this would result in insufficient Nitrification.

Table 3.1 gives a comparison of the existing plant treatment units' capacity as per current C of A and the actual capacity based on the recommendations to de-rate the existing plant capacity.

Table 3 – Existing Units Treatment Capacity

Treatment Unit	Capacity per C of A	Actual Capacity
Fine Screen	8,640 m^3/day	8,640 m^3/day
Aeration Tanks	3,910 m^3/day	2,700 m^3/day
Secondary Clarifiers	3,910 m^3/day	2,700 m^3/day
Aerobic Digesters	Suitable for 3,910 m^3/day	Suitable for 3,910 m^3/day
Sludge Holding Tanks	Suitable for 3,910 m^3/day	Suitable for 3,910 m^3/day
UV Disinfection	5,720 m^3/day	5,720 m^3/day
Outfall Sewer		50,000 m^3/day

Assuming a peaking factor of 3.0, the plant peak treatment capacity based on the existing C of A is 11,730m3/d and the re-rated peak treatment capacity is 8,100m3/d. The capacity of the on-site influent Pumping Station is 147 L/s

4.0 Historical Plant Performance

4.1 Current Effluent Criteria

Tables 4.1 and 4.2 provide a summary of the treated effluent objectives and limits of the current C of A as compared to the design effluent objectives and limits of the 2007 Wastewater Treatment Class EA study and the 2010 Alternative for Plant Upgrades study.

Table 4 – Effluent Objectives

	Monthly Average Concentration *(mg/l unless otherwise indicated)*			Annual Average Loading *(kg/day unless otherwise indicated)*	
Effluent Parameter	**C of A**	**2007 ESR**	**2010 Study**	**C of A**	**2007 ESR**
$CBOD_5$	15	10	15	58.7	58.3
Total Suspended Solids	15	10	15	58.7	58.3
Total Phosphorus	2.0	0.5	1.0	7.8	2.9
Total Ammonia					
- Non-Freeze	3.0	3.0	3.0	11.7	17.5
- Freeze	5.0	5.0	5.0	19.6	29.1

Table 5 – Effluent Limits

	Monthly Average Concentration (mg/l unless otherwise indicated)			Annual Average Loading (kg/day unless otherwise indicated)	
Effluent Parameter	**C of A**	**2007 ESR**	**2010 Study**	**C of A**	**2007 ESR**
$CBOD_5$	20	15	20	78.2	87.4
Total Suspended Solids	20	15	20	78.2	87.4
Total Phosphorus	4.0	0.8	2.0	15.6	4.7
Total Ammonia					
- Non-Freeze	3.0	3.0	3.0	11.7	17.5
- Freeze	5.0	5.0	5.0	19.6	29.1

pH of Effluent maintained between 6.0 to 9.5 at all time

4.2 Historical Hydraulic and Raw Sewage Loading

The operating data for the period 2011 to 2013 was reviewed to establish the historical hydraulic and sewage loading to the plant. According to the Uncommitted Reserve Capacity Report of 2013, the Current Equivalent serviced population is 5869.Table 4.3 summarizes the historical raw sewage flows to the plant and Table 4.4 gives the historical raw sewage loading concentration (BOD, TSS, NH3, P) to the plant.

Table 6 – Historical Raw Sewage Flows

Year	Equivalent Serviced Population	Average Daily Flow - (m3/d)	Peak Daily Flow (m3/d)	Peak Factor	Per Capita Sewage Generation (l/c/d)
2011	5869	2676	9505	3.6	456
2012	5869	2346	8715	3.7	400
2013	5869	2777	11774	4.2	473
3 Year Average	**5869**	**2599.9**	**9998**	**3.8**	**443**

Table 7 – Historical Raw Sewage Loading

Year	BOD_5 (mg/l)	TSS (mg/l)	NH_3 (mg/l)	P (mg/l)
2011	104.5	116.1	20.9	2.7

2012	139.1	155.6	22.5	2.6
2013	113.2	138.3	19.0	2.4
3 Year Average	118.9	136.7	20.8	2.5
MOE Guidelines	200.0	200.0	25.0	8.0

2011 maximum daily peak flow occurred in March resulting from heavy rains and snow melt; 2012 maximum daily peak flow occurred in October resulting from heavy rains and 2013 maximum daily peak flow occurred in January resulting from heavy rains and snow melt.

Influent sewage strength may be considered weak and is reflective of a high level of inflow and infiltration into the sewers.

4.3 Historical Effluent Data

All 2011 effluent annual loading and monthly average concentration limits, with the exception of Total Ammonia Nitrogen were within the C of A limits. All 2012 and 2013 effluent annual loading and monthly average concentration limits were within the C of A limits. Table 4.5 summarizes the concentration and loading of effluent from the plant.

Table 8 – Effluent Concentration and Loading

Year	$CBOD_5$		TSS		NH_3		P	
	Avg. Conc (mg/l)	Loading (kg/d)	Avg. Conc (mg/l)	Loading (kg/d)	Avg. Conc (mg/l)	Loading (kg/d)	Avg. Conc (mg/l)	Loading (kg/d)
2011	4.41	11.81	6.75	18.29	2.72	8.06	1.70	4.15
2012	4.40	10.07	8.95	20.82	0.48	1.35	1.90	4.05
2013	3.96	10.65	6.22	16.53	0.66	1.86	1.85	4.57
3 Year Average	**4.26**	**10.84**	**7.31**	**18.55**	**1.29**	**3.76**	**1.82**	**4.25**
C of A Objective	15	58.7	15	58.7	5	19.6	2	7.8
C of A Limit	20	78.2	20	78.2	5	19.6	4	15.6

4.4 Capacity Utilization

According to the Uncommitted Reserve Capacity Report of 2013, the Number of Unconnected Approved Lots (434 Units) need a capacity of 562.5 m3/d (based on the planned future average per capita flow set at 540 l/c/d, giving a flow per unit rate of 1.296 m3). Tables 4.6 and 4.7 summarize the plant capacity utilization based on the existing C of A capacity and the de-rated capacity respectively.

Table 9 – Plant Capacity Utilization Based on C of A Capacity

Year	Average Daily Flow – (m^3/d)	Utilization based on C of A Capacity (3,910m^3/d) - (%)	Hydraulic reserve capacity based on a Unconnected Capacity of 562.5m^3/d - (m^3/d)
2011	2676	68.5%	671
2012	2346	60.0%	1001
2013	2777	71.0%	571
3 Year Average	**2599.9**	**66.5%**	**748**

Table 10 – Plant Capacity Utilization Based on De-rated Capacity

Year	Average Daily Flow – (m^3/d)	Utilization based on C of A Capacity (2,700m^3/d) - (%)	Hydraulic reserve capacity based on a Unconnected Capacity of 562.5m^3/d - (m^3/d)
2011	2676	99.1%	-539
2012	2346	86.9%	-209
2013	2777	102.8%	-639
3 Year Average	**2599.9**	**96.3%**	**-462**

Based on the de-rated plant capacity of 2,700m3/d, there is no capacity available to service future growth.

5.0 Upgrade Requirements

5.1 Repairs and Refurbishments

To improve performance of the plant, a variety of repairs and refurbishments will be required and will include:

- Minor repairs to concrete structures
- Replace steel and other components of the Clarifiers (Scraper Mechanism, Steel Catwalk, Handrails)

- Minor repairs to the Outfall
- MCC, SCADA and general electrical upgrades
- Wash water pump repairs
- Demolish and remove old Digester

5.2 Upgrades and Expansion Options

Headworks

The existing Headworks facility needs to be upgraded to address the following performance issues:

- Review Screen capacity to ensure that there is no hydraulic bottleneck as identified in previous studies
- Consideration to add a Grit removal system. Accumulated grit has to be removed from Aeration tanks every year
- Review of Odour problems resulting from increased flows

Secondary Treatment

The Aeration Tanks and Clarifiers are the limiting treatment processes and as recommended by previous studies their capacity limitation will result in de-rating the current plant capacity from 3.9 ML/d to 2.7 ML/d. This current treatment capacity should be reviewed and confirmed. An analysis should also be done to investigate optimization options that will lead to a capacity increase while addressing all performance issues. Upgrades to include replacing diffusers and provisions for to DO control.

Disinfection – UV

Upgrades may include adding a backup UV lamp module and enclosing the UV Unit in a covered building space

6.0 Conclusion and Recommendations

Initial analysis has shown that based on previous studies recommendation to de-rate the existing plant capacity from 3,910m3/d to 2,700m3/d, there is no capacity available to service future growth. Meaford WPCP upgrades and expansion will be required to fulfil current and future wastewater treatment capacity requirements for the Municipality of Meaford. The upgrades will include repairs and optimization of the existing plant treatment processes. It is recommended that further analysis be done to investigate and assess options to optimize the existing plant treatments process to maximize plant capacity within limits of current MOE Guidelines.

Municipality of Meaford

Water and Wastewater Servicing Master Plan
Sewer Model – Technical Memorandum

February 2015

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Sewer Model – Technical Memorandum

Project No. 114106

Prepared for:
Municipality of Meaford

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7.0

1.0 Base Model Assumptions

Unit sanitary loads were applied to the model based on typical design values. Unit loads for homes and apartments are applied to the model based on the number of units and the assumption that each unit has an average of 2.4 residents. Table 1 describes the unit flow rates that were originally applied to the model.

Table 11 - Original Unit Sanitary Loads Based on Design Criteria

Unit Sanitary Load	Unit Flow Rate/ Day
Home	450 L/resident
Apartment	450 L/resident
School	40 L/student
Hospital	650 L/bed
Motel	120 L/guest
Office	275 L/employee
Shopping Centre	275 L/employee

Modeled flows were compared to average flows from 2013. The comparison of the modeled flows and average flows at the three major pumping stations and the WWTP are listed in Table 2.

Table 12 - Comparison of Modeled Flows to Average Flow 2013

Location	Modeled Avg. m^3/d	2013 Avg. Measured m^3/d	Difference m^3/d
SPS 1	2,209	2,215	6
SPS 2	496	514	28
SPS 3	285	226	32
WWTP	2,705	2,729	24

Overall the accuracy of the sewer model to predict WWTP flow rates based on the unit loading rates in Table 1 is high. The model accuracy is off by only 0.9% when considering the WWTP alone. However, the flow at SPS 3 is off by approximately 26%. The sewershed feeding into SPS 3 is predominantly residential and therefore the loading rate of 450 L/resident/day is likely too high and a portion of the actual flows in the SPS 1 and SPS 2 sewersheds are from I/I sources. Further, average daily water use within Meaford has ranged between 270 L/cap/day to 330 L/cap/day over the past 5 years, much less than the assumed 450 L/cap/day making a lower sewer loading rate from residential use a reasonable assumption. The unit loading rates were revised to reflect the reduced per capita flow rates and the model was recalculated. The revised unit loading rates are listed in Table 3.

Table 13 - Revised Unit Sanitary Loads

Unit Sanitary Load	Unit Flow Rate/ Day
Home	350 L/resident
Apartment	350 L/resident
School	40 L/student
Hospital	650 L/bed
Motel	120 L/guest
Office	55 L/employee
Shopping Centre	55 L/employee

Modeled flows based on the revised unit loads are listed in Table 4 and compared to the average flows at the three major pumping stations and the WWTP.

Table 14 - Comparison of Modeled Flows to Average Flow 2013 with Revised Unit Loads

Location	Modeled Avg. m^3/d	2013 Avg. Measured m^3/d	Difference m^3/d
SPS 1	1,760	2,215	455
SPS 2	399	514	115
SPS 3	226	226	0
WWTP	2,159	2,729	570

The revised residential unit load resulted in a direct match of flow rates seen at SPS 3. Assuming that there is minimal I/I within the SPS 3 sewershed and the average flow rate in the SPS 3 sewershed is representative of the entire urban area, the difference between the modeled flow and measured flow for SPS 1 and SPS 2 is attributable to I/I.

1.1 Model I/I Distribution

The Municipality has undertaken an initiative to complete CCTV inspection of all of the sewers within the urban area. To date, several defective sewers have been located. For the purpose of applying infiltration loadings to the model, the identified defects listed in Table 5 were used to distribute point source infiltration loadings to the system. The attributed infiltration is based on the severity of the noted defect as well as the identified difference between the modeled flow and measured flow. For the purpose of distributing flow, a severity was assigned to each defective location based on the type of defect, number of issues, and location. Higher severity levels were assigned a greater portion of the extraneous flow.

Table 15 - Assigned Infiltration Rates and Locations

Street/ Location	Sewershed	Defect	Severity (1-5)	Applied Load
Albert Street MH 11781 to MH 11770	SPS 1	Multiple Fractures, Defective Connection	2	0.25
Blake Street MH 11501 to MH 11500	SPS 1	Broken Pipe	3	0.38
Boucher Street MH 11320 to MH 11310	SPS 1	Broken Pipe, Longitudinal/ Circumferential Cracking,	3	0.38
Centennial Heights Court MH 11450 to MH 11440	SPS 1	Offset Joint	3	0.38
Coleman Street MH 12800 to MH 12790	SPS 1	Circumferential Crack	1	0.13
Collingwood Street MH 11980 to MH 19981	SPS 1	Several Defective Connections, Hole in Sewer, Multiple Fractures	4	0.50
Farrar Street MH 11491 to MH 11490	SPS 1	Broken Pipe	3	0.38
Grandview Drive MH 32600 to MH 32580	SPS 3	Intruding Connection, Infiltration, Open Joint, Broken Pipe	4	0.00
Marshall Street MH 10860 to MH 10850	SPS 1	Hole in Sewer (possibly repaired)	2	0.25
Middle Avenue MH 22680 to MH 22670	SPS 2	Broken Pipe	3	0.67
Montgomery Street MH 20510 to MH 20500	SPS 2	Infiltration	2	0.44
Nelson Street MH 12161 to MG 12150	SPS 1	Infiltration	1	0.13
Noble Street MH 12211 to MH 12220	SPS 1	Hole in Pipe	3	0.38
Paul Street MH 10801 to MH 10730	SPS 1	Hole in Pipe, Roots, Broken Pipe	3	0.38
Sadler Street MH 20450 to MH 20440	SPS 2	Infiltration	1	0.22
Susan Street MH 32630 to MH 32620	SPS 3	Broken Pipe, Joint Displacement	3	0.00
Sykes Street MH 10750 to MH 10720	SPS 1	Numerous Cracks, Broken Pipe, Hole in Pipe, Separated Joint	5	0.63
Trowbridge Street MH 12470 to MH 12451	SPS 1	Joint Displacements, Multiple Cracks, Broken Pipe	4	0.50
Union Street MH 11480 to MH 11490	SPS 1	Infiltration	2	0.25
William Street MH 11690 to MH 11730	SPS 1	Open Joint, Broken Pipe, Cracking	3	0.38

Modeled flows based on the revised unit loads including the assumed infiltration rates are listed in Table 6 and compared to the average flows at the three major pumping stations and the WWTP.

Table 16 - Comparison of Modeled Flows to Average Flow 2013 with Revised Loads

Location	Modeled Avg. m^3/d	2013 Avg. Measured m^3/d	Difference m^3/d
SPS 1	2,218	2,215	3
SPS 2	514	514	0
SPS 3	226	226	0
WWTP	2,732	2,729	3

1.2 Peak Day Simulation 2013

The highest daily flow of 2013 occurred on January 30th. The flow at the WWTP totaled 11,774 m^3 over the day. The total flows passing through SPS 1 and SPS 2 were 9,242 m^3 and 1,665 m^3 for a total combined flow of 10,907 m^3. All flow entering the WWTP passes through either SPS 1 or SPS 2 and should be approximately equal to the flow measured at the WWTP. There is an 867 m^3 difference in the measured flows suggesting that at least one of the flow monitors provides inaccurate flow measurement during high flow events. For the purpose of analysis it is assumed that the flow monitors at the pumping stations are correct. The flow rates measured on January 30th are compared with the modeled average flow rates in Table 7.

Table 17 - Peak Day Flow by Sewershed

Location	Peak Day Flow (Jan 30, 2013) m^3/d	Modeled Avg. m^3/d	Flow Increase m^3/d	% Increase m^3/d
SPS 1	9,242	2,218	7,024	416.7
SPS 2	1,665	514	1,151	323.9
SPS 3	1,194	226	968	506.9
WWTP	10,907	2,732	8,175	399.2

It can be seen from the data presented in Table 7 that while the SPS 3 sewershed has the least overall flow and the lowest absolute flow increase, the percent increase in flow in that sewershed is highest. This suggests that the SPS 3 sewershed experiences more wet weather I/I per resident than the SPS 1 or SPS 2 sewersheds. Using the calculated percentage increase in flow for the individual sewersheds the flows in the model were increased to peak day flow. The comparison of the modeled flows and measured flows is presented in Table 8.

Table 18 - Comparison of Modeled Peak Day Flow to Actual Peak Day Flow

Location	Modeled Peak Day Average m^3/d	Peak Day Avg. Measured m^3/d	Difference m^3/d
SPS 1	9,247	9,242	5
SPS 2	1,662	1,665	3
SPS 3	1,190	1,194	4
WWTP Flow	10,910	10,907	3

A 48-hour extended period simulation was conducted at the peak day flow rate. Over the simulation the highest flow occurred at 34 hours however at this time only the Big Head River syphon experienced flows in excess of 50% of their design capacity. At the peak flow the syphon reached 55% capacity in this scenario.

1.3 Peak Hour (Storm Event) Simulation

In order to determine the effects a significant rainfall event would have on the pipe network a peak hour flow rate was modeled. On May 22nd, 2013 a flow rate of 15,860 m^3/d was observed at the WWTP, this flow rate was used the most significant peak the plant has experienced in several years and was selected for modeling purposes. The peak hour flow rate was distributed within the model with the same percentages as assumed for the peak day flows.

The storm was simulated over two consecutive days, during the second hour of the storm simulation on the second day the flow rates within the model peaked. Again, the pipe that experienced the greatest use of capacity was the syphon at 70%.

After the syphon the greatest use of capacity was between MH 11550 and MH 11551. This section of pipe is at the intersection of Nelson Street and Bayfield Street where two significant sewersheds combine. This section of pipe is also very close to the downtown core where there is a known issue of inflow from the roof drains on the commercial buildings along Sykes Street. A graph of the flow rates in the pipe section is shown in Figure 1.

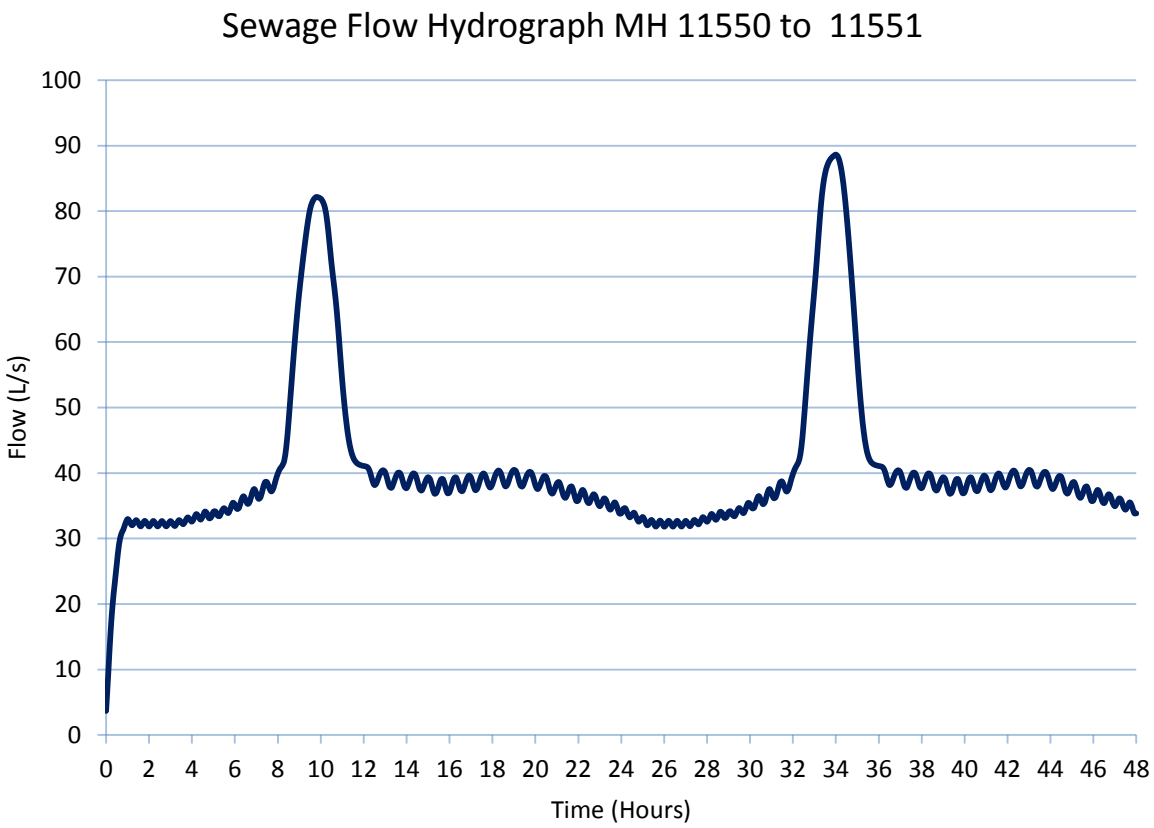


Figure 6 - Peak Hour Hydrograph of Sewage Flows Between MH 11550 and MH 11551

From the peak hour flow analysis, it is clear that the sewer network has significant spare capacity for growth. There are no backups or surcharged manholes caused by the most significant flow rates that are currently experienced within the sewer network as a result of pipe sizing. At the current peak day flow rates the Big Head River Syphon appears to be the most likely choke point in the system in the future.

2.0 Ultimate Flow Model

The ultimate flow projections are based on the assumption that all vacant land is developed according to the current zoning and planning densities within the Official Plan. The flow generated from the vacant lands is calculated according to the factors outlined in Table 9.

Table 19 - Sewage Generation Factors

Land Designation	Flow Rate
Residential	350 L/cap/day
Commercial	28 m3/ha*day
Industrial	28 m3/ha*day

Based on the land available for development and intensification a projected Ultimate ADF was calculated to be approximately 5,400 m^3/d. The Town's GIS data was used to distribute the sewage flow within the sewer model. A resulting "Ultimate ADF Scenario" was created to determine the effect the growth would have on the sewage network. The flow entering SPS 1, SPS 2 and SPS 3 under the Ultimate ADF Scenario are shown in Figure 2.

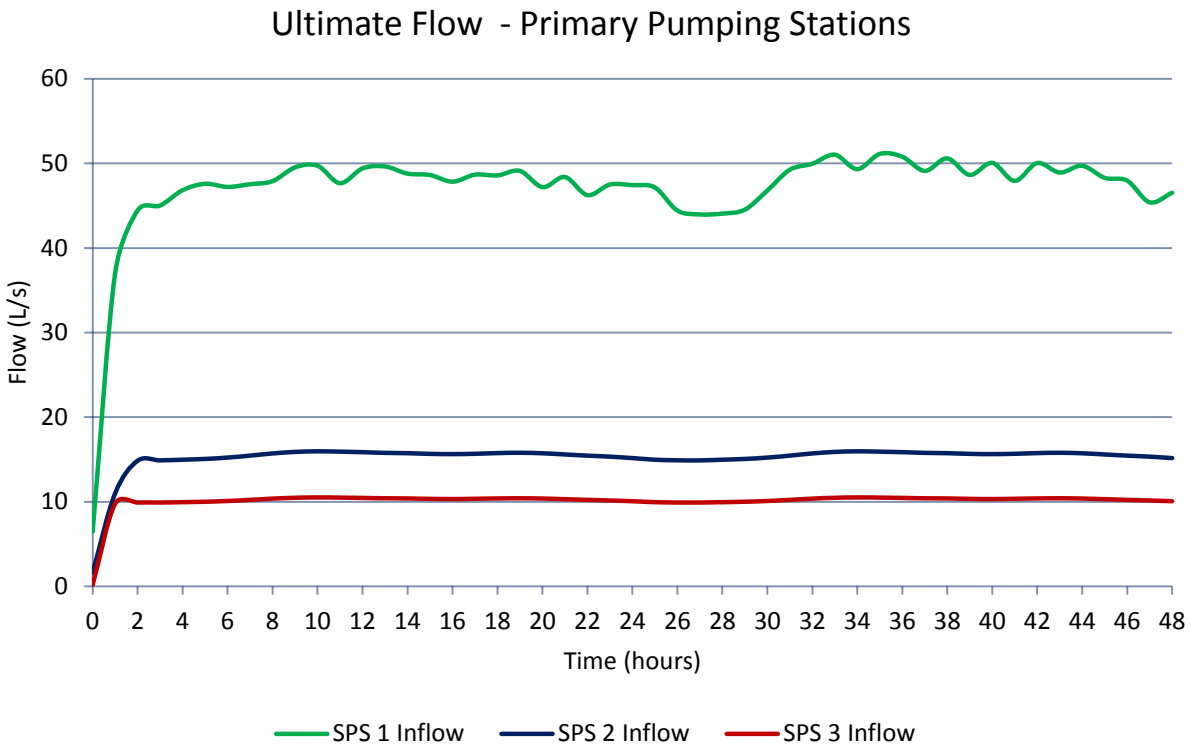


Figure 7 - Ultimate ADF, Primary Pumping Stations

A comparison of the modeled ultimate flows to the 2013 ADF rates is presented in Table 10.

Table 20 - Modeled Ultimate Flow to 2013 ADF Comparison

Location	Modeled Avg. 2013 m^3/d	Modeled Avg. Ultimate m^3/d	Difference m^3/d
SPS 1	2,220	4,540	2,230
SPS 2	515	1,410	895
SPS 3	225	885	660
WWTP	2,735	5,950	3,215

The ultimate flow rate will represent a doubling of the current flow rates at the WWTP. A bottleneck was identified at MH 33500 at the Ultimate ADF causing the upstream pipe section to reach 80% capacity. The pipe section flowing into the bottleneck was shown to have a negative grade within the

sewer model due to the invert elevation of MH 33500; it is unclear if this was an input error or the correct information. The invert of MH 33500 was changed from an elevation of 185.49 to 184.75. The new elevation represents the midpoint between the upstream and downstream manholes. The revised elevation completely eliminated the bottlenecking issue. There were no additional sewage network bottlenecks.

2.1 Ultimate Flow – Peak Day Scenario

An ultimate flow peak day scenario was generated by building upon the 2013 peak day scenario. The 2013 peak day flows were kept consistent and additional flow from development was added. The additional flow from new residential development was multiplied by the Harmon Peaking Factor (M) to simulate a peak day. The Harmon Peaking Factor was calculated following Equation 1.

$$M = 1 + \frac{14}{(4+P^{0.5})}$$, where P = Population in thousands.

Equation 1 – Harmon Peaking Factor

For the ultimate population of 12,000 the Harmon Peaking Factor for the urban area of Meaford is 2.875. For industrial and commercial land uses, a peaking factor of 2 was used, which is typical of industrial flow patterns.

A 48-hour extended period simulation of the ultimate peak day scenario was run. The flow entering SPS 1, SPS 2 and SPS 3 under the ultimate peak day scenario are presented in Figure 3.

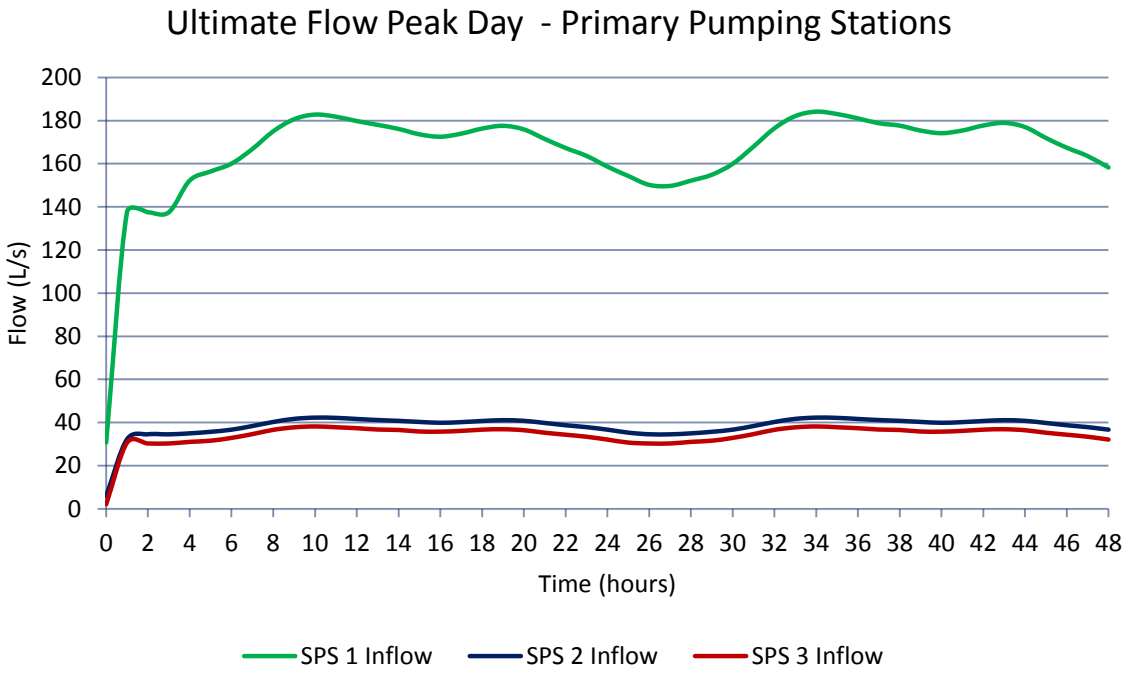


Figure 8 - Ultimate Peak Day Flow, Primary Pumping Stations

Over the simulation the highest flow occurred at 34 hours, at this time there were 9 pipe sections that experienced flows in excess of 50% of their design capacity. The pipes exceeding 50% capacity are listed in Table 11. Again, the pipe that experienced the greatest use of capacity was the syphon. In the Ultimate Peak Day scenario the syphon used 90% of capacity.

Table 21 - Pipe Section Capacity Use - Peak Day, Ultimate Buildout

Section	Flow/ Design Capacity
Bighead River – Syphon	89.6
Nelson St. - MH 12250 to MH 12260	72.1
Sykes St. - MH 10760 to MH 10750	69.1
Union St. - MH 11440 to MH 11410	65.9
Nelson St. – Proposed 200 mm dia. extension	64.3
Bayfield St. – MH 11550 to MH 11551	63.1
Nelson St. – MH 12250 to MH 12210	61.1
Bayfield St. – MH 11570 to MH 11571	54.4
Bayfield St. – MH 11551 to MH 11542	53.8

A comparison of the ultimate peak day flows to the ultimate ADF rates is presented in Table 12.

Table 22 - Peak Day Flow Rates, Ultimate Buildout

Location	Modeled Avg. Day Ultimate (m^3/d)	Modeled Peak Day Ultimate (m^3/d)
SPS 1	4,540	14,554
SPS 2	1,410	3,306
SPS 3	885	2,952
WWTP	5,950	17,862

2.2 Ultimate Flow – Peak Hour Scenario

The ultimate peak hour scenario assumes that the current inflow and infiltration issues remain consistent into the future and no efforts are made to rehabilitate any of the network. The peak hour flow from 2013 is assumed for the existing sewer network and the Harmon peaking factor was assumed for all new development.

A comparison of the ultimate peak day and ultimate peak hour flows is presented in Table 13.

Table 23 - Peak Day and Peak Hour Comparison, Ultimate Buildout

Location	Peak Day Avg. m^3/d	Ultimate Peak Flow m^3/d
SPS 1	10,489	17,774
SPS 2	2,615	3,951
SPS 3	2,606	3,821
WWTP	13,104	21,725

A 48-hour extended period simulation of the ultimate peak hour scenario was run. The flow entering SPS 1, SPS 2 and SPS 3 under the ultimate peak hour scenario are presented in Figure 4.

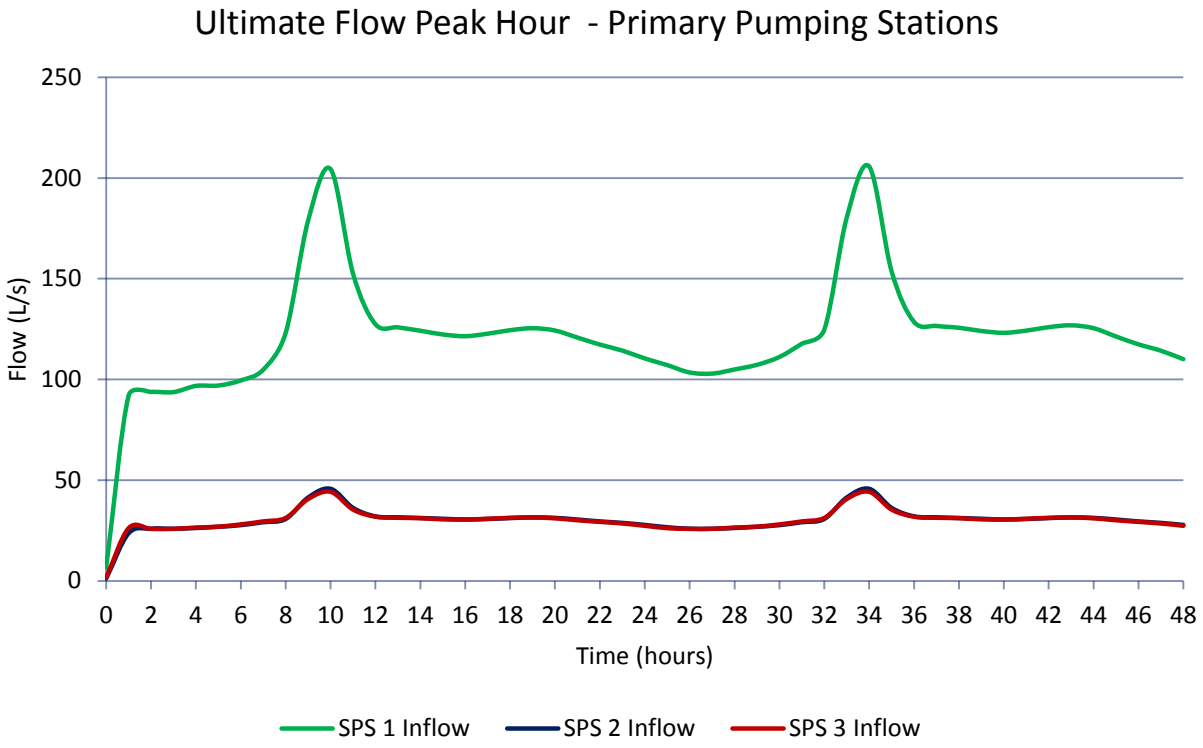


Figure 9 - Ultimate Peak Hour Flow, Primary Pumping Stations

Over the simulation the highest flow occurred at 34 hours however at this time there were seventeen (17) pipe sections that experienced flows in excess of 50% of their design capacity. Six (6) of the seventeen (17) pipes that experience significant use of capacity, are along the major trunk sewer on Bayfield Street. The pipes exceeding 50% capacity are listed in Table 14. Besides the syphon, the pipe that experienced the greatest use of capacity was the pipe between MH 11550 and MH 11551 along Bayfield Street. In the Ultimate Peak Hour scenario the pipe section used 77.3% of capacity. At the peak hour ultimate flow the syphon exceeded its design capacity by 10%.

Table 24 - Pipe Section Capacity Use - Peak Day, Ultimate Buildout

Section	Flow/ Design Capacity
Bighead River – Syphon	109.9
Bayfield St. – MH 11550 to MH 11551	77.3
Sykes St. - MH 10760 to MH 10750	75.9
Nelson St. – MH 11260 to MH 11250	73.7
Union St. - MH 11440 to MH 11410	68.5
Bayfield St. – MH 11570 to MH 11571	67.5
Bayfield St. – MH 11551 to MH 11542	66.0

Section	Flow/ Design Capacity
Nelson St. – Proposed 200 mm dia. extension	64.3
Nelson St. – MH 12250 to MH 12210	63.0
Sykes St. - MH 11630 to MH 11631	54.9
Sykes St. - MH 11631 to MH 11620	54.8
Helen St. – MH 33900 to MH 33800	53.1
Bayfield St. – MH 11571 to MH 11560	52.0
Union St. - MH 17610 to MH 17600	50.7
Bayfield St. – MH 11590 to MH 11580	50.6
Nelson St. – MH 18000 to MH 12080	50.4
Bayfield St. – MH 11542 to MH 11540	50.2

3.0 Inflow and Infiltration Reduction Scenarios

It was assumed that through a substantial effort by the town to address the current I/I issues, the inflow could be reduced by 50% and the infiltration could be reduced to match the ultimate harmon peaking factor for the urban area of 2.78 on peak days. The average day flow would be reduced to 5,370 m^3/d from 5,940 m^3/d, this reduction is shown in Figure 5. Two scenarios were generated under the assumption that the Municipality undertakes an initiative to reduce I/I: Ultimate Peak Day – I/I Reduced, Ultimate Peak Hour – I/I Reduced.

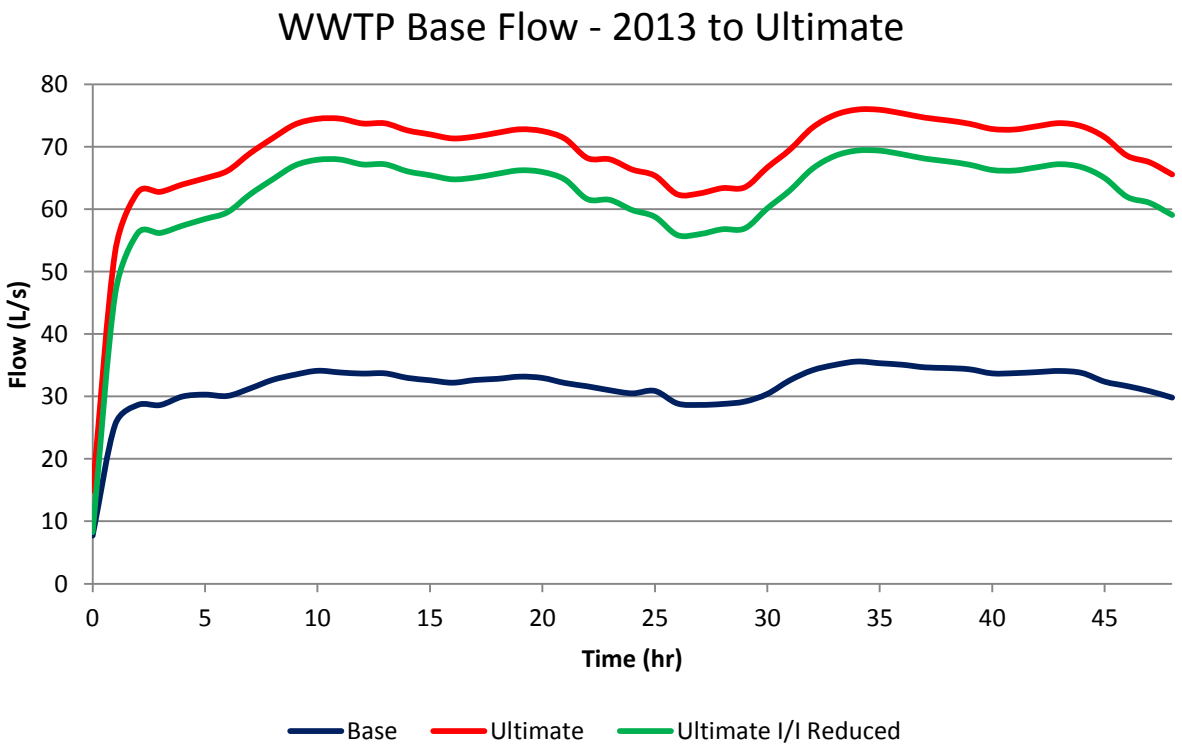


Figure 10 – Effect of I/I Reduction on Ultimate ADF

3.1 Ultimate Peak Day – I/I Reduced

A comparison of the ultimate peak hour before and after I/I reduction is presented in Table 15.

Table 25 – Ultimate Peak Day Before and After I/I Reduction

Location	Ultimate Peak Day Avg. m^3/d	I/I Reduced m^3/d
SPS 1	14,325	10,935
SPS 2	3,300	3,250
SPS 3	2,950	2,650
WWTP	17,600	14,185

Based on the applied changes the peak day flow at the plant was reduced from 17,600 to 14,185 m^3/d. Assuming the I/I reduction program met the targets described in section 3.0, a total reduction in peak day flow of 3,415 m^3/d. The reduction in peak flows is illustrated in Figure 6.

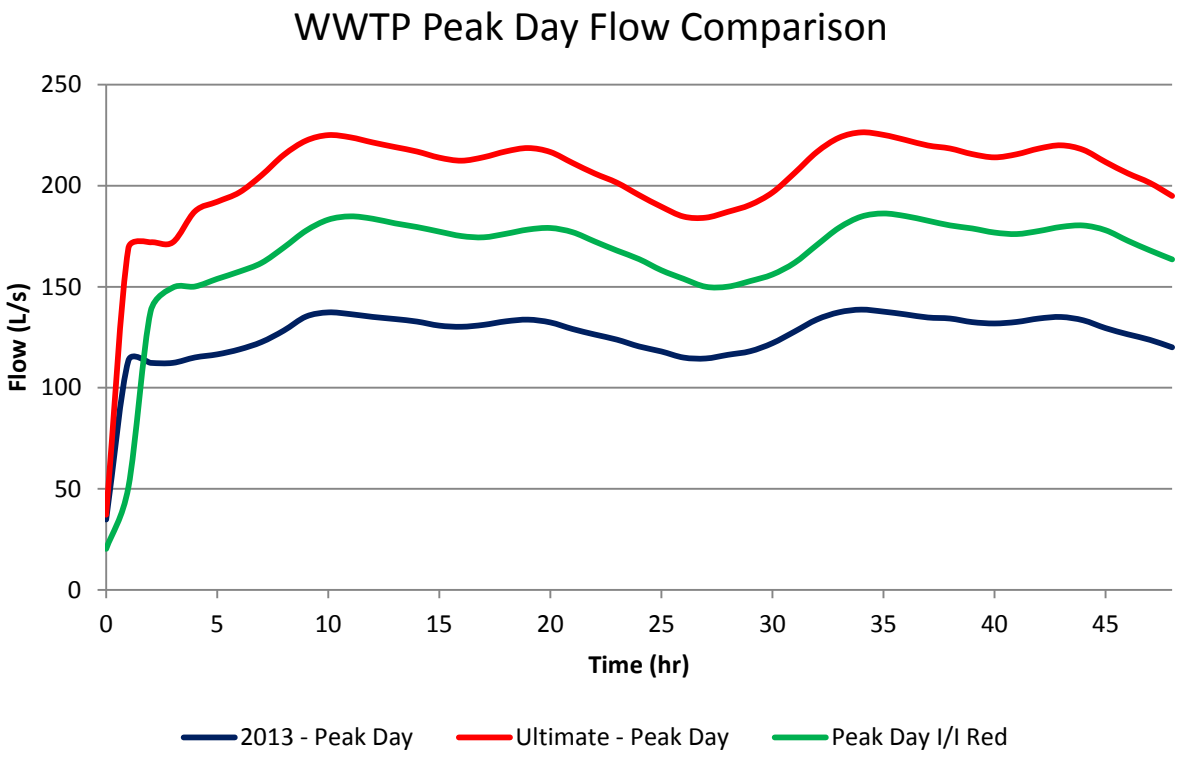


Figure 11 – Effect of I/I Reduction on Peak Day Flow

3.2 Ultimate Peak Hour – I/I Reduced

A comparison of the ultimate peak hour before and after I/I reduction is presented in Table 15.

Table 26 – Ultimate Peak Hour Before and After I/I Reduction

Location	Ultimate Peak Hour Avg. m^3/d	I/I Reduced m^3/d
SPS 1	10,489	9,525
SPS 2	2,615	2,450
SPS 3	2,600	2,250
WWTP	13,100	11,975

Based on the applied changes the peak flow at the plant may be reduced from 251.5 L/s to 200 L/s representing a reduction in flow of 370 m^3. The reduction in peak flows is illustrated in Figure 7.

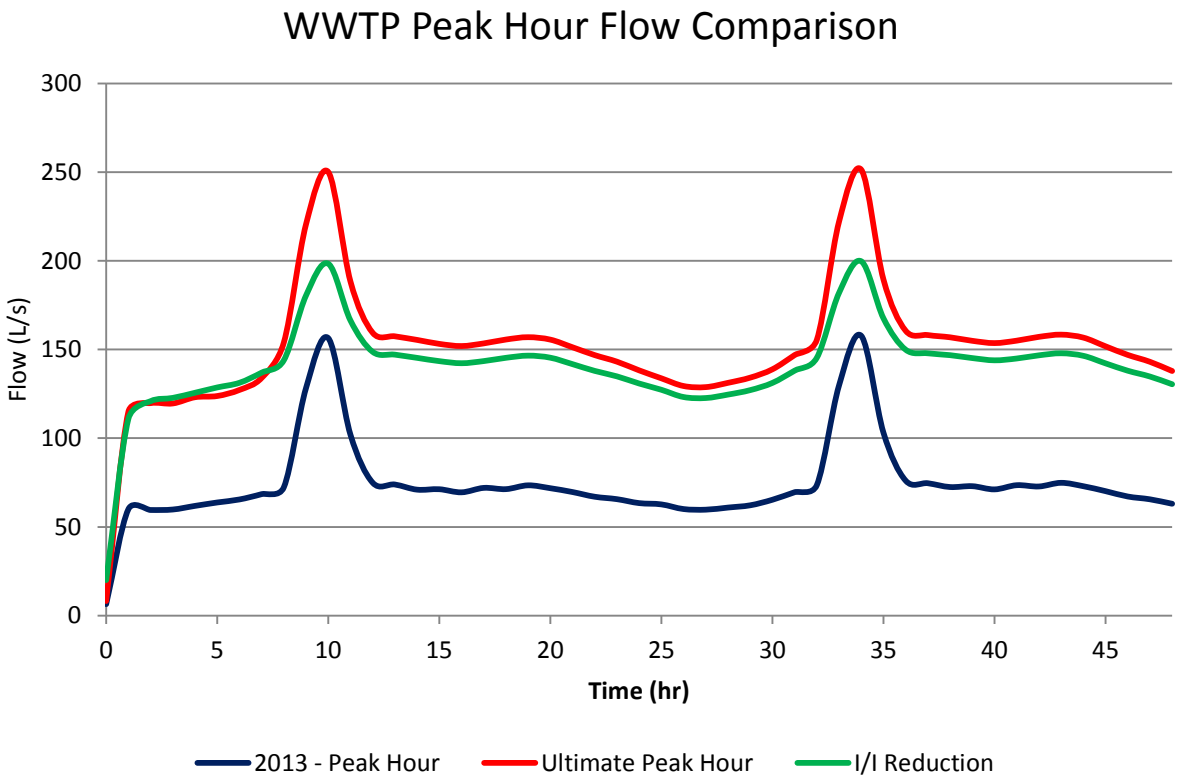


Figure 12 – Effect of I/I Reduction on Peak Hour Flow

The reduction in peak flows effectively addresses the capacity issue at the Big Head River Syphon. Over the simulation the Syphon reaches a peak use of capacity of 90%.

4.0 Conclusions

The results of the ultimate buildout peak hour flow model shows without addressing the current I/I issues the Big Head River Syphon will eventually create a bottleneck within the collection system during peak flows. Addressing the current inflow and infiltration issues will eliminate the potential bottleneck at the syphon, reducing the peak use of capacity to 90%. Alternatively, the syphon could be replaced with a 300 mm dia. main.

Without addressing I/I, the Ultimate ADF at the WWTP is 5,950 m^3/d, the expected peak day flow is 17,860 m^3/d. Ultimate ADF at SPS 1 is 4,540 m^3/d, the expected peak day flow is 14,560 m^3/d. The pump capacity at SPS 1 is sufficient to meet the ultimate flow requirements. Ultimate ADF at SPS 2 is 1,410 m^3/d, the expected peak day flow is 3,310 m^3/d. The pump capacity at SPS 2 is sufficient to meet the ultimate flow requirements.

Ultimate ADF at SPS 3 is 890 m^3/d, the expected peak day flow is 2,960 m^3/d. The lead pump at SPS 3 will need to be replaced to service development in the northwest. A pump with 12 L/s capacity will be sufficient to meet average day demands. The town should also consider replacing the lag pump at the station. The current pump is oversized for the ultimate flow, a pump with 50 L/s capacity will be sufficient to meet the expected peak hour flows to the station. The town should also consider installing a VFD at the station for pump control. In the case that an I/I reduction program is initiated, the recommended upgrades to this station remain the same.

Municipality of Meaford

Water and Wastewater Servicing

Master Plan

Technical Memorandum

Wastewater Alternatives and Evaluation

February 2015

Ainley GROUP
CONSULTING ENGINEERS & PLANNERS

Water and Wastewater Servicing Master Plan
Wastewater Alternatives and Evaluation

Project No. 114106

Prepared for:
The Municipality of Meaford

Prepared By:

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8.0 Introduction

The existing waste water treatment plant in Meaford does not have the capacity to service the ultimate population. Additionally, a number of minor upgrades are required for the sewage pumping stations within the urban area. This technical memo outlines and evaluates the possible solutions for servicing the ultimate population. Ultimate population is defined as the full build out population for the existing community boundaries.

The Class EA of the existing WWTP was completed in 2007 and outlined the expansion needs of the plant on the basis of an expansion in the urban area to service a total population of 11,500 residents. It was assumed within the 2007 Class EA that the population in the urban area of Meaford would reach 11,500 by 2027. This rate of growth is no longer expected to occur as historical trends have shown that average growth rates are typically around 0.5%/year in the urban area. Based on the historical growth rate the urban area of Meaford will not reach a population of 11,500 within the next thirty years.

While the rate of growth in the urban area is not expected to occur at such a rapid pace, the suggestions for upgrades and expansion to the existing plant remain valid and are carried forward in the alternatives discussed in this memo.

Capacities of the current unit processes at the WWTP are shown in Figure 1.

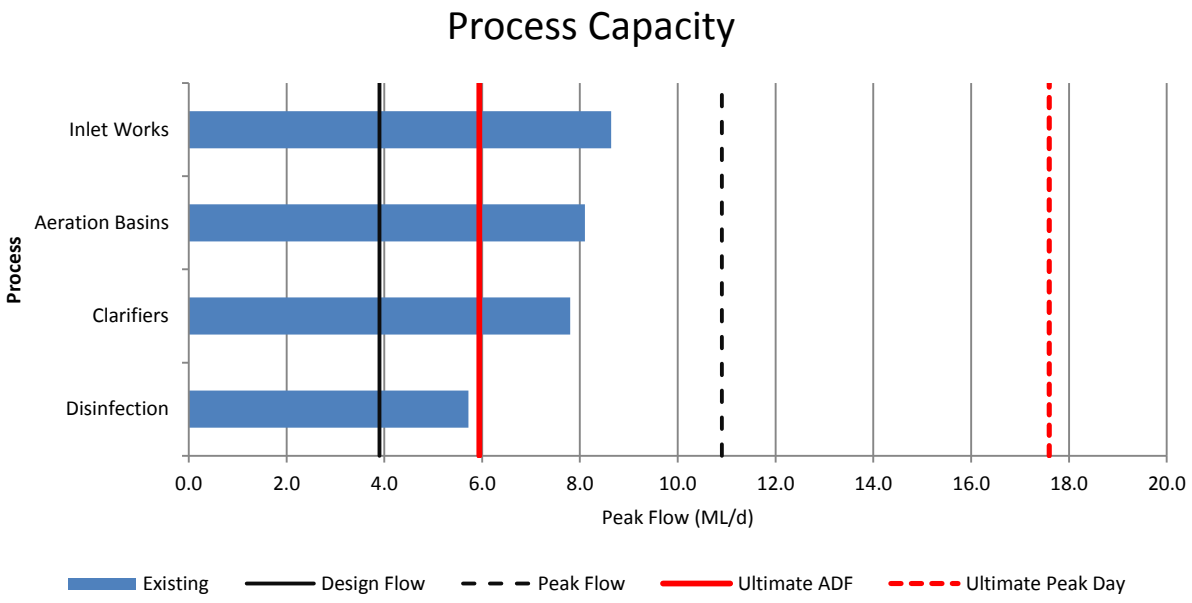


Figure 13 – Existing Unit Process Capacity

As shown in Figure 1, the existing plant does not have enough capacity to meet the needs of the ultimate development in the urban area and upgrades and unit process expansions of the plant are necessary.

Of the five sewage pumping stations in the urban area only SPS 3 requires an increase in pumping capacity to service the ultimate population. However, the three major pumping stations (SPS1, SPS2, and SPS 3) would all benefit from instrumentation and control upgrades.

9.0 Class EA (2007) Recommendations

In order to accommodate the future flow to the WWTP an expansion of the facility was recommended and described in the 2007 Class EA. The design basis for the ultimate plant is summarised in Table 1.

Table 27 – 2007 Class EA Design Basis

Ultimate Service Area	
Population	11,500
Per Capita Flow Rate (L/c/d)	515
Total ADF (m^3/d)	6,000
Peaking Factor	3.5
Peak Day Flow (m^3/d)	21,000

The recommended upgrades to the existing process are summarised in Figure 2.

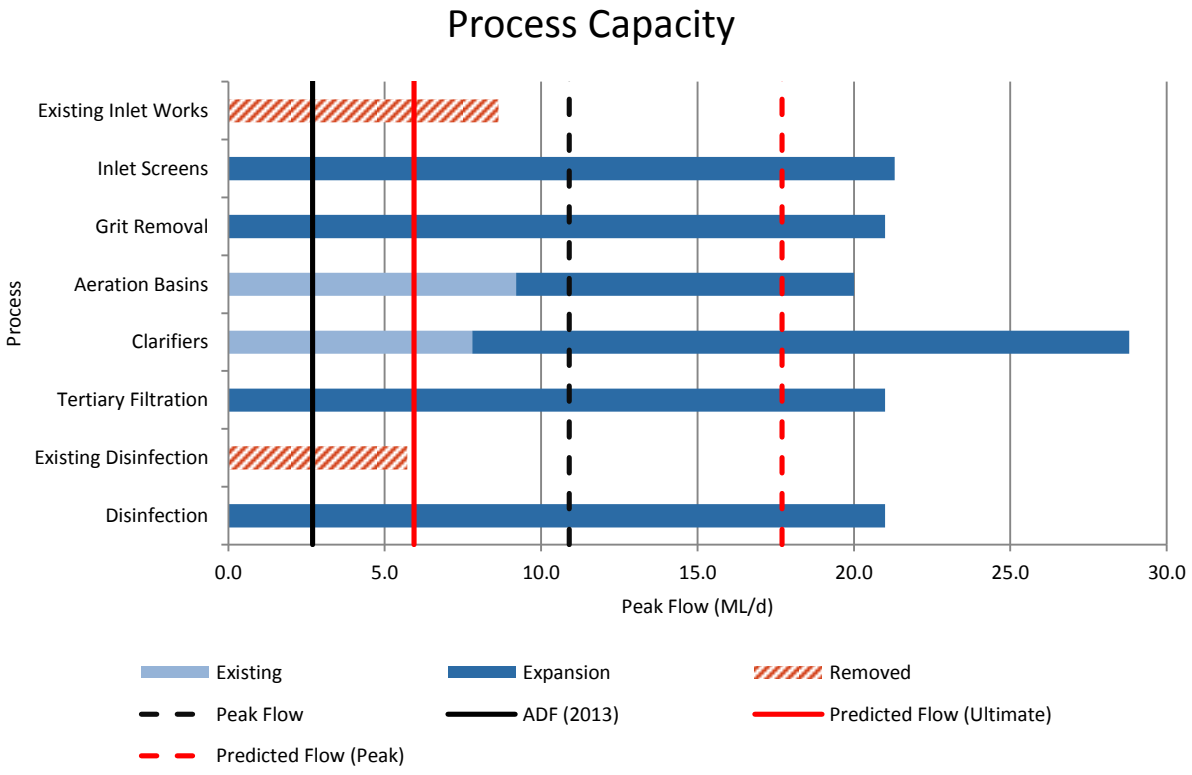


Figure 14 – 2007 Class EA Plant Expansion Plan

The expected effluent limits and design objectives of the 2007 Class EA are summarised in Table 2.

Table 28 – Compliance Limits and Effluent Objectives

Effluent Parameter	Compliance Limit		Effluent Objectives	
	Monthly Avg. (mg/L)	Monthly Loading (kg/d)	Monthly Avg. (mg/L)	Monthly Loading (kg/d)
$CBOD_5$	15	87.4	10	58.3
Total Suspended Solids	15	87.4	10	58.3
Total Phosphorus	0.8	4.7	0.5	2.9
Total Ammonia				
Non-Freeze	3.0	17.5	3.0	17.5
Freeze	5.0	29.1	5.0	29.1
pH	6.0 – 9.5			

A detailed description of each initiative to upgrade the plant and the rationale for the change is listed in Table 3.

Table 29 – Recommended Upgrades of the 2007 Class EA

Initiative:	Rationale:
Derate plant capacity	Achieve aeration basin SRT of 10 days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Derate plant from 3,910 m^3/d to 2,700 m^3/d.
Establish a new influent forcemain.	Existing forcemain has been identified to be undersized.
Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck, the screens are undersized and will be replaced.
Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
Replace steel components of secondary clarifiers.	Units in service for >40 years which is the expected lifespan of this equipment.
Demolish the abandoned digester.	No longer in use and there is no plan to use in the future.
New Screening facility: 2 screens, each 6,300 m^3/d ADF 21,300 m^3/d peak	Replacements to meet expected ADF/Peak flows. Includes 300 m3/d recycle streams.
New grit removal system 2 separators, each 21,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.

Initiative:	Rationale:
New secondary treatment train. 2, 714 m^3 rectangular tanks Total SRT 8-10 days	Current capacity is not sufficient to meet the requirements of growth. Additional capacity to meet ADF of 6,000m^3/d in conjunction with existing aeration basins.
New secondary clarifiers 2 circular tanks 17.5 m dia, 4.2 m SWD each	Current capacity is not sufficient to meet the requirements of growth. Additional capacity sufficient to meet peak day flow rate of 19,240 m^3/d
New tertiary treatment system 2 traveling bridge sand filters each 21,000 m^3/d capacity	Phosphorus removal to meet the anticipated revised effluent limits.
New UV disinfection system 2 channels, total 6,000 m^3/d ADF 20,000 m^3/d peak Decommission and remove existing UV disinfection.	Current UV System is undersized for the ultimate flow and would also need to be moved to incorporate the tertiary treatment system.
Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
New odour control system	To be incorporated as a part of the Municipalities odour management strategy to address the historical odour complaints at the site.
New effluent pumping station	As per the requirements of the 2007 Class EA
Remove diffuser caps from outfall	Existing caps are showing signs of damage causing inconsistent release of effluent.
Upgrade electrical supply and distribution. New stand-by power generator	Existing MCC is reaching the end of its useful life and needs to be replaced. Existing generator not sufficient to meet the demands of the expanded plant.

10.0 Changes since 2007 Class EA

Since the 2007 Class EA there have been changes to the projected population growth rate as well as the ultimate flow at the WWTP. This section will outline the revised population and flow projections and the reasoning behind the changes.

In 2007 it was projected that the population in the urban area of Meaford would reach approximately 13,000 by 2031. The historical growth in the area does not match the projection of the Class EA and therefore the population projection was revised. For the purposes of this study it was estimated that the population in the urban area would reach approximately 5,520 by 2031. This revised population estimation is based on a historical average growth rate of 0.5%/year within the urban area. Further, based on an analysis of the total area of vacant and underdeveloped land and the current zoning, the ultimate (full build out) population in the urban area is 12,000.

The 2007 EA provided a projection of average daily flow (ADF) and Peak Flow for 2031 of 6,000 m^3/d and 20,000 m3/d respectively. The flow projection is based on the 2031 population. Flow projections have been since recalculated based on the ultimate population of the town and the existing zoning to an ultimate population of 12,000. At the ultimate buildout of the urban area it is projected that the ADF at the WWTP will be 5,950 m^3/d with a peak flow of 17,650 m^3/d. At the current growth rate this is not expected to occur until 2180.

11.0 Existing WWTP Issues

The Meaford WWTP has a rated capacity of 3,910 m^3/d with a peak flow capacity of 11,730 m^3/d as per the current certificate of approval. A review of the plant capacity by the Ainley Group in 2006 determined that the existing clarifiers are a considerable hydraulic bottleneck with the surface settling rate limiting the peak flow to 6,874 m^3/d.

A review of the capacity analysis, also completed in 2006 was conducted by Hydromantis Inc. The study review concluded that the existing aeration basins are an additional bottleneck on the basis that the plant does not have the capacity for nitrification. The plant was originally designed as a high rate activated sludge process which is no longer a typical configuration and does not conform to the current design standards for either a conventional activated sludge (CAS) or extended aeration activated sludge (EAAS) plants. The report states that the WWTP should be designed to operate at an SRT much greater than 10 days at an MLSS concentration less than 3500 mg/l. MOE guidelines for EAAS plants state that the aeration step should have an SRT of 15 days and an HRT of at least 15 hours. Based on the MOE guidelines the plant is most heavily constrained by the 15 hour HRT which would limit the ADF to 1,650 m^3/d when compared to the SRT constraint which would limit the plant to an ADF of 2,566 m^3/d. As it currently stands it is recommended that the MLSS concentration be kept at 3500 mg/L.

The Hydromantis review identified an additional constraining factor with respect to the clarifiers at the Meaford WPCP. The existing clarifiers are much shallower than recommended by the current MOE design guidelines. Hydromantis identified that since the clarifiers are shallow there is a much greater potential for solids to flow over the weirs at peak flows particularly as the sludge blanket thickens. In order to prevent solids from leaving the sedimentation basin it is recommended that the RAS rate be kept at 100%. Based on the MOE design guidelines before 2008, at an ADF of 2700 m^3/d, a RAS rate of 100% with an MLSS of 3500 mg/L the existing clarifiers were limited to a peak flow of 5,316 m^3/d to meet a peak solids loading rate of 120 kg/m^2·d. Since 2008, MOE has increased the peak solids loading rate to 170 kg/m^2·d which increases the peak flow to 8,656 m^3/d.

The existing screens are not ideally located at the plant. In order to incorporate new process trains into the plant the headworks will need to be set back from the aeration tank area in order to allow space for flow splitting after screening. The existing screen is also undersized to meet the peak flows at the plant with a peak capacity of 9,842 m^3/d.

The existing disinfection consists of (2) channels, one equipped with UV lamp modules rated for a peak flow of 5,720 m^3/d and a second channel equipped with weir and isolation channel for future UV lamp

modules, with a UV bypass and isolation Valve. The existing disinfection is undersized to meet the existing peak flows.

Overall it has been recommended that the plant be derated to an ADF of 2,700 m^3/d with a peak capacity of 8,100 m^3/d.

11.1 Changes to the Class EA Recommendations

While the majority of recommendations from the 2007 Class EA remain valid there are changes to the Class EA that are recommended based on the results this master plan study.

The Class EA recommended that the plant be upgraded to meet the ADF of 6,000 m^3/d and 20,000 m^3/d peak in one single upgrade. Based on the projected rate of growth and the resulting increase in flow over the next 20 years a full upgrade of the plant in order to service the ultimate population should not be required in the near term.

As discussed in the 2007 EA, the effluent limit for phosphorus is expected to change as a result of any upgrades to the plant. However, a new limit requiring tertiary filtration is not expected. A survey of plants discharging into Georgian Bay close to Meaford suggests that a phosphorus limit of 1 mg/L would be imposed. An effluent concentration of 1 mg/L phosphorus could be achieved by a single-point alum injection.

The influent forcemain was identified as being undersized for the ultimate flows at the WWTP. Based on available information the influent forcemain has a diameter of 450 mm. A 450 mm forcemain will provide sufficient capacity for the projected peak flows.

12.0 WWTP Objectives

The objective of the servicing study is to determine solutions to the problems identified within the problem statement. The problems identified for the Meaford WWTP include:

- Components of the plant exceed 45 years of age and require upgrades to meet future needs.
- Peak flows to the plant exceed the design capacity of some treatment processes.
- Improvements to the plant control systems have the potential to improve plant performance and reduce energy use.
- Upgrades are required to meet the revised effluent requirements.

The primary purpose of any action strategy at the Meaford WWTP is to provide solutions to the identified problems. As such, the presented alternatives each address the components of the plant that have reached the end of their useful life, the issue of peak flows and aim to minimise the energy use of the ultimate system. The main objective is to maintain the effluent quality within the effluent objectives of the plant Certificate of Approval. Based on the previous studies of the WWTP it may be anticipated that the plant is unable to meet the effluent objectives for nitrification while operating at an ADF in excess of 2,700 m^3/d. Further, studies at the plant have recommended limiting peak flows to the plant to 8,100 m^3/d due to bottlenecks created by the inlet works and clarifiers.

12.1 Options to Meet Objectives

Over 2011-2013 the ADF at the Meaford WWTP was 2,600 m^3/d with a peak flow of 11,780 m^3/d. Assuming the recommended capacity, the plant is currently operating at 96% of ADF capacity and 145% of peak capacity. Due to the present flows and expected flows from growth, actions are necessary to either resolve process bottlenecks or to manage flows in order to ensure effluent quality is maintained as development occurs. Alternatives include:

1. Expand the existing WWTP to meet the ADF and peak flows expected at full build-out while addressing the existing inflow and infiltration issues.
2. Expand the existing WWTP in 2 phases with the ultimate WWTP able to meet ADF and peak flows at full build-out while addressing the existing inflow and infiltration issues.
3. Manage peak flows at the WWTP by establishing an equalization storage system while managing ADF through an inflow and infiltration reduction program. Upgrade the existing WWTP when I/I reduction can no longer support development.
4. Expand the existing WWTP to meet the ADF and peak flows expected at full build-out without addressing the existing inflow and infiltration issues.
5. Expand the existing WWTP in 2 phases with the ultimate WWTP able to meet ADF and peak flows at full build-out without addressing the existing inflow and infiltration issues.

12.2 Selection Rationale

The current configuration of the WWTP is not ideal for the integration of additional process units. The existing headworks feeds directly into the aeration basins with no space provided for flow splitting to a new treatment train. In order to expand the WWTP a new headworks would need to be established upstream of the aeration basins to provide space for a flow splitting chamber. As this is the case, option 1, 2, 4, and 5 would all require that a new headworks be established as a component of any plant upgrades in order to have sufficient peak capacity even with reduction of I/I.

Equalization storage provides a simple solution for managing the excessive peak flows in the short term without moving ahead with an expansion to the plant. Equalization storage would improve the flexibility of the plant and allow the operators to overcome existing peak flow issues. Establishing a flow equalization system will not provide additional ADF capacity. In order to keep the ADF below the recommended capacity of the plant an I/I reduction program would be needed. The I/I program would be required to reduce extraneous flows at a faster pace than development. Based on the historical growth rates of the urban area and the potential for flow reduction this is a feasible solution.

Additionally, successfully reducing I/I will provide benefits upstream of the WWTP specifically at the Big Head River syphon. Without reduction of I/I the syphon will need to be expanded to accommodate peak flows at ultimate buildout.

For the reasons discussed above the reduction of I/I should remain a priority for the Municipality. As such, options 4-5 are not considered to be ideal and are not considered further.

13.0 Evaluation of WWTP Alternatives

13.1 Alternative 1 – Full Plant Expansion, Continuing I/I Reduction

A full plant expansion at the Meaford WWTP to service the ultimate population would closely follow the recommendations of the 2007 Class EA. However, between the reduced ultimate population and the continuation of I/I reduction the ultimate flow is expected to be lower than originally projected. Additionally, since 2007 the MOE design guidelines for sewage works have been modified. The expected flows at ultimate buildout are summarised in Table 4.

Table 30 – Flow Projections

	ADF (m^3/d)	Peak Day (m^3/d)
2013	2,740	10,870
Ultimate	5,940	17,700
Ultimate with I/I Reduction	5,350	15,600

The process expansions required to meet the ultimate flows are summarised in Figure 3.

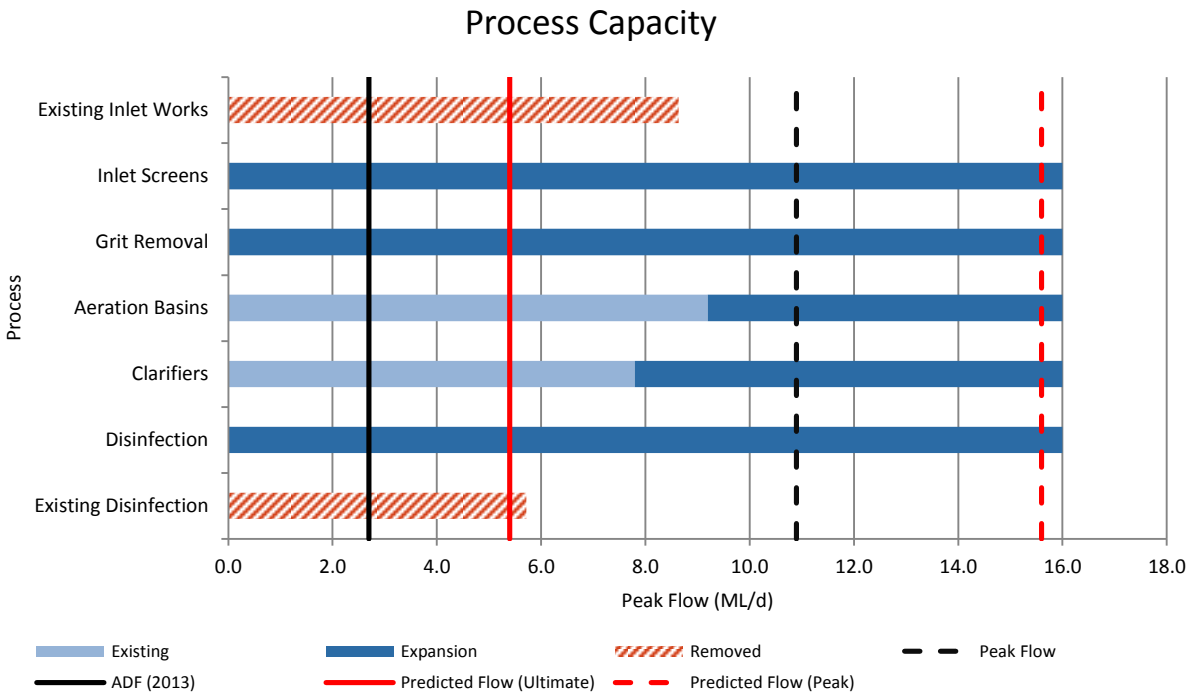


Figure 15 – Ultimate Plant Expansion Process Capacities

As described in the 2007 Class EA it is recommended that the existing inlet works be decommissioned and a new headworks building be established at the site to house both new inlet screens and a grit removal system. The addition of the grit removal system will alleviate the need to have the aeration basins off line once each year to remove the accumulated sediment.

Based on the current design guidelines for extended aeration plants providing nitrification, the HRT should be ≥ 15 hours and the SRT should be ≥ 15 days at the ADF for the biological step. For an ADF of 5,400 m^3/d the ultimate plant should have a total aeration volume of 3,375 m^3. An additional aeration volume of 2,275 m^3 for aeration is therefore required.

The current design guidelines for secondary clarifiers specifies a maximum surface overflow rate of 40 m^3/m^3-d and a peak solids loading rate of 170 kg/m2-d. At a RAS rate of 100% and a MLSS of 3500 mg/L the total clarifier area required to meet the ultimate peak flow is 450 m^2 assuming a SWD of 4.5 m the total settling volume needed is 2025 m^3. The capacity of the existing clarifiers has been brought into question by the capacity report review by Hydromantis specifically due to the lower SWD than is typically recommended. Considering that the plant has consistently met the effluent limits for nitrification and solids over the past 6 years while operating at an ADF around 2,700 m^3/d it is assumed they will continue to be capable of treating this portion of the flow. To treat the remaining 2,700 m^3/d an additional 230 m^2 of clarifier area is required where the peak solids loading rate is the limiting factor.

As discussed, the existing plant headworks represent a major bottleneck and will need to be replaced. The 2007 Class EA recommended a headworks building that contained both screening, grit removal and odour control. This recommendation is carried forward as grit accumulation in the aeration basins is an ongoing issue at the WWTP.

The existing UV disinfection system consists of two (2) channels, one equipped with UV lamp modules rated for 5,720 m^3/d and a second channel equipped with weir and isolation channel for future UV lamp modules. While the second channel could be equipped with an additional UV module the peak flow rating would not be sufficient to meet the ultimate demands. In order to meet the ultimate demands it is recommended that a new UV disinfection system be established at the site with a peak flow capacity of 16,000 m^3/d.

The recommendation for tertiary filtration is not carried forward in this option. Based on the anticipated effluent limit phosphorus of 1 mg/L, tertiary filtration is not required. An effluent concentration of 1 mg/L phosphorus can be met and exceeded by using coagulant addition.

Table 5 summarises the recommended upgrades for the facility.

Table 31 – Recommended Upgrades of the 2007 Class EA - Revised

Initiative:	**Rationale:**
Derate plant capacity	Achieve aeration basin SRT of 15 days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Derate plant from 3,910 m^3/d to 2,700 m^3/d.
Establish a new influent forcemain.	Existing forcemain has been identified to be undersized.
Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck, the screens are undersized and will be replaced.

Initiative:	Rationale:
Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
Replace steel components of secondary clarifiers.	Units in service for >40 years which is the expected lifespan of this equipment.
Demolish the abandoned digester.	No longer in use and there is no plan to use in the future.
New Screening facility: 2 screens, each 5,400 m^3/d ADF 16,000 m^3/d peak	Replacements to meet expected ADF/Peak flows.
New grit removal system 2 seperators, each 16,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
New secondary treatment train. 2, 1,138 m^3 rectangular tanks Total SRT 15 days	Current capacity is not sufficient to meet the requirements of growth. Additional capacity to meet ADF of 5,400m^3/d in conjunction within existing aeration basins.
New secondary clarifiers 2 circular tanks 12.2 m dia, 4.2 m SWD each 3, 21 L/s RAS pumps 3, 15 L/s WAS pumps	Current capacity is not sufficient to meet the requirements of growth. Additional capacity sufficient to meet peak day flow rate of 16,000 m^3/d in conjunction with existing clarifiers. Refurbishment of RAS/WAS pumping station.
New UV disinfection system 2 channels, total 5,400 m^3/d ADF 16,000 m^3/d peak Decommission and remove existing UV disinfection.	Current UV System is undersized for the ultimate flow.
Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
New odour control system	To be incorporated as a part of the Municipalities odour management strategy to address the historical odour complaints at the site.
New effluent pumping station	
Remove diffuser caps from outfall	Existing caps are showing signs of damage causing inconsistent release of effluent.
Upgrade electrical supply and distribution. New stand-by power generator	Existing MCC is reaching the end of its useful life and needs to be replaced. Existing generator not sufficient to meet the demands of the expanded plant.

In 2007 the estimated capital cost of the plant upgrade was $26.5 million. This estimate included $3 million for tertiary treatment which has been removed. Based on an inflation rate of 2.2% since 2007 the estimated capital cost for this project in 2015 is $28 million.

This alternative will allow for the plant's capacity to be upgraded immediately removing all bottle necks in the system. With all the capital costs up front, future costs will consist of routine maintenance and replacements as needed. The downside to this alternative is the high capital cost to construct a plant that will operate at approximately 50% capacity for the next 15-20 years.

13.2 Alternative 2 – Phased Plant Expansion

The phased plant expansion is based on the recommendations of the 2007 Class EA and aims to provide a plan to expand the plant that will meet the immediate needs of the Municipality while moving towards a plant that will be capable of meeting the ultimate demands. Ideally, a phased plant expansion would occur in equal stages however due to the existing layout of the WWTP a multi-stage expansion is not feasible for some processes. Table 6 provides a summary of the upgrades required to expand the WWTP to meet ultimate demands and provides a suggested order in which the upgrades should be completed.

Table 32 – Revised Upgrades of the 2007 Class EA as a Phased Expansion Plan

Phase:	Initiative:	Rationale:
1	Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
	Replace steel components of secondary clarifiers.	Units in service for >40 years which is the expected lifespan of this equipment.
	Refurbish RAS/WAS pumping station 3, 21 L/s RAS pumps 3, 15L/s WAS pumps	RAS/WAS pumping station reaching the end of its useful life.
	Upgrade electrical supply and distribution.	Existing MCC is reaching the end of its useful life and needs to be replaced.
2	Derate plant capacity	Achieve aeration basin SRT of 15 days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Derate plant from 3,910 m^3/d to 2,700 m^3/d.
	Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck, the screens are undersized and will be replaced.
	Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.

Phase:	Initiative:	Rationale:
	New screens 2 screens, each 5,400 m^3/d ADF 16,000 m^3/d peak	Replacements to meet expected ADF/Peak flows.
	New grit removal system 2 seperators, each 16,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
	New secondary treatment train. 1, 1,138 m^3 rectangular tank Total SRT 15 days	Current capacity is not sufficient to meet the requirements of growth. Additional capacity to meet ADF of 4,050 m^3/d in conjunction within existing aeration basins.
	New secondary clarifier 1 circular tank 12.2 m dia, 4.2 m SWD each	Current capacity is not sufficient to meet the requirements of growth. Additional capacity sufficient to meet peak day flow rate of 12,050 m^3/d in conjunction with existing clarifiers.
	Retrofit existing UV channels and provide an additional UV module	Doubles the current disinfection capacity to 11,440 m^3/d.
3	New effluent pumping station	As per the 2007 Class EA requirements.
	Demolish the abandoned digester.	No longer in use and there is no plan to use in the future.
	Remove diffuser caps from outfall.	Existing caps are showing signs of damage causing inconsistent release of effluent.
4	Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
	New odour control system	To be incorporated as a part of the Municipalities odour management strategy to address the historical odour complaints at the site.
5	New secondary treatment train. 1, 1,138 m^3 rectangular tank Total SRT 15 days	Additional capacity to meet ADF of 5,400 m^3/d in conjunction within existing aeration basins.
	New secondary clarifier 1 circular tank 12.2 m dia, 4.2 m SWD each	Additional capacity sufficient to meet peak day flow rate of 16,000 m^3/d in conjunction with existing clarifiers.
	New UV disinfection system 2 channels, total 5,400 m^3/d ADF 16,000 m^3/d peak Decommission and remove existing UV disinfection.	UV System is undersized for the ultimate flow.
	New stand-by generator	Existing generator not sufficient for expanded plant.

The estimated costs of each phase inclusive of design are summarised in Table 7.

Table 33 – Phased Expansion Cost Estimations

Expansion Phase		Cost (2015 Dollars)
Phase 1	Construction	$2,150,000.00
	Engineering and Contingencies (25%)	$569,750.00
	Total:	$2,719,750.00
Phase 2	Construction	$8,050,000.00
	Engineering and Contingencies (25%)	$2,133,250.00
	Total:	$10,183,250.00
Phase 3	Construction	$2,000,000.00
	Engineering and Contingencies (25%)	$530,000.00
	Total:	$2,530,000.00
Phase 4	Construction	$6,200,000.00
	Engineering and Contingencies (25%)	$1,643,000.00
	Total:	$7,843,000.00
Phase 5	Construction	$5,360,000.00
	Engineering and Contingencies (25%)	$1,420,400.00
	Total:	$6,780,400.00

The plant expansion will be completed in 5 stages to allow the plant to meet the needs of the growing population. Phase 1 should occur within the next five years based on the remaining useful life of the equipment suggested to be rehabilitated and the current condition. Phase 2 should occur when the plant begins to have difficulty meeting effluent objectives. Phase 3 and Phase 4 are not imperative to the operation of the plant and may occur when convenient for budgeting purposes. The timing of Phase 5, similar to Phase 2, will be dependent upon the ability of the plant to meet effluent objectives. This phased approach will allow the construction phases to follow population growth allowing for the Town to change the timeline if the predicted population growth changes. By completing the expansion in stages the initial capital costs will be reduced with the remaining costs incurred in the future. The Town will have more time to come up with the necessary funds to complete the project.

13.3 Alternative 3 - Equalization Storage, I/I Reduction, Future Expansion

Between 2006 and 2014 the greatest flow events at the Meaford WWTP have occurred between December and January as a result of snow melting events. Over this period, the highest daily flow occurred during December 2008 with a max day flow of 13,880 m^3. During January of 2008 the WWTP experienced a peak day flow of 12,508 m^3. Since 2008, efforts have been made to reduce the total I/I and the peak flows have been reduced as a result. Since 2008, the most severe peak day flow occurred on January 30th 2013 with a peak day flow of 11,774 m^3/d. While the flow on this day is only slightly above the C of A rated capacity of the plant it is well above the plant's recommended re-rated peak capacity of 8,100 m^3/d. The event is shown in Table 8 as recorded in the plant annual report.

Table 34 – Peak Flow Event Summary

Date	ADF (m^3/d)	Peak (m^3/d)	(Capacity – ADF) (m^3/d)	(Peak Capacity – Peak) (m^3/d)
1/28/2013	2,279.00	4,400.00	5821	3700
1/29/2013	6,769.00	7,872.00	1331	228
1/30/2013	11,774.00	15,252.00	-3674	-7152
1/31/2013	7,217.00	12,300.00	883	-4200
02/01/2013	5,653.00	6,890.00	2447	1210
02/02/2013	3,896.00	6,600.00	4204	1500

As seen in Table 8, the plant treated an excess of 3,674 m^3 based on a peak capacity of 8,100 m^3/d. The 2013 peak flow event was caused by a 22mm which resulted in rapid melting of the accumulated snowfall. Based on the information provided in the annual report, the peak flow events that occurred during 2008 were also the result of heavy rains causing a rapid snow melt. The rapid melting events have historically occurred over a one to two day period and would therefore be well accommodated by a temporary storage option such as an equalization tank. Due to the short duration of the peak flow events it would be possible for the stored sewage to be pumped out and treated within the following days. The plant has a need for an expansion of the aeration basins and clarifiers, based on previous reports. It is proposed that the clarifier and aeration tankage be constructed at the site to be used as equalization storage in the short term before being modified to operate in their intended manner. An equalization tank for the Meaford WWTP would need to be large enough to temporarily store the flow over and above the peak capacity for an event as described above. The required ultimate clarifier and aeration volume is suitable for the purposes of equalization storage as shown in the following discussion.

In order to accommodate growth and ensure the plant continues to meet the effluent objectives, a plan for reducing I/I will be required to keep the ADF below 2,700 m^3/d. Based on the 2014 I/I Study Report there is significant opportunity to reduce extraneous flows and reclaim reserve capacity at the plant. During the month of April 2014 an estimated 2,458 m^3/d of flow was determined to be extraneous which translates to an increase in the yearly ADF of 205 m^3/d. In terms of growth planning, 205 m^3/d of reclaimed capacity through I/I reductions would be sufficient to service an additional 18 years of growth in the urban area based on the historical growth rate and an assumed sewage production rate of 450 L/cap/day.

Based on the known extent of extraneous flows and the historical rate of growth in the urban area, equalization and storage and I/I reduction would be an effective solution for the plant for the next 15-20 years. Eventually opportunities for I/I reduction become limited or impractical and a plant upgrade will be required to increase capacity. The existing and projected flow rates for the ultimate population are presented in Table 9.

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Table 35 – Flow Projections

	ADF (m^3/d)	Peak Day (m^3/d)
2013	2,740	10,870
Ultimate	5,940	17,700
Ultimate with I/I Reduction	5,350	15,600

It is expected that by continuing with the existing I/I reduction program the Municipality can reduce the ultimate peak day from the 17,700 m^3/d to 15,600 m^3/d.

Based on the current design guidelines for extended aeration plants providing nitrification, the HRT should be ≥ 15 hours and the SRT should be ≥ 15 days at the ADF for the biological step. For an ADF of 5,400 m^3/d the ultimate plant should have a total aeration volume of 3,375 m^3.

The current design guidelines for secondary clarifiers specifies a maximum surface overflow rate of 40 m3/m3-d and a peak solids loading rate of 170 kg/m2-d. At a RAS rate of 100% and a MLSS of 3500 mg/L the total clarifier area required to meet the ultimate peak flow is 450 m^2 assuming a SWD of 4.5 m the total aeration volume needed is 2025 m^3.

While the need for equalization storage is required in the short term it is anticipated that this need will be eliminated by the reduction of inflow sources and plant expansion. It is recommended that the tankage for the future clarifiers and aeration basins be designed to operate as equalization storage in the short term. This course of action will defer the need for full expansion in the short term and will spread out the investment in the plant over a longer time period. The total additional tank volume needed to treat the ultimate flows is 3,622 m^3 which is very similar to the calculated volume needed for an equalization tank to meet the current needs. The additional space requirements for benching and appurtenances should be taken into account in the design. Design of the tanks for future modification is important for both the reduction of long term capital costs as well as management of space at the site. This aspect of Alternative 3 is integral to its viability in comparison to the other alternatives presented.

When development outpaces the ability of the Municipality to reduce extraneous flows and a subsequent loss in effluent quality is experienced, the second phase of the program should be initiated and the plant should be expanded to meet the ultimate flows. The process expansions required to service the population at ultimate build out are summarised in Figure 4.

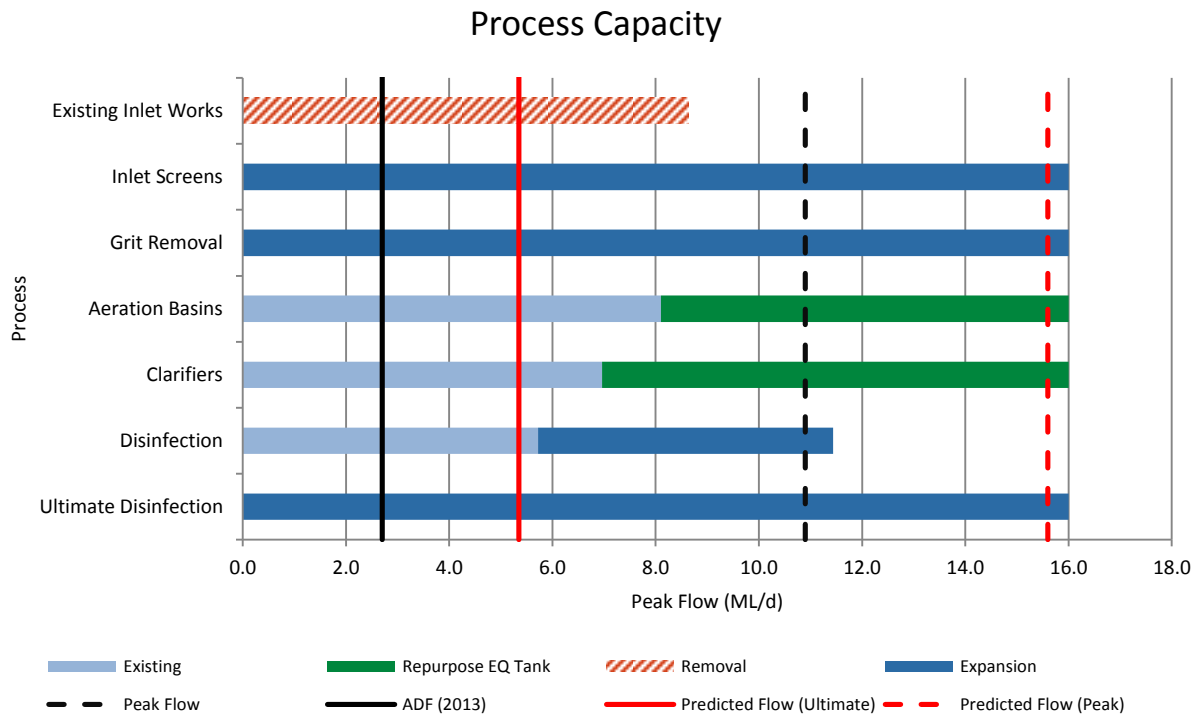


Figure 16 – Equalization Tank and Future Expansion Process Capacities

Given the existing site plan, the best location to construct the proposed tankage is at the southeast corner of the site. Constructing at this location would involve demolishing the abandoned sludge storage tank. The estimated capital cost of the equalization tank construction is $4.13 million, a cost breakdown is presented in Table 10.

Table 36 – Detailed Cost Estimate: Equalization Tank

Category		Cost (2015 Dollars)
General		$250,000.00
Siteworks		$350,000.00
Structural		$1,550,000.00
Civil		$300,000.00
Process Mechanical		$350,000.00
Electrical		$300,000.00
I&C/SCADA		$120,000.00
	Sub Total:	**$3,220,000.00**
Design (7%)		$225,000.00
Construction Admin (8%)		$258,000.00
Permits/ Approvals		$50,000.00
	Sub Total:	**$3,753,000.00**
Contingencies (10%)		$375,000.00
	Total:	$4,128,000.00

Additional costs will be incurred during the I/I reduction project. A number of damaged areas have been identified in the Inflow and Infiltration Study which will provides a basis to continue reduction of extraneous flow. Additionally it is suggested that a new by-law should be put in place to ban all sump pump and eavestrough sanitary sewer connections and actions should be taken to enforce the sewer sue restrictions.

As discussed above, it is expected that equalization storage and I/I reduction efforts will provide significant capacity for the municipality for the next 15-20 years however a plant expansion will be required eventually and a number of refurbishments to the plant are needed in the near-term. The recommended plant upgrades are summarised in Table 11.

Table 37 – Recommended Plant Upgrades

Planning Term:	Initiative:	Rationale:
Short-Term	Commit to the operation of the plant at a decreased capacity	Achieve aeration basin SRT of 15 days. Primary clarifier SOR and SLR capacity identified as being between 2400 m^3/d and 2800 m^3/d. Operate the plant within these parameters.
	Repairs to concrete structures	Repairs are needed for the existing clarifiers and aeration basins as identified by structural assessment.
	Replace steel components of secondary clarifiers.	Units in service for >40 years which is the expected lifespan of this equipment.
	Retrofit existing UV channels and provide an additional UV module	Doubles the current disinfection capacity to 11,440 m^3/d.
	Upgrade electrical supply and distribution. New stand-by power generator	Existing MCC is reaching the end of its useful life and needs to be replaced. Existing generator not sufficient to meet the demands of the expanded plant.
	Refurbish RAS/WAS pumping station 3, 21 L/s RAS pumps 3, 15L/s WAS pumps	RAS/WAS pumping station reaching the end of its useful life.
Medium-Term	Establish a new headworks building.	The new headworks building will house properly sized screens and provide containment for an odour removal system and a grit removal system.
	Remove existing inlet screens.	The existing screens have been identified as a hydraulic bottleneck, the screens are undersized and will be replaced.
	New screens 2 screens, each 5,400 m^3/d ADF 16,000 m^3/d peak	Replacements to meet expected ADF/Peak flows.

Planning Term:	Initiative:	Rationale:
	New grit removal system 2 separators, each 16,000 m^3/d capacity	Aeration tanks are drained annually to remove grit which is time consuming and labour intensive.
	Remove diffuser caps from outfall	Existing caps are showing signs of damage causing inconsistent release of effluent.
Long-Term	Repurpose storm tank to Clarifiers/Aeration Basins	Repurposed storm tanks will provide aeration capacity to meet ADF of 5,400m^3/d in conjunction within existing aeration basins and clarifier capacity to meet peak flow of 16,000 m^3/d along with the existing clarifiers.
	New UV disinfection system 2 channels, total 5,400 m^3/d ADF 16,000 m^3/d peak Decommission and remove existing UV disinfection.	Current UV System is undersized for the ultimate flow.
	Expand biosolids stabilization facility with new WAS thickening	Incorporation of a specific biosolids thickening process to reduce odours/ address complaints.
	New odour control system	To be incorporated as a part of the Municipalities odour management strategy to address the historical odour complaints at the site.
	New effluent pumping station	As per the requirements of the 2007 Class EA

This alternative will result in improvements to the entire sanitary collection system with improvements to both the sanitary sewers and the Meaford WWTP. By first focusing on the I/I problem the upfront capital costs will be reduced. Once the population growth exceeds the I/I reduction the WWTP improvements can be completed in phases to meet the needs of the growing population. This alternative will allow for a more optimized system. Unexpected peaks in flow will no longer occur during storm events allowing for more consistent flow through the treatment train.

The capital costs associated with the upgrades described in each planning term are summarised in Table 12 below.

Table 38 – Capital Cost Estimates for Planned Upgrades: Alternative 3

Planning Term		Cost (2015 Dollars)
Short-Term Upgrades	Construction	$2,500,000.00
	Engineering and Contingencies (25%)	$625,000.00
	Total:	$3,125,000.00
Medium-Term Upgrades	Construction	$5,200,000.00
	Engineering and Contingencies (25%)	$1,300,000.00

	Total:	$6,500,000.00
Long-Term Upgrades	Construction	$13,200,000.00
	Engineering and Contingencies (25%)	$3,300,000.00
	Total:	$16,500,000.00

14.0 WWTP Alternative Evaluation Conclusions

Based on the evaluation of the alternatives Option 3 was selected as the most optimal solution. Table 13 outlines the comparative evaluation of the three alternatives based on the EA evaluation criteria. Each alternative was rated between 1 and 5 on its performance under each criterion where 1 is poor performance and 5 is exceptional performance. The rating under each criterion was multiplied by its weighting to calculate the alternative score. The maximum score for any option is 5.

Table 39 – Evaluation of WWTP Alternatives

Alternatives		Option 1		Option 2		Option 3	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	**15**	**4**	**0.60**	**4**	**0.60**	**5**	**0.75**
Natural Environment	**10**	**5**	**0.50**	**5**	**0.50**	**4**	**0.40**
Social Environment	**20**	**4**	**0.80**	**4**	**0.61**	**4**	**0.70**
Air Quality, Noise and Vibration	10	4	0.40	4	0.40	3	0.30
Quality of Life	5	4	0.20	4	0.01	4	0.20
Community Accessibility	5	4	0.20	4	0.20	4	0.20
Cultural Environment	**10**	**5**	**0.50**	**5**	**0.50**	**5**	**0.50**
Archaeological	5	5	0.25	5	0.25	5	0.25
Heritage Features	5	5	0.25	5	0.25	5	0.25
Technical Considerations	**25**	**3**	**0.75**	**3**	**0.85**	**4**	**0.95**
Performance	5	4	0.20	4	0.20	3	0.15
Technical Suitability	5	4	0.20	4	0.20	4	0.20
Phasing	5	1	0.05	3	0.15	5	0.25
Construction Considerations	5	3	0.15	3	0.15	4	0.20
Operational Considerations	5	3	0.15	3	0.15	3	0.15
Economic Considerations	**20**	**2**	**0.40**	**4**	**0.70**	**5**	**1.00**
Capital Cost	10	2	0.20	4	0.40	5	0.50
Operational Cost	10	2	0.20	3	0.30	5	0.50
Total	**100**	**Score:**	**3.55**	**Score:**	**3.76**	**Score:**	**4.30**

15.0 Sewage Collection System

15.1 General Description of Sewer Network

The majority of the Meaford urban area is serviced by a municipal sanitary sewer system consisting of a network of gravity sewers and five sanitary sewage-pumping stations. This system comprises approximately 35,080 m of gravity sewer pipe and approximately 2,140 m of forcemain. A major portion of the flows, approximately 80 percent, is directed to a centrally located main pumping station (SPS No. 1) on the east side of the Bighead River. In total the Municipality has 5 sewage pumping stations to service the urban area.

The Inflow and Infiltration Study (2015) has identified that inflow and infiltration remains a key issue for the Municipality moving forward. Extraneous flows are most prevalent south of the Big Head River between January and March and coincide with snow melting events. Through the Municipality's effort to catalog the condition of the sewer system by CCTV inspection, several major deficiencies have been identified. Most notably a series of cracks, holes and pipe misalignments were identified along Sykes Street south of the Big Head River. To a lesser degree, cracks and breaks have been identified throughout the collection network. Encrustation issues have also been identified at numerous locations throughout the sewer network.

15.2 Overview of Alternatives for Sewer

As noted in Phase 1 of the project , through CCTV inspection and reiterated in the Inflow and Infiltration study, the existing sanitary collection system in Meaford requires improvement to correct deficiencies, including: broken and cracked pipes, misaligned joints, being partially plugged due to encrustation; and due to age. While this section addresses alternatives for sewermain renewal, there is no global "preferred alternative" for this aspect of the project. The preferred alternative for each section of sewermain will depend on the particular circumstances in that street and sewermain condition. The intent of this section is to identify guidelines for determining the preferred solution on each section of sewermain. Various sewermain renewal options are available. These renewal options include sewermain rehabilitation (relining) or sewermain replacement. The main reasons for renewal of sewermains are to prevent structural failure and to reduce inflow and infiltration sources.

Trenchless sewer rehabilitation is a commonly used method for the rehabilitation of compromised sewermains. Several methods for trenchless rehabilitation exist and include: pipe bursting, sliplining, and cured-in-place pipe (CIPP). Each rehabilitation method can successfully reduce inflow and infiltration, and both sliplining and pipe bursting provide improved structural integrity equivalent to a fully replaced pipe. CIPP rehabilitation will provide a minor improvement in structural integrity but is not recommended for severely damaged pipes. The number of service connections, will affect the cost of the lining projects as services need to be recut from the new pipe. The cost of lining is generally less expensive than replacement, provided the pipe has a reasonable remaining life. The expected service life of the pipe can be extended by 30 to 50 years with CIPP if the pipe is in good structural condition. Sliplining and pipe busting both provide a full 80-100 year lifecycle. For older pipes, typical of the

Meaford water system, CIPP relining may have a higher lifecycle cost. Further, the mobilization costs for rehabilitation methods tend to be much higher than for replacement making the relining of short pipe sections uneconomical.

Sewermain replacement is the other most common sewer renewal alternative and is more applicable when a pipe is closer to the end of its useful life and may fail to provide adequate service and does not have enough structural strength, and becomes prone to failure. While initial sewermain replacement costs are typically more expensive than other renewal options, this option extends the useful life longer and reduces future maintenance costs. The service life of the sewermain will be the full design life of the replacement pipe and ranges from 80 to 125 years.

15.2.1 Advantages & Disadvantages of Watermain Renewal Alternatives

Both renewal options have their advantages and disadvantages. Table 14 below outlines the advantages and disadvantages of the watermain renewal options:

Table 40 - Advantages & Disadvantages of Watermain Renewal Alternatives

Renewal Type	Advantages	Disadvantages
Rehabilitation	• Traffic interruption and noise are confined to two pits for each section • Hydraulic capacity improved • Minimal excavation/streetscape interference required • Restores corrosion resistance of pipe and extends useful life • Less up-front costs than replacement • Could add 30-50 years to service life if the structural integrity of the existing pipe is good • Construction can be phased • Inflow/Infiltration reduction	• Service connections cannot be used for 24 hours in most cases. Construction must be coordinated with residents. • Work cannot be effectively performed in the winter, as the bypass line may freeze • Contractors may not be locally available • High mobilization costs; it is not cost effective for small rehabilitation projects • Shorter service life compared to pipe replacement
Replacement	• Repair costs will be lower because the new pipe can be expected to have lower break rates compared to older pipes • Hydraulic capacity increased • Reduced inflow/infiltration • Pipe material can be chosen to suit the Municipality's needs and soil conditions • Can be replaced with less disruption of sewer service • Local contractors likely more readily available • Longer service life • Structural integrity of pipe is good • Construction can be coordinated with Municipal improvement plans	• More disruptive to streetscape than alternative of repairing breaks or rehabilitation • All service connections have to be reinstated • Higher initial costs than repair or rehabilitation

15.2.2 Evaluation of Watermain Renewal Alternatives

Table 15 outlines evaluation of each sewermain renewal alternative.

Table 41 – Sewermain Evaluation of Alternatives

Alternatives		Rehabilitation		Replacement	
Criteria	**Weighting (%)**	**Qualitative Ranking**	**Score**	**Qualitative Ranking**	**Score**
Land Use Planning	15	5	0.75	5	0.75
Natural Environment	10	4	0.4	3	0.3
Social Environment					
Air Quality, Noise and Vibration	10	4	0.4	3	0.3
Quality of Life	5	4	0.2	5	0.25
Community Accessibility	5	4	0.2	4	0.2
Cultural Environment					
Archaeological	5	3	0.15	3	0.15
Heritage Features	5	5	0.25	5	0.25
Technical Considerations					
Performance	5	4	0.2	5	0.25
Technical Suitability	5	4	0.2	5	0.25
Phasing	5	4	0.2	5	0.25
Construction Considerations	5	3	0.15	4	0.2
Operational Considerations	5	3	0.15	5	0.25
Economic Considerations					
Capital Cost	10	3	0.3	3	0.3
Operational Cost	10	2	0.2	4	0.4
Total	**100**	**Score:**	**3.75**	**Score:**	**4.1**

15.2.2.1 Sewermain Renewal Alternative Conclusions and Recommendations

In general, sewermain rehabilitation is less expensive to implement than full replacement on an initial capital cost basis. However, factors such as the length and structural integrity of sewermain being replaced, the traffic conditions within the area and number of service connections must be taken into account.

CIPP relining does not always improve the structural integrity of the sewermain meaning the chance of a break would not change if it is relined. Therefore, it would not be economical to reline a sewermain that has poor structural integrity. In these cases, if a relining strategy is preferred, either sliplining or pipe busting would be more appropriate as structural integrity would be improved. The disruption from construction is minimal, for CIPP the liner is installed from manhole to manhole. Sliplining and pipe busting both require only entry and exit pits to be dug. The sewermain cannot be used during the relining process; the rehabilitation must be coordinated with the residents along the section to ensure they are not attempting to use the sewer for a minimum of 24 hours. Both slip lining and CIPP will reduce the internal diameter of the sewer pipe however it will also decrease the local infiltration rates and reduce the friction factor of the pipe.

Sewermain replacement is the more expensive option to implement. There is a large up front capital cost to replace the sewermain; however, depending on the section being repaired, often pipe replacement has a lower lifecycle cost. The most common method of sewermain replacement is open cut method; this usually involves excavation of up to half the road to install the sewermain. This can cause disruption to nearby residents while construction is being completed however the sewer service can be maintained throughout construction.

The following is recommended for the Meaford sewer collection system upgrade:

- Pipe relining should be preferred where the useful service life can be increased by at least 40 years.
- Small pipe sections requiring rehabilitation should be replaced due to the high mobilization costs associated with relining.

15.3 Sewage Pumping Station No. 1 - Upgrades

Sewage Pumping Station No. 1, also known as the Bighead River Pumping Station, is located east of Sykes Street and South of the Bighead River. A double barrel inverted siphon connects the area north of the Bighead River to the pump station. The station was reconstructed in 1991 and consists of a reinforced concrete wet well divided into two compartments by a common wall.

The station is equipped with four (Flygt model CP3300) 66 kW submersible pumps, three duty and one standby, each rated at 104.6 L/s at a TDH of 25.5 m. Two pumps are run by a fixed speed drive and two pumps are run by a variable speed drive. The station is rated with a total firm capacity of 181 L/s against a total dynamic head (TDH) of 51 m. Peak hour flows to the station have been modeled for ultimate

build out to be 157 L/s therefore the station is sufficient to support growth without any increase in capacity.

Upgrades recommended at this station are listed in Table 16:

Table 42 – SPS 1 Recommended Upgrades

Upgrade	Cost ($2015)
New Flow Monitor	$ 150,000
SCADA System	$ 75,000

15.4 Sewage Pumping Station No. 2- Upgrades

Sewage Pumping Station No. 2 was constructed at the Water Pollution Control Plant site in 1978 to service the southeast area of Meaford. The station is a wet well/dry well facility equipped with two variable speed 37 kW pumps (Fairbanks Morse model 5414) complete with Benshaw VFD drives. The pumps are rated at 148 L/s at a TDH of 18.8 m. The wet well has a storage capacity of approximately 22 m^3. Peak hour flows to the station have been modeled for ultimate build out to be 46 L/s therefore the station is sufficient to support growth without any increase in capacity.

The station is in good overall condition however it suffers from excessive rag collection causing the pumps to become clogged. The station would benefit from a switch to submersible grinder style pumps.

Upgrades recommended at this station are listed in Table 17:

Table 43 – SPS 2 Recommended Upgrades

Upgrade	Cost ($2015)
Replace Pumps	$ 125,000
SCADA System	$ 75,000

15.5 Sewage Pumping Station No. 3- Upgrades

Sewage Pumping Station No. 3 is located on the east side of Sykes Street directly north of Pete's Creek, approximately 150 m southeast of Grandview Drive. The station services a small residential area at the north west end of the town. All flow passing through this station is pumped into the gravity sewer that eventually passes through the inverted siphon and into SPS 1.

The station was originally oversized and included two 72.5L/s @ 9.5m TDH pumps. One pump has since been replaced with a 2.2 kW pump rated for 10 L/s. For normal operation the replacement pump is currently more than sufficient to handle flows at the station. However, ultimate build out flows are estimated to be 11 L/s ADF and 32 L/s peak day. For ultimate build out it is recommended that 2, 20 L/s pumps with VFD control be installed at the site.

The station is in good overall condition but would benefit from a SCADA and instrumentation upgrade.

Upgrades recommended at this station are listed in Table 18:

Table 44 – SPS 3 Recommended Upgrades

Upgrade	Cost ($2015)
Replace Pumps	$ 80,000
SCADA System	$ 75,000
Flow Monitor	$ 50,000

15.6 Sewage Pumping Station No. 4 - Upgrades

SPS No. 4, located at the east end of Boucher Street, services Stanley Knights Limited. The station is equipped with two, 2.2 kW Myers pumps. Flow passing through this station is lifted to the gravity sewer on Boucher street to flow by gravity to SPS 1.

There is no change in flow rates expected at this pumping station therefore there are no recommendations for upgrades.

15.7 Sewage Pumping Station No. 5 - Upgrades

SPS No. 5 located on St. Vincent Street services the Canadian Coast Guard and Harbour Masters Offices as well as some washrooms located at the Marina. The station is equipped with two, 1.5 kW Myers pumps. Flow passing through this station is lifted to the gravity sewer on St. Vincent street to flow by gravity to SPS 1.

There is no change in flow rates expected at this pumping station therefore there are no recommendations for upgrades.

15.8 Future Sewage Pumping Station No. 6

In order to service development in the southwest of the town along Centre St., Union St., and the future Coleman St., an additional sewage pumping station will be needed. The proposed location for the future SPS is approximately 100 m south of Meaford Creek along Coleman Street.

The ultimate flows projected at the station are approximately 520 – 610 m^3/d ADF with a peak flow of 1300 – 1600 m^3/d. It is recommended that this station include three (3) 10 L/s pumps (2 duty, 1 standby) to service the ultimate development scenario. The station will discharge into the sewer on St. Vincent St. and sewage will subsequently flow by gravity to the WWTP. A 100 m span of 200 mm dia. sewermain on St. Vincent Street will need to be replaced with 250 mm pipe to accommodate the additional flow.

It is estimated that the new sewage pumping station, forcemain and sewer upgrades will cost $750,000.

15.9 Sewage Collection System – I/I Reduction Program

Maintaining a WWTP ADF below 2,700 m^3/d and ensuring the effluent objectives continue to be met is the primary driver for an I/I reduction program. Based on the 2014 I/I Study Report there is significant opportunity to reduce extraneous flows and reclaim reserve capacity at the plant. During the month of

April 2014 an estimated 2,458 m^3/d of flow was determined to be extraneous which translates to an increase in the yearly ADF of 205 m^3/d, while fully eliminating inflow and infiltration during the spring melt is not feasible this point serves to illustrate the extent and severity of extraneous flows in the collection system. In terms of growth planning, 205 m^3/d of reclaimed capacity through I/I reductions would be sufficient to service an additional 18 years of growth in the urban area based on the historical growth rate and an assumed sewage production rate of 450 L/cap/day.

Figure 5 shows the projected growth rate and the cumulative reduction in I/I required to maintain the plant ADF at 2600 m^3/d. Overall the yearly requirement to keep up with development is an approximate 20 m^3/d in I/I reduction each year. Additionally, the continuation of inflow and infiltration reduction will ensure that the sewage flows will not exceed the capacity of the Big Head River syphon.

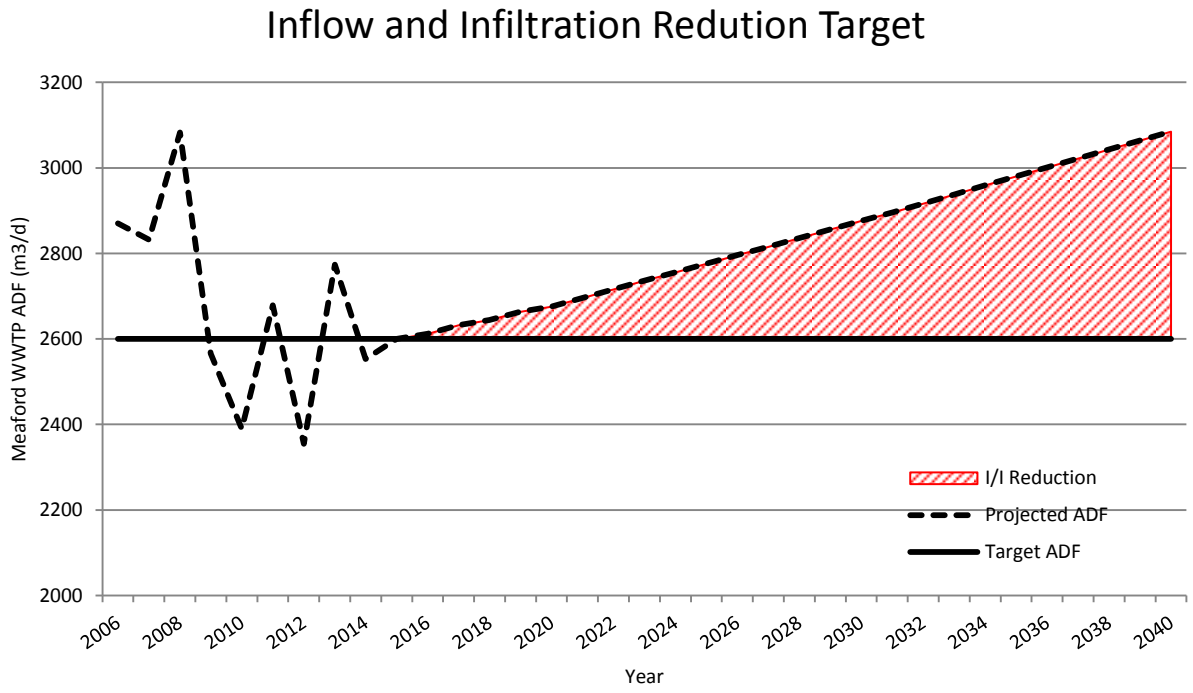


Figure 17 – Inflow and Infiltration Reduction Objective

A phased action plan for reducing inflow and infiltration is presented in Table 19.

Table 45 – Inflow and Infiltration Reduction Plan

Planning Term:	Initiative:	Description:
1-5 years	Replace Identified Damaged Pipe	• Sykes Street - MH 10750 to MH 10720 (North of Ivan St. to Margaret St.) • Ivan Street – MH 10791 to MH 10760 (from Sykes St. halfway to Victor St.) • William Street – MH 11730 to MH 11680 (from Thompson St. to Cook St.)

Planning Term:	Initiative:	Description:
		• Susan Street – MH 32630 to MH 32620 (from Thompson St. halfway to Mary St.)
	Smoke Testing	Complete smoke testing and notify home owners with illicit connections.
	Disconnection Program	Devise a program to disconnect improper sewer connections in the urban area either by incentive or penalty.
	Continue MH and CCTV Inspection	Continue MH inspections and CCTV inspection of pipes in the network that have yet to be inspected
5-10 years	Replace Identified Damaged Pipe	• Farrar St. – MH 11491 to MH 11490 (from Union Street) • Union Street – MH 11490 to MH 11470 (from Farrar to North of Louisa) • Blake Street – MH 11500 to MH 11501 (from Louisa, South on Blake) • Albert Street – MH 11730 to MH 11690 (from Cook St. to West of Thompson)
	Monitor I/I contribution to the WWTP	Monitor and identify the amount if I/I reduction that occurred from the first 5 years of the I/I reduction plan
	Smoke Testing	Complete smoke testing if inflow is still and issue from prohibited connections
	Enact Disconnection Program	Take actions towards disconnecting improper connections that have not been rectified. For example: fine/ increase sewer charges of users who still have prohibited connections. Alternatively, fix the existing issue and charge the sewer user for the cost.
	Identify Additional Pipe Defect Location	From the continued CCTV inspection identify additional areas of damaged pipe
10-15 years	Inflow and Infiltration Study	Complete an Inflow and Infiltration study to determine the impact of reduction program and identify new locations for rehabilitation.
	Replace/ Reline Identified Damaged Pipe	Fix areas of damaged sewer pipe that have been identified by the continued CCTV inspection and confirmed through I/I Study.
15-20 years	Monitor I/I contribution to the WWTP	Monitor and identify the amount if I/I reduction that occurred from the first 5 years

Planning Term:	Initiative:	Description:
		of the I/I reduction plan
	Replace/ Reline Identified Damaged Pipe	Fix areas of damaged sewer pipe that have been identified by the continued CCTV inspection and confirmed through I/I Study.

16.0 Wastewater System Conclusions and Overall Plan

Overall, it is recommended that the Municipality adopt Alternative 3 for the expansion of the WWTP which involves establishing the ultimate clarifier and aeration basin tanks at the existing WWTP site to be used for storm retention in the near term. The plant currently experiences significant peak flows which will be effectively managed by establishing equalization storage at the site. It is recommended that the clarifier and aeration basin tankage be designed to be effective as storm retention tanks until they are required in order for the plant to meet effluent objectives. The inflow and infiltration reduction program is integral to this alternative as it has been identified in previous studies that the existing WWTP may be not be able to meet the C of A effluent limits while operating at an ADF greater than 2,700 m^3/d. The objective of the inflow and infiltration reduction program will therefore be to reduce extraneous flows at the same pace as development and keep the plant ADF at approximately 2,600 m^3/d. This will allow the plant to essentially be operated as an EAAS plant with a capacity of 2,700 m^3/d and an 8,100 m^3/d peak and maximize the level of treatment. A phased strategy for the overall wastewater collection and treatment system is presented below in Table 20. A proposed timeline for the suggested work is provided in Figure 6.

Table 46 – Overall Wastewater System Improvement Plan

Project Name		Estimated Cost
Phase 1		
Design New RAS/WAS Pumping and Electrical Improvements	$	150,000.00
WWTP Refurbishment and Demolition of Old Sludge Storage A	$	2,550,000.00
Upgrade UV Disinfection Channel (Add Additional Module) A	$	50,000.00
Sykes Street, Paul Street, and Ivan Street Reconstruction	$	210,000.00
Develop a Disconnection Program for Illegal Connections	$	N/A
Sewer CCTV and Manhole Inspections	$	200,000.00
Smoke Testing and Identification of Locations with Illegal Connections	$	160,000.00
Notify Property Owners of Illegal Connections/Disconnection Program	$	N/A
Total Phase 1:	**$**	**3,240,000**
Phase 2		
Storm Equalization Basin Design	$	220,000.00
Storm Equalization Basin Construction B	$	3,900,000.00
William Street Sewer	$	120,000.00
Susan Street Sewer	$	80,000.00
Repair/Raise Low Lying Manholes & Install Watertight Cover (assume 50 repairs)	$	370,000.00
Review CCTV Inspection Data and Re-evaluate Rehab Priorities	$	10,000.00
Review Flow Rates and Compare to Historical Flows	$	5,000.00
Implement Disconnection Program (assume 500 connections)	$	750,000.00
1 km of sewermain repairs each year	$	2,000,000.00

Total Phase 2:	**$**	**7,455,000**
Phase 3		
Union Street, Farrar Street and Blake Street Sewer	$	225,000.00
Albert Street Sewer	$	100,000.00
SPS 3 Upgrades Design	$	20,000.00
SPS 3 Upgrades Construction A+	$	205,000.00
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 3:	**$**	**2,550,000**
Phase 4		
Inflow and Infiltration Study Update	$	50,000.00
SPS 2 Upgrades Design	$	20,000.00
SPS 2 Upgrades Construction A	$	200,000.00
SPS 1 Upgrades Design	$	22,000.00
SPS 1 Upgrades Construction A	$	225,000.00
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 4:	**$**	**2,517,000**
Phase 5		
Continue System Rehab as Guided by CCTV Inspection and I&I Study	$	TBD
1,000 m of sewermain repairs each year	$	2,000,000.00
Total Phase 5:	**$**	**2,000,000**
Phase 6		
Repurpose Storm Equalization to Clarifiers/Aeration (Effluent Trigger) C	$	2,250,000.00
Design a New Headworks Building	$	350,000.00
New Headworks Building Construction C	$	4,750,000.00
Design Biosolids Storage Expansion	$	310,000.00
New Biosolids Works Construction C	$	4,420,000.00
Design New UV Disinfection Channel	$	200,000.00
New UV Disinfection Construction C	$	2,750,000.00
Design Odour Control System	$	350,000.00
Odour Control System Construction A	$	5,100,000.00
Total Phase 6:	**$**	**20,480,000**
Total Program:	**$**	**38,242,000**

The goal of the Improvement Plan Phase 1 is to rehabilitate the existing plant and continue inflow and infiltration reduction efforts. Rehabilitation efforts will extend the useful life of the existing plant. The continued efforts to reduce inflow and infiltration aim to maintain the average daily flow of the plant below 2,600 m^3/d and sustain the ability of the plant to meet effluent criteria.

The primary objective of Phase 2 of the Improvement Plan is to establish the future clarifiers and aeration basins at the WWTP site to be used for peak flow management. The continuation of inflow and infiltration efforts is suggested to continue with an increased effort to have improper sewer connections removed throughout the town.

With peak flows effectively managed by the interim retention tank, Phase 3 of the Improvement Plan continues to focus on the reduction of inflow and infiltration to increase reserve capacity at the plant to allow for the continuation of development.

At Phase 4 it is suggested that all of the sewage pumping station upgrades be completed. Further, it is suggested that the Inflow and Infiltration Study be updated to determine the best course of action with respect to continuing rehabilitation of the sanitary collection system.

Phase 5 of the improvement plan consists of the continuation of inflow and infiltration reduction efforts. Phase 6 of the plan is initiated when the WWTP can no longer meet the effluent criteria and is essentially a full plant expansion. At this point the interim storm tanks will be retrofitted to operate as aeration basins and clarifiers to service the full build-out population.

A number of defects have been identified throughout the collection system that are not considered to be critical at this time however they should be given future consideration for repair and will be reevaluated during Phase 4 of the improvement plan. Table 21 provides a listing of the defects and their locations.

Table 47 – Sanitary Collection System Defects for Future Consideration

Location	Defect
Boucher Street	
MH 132 to MH 131 @ 1 m @ 31.0, 31.6 m	Pipe broken
MH 130 to MH 125 @ 16.9, 21.8, 30.3, 41.9 m	Longitudinal/ Circumferential Cracking
Centennial Street	
MH 11450 to MH 11440 @ 78.1 m	Offset Joint
Coleman Street	
MH 12800 to MH 12790 @ 60.3 m	Circumferential crack
Grandview Drive	
MH 32591 to MH 32600 @ 1.6 m	Intruding connection, Infiltration
MH 32591 to MH 32590 @ 40.1 m	Open Joint
MH 32590 to MH 32580 @ 9.4 m	Broken Pipe at Joint
Margaret Street	
MH 176 to MH 177 @ 49.3 m	Joint Displacement
Marshall Street	
MH 10860 to MH 10850 @ 17.5 m	Hole in sewer (possible repair)
Middle Avenue	
MH 22680 to MH 22670 @ 55.6	Broken Pipe
MH 20360 to MH 22670 @ 39 m	Infiltration
Montgomery Street	
MH 20510 to MH 20500 @ 88.7 m	Infiltration
Nelson Street	
MH 12161 to MH 12150 @ 47.8 m	Infiltration at joint
Noble Street	
MH 12211 to MH 12220 @ 79.3 m	Hole in pipe
Parklane Crescent	
MH 22730 to MH 22740 @ 62.4 m	Infiltration
MH 22730 to MH 22720 @ 57, 82.6 m	Cracking
MH 22700 to MH 22670 @ 19.6 m	Cracking
Trowbridge Street	
MH 12450 to MH 12451 @ 0.4, 2.4 m	Joint Displacement
MH 12460 to MH 12470 @ 103 m	Multiple Cracks
MH 12460 to MH 12450 @ 7.7, 25.7, 93.4, 129.3 m	Multiple Cracks, Broken Pipe

Location	Defect
MH 12460 @ 148.3 m	Joint Offset

In addition to the repairs and replacements needed throughout the urban area, there are a number of trunk sewers that will be required to service the ultimate development. The locations of the required sewermains and their anticipated capital cost are listed in Table 22.

Table 48 – New Development Sewers

Project Name	Estimated Cost
Centre Street Sewermain	$ 600,000.00
Union Street Sewermain	$ 400,000.00
Coleman Street Sewermain	$ 420,000.00
St. Vincent Street Sewermain	$ 370,000.00
Muir Street Sewermain	$ 290,000.00
Nelson Street Sewermain	$ 310,000.00
Miller Street Sewermain	$ 250,000.00
Pearson Street Sewermain	$ 140,000.00
Sewage Pumping Station 6	$ 750,000.00
Total New Development	**$ 2,780,000.00**