UTILITIES KINGSTON

CITY OF KINGSTON WATER MASTER PLAN UPDATES

WATER MODEL CALIBRATION REPORT

JANUARY, 2017

WSP

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WATER MODEL CALIBRATION REPORT

Utilities Kingston

Final Report

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VERSION	DATE	DESCRIPTION
1	**MARCH 2016**	DRAFT REPORT
2	**AUGUST 2016**	DRAFT REPORT 2
3	**JANUARY, 2017**	FINAL REPORT

SIGNATURES

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EXECUTIVE SUMMARY

Utilities Kingston (UK) retained WSP to conduct an update to the Water and Wastewater Master Plan (MP) for the City of Kingston (City). As part of this MP, an up-to-date and calibrated water model is required to simulate water system performance and to evaluate future projections.

WSP audited and completely rebuilt the InfoWater model provided by UK based on the latest GIS data, incorporating all isolation valves and using GIS-based ID numbers. Working closely with the City and UK, WSP also used GIS to scrutinise every pipe, water meter and parcel (land-use).

Early model runs were also used to identify excessively high or low pressures, high velocities and bottleneck pipes. Using the information obtained from UK and the Condition Assessments performed during this MP, the model was updated to include recent or re-built pipes (not in GIS) and made ready for adding water demands. This update included recently approved subdivisions.

Water demands are based on a water balance of the system to ensure the sum of all demands and losses match the total water produced by UK. Water balance components include: system input volume (plants); authorized consumption (billed and unbilled usage); and, water losses (apparent loss, unauthorized consumption, inaccurate meters, pipe leakage and breaks). GIS was used to assign billed consumption to each parcel and these were aggregated to the nearest model node. Each category of the water consumed was analysed and loaded in the model separately.

The 24-hour diurnal water demand pattern for a residential area was obtained from a recent, 2015 pilot project in Kingston. This was compared to published patterns and to the earlier MP. WSP also developed a 24/hour pattern for Industrial/Commercial/Institutional (ICI) land-uses and applied it to each applicable water demand component. Based on this review and the proportion of ICI customers, a slightly different pattern was developed for the West, Central and East service areas. Each modelled demand has a 24-hour diurnal pattern.

The updated model was then calibrated to match the 2013-2014 conditions that best represent the current system. The latest available SCADA data was used to pre-set all supply (including boosters) and storage flows and pressures – with water demands following their 24-hour patterns – enabling calibration to be completed in two stages:

1. In stage 1, WSP selected a representative set of hydrant flow test locations for each zone in the West, Central and East service areas. WSP adjusted the pipe roughness (C-factor) parameter to match results at the time of each hydrant flow test for both steady-state (static pressure) and high-flow (20 psi) conditions. Roughness was adjusted for pipe sets.

   The pipes were grouped into nine (9) sets consisting of concrete, metal and plastic pipes that were each old, middle-aged or relatively young. First, the C-factors were adjusted for the entire pipe group to ensure rational adjustments and City-wide consistency. Second, the C-factors were reduced a little for large-diameter transmission mains based on recent literature. Finally, a handful of hydrant leads were assigned local losses to match tests.

2. In stage 2, the calibrated model was used to reproduce flow measurements and SCADA information gathered during a September 2015 day when the inter-connecting valve between the West and Central zones was opened. A reasonable agreement was found between the model prediction and actual flows from Central to West (or vice-versa).

The calibrated WSP MP model has average differences between simulated and observed pressure of 2.6% (steady) and of 5% (high flows). The calibrated model was also run to simulate conditions at a separate set of validation locations, reproducing them with average differences of 6% (steady) and 9% (high flows): this is twice as accurate as the former MP model for high flows.

The present MP model is well within the AWWA guidelines for water model calibration and validation for multi-zone, large-city models.

Using the updated and calibrated model, the gap analysis and evaluation of alternatives can proceed. Following this, the future scenarios (and alternatives) will be simulated to a high degree of prediction accuracy, enabling solid decisions to be made.

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1 INTRODUCTION

Utilities Kingston (UK) retained WSP to conduct an update to the Water and Wastewater Master Plan (MP) for the City of Kingston (City). As part of this MP, an up-to-date and calibrated water model is required to simulate water system performance and to evaluate future performance.

This report documents the water model update and calibration tasks and their links to parallel tasks used to update the trunk wastewater model – documented in a separate report. A few common tasks are documented in both reports for completeness.

UK supplied an InfoWater water model originally created as part of the *Master Plan for Water Supply for the City of Kingston Urban Area and the Class Environmental Assessment* as completed in 2007 by Simcoe Engineering Group Ltd. WSP audited and completely rebuilt this model using the GIS information and data provided.

Working closely with the City and UK, WSP used the GIS information to scrutinise every pipe, water meter and parcel (land-use). Early model runs were also used to identify excessively high or low pressures, high velocities and bottleneck pipes. Once the initial work was completed and using the GIS information obtained from UK and the Condition Assessments performed by WSP during this MP, the model was completely rebuilt using all pipes in the GIS plus recently constructed or lined pipes. This included every isolation valve in the GIS, complete with IDs. The all-pipe model was then made ready for loading water demands from every parcel (land use) to every model node.

In order to represent real-world events on specific days and times, the actual water production, consumption and SCADA data (pumps on/off, reservoir levels) are used in the simulations. This requires a significant amount of pre-processing to select representative Average Day Demand (ADD) and Maximum Day Demand (MDD) conditions; as well as specific Minimum Hour Demand (MHD) and Peak Hour Demand (PHD) that occur during these days.

As noted in the next section, model calibration is a process whereby pipe roughness (and sometimes leakage) are adjusted according to a consistent and systematic framework to achieve a high degree of agreement between model predictions and observed SCADA and hydrant flow test data. The next step is to leave every parameter as-is and to simulate a separate set of observations (the validation data set) to check that the calibrated model predictions are ‘valid’ for other areas. The process is complete when both the calibration and validation errors are within acceptable tolerance.

Appendices contain specifics pertaining to each of the broad topics and tasks mentioned above.

2 OVERVIEW AND APPROACH

2.1 WATER MODEL OVERVIEW

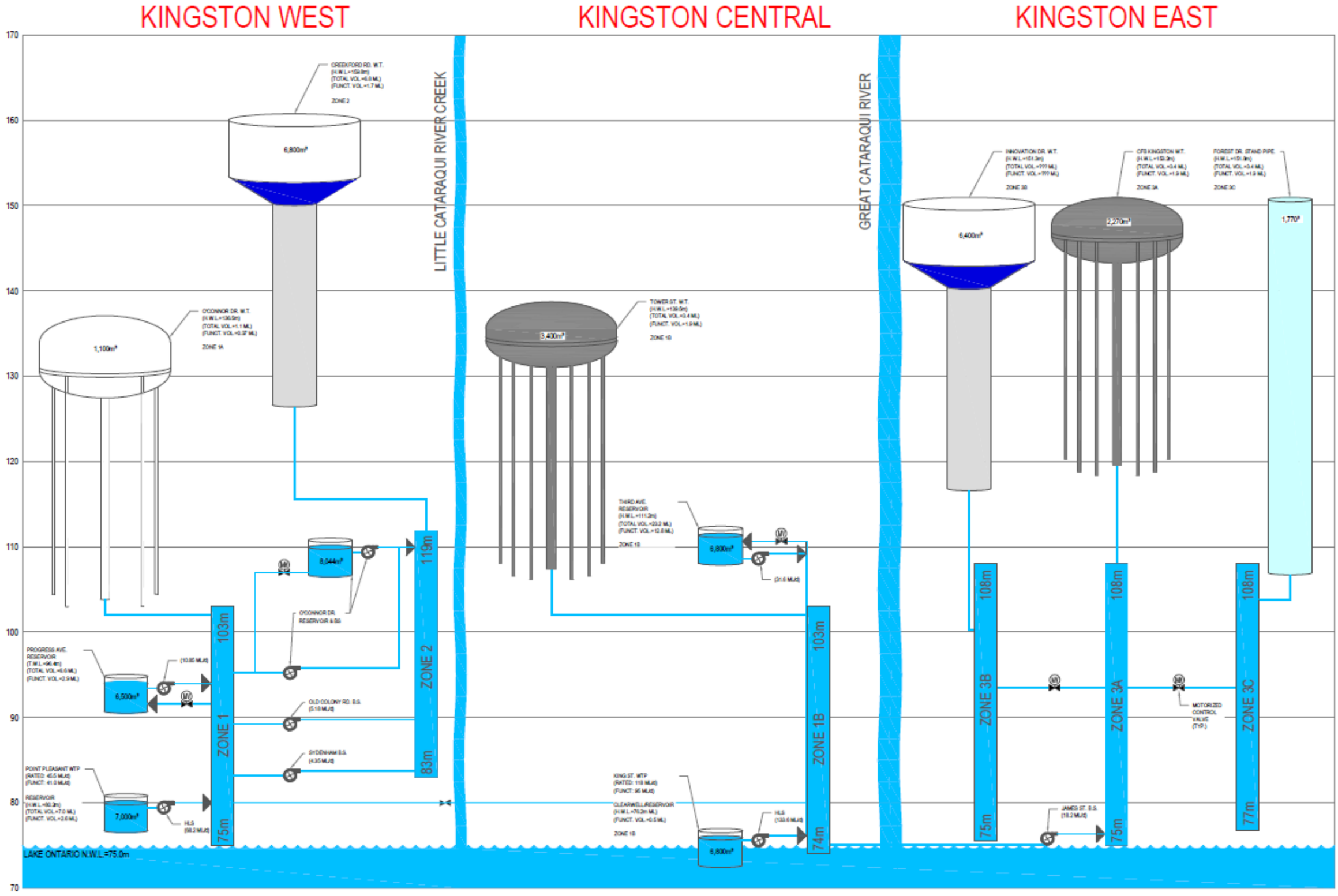
The InfoWater model represents a water distribution system that services the City of Kingston using three distinct areas: West, Central and East – each with several pressure zones. Figure 2-1 shows the system schematic. Two separate water treatment facilities supply the West and Central areas:

- The newer Point Pleasant Water Treatment Plant (PPWTP) supplies the Kingston West area, including the portion of the City within the urban boundary west of Little Cataraqui Creek.
- The older King Street Water Treatment Plant (KSWTP) supplies the Kingston Central area to the east of the Little Cataraqui Creek.
- The James St. Booster supplies the Kingston East area, east of Cataraqui Creek.

The InfoWater computer model represents the City's water distribution system with a combination of pipes (watermains), junctions and special hydraulic elements (pumps, storage tanks and reservoirs). Where available, set-points used to control levels, flows or pressures in the real world are likewise incorporated as Control Rules in the water model. The model operates within the GIS, providing full access to water meter data, hydrant locations, crossings and other constraints.

Before the MP water model can be used to evaluate alternatives and future conditions, it must be calibrated and validated to represent existing conditions. This provides the basis for the future Scenarios that consider growth projections based on the City's Official Plan, decisions made during this Water Master Plan and updates from the City of Kingston planning department which are detailed in the Growth Development Report (2015 Master Plan WSP).

Figure 2-1 KingstonWater Distribution System Schematic



2.2 COMBINED WATER AND WASTEWATER MODELLING APPROACH

Given that the water and wastewater computer models are being rebuilt and updated respectively there are synergies while developing them by using the same input and loading information. This process increases accuracy by reducing duplication of work and allows both models to match growth projection scenarios across developed scenarios and alternatives. The proposed approach has four (4) phases, as shown in Figure 2-2:

- **Phase 1:** Review data sources such as GIS and the specific processes used to transfer information into the models. Using maps and tables, identify new information and update the model to represent actual infrastructure in the ground (i.e.: pipe sizes and materials, node elevations, geocoded locations, pump curves and other station data, etc…).
  - WSP preserved the earlier model data and re-built the new model in the same file to facilitate cross-checks and comparisons between the earlier work and the present MP.
  - Phase 1 checks included units, realistic ranges for parameters, outlier tagging, location consistency and the completeness of association fields such as pressure zones.
- **Phase 2:** Load models with water demand and dry weather flow consisting of residential and non-residential loads. Since properties are typically serviced for both water and wastewater, the models use similar loading but reduce the wastewater to a fraction of the water consumed. This ensures consistency between the models for their most significant input: flow rate.
  - WSP processed and corrected the City's water meter geo-database to assign real-world water demands to each land parcel, tagging it based on land-use.
  - Phase 2 checks included units, verifications of the largest water users, realistic ranges for parameters, and a review of 24-hour demand variation against a 2015 pilot project.
- **Phase 3 (Water Model specific):** Flow and pressure monitoring data from SCADA records and/or tests are compared to initial model simulations and key model parameters are adjusted until simulated values match real-world observations.
  - WSP represented leakage as a time-dependent demand to reflect the influence of system pressure on losses. For pipe roughness, WSP grouped water mains into nine groups based on three materials (concrete, metal and plastic) and three age groups. This allowed values to be adjusted consistently across the City during calibration.
- **Phase 4 (Water Model specific):** Without changing any parameters, the calibrated model is used to predict conditions at specific locations: the validation dataset. If these predictions are within an acceptable range, the model is deemed "validated" and ready for use as a decision-support tool of the MP. The alternatives and future conditions are simulated using the calibrated parameters and a series of future water demand and growth projections out to the project horizon.

The major sections of this report document each phase of the WSP MP modelling approach.

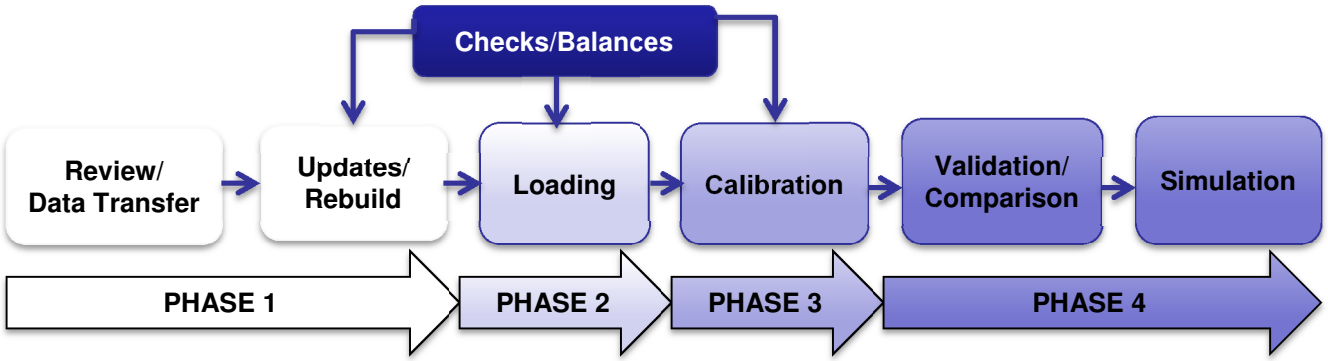


Figure 2-2 Combined Approach for Water and Sewer Modelling

2.3 WATER MODEL PROCEDURES

Specific to the water model, each of the steps in Phases 1 to 4 have particular priorities and a specific procedure is used to proceed from one step to the next, as shown in Table 2-1. Please note the following steps taken to improve model accuracy and precision:

- WSP added a lead, minor losses and fire hydrant at each location used for calibration and validation. This ensures the correct local losses and nozzle elevation are used to simulate system performance and enables calibration to be more precise.
- WSP matched every water meter record to a parcel and used its land use to assign the correct 24-hour water demand pattern to the average day demand (ADD). This distributes demands throughout the distribution system and varies it hourly – like the real world.
- WSP completed a standards-compliant “water balance” for the West, Central and East service areas. This enables leakage rates to vary for newer and older parts of the City.
- WSP assigned a leakage “demand” to every node to enable pressure-dependent leak simulation. Leakage flow correlates to local pressure that is simulated by the model at nodes.
- WSP used notes fields to track changes or special conditions at the individual pipe or node level wherever possible. This results in a “self-documented” model with a built-in audit trail.

The above approaches and procedures are the result of experience informed by best practices as documented in industry publications, manuals and standards of practice by OWWA-AWWA.

Table 2-1 Water Model Update, Calibration and Validation Procedure

<table>
<tr><th colspan="2">Phases 1 & 2: Fact-Checking and Updates</th></tr>
<tr><th>Physical Parameters</th><th>Operational Settings</th></tr>
<tr><td>1. Elevations (2014 DEM)
2. Pipe roughness allocated to pipe groups based on age and material
3. Demands (2014 customer and master meters). Leakage and losses allocated to pipe groups based on mass balance.</td><td>1. Storage levels and ranges (inspections)
2. Pump curves and speeds (inspections)
3. Occasional demands and auto-flushing</td></tr>
<tr><td colspan="2">⬇</td></tr>
<tr><th colspan="2">Phase 3: Average Day Calibration
(using Hydrant Flow Tests & 24-hour SCADA Measurements)</th></tr>
<tr><td rowspan="2">For West, Central and East areas and for every pressure zone, match:
1. Static pressures with typical water main flow but zero hydrant flow
2. Largest local flow (& lowest local pressure) achieved at hydrant during test</td><td>CALIBRATION PROCEDURE:
Adjust parameters using pipe groups for roughness.
1. Calculate simulated vs observed statistics for each area and overall.
2. If step 2 is not within calibration tolerance, repeat 1 and 2.</td></tr>
<tr><td>3. Open inter-connection valve and check if flow direction and magnitude are as tested in 2015.</td></tr>
<tr><td colspan="2">⬇</td></tr>
<tr><th colspan="2">Phase 4: Average & Maximum Day Validation</th></tr>
<tr><td>1. Use calibrated parameters and known operations from SCADA to simulate flows and pressures for each pressure zone at the same time as the validation hydrant tests.

Note: No change to C-factors

2. Calculate simulated vs observed pressures for each area and zone.
3. If validation values are not close enough to support solid conclusions, repeat calibration and validation steps.</td><td>Validation is achieved for average and maximum day conditions because hydrant flow tests are selected from both periods of the year.</td></tr>
</table>

3 PHASE 1: REVIEW, DATA TRANSFER AND MODEL UPDATES/REBUILD

The first step in Phase 1 is to review the existing 2007 model provided by UK in order to identify gaps in data and information that will require updates. WSP had previous working experience with the UK models due to its earlier work on the Front Rd. Water Interconnection and Portsmouth Pumping Station (PS) Forcemain Environmental Assessment (EA).

A Water System Schematic was also included with the annual reports for the system and it was used to summarise the all-pipe model information. Figure 2-1 shows the schematic as updated by WSP.

Water zones originally developed during the last water master plan were provided in GIS format. The zones were discussed with UK and extended north to cover all areas under consideration in this MP. Appendix F shows the proposed development boundaries in relation to the existing water zones.

3.1 2007 WATER MODEL PROVIDED BY UK

The model provided by UK was previously developed for the Master Plan for Water Supply for the City of Kingston Urban Area and the Class Environmental Assessment as completed by Simcoe Engineering Group Ltd. in 2007. The water model is an all-pipe representation of the City's distribution system and was originally developed using InfoWater software. The detailed description of the model can be found in the *Baseline Review Report – Water* in this study.

The provided InfoWater model was reviewed in order to determine the extent of calibration required prior to data collection and making model updates. A number of updates were required, including:

1. Distribution system needed to be updated reflect current conditions, including new subdivisions and watermain upgrade projects completed since the last MP.
2. Pump curves were updated and validated against observed flows and pressures, where available from SCADA and/or notes taken during the Condition Assessment visits.
3. The former model used a single 24-hour diurnal water demand pattern for all water users across the City; including residential and ICI. WSP developed and applied specific 24-hour diurnal patterns for residential and ICI customers in each water supply area.

The next step was to re-build the water model using data from the original model and additional GIS data sources into a new all-pipe model. This transfer included but was not limited to:

- Current pump curves
- Latest GIS information on pipes and nodes
- Current infrastructure details including booster stations, water towers/reservoirs etc.

3.2 MODEL REBUILD AND ADDITIONS

Once the model data transfer was completed, the water model rebuild continued with the input of the data provided in response to the RFI and by adding details from additional inquiries, including:

- Confirming and updating pump curves based on pump station visits or SCADA
- Confirm as-built and GIS details (pipe diameters determine inside pipe diameters, pipe material, and identify high and low points etc.)
- Water Treatment Plant (WTP) drawing details
- Confirm Operational detail for facilities (Booster Stations, Reservoirs, Water Towers, etc.)

Table 3-1 is a list of the infrastructure additions/upgrades and key considerations provided by UK. WSP reviewed these with UK and the model was completed in accordance with the feedback received.

Table 3-1 Alternatives/Inclusions and Infrastructure Additions

MODEL ALTERNATIVES/INCLUSIONS

- Calibration to 2013/2014 flow and pressure data
- 2013/2014 diurnal patterns developed from flow data
- 2013/2014 adjusted water consumption loading
- Max-day flow, average-day flow and fire flow alternatives for calibrated conditions

INFRASTRUCTURE ADDITIONS/UPGRADES

General Additions/Updates:

- Model element additions identified in RFP and from 2015 GIS data update including additional watermains and communities

Linear Works:

- Watermain on Gatwick Ave from Kendal to Creekford (300mm)
- Watermain from Centennial Dr. to Resource Rd. (400mm)
- Watermain on Cataraqui Woods Dr. from Centennial Dr. to Sydenham Rd. (400mm)
- Watermain on Agusta Dr. from Atkinson St. to Cataraqui Woods Dr. (400mm)
- Watermain on John Counter Blvd. from Indian Rd. to Princess St. (400mm)
- Front Rd. Watermain Interconnection (2019)

Facilities:

- Point Pleasant WTP Upgrades (2016)
- Purdy's BS (Sydenham BS) keep active (was retiring in 2015 in the original model)

The model information used to complete the updates for each facility is summarized in Facility Summary Sheets (see example in Appendix A) which were prepared during the Condition Assessment phase of the project.

3.3 FLOW DATA COLLECTION AND VALIDATION

3.3.1 WATER PRODUCTION AND CONSUMPTION DATA

Water production and consumption data was provided by Utilities Kingston for all billed water distribution areas in Kingston. This data includes Kingston West, Central and East service area data for both 2013 & 2014.

The historic water production from Point Pleasant WTP Flows, King Street WTP Flows and consumption information from water meters are used as the main source for demand loading for the all-pipes model and is also used for the development of diurnal patterns and model calibration.

3.3.2 PIPE BREAK & WATER LEAKAGE DATA

In addition to water consumption data, leakage data was also provided via reports and GIS databases. There are two data sources of leakage, break and repair records:

- Leak repair/report tracking data (2011-2014)
- GIS beak layer in the model (1998-2014)

The GIS data included the location of water breaks and address information to link them to reports suitable for identifying their approximate geocoded location.

3.3.3 HYDRANT FLOW TEST DATA

The hydrant flow test reports are linked with Hydrant IDs. Data spans numerous years and there are some repeated tests, or results from neighbouring hydrants, enabling WSP to screen a large number of hydrants to select a few representative tests for each part of each zone in each service area.

The detailed hydrant flow tests provided by UK can be found in Appendix E.

3.3.4 FLOWS & PRESSURE FROM SCADA

All available GIS and SCADA information was reviewed for various Booster Stations, Reservoirs and Water Towers. Utilities Kingston Annual Reports were also reviewed to supplement SCADA information.

In particular, the SCADA data on the testing time for each every hydrant test provided to WSP was obtained from UK, which is the critical information required for the model calibration.

4 PHASE 2: LOADING

The second phase of model development using the combined approach provides the greatest synergies between both models. Loading a model involves the allocation of water demand and the generation of dry-weather sewage flow for the water and wastewater models, respectively. This step provides the connection between the Kingston population and land uses with the model simulations.

Water demands are based on a water balance of the distribution system to ensure the sum of all demands and losses match the total water produced by UK. Water balance components include: system input volume; authorized consumption (billed and unbilled usage); and, water losses (apparent loss, unauthorized consumption, inaccurate meters, pipe leakage and breaks). GIS was used to assign billed consumption to each parcel of property and these were aggregated to the nearest model node. Each category of the water consumed was analysed and loaded to the model.

The 24-hour diurnal water demand pattern for a residential area was obtained from a recent, 2015 pilot project. This was compared to published patterns and to the pattern used in the earlier MP. A slightly different pattern was developed for the West, Central and East service areas. WSP also developed a 24/hour pattern for Industrial/Commercial/Institutional (ICI) land-uses and applied it to each applicable water demand component. Each modelled demand has a 24-hour diurnal pattern.

At the Master Plan level, certain simplifying assumptions are necessary to load the models. Three different methods may be used as described in Table 4-1.

Table 4-1 Master Plan Modelling: Loading Methods

METHOD	METHOD DESCRIPTION
A	Area – Landuse – Design Criteria: Using the square footage of a building x Pre-defined Design Criteria (specified per land use type such as Industrial, Institutional, Commercial)
B	Metering Data: Can equate water usage to demand and sewage generation. Is valid for most facilities/properties
C	# of residents or employees/students: Can use per capita rate by zone/property

WSP used approach B because it produces the closest match in terms of magnitude and distribution of actual flows within distribution and/or collection system. This approach is also more efficient and allows for updates to the model once the process has been set up for future amendments.

4.1 WATER BALANCE

UK Water Distribution System includes three water supply zones based on water sources:

1. West zone water supply is from Point Pleasant Water Treatment Plant
2. Central zone water supply is from King Street Water Treatment Plant
3. East zone water supply is also from King Street Water Treatment Plant through James Street Boost Station.

There are no current national or provincial guidelines that provide the amount of water loss from a public water supply's distribution system. Neither the term "unaccounted-for-water" nor the use of percentages as measures of water loss is sufficient to completely describe the nature and extent of distribution system water loss. The International Water Association (IWA) and the American Water Works Association (AWWA) standardized terminology and definitions, which is crucial to consistent measurement.

Table 4-2 summarises the water balance components required to account for all of the water in the distribution system. The sum of any of the columns should also total the System Input Volume. The City of Kingston has used this methodology to evaluate the water balance in its own water distribution systems.

Appendix B provides 2003 AWWA data showing published water loss values for several USA water distribution systems (EPA 816-D-09-001, November 2009). It is typical to have 15% or more total water loss, of which more than 50% is real loss.

Table 4-2 AWWA/IWA Water Balance Terms

<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="3">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Un-metered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Un-metered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="2">Apparent Losses (Commercial Losses)</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Meter Inaccuracies and Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses (Physical losses)</td><td>Leakage in Transmission and Distribution</td></tr>
<tr><td>Storage Leaks and Overflows from Water Storage</td></tr>
<tr><td>Service Connections Leaks up to the Meter</td></tr>
</table>

4.1.1 UK SYSTEM WATER BALANCE

UK has been performing a comprehensive water balance study for years. Table 4-3 is a summary of the water balance results for City of Kingston system as a whole; as well as for the three service areas: West, Central and East in the year 2014. The water balance details can be found in Appendix C.

Table 4-3 City of Kingston 2014 Water Balance Summary

KINGSTON DWS	WATER BALANCE						
	Revenue Water			Non-Revenue Water		Unknown Losses	
Area	Net Flow	Billed Use	% Revenue Water	Non-Revenue Water	% Non-Revenue	Unknown Real & Apparent Losses	% Unknown Issues
Kingston	24,904,204	13,655,690	55%	11,248,514	45%	6,389,301	26%
West	7,349,126	4,229,983	58%	3,119,142	42%	2,204,927	30%
Central	15,571,843	7,774,001	50%	7,797,842	50%	3,935,927	25%
East	1,983,236	1,651,706	83%	331,530	17%	248,447	13%

4.1.1 WSP WATER BALANCE FOR MODEL INPUT

This section documents the methodology used to load the water model with UK's 2014 water demand data. Water input to the distribution system data used in this section is from:

- Kingston Water Balance Master Spreadsheet (Appendix C)
- Point Pleasant WTP Flows 2014
- King Street WTP Flows 2014
- UK's 2014 water billing records

Because some data was not available, a water balance procedure is required to ensure that the model represents the real condition of the Kingston's water (and wastewater) systems. The components involved in water balance include:

1. System Input Volume, i.e.: water produced in 2014
2. Authorized Consumption, Water metered
   i. Billed
   ii. Unbilled (zero-meters)
3. Water Losses, consisting of:
   i. Apparent losses (unauthorized consumption, inaccurate meters, etc…)
   ii. Real Losses (leakage).

The items 1 and 2 data are available from UK's 2014 billing records. Item 3 is determined based on UK's water balance spreadsheet, which is described in the following sections. The water balance formula used for the model loading procedure is defined below:

Water Produced (1) = Water metered (2) + Water losses (3)

Table 4-4 shows the summary of 2014 Kingston water billed and non-billed water e.g.: water losses.

Table 4-4 Billed and Non-billed Water in 2014

SERVICE AREA	2014 WATER VOLUME BILLED (M^3/YEAR)	2014 WATER VOLUME PRODUCED (M^3/YEAR)	NON-BILLED (ZERO-METER, APPARENT LOSSES + LEAKAGE)	PERCENTAGE NON-BILLED VS PRODUCED
West	4,235,417	7,349,126	3,113,709	42%
Central	7,313,859	15,571,844	8,257,985	50%
East	1,629,177	1,983,236	354,059	17%
Total	13,655,690	24,904,206	11,248,516	45%

4.1.1 WATER PRODUCED AND WATER CONSUMPTION

Water consumption data was provided by UK for all billed water distribution areas in Kingston. This data includes Kingston West, Central and East service area data for both 2013 & 2014. However, the water consumption value from water meters is less than water produced from the water treatment plants due to water losses and other non-metered uses.

Table 4-4 is based on UK's 2014 billing records summary. During the billing record data review, it was found that a small portion of the data is inaccurate regarding its location or address, including: street name not matching the zoning; duplicated addresses; and, mismatch between address and postal code. These were provided as maps with attribute tables and resolved using UK's feedback.

Table 4-5 and Table 4-6 show the comparison of UK's record and WSP modified number of billed water in the Kingston System. The total water volume billed data and total number of water meters remained unchanged during this meter locating process.

Table 4-5 UK 2014 Water Billing Record Data

LOCATION	2012 TOTAL WATER PRODUCED (M^3/YEAR)	# TOTAL METERS	# ZERO-METERS	TOTAL METERED VOLUME (M^3/YEAR)	TOTAL WATER LOSS (M^3/YEAR)	TOTAL LOSS PERCENTAGE
West	4,235,417	17,597	87	4,229,983	3,098,126	42.2%
Central	7,313,859	16,751	136	7,774,001	7,734,210	49.7%
East	1,629,177	2,957	9	1,651,706	326,488	16.5%
Total	13,655,690	37,305	232	13,655,690	11,248,516	

Table 4-6 WSP Modified UK 2014 Water Billing Record Data

LOCATION	2012 TOTAL WATER PRODUCED (M^3/YEAR)	# TOTAL METERS	# ZERO-METERS	TOTAL METERED VOLUME (M^3/YEAR)	TOTAL WATER LOSS (M^3/YEAR)	TOTAL LOSS PERCENTAGE
West	7,349,126	17,597	62/25	4,235,417	3,113,709	41.7%
Central	15,571,844	16,751	80/56	7,313,859	8,257,985	52.4%
East	1,983,236	2,957	8/1	1,629,177	354,059	17.7%
Total	24,904,206	37,305	232	13,178,454	11,725,752	

4.2 ALL-PIPE WATER MODEL DEMAND LOADING

The water model was loaded with water demand information to represent existing and future conditions based on the developed scenarios and alternatives for the Master Plan:

- Loading method selected to support an All-Pipe Model set-up
- Demand allocation process was documented and used InfoWater's built-in features

Water demands are allocated to nodes within an all-pipe model and adjusted based on the scenarios and alternatives to be simulated. The scenarios and alternatives for the water model are shown in Table 4-7**;** as originally described in the Growth Scenario Report of this MP.

Table 4-7 Scenarios and Alternatives (Tentative): Water Model

SCENARIO	DESCRIPTION
Calibration	Existing Conditions
2021	Based on Committed and Pending Development Applications
2026	Based on remaining Committed and Pending Development Applications ("Committed Conditions")
2036	Based on Future Known Potential Developments
Full Build-out	Based on Undeveloped and Under-Developed Land as of 2036 with their anticipated development density (based on Official Plan)
Ultimate	Full Build-Out plus specific urban boundary extensions

For each scenario, the water demand increases to reflect the population growth. This information aligns with the Growth Development Technical Memorandum that was completed with input from UK and the City of Kingston's planning staff for the MP by WSP.

The method selected for the base scenario (2014) will be applied similarly for all growth projection years for the water model. Checks and balances are conducted at the end of the loading exercise and a water demand leakage adjustment is made to account for water that does not match reported water production from the water treatment plants annual reporting.

4.2.1 ZERO-METER LOADING

A zero-meter "load" may be due to a broken meter or one that has not been read in the reporting period, resulting in a zero flow in the customer database for a parcel or dwelling unit. In reality, every house uses some water and if it is not measured it must be assumed to ensure the MP model is as realistic as possible zone or system-wide. Zero-meter loading is assumed as the same rate as average metered and billed volume for each property in the same category of the same water supply zone. Zero-meters represent unbilled authorized consumption and as a general assumption is categorized as either residential or ICI based on zoning for model allocation.

Table 4-8 is a summary of zero-meter loading rate for Kingston Water System. The detailed calculation is shown in Appendix C.

Table 4-8 Zero-meter and Leakage Loading Rates for each Water System

SERVICE AREA	ZERO-METER LOADING RATE (M^3/METER)		TOTAL LOSS AFTER BILLED AND ZERO-METER LOADING (M^3/YEAR)	ZERO-METER LOADING PERCENTAGE
	Residential	ICI		
West	7,349,126	17,597	62/25	4,235,417
Central	15,571,844	16,751	80/56	7,313,859
East	1,983,236	2,957	8/1	1,629,177

4.2.1 WATER LOADING AND LOSS ALLOCATION METHOD

The method which was used to load the water losses into the model was to allocate demand based on the leakage and break factors for each pipe based on the pipe age, roughness and length.

The procedure followed in this MP was to allocate a proportion of known losses due to leaks and breaks to each pipe according to its age/material group. This enables comparisons to multi-year statistics for each age class, e.g.: total breaks for ductile pipes 0 to 20 years old, compared to PVC with the same age.

Water demand loading to represent losses in the Kingston Water System was determined as follows:

1. Metered and billed loading is from UK's billing record data. The water volume for each billed meter is loaded to the corresponded nearest junction to the property.
2. Zero-meters are loaded with an average volume from the billed meters of same property feature in the system.
3. Total Kingston system water loss and unbilled water volume in 2014 is 11,570,700 m^3 in 2014 including:
    i. Total Authorized Unbilled Use 152,875 m^3
    ii. Known Real Losses 4,704,338 m^3, and
    iii. Unknown Real & Apparent Losses 6,711,487 m^3.

4.2.1.1 WATER LOSS CATEGORIES

Water balance data obtained from UK for the last 3 years and contained in the UK Kingston System Water Balance record was used to determine the water loss categories to be used in the model for lost water loading in the model. The lost water categories include:

- Apparent water loss volume
- Break/leak losses include known and
- Unknown water loss volume

The Water loss loading methodology is discussed below.

4.2.1.2 APPARENT WATER LOSSES

Apparent water losses account for unauthorized consumption, meter inaccuracies, data handling errors. The apparent loss volume in each service zone (West, Central, and East) will be loaded separately in the model.

The volume of the apparent loss for each water supply zone in 2014 is from UK's water balance report, however the specific whereabouts and cause is unknown. Therefore the loading was spread out to each of the junctions in the water zones. Table 4-9 below is a summary of 2014 apparent water loss loading to the model.

Table 4-9 Apparent Water Loss for 2014 Loading

ZONE	APPARENT LOSSES (M^3/YEAR)	# OF TOTAL JUNCTIONS	APPARENT LOSSES LOADING (M^3/JUNCTION/YEAR)
West	75,971	4,649	16.3
Central	65,610	5,224	12.6
East	11,294	1,551	7.3

4.2.1.3 BREAK/LEAK LOSSES

The total water losses in the Kingston water distribution system represent about 50% of water produced, of which, the break and leakage water losses specifically make a significant portion (Table 4-10). This category includes:

- Known break losses
- Known leak losses
- Unknown break/leak losses

Table 4-10 Water Loss Percentage Distribution for 2014

ZONE	NON-REVENUE WATER	KNOWN MAIN BREAK LOSS	KNOWN LEAK LOSS	TOTAL UNKNOWN LOSSES
West	42.44%	9.83%	1.58%	30.00%
Central	50.08%	19.83%	4.55%	25.28%
East	16.72%	0.18%	3.44%	12.53%
Kingston (system wide)	45.17%	15.31%	3.59%	23.4%

It was found that in the West and Central Zones, the water losses were up to about 50%, which is not surprising given that these zones have large portions of aged watermain. On the other hand, the known leak loss does not appear to be related to the known break pattern by area.

4.3 DIURNAL PATTERN DEVELOPMENT

This section is a summary of the water demand diurnal pattern development. The detailed description can be found in Appendix F.

4.3.1 WATER PRODUCTION AND CONSUMPTION DATA

The patterns that are being used for the model simulation were created by using the 2013 water usage data which represents a typical year to pull out the average week and maximum week. Hourly flow data was used to create the patterns.

Kingston historical monthly water usage summary and analysis can be found in Appendix F. It was observed that 2013 data is close to the 5 year (2010 – 2014) average trend for West and Central zones. Due to the East Zone having little water demand, the fluctuation of the demand trend is not a surprise, thus the data was deemed suitable for creation of water usage patterns.

After the flow data analysis was completed the average week and maximum week water demand periods were determined as shown in Table 4-11.

Table 4-11 Average week and maximum week water demand

SYSTEM	ALL ZONE EXCEPT THRID AVE. RESERVOIR	THIRD AVE. RESEVOIR
Average Week	September 9-15, 2013	December 9-15, 2013
Maximum Week	July 15-21, 2013	

It was found that there is no data in September 2013 for Third Ave Reservoir. Dec 9 - 15, 2013 SCADA data (real average week before the unification) so the Third Ave Reservoir water level data was used for the curve plotting instead.

The SCADA data for these weeks for all Kingston water facilities was plotted and analysed. The water flow, storage tank water level curves, and the curve tag descriptions can be found in the Appendix F.

The daily water demand patterns for each water distribution zone were created based on the 2013 average and maximum week SCADA data. It is worth noting that these curves are the combination of residential and other variations land use water demands. The detailed discussion and steps to determine weekly average daily and weekly maximum flows can be found in Appendix F.

4.3.2 RESIDENTIAL WATER DEMAND PATTERN

The most recent flow patterns of Westbrook DMA, a north-west residential community in West Zone have been provided by UK. Four weeks average flow data was used for the residential diurnal pattern creation. The data was calibrated with consideration towards significant water loss in the system.

The Westbrook DMA day to day water flow curves are shown in Appendix F, which is used to validate the pattern that was extracted for use in this MP. This 24-hour diurnal pattern for residential water consumption is shown in Figure 4-1.

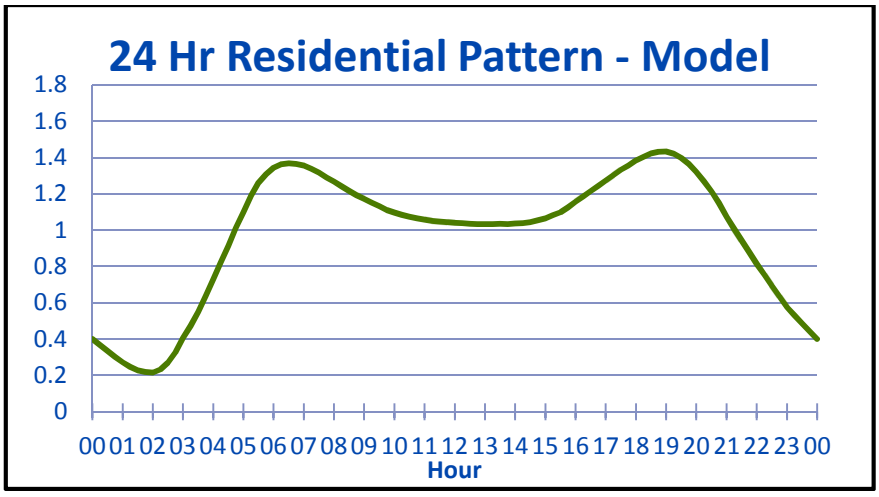


Figure 4-1 Residential Water Demand Diurnal Pattern development in this Study

4.3.3 ICI WATER DEMAND PATTERN FOR KINGSTON

The ICI pattern creation was based on the combination of the typical business district, office, boot camp and industrial patterns shown in Appendix F. Figure 4-2 shows the ICI pattern which was used in the WSP model.

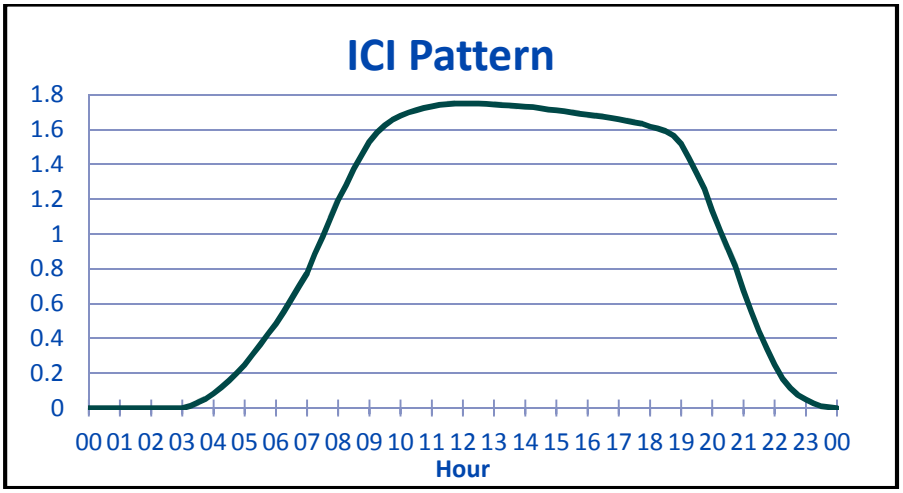


Figure 4-2 ICI Water Demand Diurnal Pattern Development in this Study

4.3.4 DIURNAL PATTERN COMBINATIONS

Residential and ICI combined patterns for each water supply zone are used for all future scenarios when the land use is not specified. The patterns were developed based on the land-use percentage for each zone. The water demand based on ultimate land-use information provided by UK was applied to determine the residential and ICI water use weight.

Table 4-12 and Figure 4-3 show the water use percentage between residential and ICI and the combined diurnal patterns developed based on the land-use for each zone.

Table 4-12 Land-use Percentage for each Water Supply Zone

		WEST ZONE	CENTRAL ZONE	EAST ZONE
Water Demand	**Res (L/s)**	102.9	134.4	26.4
	ICI (L/s)	31.4	97.3	10.4
Ratio	**Res**	77%	58%	72%
	ICI	23%	42%	28%

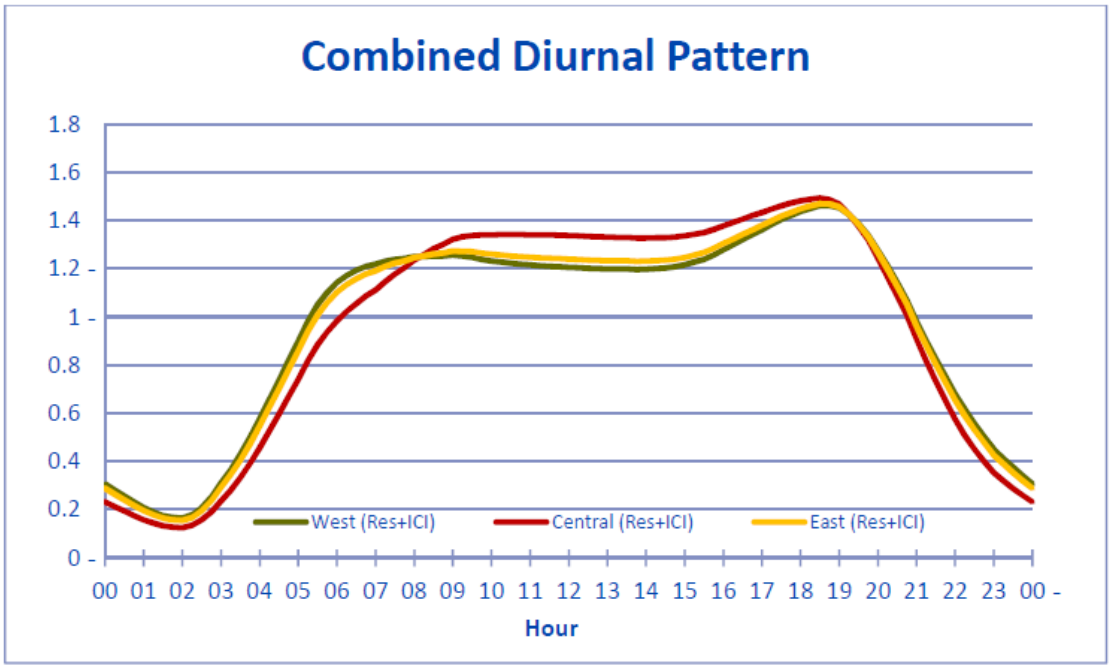


Figure 4-3 Residential and ICI Combined Water Demand Diurnal Pattern Development in this Study

5 PHASE 3: CALIBRATION

After loading the model and when preliminary checks and balances are complete, work began to calibrate the models in phase 3. Calibration is a necessary step which ensures that the models provide accurate representations of the water and wastewater systems based on available flow monitoring, rainfall, and SCADA data. A calibration program for both the water and wastewater model includes the application of calibration targets to ensure that simulation results are reasonable and the model is updated accordingly.

5.1 WATER ALL-PIPE MODEL CALIBRATION

5.1.1 MODEL CALIBRATION PROCESS

The water model is calibrated to accurately simulate average daily flow (ADF) and max daily flow (MDF) across the distribution system. The calibration process includes:

1. Meeting established distribution system measurements such as hydrant flow tests or permanent pressure and flow measurements, if any.
2. SCADA measurement comparisons (e.g.: tank/reservoir levels, flow and pump status, valve settings, pressure and flows).
3. Pump curve/speed updates to match flow and pressure monitoring data.

The water distribution system calibration/validation targets are:

- Simulated pressures (at known flows) to be within ±10-15% of observed values for ADF, e.g.: within 5psi for steady-state and 10psi for high-flow events such as fire hydrant tests.
- Simulated tank/reservoir levels to be within ±10-15% of observed values for ADF.
- MDF pressures, flows and levels are used as validation on both the calibration and peak factors.

Calibration of the water model was done in two stages:

- The first stage of calibration was to compare initial simulation results to representative hydrant test flow and pressure measurement(s). The goal was not to match the extrapolated flow at 20psi but this can be compared to the simulated model results as well. The hydrant test data was used to compare the initial model simulation results to determine if demands, elevations and pipe roughness adjustments are within the bounds of the distribution system targets for representative locations across each zone.
- The second and final stage of calibration was to simulate the ADF from representative 24-hour periods, using the same initial water levels and pump operation times and speeds. The SCADA measurements were cross-referenced with the simulated values and model adjustments were made to pipe roughness (grouped by age and material) until the distribution targets are met on average, with any significant deviations noted and explained.

While the results of the second-stage calibration were provided for every node, it is the zone-specific statistics that determine the adequacy of the calibration.

The final checks were done at the end of this exercise to compare the results and complete a water distribution system mass balance which related the total flow demand simulated with the documented flow demand. The expectation was that the overall zone-by-zone balances would not change but the spatial and temporal distribution of the leakage within each zone may not be uniform.

5.1.2 DATA CHECKING AND MODEL UPDATES

The following are the key steps and decisions that guide model updates (fact-checking), calibration and validation:

- Get and check the facts that govern flows and pressures across the distribution system.
- Group the key parameters that modify the flow paths and pressures in space and time. Only allow systematic (age- or soil-related) and realistic (engineering ranges) variations in these parameters.
- Calibrate the model by adjusting parameters until the statistical differences between the simulated and measured values are within tolerance; explain any notable local differences, if any.
- Verify that the parameters selected during calibration, left unchanged, result in system simulations results that are close enough to validation targets to support firm Master Plan conclusions.

5.2 C-FACTOR CALIBRATION

5.2.1 PIPE GROUPS

C-factor is a parameter that summarizes the Hazen-Williams surface roughness of a particular pipe material and age, as a means of simulating the pipe's resistance to flow or "friction loss". Pipe groups are created based on the pipe materials and ages, as shown in the Table 5-1. The pipe group information is then used for C-factor adjustment and leakage/break occurrence potential estimation.

Table 5-1 Pipe Group Descriptions by Material and Age

MATERIAL	AGE (YEAR)	PIPE GROUP
Metal **(DI/CI/SSTL/CU/CIPP)**	< 35	1
	35-75	2
	>75	3
Plastic **(PVC/HDPE)**	< 35	4
	35-75	5
	>75	6
Concrete **(AC/CPP)**	< 35	7
	35-75	8
	>75	9

5.2.2 RANGE OF C-FACTOR ADJUSTMENTS

The model was calibrated by further adjusting the C-factor based on pipe group described previously and pipe diameter. The detailed C-factor ranges post adjustment are shown in Table 5-2. From here, the SCADA data is then used to cross-reference with the observed values and model adjustments are made until the distribution targets are met. The final checks and balances are done at the end of this exercise to compare the results and to complete a water distribution system mass balance which relates the total flow demand simulated with documented flow demand.

Table 5-2 C-Factor Ranges Based on the Pipe Group and Diameter

PIPE GROUP	DIAMETER GROUP	MIN ROUGHNESS	MAX ROUGHNESS	AVERAGE ROUGHNESS
1	<400	70	132	90.60
	<600	80	135	98.69
	>=600	135	135	135.00
2	<400	80.5	138	90.00
	<600	92	130	99.89
	>=600	103.5	135	131.06
3	<400	77	99	77.83
	<600	88	120	88.65
	>=600	135	135	135.00
4	<400	100	132	131.96
	<600	132	140	132.19
	>=600	135	135	135.00
5	<400	120	120	120.00
	<600	120	120	120.00
	>=600	135	135	135.00
7	<400	121	121	121.00
	<600	121	121	121.00
	>=600	135	135	135.00
8	<400	110	110	110.00
	<600	110	120	110.45
	>=600	100	135	133.75

5.3 HYDRANT FLOW TEST ANALYSIS

5.3.1 RANGE OF C-FACTOR ADJUSTMENTS

WSP received hydrant flow tests from 15 locations across the City's water distribution network. In the first batch of 15 hydrant flow tests, 4 only had one (1) flow data point, i.e.: one static pressure and one test point with flow and pressure. The remaining 11 have two flow data points that allow for a fuller analysis. Additional nearby hydrant flow tests were acquired to close the data gap.

Overall, 34 hydrant tests data were provided by the UK to represent each area of the pressure zones. The tests that were used are listed in Table 5-3.

Table 5-3 Hydrant Flow Test Data Received from UK

ZONE	TEST	HYDRANT NUMBER	TEST DATE	TEST TIME	NEAREST JUNCTION (MODEL-GIS)
Central	1	770	07/16/2012	9:23 AM	UKJ-8253
	2	2837	05/29/2015	10:23 AM	UKJ-2675
	3	3326	05/27/2015	9:45 AM	UKJ-9073
	4	3712	07/31/2012	1:35 PM	UKJ-750
	5	3935	06/08/2012	1:28 AM	UKJ-9405
	6	4107	07/18/2013	6:25 AM	UKJ-2789
	16	3917	07/08/2013	12:55 PM	UKJ-9400
	17	4093	15/09/2014	1:25 PM	UKJ-14162
	18	4232	07/04/2013	9:40 AM	UKJ-8593
	19	4272	09/23/2014	10:50 AM	UKJ-14417
	20	4415	11/20/2013	9:35 AM	UKJ-13978
	21	4423	11/20/2013	9:00 AM	UKJ-13981
	23	1033	5/27/2015	8:40 AM	UKJ-9074
	24	1035	5/27/2015	8:52 AM	UKJ-9076
East	7	1276	05/08/2015	11:15 AM	UKJ-9787
	8	3384	06/05/2015	2:00 PM	UKJ-10262
West Zone 1	9	1868	05/31/2013	1:20 PM	UKJ-10723
	10	2122	05/13/2014	1:25 PM	UKJ-10621
	11	2307	06/06/2014	1:50 PM	UKJ-11161
	22	1869	5/31/2013	12:00 AM	UKJ-10727
	25	2308	06/06/2014	11:20 AM	UKJ-11160
	26	2310	06/02/2014	2:30 AM	UKJ-11162
	27	2312	06/03/2014	9:40 AM	UKJ-11168
	28	2313	06/03/2014	9:56 AM	UKJ-11163
West Zone 2a	12	2648	06/19/2014	1:40 PM	UKJ-11592
West Zone 2b	13	1645	05/23/2013	2:38 PM	UKJ-11708
	14	3551	05/09/2014	1:20 PM	UKJ-11629
	29	1644	05/23/2013	2:26 PM	UKJ-11709
	30	1629	06/11/2013	10:45 AM	UKJ-11705
	31	1650	06/11/2013	10:35 AM	UKJ-11697
West Zone 2c	15	1701	07/08/2013	12:55 PM	UKJ-12042
	32	1700	07/08/2013	12:45 PM	UKJ-12043
	33	1702	07/08/2013	12:45 PM	UKJ-12041
	34	1703	07/09/2013	10:00 AM	UKWV-2147

It is to be noted that areas near each Water Treatment Plant (WTP) are automatically matched by the calibration process, since the SCADA information available there is used to set the corresponding flows and pressures.

5.3.2 CALIBRATION RESULTS

During this MP water model calibration, steady-state modeling was used to “fix” the pump on/off status and tank/reservoir levels in the model to set boundary conditions for the model based on available SCADA data for pressure, tank level, and flow measurements at the time of the hydrant flow test being calibrated.

The scenario with 2014 water demand loading was used to compare simulation results to hydrant flow test results. The resulting plots showing hydrant flow vs pressure provide a basis for evaluating the earlier model's accuracy in matching a significant number of hydrant flow tests across the City.

The AWWA M32 standard suggests a practical approach to calibration targets: "**Acceptable limits of accuracy depend on how a model is used and the questions to be answered (Walski). For example, models used to design elevated tanks must predict tank HGLs well within 20 ft (6m), because 20 ft (6m) is the difference between an empty tank and a half-full tank. Better goals are HGLs within 5 ft (1.5 m) and flows within 10 percent. Calibration guidelines have not yet been adopted.**"

As noted, calibration guidelines are not universal but getting HGL within 1.5m (about 2psi) for tanks and 3.45m (5psi) throughout the distribution system are commonly used values.

This is especially difficult to achieve when one considers that HGL differences include errors due to incorrect elevations (estimated as an average 1 to 2m) and errors due to pressure gauge and/or reading inaccuracy (10%). The target is to achieve average modelled values that are within 1.5 to 3.45m of SCADA and test values for storages and junctions, respectively.

The water model is calibrated to simulate average daily flow (ADF) and max daily flow (MDF) across the distribution system; for static (zero hydrant flow) and maximum hydrant flow (as tested) and the corresponding SCADA boundary conditions at the time. Results:

- Of 16 test locations used for steady-state calibration, 3 HGL model results are more than 3.45m different from the tested "static pressure"; meaning that over 80% of model values are on target. The average difference between simulated and tested static hydrant pressure is 2.6%, which is excellent. The current MP model is more accurate than the earlier MP model

- For the same locations and the highest hydrant flow tested, 3 HGL model results are more than 3.45m different from the tested "high-flow pressure"; meaning that over 80% of model values are on target. The average difference between simulated and tested static hydrant pressure is 4.8%. The current MP model is more accurate than the earlier MP model.

The calibration results are summarized in Table 5-4 and detailed results are tabulated for each test in Appendix E. The tables documenting the present calibration and validation effort provide both absolute and relative (%) calibration statistics.

Table 5-4 Steady-State Calibration Results

PRESSURE ZONE(S)	STATIC PRESSURE	HIGH FLOW PRESSURE
West Zones	2.4%	4.0%
Central Zones	3.2%	5.5%
East Zone	0.8%	4.6%
Kingston Overall	2.6%	4.8%

5.4 INTERCONNECTION CALIBRATION

5.4.1 INTERCONNECTION TEST

An interconnection test was performed between September 15th and 18th, 2015 by UK. The test was performed by opening the interconnection valve at Via Rail along Princess St. and setting a flow meter to read flows from the central system to the west.

On Sept. 16th at around 5pm we changed tower set-points so the central tower was operating in the higher range (7.0 meters on SCADA set-point) and the west end tower in a lower band (6.5 meter range on SCADA set-points) until 8am on Sept. 17th to see how a 1 meter change in set-points would affect volumes transferring from the Central zone to the west.

The attached graph shows the hourly volumes transferred during this period of the test; based on a volumetric flow meter at the inter-connection.

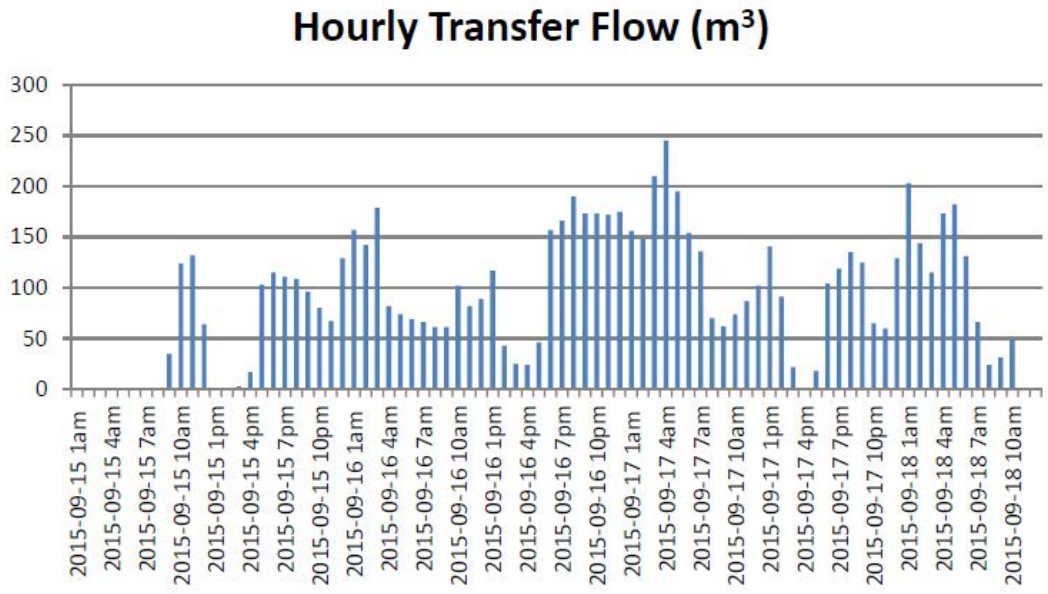


Figure 5-1 Interconnection Test Flow Record

It must be kept in mind that many boundary conditions may not match SCADA values at the time (or throughout that day) and also that control rules in the model continued to operate; which may have differed from real-world pump starts on that day. For example, the initial storage levels could differ.

Zero-meters are loaded with an average volume from the billed meters of same property feature in the system

Overall, there is general agreement between the simulated values and the test flows measured. In comparing the bulk water transfer to the west:

1. The peak flow timing and magnitudes correspond reasonably well to Figure 5-1.
2. The average transfer flow of about 30L/s (modelled) or 108 m^3/hr is again reasonably close.
3. Because the pump and storage control rules in the model may not match conditions on the day of the test, short-duration "negative" flows are simulated but these can be overlooked since pumps at the West zone would likely not have turned-on to create an easterly flow during the test.

If additional verification is to occur, a complete SCADA dataset would be required for one day before the test, the test period itself and up to one day afterwards. The model would need to start from all the same initial storage levels and pump status, then have special rules to turn pumps on and off (or close/open reservoir inlet valves) at the same times the real-world system did during the test.

6 PHASE 4: MODEL VALIDATION

6.1 MODEL VALIDATION

To evaluate the stability of the calibrated MP model, EPS (Extended Period Simulation) simulations a separate set of hydrant flow test curves representative for each area in each zone were performed. As for the calibration procedure, the validation simulations were done by advancing the clock to the same time when the tests were performed – one at a time.

The local hydraulic conditions of the real system are primarily based on the water usage at the time the hydrant test is completed, which can be impacted by weather, temperature and other factors. However, the model was built based on the historic statistical data to simulate a representative average condition of the system.

Since exact system conditions are not set from SCADA, the EPS validation simulations are expected to have a higher difference between simulated and tested pressures. The results of the EPS simulations of hydrant flow tests are shown in Table 6-1 and more detailed results are provided in Appendix E.

Validation results indicate that the calibrated model has an average difference of 5.9% for static pressure and 8.9% for the highest flow tested. These values are nearly the same as the industry calibration targets, indicating the model is very robust. This indicates the calibrated model provides a good representation of the real-world system, as "validated" by typical EPS control rules and settings.

Table 6-1 EPS modelling Validation Results

PRESSURE ZONE	2016 MP MODEL	
	STATIC PRESSURE MATCH	HIGH FLOW PRESSURE MATCH
West Zone	5.2%	10.6%
Central Zone	8.4%	7.7%
East Zone	1.4%	5.9%
Kingston Overall	5.9%	8.9%

The final phase of the modelling approach is to check the calibrated and validated model against other sources prior to final simulations to evaluate alternatives. This step included a complete review of the earlier models (as provided to WSP) and their documentation, e.g.: 2007 MP model.

The current MP model is significantly more accurate than the model used in the former MP, especially for high flows. The former model had the following differences between simulated and tested pressures during hydrant flow tests:

Earlier model:	WEST:	6% (steady) and	56% (high flows)
	CENTRAL:	11% (steady) and	37% (high flows)
	OVERALL:	8.7% (steady) and	45.9% (high flows)

Using the updated and calibrated model, the gap analysis and evaluation of alternatives can proceed. Following this, the future scenarios and alternatives that will be simulated are expected to achieve a high degree of prediction accuracy, enabling solid decisions to be made.

6.2 HGL CHECK ALONG MP MODEL PROFILES

Two profiles were used to plot pipe elevation and steady-state HGL from WTP to WTP, as a check of model stability against static pressures obtained by hydrant test along these routes. To compare with the previous MP model, before the update to add pipes and GIS IDs, the same plots were used as those previously included in WSP's May 5, 2015 technical memorandum to UK: "InfoWater Model Update Recommendations for Transient Analysis" (Figure 6-1).

Check plots of HGL profiles are a best-practice based on AWWA. The profiles are as follows:

- **Profile 1 (Front Rd. & King St):** This profile begins at the West WTP, proceeds North along Sunny Acres Rd., then East along Front Rd. and then King St. to the Central WTP.
- **Profile 2 (Bath Rd. / HWY 33):** This profile begins at the West WTP, proceeds North along Sunny Acres Rd., East along Bath Rd./Highway 33, south on Portsmouth and east on King St. to the Central WTP.

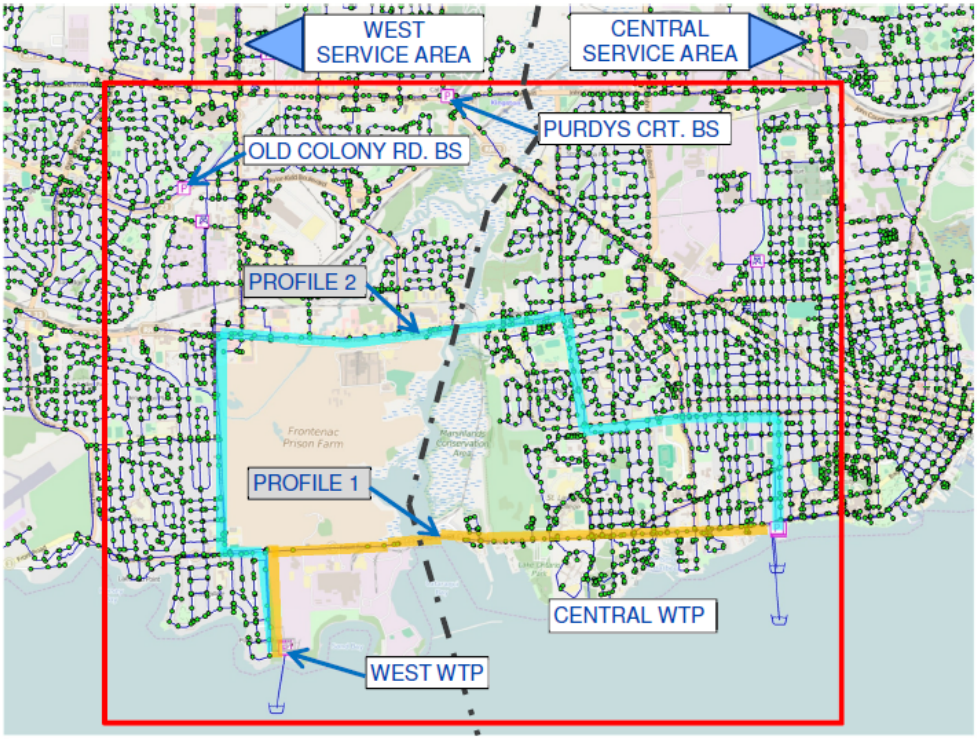


Figure 6-1 InfoWater Model – Key Facilities and HGL Profiles

At the time the hydrant tests were completed, the West and Central water pressure zones were separated by a closed valve located along Bath Road; resulting in the dashed line separating zones 1A and 1B shown in Figure 6-2. The proposed Portsmouth watermain along Front Rd. was not yet built. It is therefore possible (and expected) for different HGL to occur across the zone boundary. Current zone HGL are shown in Figure 6-2 and Figure 6-3.

Figure 6-2 and Figure 6-3 show the matches of the existing conditions represented by the hydrant flow tests and the WSP model simulation in EPS mode. Depending on the time-of-day simulated, the results typically show a reasonably good agreement with the static pressure measurements taken at hydrants across the water system – each at different times of the day. In other words, model results reproduce real-world conditions to an acceptable standard.

Comparing with the same profile check using UK model reported in the previous tech memorandum stated above, the present WSP Model shows better agreement on the HGL profile between the real-world hydrant test data and model simulation results. The hydrants' static pressures (shown as equivalent HGL) cannot be compared directly to the simulated HGL in this case: they are only shown for comparison to the existing conditions generally.

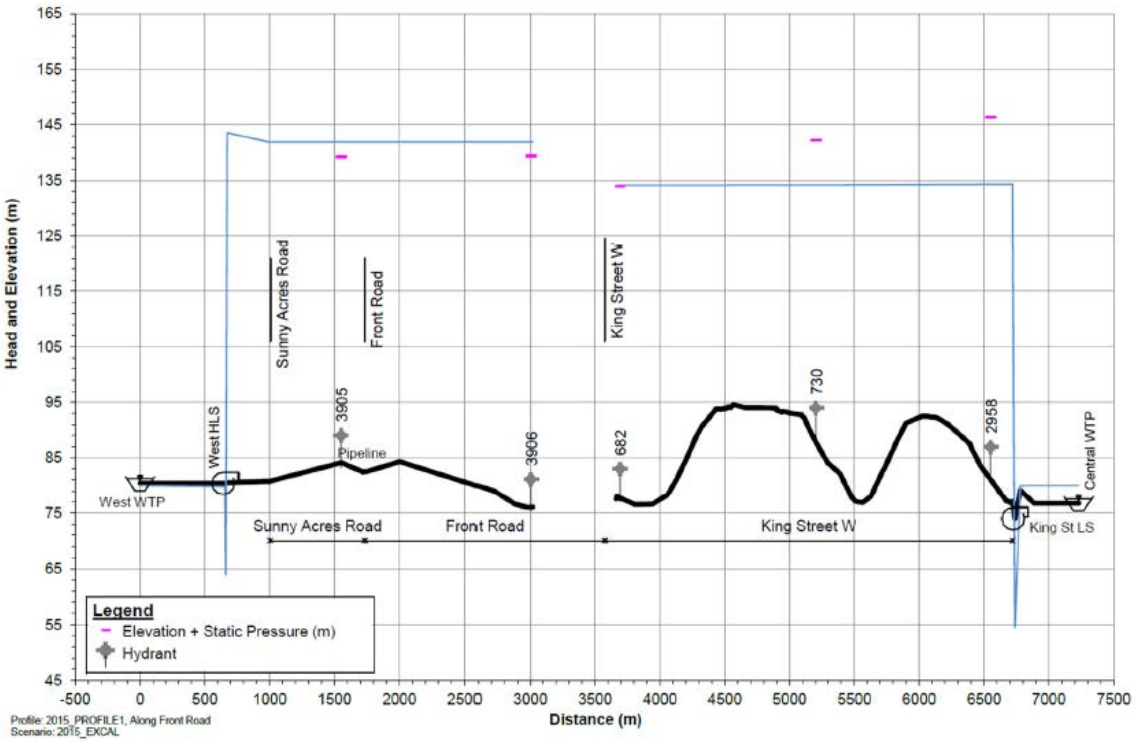


Figure 6-2 Profile 1 from West to central WTP along King St.

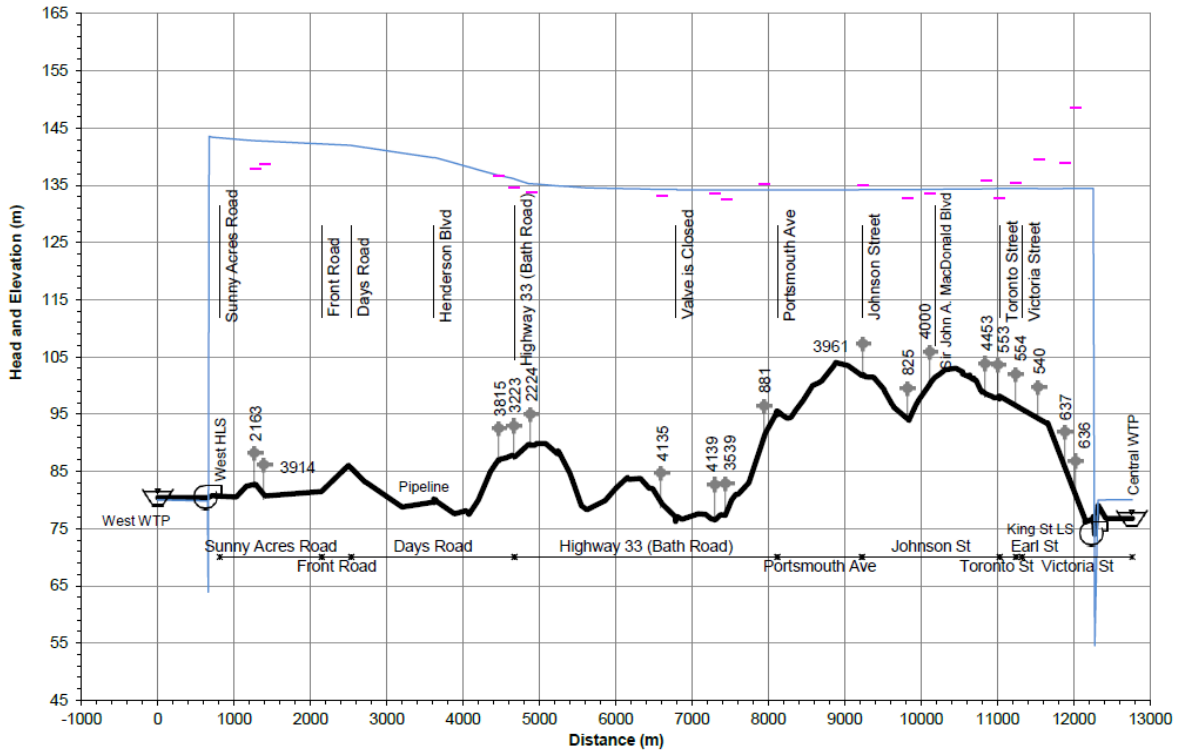


Figure 6-3 Profile 2 from West Central WTP along Bath Rd.

7 SCENARIO SIMULATIONS

7.1 GAP REPORTING AND DEVELOPMENT SCENARIOS

The model simulation scenarios were development based on the City of Kingston's population projections, commercial inventory, industrial land demand and institutional growth projections. The detailed information is reported in the Growth Scenario Report of this Master Plan. There are seven scenarios in the water model as described below:

7.1.1 2015 EXISTING

This scenario represents the existing conditions of the system, which uses 2013/2014 flow and hydrant test data. The total loading to the system is 68,231 m3/d, which matches to the Kingston water produced volume in 2014. This scenario is used the model calibration and validation.

7.1.2 2015 INTERCONNECTION

This scenario has the same model conditions as 2015 existing scenario except the activated interconnection between Central zone and West Zone at Via Rail and Bath Rd.

7.1.3 2021

This scenario includes committed and pending development applications. The total loading to the system is 75,610 m3/d including 7,379 m3/d of future ICI and residential development demand.

7.1.4 2026-COMMITTED

This scenario is based on remaining committed and pending development applications ("Committed Conditions"). The total loading to the system is 81,532 m^3/d including 5,922 m^3/d of future ICI and residential development demand between year 2021 and 2026.

7.1.5 2036

This scenario is based on future known potential developments. The total loading to the system is 89,512 m^3/d including 7,981 m^3/d of future ICI and residential development demand between year 2026 and 2036.

7.1.6 BUILDOUT

This scenario is based on undeveloped and under-developed land as of 2036 with their anticipated development density (based on Official Plan). The total loading to the system is 100,794 m^3/d including 11,281 m^3/d of future ICI and residential development demand.

7.1.7 ULTIMATE

This is a full build-out scenario, which is based on undeveloped and under-developed land as of 2036 with their anticipated development density (based on Official Plan). The total loading to the system is 125,540 m^3/d including 24,746 m^3/d of future ICI and residential development demand to the entire Official Plan projected development.

7.2 MODEL SIMULATION FOR ADD, MDD & PHD

Extended-period simulations (EPS) were performed for the scenarios described above with calibrated Kingston Water Distribution model.

First, statistics identify average values for multiple years and then a specific week or day is extracted from the SCADA records.

System service pressure is simulated for average day demand (ADD), maximum day demand (MDD) and peak hour demand (PHD) conditions to evaluate the service pressures. 1.5 peaking factor for maximum day demand is used. Peaking hour factor is 2.25, which matches the diurnal pattern developed in this study.

7.3 MODEL SIMULATION FOR FIRE FLOW ANALYSIS

Fire flow simulation was carried out under MDD conditions. The fire flow requirements for residential is 100 L/s and for ICI is 270 L/s as described in the Gap Report.

The pipes with diameter smaller than 150mm and the junctions in water infrastructure facilities i.e. booster station, tanks and reservoirs are not supposed to provide fire flow. Therefore, these pipes and nodes are not included in the fire flow scenario modeling. In general, 150 mm watermains have difficulties to meet fire flow requirement. 200 mm watermains are okay in this regarding.

The future proposed pipe diameter, nodes and the connection point to the City's system can be optimized or re-designed to meet the fire flow requirement.

7.4 SCENARIOS FOR ALTERNATIVES AND DEVELOPMENT

The Alternatives report will document the specifics of each alternative to be considered in this MP. From a modelling perspective, any of the major parameters can be adjusted to reflect assumptions in terms of demands, new pipes, operating set-points or other items that could be modified to achieve optimal service levels. Details and definition of the alternatives reviewed in the Master Plan are summarized in Appendix G

8 CONCLUSIONS

The InfoWater model for the Kingston water supply and distribution system was re-built and recalibrated to match 2013-2014 conditions. This included a thorough review of existing and new data about facilities, mains and controls. Based on the work completed during this Master Plan, WSP makes the following conclusions and recommendations:

1. The InfoWater model reflects the contents of the GIS and infrastructure data sources as of early 2016. Operating within a copy of the City's geo-database helps to ensure access to relevant and current data (from attribute tables). Network coverage was also confirmed by exporting the model to Google Earth Pro to verify that the extent of the distribution system matches the location of residential developments.
2. The City's pressure zones were expanded to the North in some cases to ensure that present and future residential and Industrial/Commercial/Institutional (ICI) developments will be allocated to a zone. This required verification of the range of elevations in each zone using the GIS and Google Earth Pro.
3. Condition assessment visits to pumping and storage facilities have confirmed the location, type and operational set-points of flow control equipment. Facility summary sheets were developed to centralise each facility's hydraulic characteristics, including minor losses due to pipe bends, isolation valves and tee or wye branches. Pump curves were re-confirmed from primary sources and operating point data where available. New pumps were also added.
4. Working with UK and the City, WSP was able to use a water balance for each service area as a basis for allocating water demands for every water meter to every parcel; complete with a 24-hour diurnal pattern that is unique to each service area and zoning (residential or ICI). Similarly, leaks and other losses were allocated to each node and varied by time of day. The detailed loading results in more realistic simulations of pipe velocities and node pressures, improving the precision and accuracy of all model predictions. It also paves the way for operational "what-if" analyses of alternatives and operational efficiencies such as flushing plans with provable scour velocities achieved with minimum water use overall.
5. The highest calibration accuracy and precision possible (better than 5%) was achieved for each service area and zone, surpassing the applicable standards and making a very significant improvement over the earlier MP. Validation was likewise achieved to about 5%. The results of the all-pipe MP water model can be relied upon to test alternatives and to predict future conditions.
6. Tests conducted in September 2015 confirmed that the West and Central service areas can be operated as a single pressure zone near Lake Ontario. The model is able to reproduce the large-scale effect of the test but additional data and/or tests would be needed for a match. Merging "Zone 1" will improve water security and reliability for all residents by providing more pathways to reach them. Energy efficiency can also improve since water can travel more efficiently. Fewer dead-ends also improves water quality by reducing average water age.
7. New operating procedures must be developed and tested to cycle the storages while maintaining adequate pressure in the zones. These amount to "operational alternatives" that are the subject of a

different MP report, compiled using the calibrated and validated model developed in this MP and documented in this report.

Appendix A

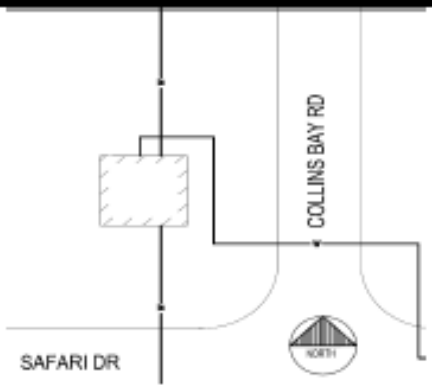
FACILITY SUMMARY SHEET EXAMPLE

Pump Station Facility Summary

Facility Name:	Collins Bay Road BS		**Notes:**
Facility Address:	Crnr Collins Bay Rd and Safari Drive		
Community/Service Area:	Point Pleasant WTP		
Coordinates (Lat./Long.):	371886.704E, 4901410.417N		
Reference Drawing(s): Include Revision(s) & Date(s)	Site Plan, 1987		
Page No.	Page 1 of 2		
Inflow and Outflow Types	**Units**	**Length**	**Diameter**
Inflow Pipe Length & Dia.:	m	N/A	0.20
Main Pipeline Length & Dia.:	m	N/A	0.30
Main Discharge Location.	n/a	Watermain	
Overflow Pipe Length & D.:	m	N/A	N/A
Overflow Discharge Loc.:	n/a	N/A	
Backup Power?:	n/a	Yes	
Site Fencing?:	n/a	No	
CofA/ECA?:	n/a	N/A	

Photo: Exterior

Plan View:

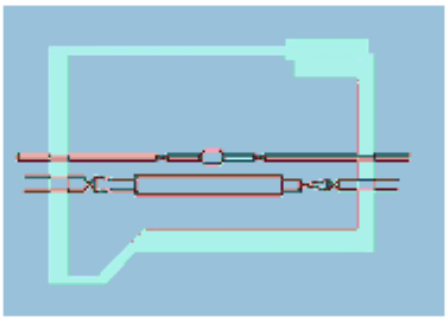


Storage Well & Pump Suction Details

Operational Data	**Units**	**HGL**	**Level**	**Notes:**
Reference Drawing Number:	n/a	Site Plan, Drawing 1, 1987		
Base Elevation & Level:	m	88.29	**0.00**	
Low Alarm Elevation:	m	N/A	N/A	
Minimum Elevation:	m			
Initial/Normal Elev. & Level:	m	N/A	N/A	
Maximum Elevation:	n/a			
High Alarm Elevation:	m	N/A	N/A	
Ground Elevation:	m	90.98	2.69	
Physical Data:	**Units**			
Section (circular, oval, etc...)	n/a	Rectangular		
Average Cross-Section Area:	sq.m	10.41		
Length & Width (or Diam.):	m	4.27	2.44	

Photo: Interior

Profile View:



Pump Station Facility Summary

Facility Name:	Collins Bay Road BS	**Notes:**
Facility Address:	Crnr Collins Bay Rd and Safari Drive	
Community/Service Area:	Point Pleasant WTP	
Coordinates (Lat./Long.):	371886.704E, 4901410.417N	
Reference Drawing(s): Include Revision(s) & Date(s)	Site Plan, 1987	
Page No.	Page 2 of 2	

Pump Details						
Number of Pumps		2		**Notes:**		
SCADA Flow?		No				
SCADA Level?		No				
Pump Type		**Lead**	**Lag 1**			
Make:		Pleuger				
Model ID or Rating:		QN82 2 M6 53				
Impeller ID or Size:		N/A				
Variable-Speed?:		N/A	N/A			
Year Installed		1987	1987			
Pump Curve ID in Model:		Expoenential 3-Point Curve				
Flow and Level Set Points	**Units**	**Lead**	**Lag 1**			
Tested Flow (e.g.: Drawdown):	**L/s**	26.00	27.00			
Shutoff Head	**m**	27.40	27.40			
Design Head	**m**	21.60	21.60			
Design Flow	**L/s**	82.00	82.00			
High Head	**m**	9.10	9.10			
High Flow	**L/s**	151.00	151.00			

Piping Details					**Minor Losses**	
Description (Year Installed)	**Units**	**Length**	**Diameter**	**Mat.**	**Qty.**	**Type**
Suction Line (1987):	**m**	N/A	0.2/0.15	DI	1/1/1	E, BFV, CV
Discharge Line (1987):	**m**	N/A	0.15/0.2	DI	1/1	E, BFV
Pump Station (1987):	**m**	N/A	N/A	N/A	N/A	N/A
Yard Piping (1987):	**m**	N/A	0.20	DI	1	Valve
Main Pipeline (1987):	**m**	N/A	0.30	DI	N/A	N/A
Exit Elevation:	**m**	88.29				

Legend:

C = Contraction/Reducer , 90EL = 90 DEG Elbow, CV = Check Valve, MF = Magnetic Flow Meter, GV = Gate Valve, 45EL = 45 Deg Elbow, E = Expansion

Notes:

Pumps havent been turned on in over two years.. No longer in active use.

Appendix B

AWWA WATER LOSS TABLE

Table B-1 is the AWWA 2003 data showing the high water loss within US's water distribution system (EPA 816-D-09-001, November 2009). It is stated that greater than 15% total water loss, of which more than 50% was real loss.

Table B-1 Snapshot of high water loss within distribution systems

Name	State	Volume Input (MG/Year)	Water Losses (MG/Year)	Loss Percentage	Population Served	Per Capita Loss in Gallons/Year	Value of Losses (2008 Yr USD)
Philadelphia Water Department	PA	97,637	30,448	31.18%	1,670,000	58,465	$32,272,301
Cleveland Division of Water	OH	94,000	27,000	28.72%	1,500,000	62,667	$28,617,713
Memphis Light, Gas & Water	TN	54,798	8,330	15.20%	908,222	60,335	$8,829,094
Cincinnati Water Works	OH	47,047	8,303	17.65%	900,000	52,274	$8,800,477
Jefferson Parish Water Department	LA	25,098	6,055	24.12%	425,108	59,039	$6,417,787
Portland Water District	ME	9,293	1,678	18.06%	190,000	48,911	$1,778,538
Ann Arbor Utilities Department	MI	6,222	1,604	25.78%	163,500	38,055	$1,700,104
Duluth/ Public Works & Utilities/ Water	MN	8,774	1,424	16.23%	99,600	88,092	$1,509,319
North Penn Water Authority	PA	3,311	538	16.25%	80,000	41,388	$570,234
Waterloo Water Works	IA	5,212	812	15.58%	75,000	69,493	$860,651
Lorain Utilities Department	OH	4,250	850	20.00%	74,000	57,432	$900,928
Madison County Water Department	AL	2,326	623	26.77%	67,200	34,613	$660,327
Elmira Water Board	NY	2,509	634	25.27%	65,000	38,600	$671,986
Lebanon Authority	PA	2,371	500	21.08%	57,000	41,596	$529,958
Selmer Utility Division	TN	800	200	25.00%	55,000	14,545	$211,983
Renton	WA	2,666	498	18.66%	51,140	52,131	$527,838
Williamsport Municipal Water Authority	PA	2,610	917	35.13%	51,000	51,176	$971,942
Albany	OR	3,163	788	24.91%	41,000	77,146	$835,213
Eastpointe Water and Sewer	MI	1,386	359	25.88%	34,077	40,673	$380,510

Name	State	Volume Input (MG/Year)	Water Losses (MG/Year)	Loss Percentage	Population Served	Per Capita Loss in Gallons/Year	Value of Losses (2008 Yr USD)
Lake County East Utilities	OH	1,394	219	15.72%	26,650	52,308	$232,121
Paradise Irrigation District	CA	2,801	464	16.57%	26,000	107,731	$491,801
Cordele	GA	4,911	746	15.19%	21,600	227,361	$790,697
Shoshone Municipal Pipeline	WY	4,911	746	15.19%	21,600	227,361	$790,697
Piqua Municipal Water System	OH	721	152	21.10%	20,500	35,171	$161,107
Fredericksburg	VA	1,460	365	25.00%	20,000	73,000	$386,869
Clearfield Municipal Authority	PA	487	115	23.61%	17,000	28,647	$121,890
Bellingham DPW	MA	598	140	23.43%	15,000	39,867	$148,388
Miami Utility Dept.	OK	788	210	26.61%	14,500	54,345	$222,582
Glens Falls Water Department	NY	1,364	334	24.48%	13,000	104,923	$354,012
City of Converse-Public Works	TX	501	150	29.85%	11,508	43,535	$158,987
Spencer Municipal Utilities	IA	585	93	15.90%	11,500	50,870	$98,572
Anson County Water System	NC	2,467	614	24.87%	11,200	220,268	$650,788
Berea College Utilities	KY	851	154	18.10%	11,000	77,364	$163,227
Crossett Water Commission	AR	512	85	16.52%	9,000	56,889	$90,093
Warren County Utility District	TN	600	100	16.67%	7,200	83,333	$105,992

Appendix C

UK 2014 WATER BALANCE AND HISTORIC WATER FLOWS

Table C-1 2014 City of Kingston System Water Balance Summary

KINGSTON DRINKING WATER SYSTEM WATER BALANCE 2014 (m3)					Dec-2014
Net Water to System 24,904,204 100%	Authorized Consumption 13,808,565 55.45%	Billed Authorized Consumption 13,808,565 54.83%	Billed Metered Consumption 13,655,690 54.83%		Revenue Water 13,655,690 54.83%
			Billed Unmetered Consumption Unknown		
		Unbilled Authorized Consumption 152,875 0.61%	Unbilled Metered Consumption		Non-Revenue Water 11,248,514 45.17%
			Mains New & Relined (UK)	49,531	
			Watchdog Meters (Non-System)	19	
			Unbilled Unmetered Consumption		
			Water Facility Equipment	6,031	
			Fire Department	1984	
			Flow Testing	36,932	
			Flushing	52,678	
			Hydrant Maintenance	3,457	
			Mains New & Relined (UK)	0	
			New Mains (Development)	1,014	
			Private Hydrants	1,229	
			152,875	0.61%	
	Total Water Loses 11,095,639 44.55%	Apparent Losses 560,693.19 2.25%	Unauthorized Consumption	62,261	
			Meter Inaccuracies	464,293	
			Data Handling Errors	34,139	
			560,693.19	2.25%	
		Known Real Losses 4,706,338 18.90%	Estimated Loss - Known Main Breaks 3,813,416	15.31%	
			Estimated Loss - Known Service Leaks 892,921	3.59%	
		Unknown Losses 5,828,608 23.40%	5,828,608	23.40%	

Table B- 2 2014 Kingston West System Water Balance Summary

DISTRIBUTION AREA 1 (KINGSTON WEST) WATER BALANCE 2014 (m^3)					Dec-2014
Net Water to System 7,349,126 100%	Authorized Consumption 4,305,954 58.59%	Billed Authorized Consumption 4,229,983 57.56%	Billed Metered Consumption 4,229,983 57.56%		Revenue Water 4,229,983 57.56%
			Billed Unmetered Consumption Unknown		
		Unbilled Authorized Consumption 75,971 1.03%	Unbilled Metered Consumption		Non-Revenue Water 3,119,142 42.44%
			Mains New & Relined (UK)	15,840	
			Watchdog Meters (Non-System)	10	
			Unbilled Unmetered Consumption		
			Water Facility Equipment	2,761	
			Fire Department	208	
			Flow Testing	26,879	
			Flushing	27,330	
			Hydrant Maintenance	1,731	
			Mains New & Relined (UK)	0	
			New Mains (Development)	764	
			Private Hydrants	449	
			75,971	1.03%	
	Total Water Loses 3,043,172 41.41%	Apparent Losses	Apparent losses are calculated on a system wide bases and may not accurately reflect area losses.		
		Known Real Losses 838,244 11.41%	Estimated Loss - Known Main Breaks 722,458	9.83%	
			Estimated Loss - Known Service Leaks 115,787	1.58%	
		Unknown Losses 2,204,927 30.00%	2,204,927	30.00%	

Table B- 3 2014 Kingston Central System Water Balance Summary

DISTRIBUTION AREA 2 (KINGSTON CENTRAL) WATER BALANCE 2014 (m^3)				Dec-2014
Net Water to System 15,571,843 100%	Authorized Consumption 7,839,611 50.34%	Billed Authorized Consumption 7,774,001 49.92%	Billed Metered Consumption 7,774,001 49.92%	Revenue Water 7,774,001 49.92%
			Billed Unmetered Consumption Unknown	
		Unbilled Authorized Consumption 65,610 0.42%	Unbilled Metered Consumption Mains New & Relined (UK) 33,692 Watchdog Meters (Non-System) 9 Unbilled Unmetered Consumption Water Facility Equipment 1,431 Fire Department 1242 Flow Testing 9,526 Flushing 17,627 Hydrant Maintenance 1,357 Mains New & Relined (UK) 0 New Mains (Development) 1,014 Private Hydrants 727 65,610 0.42%	Non-Revenue Water 7,797,842 50.08%
	Total Water Loses 7,732,232 49.66%	Apparent Losses	Apparent losses are calculated on a system wide bases and may not accurately reflect area losses.	
		Known Real Losses 3,796,305 24.38%	Estimated Loss - Known Main Breaks 3,087,318 19.83% Estimated Loss - Known Service Leaks 708,987 4.55%	
		Unknown Losses 3,935,927 25.28%	3,935,927 25.28%	

Table B- 4 2014 Kingston East System Water Balance Summary

DISTRIBUTION AREA 3 (KINGSTON EAST) WATER BALANCE 2014 (m^3)					Dec-2014
Net Water to System 1,983,236 100%	Authorized Consumption 1,663,000 83.85%	Billed Authorized Consumption 1,651,706 83.28%	Billed Metered Consumption	1,651,706 83.28%	Revenue Water 1,651,706 83.28%
			Billed Unmetered Consumption	Unknown	
		Unbilled Authorized Consumption 11,294 0.57%	Unbilled Metered Consumption		Non-Revenue Water 331,530 16.72%
			Mains New & Relined (UK)	0	
			Watchdog Meters (Non-System)	0	
			Unbilled Unmetered Consumption		
			Water Facility Equipment	1,839	
			Fire Department	534	
			Flow Testing	527	
			Flushing	7,722	
			Hydrant Maintenance	369	
			Mains New & Relined (UK)	0	
			New Mains (Development)	250	
			Private Hydrants	53	
			11,294	0.57%	
	Total Water Loses 320,236 16.15%	Apparent Losses	Apparent losses are calculated on a system wide bases and may not accurately reflect area losses.		
		Known Real Losses 71,788 3.62%	Estimated Loss - Known Main Breaks	3,640	0.18%
			Estimated Loss - Known Service Leaks	68,148	3.44%
		Unknown Losses 248,447 12.53%	248,447	12.53%	

Kingston DWS	Water Balance													
										Authorized Use				
	Revenue Water							Non-Revenue Water		Aut				
Year	Net Flow	Avg Net Flow m3/day	Metered Service	Metered Bulk	Billed Use	Avg Billed Use m3/day	% Revenue Water	Non-Revenue Water	% Non-Revenue	Cl2 Analyzer Waste	Pump Packing Waste	Cooling Water	Fire Dept.
2005	28,769,024.04	78,819.24	16,979,727.97	0.00	16,979,727.97	46,519.80	59.02	11,789,296.07	40.98	3,066.00	1,312.00	46.00	0.00
2006	27,368,714.12	74,982.78	15,913,257.12	67,355.00	15,980,612.12	43,782.50	58.39	11,388,102.00	41.61	3,066.00	1,312.00	46.00	0.00
2007	26,979,987.03	73,917.77	15,449,403.30	94,083.00	15,543,486.30	42,584.89	57.61	11,436,500.73	42.39	3,066.00	1,312.00	46.00	0.00
2008	27,273,688.26	74,722.43	14,900,043.14	69,824.00	14,969,867.14	41,013.33	54.89	12,303,821.12	45.11	3,066.00	1,312.00	46.00	0.00
2009	27,538,537.71	75,448.05	15,402,417.04	61,897.00	15,464,314.04	42,367.98	56.16	12,074,223.67	43.84	3,066.00	1,312.00	46.00	430.50
2010	25,197,053.03	69,033.02	14,141,754.01	66,798.00	14,208,552.01	38,927.54	56.39	10,988,501.02	43.61	3,504.00	1,312.00	46.00	766.00
2011	25,110,266.28	68,795.25	13,508,206.16	71,722.00	13,579,928.16	37,205.28	54.08	11,530,338.12	45.92	4,380.00	1,575.00	76.00	1,124.00
2012	25,167,891.91	68,764.73	14,431,839.74	91,285.00	14,523,124.74	39,680.67	57.70	10,644,767.17	42.30	4,380.00	1,575.00	76.00	458.15
2013	26,616,260.45	72,921.26	14,060,772.67	76,449.00	14,137,221.67	38,732.11	53.11	12,479,038.78	46.89	4,380.00	1,575.00	76.00	18,424.85
Dec 14	24,904,204.30	68,230.70	13,591,521.97	64,168.00	13,655,689.97	37,412.85	54.83	11,248,514.33	45.17	4,380.00	1,575.00	76.00	1,984.09

Authorized Unbilled Use (Unmetered)						Authorized Unbilled Use (Metered)		Total Authorized Unbilled Use		Authorized Use Total	Authorized Use %	Total Water Losses	Avg Total Losses m3/day
Flow Testing	Flushing	Hydrant Inspection & Maintenance	Testing New & Relined Mains (Estimated)	Testing New Mains (Development)	Private Hydrant Maint.	Watch Dog Meters (New & Relined Mains)	Watch Dog Meters (Non System)	Authorized Unbilled Use	Authorized Unbilled %				
591.00	5,577.00		0.00		0.00			10,592.00	0.04	16,990,319.97	59.06	11,778,704.07	32,270.42
4,325.00	5,531.00		0.00		0.00			14,280.00	0.05	15,994,892.12	58.44	11,373,822.00	31,161.16
2,633.00	6,472.00		0.00		0.00			13,529.00	0.05	15,557,015.30	57.66	11,422,971.73	31,295.81
3,385.00	947.00		0.00		0.00			8,756.00	0.03	14,978,623.14	54.92	12,295,065.12	33,685.11
962.00	13,423.00		0.00		0.00			19,239.50	0.07	15,483,553.54	56.23	12,054,984.17	33,027.35
7,808.00	27,043.00	3,297.00	34,004.02		0.00			77,780.02	0.31	14,286,332.03	56.70	10,910,721.00	29,892.39
8,123.00	29,149.00	3,825.00	3,469.32		1,813.00			53,534.32	0.21	13,633,462.48	54.29	11,476,803.79	31,443.30
47,678.40	45,787.20	3,530.00	1,947.50		1,671.80		35.00	107,139.05	0.43	14,630,263.79	58.13	10,537,628.11	28,791.33
111,023.30	45,428.50	3,950.00	605.71	5,179.19	1,373.10	5,282.24	11,359.25	208,657.14	0.78	14,345,878.81	53.90	12,270,381.65	33,617.48
36,931.50	52,677.90	3,457.00	0.00	1,014.00	1,229.40	49,531.12	19.10	152,875.11	0.61	13,808,565.08	55.45	11,095,639.23	30,399.01

Water Losses											
% Water Losses	Apparent Losses					Real Losses				Unknown Losses	
	Unathorized Consumption	Meter Inaccuracies	Data Handling Errors	Apparent Losses	% Apparent Losses	Estimated Loss Main Leaks Repaired	Estimated Loss Service Leaks Repaired	Known Real Losses	% Known Real Losses	Unkown Real & Apperant Losses	% Unkown Losses
40.94				0.00	0.00			0.00		11,778,704.07	40.94
41.56				0.00	0.00			0.00		11,373,822.00	41.56
42.34				0.00	0.00			0.00		11,422,971.73	42.34
45.08				0.00	0.00			0.00		12,295,065.12	45.08
43.77				0.00	0.00			0.00		12,054,984.17	43.77
43.30				0.00	0.00			0.00		10,910,721.00	43.30
45.71				0.00	0.00	1,442,728.23	1,344,601.79	2,787,330.02	11.10	8,689,473.78	34.61
41.87	62,919.73	493,786.24	36,307.81	593,013.78	2.36	2,132,755.24	1,362,313.28	3,495,068.52	13.89	6,449,545.81	25.63
46.10	66,540.65	480,665.54	35,343.05	582,549.24	2.19	3,374,844.70	1,392,223.20	4,767,067.90	17.91	6,920,764.51	26.00
44.55	62,260.51	464,293.46	34,139.22	560,693.19	2.25	3,813,416.33	892,921.50	4,706,337.83	18.90	5,828,608.20	23.40

NOTE: Apparent losses have been estimated based on the results of the IWA Water Audit completed by K Blease for 2012.

Unauthorized Consumption: IWA default - 0.25% of Net Water to System

Meter Inaccuracies: 3.4% under registration

Data Handling Errors: IWA Default - 0.25%

NOTE: Apparent losses are calculated on a system wide bases and may not accurately reflect area losses.

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
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K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Raw Water Flows** 2010

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	57,000	61,700	63,700	57,300	56,400	67,000	47,600	49,700	52,200	50,200	48,300	
2	57,200	67,700	68,700	50,700	56,300	53,200	47,900	48,900	53,400	56,700	49,000	56,100
3	57,100	68,200	62,300	57,300	48,900	51,200	47,900	50,600	56,800	41,800	49,400	53,600
4	51,800	52,700	59,900	55,000	47,800	53,700	53,000	51,300	54,300	49,600	48,800	43,100
5	57,900	63,800	68,900	49,700	56,400	56,000	57,200	60,000	47,500	51,300	48,600	55,700
6	58,600	68,600	66,200	57,200	56,200	49,200	57,900	50,200	50,300	49,300	51,800	48,400
7	59,700	60,900	58,600	62,000	56,000	49,300	59,000	50,100	50,800	50,000	50,400	48,600
8	57,200	60,000	61,600	67,600	49,100	49,200	56,800	45,200	56,100	52,500	42,300	49,400
9	57,500	69,200	68,400	54,800	48,400	51,700	56,900	56,000	50,900	50,000	54,500	48,400
10	57,700	62,200	67,400	57,200	48,600	56,400	48,500	47,500	47,500	39,100	52,400	49,300
11	61,700	60,100	55,200	53,800	49,900	53,500	47,800	51,600	48,200	47,800	49,300	55,800
12	67,400	68,900	61,400	57,300	56,000	42,100	49,500	49,900	48,300	56,900	47,800	51,200
13	52,500	68,700	68,300	57,300	56,800	51,100	56,500	50,200	48,800	39,800	49,200	49,100
14	62,700	53,400	60,100	57,200	52,200	51,300	56,800	50,200	52,000	48,100	55,800	50,000
15	67,900	62,700	57,800	57,100	50,800	50,400	57,000	52,000	58,000	56,500	44,400	56,000
16	61,400	69,300	57,800	57,200	52,000	50,300	56,500	57,100	55,400	41,600	47,900	55,800
17	57,800	69,100	65,400	57,200	56,400	56,800	47,000	56,500	46,300	56,400	47,400	51,100
18	60,400	57,400	62,000	58,900	56,200	51,200	48,500	49,900	39,100	38,300	49,000	53,600
19	68,000	63,300	60,700	49,600	57,300	57,600	48,500	48,200	50,300	50,800	47,200	50,900
20	60,700	68,800	60,700	61,100	52,300	47,600	52,300	47,600	57,400	55,900	47,400	49,500
21	59,000	61,200	68,300	69,800	54,000	52,600	56,900	47,500	45,000	49,700	50,100	49,400
22	68,200	58,700	55,100	58,100	56,200	56,000	50,700	47,500	56,600	50,600	55,700	49,600
23	54,900	58,200	57,500	49,700	56,000	41,300	47,800	47,700	48,500	49,400	49,600	49,700
24	67,900	64,400	62,400	51,000	51,000	55,100	47,900	47,700	47,900	49,200	42,100	49,400
25	57,800	68,700	68,200	60,600	56,000	55,700	47,800	49,000	51,200	49,300	48,400	49,300
26	57,900	59,800	57,600	58,100	68,600	49,500	48,100	47,500	54,600	49,300	56,400	49,200
27	60,100	58,100	56,800	58,400	58,000	46,900	48,500	47,600	49,600	49,300	49,500	49,000
28	65,100	58,300	52,500	63,100	54,200	48,300	54,200	47,700	50,000	48,000	48,600	52,200
29	68,000		57,300	61,200	51,100	47,800	57,200	48,500	49,600	49,600	48,500	51,500
30	56,500		59,200	56,600	53,300	50,400	50,700	59,800	48,800	55,900	47,700	49,800
31	57,600		68,600		58,700		49,300	53,600		49,000		49,600
Total	1,865,200	1,764,100	1,918,600	1,722,100	1,681,100	1,552,400	1,612,200	1,566,800	1,525,400	1,531,900	1,477,500	1,524,300
Average	60,168	63,004	61,890	57,403	54,229	51,747	52,006	50,542	50,847	49,416	49,250	50,810
Min	51,800	52,700	52,500	49,600	47,800	41,300	47,000	45,200	39,100	38,300	42,100	
Max	68,200	69,300	68,900	69,800	68,600	67,000	59,000	60,000	58,000	56,900	56,400	56,100

PTTW Amount ***118,000 m^3/day***

Yearly Average **54,276**

Yearly Min

Yearly Max **69,800**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Raw) Flows** 2010

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	61,650	73,700	67,000	67,080	61,820	74,380	51,000	51,550	57,000	56,000	68,000	67,000
2	61,490	78,010	73,410	60,220	62,040	60,370	51,000	50,850	73,590	64,000	54,000	62,000
3	61,580	73,830	72,100	63,000	57,000	61,580	52,000	58,760	76,770	55,070	61,000	67,000
4	61,000	70,470	74,490	71,150	51,000	63,000	76,110	58,640	73,460	68,000	53,000	67,000
5	81,000	73,390	74,420	59,000	68,600	63,000	73,840	74,570	57,000	64,580	51,100	60,880
6	73,810	73,440	74,480	64,000	61,280	59,000	72,340	72,580	56,000	68,000	75,320	56,320
7	71,670	72,390	68,520	73,600	62,000	54,000	79,000	60,540	69,000	52,400	56,500	54,000
8	61,890	71,690	67,000	74,320	57,000	54,000	61,000	57,300	64,110	60,000	59,520	59,280
9	66,260	74,050	73,510	68,000	53,000	68,000	62,000	60,320	59,380	60,000	65,000	51,580
10	63,110	71,580	75,010	64,000	54,000	64,960	59,000	58,910	49,840	53,000	76,900	74,440
11	72,140	72,140	61,870	63,000	61,000	62,000	49,750	57,590	53,000	70,570	59,300	61,000
12	72,800	74,350	76,580	64,000	63,000	50,950	69,000	52,460	54,000	69,930	49,580	61,000
13	66,000	74,310	73,220	64,000	101,000	75,180	67,810	54,000	62,000	61,630	58,330	54,000
14	77,960	64,740	72,590	6,300	60,000	54,480	61,000	56,000	69,000	68,000	61,000	58,000
15	72,520	74,130	62,960	63,000	57,000	61,060	53,300	61,000	64,630	61,610	67,000	61,240
16	67,000	73,890	63,000	63,000	58,000	68,000	61,000	62,000	64,000	58,570	52,000	67,360
17	66,000	74,420	81,600	63,000	65,100	79,060	55,000	61,000	49,700	62,000	51,000	59,730
18	73,830	73,980	73,990	73,070	61,150	70,830	52,330	56,140	47,610	54,190	50,000	62,000
19	73,990	74,370	72,190	55,000	66,220	73,790	50,660	67,000	61,480	66,020	51,000	58,000
20	70,990	73,360	71,240	10,500	62,000	50,420	70,000	77,000	70,140	60,960	51,000	54,000
21	69,380	71,390	73,470	75,490	62,000	61,570	60,330	51,000	61,000	57,610	67,000	57,000
22	72,760	65,000	71,320	70,200	62,000	60,490	58,920	51,000	64,000	74,140	62,000	57,000
23	70,810	67,000	66,000	58,040	62,000	67,900	52,000	51,000	60,000	51,570	57,000	66,000
24	73,840	74,210	81,900	59,200	60,060	69,000	52,000	51,000	50,770	50,900	58,500	51,510
25	66,490	73,810	73,640	73,630	75,430	63,000	52,000	63,510	59,700	53,000	67,000	51,780
26	62,450	71,250	69,880	70,140	74,760	54,000	52,000	51,000	59,260	51,840	63,000	51,840
27	67,000	52,580	62,130	66,000	72,480	69,000	70,000	50,920	56,120	51,980	58,000	51,790
28	72,960	67,630	60,380	83,070	63,860	53,000	69,000	50,270	57,000	51,710	53,000	58,870
29	72,970		63,000	98,280	60,000	51,000	68,000	51,750	68,000	64,480	50,880	58,410
30	69,860		66,000	62,010	63,000	51,000	6,800	77,190	53,000	63,000	51,080	63,000
31	63,000		77,130		71,390		51,690	72,490		58,000		52,090
Total												
Average												
Min												
Max	81,000	78,010	81,900	98,280	101,000	79,060	79,000	77,190	76,770	74,140	76,900	74,440

CoA Amount ***118,000 m^3/day***

Yearly Average
Yearly Min
Yearly Max **101,000**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Treated Water Flows** 2010

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	51,900	56,600	58,100	52,400	52,000	60,900	43,300	43,400	46,200	44,600	43,200	44,200
2	52,200	63,100	62,900	45,700	51,800	48,900	43,400	43,500	47,700	51,400	43,100	51,900
3	52,200	63,100	56,400	52,000	44,900	46,100	43,400	45,700	51,300	34,900	43,600	48,700
4	46,100	47,700	54,100	51,800	43,800	49,100	46,800	45,500	47,600	44,800	43,300	38,700
5	52,400	58,400	63,200	44,600	50,300	51,700	51,500	53,700	40,700	46,400	43,100	51,500
6	53,800	63,000	60,300	52,100	51,800	43,800	52,600	45,600	43,400	43,300	46,200	42,900
7	55,000	55,200	52,800	56,600	51,700	43,800	53,900	45,600	44,100	44,000	47,100	43,500
8	52,200	54,500	56,000	61,500	44,200	43,700	52,000	39,700	51,100	47,300	37,000	44,300
9	52,600	63,100	62,900	49,700	43,700	46,800	52,000	50,800	45,200	44,000	45,300	43,600
10	52,800	56,500	62,000	52,200	43,800	51,700	44,000	41,400	43,400	34,000	43,200	45,900
11	56,800	54,300	50,100	48,600	45,400	48,300	43,300	45,300	43,300	42,500	43,700	51,400
12	62,900	63,200	56,000	52,300	51,700	36,900	45,500	43,400	43,200	51,000	43,200	45,900
13	47,700	62,800	62,600	52,300	52,300	45,900	51,900	43,500	43,600	35,200	44,800	43,600
14	58,100	48,000	54,500	52,300	47,500	46,000	51,900	43,500	46,800	43,400	51,100	45,000
15	63,000	56,800	52,400	52,300	46,300	45,500	51,700	45,800	51,800	51,500	39,400	51,500
16	56,700	63,100	52,600	52,300	47,700	46,000	51,600	52,000	50,500	36,500	43,200	50,900
17	52,900	62,800	60,000	52,400	51,900	51,600	42,100	51,600	41,800	51,600	43,200	45,200
18	55,600	51,400	56,700	53,600	51,800	45,400	43,200	43,100	34,500	33,300	44,600	48,500
19	63,000	57,600	55,100	44,200	52,700	52,200	43,300	44,100	45,100	46,300	43,100	45,100
20	55,800	62,800	55,400	52,600	47,500	43,600	47,800	43,200	51,500	51,100	43,200	43,500
21	54,100	55,300	62,900	63,000	49,600	48,300	51,800	43,200	39,300	43,700	45,800	43,500
22	63,400	52,900	50,500	53,100	51,900	51,500	45,600	43,200	51,500	43,000	51,200	43,600
23	50,000	52,600	52,600	44,900	51,800	36,300	43,200	43,300	43,300	43,200	44,600	43,600
24	63,000	58,600	52,500	46,700	46,100	50,800	43,200	43,200	43,300	43,300	37,400	43,300
25	52,600	62,600	62,600	55,700	51,400	50,900	43,100	44,600	46,900	43,200	44,300	43,200
26	52,800	53,900	53,200	53,200	62,800	43,400	43,400	43,300	49,200	43,200	52,000	43,200
27	55,100	52,500	52,200	52,100	53,200	42,400	43,900	43,400	43,200	43,200	44,200	43,300
28	60,200	52,500	48,000	52,400	49,000	43,500	49,400	43,200	43,400	43,000	43,500	46,700
29	63,300		52,500	52,200	46,100	43,500	51,900	44,100	43,600	45,000	43,500	45,500
30	51,600		53,500	52,100	48,800	45,800	45,000	54,400	43,200	51,200	43,400	43,400
31	52,600		62,900		54,100		43,400	47,400		42,100		43,200
Total	1,712,400	1,604,900	1,747,500	1,556,900	1,537,600	1,404,300	1,459,100	1,403,700	1,359,700	1,361,200	1,324,500	1,408,300
Average	55,239	57,318	56,371	51,897	49,600	46,810	47,068	45,281	45,323	43,910	44,150	45,429
Min	46,100	47,700	48,000	44,200	43,700	36,300	42,100	39,700	34,500	33,300	37,000	38,700
Max	63,400	63,200	63,200	63,000	62,800	60,900	53,900	54,400	51,800	51,600	52,000	51,900

CoA Amount ***118,000 m^3/day***

Yearly Average	**49,033**
Yearly Min	**33,300**
Yearly Max	**63,400**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Treated) Flows** 2010

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	55,180	65,830	68,230	63,290	55,190	65,350	44,680	44,560	47,720	52,930	61,160	51,590
2	54,760	66,140	65,840	5,318	54,620	54,660	44,590	44,150	64,910	53,850	44,500	54,670
3	54,290	65,550	76,370	54,530	51,250	62,080	44,580	53,900	65,770	44,300	61,180	57,830
4	54,550	64,370	63,960	54,020	45,280	54,630	64,570	63,790	62,350	53,520	44,450	53,920
5	71,750	65,670	65,920	51,880	77,790	54,640	64,490	64,390	53,310	66,210	44,380	54,210
6	67,350	65,570	64,680	55,320	54,840	51,420	62,860	61,450	44,540	44,750	64,390	52,250
7	65,970	63,850	54,910	65,220	54,870	44,890	76,840	54,150	53,720	61,460	51,710	45,050
8	55,100	62,960	64,970	65,430	51,610	45,010	54,810	51,890	61,620	53,270	51,040	52,240
9	55,290	65,960	65,620	54,770	44,810	62,390	54,720	54,310	52,960	50,530	53,760	44,690
10	55,310	65,920	65,530	54,870	45,370	54,890	52,190	52,900	44,890	43,330	44,320	56,600
11	65,760	64,350	63,360	54,250	53,160	54,210	44,430	51,680	44,480	53,760	59,240	54,300
12	66,200	65,840	64,860	54,740	54,970	44,650	54,150	44,570	44,390	53,870	44,760	53,600
13	65,660	65,500	65,520	55,490	65,560	66,990	54,850	44,750	46,570	57,420	52,230	45,300
14	76,030	62,440	64,320	55,010	53,520	47,700	54,820	44,540	52,020	54,100	53,930	52,590
15	65,670	65,720	55,130	55,240	47,850	53,910	54,970	53,500	61,560	53,940	52,490	54,990
16	64,810	65,920	55,150	55,180	53,800	54,800	55	54,520	59,610	51,320	44,440	69,030
17	55,430	65,880	85,940	54,700	54,830	71,370	50,140	54,220	43,820	53,710	44,470	53,480
18	68,990	70,750	65,240	65,320	54,710	61,820	44,430	55,840	43,480	50,120	74,370	54,640
19	66,330	65,150	64,560	46,670	65,620	64,570	44,530	64,200	53,380	64,730	44,650	51,260
20	73,500	65,730	64,460	65,180	55,170	44,900	68,100	60,740	54,370	53,480	44,980	45,350
21	63,090	64,290	65,710	73,780	54,470	55,100	54,110	44,370	53,020	52,220	53,370	45,020
22	75,970	55,500	63,650	61,310	54,290	55,050	62,820	44,480	53,900	44,450	54,120	57,020
23	63,590	55,080	55,170	52,250	54,490	65,900	60,230	44,520	51,080	44,600	50,690	63,420
24	65,680	65,660	72,150	53,670	53,610	54,510	44,400	44,470	44,400	44,420	54,440	44,170
25	63,980	67,220	65,370	64,560	64,370	54,390	44,150	77,580	53,350	44,470	60,560	44,240
26	55,260	63,520	62,030	62,000	66,100	44,680	44,580	44,410	53,390	44,650	54,680	44,360
27	79,670	54,850	54,630	55,150	68,760	44,700	51,930	44,450	44,450	44,400	53,460	44,120
28	65,850	55,160	54,890	56,150	53,840	44,700	62,270	44,140	44,850	59,270	45,090	53,810
29	65,790		55,000	55,060	53,220	44,710	62,680	46,670	57,550	63,790	44,300	55,920
30	63,270		64,810	54,930	54,570	68,790	53,110	67,350	44,650	54,120	44,410	67,470
31	54,980		68,380		64,600		44,710	65,480		51,760		44,610
Total												
Average												
Min												
Max	79,670	70,750	85,940	73,780	77,790	71,370	76,840	77,580	65,770	66,210	74,370	69,030

CoA Amount ***118,000 m^3/day***

Yearly Max **85,940**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Net to Distribution System** 2010 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	49,952	58,051	57,431	52,480	48,409	50,870	43,479	44,010	48,141	44,786	43,909	45,909
2	51,650	58,429	59,554	51,603	51,475	50,543	45,149	45,117	50,118	44,291	44,034	46,229
3	50,643	58,860	58,070	50,430	48,862	49,459	46,342	46,932	47,709	44,056	45,435	46,063
4	53,043	58,214	59,042	51,793	48,391	48,921	46,581	48,899	43,811	45,264	44,095	44,583
5	53,652	57,539	58,529	51,046	49,373	48,368	50,447	49,937	43,993	45,512	42,795	46,074
6	53,846	58,117	58,617	53,498	49,561	46,390	52,958	45,554	45,421	44,353	43,994	45,192
7	53,258	56,923	58,034	53,765	47,957	47,060	53,681	44,845	47,625	44,504	45,894	46,090
8	52,061	58,343	57,848	53,550	44,988	47,344	50,622	42,880	44,760	44,643	44,056	45,930
9	54,177	59,947	59,038	53,085	45,906	46,893	49,403	44,824	46,883	40,827	44,565	46,449
10	54,052	57,785	58,052	51,114	48,033	47,010	46,617	45,819	44,500	39,439	44,379	46,755
11	56,747	58,653	57,918	53,171	47,176	46,611	46,831	45,982	44,652	41,857	45,025	47,498
12	57,335	58,370	57,259	51,505	49,057	43,499	48,806	45,354	44,916	45,402	43,664	46,013
13	56,154	58,553	55,896	53,473	49,405	46,344	48,641	46,316	47,423	43,223	43,859	48,171
14	59,061	57,136	56,090	53,585	47,917	46,894	51,476	44,732	45,230	44,573	45,197	46,729
15	58,647	58,059	57,210	51,479	48,572	47,037	51,071	43,435	48,196	44,974	44,051	48,757
16	56,210	58,880	56,058	52,976	52,185	46,000	48,254	49,536	44,975	42,542	44,525	47,793
17	56,789	59,309	57,555	51,645	51,304	47,645	45,830	47,009	44,907	45,114	44,976	47,466
18	56,084	59,536	56,495	52,732	49,872	48,560	45,101	47,075	42,874	43,165	44,521	46,864
19	58,157	58,070	57,392	51,401	50,554	47,026	46,069	47,128	44,623	45,240	43,696	45,186
20	58,828	56,904	54,598	53,229	50,978	45,362	47,350	44,929	46,405	44,376	44,969	45,110
21	57,426	56,062	56,567	54,235	51,230	48,439	46,116	43,803	43,971	45,078	46,370	45,898
22	57,901	56,974	58,841	52,610	49,694	46,021	46,229	43,180	47,585	44,458	45,483	45,217
23	55,393	55,561	55,568	52,128	48,441	46,112	45,101	43,399	46,646	43,505	44,772	46,051
24	56,541	56,705	51,526	50,900	53,692	46,719	44,194	43,882	45,844	43,227	43,992	42,969
25	55,681	57,121	55,776	53,792	53,215	46,865	45,041	44,964	45,482	44,161	45,459	41,630
26	57,444	55,596	53,538	53,094	54,068	44,480	45,500	43,883	45,821	45,161	45,779	43,227
27	56,014	53,977	53,088	50,470	52,061	44,520	47,365	44,434	45,141	44,949	45,340	44,128
28	58,232	56,939	53,307	52,539	52,306	45,488	46,909	44,777	43,950	43,788	44,832	43,884
29	57,914	0	53,944	52,392	51,672	46,077	45,275	45,438	46,303	44,993	45,739	44,520
30	55,926	0	53,984	51,974	51,218	44,939	46,928	49,922	45,294	45,271	44,778	45,328
31	56,681	0	55,023	0	54,365	0	44,043	48,791	0	44,121	0	44,552
Total	1,725,498	1,614,612	1,751,846	1,571,694	1,551,937	1,407,493	1,467,408	1,416,784	1,373,195	1,366,851	1,340,181	1,416,263
Average	55,661	57,665	56,511	52,390	50,062	46,916	47,336	45,703	45,773	44,092	44,673	45,686
Min	49,952	53,977	51,526	50,430	44,988	43,499	43,479	42,880	42,874	39,439	42,795	41,630
Max	59,061	59,947	59,554	54,235	54,365	50,870	53,681	49,937	50,118	45,512	46,370	48,757

Yearly Average	**49,372**
Yearly Min	**39,439**
Yearly Max	**59,947**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Kingston Central Water Treatment Plant - **City East** Flows 2010

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5,252	5,808	5,757	5,404	4,495	4,141	3,889	3,788	3,889	3,182	2,626	4,141
2	6,464	6,111	6,111	6,010	6,262	4,949	3,636	3,636	4,394	3,232	3,283	3,485
3	5,757	5,959	5,757	5,808	4,596	5,101	4,394	4,141	3,182	4,040	4,242	3,838
4	5,858	5,858	6,212	5,858	4,394	3,990	4,394	4,293	3,283	3,131	3,434	4,343
5	6,010	5,959	5,757	4,646	5,454	4,495	4,697	4,242	3,131	2,778	2,828	4,040
6	5,757	5,757	6,161	6,767	4,697	3,990	5,858	3,737	3,485	3,384	3,586	3,434
7	5,202	5,555	6,313	4,899	4,495	3,990	5,353	3,939	4,242	2,525	3,384	4,394
8	4,242	6,363	6,161	6,212	3,232	4,394	5,000	3,081	2,323	3,939	3,434	3,939
9	5,303	6,262	6,060	5,505	4,697	4,949	4,495	2,727	4,192	3,131	3,636	3,889
10	5,151	5,959	5,606	5,757	4,646	3,737	4,394	3,030	2,929	3,838	3,232	4,040
11	4,697	6,111	5,858	6,414	3,990	3,939	4,192	4,141	2,879	3,081	4,091	4,040
12	5,353	5,959	6,212	5,050	4,596	3,788	4,444	3,687	3,333	3,939	3,182	3,788
13	5,252	5,909	4,747	6,363	5,050	4,747	4,596	3,990	4,697	3,030	3,384	4,444
14	6,717	6,010	6,616	6,010	4,646	3,636	5,555	3,333	2,374	3,081	3,838	4,394
15	6,212	6,060	5,404	5,151	5,707	4,495	5,050	2,980	3,788	3,586	3,535	4,343
16	5,202	6,010	5,707	5,353	8,737	4,242	4,040	4,495	3,081	2,626	4,040	3,788
17	5,404	5,353	5,606	5,656	5,555	4,343	4,091	3,838	3,384	3,838	3,788	4,192
18	5,404	6,919	5,808	5,959	4,596	6,161	4,141	3,838	3,030	2,778	3,586	4,091
19	5,808	5,858	5,555	5,000	5,353	4,293	4,040	4,545	2,828	3,737	2,828	3,737
20	5,909	5,909	5,404	5,656	5,101	4,141	3,990	3,485	3,586	2,980	3,990	4,192
21	5,656	5,656	5,606	5,606	5,252	4,444	3,737	4,040	2,374	3,232	4,192	3,535
22	5,909	6,666	6,767	5,959	4,192	3,535	3,586	3,333	3,283	3,687	3,485	4,293
23	5,454	5,909	5,454	5,151	4,343	4,040	3,434	3,737	3,687	3,384	3,889	3,838
24	5,959	5,555	5,858	5,858	6,313	3,838	3,485	2,626	3,535	3,232	3,384	3,687
25	5,454	6,565	5,606	6,363	5,303	4,141	3,889	3,687	2,778	3,636	3,485	3,737
26	6,161	5,303	5,757	5,505	5,151	3,990	3,333	3,384	3,434	3,990	4,242	3,737
27	4,949	5,656	5,808	4,495	5,252	3,737	3,687	3,081	3,485	3,737	4,394	4,293
28	6,111	6,010	6,464	5,303	5,353	3,485	3,131	3,434	2,929	2,424	3,889	3,687
29	5,454		6,313	5,808	5,707	4,646	3,232	3,838	3,434	3,636	3,889	4,040
30	5,101		5,808	5,454	5,101	3,283	4,798	4,495	3,384	3,687	3,485	3,990
31	5,757		6,212		5,454		4,242	4,040		4,040		3,636
Total	172,912	167,004	182,457	168,973	157,712	126,654	130,795	114,635	100,344	104,535	108,272	123,018
Average	5,578	5,964	5,886	5,632	5,087	4,222	4,219	3,698	3,345	3,372	3,609	3,968
Min	4,242	5,303	4,747	4,495	3,232	3,283	3,131	2,626	2,323	2,424	2,626	3,434
Max	6,717	6,919	6,767	6,767	8,737	6,161	5,858	4,545	4,697	4,040	4,394	4,444

Yearly Average	**4,548**
Yearly Min	**2,323**
Yearly Max	**8,737**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Raw Water Flows** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	49,500	64,300	57,300	56,900	56,800	66,100	52,200	53,300	56,500	56,400	53,300	55,300
2	49,500	65,300	54,500	56,300	56,300	56,300	57,900	51,200	48,500	49,900	56,300	47,500
3	49,600	57,000	56,700	51,000	56,100	50,200	58,200	57,300	57,200	47,900	61,300	47,700
4	53,100	57,400	57,400	60,000	48,900	50,300	58,100	49,500	53,600	47,900	53,100	47,800
5	56,900	58,200	57,600	57,600	48,900	52,400	59,400	57,100	48,800	50,000	46,300	52,200
6	53,100	58,400	56,400	56,000	53,600	57,300	58,900	57,100	47,800	56,400	60,500	56,500
7	47,900	52,300	56,800	56,200	56,300	57,500	54,500	45,800	48,800	56,700	47,300	49,400
8	48,000	65,000	56,700	56,100	56,300	57,800	57,800	57,300	53,500	45,200	56,500	47,800
9	51,600	50,500	57,600	56,100	51,500	53,200	57,800	57,300	57,000	42,800	55,500	47,600
10	57,000	64,800	57,900	56,000	53,900	61,400	58,400	53,700	57,100	52,100	51,900	48,900
11	57,000	61,400	57,800	56,200	57,700	48,500	57,300	42,900	50,700	49,200	48,900	57,100
12	57,100	51,700	58,900	56,300	65,200	52,200	58,300	54,800	51,600	49,500	49,000	57,200
13	56,500	58,600	65,800	56,500	57,200	57,300	58,000	57,400	57,200	56,100	48,900	51,300
14	61,300	64,300	48,900	57,100	55,400	57,200	57,000	52,800	57,100	56,900	49,600	50,400
15	57,000	54,000	64,700	56,300	49,200	46,200	56,700	51,100	50,500	41,900	55,500	53,900
16	57,100	60,000	47,900	56,300	49,400	57,500	58,900	52,400	48,000	49,100	56,000	53,700
17	57,700	57,100	61,000	52,200	56,500	57,500	58,000	56,900	51,200	56,700	56,400	53,800
18	57,500	57,900	59,500	60,900	57,000	57,200	58,000	57,500	56,500	55,600	52,500	53,300
19	57,800	64,700	57,500	54,400	57,100	51,300	52,700	53,900	57,000	49,100	44,300	50,600
20	56,800	47,700	57,400	55,800	51,000	51,900	56,200	53,200	42,800	49,800	55,500	50,600
21	57,600	47,800	57,100	56,300	50,200	57,600	59,600	53,400	55,700	49,800	49,400	50,700
22	58,100	56,300	57,400	56,300	52,100	58,000	59,900	53,300	57,000	50,900	47,800	50,400
23	57,500	67,600	56,400	56,500	57,200	57,600	57,500	50,800	56,700	57,100	54,700	50,600
24	58,100	51,600	59,300	51,700	57,200	52,000	57,300	51,000	51,400	50,000	58,800	50,500
25	59,700	48,700	56,700	51,400	56,700	50,007	57,500	52,000	45,300	47,600	55,600	50,400
26	68,700	57,400	57,100	56,900	45,100	53,100	56,200	56,900	56,900	50,100	46,700	50,400
27	53,500	57,700	56,900	57,400	53,900	57,800	51,300	52,300	56,800	57,000	47,600	50,300
28	57,200	57,200	56,600	54,300	57,100	58,100	52,600	50,400	50,700	56,600	51,800	50,400
29	57,300		57,000	53,100	55,000	57,900	57,800	48,600	49,600	53,800	56,200	48,400
30	57,700		56,900	57,800	50,000	51,800	57,400	50,600	51,500	49,400	45,900	47,400
31	58,200		63,500		52,000		57,600	56,800		49,300		47,300
Total	1,735,600	1,614,900	1,783,200	1,675,900	1,680,800	1,653,207	1,769,000	1,648,600	1,583,000	1,590,800	1,573,100	1,579,400
Average	55,987	57,675	57,523	55,863	54,219	55,107	57,065	53,181	52,767	51,316	52,437	50,948
Min	47,900	47,700	47,900	51,000	45,100	46,200	51,300	42,900	42,800	41,900	44,300	47,300
Max	68,700	67,600	65,800	60,900	65,200	66,100	59,900	57,500	57,200	57,100	61,300	57,200

PTTW Amount ***118,000 m^3/day***

Yearly Average	**54,507**
Yearly Min	**41,900**
Yearly Max	**68,700**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Raw) Flows** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	51,650	73,060	64,740	72,090	60,590	75,610	62,000	63,900	61,000	63,000	74,810	65,890
2	51,640	74,170	66,780	59,880	59,950	65,900	62,000	63,000	60,030	62,000	66,000	62,070
3	54,000	62,870	70,010	57,590	59,800	53,040	63,000	60,570	60,870	51,000	81,700	49,510
4	62,000	66,890	63,000	72,920	51,450	57,000	62,000	66,000	58,680	52,000	72,510	49,230
5	68,930	67,950	66,390	97,000	51,410	62,000	76,800	62,000	56,000	58,920	67,000	58,000
6	69,210	74,270	61,000	62,000	59,560	60,590	69,480	61,000	51,000	61,150	65,380	59,000
7	51,000	71,740	62,100	63,000	62,000	63,000	61,190	61,000	65,840	63,000	76,250	58,000
8	52,000	74,460	61,390	59,250	61,000	63,000	70,000	61,080	81,180	56,300	62,070	61,000
9	68,000	60,000	65,460	61,010	61,000	71,000	61,090	61,200	62,000	68,000	61,000	49,270
10	63,000	75,770	66,160	59,320	78,060	75,230	70,000	57,420	63,000	62,000	66,000	62,660
11	63,000	70,600	66,510	60,210	77,710	52,000	64,000	56,320	59,000	53,000	53,020	63,980
12	63,000	61,170	63,000	62,000	90,340	68,000	63,000	67,000	60,000	59,000	53,000	67,000
13	68,740	74,780	73,880	62,000	72,100	61,660	63,000	63,000	62,000	63,000	53,000	60,000
14	72,530	74,830	65,980	61,000	62,000	60,790	63,000	58,000	62,000	67,250	53,810	60,340
15	62,000	66,040	78,140	62,000	54,000	75,520	74,320	57,000	82,000	57,470	66,300	58,000
16	65,000	109,000	51,000	61,000	61,000	61,320	72,260	62,000	58,000	59,450	61,140	58,000
17	65,820	63,000	83,930	61,000	62,000	60,830	62,000	59,900	61,000	61,000	64,510	58,000
18	67,300	66,230	77,190	81,830	62,000	60,460	69,000	67,370	64,000	63,000	59,000	58,000
19	66,160	72,440	62,280	77,380	62,000	59,200	61,000	60,000	60,990	56,630	63,000	55,000
20	67,340	49,910	62,030	61,000	58,690	60,110	76,170	58,000	58,330	55,000	61,000	54,000
21	65,730	52,000	63,000	61,000	52,990	60,920	73,660	62,000	66,520	51,740	59,000	55,000
22	69,980	62,000	64,000	62,000	59,880	60,980	74,100	58,000	62,000	58,380	54,000	53,120
23	62,470	72,260	62,130	62,000	62,000	60,420	62,000	68,000	63,000	63,520	61,790	55,000
24	65,600	67,000	62,000	61,000	61,000	61,000	61,430	56,000	60,000	55,640	65,970	55,000
25	64,000	61,000	61,740	57,710	70,000	55,000	64,000	60,060	68,000	51,000	66,810	55,000
26	74,350	66,540	63,000	60,570	74,060	62,000	62,000	61,000	61,980	67,000	51,000	52,820
27	71,250	66,710	64,000	85,000	64,980	63,000	64,920	60,000	59,880	71,480	51,000	52,910
28	64,000	66,390	63,000	68,000	61,090	62,000	69,000	55,000	58,440	74,460	60,720	55,000
29	63,000		63,000	70,150	60,850	61,370	62,000	55,000	53,300	66,000	97,300	67,000
30	64,210		63,000	70,870	55,000	59,210	62,000	70,000	62,000	54,000	61,520	50,000
31	68,770		79,020		71,000		62,000	63,480		55,000		50,000
Total												
Average												
Min												
Max	74,350	109,000	83,930	97,000	90,340	75,610	76,800	70,000	82,000	74,460	97,300	67,000

CoA Amount ***118,000 m^3/day***

Yearly Average
Yearly Min
Yearly Max **109,000**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Treated Water Flows** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	43,000	58,500	51,400	52,100	51,700	59,200	45,100	46,900	50,800	51,500	46,900	50,800
2	43,300	58,900	51,600	51,500	51,200	50,100	51,400	45,100	43,000	45,300	49,200	42,800
3	43,300	51,400	52,200	45,600	50,900	43,300	51,600	51,300	51,800	43,300	51,300	42,600
4	47,200	51,500	51,500	54,100	43,200	43,300	51,800	43,400	47,000	43,300	44,700	42,800
5	51,300	51,500	51,800	52,500	43,300	45,900	53,000	51,400	43,500	45,400	41,700	47,100
6	48,000	52,300	51,400	51,200	48,600	51,200	52,000	51,400	43,100	51,400	53,300	50,600
7	43,200	46,000	51,700	51,500	51,300	51,500	48,800	40,200	43,900	51,700	38,000	44,400
8	43,100	58,300	51,700	51,600	51,300	51,900	51,500	51,400	48,600	40,400	51,700	42,800
9	46,400	45,100	52,000	51,600	44,700	49,600	51,400	51,500	51,900	38,200	51,000	42,700
10	51,400	58,500	51,700	51,500	43,400	55,300	51,600	46,900	51,900	46,500	46,300	43,500
11	51,600	55,100	51,700	51,500	47,500	43,500	50,900	37,300	43,800	43,200	43,400	50,300
12	51,700	45,600	53,000	51,500	54,400	46,800	52,000	49,000	45,400	44,100	43,400	50,300
13	51,100	52,300	58,000	51,600	51,200	51,400	51,600	51,300	51,900	51,200	43,400	43,100
14	55,500	57,500	43,400	52,100	49,600	51,200	50,300	46,000	51,700	51,900	44,200	42,900
15	51,600	48,100	60,000	51,400	43,200	40,000	50,500	43,800	44,700	37,000	50,500	45,800
16	51,400	51,600	43,300	51,500	43,400	51,300	52,500	45,400	43,300	44,500	51,600	45,600
17	51,700	51,700	55,800	46,300	50,800	51,400	51,700	51,400	46,400	51,700	51,700	45,700
18	51,700	52,200	54,000	54,000	51,200	51,200	51,400	51,400	51,400	50,500	47,400	45,100
19	51,800	58,600	51,900	49,700	51,200	44,300	45,400	47,300	51,900	42,800	40,100	42,500
20	51,500	42,800	51,900	51,500	44,400	45,200	50,000	46,500	36,400	43,200	50,500	42,500
21	51,700	43,100	51,800	51,600	43,400	51,300	53,600	46,500	49,100	43,200	43,400	42,600
22	51,500	50,200	52,000	51,500	45,400	51,700	53,900	46,300	51,700	44,700	43,400	42,300
23	51,800	61,900	51,800	51,400	51,000	51,300	51,600	43,700	51,600	51,400	47,600	42,500
24	51,900	46,300	53,600	45,300	51,100	44,600	51,500	43,500	46,200	45,600	51,400	42,400
25	54,000	44,100	52,000	45,300	50,700	43,300	51,500	45,100	39,800	43,100	49,600	42,400
26	62,200	51,400	51,800	51,800	39,300	46,100	50,100	51,000	51,700	45,500	43,400	42,300
27	46,500	51,300	52,000	52,300	47,700	51,300	44,400	45,200	51,900	51,300	43,600	42,300
28	51,700	51,500	51,800	49,400	51,200	51,700	45,700	43,000	44,600	51,700	47,300	42,400
29	51,700		52,000	47,000	48,700	51,500	51,700	43,100	43,300	47,900	50,900	42,400
30	51,800		52,000	52,700	43,300	44,200	51,400	45,800	45,800	43,100	41,000	42,500
31	51,700		58,200		46,100		51,700	51,100		43,100		42,400
Total	1,556,300	1,447,300	1,619,000	1,522,600	1,484,400	1,464,600	1,571,600	1,453,200	1,418,100	1,427,700	1,401,900	1,370,400
Average	50,203	51,689	52,226	50,753	47,884	48,820	50,697	46,877	47,270	46,055	46,730	44,206
Min	43,000	42,800	43,300	45,300	39,300	40,000	44,400	37,300	36,400	37,000	38,000	42,300
Max	62,200	61,900	60,000	54,100	54,400	59,200	53,900	51,500	51,900	51,900	53,300	50,800

CoA Amount ***118,000 m^3/day***

Yearly Average	**48,618**
Yearly Min	**36,400**
Yearly Max	**62,200**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Treated) Flows** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	49,990	65,320	54,310	64,300	54,250	65,010	52,870	53,310	54,380	54,310	67,590	63,540
2	44,600	64,930	54,330	53,280	53,950	64,340	54,260	54,280	53,850	53,100	54,290	60,210
3	44,850	54,470	66,420	52,020	54,160	44,090	54,110	54,540	54,090	44,690	54,320	43,570
4	53,910	53,930	54,140	65,140	44,530	44,920	54,190	65,370	52,740	45,090	51,830	44,020
5	66,570	54,610	54,070	63,720	45,180	53,030	83,980	54,120	46,460	60,290	53,880	53,650
6	68,420	54,000	53,950	54,000	63,420	54,380	61,940	54,040	44,450	54,680	54,120	53,380
7	44,630	64,150	53,430	54,310	53,740	54,390	53,830	53,450	62,240	54,150	51,000	51,790
8	44,530	65,370	53,400	54,110	53,940	54,560	53,650	54,410	74,140	52,400	53,560	44,220
9	53,780	51,800	60,980	54,220	53,000	62,720	53,410	54,270	54,690	53,320	54,290	44,280
10	54,490	65,240	54,370	54,070	44,810	64,760	53,510	50,900	54,500	53,440	67,070	51,690
11	55,050	62,210	54,910	53,670	53,680	44,840	54,060	50,060	52,610	44,970	44,480	52,990
12	5,486	52,740	64,110	54,030	64,300	53,940	54,050	78,510	53,280	52,370	44,570	53,960
13	61,470	64,880	64,210	54,370	65,740	53,450	54,250	54,410	54,460	54,670	44,410	51,010
14	64,690	64,920	62,150	74,470	53,780	53,190	57,700	47,600	54,430	56,510	47,880	66,080
15	54,240	53,570	64,920	54,070	44,510	78,510	64,790	46,600	51,860	52,820	55,800	47,780
16	54,390	55,010	44,760	53,950	47,240	54,070	61,240	53,920	60,090	51,810	53,800	47,360
17	53,900	54,360	80,320	53,230	53,930	53,990	54,320	53,760	53,780	53,870	54,520	47,460
18	53,670	62,570	70,480	71,410	53,480	53,700	54,440	60,580	54,550	54,470	51,420	47,470
19	59,970	65,330	54,830	70,230	54,020	52,510	53,870	52,180	54,070	44,230	54,450	43,910
20	54,410	44,560	53,990	53,810	52,050	52,760	73,500	47,730	52,800	44,680	53,980	43,950
21	54,360	44,690	54,300	54,230	44,140	54,060	64,290	61,250	67,070	44,520	44,790	44,230
22	54,520	61,620	54,850	54,140	52,550	55,700	62,810	47,930	54,510	52,670	46,510	44,140
23	54,760	65,040	54,500	53,710	53,810	53,570	53,730	47,560	54,450	54,190	65,100	45,250
24	54,490	65,230	78,630	52,890	53,230	50,730	54,190	56,350	53,210	52,770	54,460	44,040
25	66,750	52,700	54,980	52,280	54,040	44,420	54,140	53,450	53,690	44,370	54,330	44,670
26	64,250	53,920	54,800	54,080	63,190	60,900	54,080	54,210	54,830	53,650	44,630	43,300
27	63,760	54,110	54,740	63,110	60,860	54,350	64,370	53,360	54,680	60,740	45,190	43,220
28	54,200	53,990	54,460	53,490	53,870	54,310	62,040	44,100	53,620	53,940	54,330	44,030
29	54,390		54,640	63,620	53,940	54,420	54,720	44,530	47,111	55,700	53,470	53,810
30	54,650		54,880	62,100	44,800	63,280	54,270	53,490	54,350	44,460	52,160	44,080
31	54,210		67,790		52,580		54,120	59,090		44,380		44,200
Total												
Average												
Min												
Max	68,420	65,370	80,320	74,470	65,740	78,510	83,980	78,510	74,140	60,740	67,590	66,080

CoA Amount ***118,000*** ***m^3/day***

Yearly Max **83,980**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Net to Distribution System** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	44,126	54,181	51,135	51,703	50,017	52,615	48,810	45,171	48,110	45,180	47,258	46,852
2	45,619	53,945	52,302	52,043	48,172	48,603	48,995	49,333	47,611	46,234	47,093	44,450
3	45,665	53,931	52,657	50,476	48,343	46,964	50,613	48,438	46,487	46,122	47,617	45,157
4	47,041	52,216	52,043	52,265	47,546	46,758	51,634	49,144	47,921	47,341	46,105	45,569
5	47,875	50,877	51,899	52,798	49,435	48,179	53,272	49,784	46,097	46,579	45,079	44,788
6	46,198	52,399	51,652	51,220	48,057	49,902	49,933	47,425	46,373	47,491	49,451	45,770
7	46,519	50,419	53,158	52,818	48,014	49,817	51,324	47,037	46,418	45,618	47,772	45,911
8	47,009	53,265	52,866	51,680	46,709	49,999	50,294	49,479	47,951	43,706	47,725	45,159
9	48,494	52,388	52,875	51,282	48,370	50,746	51,003	48,201	48,872	41,705	46,826	45,251
10	50,612	54,247	52,356	50,857	48,607	53,014	52,282	46,204	47,051	44,917	47,287	45,050
11	50,520	52,397	53,025	52,255	50,263	48,025	51,920	46,529	48,073	47,069	45,136	46,093
12	51,468	51,390	51,880	52,626	50,180	47,304	52,444	46,940	50,051	46,869	46,381	48,915
13	51,451	53,062	49,560	51,030	49,140	47,736	50,514	47,941	49,263	47,205	46,282	46,578
14	52,088	52,492	51,642	51,696	48,408	48,888	50,664	45,112	51,707	47,097	46,188	45,928
15	51,044	53,069	52,838	52,129	46,678	47,652	54,058	46,609	47,377	45,884	48,407	45,800
16	51,003	53,945	47,441	49,453	47,832	51,499	50,711	47,586	46,818	45,421	48,983	45,401
17	53,105	52,270	53,296	50,871	48,064	47,856	52,349	48,896	46,029	47,175	49,520	43,838
18	53,144	51,809	53,106	52,450	48,557	47,788	49,578	49,519	48,810	50,500	46,108	44,305
19	52,257	50,418	51,251	51,873	49,358	48,169	49,574	48,526	48,965	46,689	46,208	44,587
20	52,520	47,703	52,682	50,785	46,699	50,030	51,709	46,739	46,583	46,108	45,949	44,276
21	52,455	49,805	52,039	51,295	46,958	51,227	55,091	45,811	48,398	46,347	47,600	44,150
22	51,924	50,889	53,252	50,043	47,653	49,653	53,456	45,055	48,275	45,641	47,720	42,664
23	52,906	52,638	52,754	48,750	47,747	48,253	51,481	46,377	47,135	46,100	48,017	43,977
24	53,907	49,553	53,309	48,924	49,046	47,376	50,944	46,382	46,882	47,634	48,035	41,665
25	52,861	50,718	52,762	50,607	48,414	45,705	48,188	46,160	47,015	46,565	48,441	39,465
26	54,681	49,201	53,059	51,244	48,038	47,365	48,007	46,707	48,129	47,580	46,918	41,624
27	54,046	49,644	53,159	51,220	46,686	49,631	50,555	45,657	48,800	46,881	46,906	42,399
28	51,879	52,547	52,496	50,897	46,894	49,819	50,351	44,557	47,270	47,858	47,075	42,665
29	53,164		53,133	50,366	47,779	49,513	50,209	46,446	48,256	50,696	48,078	42,486
30	53,324		51,821	49,222	48,454	49,719	46,690	47,847	47,715	46,757	45,737	43,116
31	53,608		53,602		50,883		48,653	47,390		44,591		43,586
Total	1,572,511	1,451,414	1,621,047	1,534,876	1,497,001	1,469,801	1,575,303	1,462,998	1,434,437	1,441,560	1,415,899	1,377,476
Average	50,726	51,836	52,292	51,163	48,290	48,993	50,816	47,193	47,815	46,502	47,197	44,435
Min	44,126	47,703	47,441	48,750	46,678	45,705	46,690	44,557	46,029	41,705	45,079	39,465
Max	54,681	54,247	53,602	52,818	50,883	53,014	55,091	49,784	51,707	50,696	49,520	48,915

Yearly Average	**48,938**
Yearly Min	**39,465**
Yearly Max	**55,091**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Kingston Central Water Treatment Plant - **City East** Flows 2011 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	3,939	4,646	3,283	3,485	4,141	4,343	4,495	3,788	4,192	2,980	3,788	3,990
2	4,343	5,252	4,343	4,343	3,384	3,889	3,889	4,343	4,040	3,788	3,737	3,838
3	3,586	3,990	3,687	3,283	3,737	3,586	4,899	4,192	3,990	3,990	4,242	3,182
4	4,141	4,293	3,737	4,091	3,737	4,040	4,848	4,192	4,192	3,838	3,131	4,242
5	3,889	3,030	4,293	3,737	2,323	4,646	5,959	3,990	3,788	3,586	3,687	2,980
6	3,687	4,596	3,182	3,788	3,636	3,990	4,141	3,737	4,293	3,687	4,040	4,394
7	4,444	3,838	4,343	3,687	4,141	4,141	5,555	4,444	3,131	3,838	4,040	3,838
8	4,242	3,788	3,788	3,586	3,182	4,747	4,545	3,939	4,141	3,889	3,990	3,030
9	3,939	3,788	3,889	4,091	4,040	4,293	5,606	4,192	4,141	3,384	3,030	3,939
10	4,697	4,091	4,040	3,182	4,444	3,889	5,050	3,636	3,939	4,293	4,242	3,030
11	4,444	3,333	3,990	4,596	4,242	4,242	4,949	3,838	4,343	3,737	3,434	4,040
12	4,697	4,242	3,485	3,939	4,192	3,687	5,202	3,485	4,495	4,242	3,687	3,081
13	4,141	3,788	3,081	3,434	3,737	4,091	3,687	3,939	4,495	3,081	3,485	4,798
14	4,747	3,687	4,444	4,242	3,636	4,596	4,848	4,091	4,394	3,990	3,586	3,990
15	4,596	3,990	3,384	3,939	3,283	3,889	5,656	3,737	3,687	3,586	4,192	4,040
16	3,838	5,555	3,636	3,182	4,091	5,606	5,505	3,990	4,242	3,434	3,232	3,232
17	4,545	3,889	3,838	4,091	3,434	4,141	4,848	4,343	3,131	4,242	4,596	2,727
18	4,242	3,889	3,434	4,394	4,091	3,939	5,101	5,000	4,394	3,131	3,081	3,687
19	3,990	3,535	3,586	3,687	3,838	4,192	4,394	4,242	4,545	4,192	4,495	3,687
20	4,444	3,384	3,838	3,889	3,737	5,000	4,596	4,141	3,182	3,737	3,081	3,485
21	5,101	3,990	3,889	3,636	3,939	4,192	5,656	4,141	4,040	4,091	4,040	3,283
22	4,192	4,242	3,889	3,586	3,788	4,394	5,353	3,939	4,192	3,434	4,091	2,828
23	4,848	3,030	3,333	3,384	2,980	3,687	5,454	3,636	3,687	3,333	3,939	3,838
24	4,394	3,485	3,838	3,485	4,495	3,485	4,697	3,889	4,394	4,343	3,990	3,131
25	4,444	3,990	4,040	4,192	3,737	2,929	4,495	3,889	3,838	3,586	4,596	3,283
26	5,050	3,131	3,737	3,838	3,333	4,141	4,242	3,333	3,788	4,242	3,535	3,384
27	4,747	3,485	4,040	1,061	3,737	3,737	5,050	3,939	4,495	3,131	4,242	3,434
28	4,141	4,343	3,535	3,939	3,333	4,343	4,343	3,838	2,929	4,394	3,131	3,232
29	4,545		4,343	3,737	3,434	3,838	4,697	3,939	4,192	3,081	4,697	2,778
30	5,202		3,737	3,939	3,737	4,091	3,636	4,798	4,192	4,242	3,232	3,384
31	4,242		3,737		4,899		5,505	3,939		3,636		3,384
Total	135,492	110,292	117,413	111,454	116,453	123,776	150,894	124,533	120,493	116,150	114,282	109,181
Average	4,371	3,939	3,788	3,715	3,757	4,126	4,868	4,017	4,016	3,747	3,809	3,522
Min	3,586	3,030	3,081	1,061	2,323	2,929	3,636	3,333	2,929	2,980	3,030	2,727
Max	5,202	5,555	4,444	4,596	4,899	5,606	5,959	5,000	4,545	4,394	4,697	4,798

Yearly Average	**3,973**
Yearly Min	**1,061**
Yearly Max	**5,959**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Raw Water Flows** 2012 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	47,300	58,000	57,900	58,000	48,200	51,100	56,200	56,700	55,500	52,400	51,400	48,800
2	47,400	63,300	58,000	53,500	52,800	46,900	43,500	57,200	55,600	51,000	53,300	48,900
3	47,900	63,400	58,200	51,800	51,000	50,300	57,200	57,000	55,400	51,000	53,800	51,700
4	57,400	58,500	58,400	56,500	54,800	46,400	57,300	55,700	55,500	53,700	48,500	53,100
5	57,600	60,200	63,400	57,600	57,300	53,700	57,100	50,200	51,700	49,100	47,000	52,800
6	47,000	69,100	58,800	57,500	52,100	52,000	57,700	50,200	48,800	47,500	47,800	54,400
7	50,900	58,700	57,900	52,200	49,400	54,200	57,100	51,800	54,100	47,400	51,000	53,200
8	51,000	57,900	57,800	50,400	49,900	55,300	54,200	57,300	56,900	47,500	55,100	52,400
9	54,900	63,200	58,100	51,900	50,900	43,700	59,300	56,800	54,300	47,600	50,500	47,500
10	57,700	60,300	58,000	57,800	52,800	60,600	61,300	56,700	49,900	47,600	47,000	48,400
11	57,800	62,000	59,100	57,700	53,400	62,400	61,600	46,200	48,200	52,100	47,200	54,700
12	56,600	57,700	66,800	54,900	50,400	54,100	57,700	47,200	54,800	52,100	47,000	55,300
13	57,900	65,600	49,500	53,900	50,600	54,900	57,300	47,200	59,500	51,000	48,800	55,100
14	57,700	57,300	57,400	50,800	57,500	56,700	60,000	52,700	50,900	51,000	55,800	48,700
15	57,700	59,900	58,800	52,600	55,600	55,700	58,000	56,600	50,800	51,000	52,400	47,900
16	57,800	70,200	58,100	58,500	55,400	50,300	56,900	56,900	52,000	51,000	47,800	55,300
17	58,000	60,100	58,000	58,600	50,900	50,100	56,900	51,700	55,700	43,900	47,700	59,000
18	58,200	52,400	58,100	56,000	50,300	53,200	61,500	51,300	55,900	51,700	48,700	60,000
19	58,700	57,000	58,200	57,600	54,300	55,800	58,100	50,100	47,900	55,400	54,800	57,500
20	57,900	55,200	57,900	57,000	50,600	57,100	57,400	53,300	50,200	48,800	53,600	57,900
21	58,000	66,000	57,800	52,400	52,600	57,200	57,100	56,800	54,800	47,500	48,700	46,200
22	57,900	50,500	57,800	57,400	57,100	57,200	57,200	56,700	54,700	47,400	47,000	46,500
23	58,000	56,800	58,000	54,100	54,600	51,400	60,000	55,300	48,700	49,700	46,700	46,600
24	57,900	60,400	57,700	48,500	53,500	50,300	62,700	56,100	47,300	54,600	50,100	46,700
25	60,900	50,700	57,800	50,400	50,800	56,900	57,400	56,200	50,600	51,200	53,900	46,600
26	57,700	62,400	54,700	57,100	55,100	48,400	54,800	53,100	55,000	47,400	54,200	46,500
27	54,500	60,300	54,300	51,800	57,300	49,800	55,000	57,600	55,700	47,500	47,700	46,600
28	59,100	58,000	54,000	53,100	57,200	57,500	57,000	50,900	47,000	47,300	47,300	46,900
29	62,700	57,800	57,900	57,200	52,200	57,000	47,400	56,100	51,200	50,400	50,800	46,500
30	57,500		58,100	57,100	54,300	57,100	52,400	55,700	55,200	50,100	53,900	48,300
31	57,600		57,700		61,800		58,000	55,600		46,700		57,000
Total	1,739,200	1,732,900	1,794,200	1,643,900	1,654,700	1,607,300	1,765,300	1,672,900	1,583,800	1,542,600	1,509,500	1,587,000
Average	56,103	59,755	57,877	54,797	53,377	53,577	56,945	53,965	52,793	49,761	50,317	51,194
Min	47,000	50,500	49,500	48,500	48,200	43,700	43,500	46,200	47,000	43,900	46,700	46,200
Max	62,700	70,200	66,800	58,600	61,800	62,400	62,700	57,600	59,500	55,400	55,800	60,000

PTTW Amount ***118,000 m^3/day***

Yearly Average	**54,205**
Yearly Min	**43,500**
Yearly Max	**70,200**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Raw) Flows** 2012

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	49,370	62,000	69,000	62,000	62,000	60,000	61,000	62,000	58,710	59,000	58,600	58,000
2	49,340	74,070	61,000	63,000	64,000	58,000	60,000	67,000	58,430	54,000	57,900	62,970
3	60,710	68,000	62,000	67,550	60,000	54,000	61,000	61,000	58,880	53,040	60,000	57,000
4	62,820	69,480	61,000	67,000	59,500	61,000	61,000	61,000	60,850	65,970	49,000	57,600
5	63,630	78,000	71,020	61,000	59,320	68,000	61,000	55,000	59,000	58,000	53,920	66,000
6	60,000	74,880	68,610	61,000	58,490	58,700	61,000	54,000	58,000	51,000	51,000	59,000
7	56,000	70,470	61,340	61,000	52,880	82,560	62,000	60,000	67,000	49,240	61,000	62,000
8	58,000	69,000	68,000	56,000	63,000	68,000	80,090	64,760	60,000	52,000	63,030	64,000
9	61,000	71,780	62,000	58,720	61,000	60,000	73,420	61,000	60,000	51,000	58,000	52,000
10	61,000	69,200	61,000	60,200	60,000	67,000	74,430	61,000	60,000	53,000	50,000	57,780
11	59,670	73,600	71,600	61,000	61,000	85,450	66,000	56,990	53,000	65,000	51,000	59,450
12	73,950	62,000	42,000	61,000	54,000	70,600	66,000	50,690	59,000	70,040	51,000	61,000
13	62,000	74,100	55,000	55,770	56,000	90,000	61,000	50,000	72,960	55,000	58,360	60,000
14	61,000	69,700	72,500	55,260	61,000	74,620	74,750	67,000	58,000	55,000	59,110	57,000
15	61,000	72,110	67,570	60,700	67,000	74,560	61,000	60,000	58,000	55,000	61,190	55,000
16	61,000	75,380	62,000	72,770	61,000	53,000	62,920	72,260	58,000	55,000	49,090	64,000
17	62,000	70,940	66,000	70,240	60,000	53,000	63,780	60,000	63,160	55,000	50,240	67,690
18	66,000	59,010	62,000	61,930	55,000	74,070	76,860	60,000	70,000	61,000	55,800	68,780
19	70,010	71,950	62,000	62,000	61,000	68,000	72,800	54,000	60,000	61,000	59,000	68,670
20	61,000	69,200	62,000	68,000	60,000	61,790	61,000	66,000	67,000	57,000	58,000	69,290
21	62,000	68,000	61,480	60,000	62,000	60,150	61,000	60,000	60,000	52,000	57,000	50,000
22	62,000	55,000	73,660	61,000	61,000	62,000	61,000	61,000	59,000	49,070	49,000	50,000
23	62,000	71,180	69,230	68,000	60,000	60,000	74,610	61,000	54,000	57,230	51,000	50,000
24	61,760	69,470	61,000	61,000	59,000	56,000	75,560	70,030	52,000	60,000	66,000	51,000
25	81,290	53,150	62,000	61,000	58,000	61,000	59,510	60,000	67,000	60,000	58,000	51,000
26	72,330	73,050	62,000	80,000	61,000	56,000	58,210	59,000	63,000	51,000	58,000	51,000
27	73,970	70,690	59,000	61,000	62,000	68,000	60,000	59,000	65,000	51,000	57,000	50,000
28	72,230	64,010	60,000	69,000	59,450	87,000	61,000	59,000	58,020	51,000	67,000	51,000
29	71,010	62,000	62,000	61,000	67,000	61,000	60,000	72,640	57,870	60,000	67,000	50,000
30	62,000		64,690	61,000	74,550	61,000	61,000	58,140	61,000	61,000	59,000	66,000
31	61,000		61,000		76,990		70,730	61,000		48,710		75,790
Total												
Average												
Min												
Max	81,290	78,000	73,660	80,000	76,990	90,000	80,090	72,640	72,960	70,040	67,000	75,790

CoA Amount ***118,000 m^3/day***

Yearly Average

Yearly Min

Yearly Max **90,000**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Treated Water Flows** 2012

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	42,400	50,600	50,500	50,200	41,800	43,200	49,200	50,300	50,300	47,400	46,400	43,600
2	42,500	56,700	50,700	46,300	45,400	41,900	38,200	50,700	50,400	45,900	48,300	43,700
3	42,700	56,600	52,500	44,000	43,000	45,600	50,500	50,600	50,300	45,900	48,900	46,900
4	49,990	51,200	50,600	49,000	47,600	39,700	50,700	49,000	50,200	48,300	43,700	49,000
5	49,700	52,500	56,600	50,300	50,400	46,600	50,500	42,400	46,100	43,700	42,200	48,000
6	41,400	60,900	51,900	50,200	44,100	45,900	51,200	42,500	42,500	42,000	42,400	49,000
7	45,900	50,900	50,300	44,000	42,500	47,400	50,500	44,400	48,300	41,900	46,000	48,800
8	46,000	50,500	50,300	42,300	43,600	48,500	48,700	50,800	51,800	41,900	49,800	48,100
9	48,600	56,600	50,600	44,100	42,900	37,700	52,700	50,200	48,700	42,200	45,800	43,100
10	50,500	53,300	50,500	50,400	45,200	50,300	54,900	50,200	44,300	42,100	42,500	44,000
11	50,800	54,300	52,300	50,800	45,800	52,000	55,400	40,700	42,100	46,900	42,400	50,100
12	49,300	50,000	60,600	47,400	42,400	46,000	52,000	42,300	49,300	46,900	42,300	51,200
13	50,700	57,700	42,500	45,800	42,600	46,400	50,900	42,400	53,900	46,000	43,800	51,000
14	50,700	51,400	52,000	45,900	50,600	45,100	53,800	47,000	46,200	46,000	50,500	44,100
15	50,400	52,300	51,200	47,200	48,100	45,100	51,600	50,200	46,000	45,900	47,200	43,600
16	50,500	61,700	50,600	52,900	48,400	45,200	50,900	50,400	46,600	45,900	42,400	51,100
17	50,800	52,600	50,500	51,800	43,000	45,200	50,900	44,100	50,400	39,200	42,400	54,800
18	50,900	44,100	50,600	50,600	42,400	47,800	55,800	43,900	50,300	47,000	43,400	55,300
19	51,400	49,600	50,600	50,500	47,100	49,300	51,600	42,200	43,200	50,000	49,800	53,000
20	50,700	47,700	50,000	49,800	42,800	50,400	51,000	47,000	45,200	42,000	48,800	53,700
21	50,700	59,900	50,400	44,600	45,300	50,500	50,700	50,400	49,600	42,000	43,900	42,400
22	50,500	42,500	50,400	50,300	50,100	50,600	50,800	50,400	49,500	42,100	42,500	42,800
23	50,400	49,500	50,900	47,700	47,000	43,600	53,700	49,300	42,900	44,700	42,200	42,900
24	51,000	53,100	50,300	42,700	46,000	42,600	56,700	50,000	42,100	49,700	45,500	43,000
25	54,100	42,500	50,200	45,000	43,100	49,900	50,800	50,400	45,600	46,000	48,900	42,800
26	52,300	56,100	46,800	50,300	47,900	40,600	47,600	46,700	49,900	42,100	49,300	42,800
27	47,900	52,800	46,000	45,900	50,500	43,500	48,000	51,700	50,600	42,100	43,000	42,800
28	51,800	50,600	46,200	47,000	50,200	50,800	50,300	44,700	40,400	42,100	42,900	43,100
29	55,800	50,300	50,200	50,300	44,400	50,500	42,000	50,800	45,900	45,200	46,100	42,800
30	49,700		50,500	50,000	46,800	50,500	46,700	50,500	50,100	44,900	49,100	44,200
31	50,000		50,000		55,500		51,200	50,400		42,100		52,400
Total	1,530,090	1,518,500	1,567,300	1,437,300	1,426,500	1,392,400	1,569,500	1,476,600	1,422,700	1,380,100	1,362,400	1,454,100
Average	49,358	52,362	50,558	47,910	46,016	46,413	50,629	47,632	47,423	44,519	45,413	46,906
Min	41,400	42,500	42,500	42,300	41,800	37,700	38,200	40,700	40,400	39,200	42,200	42,400
Max	55,800	61,700	60,600	52,900	55,500	52,000	56,700	51,700	53,900	50,000	50,500	55,300

CoA Amount ***118,000 m^3/day***

Yearly Average	**47,928**
Yearly Min	**37,700**
Yearly Max	**61,700**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Treated) Flows** 2012

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	44,190	53,560	52,920	53,370	52,900	56,680	53,190	53,210	52,720	58,820	60,250	51,110
2	44,140	84,500	53,630	57,400	69,130	47,680	50,080	59,590	52,770	47,420	52,350	62,650
3	50,040	64,330	53,570	60,770	52,250	47,710	52,990	52,760	52,770	47,360	52,560	51,510
4	52,800	62,840	53,490	69,100	53,400	46,820	53,130	53,240	53,090	67,440	43,420	52,410
5	54,180	62,230	64,100	53,220	52,990	65,420	53,220	43,760	51,470	51,300	43,820	58,950
6	67,440	63,740	60,740	53,400	50,580	58,980	66,040	49,340	58,700	43,150	43,740	66,009
7	47,490	61,160	53,430	51,840	44,010	65,680	53,060	51,650	63,650	43,060	53,290	71,010
8	48,370	54,720	64,310	43,680	52,820	54,200	69,820	66,230	62,790	43,040	67,210	54,130
9	53,030	67,200	53,310	58,880	58,540	51,560	65,990	53,210	52,480	43,280	52,610	44,060
10	53,900	62,550	53,230	53,540	57,560	53,260	66,730	52,790	51,960	43,330	44,030	51,960
11	53,550	64,680	63,910	53,600	50,500	67,710	68,350	50,090	43,430	65,410	43,550	63,940
12	60,600	53,560	64,130	64,360	43,880	64,870	66,920	43,460	66,770	62,640	43,530	53,790
13	54,360	63,950	44,740	47,600	25,800	51,710	53,310	43,470	67,100	47,590	51,500	56,080
14	54,020	63,720	63,790	47,980	52,870	46,490	67,930	52,930	63,670	47,510	53,240	50,540
15	55,680	62,970	60,100	52,370	62,120	47,170	66,580	52,750	48,090	47,490	53,950	51,350
16	54,030	64,080	53,470	70,000	53,520	46,730	53,430	66,210	51,630	47,400	43,640	53,670
17	53,390	61,910	52,920	63,340	52,070	46,970	53,290	52,040	52,740	59,590	43,810	69,030
18	66,120	52,410	53,370	53,560	44,230	69,400	70,860	52,610	53,090	52,300	50,790	60,850
19	70,430	63,520	53,040	53,760	53,350	58,070	71,360	43,300	51,810	52,900	52,570	60,670
20	54,420	63,470	53,430	53,640	51,190	52,760	53,280	61,380	51,060	51,000	51,700	60,720
21	56,980	64,040	53,740	50,910	52,810	53,100	52,700	59,140	52,880	43,100	57,350	43,990
22	54,180	46,670	66,150	53,380	53,410	53,580	52,930	53,020	52,000	43,360	59,540	44,060
23	5,350	62,770	64,610	53,740	51,750	51,950	66,360	58,870	46,720	51,430	43,670	44,060
24	53,640	62,160	52,990	49,700	47,500	49,880	67,950	65,120	42,990	56,530	51,640	44,010
25	71,820	44,350	53,140	59,300	47,240	52,810	53,300	52,950	51,640	52,620	51,600	44,090
26	65,400	63,870	51,970	58,940	67,940	45,370	61,140	52,290	52,960	43,280	51,850	44,110
27	64,240	62,830	47,790	53,200	53,250	58,750	65,370	68,650	60,380	43,230	48,260	44,010
28	65,040	54,330	52,100	53,010	52,990	66,280	53,120	51,840	51,150	43,360	55,990	44,130
29	63,090	53,340	53,210	53,230	50,300	52,400	52,020	67,800	52,170	52,360	59,070	44,240
30	53,380		57,680	68,710	70,100	53,380	59,050	52,890	52,850	52,480	51,830	47,850
31	53,510		52,880		70,600		66,490	53,140		43,080		67,650
Total												
Average												
Min												
Max	71,820	84,500	66,150	70,000	70,600	69,400	71,360	68,650	67,100	67,440	67,210	71,010

CoA Amount ***118,000 m^3/day***

Yearly Max **84,500**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Net to Distribution System** 2012

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	43,248	53,416	52,501	47,908	45,901	45,274	46,630	45,066	49,240	46,161	45,771	46,833
2	43,441	53,222	50,700	49,950	45,811	43,112	48,383	49,037	49,724	46,496	46,279	46,191
3	45,867	56,600	52,500	48,021	47,618	43,049	50,169	49,335	50,380	46,973	44,077	47,894
4	44,412	51,200	50,600	48,702	46,123	44,649	50,587	48,119	49,644	47,240	46,999	47,410
5	47,395	52,500	52,956	48,697	45,411	45,315	51,646	45,514	47,597	44,826	45,976	46,920
6	45,123	60,900	51,900	46,033	44,988	46,549	52,359	45,554	48,993	43,206	45,070	48,603
7	47,132	50,900	50,300	46,147	45,859	47,400	48,784	47,295	48,658	40,012	44,463	47,853
8	48,862	54,641	50,300	45,672	44,634	48,500	49,581	50,800	47,441	43,941	46,276	46,987
9	49,852	52,791	50,600	46,081	45,365	45,581	52,124	50,200	46,832	44,492	45,568	46,890
10	49,944	53,797	50,500	48,194	45,664	50,300	53,867	45,457	47,030	45,817	38,524	48,631
11	49,926	53,803	52,300	48,846	45,436	52,000	53,267	44,967	47,771	46,542	45,646	48,033
12	48,618	53,313	60,600	48,844	43,791	45,669	52,570	45,268	49,101	45,052	44,460	48,577
13	49,945	57,700	42,500	48,781	43,958	46,400	52,980	45,527	51,515	44,801	46,125	48,615
14	50,150	51,400	52,166	48,351	45,982	46,842	51,972	46,728	49,744	44,085	45,776	46,777
15	50,407	52,300	50,538	48,936	46,013	45,100	50,275	47,563	46,947	46,629	46,114	47,568
16	50,083	61,700	50,945	51,052	46,817	47,433	52,596	46,929	46,925	45,105	44,931	47,655
17	50,654	52,600	50,626	49,090	46,246	47,042	53,596	46,187	48,532	44,666	44,659	51,011
18	51,748	44,100	51,932	49,374	44,845	47,648	54,309	45,291	48,101	46,596	45,116	55,618
19	51,420	49,600	50,097	49,281	45,768	46,928	52,349	45,665	47,937	44,475	45,832	54,603
20	49,865	47,700	50,345	48,892	46,126	48,876	52,418	46,457	46,982	43,537	44,991	53,972
21	50,356	50,671	50,884	48,429	46,347	50,301	51,223	49,850	47,023	44,385	46,365	44,898
22	51,898	50,245	48,413	48,094	46,317	48,394	51,171	48,572	45,260	45,552	44,912	43,509
23	51,692	49,500	49,595	47,972	46,649	46,058	55,654	49,916	46,080	45,846	45,817	42,900
24	52,193	53,100	47,942	47,377	47,570	45,402	53,460	49,139	45,896	44,798	44,632	43,000
25	52,689	42,500	48,504	47,849	47,545	43,759	51,906	48,141	46,064	45,205	46,707	42,972
26	52,300	56,100	49,735	48,240	47,927	46,344	46,646	48,820	47,628	44,101	46,743	42,157
27	50,550	52,800	49,829	47,305	47,539	47,866	46,827	50,117	46,923	45,406	46,134	44,125
28	51,138	50,600	49,002	47,822	47,802	48,216	46,497	50,570	45,581	43,730	45,808	43,100
29	52,819	51,632	48,762	45,364	48,110	49,910	48,247	49,164	46,669	45,121	47,213	42,800
30	49,700		48,970	48,112	50,265	48,049	50,529	51,375	47,404	44,913	44,834	46,280
31	50,000		47,410		47,172		50,962	49,486		44,830		47,537
Total	1,533,422	1,521,329	1,563,948	1,443,415	1,435,596	1,407,966	1,583,585	1,482,105	1,433,618	1,394,536	1,361,816	1,459,917
Average	49,465	52,460	50,450	48,114	46,310	46,932	51,083	47,810	47,787	44,985	45,394	47,094
Min	43,248	42,500	42,500	45,364	43,791	43,049	46,497	44,967	45,260	40,012	38,524	42,157
Max	52,819	61,700	60,600	51,052	50,265	52,000	55,654	51,375	51,515	47,240	47,213	55,618

Yearly Average	**48,157**
Yearly Min	**38,524**
Yearly Max	**61,700**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Kingston Central Water Treatment Plant - **City East** Flows 2012 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	3,636	4,646	4,798	4,596	3,889	4,091	4,646	4,798	5,505	4,141	3,889	4,848
2	3,333	4,091	3,990	4,646	3,990	4,343	5,858	5,151	5,606	4,646	4,596	5,000
3	3,333	4,646	4,545	3,939	5,000	3,788	6,161	5,303	5,959	4,495	3,788	4,394
4	2,929	3,535	3,889	4,697	4,444	4,697	5,959	5,303	4,949	4,646	5,555	4,899
5	3,838	4,444	4,747	4,141	4,293	4,040	5,959	4,394	4,596	4,192	4,697	4,899
6	3,131	1,212	4,545	3,838	4,141	4,444	6,161	5,151	4,949	4,545	4,798	4,192
7	4,343	4,495	3,535	4,293	4,899	4,394	5,303	4,192	4,293	3,687	3,838	4,747
8	3,434	4,495	4,646	4,394	3,939	6,010	5,404	5,555	4,646	4,646	4,899	5,000
9	4,141	4,495	4,192	3,939	4,697	3,990	6,212	5,050	4,394	4,040	4,747	4,091
10	3,030	4,444	4,040	4,545	3,990	4,697	6,767	4,495	4,697	4,242	4,091	5,303
11	3,939	4,495	4,495	3,889	4,394	5,555	6,161	4,394	4,596	4,495	4,646	4,242
12	3,788	4,293	3,838	4,899	4,596	4,242	6,313	4,798	4,798	4,040	4,040	4,697
13	3,384	4,798	4,192	4,192	4,091	4,545	6,212	3,838	4,697	4,545	4,949	4,798
14	3,939	4,141	4,697	3,687	4,747	4,343	5,606	4,444	5,000	3,889	4,394	4,242
15	3,434	4,798	4,394	4,798	4,242	4,545	5,606	5,303	4,646	4,747	4,848	4,949
16	3,384	4,798	4,040	3,889	5,353	5,050	6,262	4,091	3,990	4,444	3,889	4,646
17	4,242	4,495	3,737	4,242	4,747	4,848	6,313	4,596	4,192	4,343	4,848	4,040
18	3,485	3,838	5,000	4,444	3,990	4,444	6,161	4,798	4,596	4,444	4,394	4,394
19	4,242	4,798	4,394	4,596	5,101	4,697	6,616	4,949	4,848	3,939	4,899	4,697
20	3,485	4,192	3,687	3,990	4,798	5,000	6,616	4,091	4,091	4,444	3,990	4,495
21	3,333	3,838	4,798	4,394	5,303	5,202	5,909	5,959	4,545	4,444	5,202	4,394
22	4,545	4,495	4,697	4,343	4,495	5,656	5,505	5,404	4,444	4,848	3,939	3,939
23	4,040	4,293	4,242	3,990	5,303	4,343	6,767	5,404	4,545	4,444	4,949	4,343
24	4,899	3,889	4,141	4,141	4,747	4,697	5,858	5,252	4,394	3,939	4,293	4,545
25	4,848	3,889	3,838	4,293	5,151	4,091	5,808	5,101	3,990	4,444	4,646	4,545
26	4,444	4,495	4,495	4,394	5,101	5,000	4,646	5,505	4,949	4,091	4,747	4,242
27	3,838	4,242	4,697	3,434	5,252	5,656	5,000	5,909	4,697	4,545	4,747	4,141
28	4,192	4,545	4,596	4,747	5,303	4,747	4,747	5,505	4,293	3,990	4,343	5,050
29	4,040	3,737	3,939	3,333	5,050	6,161	5,202	5,303	4,444	4,545	5,303	3,788
30	4,394		4,343	5,252	5,454	5,000	5,909	5,858	4,697	4,596	3,990	4,747
31	4,091		3,788		5,202		5,808	5,757		4,242		4,646
Total	119,130	122,564	132,967	127,967	145,693	142,309	181,447	155,641	140,037	134,734	135,946	140,946
Average	3,843	4,226	4,289	4,266	4,700	4,744	5,853	5,021	4,668	4,346	4,532	4,547
Min	2,929	1,212	3,535	3,333	3,889	3,788	4,646	3,838	3,990	3,687	3,788	3,788
Max	4,899	4,798	5,000	5,252	5,454	6,161	6,767	5,959	5,959	4,848	5,555	5,303

Yearly Average	**4,586**
Yearly Min	**1,212**
Yearly Max	**6,767**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Raw Water Flows** 2013 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	51,200	57,700	57,100	66,200	52,800	54,600	50,200	53,500	47,500	53,300	46,400	58,700
2	52,300	66,100	66,500	53,100	56,100	53,400	49,700	50,100	47,300	53,300	47,700	53,600
3	51,300	57,600	55,600	66,500	53,600	51,500	54,600	50,400	51,200	58,000	54,400	53,500
4	51,700	56,700	64,000	50,300	60,400	56,600	61,500	55,100	56,000	55,200	53,700	51,800
5	57,600	65,200	66,600	62,000	52,000	56,000	51,400	42,800	53,800	53,400	52,900	54,800
6	55,300	70,700	56,300	64,700	64,800	51,800	55,600	56,800	50,300	53,500	51,700	58,100
7	57,100	68,300	64,100	51,000	54,500	49,500	52,500	56,300	55,800	53,700	51,600	54,200
8	60,100	55,900	66,200	66,800	61,600	52,800	54,500	50,600	54,800	54,800	49,500	55,000
9	56,300	69,500	50,700	51,400	50,400	65,500	64,400	50,400	49,700	49,600	50,900	55,100
10	56,900	55,800	59,000	61,600	60,800	47,400	61,300	56,700	54,300	48,500	50,600	51,400
11	64,800	64,200	66,600	56,600	54,800	46,700	60,500	55,400	56,800	48,300	46,500	54,300
12	55,800	60,200	51,500	64,300	53,100	52,100	50,700	47,800	56,600	49,900	51,500	54,400
13	55,500	60,500	66,600	51,400	52,800	55,700	54,500	49,100	55,400	45,800	54,400	55,000
14	54,600	65,900	60,200	66,100	59,300	54,200	57,500	56,500	47,200	47,200	54,000	55,000
15	62,000	65,600	56,400	46,800	53,100	49,800	57,400	56,300	48,100	52,200	48,400	55,100
16	58,600	59,700	63,400	62,400	50,200	49,500	57,500	56,200	54,300	56,200	48,000	54,800
17	53,900	57,100	59,800	57,100	63,000	49,500	58,100	47,700	55,100	57,000	55,000	63,900
18	65,500	66,600	62,000	60,700	49,500	49,600	57,600	51,800	55,600	53,300	52,600	60,800
19	66,400	56,500	53,700	57,100	59,600	55,300	63,600	53,700	50,200	53,800	46,600	54,400
20	57,000	54,600	60,100	55,500	49,600	56,700	50,400	54,700	53,100	46,200	52,000	55,400
21	56,000	66,300	58,700	58,300	58,900	51,500	50,600	60,800	50,700	50,200	54,100	52,900
22	55,900	56,900	60,500	66,200	52,000	49,500	57,500	57,600	50,300	48,500	52,000	52,800
23	60,200	56,200	64,800	53,900	53,300	49,700	57,300	47,200	49,500	49,400	52,000	54,600
24	66,400	59,400	60,000	53,900	56,200	56,500	52,900	46,001	51,800	54,300	51,900	55,100
25	56,400	70,200	64,300	60,400	50,000	56,500	53,200	56,100	54,400	48,400	54,600	55,300
26	59,100	52,900	61,900	56,000	46,700	55,100	53,700	48,400	52,400	50,100	55,300	49,700
27	65,900	66,800	56,500	64,100	53,200	56,700	53,600	47,500	55,600	55,100	52,800	52,500
28	59,300	62,200	60,500	54,300	56,000	53,600	54,700	55,800	50,000	51,400	51,600	55,200
29	56,400		62,100	53,000	56,200	49,500	57,000	54,800	56,500	48,400	52,000	55,700
30	60,600		52,600	64,100	51,900	49,500	57,000	52,200	60,400	52,000	54,900	55,500
31	62,100		55,500		51,600		56,800	55,500		53,500		55,800
Total	1,802,200	1,725,300	1,863,800	1,755,800	1,698,000	1,586,300	1,727,800	1,633,801	1,584,700	1,604,500	1,549,600	1,704,400
Average	58,135	61,618	60,123	58,527	54,774	52,877	55,735	52,703	52,823	51,758	51,653	54,981
Min	51,200		50,700	46,800	46,700	46,700	49,700	42,800	47,200	45,800	46,400	49,700
Max	66,400	70,700	66,600	66,800	64,800	65,500	64,400	60,800	60,400	58,000	55,300	63,900

PTTW Amount ***118,000 m^3/day***

Yearly Average **55,476**
Yearly Min
Yearly Max **70,700**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Raw) Flows** 2013

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	54,120	76,090	67,720	72,960	55,460	71,590	60,030	56,420	51,440	75,880	49,670	71,180
2	70,050	75,660	73,100	69,880	69,870	69,710	52,850	54,540	49,700	73,830	52,750	66,740
3	56,100	72,750	70,960	72,690	71,080	59,250	73,400	55,400	60,170	68,950	56,860	65,070
4	54,590	63,030	72,500	62,310	72,300	59,730	70,430	59,500	61,250	67,230	58,880	57,000
5	74,220	75,620	73,040	66,000	70,010	59,350	70,740	58,100	59,270	55,960	65,670	69,580
6	73,120	76,900	71,580	72,780	73,370	69,270	70,050	59,790	60,990	55,810	57,700	70,540
7	71,140	76,710	71,950	54,000	68,830	53,630	70,790	59,260	58,760	56,010	54,040	63,750
8	72,280	74,090	71,960	72,520	72,640	59,550	68,670	58,010	58,250	58,730	54,080	61,400
9	75,070	76,280	57,000	68,970	62,000	74,680	78,550	56,730	52,280	57,060	59,100	62,300
10	67,860	73,090	57,000	72,210	72,440	65,500	81,130	59,560	75,100	65,610	66,290	64,900
11	72,100	75,460	73,140	72,810	69,900	49,620	93,070	59,210	70,990	56,360	63,920	63,140
12	66,590	74,160	59,000	72,520	55,980	59,340	57,000	50,360	69,570	56,680	54,740	59,580
13	64,710	71,630	72,720	71,840	55,500	58,720	59,560	60,050	60,000	53,790	72,090	64,330
14	71,470	72,330	73,010	73,210	71,520	58,790	59,770	58,810	49,160	51,920	70,980	59,520
15	71,100	72,310	71,160	52,340	68,880	54,980	60,340	59,040	53,530	68,840	66,060	59,380
16	69,770	71,970	75,840	72,800	70,450	52,710	60,340	59,170	62,850	75,690	60,000	60,310
17	66,740	71,490	76,130	66,000	72,170	53,110	70,890	55,000	58,520	77,920	63,000	92,690
18	72,530	71,870	74,570	75,890	52,820	52,750	60,180	58,880	58,880	75,360	60,450	74,540
19	72,570	72,600	73,790	75,720	70,780	67,990	72,870	75,270	57,690	69,920	72,240	62,000
20	70,170	59,270	65,000	72,740	52,810	59,680	53,160	58,930	59,470	64,530	54,250	65,100
21	60,020	78,320	71,750	72,520	70,240	59,050	53,130	74,600	72,220	61,510	72,690	62,820
22	61,350	68,560	70,020	72,910	68,480	52,730	60,350	72,210	59,030	50,930	57,760	63,640
23	73,000	64,000	70,590	54,000	68,290	53,230	59,840	50,600	54,490	66,950	54,870	56,000
24	72,800	75,100	73,010	67,750	59,500	59,570	58,470	57,760	59,790	69,280	56,000	63,000
25	62,390	74,940	75,010	70,970	58,750	59,490	68,000	59,190	60,750	50,560	68,450	63,000
26	77,930	77,420	72,120	67,000	49,920	59,800	59,000	55,180	58,540	56,420	69,130	57,000
27	79,370	72,620	73,790	75,370	61,010	59,880	58,000	49,830	58,820	60,410	67,240	56,990
28	74,400	71,730	76,850	67,310	58,840	59,450	61,000	71,520	57,250	59,650	55,600	58,150
29	65,320		72,940	58,000	59,620	52,880	62,000	70,410	69,870	50,890	54,730	60,730
30	73,390		58,000	58,000	68,270	52,930	67,000	59,350	69,460	63,590	57,000	60,000
31	77,380		72,550		72,460		61,000	58,950		64,180		61,710
Total												
Average												
Min												
Max	79,370	78,320	76,850	75,890	73,370	74,680	93,070	75,270	75,100	77,920	72,690	92,690

CoA Amount ***118,000 m^3/day***

Yearly Average
Yearly Min
Yearly Max **93,070**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Treated Water Flows** 2013 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	46,600	53,300	52,600	61,500	46,900	48,900	43,500	46,300	42,600	48,700	42,600	53,800
2	47,700	61,700	62,000	47,500	50,400	47,400	42,900	42,700	42,600	48,400	43,800	48,600
3	46,700	53,100	50,300	62,000	47,300	45,500	48,500	43,100	46,100	52,800	49,300	48,400
4	46,900	52,300	59,500	44,400	55,200	51,300	56,100	48,500	50,300	50,000	48,800	46,700
5	53,200	60,300	61,900	57,100	45,800	50,900	44,800	35,400	47,800	47,900	47,900	49,600
6	50,600	66,200	50,800	60,000	60,000	45,400	49,700	50,700	45,100	48,000	46,600	53,300
7	52,700	63,600	59,500	45,100	48,300	43,000	46,200	50,000	49,700	47,900	46,300	49,500
8	55,600	51,100	61,500	62,300	56,300	47,000	45,400	43,500	48,400	49,400	43,800	50,400
9	52,000	64,600	45,500	45,500	43,900	60,700	51,100	43,300	42,600	43,100	46,200	50,500
10	52,700	50,800	54,300	56,800	55,700	43,300	50,550	50,600	47,900	43,100	46,000	47,200
11	60,200	59,500	61,900	51,400	49,200	42,700	50,100	49,200	51,400	43,700	40,900	49,400
12	51,700	55,700	46,300	59,700	46,700	47,400	43,400	42,800	51,200	43,900	46,600	50,600
13	51,400	56,000	62,100	47,200	46,800	50,000	47,600	44,000	50,100	40,600	49,200	50,600
14	50,100	61,400	55,400	61,500	53,200	47,800	50,700	50,600	42,600	42,000	48,900	50,700
15	57,600	60,800	51,300	42,800	47,900	43,300	50,800	50,300	43,600	42,400	43,400	50,700
16	54,100	54,800	58,600	58,000	46,200	43,000	50,800	50,200	49,300	45,500	43,300	50,300
17	50,000	52,000	55,300	51,600	58,100	42,900	52,000	42,200	49,500	46,700	50,300	59,600
18	61,000	62,000	57,900	55,400	43,200	43,000	51,100	46,400	50,400	44,600	47,600	55,100
19	61,900	51,000	49,100	51,600	54,400	49,600	57,500	47,200	43,800	48,200	41,800	49,400
20	52,600	49,900	55,500	49,500	43,200	50,700	42,800	48,300	47,300	40,700	46,700	50,800
21	51,800	61,800	55,000	53,000	53,700	45,100	43,000	54,800	45,500	44,500	49,000	48,500
22	51,600	52,400	55,600	61,600	46,000	43,100	50,900	52,500	45,300	42,300	46,500	48,900
23	55,900	51,400	60,200	47,800	47,700	43,200	50,600	42,300	42,600	45,000	46,600	50,000
24	62,000	54,900	52,600	47,900	51,100	50,600	47,300	41,200	46,100	48,700	46,700	50,500
25	52,000	65,700	58,400	55,100	44,700	50,700	47,000	50,300	49,300	42,400	49,200	50,400
26	54,500	48,100	55,800	50,400	43,000	49,500	46,400	42,800	47,000	44,200	50,200	43,100
27	61,700	62,200	51,000	59,100	48,600	50,800	46,400	42,600	50,500	50,300	47,600	46,900
28	54,900	57,700	55,800	48,100	50,800	47,300	47,800	50,600	44,600	45,900	46,600	50,300
29	52,100		57,100	46,900	51,100	42,800	50,600	48,000	51,200	42,700	46,700	50,800
30	56,400		47,000	59,000	45,600	43,200	50,800	45,700	54,900	46,800	49,700	50,600
31	57,700		50,200		45,500		50,500	49,500		49,000		50,800
Total	1,665,900	1,594,300	1,710,000	1,599,800	1,526,500	1,410,100	1,506,850	1,445,600	1,419,300	1,419,400	1,398,800	1,556,000
Average	53,739	56,939	55,161	53,327	49,242	47,003	48,608	46,632	47,310	45,787	46,627	50,194
Min	46,600		45,500	42,800	43,000	42,700	42,800	35,400	42,600	40,600	40,900	43,100
Max	62,000	66,200	62,100	62,300	60,000	60,700	57,500	54,800	54,900	52,800	50,300	59,600

		Yearly Total	**18,252,550**
		Yearly Average	**50,047**
CoA Amount	***118,000 m^3/day***	**Yearly Min**	
		Yearly Max	**66,200**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Treated) Flows** 2013 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	48,260	68,340	62,710	64,300	48,340	63,350	51,170	51,770	43,840	64,050	43,810	63,950
2	63,090	68,090	64,280	63,830	63,910	62,510	44,130	46,300	43,870	78,460	47,700	59,140
3	48,090	65,390	63,250	64,510	62,610	52,430	68,950	46,330	56,750	60,270	52,820	60
4	48,290	66,160	64,350	63,160	63,970	53,450	68,660	52,200	53,240	59,670	53,060	56,730
5	67,280	68,070	64,320	77,830	62,480	53,940	61,990	51,660	52,470	49,820	53,130	63,440
6	65,450	69,320	63,680	64,250	64,320	73,380	63,520	53,010	53,100	49,730	51,870	62,140
7	62,360	68,500	64,090	62,680	62,930	44,430	62,720	63,070	52,880	49,660	48,150	52,590
8	63,960	68,190	64,540	64,420	64,140	53,550	52,950	52,980	53,030	52,870	46,730	52,330
9	67,660	68,060	62,270	72,830	59,950	67,360	53,470	50,360	44,030	56,660	52,820	57,510
10	62,820	67,700	64,400	64,280	64,340	62,860	53,410	52,960	66,650	60,250	52,610	52,360
11	63,860	68,290	64,540	63,450	61,990	43,920	53,400	52,820	63,830	52,240	52,410	52,880
12	54,260	67,130	63,380	64,290	48,070	53,110	59,360	43,960	67,310	51,800	47,920	52,960
13	54,290	64,250	64,410	63,010	48,420	53,570	53,240	51,760	53,280	63,770	64,600	64,320
14	63,900	64,420	72,040	64,190	63,830	52,550	53,180	53,010	43,950	43,200	64,910	52,880
15	63,530	73,670	65,620	52,210	61,080	47,550	53,430	53,110	47,700	43,320	64,910	53,230
16	61,250	64,200	68,180	64,440	63,430	44,040	53,420	52,500	63,470	52,790	53,180	52,740
17	58,810	64,400	67,930	72,060	64,010	44,380	67,620	49,200	53,470	54,250	52,980	82,860
18	64,510	64,480	68,220	68,060	44,460	44,340	53,400	63,920	52,900	62,910	66,210	67,030
19	64,690	63,940	66,840	67,600	64,220	68,190	64,280	70,190	51,340	62,580	65,870	52,790
20	62,007	65,930	69,050	65,250	44,520	53,660	44,220	53,090	52,830	52,060	48,110	52,880
21	54,160	70,540	78,900	63,740	64,120	52,200	49,680	72,670	62,220	53,530	64,790	59,010
22	53,950	68,360	63,590	64,640	61,530	44,410	53,380	64,520	52,670	43,730	60,420	56,300
23	82,510	53,990	63,230	64,000	69,820	44,240	53,280	48,760	44,040	59,960	47,900	52,999
24	64,520	66,760	63,610	62,620	53,500	53,700	52,410	51,550	53,170	61,550	48,040	64,850
25	61,260	68,120	64,270	63,620	53,100	53,560	61,400	52,960	65,009	43,760	61,970	52,620
26	72,120	67,080	63,350	64,260	48,760	66,090	48,100	47,170	53,000	51,350	61,280	50,910
27	72,150	64,300	68,130	67,530	59,760	53,800	48,160	43	53,090	53,080	60,390	52,020
28	68,320	63,330	66,260	65,555	53,540	53,050	53,050	63,550	51,900	57,090	47,840	52,410
29	54,010		63,970	48,340	53,540	44,130	53,330	61,370	61,140	43,900	47,780	52,480
30	67,820		48,490	67,490	66,240	52,380	64,820	52,780	61,240	58,980	63	53,110
31	70,960		63,440		63,300		53,430	52,710		53,050		52,990
Total												
Average												
Min												
Max	82,510	73,670	78,900	77,830	69,820	73,380	68,950	72,670	67,310	78,460	66210.00	82,860

CoA Amount ***118,000 m^3/day***

Yearly Max **82,860**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
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King St. Water Treatment Plant - **Net to Distribution System** 2013

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	46,580	55,228	57,668	54,444	49,603	48,927	44,547	47,340	47,655	51,549	45,747	51,216
2	48,959	55,989	56,481	53,489	53,547	47,029	45,808	43,661	45,051	55,423	46,092	50,780
3	46,939	55,551	56,892	55,223	55,363	48,183	50,673	46,081	48,286	50,534	49,532	47,751
4	49,298	57,176	56,565	54,735	51,828	48,465	50,369	43,087	47,107	51,159	46,574	50,172
5	52,418	58,246	56,733	53,549	50,537	48,124	48,199	46,080	48,370	46,754	48,072	50,428
6	52,700	60,874	56,352	55,588	55,031	47,321	48,031	45,546	48,287	49,226	44,924	49,795
7	54,098	63,468	57,751	52,189	51,328	45,047	46,651	49,755	45,679	47,019	46,234	49,434
8	54,063	57,215	58,718	55,085	52,855	50,233	49,037	45,242	48,632	45,074	46,125	48,678
9	53,603	57,220	54,219	52,463	50,724	53,068	49,172	47,686	46,158	46,704	44,756	50,765
10	54,317	57,796	54,373	53,865	50,003	46,063	48,728	47,566	50,669	43,961	46,808	48,459
11	54,450	58,672	56,468	55,223	49,399	46,231	46,754	44,874	48,286	45,436	44,544	50,831
12	54,045	57,164	54,210	53,082	48,515	47,228	48,369	49,226	50,273	40,588	48,786	50,328
13	52,864	58,147	56,866	55,230	49,119	47,304	49,217	46,074	46,655	42,846	45,735	50,892
14	52,949	58,319	55,837	54,425	50,663	46,356	49,892	50,077	48,649	41,099	47,237	50,329
15	54,884	56,924	55,023	51,340	48,834	45,778	52,291	46,776	45,561	46,680	45,487	52,356
16	55,233	55,615	56,507	55,277	50,884	42,927	52,443	46,722	48,525	44,268	47,043	50,181
17	54,989	58,360	55,572	52,263	50,342	45,881	52,795	47,434	46,062	50,675	45,888	60,276
18	57,217	57,495	55,714	52,922	49,547	45,716	52,617	48,918	48,572	44,600	48,322	55,908
19	55,626	52,795	55,447	54,508	49,199	47,063	49,292	48,181	46,271	48,200	46,060	50,944
20	55,661	55,955	54,175	51,971	48,427	46,977	47,603	51,493	48,440	40,700	47,561	49,740
21	55,682	56,540	56,524	53,636	51,275	47,465	46,982	50,143	44,447	44,500	47,953	48,911
22	54,853	54,553	57,170	59,414	48,696	45,975	48,396	49,095	47,738	42,300	45,440	50,033
23	56,238	53,739	54,821	52,563	48,197	46,493	48,122	42,843	45,383	45,543	47,726	48,470
24	56,992	56,960	55,714	53,538	47,788	48,467	46,174	47,023	47,624	46,766	48,409	49,818
25	55,339	56,895	56,731	59,287	46,290	48,461	51,704	44,251	45,968	43,480	47,213	46,703
26	56,170	57,607	55,316	51,235	47,220	48,838	48,169	47,881	48,530	45,870	49,511	46,962
27	57,858	59,245	55,406	54,151	48,772	49,535	47,122	44,111	45,233	46,080	47,282	48,967
28	56,364	57,236	55,244	50,452	48,316	46,929	48,542	49,116	47,654	47,980	50,277	52,506
29	55,585		53,450	47,178	47,894	43,012	48,222	46,622	51,763	44,230	46,693	49,753
30	57,063		51,465	60,590	48,734	46,711	50,800	47,356	52,714	47,595	50,038	50,799
31	56,965		53,234		45,500		51,401	44,319		44,707		50,045
Total	1,679,998	1,600,985	1,726,642	1,618,913	1,544,427	1,415,804	1,518,119	1,454,577	1,430,238	1,431,544	1,412,070	1,562,228
Average	54,193	57,178	55,698	53,964	49,820	47,193	48,972	46,922	47,675	46,179	47,069	50,394
Min	46,580		51,465	47,178	45,500	42,927	44,547	42,843	44,447	40,588	44,544	46,703
Max	57,858	63,468	58,718	60,590	55,363	53,068	52,795	51,493	52,714	55,423	50,277	60,276
					Yearly Total		**18,395,544**					
					Yearly Average		**50,438**					
					Yearly Min							
					Yearly Max		**63,468**					

1211 John Counter Blvd
P.O. Box 790
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Kingston St. Water Treatment Plant - **City East** Flows 2013

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3,939	4,747	6,010	5,101	4,747	5,656	4,444	6,111	5,656	3,384	7,807	5,626
2	5,050	5,404	4,848	5,707	5,606	4,949	3,990	3,030	3,384	6,060	7,484	6,378
3	4,394	5,151	6,363	5,252	5,555	6,111	6,010	6,414	5,707	3,838	5,949	6,525
4	4,394	5,858	6,161	6,010	6,161	5,505	4,596	3,485	4,192	5,959	6,913	7,040
5	5,404	5,353	5,000	4,949	5,505	5,303	5,303	5,959	4,596	3,283	6,605	6,025
6	5,252	7,070	5,707	6,262	7,272	4,848	4,899	3,838	5,606	5,808	7,540	7,025
7	5,252	7,676	6,818	4,848	5,555	4,495	4,040	7,373	3,838	3,838	7,060	6,368
8	5,252	5,555	5,656	6,111	7,070	7,828	6,060	4,242	6,060	3,788	7,459	7,100
9	4,949	5,353	4,949	4,747	5,808	7,878	5,101	5,151	3,737	4,596	5,999	7,055
10	5,505	5,808	6,262	5,808	4,697	5,151	4,848	5,959	5,959	3,586	7,525	6,489
11	5,101	5,555	5,151	5,909	6,363	5,505	4,495	4,343	3,485	5,505	5,570	5,954
12	5,959	5,303	5,202	4,798	5,606	4,848	6,313	7,121	6,262	2,929	6,616	6,994
13	5,353	5,555	5,808	6,565	4,798	4,899	5,909	3,636	3,737	5,454	6,363	6,065
14	4,798	5,353	4,798	5,656	5,404	4,495	5,606	8,484	6,414	3,081	6,100	6,974
15	5,454	5,303	5,404	4,848	5,202	4,899	6,111	4,646	3,838	5,303	7,060	6,323
16	5,202	5,555	5,555	5,757	6,010	4,040	5,909	4,242	6,161	3,535	6,403	7,085
17	4,646	6,565	5,606	4,798	6,262	4,293	6,565	6,060	3,131	4,848	6,979	5,919
18	5,858	5,505	4,949	5,757	5,454	4,747	7,525	6,161	5,454	4,141	6,398	6,434
19	5,202	4,495	6,262	6,212	5,808	4,949	4,495	5,606	3,535	4,798	7,166	7,110
20	5,454	6,010	4,444	4,444	5,454	4,545	5,808	6,868	5,959	2,980	5,903	5,909
21	5,000	5,858	6,313	6,262	6,111	5,000	5,353	5,505	2,677	6,010	7,504	8,661
22	5,454	5,757	5,202	4,747	5,606	5,151	5,151	6,111	5,505	3,232	5,600	7,873
23	5,101	4,747	5,303	6,414	5,757	5,303	4,444	3,283	3,838	4,798	6,075	8,338
24	5,303	6,616	5,808	5,353	4,899	4,545	4,343	6,818	5,101	4,798	6,004	6,328
25	4,949	5,202	5,757	5,808	4,949	5,000	7,626	3,687	3,434	3,030	6,590	7,060
26	5,252	6,060	5,656	5,000	4,899	4,091	4,949	7,323	5,454	5,555	6,343	5,974
27	5,959	5,252	4,798	5,959	5,404	4,747	5,050	2,980	3,283	3,889	5,651	7,060
28	5,353	6,313	6,111	4,798	5,050	5,656	6,212	5,909	5,454	6,161	6,323	6,388
29	5,353		4,747	5,757	5,202	2,879	4,899	4,798	4,394	3,030	5,929	7,050
30	5,505		5,454	6,010	5,454	5,404	5,707	5,606	4,495	5,555	6,313	6,070
31	5,454		5,353		5,505		3,838	3,636		3,788		6,974
Total	161,095	158,974	171,448	165,640	173,165	152,712	165,590	164,378	140,340	136,552	197,233	208,171
Average	5,197	5,678	5,531	5,521	5,586	5,090	5,342	5,303	4,678	4,405	6,574	6,715
Min	3,939		4,444	4,444	4,697	2,879	3,838	2,980	2,677	2,929	5,570	5,626
Max	5,959	7,676	6,818	6,565	7,272	7,878	7,626	8,484	6,414	6,161	7,807	8,661
					Yearly Total		**1,995,295**					
					Yearly Average		**5,468**					
					Yearly Min							
					Yearly Max		**8,661**					

Utilities Kingston

1211 John Counter Blvd
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King St. Water Treatment Plant - **Raw Water Flows** 2014

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	55,400	64,600	65,500	61,600	56,600	53,800	47,200	47,000	47,200	48,200	47,900	54,400
2	57,400	58,000	58,200	65,300	45,200	58,800	52,100	46,900	47,300	56,000	51,100	51,500
3	55,400	66,100	66,500	61,300	52,800	54,400	53,000	47,000	47,200	46,100	50,400	50,500
4	62,300	63,900	59,700	62,800	54,400	50,300	49,700	47,100	53,900	45,800	47,800	51,800
5	56,400	60,400	57,300	55,800	53,300	46,600	56,900	47,000	51,300	46,400	50,900	52,100
6	70,000	66,000	69,900	55,600	54,000	47,700	50,700	51,100	55,300	49,100	48,500	51,200
7	57,000	66,300	56,700	56,400	51,400	47,500	49,700	48,100	50,200	47,700	46,000	51,000
8	61,800	60,100	68,500	55,900	53,500	47,400	49,800	47,100	49,600	51,700	50,100	49,000
9	71,100	66,500	61,100	62,500	50,000	51,100	47,900	53,900	52,400	50,700	51,100	48,000
10	57,000	58,800	58,400	56,800	50,400	54,100	52,800	50,700	52,500	51,000	49,600	50,900
11	57,600	66,200	61,500	55,400	57,100	54,200	49,900	49,900	51,400	42,700	45,500	51,300
12	69,700	59,900	64,100	53,500	50,400	50,000	49,800	53,200	49,500	45,400	45,600	48,300
13	60,500	57,000	68,600	55,000	46,900	47,400	49,500	49,900	51,200	45,600	47,500	50,400
14	65,700	62,800	55,100	56,100	47,500	47,500	49,700	48,400	53,700	45,500	47,600	52,800
15	62,500	62,300	65,300	56,400	47,800	47,500	49,700	46,300	50,400	45,700	49,600	49,300
16	56,600	61,700	57,400	54,100	50,100	47,500	55,500	46,300	49,700	45,900	49,000	48,100
17	67,200	59,900	64,600	52,500	49,900	47,500	44,000	33,500	56,500	54,300	48,400	49,700
18	63,500	55,900	64,000	54,500	49,700	49,400	47,200	47,200	49,800	49,200	46,100	50,000
19	57,500	59,800	55,400	56,100	51,000	49,900	47,400	47,100	47,300	51,400	54,800	48,000
20	69,400	60,000	68,500	49,600	55,800	50,000	47,000	47,400	50,100	48,100	48,200	45,500
21	64,500	63,300	59,700	54,000	44,400	50,100	47,400	47,100	49,400	50,900	47,600	45,400
22	62,600	52,300	59,200	56,500	49,800	49,900	57,900	47,100	53,900	49,400	48,600	45,500
23	60,800	60,800	67,700	56,400	53,700	50,200	49,000	47,100	47,900	47,000	51,100	46,800
24	66,700	61,800	55,600	56,500	50,600	50,400	49,800	47,100	48,400	45,000	51,200	48,200
25	56,400	62,500	67,300	56,200	47,800	48,500	55,500	47,200	50,400	45,700	55,200	42,800
26	63,600	57,700	57,700	53,200	53,200	52,800	51,600	46,900	49,400	53,900	45,200	41,600
27	69,200	72,500	61,400	50,200	48,900	56,900	45,600	47,000	49,200	46,000	52,400	45,300
28	57,200	54,600	57,300	52,300	51,000	46,600	46,900	47,900	52,000	46,300	48,100	45,300
29	69,500		56,000	55,700	48,100	47,200	46,800	53,500	48,800	49,500	47,800	45,400
30	62,600		61,400	55,900	48,500	47,200	47,100	53,100	47,300	49,900	47,900	44,600
31	62,600		59,000		49,000		46,800	46,800		47,600		46,000
Total	1,929,700	1,721,700	1,908,600	1,684,100	1,572,800	1,502,400	1,543,900	1,485,900	1,513,200	1,497,700	1,470,800	1,500,700
Average	62,248	61,489	61,568	56,137	50,735	50,080	49,803	47,932	50,440	48,313	49,027	48,410
Min	55,400		55,100	49,600	44,400	46,600	44,000	33,500	47,200	42,700	45,200	41,600
Max	71,100	72,500	69,900	65,300	57,100	58,800	57,900	53,900	56,500	56,000	55,200	54,400

PTTW Amount ***118,000 m^3/day***

Yearly Average **53,015**

Yearly Min

Yearly Max **72,500**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Raw) Flows** 2014

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	62,070	74,370	74,510	77,800	59,630	73,870	50,280	49,020	49,340	54,910	50,480	69,170
2	83,340	70,760	72,280	78,460	58,990	76,450	69,960	48,520	49,550	70,040	53,360	66,890
3	61,600	70,750	78,380	75,410	73,370	65,620	71,050	50,140	49,840	49,150	53,270	72,890
4	77,840	79,740	74,920	75,050	68,270	55,570	52,790	50,170	71,530	49,150	50,420	71,230
5	64,940	70,310	77,480	58,720	56,960	49,500	71,180	49,540	73,320	56,110	67,420	66,440
6	75,420	79,200	75,300	58,420	56,870	49,780	62,880	68,240	70,240	69,940	66,830	53,980
7	68,120	71,520	57,000	74,900	56,690	50,560	52,460	51,870	62,300	72,520	49,230	53,550
8	75,360	70,710	79,800	63,100	63,320	49,980	52,560	49,860	52,460	72,520	54,070	52,760
9	79,180	70,800	77,630	69,900	52,680	72,030	52,850	70,850	71,760	70,260	53,680	51,270
10	78,470	63,000	78,450	67,500	56,390	56,920	69,130	62,860	68,890	53,520	53,220	70,710
11	73,060	70,770	76,650	62,050	62,800	57,160	52,620	52,960	69,680	51,540	48,340	66,510
12	75,630	73,700	63,000	59,080	58,740	56,350	52,530	71,960	52,140	47,410	54,730	50,850
13	72,360	79,630	79,170	59,920	52,980	51,000	53,210	64,090	75,670	48,330	49,870	67,350
14	75,480	70,910	78,030	58,890	49,930	51,000	52,960	62,420	73,890	47,060	47,600	69,810
15	72,900	71,030	80,990	59,140	52,210	51,000	52,610	51,190	63,160	48,770	68,870	66,710
16	73,370	70,850	72,440	59,250	52,970	49,690	70,640	50,070	52,320	49,010	61,920	50,850
17	64,000	69,610	78,650	58,890	52,600	50,310	56,350	49,040	70,720	72,210	51,750	66,030
18	74,770	67,870	76,880	58,980	52,470	68,750	49,490	49,960	69,770	53,240	55,380	66,270
19	63,000	73,180	64,570	58,030	58,730	53,230	49,560	49,780	52,720	68,150	70,420	68,280
20	75,800	70,470	78,720	56,730	59,200	53,200	50,280	60,020	52,100	50,420	59,000	48,170
21	74,870	70,920	74,960	58,920	53,270	53,160	50,430	50,030	52,110	68,670	52,070	48,510
22	77,740	58,620	76,170	58,240	52,890	53,100	71,730	50,010	73,320	67,390	52,650	47,600
23	73,760	76,050	77,070	61,020	59,640	56,000	56,460	49,570	62,870	54,420	54,230	50,640
24	74,540	74,150	60,120	58,690	59,130	57,100	52,780	49,920	55,790	47,450	56,000	51,270
25	73,860	79,540	77,960	58,570	59,170	57,750	69,740	49,970	72,090	48,480	71,600	51,890
26	74,140	76,280	72,160	58,550	60,160	73,770	69,920	57,660	51,320	68,150	50,000	50,000
27	74,040	79,580	75,510	59,280	58,150	71,450	58,000	49,180	51,260	59,410	68,900	50,000
28	73,450	73,860	75,230	57,880	55,930	51,100	49,140	56,850	70,420	50,910	68,900	50,000
29	73,340		62,850	58,120	52,130	50,220	52,950	55,950	61,830	68,190	50,460	50,000
30	73,620		74,560	59,240	61,760	51,000	48,700	55,690	50,070	66,730	50,850	48,740
31	73,980		77,320		73,770		49,200	51,240		53,570		48,470
Total												
Average												
Min												
Max	83,340	79,740	80,990	78,460	73,770	76,450	71,730	71,960	75,670	72,520	71,600	72,890

CoA Amount ***118,000 m^3/day***

Yearly Average
Yearly Min
Yearly Max **83,340**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Treated Water Flows** 2014 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	50,300	60,200	60,900	54,400	50,800	47,800	43,300	43,100	43,400	43,200	42,400	48,900
2	51,600	53,500	53,000	51,000	41,400	53,100	48,000	42,900	43,400	51,200	46,200	46,300
3	50,700	61,400	61,800	52,200	47,400	48,100	47,000	43,000	43,400	42,400	42,000	44,900
4	57,400	59,200	54,700	58,200	47,900	44,800	43,300	43,100	49,600	42,100	42,400	46,600
5	51,600	55,900	52,500	50,900	47,200	43,300	51,300	43,000	45,300	42,700	46,600	47,300
6	65,700	61,200	65,500	50,700	47,000	43,100	44,300	47,000	49,700	45,400	44,900	46,200
7	52,100	61,500	51,400	51,300	44,500	43,500	43,100	43,200	43,900	44,000	42,400	46,100
8	57,200	54,800	63,900	50,800	43,500	43,500	43,200	43,300	43,300	46,700	45,300	43,500
9	66,700	61,700	56,100	57,600	43,400	46,200	43,100	49,800	46,500	46,900	46,200	42,500
10	51,600	53,300	52,700	51,700	43,900	47,400	47,500	44,500	46,700	45,900	45,300	45,600
11	53,600	61,600	55,600	50,700	51,600	47,500	43,300	43,500	45,400	38,700	41,500	45,800
12	65,900	55,300	59,700	49,900	43,800	44,600	43,100	47,200	43,300	41,600	41,800	42,500
13	55,700	51,500	64,300	51,200	42,000	43,500	43,000	44,800	45,200	41,700	41,400	44,700
14	61,300	57,900	49,800	50,900	43,500	43,600	43,100	43,500	48,100	41,800	41,700	47,500
15	58,700	57,200	59,700	50,900	43,500	43,700	43,100	42,000	44,200	41,900	44,200	43,700
16	51,000	56,600	52,100	50,300	43,500	43,600	50,500	42,400	43,400	42,100	43,700	42,500
17	62,700	54,600	60,100	50,700	43,400	43,600	40,100	29,700	51,100	49,900	41,900	44,000
18	58,500	50,700	59,300	50,700	43,300	44,500	43,200	43,200	45,900	44,300	42,000	44,400
19	51,900	54,600	50,800	50,300	44,800	43,500	43,400	43,300	43,300	45,900	50,800	43,600
20	65,000	55,200	62,200	42,900	49,700	43,500	43,100	43,500	43,300	42,300	42,700	41,900
21	59,700	58,100	53,900	48,200	38,200	43,700	43,400	43,200	43,300	45,500	41,900	41,900
22	58,000	46,600	54,500	50,700	43,400	43,500	53,600	43,300	48,300	43,600	42,900	41,900
23	55,700	56,100	63,200	50,800	47,900	43,700	43,600	43,200	44,000	42,300	46,100	41,900
24	62,100	57,200	50,800	50,700	44,300	44,000	43,200	43,200	43,400	41,900	46,100	42,400
25	50,600	57,700	62,600	50,300	41,400	43,200	49,700	43,400	45,100	42,000	50,700	37,200
26	58,500	53,100	52,900	47,300	48,100	46,900	47,800	43,500	43,600	50,000	41,500	37,900
27	64,700	68,000	56,600	44,200	43,600	51,300	41,700	43,300	43,400	42,600	48,700	41,800
28	51,500	49,400	52,600	48,000	44,500	42,600	43,000	43,800	46,600	42,400	42,100	41,800
29	65,100		50,900	49,900	43,100	43,300	41,000	47,700	44,200	45,700	42,000	41,900
30	57,500		56,900	50,000	44,500	43,300	43,300	47,200	43,500	44,300	41,900	41,400
31	57,700		54,300		44,800		43,000	43,200		42,600		41,900
Total	1,780,300	1,584,100	1,755,300	1,517,400	1,389,900	1,347,900	1,383,300	1,351,000	1,353,800	1,363,600	1,319,300	1,350,500
Average	57,429	56,575	56,623	50,580	44,835	44,930	44,623	43,581	45,127	43,987	43,977	43,565
Min	50,300		49,800	42,900	38,200	42,600	40,100	29,700	43,300	38,700	41,400	37,200
Max	66,700	68,000	65,500	58,200	51,600	53,100	53,600	49,800	51,100	51,200	50,800	48,900

		Yearly Total	**17,496,400**
		Yearly Average	**47,986**
CoA Amount	***118,000 m^3/day***	**Yearly Min**	
		Yearly Max	**68,000**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Peak (Treated) Flows** 2014

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	62,600	67,810	67,720	68,730	53,590	66,770	44,480	44,180	44,320	61,630	46,270	61,800
2	68,750	63,880	66,700	65,590	54,880	68,270	69,960	44,250	44,340	62,020	47,680	59,210
3	53,050	63,930	69,610	66,030	65,960	63,470	65,230	43,860	44,300	43,830	70,000	61,420
4	70,240	71,640	69,450	66,710	65,590	57,440	44,070	43,790	65,230	43,140	43,340	65,390
5	57,210	63,080	66,340	52,030	48,280	44,890	62,410	44,220	63,650	50,470	61,030	65,210
6	67,910	63,750	67,620	52,440	48,270	44,490	59,950	60,850	63,340	61,510	65,280	47,930
7	74,190	63,260	70,510	67,710	57,970	44,390	44,370	44,290	61,450	64,880	43,460	48,000
8	68,650	63,180	71,120	53,300	44,060	44,640	44,390	44,540	45,920	63,750	47,850	46,920
9	70,850	63,430	71,430	69,960	44,510	61,680	44,460	64,760	63,610	72,220	47,940	43,880
10	76,240	63,520	69,140	66,000	51,440	48,830	62,920	60,730	62,260	47,200	48,150	61,980
11	67,550	63,800	68,620	53,490	53,730	49,210	44,300	44,530	61,340	46,130	65,750	59,430
12	68,600	68,000	71,090	53,040	75,120	61,360	44,400	64,150	44,370	42,790	43,220	43,840
13	65,950	70,420	70,960	53,670	44,420	44,770	44,360	60,990	67,480	43,300	42,830	61,560
14	67,710	62,590	71,390	53,530	44,490	44,533	44,380	59,520	64,040	43,040	43,260	62,190
15	68,050	62,670	71,580	53,840	44,270	44,620	44,450	44,980	61,560	43,270	59,800	61,320
16	67,940	62,790	68,180	53,850	44,050	44,700	65,620	44,320	44,210	53,390	59,960	43,960
17	67,750	63,920	69,740	53,530	44,330	44,630	55,370	44,220	65,150	66,440	43,240	61,970
18	67,260	62,090	68,840	52,900	44,360	58,380	44,410	44,180	66,130	61,520	51,010	60,100
19	68,020	69,320	52,490	53,300	53,340	44,410	44,410	44,640	44,190	61,170	62,770	61,710
20	67,280	62,740	70,530	50,500	53,220	44,840	44,300	58,670	44,270	43,850	65,430	43,150
21	67,520	63,520	67,010	52,510	44,210	44,850	44,380	45,590	44,200	61,630	43,460	43,380
22	66,970	53,020	69,720	52,540	44,330	44,470	63,700	43,830	63,970	61,440	47,190	43,020
23	67,170	68,940	70,260	58,470	53,660	44,490	57,720	19,400	61,800	56,670	47,880	43,520
24	78,230	69,530	53,470	53,360	52,160	47,620	56,210	43,800	44,280	43,350	47,950	43,700
25	66,360	71,440	71,100	52,900	52,480	44,980	62,350	44,250	64,750	43,450	65,710	43,490
26	79,020	68,250	68,510	52,730	52,890	62,470	62,130	58,870	44,450	62,570	49,710	43,170
27	67,670	71,510	69,640	64,410	54,980	63,480	44,450	44,370	44,260	59,630	65,800	43,110
28	65,960	69,280	66,570	51,150	63,630	44,460	44,110	48,630	62,540	43,880	58,960	43,000
29	67,350		52,750	51,720	54,140	44,400	43,990	49,180	60,790	61,370	43,070	43,110
30	67,060		66,500	53,210	66,170	44,480	56,550	49,260	44,420	60,890	43,170	42,160
31	67,180		68,230		66,030		44,180	44,260		43,930		42,820
Total												
Average												
Min												
Max	79,020	71,640	71,580	69,960	75,120	68,270	69,960	64,760	67,480	72,220	70000.00	65,390

CoA Amount ***118,000*** ***m^3/day***

Yearly Max **79,020**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

King St. Water Treatment Plant - **Net to Distribution System** 2014 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	50,492	57,762	58,780	55,354	47,600	47,369	45,917	43,451	46,043	43,180	43,692	45,336
2	50,492	59,761	55,922	52,007	45,925	49,874	48,285	42,410	45,752	46,529	42,536	47,572
3	52,886	57,809	58,713	56,049	48,043	46,053	45,264	44,332	45,335	45,825	42,947	46,371
4	56,539	58,610	56,389	53,198	44,588	44,244	46,122	44,286	47,043	42,537	46,090	46,534
5	57,139	59,895	57,429	53,762	47,220	45,798	47,259	44,471	47,321	45,045	44,202	44,219
6	58,247	57,907	58,054	52,688	45,682	42,444	43,353	46,106	46,460	43,605	45,516	44,690
7	56,314	58,896	56,879	50,638	47,309	45,839	44,717	44,571	43,999	47,942	44,441	45,815
8	61,043	56,523	58,997	53,596	45,276	43,162	44,379	45,778	45,453	43,056	43,525	45,693
9	58,750	60,262	55,895	51,558	43,970	48,095	43,776	47,124	47,454	46,483	44,372	44,912
10	57,496	56,136	60,531	52,674	46,206	46,208	44,188	45,116	47,230	42,468	43,750	45,017
11	55,952	58,301	57,395	51,654	44,650	45,705	46,096	45,315	44,711	41,224	41,606	46,761
12	65,257	57,095	57,448	49,655	43,668	42,970	43,206	43,947	44,161	40,480	44,583	44,673
13	52,884	55,899	59,371	51,200	42,000	44,176	41,443	42,743	45,955	42,952	42,361	44,051
14	63,288	58,271	53,338	50,900	43,500	43,269	44,922	41,850	45,457	42,873	42,621	46,301
15	58,223	52,987	59,627	50,900	43,202	41,991	42,828	40,622	44,134	43,768	44,770	43,521
16	57,208	57,051	56,267	50,578	44,726	44,256	45,220	42,056	47,037	47,069	43,091	44,653
17	58,685	53,991	59,067	48,805	43,586	42,878	43,697	38,313	46,781	44,653	44,159	44,669
18	56,089	54,052	56,504	50,793	40,663	45,308	42,995	43,147	46,457	45,327	43,921	42,220
19	59,877	54,097	56,968	48,207	45,138	44,540	45,301	41,538	44,168	46,529	45,381	43,196
20	58,918	56,711	58,384	48,054	43,552	43,242	42,530	41,903	44,512	42,479	44,654	41,615
21	59,601	53,588	54,973	47,292	45,746	44,859	46,858	45,393	43,598	45,586	43,735	42,145
22	56,516	54,676	58,309	50,833	43,354	44,222	46,081	42,320	47,061	42,461	44,642	41,350
23	58,787	55,954	55,999	48,581	45,793	46,926	48,026	42,756	42,668	45,460	45,868	43,695
24	59,185	58,273	50,979	50,740	41,670	42,788	44,220	42,776	45,686	43,046	44,742	40,651
25	56,967	56,819	56,359	48,279	45,170	43,598	46,964	44,500	44,060	44,908	46,639	38,267
26	59,646	56,744	56,974	47,148	44,271	45,668	43,911	45,368	45,349	45,045	47,423	41,259
27	58,214	58,275	55,056	49,460	46,846	46,126	43,615	44,486	43,625	44,475	45,076	41,409
28	58,635	55,939	52,633	46,927	42,923	43,740	40,542	45,450	47,687	42,427	45,161	42,800
29	67,015		55,822	49,244	45,280	45,135	43,425	44,209	42,736	45,707	43,338	41,370
30	57,997		53,753	47,377	46,892	44,612	41,783	43,702	45,541	46,195	45,610	42,129
31	63,305		54,499		44,297		41,509	42,856		45,091		39,296
Total	1,801,644	1,592,282	1,757,314	1,518,149	1,388,741	1,345,091	1,378,431	1,352,891	1,363,473	1,374,425	1,330,450	1,352,189
Average	58,118	56,867	56,688	50,605	44,798	44,836	44,466	43,642	45,449	44,336	44,348	43,619
Min	50,492		50,979	46,927	40,663	41,991	40,542	38,313	42,668	40,480	41,606	38,267
Max	67,015	60,262	60,531	56,049	48,043	49,874	48,285	47,124	47,687	47,942	47,423	47,572
					Yearly Total		**17,555,079**					
					Yearly Average		**48,148**					
					Yearly Min							
					Yearly Max		**67,015**					

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Kingston St. Water Treatment Plant - **City East** Flows 2014 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	4,848	4,040	5,656	6,767	6,818	6,010	5,404	4,848	5,959	4,091	5,101	4,798
2	4,293	6,464	4,394	4,848	5,353	6,313	6,464	4,394	4,949	5,757	4,444	7,272
3	5,151	4,697	6,111	7,777	7,373	6,515	6,060	6,212	4,949	5,808	4,848	5,606
4	4,545	4,242	4,394	5,202	4,949	3,889	6,666	5,959	5,151	3,990	6,919	6,565
5	5,050	7,222	5,707	7,222	7,626	6,414	6,464	4,949	4,747	6,212	4,141	5,252
6	5,151	4,495	4,697	5,858	5,454	3,586	4,646	6,060	5,454	4,394	5,656	6,212
7	3,889	5,505	5,454	5,454	7,424	6,111	5,454	5,101	4,545	6,414	6,060	6,515
8	6,515	4,495	6,161	7,474	5,808	3,889	5,404	6,111	4,293	3,333	4,899	6,010
9	4,899	6,616	5,555	5,808	4,040	6,969	4,949	6,363	5,808	6,666	5,909	3,384
10	4,798	4,394	7,525	7,121	5,959	4,141	4,697	6,060	4,798	4,141	5,505	4,646
11	3,990	6,010	5,101	6,565	4,495	6,565	6,515	5,252	4,747	5,656	4,242	7,171
12	7,575	5,353	6,010	5,050	6,818	3,687	4,495	5,404	4,697	4,192	6,666	5,151
13	4,444	4,242	7,070	7,828	3,838	5,101	3,939	5,151	5,151	5,606	4,646	5,000
14	4,798	6,161	5,353	5,707	6,565	4,747	5,454	4,949	5,757	4,495	5,151	6,919
15	5,000	3,636	7,676	6,515	3,788	4,444	4,192	4,545	3,939	3,788	5,959	5,101
16	4,848	6,969	5,454	6,919	6,060	5,303	5,656	5,000	6,060	6,717	5,202	5,656
17	4,848	4,141	7,222	5,202	4,798	3,535	4,798	4,343	4,343	4,192	5,909	6,515
18	3,788	5,353	5,151	7,525	3,384	6,464	4,444	4,949	6,161	5,555	4,848	4,848
19	6,515	4,141	6,616	5,353	6,868	5,050	6,363	4,394	5,252	5,909	5,555	6,161
20	4,293	6,010	6,161	6,161	3,788	4,242	4,444	4,242	5,555	3,939	6,313	5,101
21	6,363	4,444	5,151	5,909	6,010	5,909	6,313	5,959	4,242	6,666	4,747	5,959
22	3,990	4,899	7,929	7,474	4,192	4,899	4,394	3,737	6,464	2,626	5,808	5,101
23	4,949	4,545	5,252	5,757	5,757	6,262	7,323	5,505	4,192	5,909	6,111	6,868
24	5,454	6,262	7,575	7,272	3,586	4,141	4,596	4,495	6,414	4,495	5,555	5,252
25	4,091	4,596	5,353	5,757	5,959	4,798	6,666	5,606	5,404	5,757	4,697	4,949
26	6,666	5,303	7,070	5,303	3,939	5,555	4,040	5,656	6,212	4,394	6,616	6,818
27	4,343	5,252	5,454	8,686	6,616	5,101	6,313	5,353	4,747	5,555	5,202	5,202
28	5,454	4,495	5,555	5,151	3,687	4,899	3,788	5,808	7,525	4,293	6,515	6,414
29	5,959		7,626	7,222	5,555	4,646	5,252	4,949	4,444	5,858	5,151	5,454
30	4,343		5,353	5,151	6,060	5,606	4,899	5,101	6,010	6,262	6,161	6,010
31	6,717		6,161		4,141		4,747	4,596		6,060		5,252
Total	157,560	143,976	185,941	190,032	166,701	154,783	164,832	161,045	157,964	158,722	164,529	177,154
Average	5,083	5,142	5,998	6,334	5,377	5,159	5,317	5,195	5,265	5,120	5,484	5,715
Min	3,788		4,394	4,848	3,384	3,535	3,788	3,737	3,939	2,626	4,141	3,384
Max	7,575	7,222	7,929	8,686	7,626	6,969	7,323	6,363	7,525	6,717	6,919	7,272
					Yearly Total		**1,983,236**					
					Yearly Average		**5,433**					
					Yearly Min							
					Yearly Max		**8,686**					

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Raw Water Flows** 2010
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	20,130	21,380	21,000	20,060	21,060	23,010	18,240	21,500	21,930	17,900	17,500	17,600
2	21,460	20,910	19,800	21,840	20,810	21,500	21,280	20,600	21,720	18,900	18,000	18,800
3	20,880	22,350	21,190	20,240	21,250	20,550	20,830	22,520	20,650	21,300	17,700	18,100
4	21,300	21,930	20,950	21,080	22,340	20,410	21,400	23,140	19,780	18,300	20,200	19,100
5	21,810	20,890	20,140	21,840	20,770	21,340	23,830	19,400	19,400	18,200	17,200	17,900
6	21,720	21,870	20,570	20,580	19,430	20,370	22,320	20,400	21,530	17,900	19,000	20,000
7	21,010	21,610	23,460	20,040	21,380	21,240	23,800	19,900	21,200	20,000	18,500	18,000
8	21,300	20,490	21,420	19,980	19,220	21,220	24,300	20,700	21,220	17,300	19,100	19,100
9	20,600	21,400	20,050	21,300	19,600	20,000	22,720	19,060	19,200	19,000	17,500	19,200
10	22,100	21,260	20,430	18,770	21,170	19,890	19,610	19,790	21,610	19,300	18,600	18,700
11	21,200	21,470	20,840	21,900	20,370	20,030	22,100	18,960	19,420	19,000	17,400	19,900
12	20,360	21,500	20,800	20,500	20,310	18,950	23,100	19,400	19,780	19,800	17,800	21,000
13	21,230	21,500	20,310	20,200	21,310	21,320	21,530	19,460	21,850	18,600	18,500	20,100
14	20,780	21,300	19,980	20,850	18,480	21,230	22,860	20,950	19,770	18,500	18,900	16,100
15	20,000	22,000	20,200	20,280	20,770	21,170	24,410	18,630	20,300	18,100	18,600	18,400
16	21,100	21,500	21,400	19,520	22,780	19,880	21,100	21,700	18,100	18,500	17,100	18,900
17	21,770	19,600	20,500	19,350	21,890	20,120	21,100	20,800	18,380	19,400	17,800	21,500
18	22,010	20,500	20,200	21,140	20,790	21,420	19,600	21,830	18,750	19,100	18,250	19,100
19	19,990	21,300	20,000	21,300	22,480	20,000	19,800	22,550	19,450	18,800	17,800	19,200
20	21,310	20,500	19,950	19,960	22,670	21,040	20,500	20,200	19,510	18,500	17,700	19,200
21	21,520	21,800	21,620	20,710	23,030	22,790	21,100	19,500	18,720	18,800	20,400	20,200
22	21,180	21,000	19,720	20,070	23,630	20,950	22,000	19,200	20,200	18,600	18,600	19,000
23	21,150	19,700	20,540	19,800	24,130	20,410	20,200	19,400	18,300	17,500	18,700	20,600
24	22,710	20,200	20,700	20,300	27,830	19,230	19,800	20,120	19,590	19,700	20,500	19,080
25	21,280	19,500	20,300	21,400	25,650	20,200	20,400	18,600	19,780	20,100	19,000	18,410
26	19,800	19,700	20,580	20,600	25,620	20,190	23,500	21,600	19,800	18,600	19,100	18,450
27	20,820	20,800	20,530	19,500	22,330	19,500	21,400	21,000	20,560	19,800	19,900	19,210
28	20,500	20,400	21,450	20,210	24,980	20,600	21,900	20,400	20,200	18,600	19,300	19,360
29	20,010		20,290	20,370	26,210	19,900	18,700	21,100	20,000	19,500	21,700	20,270
30	21,940		20,160	20,690	27,020	21,300	20,900	22,800	18,100	18,200	17,600	20,740
31	21,350		21,280		26,690		21,400	22,650		18,800		19,400
Total	654,320	588,360	640,360	614,380	696,000	619,760	665,730	637,860	598,800	584,600	557,950	594,620
Average	21,107	21,013	20,657	20,479	22,452	20,659	21,475	20,576	19,960	18,858	18,598	19,181
Min	19,800	19,500	19,720	18,770	18,480	18,950	18,240	18,600	18,100	17,300	17,100	16,100
Max	22,710	22,350	23,460	21,900	27,830	23,010	24,410	23,140	21,930	21,300	21,700	21,500

PTTW Amount **39,560 *m³/day***

Yearly Average **20,418**
Yearly Min **16,100**
Yearly Max **21,300**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
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K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - Peak (**Raw) Flows** 2010
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	44,400	41,800	42,800	46,200	42,800	41,100	43,200	41,500	43,500	39,300	45,900	38,900
2	45,500	43,300	41,600	43,800	42,000	45,300	39,100	52,500	32,300	32,200	43,800	32,800
3	42,000	41,900	43,700	45,500	43,100	41,900	42,900	52,500	43,600	43,200	45,600	31,300
4	41,900	49,300	42,600	37,400	44,100	38,000	42,200	52,500	42,700	31,800	40,700	45,700
5	43,700	42,900	42,500	45,100	40,800	41,700	42,500	38,400	38,100	43,400	43,600	35,600
6	43,800	45,500	40,300	43,600	41,500	45,300	52,500	50,200	43,900	42,300	45,500	37,000
7	38,700	41,900	38,900	41,300	42,000	43,100	41,300	43,800	44,100	41,800	45,700	45,800
8	43,700	36,000	42,600	42,000	46,200	41,900	39,600	37,900	42,200	36,200	45,600	45,900
9	43,600	41,700	41,400	43,300	40,700	43,200	43,500	41,900	43,400	43,300	45,600	45,700
10	42,100	42,700	41,600	41,400	43,600	41,700	52,500	42,400	40,700	42,800	40,700	37,600
11	41,500	44,000	39,600	41,500	41,600	45,900	44,000	42,800	36,300	40,300	45,800	45,700
12	40,500	41,600	45,000	46,200	45,000	42,200	44,000	42,800	38,400	42,500	35,200	44,800
13	30,200	31,400	42,200	42,700	35,200	45,700	44,200	43,700	38,500	43,200	35,400	45,760
14	42,000	41,800	45,800	40,800	42,100	39,200	44,400	37,000	38,300	44,300	45,700	39,800
15	43,900	45,000	42,200	41,400	42,200	44,800	46,500	42,600	52,500	45,000	33,700	44,800
16	42,500	39,800	43,700	45,100	41,900	52,500	41,400	42,500	31,900	43,600	40,600	44,800
17	42,700	42,300	41,100	41,100	33,600	40,900	52,500	38,800	31,500	31,700	39,500	45,800
18	42,400	42,700	43,500	40,600	42,100	43,000	38,500	41,000	31,600	35,500	44,400	40,400
19	42,500	41,000	42,500	39,500	44,300	40,600	31,800	44,300	36,500	42,100	40,800	45,300
20	40,700	41,900	39,500	46,200	38,400	41,500	38,200	42,300	30,700	44,500	38,800	45,900
21	38,900	32,800	40,700	46,000	42,400	42,600	44,000	44,300	36,200	45,200	43,800	38,400
22	40,600	41,500	44,700	46,500	43,000	42,500	44,500	36,900	38,200	44,600	45,600	40,200
23	43,600	40,900	41,600	41,500	38,900	41,000	40,500	39,200	36,000	39,300	45,700	45,800
24	43,400	41,700	42,700	41,000	43,400	45,400	41,400	39,700	35,700	45,700	45,500	45,800
25	42,200	45,100	42,300	41,100	44,000	45,400	45,100	44,000	36,100	45,500	45,000	36,000
26	43,200	41,500	44,200	46,000	42,600	42,800	45,400	44,200	30,300	38,300	38,900	45,500
27	40,900	42,300	42,500	42,900	52,500	43,100	44,900	43,900	31,800	38	45,800	45,600
28	42,600	38,300	41,400	46,100	41,000	45,600	39,700	42,000	36,300	38,000	45,800	45,100
29	43,700		40,800	41,600	46,400	40,500	43,300	43,400	38,000	41,900	36,200	45,200
30	37,000		40,500	42,300	38,800	52,000	52,500	46,200	38,800	37,100	44,900	45,300
31	45,600		42,400		41,000		52,500	36,600		45,800		33,200
Total												
Average												
Min												
Max	45,600	49,300	45,800	46,500	52,500	52,500	52,500	52,500	52,500	45,800	45,900	45,900

PTTW Amount **56,000** ***litres/ minute***
or **80,640** ***m^3/day***

Yearly Average
Yearly Min
Yearly Max **52,500**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Treated Water Flows** 2010
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	19,460	20,400	20,400	19,490	20,270	21,710	17,150	21,200	20,830	16,900	16,600	17,200
2	21,050	20,190	19,080	20,850	20,010	21,020	20,470	20,100	21,000	18,300	17,400	17,600
3	19,640	21,630	19,900	19,430	20,400	19,450	20,190	21,720	20,000	20,400	17,700	17,300
4	20,980	21,070	20,500	19,890	21,320	19,490	21,070	22,360	19,010	17,600	19,800	18,400
5	20,950	20,380	19,230	21,730	19,840	20,630	23,240	22,100	18,800	17,200	16,200	17,200
6	20,700	21,020	19,730	19,970	18,190	19,600	21,590	19,400	20,820	17,600	18,400	19,500
7	20,290	20,760	22,690	18,770	20,820	20,140	23,080	19,500	20,500	19,100	17,900	18,000
8	20,100	19,150	20,730	19,240	18,250	20,290	23,730	19,700	20,270	16,500	19,000	18,500
9	19,700	20,710	18,950	20,940	19,090	20,030	21,800	18,400	18,800	18,400	16,200	18,600
10	21,600	20,720	19,780	17,900	20,030	19,590	19,070	18,990	20,300	18,300	18,000	17,500
11	20,900	20,620	20,220	20,800	19,620	19,340	21,460	18,060	18,690	18,800	16,700	20,300
12	19,540	24,030	19,700	20,300	20,000	18,260	22,400	19,000	19,610	19,200	17,700	20,500
13	20,570	21,000	19,600	19,400	20,530	20,840	20,870	19,010	20,640	17,100	18,100	18,200
14	19,770	20,200	18,670	20,000	17,250	20,090	22,320	20,270	18,710	17,900	18,500	16,000
15	19,110	21,300	19,700	19,560	19,990	19,910	23,690	17,680	19,800	17,100	17,800	17,000
16	20,480	20,700	20,300	18,560	22,320	18,460	20,100	21,200	17,300	18,100	16,200	19,900
17	20,920	18,700	19,900	18,100	21,140	19,690	20,400	20,500	18,210	18,600	17,100	20,400
18	21,100	20,000	19,800	20,400	19,930	20,910	19,000	20,770	18,010	18,400	18,080	18,100
19	19,260	20,100	19,170	20,600	21,630	19,420	19,200	22,020	18,420	18,100	16,800	18,000
20	20,620	19,500	18,680	19,130	22,260	20,380	19,900	19,500	19,310	17,100	18,000	18,500
21	20,780	20,900	21,230	20,150	22,140	21,960	20,500	18,100	17,880	19,000	18,900	19,600
22	20,310	20,600	18,680	19,210	22,870	20,240	21,300	18,800	19,900	17,200	17,900	18,300
23	20,340	19,200	19,140	18,400	23,710	19,600	19,400	18,900	17,280	17,100	18,600	19,300
24	21,810	19,700	20,100	19,800	26,860	18,410	18,600	19,150	18,930	19,500	20,400	18,600
25	19,860	18,900	19,600	20,500	24,510	19,300	19,900	17,900	18,670	19,500	17,900	17,680
26	19,460	19,400	20,040	20,100	24,300	19,100	23,100	21,300	19,200	17,700	18,300	17,840
27	20,030	20,000	19,440	18,400	21,800	19,100	20,800	20,000	20,190	19,700	18,700	18,910
28	19,700	19,900	21,270	19,070	24,220	19,600	20,800	19,700	19,300	18,200	18,800	18,750
29	19,330		18,900	19,710	25,350	19,200	18,000	20,600	18,500	18,200	21,960	19,060
30	21,090		19,630	20,070	26,320	20,900	20,100	22,570	17,900	17,600	16,500	19,980
31	20,710		20,890		25,850		20,700	21,970		18,600		18,600
Total	630,160	570,780	615,650	590,470	670,820	596,660	643,930	620,470	576,780	563,000	540,140	573,320
Average	20,328	20,385	19,860	19,682	21,639	19,889	20,772	20,015	19,226	18,161	18,005	18,494
Min	19,110	18,700	18,670	17,900	17,250	18,260	17,150	17,680	17,280	16,500	16,200	16,000
Max	21,810	24,030	22,690	21,730	26,860	21,960	23,730	22,570	21,000	20,400	21,960	20,500

CoA Amount 45,455 m^3 */day*

Yearly Average **19,705**
Yearly Min **16,000**
Yearly Max **26,860**

1211 John Counter Blvd
P.O. Box 790
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Point Pleasant Water Treatment Plant - **Peak (Treated) Flows** 2010

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	32,700	34,000	34,200	29,500	33,000	33,600	32,500	32,180	35,100	32,900	33,500	35,600
2	33,000	34,100	33,600	34,000	34,900	35,800	36,100	33,000	35,700	34,700	35,430	36,400
3	33,600	34,700	33,500	34,500	33,200	33,600	33,000	32,400	33,900	34,600	31,700	35,000
4	34,100	34,000	34,200	34,200	32,300	33,400	34,500	32,900	34,500	34,200	31,600	35,300
5	32,700	34,500	33,400	34,700	32,100	34,500	35,100	36,100	32,400	30,900	25,570	32,000
6	33,000	34,500	32,400	34,400	32,800	31,800	33,100	34,200	34,800	35,100	35,600	35,700
7	35,900	33,500	40,100	34,200	34,100	35,100	34,800	34,400	36,600	35,400	36,400	32,300
8	33,900	35,500	34,200	28,400	31,900	32,100	35,000	35,700	34,600	35,500	31,500	35,300
9	33,700	34,400	31,300	33,500	30,900	31,800	33,900	42,500	37,000	33,100	33,300	35,500
10	34,400	34,400	33,600	33,300	32,300	33,000	34,200	33,700	32,400	33,100	33,800	32,700
11	34,600	33,600	34,200	33,900	32,300	32,800	33,900	31,800	32,800	30,700	34,600	36,920
12	31,800	33,500	30,900	34,500	32,400	30,800	34,900	34,300	35,100	32,400	36,300	36,000
13	33,000	35,000	34,000	32,800	37,300	33,800	32,900	34,600	31,200	35,100	36,000	36,450
14	33,300	34,500	33,600	33,700	31,500	32,200	30,100	35,900	32,200	34,200	30,300	35,800
15	34,200	34,400	33,000	33,600	36,200	34,300	31,200	34,000	34,600	33,500	32,100	33,400
16	34,000	33,200	32,300	32,900	36,100	27,150	33,500	32,800	31,800	29,900	35,400	32,400
17	34,100	33,500	34,200	33,600	33,700	33,600	34,600	30,800	34,600	34,700	35,100	34,300
18	34,600	33,400	36,100	34,500	41,100	31,900	34,600	35,400	35,000	35,200	34,200	37,130
19	33,800	34,000	32,100	27,200	32,700	32,400	32,100	35,900	35,000	34,700	31,000	36,300
20	34,500	33,500	34,000	26,500	36,100	30,200	32,700	26,580	35,300	34,100	35,500	33,900
21	32,200	34,100	34,300	34,900	35,000	27,200	35,800	33,000	32,100	31,300	36,600	36,000
22	34,000	33,200	35,600	34,000	35,800	35,300	35,000	35,200	34,000	35,500	35,000	32,800
23	33,100	31,800	30,600	32,100	35,800	34,600	30,300	30,900	34,800	26,600	36,200	33,300
24	34,500	34,400	29,200	32,200	36,100	36,600	33,000	34,000	31,900	43,100	31,300	36,300
25	32,800	34,500	34,700	32,600	35,600	35,100	31,700	31,800	26,800	31,600	32,500	35,100
26	33,700	33,800	30,600	38,000	30,800	35,400	34,700	32,100	32,200	34,400	34,700	26,240
27	31,500	34,300	30,800	33,100	36,600	31,900	33,900	35,800	38,840	34,000	36,700	34,900
28	31,800	34,700	33,900	33,300	36,400	33,900	34,100	35,100	35,200	35,500	32,200	35,200
29	31,600		33,000	34,300	28,700	31,300	35,300	34,100	35,600	35,200	35,400	34,500
30	33,900		34,800	31,900	34,800	33,900	33,100	33,500	30,700	35,000	36,200	26,400
31	34,700		42,400		36,620		33,000	33,400		34,700		35,700
Total												
Average												
Min												
Max	35,900	35,500	42,400	38,000	41,100	36,600	36,100	42,500	38,840	43,100	36,700	37,130

CoA Amount 45,455 m^3 */day*

Yearly Average
Yearly Min
Yearly Max **43,100**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Net to Distribution System** 2010
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	19,463	20,403	20,403	19,493	20,273	21,714	17,153	21,203	21,133	17,859	16,789	17,768
2	21,053	20,193	19,083	20,853	20,013	21,023	20,473	20,103	20,924	18,035	17,476	17,524
3	19,643	21,633	19,903	19,433	20,403	19,454	20,193	21,723	20,530	20,274	17,700	17,300
4	20,983	21,073	20,503	19,893	21,323	19,493	21,073	22,363	19,161	17,600	18,891	18,324
5	20,953	20,383	19,230	21,733	19,843	20,633	23,243	22,104	18,409	17,061	17,033	17,995
6	20,703	21,023	19,730	19,973	18,193	19,603	21,593	19,403	20,328	17,638	18,286	19,462
7	20,293	20,763	22,690	18,773	20,823	20,143	23,083	19,503	20,121	18,936	17,597	17,432
8	20,103	19,153	20,733	19,243	18,253	20,293	23,733	19,703	20,270	17,232	18,886	18,374
9	19,703	20,713	18,953	20,943	19,093	20,033	21,804	18,403	19,633	18,627	16,579	18,512
10	21,603	20,723	19,783	17,903	20,033	19,594	19,073	18,994	20,035	18,035	17,849	18,472
11	20,903	20,623	20,223	20,803	19,623	19,344	21,463	18,063	19,384	18,535	17,003	20,679
12	19,543	24,033	19,703	20,303	20,003	18,263	22,403	19,003	19,673	18,935	17,738	19,970
13	20,573	21,003	19,603	19,403	20,533	20,843	20,873	19,013	20,148	16,595	17,986	17,443
14	19,774	20,203	18,673	20,003	17,253	20,093	22,323	20,274	18,596	17,799	18,538	15,950
15	19,113	21,303	19,703	19,563	19,993	19,913	23,693	17,683	19,800	17,428	17,535	16,987
16	20,483	20,703	20,303	18,563	22,323	18,463	20,103	21,203	16,656	18,453	16,389	19,913
17	20,923	18,703	19,903	18,103	21,143	19,693	20,403	20,503	18,210	18,474	17,365	20,173
18	21,103	20,003	19,803	20,403	19,933	20,913	19,003	20,773	17,934	18,097	17,474	18,516
19	19,263	20,103	19,173	20,603	21,633	19,423	19,203	22,024	18,685	18,365	16,876	18,000
20	20,623	19,503	18,683	19,133	22,263	20,383	19,903	19,503	19,802	16,986	18,681	18,462
21	20,783	20,903	21,233	20,153	22,143	21,963	20,503	18,103	17,880	18,470	18,408	20,143
22	20,313	20,603	18,683	19,214	22,873	20,244	21,303	18,803	19,711	18,449	17,673	18,300
23	20,343	19,203	19,143	18,403	23,713	19,603	19,403	18,903	17,621	17,453	18,789	18,568
24	21,813	19,703	20,103	19,803	26,863	18,413	18,603	19,154	18,930	19,500	20,589	19,054
25	19,863	18,903	19,603	20,503	24,513	19,303	19,903	17,903	18,481	18,730	17,370	17,831
26	19,463	19,403	20,043	20,103	24,303	19,104	23,104	21,303	19,124	17,624	18,981	18,042
27	20,033	20,003	19,443	18,403	21,803	19,103	20,804	20,003	19,849	19,549	18,700	18,897
28	19,703	19,903	21,273	19,073	24,223	19,604	20,804	19,703	19,338	18,579	18,838	18,485
29	19,333		18,903	19,713	25,353	19,203	18,003	20,603	18,462	17,935	21,884	19,211
30	21,093		19,633	20,073	26,323	20,904	20,103	22,573	17,698	17,524	15,516	19,955
31	20,713		20,893		25,853		20,703	21,973		18,714		18,398
Total	630,258	570,871	615,739	590,564	670,914	596,760	644,033	620,571	576,528	563,492	539,421	574,140
Average	20,331	20,388	19,863	19,685	21,642	19,892	20,775	20,018	19,218	18,177	17,981	18,521
Min	19,113		18,673	17,903	17,253	18,263	17,153	17,683	16,656	16,595	15,516	15,950
Max	21,813	24,033	22,690	21,733	26,863	21,963	23,733	22,573	21,133	20,274	21,884	20,679

Yearly Average **19,708**
Yearly Min
Yearly Max **26,863**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Raw Water Flows** 2011
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	19,400	21,200	19,500	19,600	21,800	22,000	21,100	21,800	20,900	20,400	19,500	20,200
2	18,900	20,600	20,800	18,500	18,900	21,600	24,200	21,700	21,300	20,000	18,900	18,700
3	20,300	19,800	19,000	21,200	18,000	23,090	19,400	21,100	20,900	19,500	18,600	20,500
4	19,400	19,600	20,000	22,800	20,700	21,440	24,400	22,500	20,600	19,600	20,300	20,300
5	19,400	20,800	20,900	20,400	19,230	22,480	23,500	23,920	20,000	19,600	20,100	19,000
6	18,900	22,300	21,600	18,300	21,000	24,200	23,000	20,490	20,800	21,400	20,800	19,900
7	18,900	19,400	18,700	19,700	19,200	23,300	24,100	22,680	19,600	22,300	19,200	20,300
8	19,200	20,400	19,300	19,400	22,000	23,300	24,200	22,410	19,300	19,800	20,200	20,000
9	21,700	18,300	23,400	21,800	22,600	22,600	25,200	21,720	20,900	19,900	19,300	19,300
10	20,500	20,800	15,700	21,500	20,900	21,100	24,800	19,320	21,000	21,200	19,400	19,700
11	20,840	20,800	22,000	20,800	20,500	22,400	23,500	21,950	18,900	21,100	19,300	22,700
12	19,500	21,800	19,900	16,500	21,100	21,600	24,100	20,910	22,600	20,480	19,800	20,800
13	18,700	21,000	22,300	20,370	20,500	21,600	26,600	20,680	19,900	19,300	20,400	21,600
14	18,640	19,300	20,100	21,500	23,000	20,500	25,100	21,140	21,200	20,700	19,600	20,900
15	20,840	19,100	18,200	20,400	20,100	21,700	25,460	20,350	20,500	19,600	18,900	20,500
16	21,270	24,100	19,700	18,800	19,900	20,830	26,650	19,710	20,200	20,300	20,100	21,310
17	20,780	20,900	21,100	22,600	17,300	20,140	25,350	21,040	19,800	20,500	21,300	20,170
18	17,500	20,600	20,900	19,600	19,200	24,750	21,770	21,470	20,800	19,800	20,500	22,030
19	19,990	20,600	18,900	19,600	20,520	23,300	21,810	21,850	20,770	20,400	20,100	23,380
20	20,500	20,900	21,200	20,700	21,100	22,000	22,720	21,730	20,200	19,400	20,600	20,510
21	19,600	21,300	20,000	20,500	22,300	21,580	24,800	20,230	19,000	18,800	19,900	21,100
22	21,000	21,800	19,500	20,900	21,700	23,030	25,200	19,810	20,800	19,700	19,700	21,950
23	21,100	20,300	18,000	20,100	21,000	21,090	24,430	20,150	20,100	19,800	18,800	21,430
24	19,000	20,600	21,500	19,600	19,500	19,400	24,110	19,720	19,300	20,670	20,000	23,900
25	20,100	20,100	21,100	20,300	19,400	20,990	21,200	19,790	20,500	19,500	19,000	19,680
26	20,500	22,100	21,000	20,200	20,000	21,490	19,800	20,050	19,400	18,700	19,620	20,910
27	19,890	20,500	21,100	20,300	19,560	21,800	21,800	20,370	20,900	19,600	19,780	22,660
28	19,300	21,000	21,300	20,400	20,880	21,000	22,810	20,500	18,600	18,300	20,500	20,970
29	20,100		19,800	20,800	21,430	22,800	21,800	19,600	18,400	20,000	21,200	22,700
30	20,600		19,700	21,200	21,250	21,500	20,400	21,200	18,700	21,500	18,800	23,200
31	20,700		20,400		21,900		20,200	21,100		19,300		21,200
Total	617,050	580,000	626,600	608,370	636,470	658,610	723,510	650,990	605,870	621,150	594,200	651,500
Average	19,905	20,714	20,213	20,279	20,531	21,954	23,339	21,000	20,196	20,037	19,807	21,016
Min	17,500	18,300	15,700	16,500	17,300	19,400	19,400	19,320	18,400	18,300	18,600	18,700
Max	21,700	24,100	23,400	22,800	23,000	24,750	26,650	23,920	22,600	22,300	21,300	23,900

PTTW Amount **39,560 *m^3/day***

Yearly Average **20,749**
Yearly Min **15,700**
Yearly Max

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - Peak (**Raw) Flows** 2011
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	45,300	40,700	43,600	44,000	44,100	41,600	44,300	38,900	43,000	36,800	42,500	44,300
2	34,200	41,600	39,300	44,400	40,600	46,500	42,900	41,200	39,200	38,500	43,400	44,500
3	39,600	35,300	43,000	43,500	43,700	41,600	38,900	36,300	38,400	38,200	38,800	44,400
4	44,800	42,900	43,600	42,100	41,000	45,000	35,000	48,100	38,700	36,600	44,500	33,100
5	40,500	41,600	41,200	41,700	37,100	44,700	41,800	40,900	45,900	36,700	43,000	41,900
6	44,700	38,000	40,800	42,700	43,600	44,000	42,200	44,200	38,600	36,900	43,400	42,300
7	36,600	43,400	43,000	45,000	43,600	39,400	40,200	43,000	39,300	38,400	44,200	45,500
8	39,300	43,300	39,900	45,200	39,100	43,700	44,600	42,500	45,900	38,300	45,400	43,100
9	44,700	45,700	43,000	40,500	40,100	43,600	42,000	36,600	36,500	43,200	39,200	44,400
10	44,700	42,500	39,000	37,900	38,700	44,300	39,200	41,900	38,600	38,600	43,900	45,000
11	36,100	40,300	42,700	44,700	43,900	44,500	41,100	52,200	37,900	38,400	30,400	44,400
12	36,100	40,300	41,800	44,700	41,300	43,000	41,600	38,700	45,900	38,400	37,500	34,500
13	44,900	43,900	36,700	45,500	37,400	39,300	44,900	39,300	45,600	32,700	42,200	41,500
14	33,900	39,900	33,000	39,100	41,100	45,600	39,200	44,600	39,100	39,700	38,800	44,800
15	34,400	45,500	43,400	33,300	37,700	40,900	44,900	39,000	44,300	38,300	44,900	44,900
16	37,900	41,700	44,100	42,700	42,700	39,300	42,400	37,400	38,500	44,800	40,200	40,500
17	36,600	43,400	45,900	44,500	38,800	45,300	39,000	52,000	38,500	44,600	45,400	37,300
18	44,300	43,100	36,000	45,000	42,400	44,800	41,500	38,500	39,800	44,800	45,700	40,400
19	44,800	43,300	43,000	38,300	46,000	39,200	43,600	43,400	38,900	44,200	35,500	43,200
20	44,800	42,100	45,100	36,000	45,500	41,800	52,500	36,400	38,800	41,200	39,900	43,900
21	38,300	38,600	30,900	43,000	41,200	43,600	43,500	38,900	38,200	44,500	43,500	43,900
22	44,500	38,900	44,000	43,300	41,300	46,700	39,400	38,400	38,300	45,400	45,200	42,200
23	43,500	45,300	44,500	35,200	43,200	39,500	41,400	38,900	31,400	38,700	45,500	43,400
24	34,300	40,400	41,600	44,100	42,400	45,600	41,800	34,100	39,600	32,900	45,500	38,800
25	35,100	42,300	44,300	42,800	39,000	39,000	38,700	38,700	38,900	41,800	45,800	43,600
26	40,500	41,800	35,900	41,600	42,000	41,200	44,400	36,300	36,700	44,200	45,500	41,700
27	38,000	42,800	38,400	39,900	41,700	42,000	43,900	38,700	38,900	43,900	45,200	41,900
28	45,200	43,800	42,400	43,000	47,000	40,800	43,800	38,300	36,200	41,300	45,640	40,900
29	44,500		40,800	43,800	37,400	43,300	39,700	46,300	38,500	43,500	42,100	39,500
30	44,400		42,900	41,000	42,800	42,700	38,800	43,300	32,500	42,500	39,700	41,200
31	40,300		42,600		45,000		44,000	39,100		36,800		44,000
Total												
Average												
Min												
Max	45,300	45,700	45,900	45,500	47,000	46,700	52,500	52,200	45,900	45,400	45,800	45,500

PTTW Amount **56,000** ***litres/ minute***
or **80,640** ***m^3/day***

Yearly Average
Yearly Min
Yearly Max **52,500**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Treated Water Flows** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	18,200	20,700	19,000	18,300	21,300	21,300	20,300	21,300	19,900	19,000	18,680	19,100
2	18,700	19,300	19,500	18,200	17,100	20,500	24,100	21,000	20,700	19,600	18,000	18,000
3	19,700	19,400	17,800	20,500	17,700	22,430	18,700	20,500	20,100	18,700	18,000	20,000
4	18,300	17,900	20,000	21,400	19,900	20,320	22,700	22,300	19,700	18,700	19,400	19,500
5	18,800	20,500	19,600	19,400	17,640	21,740	23,500	22,260	18,900	18,400	19,300	18,300
6	17,400	21,300	20,700	17,500	20,000	23,400	22,100	19,590	20,300	20,800	19,600	18,400
7	18,000	18,900	18,100	19,000	18,200	22,400	23,200	22,080	18,600	21,200	18,400	19,100
8	18,800	18,700	18,100	19,100	22,000	22,200	23,500	21,900	18,400	18,700	19,600	19,000
9	20,900	18,100	22,500	21,000	21,600	21,900	23,900	20,590	19,700	19,100	18,400	18,500
10	19,600	20,000	14,400	20,500	19,800	19,900	23,300	18,660	20,200	20,700	18,400	19,400
11	19,920	19,800	20,900	19,100	19,700	21,500	23,100	20,900	19,200	19,900	18,400	21,100
12	18,300	21,200	19,500	15,600	19,400	20,700	23,600	20,410	21,600	19,730	19,200	20,100
13	18,000	20,300	21,300	20,230	20,400	20,800	26,000	19,730	18,500	18,900	19,200	20,800
14	17,250	18,000	18,800	20,500	21,600	19,600	24,100	20,150	20,600	19,500	19,100	19,800
15	20,950	18,100	17,500	19,000	19,600	20,400	24,550	19,770	19,100	18,600	18,200	19,400
16	20,510	23,900	19,500	18,300	18,600	20,380	25,600	18,860	19,400	19,400	19,100	20,410
17	19,110	20,000	20,200	21,800	16,300	19,540	24,840	20,460	19,000	19,500	20,300	20,070
18	17,500	19,500	19,900	18,200	18,400	23,170	20,870	20,860	20,500	19,300	19,000	21,130
19	18,410	19,900	17,800	19,300	19,990	22,530	20,710	21,290	19,990	19,300	18,800	22,550
20	20,300	20,100	20,400	19,400	20,300	21,690	22,490	20,660	19,300	18,400	19,200	19,600
21	18,400	20,300	19,100	20,100	21,500	20,770	23,840	19,470	18,100	17,900	18,700	19,530
22	20,200	20,700	18,200	19,800	20,600	21,690	24,200	18,630	20,200	19,100	18,900	21,190
23	20,300	19,600	18,000	18,800	19,800	20,080	22,900	19,420	18,500	19,200	18,100	20,810
24	18,200	19,200	19,900	19,300	18,100	18,700	23,760	18,930	18,600	19,930	19,200	22,800
25	19,100	19,100	21,000	19,600	19,000	19,890	20,080	18,950	20,000	17,800	18,100	18,800
26	20,100	22,200	20,100	19,500	18,900	20,730	19,100	19,000	19,100	18,100	18,740	20,100
27	18,640	19,300	20,300	19,100	18,830	20,900	20,400	19,780	19,310	18,700	19,550	21,760
28	17,800	19,900	19,900	19,100	20,040	20,100	23,010	19,800	18,000	18,100	18,700	20,300
29	19,700		18,600	20,300	20,580	21,900	20,000	19,200	17,700	19,200	19,000	21,700
30	19,900		19,400	19,800	20,510	20,700	19,700	20,400	18,100	20,700	18,000	22,400
31	19,300		19,500		20,900		19,200	20,300		17,600		19,600
Total	590,290	555,900	599,500	581,730	608,290	631,860	697,350	627,150	581,300	593,760	565,270	623,250
Average	19,042	19,854	19,339	19,391	19,622	21,062	22,495	20,231	19,377	19,154	18,842	20,105
Min	17,250		14,400	15,600	16,300	18,700	18,700	18,630	17,700	17,600	18,000	18,000
Max	20,950	23,900	22,500	21,800	22,000	23,400	26,000	22,300	21,600	21,200	20,300	22,800

CoA Amount 45,455 m^3 */day*

Yearly Average **19,876**

Yearly Min

Yearly Max **26,000**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Peak (Treated) Flows** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	34,000	36,000	35,600	43,400	34,700	34,230	34,600	35,200	35,300	33,100	35,100	34,800
2	33,300	34,200	33,100	34,400	32,700	34,300	32,100	34,800	33,700	35,100	35,300	34,400
3	35,200	30,700	29,500	34,500	33,900	33,900	33,500	34,300	34,600	33,300	32,700	35,100
4	29,300	33,300	36,200	33,900	33,300	34,500	33,900	26,700	35,100	35,100	35,200	36,200
5	34,200	36,800	35,600	34,700	34,200	27,700	35,000	34,600	35,200	34,600	35,000	34,400
6	27,000	36,800	37,480	33,300	32,400	32,300	37,300	33,200	33,200	34,400	35,100	35,090
7	27,500	33,400	36,100	35,200	34,300	30,800	33,900	37,300	34,200	34,000	33,500	34,700
8	35,600	36,540	35,800	34,800	33,500	31,800	32,000	34,900	33,400	34,700	34,300	33,300
9	36,700	29,900	34,400	33,500	30,100	32,400	33,000	34,600	33,300	34,800	34,300	35,400
10	33,900	32,100	35,700	35,300	34,700	33,100	35,400	35,100	34,000	34,500	34,500	35,200
11	37,000	35,800	34,800	33,900	34,400	27,400	35,000	34,800	35,500	33,000	34,700	34,800
12	34,200	34,700	35,850	16,300	33,600	34,400	32,800	33,500	28,900	35,200	34,400	34,900
13	27,000	33,200	36,000	35,400	34,100	32,900	27,600	35,800	32,900	34,100	34,700	34,500
14	35,100	33,200	35,500	30,300	35,300	35,500	33,700	34,800	32,500	34,700	35,000	35,000
15	34,200	31,600	35,500	34,200	33,700	35,100	33,900	26,180	33,100	33,000	32,300	32,700
16	35,200	37,500	35,000	32,300	33,300	34,400	34,500	35,700	29,400	35,100	32,200	34,300
17	27,320	36,800	43,000	34,500	25,800	34,900	35,000	35,200	33,400	35,000	32,300	33,100
18	34,800	35,500	36,500	34,000	33,800	32,700	27,370	33,720	35,500	35,300	34,100	35,400
19	32,100	34,400	33,700	32,200	33,000	35,100	35,200	33,000	35,200	35,100	40,600	35,500
20	44,500	31,000	35,900	33,800	34,570	35,810	35,200	36,100	35,600	32,500	38,200	35,500
21	32,300	32,000	33,200	33,300	34,000	27,500	27,300	32,700	32,700	35,000	34,100	35,500
22	36,000	30,100	34,600	33,600	33,400	34,200	27,400	32,800	35,400	35,680	37,900	35,500
23	35,800	33,600	34,500	34,100	33,100	34,660	33,600	25,770	35,100	34,900	36,700	35,500
24	34,700	38,000	34,200	34,000	33,900	34,200	33,900	35,000	33,200	33,500	35,900	33,600
25	35,500	30,200	34,900	33,500	34,800	34,200	33,400	34,910	34,400	35,340	35,000	34,300
26	34,700	36,710	35,400	32,800	34,800	35,500	35,500	32,000	33,100	34,800	35,300	26,240
27	34,200	36,540	35,400	35,500	35,510	33,500	27,030	32,500	33,600	33,200	33,200	34,800
28	34,100	37,390	34,300	34,000	34,800	34,000	33,300	34,000	33,800	34,900	32,400	33,600
29	35,170		34,400	33,300	34,200	34,300	33,300	34,600	33,900	34,700	34,800	36,500
30	31,800		34,800	34,200	35,500	34,300	33,200	33,300	34,800	35,510	34,500	35,600
31	34,400		34,100		34,700		34,910	35,900		34,200		35,700
Total												
Average												
Min												
Max	44,500	38,000	43,000	43,400	35,510	35,810	37,300	37,300	35,600	35,680	40,600	36,500

CoA Amount 45,455 m^3 */day*

Yearly Average
Yearly Min
Yearly Max **44,500**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Net to Distribution System** 2011

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	18,203	20,703	19,003	18,303	21,303	21,303	20,303	21,303	19,774	19,189	18,617	18,822
2	18,703	19,304	19,503	18,203	17,103	20,503	24,103	21,003	20,940	19,411	18,038	18,353
3	19,703	19,403	17,803	20,502	17,703	22,433	18,703	20,503	20,062	18,271	18,808	19,735
4	18,303	17,903	20,003	21,402	19,903	20,323	22,703	22,303	19,586	18,738	19,400	19,450
5	18,803	20,503	19,603	19,403	17,642	21,742	23,503	22,263	18,774	18,413	18,871	18,691
6	17,403	21,303	20,703	17,503	20,003	23,403	22,103	19,593	19,959	20,800	19,449	18,249
7	18,003	18,903	18,103	19,003	18,203	22,403	23,203	22,083	18,524	21,465	18,640	18,974
8	18,803	18,704	18,103	19,103	22,003	22,203	23,503	21,903	19,044	18,814	19,322	19,278
9	20,903	18,103	22,504	21,003	21,603	21,903	23,903	20,593	19,208	19,100	18,286	18,500
10	19,603	20,003	14,403	20,503	19,804	19,903	23,303	18,663	19,935	20,586	18,665	19,816
11	19,923	19,803	20,904	19,103	19,703	21,503	23,103	20,903	20,538	20,014	18,400	20,570
12	18,303	21,204	19,504	15,603	19,403	20,703	23,603	20,413	21,335	19,730	19,276	19,684
13	18,003	20,303	21,303	20,233	20,403	20,803	26,003	19,732	18,121	18,597	19,086	20,787
14	17,253	18,004	18,803	20,503	21,603	19,603	24,103	20,153	20,524	19,298	19,138	19,649
15	20,953	18,103	17,503	19,003	19,603	20,403	24,553	19,773	19,163	19,105	18,011	20,132
16	20,513	23,903	19,504	18,303	18,603	20,383	25,603	18,863	19,286	19,551	19,214	20,410
17	19,113	20,003	20,203	21,803	16,303	19,543	24,843	20,463	19,151	19,071	19,921	20,751
18	17,504	19,503	19,903	18,203	18,403	23,173	20,873	20,863	20,576	19,489	19,025	21,016
19	18,413	19,903	17,803	19,303	19,994	22,533	20,714	21,293	18,753	19,035	19,116	21,869
20	20,303	20,103	20,403	19,403	20,303	21,693	22,493	20,663	19,817	18,476	19,162	19,285
21	18,403	20,303	19,103	20,104	21,503	20,772	23,843	19,473	18,668	17,900	19,079	19,846
22	20,203	20,703	18,204	19,803	20,603	21,693	24,203	18,633	20,238	19,403	18,900	21,076
23	20,303	19,603	18,003	18,803	19,803	20,083	22,903	19,423	18,273	19,970	17,949	20,961
24	18,203	19,203	19,903	19,303	18,103	18,703	23,763	18,933	18,676	19,362	18,771	22,371
25	19,103	19,103	21,003	19,603	19,003	19,893	20,083	18,953	19,849	17,106	18,340	19,078
26	20,103	22,203	20,103	19,504	18,903	20,733	19,103	19,003	19,744	18,327	18,778	20,138
27	18,644	19,303	20,303	19,103	18,833	20,903	20,403	19,783	18,894	18,700	19,512	21,331
28	17,803	19,903	19,903	19,103	20,043	20,103	23,013	19,803	17,584	19,312	18,738	21,146
29	19,703		18,603	20,303	20,583	21,903	20,003	19,203	17,624	18,670	19,000	21,195
30	19,903		19,403	19,803	20,513	20,703	19,703	20,403	18,592	20,132	18,038	21,719
31	19,303		19,503		20,903		19,203	20,303		17,512		19,941
Total	590,388	555,989	599,599	581,823	608,383	631,949	697,443	627,244	581,212	593,545	565,548	622,821
Average	19,045	19,857	19,342	19,394	19,625	21,065	22,498	20,234	19,374	19,147	18,852	20,091
Min	17,253		14,403	15,603	16,303	18,703	18,703	18,633	17,584	17,106	17,949	18,249
Max	20,953	23,903	22,504	21,803	22,003	23,403	26,003	22,303	21,335	21,465	19,921	22,371

Yearly Average **19,877**
Yearly Min
Yearly Max **26,003**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Raw Water Flows** 2012
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21,700	20,100	20,300	22,800	19,700	19,190	25,700	21,400	23,300	20,000	19,600	19,600
2	21,000	21,500	21,900	23,100	20,100	20,310	22,600	21,860	23,300	20,900	18,600	20,800
3	22,900	21,400	21,800	21,600	19,300	20,330	25,400	23,570	25,200	17,700	18,700	21,900
4	21,700	21,300	22,700	21,500	20,400	20,650	24,200	23,350	24,100	19,200	19,700	20,200
5	21,700	21,600	22,700	21,100	19,000	20,500	24,400	20,920	19,200	20,700	20,700	20,500
6	21,900	22,100	22,600	21,600	21,200	20,730	20,860	20,250	20,000	18,200	21,200	20,200
7	23,800	21,000	21,200	21,900	23,600	21,170	25,400	22,870	19,000	21,000	17,500	20,300
8	23,000	19,100	22,300	21,500	18,900	21,340	24,700	22,520	20,700	18,900	18,700	22,100
9	23,400	21,700	22,300	24,500	19,600	21,050	25,700	21,750	20,700	19,900	21,100	22,500
10	21,700	21,600	22,000	23,900	19,400	23,510	24,800	20,400	20,400	20,000	19,200	22,600
11	21,600	21,300	22,800	22,800	20,000	22,530	25,200	21,300	20,000	19,600	18,900	23,760
12	22,400	21,600	21,500	22,000	20,600	21,330	26,000	19,100	20,800	19,400	21,800	22,100
13	21,200	22,100	22,400	21,500	21,100	20,710	26,020	20,500	19,700	20,100	20,300	22,700
14	21,930	20,550	21,200	22,600	20,300	21,550	28,680	21,100	20,620	18,700	19,300	23,300
15	21,870	20,900	21,200	22,600	20,600	21,280	27,400	20,500	19,210	21,500	18,200	22,600
16	22,120	21,100	21,100	20,800	21,200	22,400	26,670	21,400	19,980	19,200	19,800	22,800
17	22,200	20,560	22,800	21,300	19,900	22,570	25,230	21,800	20,500	19,100	20,400	16,770
18	21,580	21,480	22,500	22,800	21,580	21,900	26,370	20,200	19,500	19,300	21,400	18,640
19	20,500	20,920	21,300	22,700	21,430	21,000	28,300	21,300	21,400	19,500	22,500	15,500
20	20,840	20,430	22,000	20,100	23,020	22,660	24,900	22,000	18,200	19,800	23,300	15,200
21	20,960	23,160	21,900	19,500	23,700	20,700	25,700	21,500	19,900	20,200	20,100	18,700
22	21,180	20,110	21,900	19,800	22,300	23,300	26,700	23,100	17,400	20,140	18,600	22,100
23	22,200	20,770	22,300	20,500	21,900	22,800	27,300	21,000	20,300	18,900	21,100	24,130
24	21,800	20,500	22,000	18,800	22,000	22,800	26,300	24,260	19,500	19,200	20,700	21,880
25	20,900	22,700	22,300	18,800	24,100	19,900	27,900	24,770	18,300	19,900	20,000	22,030
26	21,100	20,200	22,800	19,100	23,300	21,400	20,200	24,280	20,300	20,400	20,700	22,330
27	21,700	21,700	21,000	19,500	23,000	21,500	19,500	22,100	19,800	17,800	20,300	24,750
28	21,200	21,600	23,200	20,000	23,000	22,400	22,100	24,000	19,300	20,700	19,800	21,600
29	22,100	21,700	20,800	21,000	23,200	25,700	23,400	23,400	18,900	20,200	20,500	22,080
30	20,700		21,300	20,200	24,100	22,400	26,100	23,700	19,900	19,800	20,100	23,160
31	20,900		21,800		25,100		26,700	22,900		19,100		24,100
Total	673,780	614,780	679,900	639,900	666,630	649,610	780,430	683,100	609,410	609,040	602,800	660,930
Average	21,735	21,199	21,932	21,330	21,504	21,654	25,175	22,035	20,314	19,646	20,093	21,320
Min	20,500	19,100	20,300	18,800	18,900	19,190	19,500	19,100	17,400	17,700	17,500	15,200
Max	23,800	23,160	23,200	24,500	25,100	25,700	28,680	24,770	25,200	21,500	23,300	24,750

PTTW Amount **39,560 *m³/day***

Yearly Average **21,495**
Yearly Min **15,200**
Yearly Max

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - Peak (**Raw) Flows** 2012
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	41,500	42,200	44,200	41,700	43,600	45,100	44,600	43,300	44,000	40,500	44,600	45,000
2	38,400	41,200	39,200	40,900	44,000	42,200	38,200	44,100	45,700	44,300	45,300	42,300
3	41,500	40,500	38,600	42,800	52,300	36,700	41,700	43,900	41,100	39,800	44,700	42,000
4	40,200	40,500	42,300	41,800	46,400	52,500	44,100	44,500	40,500	40,300	44,900	40,700
5	43,800	42,700	40,100	52,400	44,500	52,500	43,500	38,400	44,600	45,100	41,200	44,300
6	41,400	38,900	41,000	52,500	44,000	42,900	28,230	38,300	41,200	45,300	42,600	41,900
7	43,300	38,800	45,500	43,800	43,100	45,900	44,300	46,300	43,000	42,300	43,200	43,100
8	42,900	41,400	40,600	44,900	39,700	45,500	40,700	44,400	42,300	44,400	43,600	43,100
9	41,600	45,600	38,900	44,000	46,300	41,700	44,000	38,400	42,600	44,100	40,100	42,000
10	38,700	41,800	42,300	52,500	45,600	40,900	39,300	43,600	43,400	43,600	43,200	44,000
11	40,400	38,600	41,000	46,300	41,400	41,600	39,300	38,300	42,800	42,700	42,500	41,900
12	44,400	44,200	42,800	45,000	41,100	45,100	41,500	42,800	43,600	41,200	42,200	49,800
13	38,700	39,900	43,200	42,600	43,300	42,800	41,100	38,300	38,400	41,600	43,700	40,200
14	44,100	42,500	45,300	44,000	42,400	41,000	43,700	42,800	41,700	43,800	43,000	42,300
15	42,000	43,800	44,400	41,500	40,700	40,900	46,100	39,100	41,000	39,600	44,300	39,900
16	38,700	43,600	44,600	40,400	52,500	44,700	41,100	36,900	38,300	44,500	41,600	42,200
17	33,000	41,000	44,500	40,500	37,000	42,000	42,800	43,400	43,000	38,000	41,700	40,100
18	43,500	44,800	44,700	43,800	47,400	44,900	44,300	43,500	40,800	43,200	41,500	18,800
19	42,500	32,400	44,700	52,500	39,900	38,100	43,100	43,300	41,900	42,000	42,000	18,800
20	38,700	40,300	45,300	52,500	40,900	44,700	40,800	40,400	43,200	41,600	41,200	18,700
21	44,500	41,200	42,100	45,100	42,600	38,300	41,700	41,200	42,100	45,200	45,000	42,700
22	42,300	35,800	43,800	46,100	44,600	41,800	44,100	42,800	43,900	40,400	43,800	38,400
23	42,500	41,100	41,400	41,100	43,000	43,000	45,000	42,800	42,200	40,000	39,800	41,900
24	41,000	40,800	43,300	52,500	43,700	42,400	40,800	40,700	40,300	45,700	42,600	41,600
25	44,400	44,000	39,000	38,300	52,500	45,300	44,200	43,600	42,600	40,000	41,400	41,600
26	42,500	43,000	40,200	44,500	40,800	44,700	42,500	43,100	43,600	44,300	37,600	42,600
27	40,900	42,000	46,900	37,700	43,200	45,000	41,900	44,100	42,100	44,000	44,400	40,400
28	45,000	32,600	44,000	44,500	52,500	38,500	40,400	43,000	44,200	42,800	45,100	43,100
29	40,000	38,500	40,700	43,600	32,400	41,700	43,000	44,800	41,100	43,100	39,800	43,700
30	44,400		39,000	51,000	40,600	38,700	40,500	42,700	42,600	43,400	43,100	40,200
31	45,000		44,100		52,500		39,900	45,300		44,400		42,400
Total												
Average												
Min												
Max	45,000	45,600	46,900	52,500	52,500	52,500	46,100	46,300	45,700	45,700	45,300	49,800

PTTW Amount **56,000** ***litres/ minute***
or **80,640** ***m^3/day***

Yearly Average
Yearly Min
Yearly Max **52,500**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Treated Water Flows** 2012

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21,300	19,300	19,700	21,700	19,000	17,820	24,400	21,000	22,500	19,000	18,600	19,200
2	19,900	20,200	20,600	22,600	19,200	19,610	22,000	20,830	22,600	19,700	17,600	19,100
3	21,700	20,500	21,400	20,600	18,700	19,770	25,000	23,170	24,900	17,200	17,900	20,800
4	20,700	20,400	21,600	20,600	19,000	19,610	22,900	22,560	22,300	18,200	19,300	19,000
5	21,000	20,700	21,100	20,300	18,600	19,590	23,600	19,990	19,100	19,900	19,800	19,900
6	21,000	21,000	21,700	20,400	20,600	19,450	20,630	19,410	19,300	17,800	20,000	19,200
7	22,300	20,100	20,200	21,100	22,000	20,640	24,400	21,580	18,000	19,900	16,500	18,900
8	22,500	18,100	20,900	21,000	18,100	20,430	23,700	21,670	19,500	17,800	18,000	21,400
9	22,400	20,300	21,800	23,300	18,900	20,630	25,100	20,780	20,000	19,000	20,000	21,800
10	20,600	20,600	21,500	23,200	18,200	22,650	24,100	19,700	19,600	19,000	18,500	21,200
11	20,800	20,700	21,800	21,300	19,200	21,300	24,800	20,200	19,200	19,600	18,500	23,090
12	21,400	20,100	20,400	21,500	19,800	20,550	25,100	18,900	20,000	17,900	20,300	21,100
13	20,150	21,400	21,700	19,900	19,900	19,740	25,230	19,600	18,900	19,200	19,300	21,700
14	21,310	19,700	19,900	21,800	19,510	20,670	28,090	20,300	19,620	18,600	18,500	22,300
15	20,640	20,200	20,600	22,100	19,300	20,290	26,380	20,000	18,480	19,900	17,300	21,800
16	21,270	19,700	19,900	20,100	20,500	21,170	25,820	20,500	19,240	18,900	18,900	22,000
17	21,100	19,800	22,300	20,200	19,100	21,600	24,310	21,200	19,300	18,300	19,600	17,510
18	20,710	20,490	21,100	21,200	20,360	21,700	26,430	19,300	18,600	18,600	20,000	15,690
19	19,900	20,250	20,300	22,300	20,810	19,800	27,770	20,200	20,400	18,400	22,400	14,900
20	19,600	19,570	21,600	18,800	21,570	21,930	23,100	21,100	17,400	19,100	21,600	15,100
21	20,130	21,470	20,900	18,700	23,330	20,300	25,400	21,100	19,800	19,000	19,300	20,900
22	20,170	19,250	20,700	19,300	21,300	22,200	25,500	21,900	16,000	19,570	17,900	21,000
23	20,600	19,880	21,700	19,100	21,200	21,700	26,300	20,700	20,100	18,100	20,300	22,900
24	21,500	19,700	20,500	18,000	21,400	21,900	25,900	23,480	17,800	18,100	19,700	21,540
25	19,400	21,400	21,600	18,300	22,900	19,200	26,600	24,000	17,900	18,800	19,000	20,820
26	20,900	19,000	21,900	18,300	22,800	20,200	18,100	22,840	19,500	19,600	19,900	22,100
27	20,200	21,000	20,100	18,700	21,900	21,600	18,900	21,900	19,000	17,500	19,300	23,290
28	19,900	20,900	22,500	18,900	21,900	21,400	21,300	23,400	17,800	19,900	18,100	20,570
29	21,000	20,500	19,900	19,900	22,800	24,900	22,700	21,800	18,600	19,200	19,100	21,470
30	20,100		20,200	19,500	23,500	21,800	26,000	23,500	19,200	18,700	19,100	22,150
31	20,000		20,800		23,800		24,350	21,600		17,700		22,950
Total	644,180	586,210	650,900	612,700	639,180	624,150	753,910	658,210	584,640	582,170	574,300	635,380
Average	20,780	20,214	20,997	20,423	20,619	20,805	24,320	21,233	19,488	18,780	19,143	20,496
Min	19,400	18,100	19,700	18,000	18,100	17,820	18,100	18,900	16,000	17,200	16,500	14,900
Max	22,500	21,470	22,500	23,300	23,800	24,900	28,090	24,000	24,900	19,900	22,400	23,290

CoA Amount 45,455 m^3 */day*

Yearly Average **20,608**
Yearly Min **14,900**
Yearly Max **28,090**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Peak (Treated) Flows** 2012
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	35,300	37,100	33,000	29,400	31,100	34,500	33,900	32,800	34,800	34,600	35,100	35,400
2	35,000	34,900	34,600	33,100	34,000	34,800	35,300	34,900	35,800	31,700	35,100	34,600
3	43,300	34,900	33,700	31,900	33,300	34,700	26,800	31,100	34,300	35,600	34,200	33,000
4	34,900	35,300	33,100	32,700	32,500	3,400	35,400	31,800	34,500	35,500	34,800	34,400
5	35,300	35,300	33,000	33,900	32,800	34,700	34,000	34,000	34,000	34,000	32,300	35,100
6	34,100	34,900	31,600	35,100	35,300	34,600	26,410	33,000	34,500	32,200	33,400	35,200
7	35,200	35,000	33,000	33,600	34,500	35,500	37,000	32,200	33,900	34,100	35,200	34,800
8	34,000	33,100	35,300	34,700	32,700	34,300	34,600	31,200	34,000	33,300	33,700	34,800
9	35,700	34,300	33,900	34,800	33,000	40,500	26,600	34,900	35,400	34,200	33,900	31,800
10	36,700	30,600	35,300	32,500	33,100	34,600	34,900	31,800	33,700	34,100	33,900	33,000
11	31,400	34,700	33,600	35,500	32,900	35,700	31,600	33,600	35,000	31,800	35,600	34,400
12	34,200	33,200	34,200	35,100	34,500	34,500	27,200	33,800	35,600	34,400	35,300	35,100
13	35,300	34,900	34,500	34,800	34,000	33,600	27,000	34,900	33,200	35,000	35,400	35,400
14	32,500	34,900	33,300	33,700	35,200	32,900	35,200	34,500	32,700	32,800	32,200	34,400
15	35,600	34,500	33,900	34,800	35,000	34,200	36,600	35,500	28,300	35,000	34,400	32,600
16	35,600	35,300	35,400	35,100	34,800	35,700	35,400	30,200	33,300	35,200	34,400	36,100
17	35,800	34,900	35,100	34,200	34,500	34,500	34,800	34,000	31,000	34,800	32,200	34,500
18	35,500	35,400	32,400	32,000	34,200	32,200	35,700	35,200	33,900	33,100	32,400	28,100
19	34,500	34,600	34,500	33,600	33,300	35,500	35,600	34,600	31,100	35,900	36,700	15,500
20	34,900	34,600	32,200	34,600	35,500	35,300	35,500	30,600	30,000	32,300	35,300	16,300
21	34,230	33,200	34,500	34,900	35,510	32,600	35,500	35,200	35,000	33,900	35,100	34,800
22	33,300	31,200	33,300	35,000	32,900	32,400	32,800	36,200	29,400	35,700	34,200	33,200
23	31,300	35,200	35,100	35,300	30,900	31,900	36,700	32,400	32,600	35,500	34,200	35,200
24	33,400	33,800	33,600	33,500	32,600	34,800	34,600	34,600	34,500	35,900	35,300	33,900
25	38,800	32,500	35,100	40,600	32,800	35,900	36,400	29,900	32,000	35,000	34,700	33,300
26	33,800	34,200	35,400	34,300	34,700	31,900	32,400	33,200	32,500	34,200	35,000	34,300
27	32,800	35,200	32,800	32,900	34,800	32,400	34,500	34,300	34,800	35,700	31,400	31,300
28	37,500	35,300	34,500	42,800	34,200	35,200	31,500	34,500	31,100	35,300	31,400	34,100
29	36,800	34,000	34,300	33,500	27,100	31,200	26,500	36,000	35,300	34,300	35,300	31,400
30	37,400		35,000	34,600	35,000	32,400	28,600	30,100	34,500	35,900	35,800	34,400
31	36,400		35,400		30,200		35,600	30,600		31,000		37,500
Total												
Average												
Min												
Max	43,300	37,100	35,400	42,800	35,510	40,500	37,000	36,200	35,800	35,900	36,700	37,500

CoA Amount 45,455 m^3 */day*

Yearly Average
Yearly Min
Yearly Max **43,300**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Net to Distribution System** 2012
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21,303	19,303	19,703	21,703	19,003	17,823	24,403	21,003	22,462	18,785	18,600	20,386
2	19,903	20,203	20,603	22,603	19,203	19,613	22,002	20,833	22,751	19,119	17,827	18,898
3	21,703	20,503	21,403	20,603	18,703	19,773	25,003	23,173	25,102	17,692	19,528	20,421
4	20,703	20,403	21,603	20,604	19,003	19,613	22,903	22,563	22,022	18,402	18,884	18,470
5	21,003	20,703	21,103	20,304	18,603	19,593	23,603	19,993	19,100	19,433	19,308	19,976
6	21,003	21,003	21,703	20,403	20,603	19,453	20,633	19,413	19,224	18,570	19,041	19,200
7	22,303	20,104	20,203	21,103	22,003	20,643	24,403	21,583	18,429	18,789	17,333	18,786
8	22,503	18,103	20,903	21,002	18,104	20,433	23,703	21,673	19,576	18,141	18,656	21,362
9	22,403	20,303	21,803	23,303	18,904	20,632	25,103	20,783	20,215	19,151	19,647	21,838
10	20,603	20,603	21,503	23,203	18,203	22,653	24,104	19,703	19,108	19,000	18,046	21,579
11	20,803	20,703	21,803	21,304	19,203	21,303	24,803	20,203	19,238	18,893	20,229	22,901
12	21,403	20,103	20,403	21,504	19,802	20,553	25,103	18,903	19,621	18,443	18,798	20,721
13	20,154	21,403	21,703	19,903	19,903	19,743	25,233	19,602	18,824	19,200	18,656	21,700
14	21,314	19,703	19,903	21,803	19,513	20,673	28,093	20,303	18,939	20,013	18,500	22,262
15	20,643	20,203	20,603	22,103	19,303	20,293	26,383	20,003	19,502	19,143	17,527	21,232
16	21,273	19,703	19,903	20,103	20,503	21,173	25,823	20,503	20,111	18,054	19,279	22,429
17	21,103	19,803	22,303	20,203	19,103	21,603	24,313	21,203	18,152	18,527	19,449	18,204
18	20,713	20,493	21,104	21,202	20,364	21,703	26,433	19,303	18,537	18,524	19,735	15,690
19	19,903	20,253	20,303	22,302	20,813	19,803	27,773	20,203	20,274	18,526	22,400	13,297
20	19,603	19,572	21,603	18,803	21,573	21,933	23,103	21,103	17,362	18,860	21,449	15,100
21	20,133	21,473	20,903	18,703	23,333	20,303	25,403	21,103	19,762	19,353	19,300	21,127
22	20,173	19,253	20,703	19,302	21,303	22,203	25,503	21,903	16,492	18,560	18,935	21,896
23	20,603	19,883	21,703	19,102	21,204	21,703	26,303	20,703	20,062	18,617	19,719	22,875
24	21,503	19,703	20,503	18,003	21,404	21,903	25,903	23,483	17,800	18,479	19,347	21,490
25	19,403	21,403	21,603	18,303	22,904	19,203	26,603	24,003	18,291	18,813	19,543	20,820
26	20,903	19,003	21,903	18,303	22,804	20,203	18,103	22,843	19,487	19,587	19,446	21,469
27	20,203	21,003	20,103	18,703	21,904	21,603	18,903	21,903	18,331	18,118	19,338	23,580
28	19,903	20,903	22,503	18,903	21,903	21,403	21,303	23,403	17,674	19,294	18,062	20,911
29	21,003	20,504	19,903	19,903	22,803	24,903	22,703	21,803	19,370	18,922	19,100	21,975
30	20,103		20,203	19,503	23,503	21,803	26,003	23,503	19,377	18,624	19,214	21,999
31	20,003		20,803		23,803		24,353	21,603		17,511		22,635
Total	644,274	586,294	650,994	612,789	639,277	624,237	754,004	658,305	585,195	581,148	574,893	635,229
Average	20,783	20,217	21,000	20,426	20,622	20,808	24,323	21,236	19,507	18,747	19,163	20,491
Min	19,403	18,103	19,703	18,003	18,104	17,823	18,103	18,903	16,492	17,511	17,333	13,297
Max	22,503	21,473	22,503	23,303	23,803	24,903	28,093	24,003	25,102	20,013	22,400	23,580

Yearly Average	**20,610**
Yearly Min	**13,297**
Yearly Max	**28,093**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
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Point Pleasant Water Treatment Plant - **Raw Water Flows** 2013
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	24,000	24,590	23,280	21,670	21,650	25,020	22,800	24,960	23,010	19,660	23,470	26,610
2	23,400	25,340	21,470	23,120	22,890	26,050	23,660	23,870	21,210	17,350	22,750	26,070
3	25,400	25,370	25,050	23,040	22,620	23,590	23,150	22,770	26,370	23,070	25,510	26,750
4	21,700	24,060	22,380	22,360	24,580	23,820	25,120	23,340	25,050	23,660	23,300	25,410
5	24,300	24,830	21,740	22,230	24,500	24,560	24,640	22,540	23,290	22,270	22,690	22,640
6	24,100	24,950	21,430	23,020	25,170	24,110	25,720	22,650	23,540	22,960	22,580	22,260
7	24,700	25,130	23,280	22,000	25,180	24,100	25,640	23,760	21,850	23,940	22,440	20,770
8	24,800	25,580	22,320	23,120	25,660	23,800	25,100	23,280	24,080	22,860	22,300	22,050
9	21,300	25,510	22,290	22,450	22,650	23,200	25,110	24,360	25,490	25,360	23,330	21,100
10	24,200	26,380	21,090	21,830	25,700	23,860	23,420	24,870	24,300	22,740	23,510	20,070
11	23,380	26,190	21,590	21,750	22,050	23,230	24,820	25,430	23,250	22,200	23,050	22,030
12	23,380	26,090	22,420	23,600	22,480	23,010	23,900	24,880	22,730	25,970	23,150	21,010
13	24,140	25,140	21,600	21,820	22,000	21,530	25,770	24,700	23,940	20,890	23,090	20,880
14	23,890	22,550	21,240	21,350	20,930	23,250	25,500	25,450	24,510	25,630	22,770	21,080
15	23,480	25,430	21,350	21,900	23,280	23,060	29,200	23,700	24,280	22,400	22,850	22,480
16	23,500	25,190	23,420	23,050	23,360	22,780	27,200	25,400	24,590	23,380	23,330	21,390
17	24,790	23,900	21,540	21,500	23,060	21,900	28,000	25,470	24,140	25,110	24,070	23,070
18	22,700	24,640	22,200	21,540	25,770	22,400	25,730	24,310	22,640	22,170	24,260	19,300
19	25,700	24,640	22,790	22,510	23,280	23,620	25,910	25,480	24,770	22,370	23,960	21,250
20	24,200	24,630	20,480	22,060	25,300	24,100	25,480	25,960	24,490	23,350	24,790	21,420
21	23,800	23,400	21,730	21,790	25,480	23,130	23,740	27,500	24,750	23,960	24,030	22,490
22	24,200	24,780	22,520	22,110	23,010	24,890	20,600	27,120	22,780	21,820	25,020	22,410
23	24,600	22,120	22,440	21,670	22,190	25,180	26,210	23,300	24,060	21,360	23,570	22,180
24	24,300	23,430	22,820	21,270	21,620	23,170	25,730	24,090	24,100	23,060	25,640	22,210
25	24,400	23,960	22,660	23,640	21,270	24,090	26,700	22,450	25,150	23,290	26,380	22,120
26	25,200	21,290	22,060	20,720	23,260	21,970	27,440	25,660	23,460	23,320	26,150	22,030
27	24,900	22,870	21,880	21,110	23,900	25,780	26,870	24,040	23,230	22,030	26,340	20,060
28	24,200	21,940	23,160	23,300	23,130	24,310	25,340	23,650	19,850	21,990	26,390	21,750
29	24,700		23,720	22,690	22,140	22,520	21,890	23,820	22,890	24,450	26,490	22,880
30	24,500		20,980	24,820	23,760	25,060	24,800	24,320	25,360	22,870	26,730	23,180
31	25,200		22,450		22,970		25,870	23,450		21,910		23,950
Total	747,060	683,930	689,380	669,040	724,840	711,090	781,060	756,580	713,160	707,400	723,940	692,900
Average	24,099	24,426	22,238	22,301	23,382	23,703	25,195	24,406	23,772	22,819	24,131	22,352
Min	21,300	21,290	20,480	20,720	20,930	21,530	20,600	22,450	19,850	17,350	22,300	19,300
Max	25,700	26,380	25,050	24,820	25,770	26,050	29,200	27,500	26,370	25,970	26,730	26,750

PTTW Amount **39,560 *m³/day***

Yearly Average **23,569**
Yearly Min **17,350**
Yearly Max

1211 John Counter Blvd
P.O. Box 790
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(613) 546-1181

Point Pleasant Water Treatment Plant - Peak (**Raw) Flows** 2013
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	41,900	41,600	40,500	43,000	41,800	40,600	39,300	52,500	42,100	39,000	38,400	38,900
2	42,300	42,900	40,100	45,200	43,900	34,000	37,100	44,500	43,200	42,800	38,300	38,400
3	40,500	43,600	42,500	43,000	36,000	43,600	37,200	40,400	44,500	42,100	35,400	43,300
4	41,800	40,100	40,500	42,000	39,100	43,300	40,600	38,800	39,400	41,300	37,700	45,300
5	42,800	41,100	41,600	42,200	32,500	38,000	45,200	40,700	38,700	38,200	38,800	35,200
6	40,000	43,400	45,300	40,400	38,300	43,900	41,200	43,000	41,300	35,500	43,800	40,000
7	39,900	40,400	43,200	39,100	41,500	41,100	42,500	39,700	36,900	42,700	41,800	40,400
8	43,200	42,100	41,200	41,800	41,000	41,000	39,100	43,800	44,100	41,900	42,200	43,000
9	42,700	41,400	44,500	43,100	41,500	43,000	38,900	41,600	40,100	44,300	37,900	44,000
10	42,000	40,700	45,500	44,500	39,700	40,800	44,300	42,200	43,500	45,300	42,300	44,300
11	45,200	40,800	42,500	42,000	38,700	40,800	44,100	45,900	44,100	31,000	40,800	44,400
12	40,300	40,400	42,800	42,800	31,600	46,000	41,000	38,800	42,900	44,000	41,000	44,200
13	41,300	43,400	44,500	40,700	43,300	41,000	30,900	28,900	42,700	38,800	33,000	41,300
14	40,300	40,800	43,900	46,400	45,500	42,400	41,700	44,500	38,800	38,100	41,500	42,700
15	37,900	41,100	42,700	44,800	38,800	44,300	46,300	39,700	42,800	37,100	40,100	42,200
16	38,800	40,900	44,700	41,200	43,000	40,800	45,600	40,700	39,000	42,700	38,200	41,600
17	41,800	42,600	40,200	43,600	42,700	43,300	52,500	42,300	42,500	40,100	42,900	38,400
18	44,900	40,500	41,300	52,500	41,000	38,800	52,500	40,900	44,100	42,900	42,300	42,800
19	43,500	44,200	41,500	43,500	41,000	41,800	52,500	40,700	43,500	43,200	38,200	41,800
20	40,500	40,200	40,800	41,600	40,800	41,100	46,200	43,200	41,700	43,400	37,800	40,200
21	38,300	40,400	42,700	43,800	40,700	41,200	39,100	41,800	42,500	42,700	42,200	38,000
22	41,700	40,300	43,000	39,300	38,400	41,000	40,600	40,600	44,000	40,500	38,900	42,000
23	40,100	40,400	42,500	42,900	42,000	43,700	43,100	39,200	40,100	41,400	42,200	38,600
24	43,300	40,100	41,800	41,700	43,600	46,500	42,000	41,100	38,000	34,900	43,500	44,100
25	42,300	42,700	43,600	49,900	31,500	38,800	42,900	46,100	40,500	42,600	41,200	39,900
26	43,700	42,700	41,700	52,500	41,200	38,600	42,900	41,100	40,000	43,300	38,500	43,900
27	43,300	43,000	39,200	42,000	43,000	42,400	39,600	35,600	38,400	42,500	41,400	43,300
28	41,900	42,800	44,800	42,100	43,200	43,800	45,100	50,200	42,900	42,200	38,800	42,500
29	45,300		43,600	40,600	43,200	33,200	38,500	40,800	38,900	40,500	41,800	40,200
30	40,400		42,300	38,900	40,700	42,400	52,500	42,500	42,000	36,000	42,600	43,000
31	42,900		44,500		43,300		44,000	40,400		43,000		41,200
Total												
Average												
Min												
Max	45,300	44,200	45,500	52,500	45,500	46,500	52,500	52,500	44,500	45,300	43,800	45,300

PTTW Amount **56,000** ***litres/ minute***
or **80,640** ***m^3/day***

Yearly Average
Yearly Min
Yearly Max **52,500**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Treated Water Flows** 2013

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	23,000	23,610	22,180	20,980	20,520	24,250	22,160	23,380	22,060	17,780	22,180	25,350
2	22,700	24,380	20,350	22,100	22,260	25,060	22,900	23,010	21,700	17,250	20,830	25,320
3	24,500	24,430	23,880	22,190	21,600	22,710	22,580	21,630	23,850	22,500	24,720	25,940
4	20,800	23,100	21,330	21,430	23,650	22,900	24,333	22,160	24,170	22,490	21,310	24,310
5	23,400	23,490	21,050	21,050	23,640	23,670	23,650	21,780	22,230	21,090	21,600	21,590
6	23,200	24,080	20,530	22,890	24,410	22,840	24,920	22,560	22,780	21,740	21,280	21,610
7	23,600	24,000	22,180	20,880	24,250	23,400	24,810	22,910	21,360	22,400	20,940	19,270
8	23,900	24,740	21,320	21,880	24,850	23,000	24,180	22,540	22,980	21,720	20,850	21,620
9	20,300	24,780	21,220	21,450	21,820	21,790	24,222	23,310	24,300	23,350	22,230	19,600
10	22,700	25,410	20,150	21,000	24,240	23,670	22,610	24,420	23,160	21,770	22,440	19,780
11	22,740	25,140	21,080	20,850	21,360	22,670	24,240	24,720	22,050	20,660	21,890	21,030
12	22,270	25,080	21,520	22,200	21,900	22,430	23,380	23,870	21,560	24,760	21,330	19,390
13	23,230	24,230	20,150	20,950	20,790	20,710	24,850	24,800	23,630	19,680	21,880	19,880
14	22,910	21,270	20,600	20,730	20,070	22,430	24,890	24,580	23,140	24,450	21,460	20,440
15	22,620	24,670	20,100	20,890	22,340	22,450	28,500	22,810	23,640	21,390	21,730	21,650
16	22,640	24,030	22,280	22,140	22,610	22,300	26,400	24,550	23,070	22,030	22,320	20,090
17	23,520	23,060	20,740	20,680	22,220	20,880	27,500	24,510	22,420	22,990	22,720	21,990
18	22,200	23,990	21,150	21,020	24,300	21,750	24,880	23,880	21,670	21,570	22,450	18,560
19	24,700	23,550	21,910	20,960	23,050	22,630	25,060	24,850	24,030	20,650	22,550	20,640
20	23,300	23,900	19,590	21,180	24,360	23,280	23,810	25,310	23,450	21,780	23,570	20,380
21	22,700	22,370	21,100	21,060	24,090	22,270	23,490	26,720	23,190	23,310	22,800	21,560
22	23,200	23,050	20,950	21,110	22,160	24,160	20,900	26,300	22,090	20,240	23,780	21,630
23	23,700	21,250	21,510	20,790	21,250	24,250	26,540	22,100	23,020	20,890	22,270	21,010
24	23,300	22,480	22,130	20,100	20,600	22,090	23,910	22,840	22,940	21,900	24,460	20,810
25	23,400	23,000	21,630	22,460	20,050	23,340	26,450	22,380	23,850	21,890	25,090	21,350
26	24,400	20,790	21,120	19,650	22,550	21,330	26,730	24,990	22,230	21,580	25,040	21,170
27	23,900	21,840	21,060	20,620	22,970	24,900	25,360	22,900	21,160	21,020	25,000	19,120
28	23,100	20,630	22,000	22,630	22,100	23,380	24,350	22,920	20,270	20,620	25,220	20,780
29	23,700		22,630	22,160	21,030	21,510	21,260	23,150	20,940	23,490	25,550	21,920
30	23,500		20,060	23,870	23,220	24,240	24,120	23,780	22,990	21,230	25,930	22,260
31	24,100		21,450		22,300		25,870	21,800		20,840		22,390
Total	717,230	656,350	658,950	641,900	696,560	686,290	758,855	731,460	679,930	669,060	685,420	662,440
Average	23,136	23,441	21,256	21,397	22,470	22,876	24,479	23,595	22,664	21,583	22,847	21,369
Min	20,300		19,590	19,650	20,050	20,710	20,900	21,630	20,270	17,250	20,830	18,560
Max	24,700	25,410	23,880	23,870	24,850	25,060	28,500	26,720	24,300	24,760	25,930	25,940

Yearly Total **8,244,445**

Yearly Average **22,593**

CoA Amount 45,455 m^3 */day*

Yearly Min

Yearly Max **28,500**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Peak (Treated) Flows** 2013
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	34,200	34,600	31,400	35,500	34,800	26,400	35,800	34,800	35,700	34,000	35,200	26,300
2	33,200	31,000	34,600	34,200	26,100	26,200	32,600	31,100	29,900	33,500	35,100	26,400
3	26,300	35,100	28,800	34,200	32,300	30,400	35,400	35,100	31,800	30,200	34,700	36,600
4	29,500	34,900	33,600	35,500	31,400	34,800	33,200	34,500	36,400	25,600	32,700	36,300
5	31,100	34,200	35,400	35,900	32,300	32,200	34,100	35,500	33,200	35,800	33,500	34,500
6	34,400	33,200	31,100	32,200	35,500	33,800	26,400	35,800	31,100	34,300	33,500	32,200
7	31,700	35,000	34,100	35,600	26,300	34,800	30,700	27,300	35,800	27,600	35,000	35,200
8	34,100	34,300	35,800	34,200	26,200	32,400	32,700	33,500	34,400	32,200	35,300	35,700
9	34,600	35,200	34,200	34,000	33,000	35,000	37,500	34,600	35,000	28,100	33,300	33,400
10	26,700	26,400	35,800	32,400	31,200	34,600	32,500	36,300	27,200	27,900	34,000	34,600
11	35,800	26,500	33,500	32,700	30,700	32,600	29,600	25,800	33,700	27,700	34,700	27,500
12	34,800	26,700	34,200	31,900	32,200	35,100	31,200	30,700	29,600	28,000	34,200	32,100
13	36,200	24,200	35,200	36,000	33,700	32,400	26,300	33,700	31,200	27,600	34,500	32,400
14	34,900	35,700	35,300	28,400	34,700	34,800	38,500	25,900	33,400	27,700	31,100	34,500
15	33,200	29,400	31,500	30,900	31,100	32,100	35,500	34,000	35,700	27,700	34,700	36,100
16	34,500	33,000	34,200	31,700	34,300	33,600	35,400	26,800	33,800	27,600	34,100	34,500
17	32,300	33,900	32,800	32,500	34,200	35,300	36,900	32,000	35,600	27,600	34,000	34,600
18	43,100	43,100	35,000	34,200	28,700	32,500	35,600	30,700	35,600	30,600	34,800	31,800
19	32,700	35,200	35,300	35,700	33,500	30,700	35,600	26,600	34,300	27,600	32,800	33,900
20	32,900	35,700	35,700	33,800	35,100	33,700	35,500	33,600	34,800	27,800	31,100	34,600
21	34,900	35,700	32,700	32,100	30,600	32,900	30,800	34,300	34,100	28,100	34,000	33,700
22	3,000	32,900	35,300	35,800	31,400	34,300	34,300	34,500	35,100	32,400	27,100	27,100
23	32,300	32,000	34,600	34,700	33,400	26,400	35,800	31,800	34,100	34,800	32,600	37,900
24	34,200	32,100	35,900	31,800	34,200	36,700	34,900	34,000	33,400	31,700	34,800	34,800
25	35,500	36,100	35,300	31,300	32,600	33,800	37,900	34,300	33,700	32,100	26,600	35,700
26	33,800	35,700	35,700	31,900	30,000	34,200	34,100	35,600	31,000	34,700	26,400	34,500
27	34,600	36,500	34,200	31,300	32,000	26,500	35,100	34,100	32,400	34,800	26,300	34,000
28	35,400	34,500	32,300	44,500	32,600	30,100	33,100	33,200	34,100	32,200	26,400	33,200
29	34,400		35,500	31,300	34,600	33,700	34,000	31,700	32,500	29,800	36,400	33,700
30	33,500		32,700	32,400	34,000	32,400	30,000	33,700	29,100	35,800	35,400	32,200
31	35,000		35,100		31,900		34,000	35,200		34,000		31,600
Total												
Average												
Min												
Max	43,100	43,100	35,900	44,500	35,500	36,700	38,500	36,300	36,400	35,800	36,400	37,900

CoA Amount 45,455 m^3 */day*

Yearly Average
Yearly Min
Yearly Max **44,500**

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Net to Distribution System** 2013 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	22,041	23,292	22,926	22,166	14,389	24,622	15,991	23,000	22,377	9,446	22,007	18,806
2	23,159	24,279	20,997	21,044	22,327	24,354	22,868	22,249	22,721	18,703	20,773	25,478
3	23,819	23,766	23,608	22,006	22,114	22,294	23,562	21,685	23,167	22,166	23,867	25,793
4	21,456	24,272	20,325	21,352	23,675	24,050	24,298	22,234	24,349	21,370	20,914	23,461
5	22,889	23,530	21,202	21,278	24,926	23,409	24,386	22,850	21,173	22,006	21,545	21,029
6	23,344	24,024	21,500	23,236	24,404	23,177	25,475	21,858	23,167	22,738	21,497	21,714
7	23,280	24,106	21,654	20,607	24,063	21,802	23,641	23,066	22,633	22,370	21,202	19,104
8	23,238	24,606	21,516	21,639	24,106	21,963	24,459	22,797	23,066	20,863	21,543	21,387
9	20,729	25,090	20,725	20,943	21,594	22,557	24,013	23,126	23,713	23,235	21,981	19,654
10	23,232	25,075	21,043	21,508	23,645	24,109	22,255	24,023	23,363	21,164	21,814	20,103
11	22,771	25,356	20,746	20,977	20,582	21,129	23,490	24,783	21,159	22,043	22,218	20,403
12	22,213	23,802	21,532	22,048	22,005	21,126	24,012	22,922	22,110	23,576	21,493	19,709
13	23,647	23,368	19,739	19,666	21,062	22,537	25,322	26,429	22,820	20,813	21,450	20,297
14	23,167	23,274	20,755	21,577	21,693	22,492	25,445	23,687	23,497	23,348	21,844	20,374
15	22,625	24,891	20,091	21,716	21,521	22,668	29,627	22,670	23,743	21,303	21,784	21,833
16	22,629	22,322	22,109	21,721	22,709	22,363	25,892	24,680	21,937	21,728	22,450	20,392
17	23,033	23,545	20,906	20,085	22,759	22,386	26,634	24,689	22,199	22,294	23,090	21,930
18	22,673	24,031	21,525	21,448	25,120	21,290	24,665	24,938	23,120	21,277	22,749	18,190
19	24,144	23,808	21,091	20,906	22,231	22,173	24,633	25,373	23,707	21,657	22,581	20,091
20	23,727	23,565	20,514	20,336	25,217	23,519	23,228	25,600	23,024	21,988	23,038	21,030
21	22,704	22,309	21,079	21,733	23,168	23,177	24,016	26,181	22,898	22,268	22,459	21,507
22	23,132	23,110	20,493	20,365	20,667	22,125	21,892	24,777	22,365	20,786	23,650	20,540
23	23,899	21,774	21,659	21,013	22,076	24,963	26,260	22,863	23,073	21,273	23,196	21,056
24	22,493	22,479	22,127	20,893	19,554	22,677	23,935	23,379	23,324	21,610	24,512	20,655
25	24,259	21,786	21,638	22,443	21,567	24,020	26,692	21,942	23,017	21,427	25,701	21,893
26	24,012	21,755	21,184	18,695	22,293	22,093	26,389	23,934	22,771	22,003	24,155	20,609
27	23,945	20,971	21,527	21,270	23,039	24,443	24,925	24,707	22,636	20,809	25,064	20,532
28	23,297	20,576	21,731	23,105	21,313	22,586	23,751	21,066	22,289	22,241	25,287	21,704
29	23,198		23,322	21,744	22,137	21,636	22,210	23,268	19,810	21,656	26,327	22,344
30	24,028		19,144	24,351	23,383	22,775	24,731	23,935	22,161	21,825	26,332	21,816
31	24,183		21,963		23,063		25,565	21,891		21,281		22,349
Total	716,967	654,763	660,370	641,869	692,403	684,514	754,263	730,601	681,393	661,268	686,520	655,783
Average	23,128	23,384	21,302	21,396	22,336	22,817	24,331	23,568	22,713	21,331	22,884	21,154
Min	20,729		19,144	18,695	14,389	21,126	15,991	21,066	19,810	9,446	20,773	18,190
Max	24,259	25,356	23,608	24,351	25,217	24,963	29,627	26,429	24,349	23,576	26,332	25,793
					Yearly Total		**8,220,716**					
					Yearly Average		**22,529**					
					Yearly Min							
					Yearly Max		**29,627**					

1211 John Counter Blvd
P.O. Box 790
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K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Raw Water Flows** 2014 m^3

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	22,290	25,200	22,730	21,950	18,580	23,520	21,460	21,520	21,520	19,260	17,760	21,540
2	23,750	24,460	22,410	20,620	20,490	24,340	21,250	21,150	22,750	20,180	20,940	16,750
3	22,290	24,090	22,600	21,160	20,530	21,930	21,850	21,020	18,590	20,530	19,800	20,270
4	22,610	21,680	21,450	22,330	21,460	21,730	20,880	22,070	21,640	19,800	18,940	20,410
5	26,620	21,860	21,870	21,700	20,490	21,330	21,240	21,510	20,850	19,350	19,230	20,420
6	26,150	22,600	22,960	22,450	20,280	22,290	23,360	21,500	20,330	20,840	19,680	21,600
7	23,480	22,170	22,200	22,690	20,820	23,330	20,570	22,740	20,880	19,270	19,320	19,990
8	24,100	23,270	22,720	20,370	20,530	22,570	20,250	23,830	19,790	18,580	18,690	19,700
9	18,920	23,380	22,020	21,370	20,870	24,110	19,870	21,950	20,990	19,370	21,200	20,030
10	25,430	23,140	22,260	19,970	21,620	24,290	20,550	23,610	19,940	19,380	19,080	20,750
11	25,340	22,520	21,630	20,720	21,460	21,310	21,440	24,520	20,090	19,630	19,130	21,730
12	23,000	21,950	21,800	21,640	21,290	19,950	21,170	21,300	20,580	20,690	19,880	20,170
13	23,850	23,480	20,920	21,860	21,310	19,820	20,710	20,420	19,910	17,950	19,140	22,060
14	22,100	23,590	21,480	21,350	20,120	19,450	19,760	18,010	19,640	21,170	19,060	21,830
15	23,370	22,110	21,250	21,020	18,310	20,670	19,220	21,120	19,900	18,910	19,440	21,310
16	23,390	23,380	23,410	19,150	23,060	20,290	20,880	19,470	19,610	19,480	20,040	21,710
17	22,990	23,330	22,280	21,440	20,830	20,870	20,340	20,080	20,350	18,700	20,300	21,270
18	23,920	22,880	21,200	20,840	20,470	19,760	23,340	20,680	21,000	20,500	18,630	22,040
19	23,030	22,800	22,270	21,270	20,980	21,880	19,850	18,190	19,180	19,990	19,530	21,390
20	23,400	23,250	21,790	20,690	21,550	18,010	21,310	22,540	19,550	19,930	19,230	22,480
21	22,470	21,710	21,960	21,020	21,230	21,610	21,570	19,700	21,590	17,370	19,950	20,630
22	23,730	24,760	25,150	20,060	18,390	21,610	22,990	19,850	18,800	18,690	20,080	21,320
23	24,100	20,170	25,350	22,140	22,660	22,860	22,450	20,750	20,160	19,100	20,810	19,370
24	23,510	23,500	25,100	21,410	21,080	19,620	22,460	19,890	20,350	19,930	21,460	20,630
25	24,440	22,190	16,570	19,740	20,600	18,580	22,990	21,420	19,510	17,840	19,740	20,680
26	23,790	22,410	21,730	20,350	21,480	21,770	22,830	21,060	19,540	19,470	16,340	21,550
27	23,230	21,990	20,580	21,420	22,500	20,870	21,240	22,210	19,320	19,620	20,100	22,000
28	24,050	22,070	21,080	21,940	23,610	22,310	20,990	21,470	22,040	20,010	19,410	20,590
29	23,480		20,640	19,220	22,840	21,490	18,670	20,990	19,800	18,020	21,100	22,500
30	22,140		22,050	21,460	21,840	21,500	21,300	21,430	21,090	19,570	18,790	20,620
31	24,490		22,730		22,240		19,230	19,640		19,660		21,350
Total	729,460	639,940	684,190	633,350	653,520	643,670	656,020	655,640	609,290	602,790	586,800	648,690
Average	23,531	22,855	22,071	21,112	21,081	21,456	21,162	21,150	20,310	19,445	19,560	20,925
Min	18,920	20,170	16,570	19,150	18,310	18,010	18,670	18,010	18,590	17,370	16,340	16,750
Max	26,620	25,200	25,350	22,690	23,610	24,340	23,360	24,520	22,750	21,170	21,460	22,500

PTTW Amount **39,560** ***m^3/day***

Yearly Average **21,221**
Yearly Min **16,340**
Yearly Max

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - Peak (**Raw) Flows** 2014
m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	38,800	43,400	42,300	40,000	35,900	39,000	45,100	42,100	43,500	44,200	42,500	37,500
2	40,300	43,300	43,800	42,300	42,700	40,300	41,800	44,000	42,900	39,400	42,400	39,700
3	42,100	42,000	41,900	38,100	45,600	43,000	43,200	45,000	44,400	41,600	37,600	34,800
4	43,400	43,400	35,700	42,500	42,800	44,800	43,400	45,200	35,500	44,300	44,500	42,700
5	40,300	32,500	43,100	40,600	35,900	42,700	43,400	40,400	43,900	42,700	43,800	44,800
6	40,300	43,700	43,000	41,300	44,800	43,000	43,600	43,900	43,500	42,500	44,300	40,100
7	40,700	41,300	43,600	40,900	41,500	42,800	38,800	43,200	42,700	41,000	44,300	44,300
8	39,600	43,100	42,400	41,100	36,600	38,500	44,800	43,900	43,000	40,200	38,100	40,700
9	42,700	38,400	43,300	35,600	43,000	38,800	30,600	42,200	42,800	42,800	43,800	41,200
10	43,400	30,600	42,100	38,800	43,500	40,200	39,600	38,300	44,200	42,700	43,500	44,800
11	38,400	43,400	38,200	44,500	43,200	42,600	43,300	37,700	42,200	43,100	39,800	50,600
12	43,500	38,300	37,700	41,000	42,900	43,100	42,100	42,900	37,300	40,600	43,600	47,900
13	42,300	38,600	40,000	40,400	43,700	42,200	31,300	43,300	46,100	44,500	43,700	34,500
14	38,300	42,700	42,500	43,000	43,200	42,400	39,600	37,900	40,900	43,600	44,100	40,700
15	38,600	39,100	44,500	41,800	41,800	43,800	32,900	46,600	42,500	44,700	40,300	38,300
16	44,200	39,800	43,200	36,200	39,000	43,000	44,400	40,600	40,500	44,900	39,700	32,700
17	45,400	41,100	42,200	35,200	43,300	43,700	38,600	41,300	44,100	38,400	37,800	37,300
18	43,200	31,800	43,100	40,500	43,800	43,000	42,900	40,700	40,300	34,200	33,100	39,200
19	40,300	42,900	43,300	45,000	45,300	44,800	41,500	43,000	42,700	25,800	38,000	34,700
20	42,800	35,500	42,800	36,000	39,300	40,700	42,300	42,000	44,800	33,100	41,800	46,700
21	41,100	42,000	43,600	43,800	38,700	45,000	42,500	41,500	41,900	40,700	37,600	52,500
22	45,500	40,800	37,730	44,300	44,600	40,800	40,800	43,100	42,100	40,400	44,300	52,500
23	41,900	37,900	40,410	44,800	43,800	42,900	40,100	45,300	33,300	41,700	44,200	45,200
24	42,700	38,800	37,900	45,600	41,000	44,200	42,700	41,700	44,100	44,700	36,000	45,300
25	32,300	42,400	43,600	43,000	41,000	45,400	43,600	46,200	44,700	44,500	33,900	43,900
26	40,400	43,100	43,400	38,500	45,000	37,300	42,800	44,100	46,900	40,700	43,800	39,800
27	37,500	42,400	44,300	44,000	44,600	43,700	43,400	43,400	44,600	42,900	34,600	42,400
28	42,600	35,300	43,900	42,200	42,300	42,300	45,000	42,400	35,700	42,800	39,600	41,400
29	45,400		38,300	31,600	38,900	43,900	45,200	43,500	43,200	39,300	40,900	39,800
30	43,100		40,200	38,200	45,100	44,100	35,800	41,700	43,400	46,700	35,300	43,700
31	43,400		37,800		39,000		41,900	43,900		34,200		40,700
Total												
Average												
Min												
Max	45,500	43,700	44,500	45,600	45,600	45,400	45,200	46,600	46,900	46,700	44,500	52,500

PTTW Amount **56,000** ***litres/ minute***
or **80,640** ***m^3/day***

Yearly Average
Yearly Min
Yearly Max **52,500**

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Point Pleasant Water Treatment Plant - **Treated Water Flows** 2014

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21,870	24,190	22,190	21,050	17,340	22,900	20,770	21,210	21,750	17,550	16,300	20,120
2	22,600	23,650	21,320	19,740	19,470	23,750	19,700	19,030	21,410	19,030	19,510	18,580
3	21,080	23,120	21,570	20,100	18,530	20,330	21,090	20,740	17,720	19,320	18,570	18,480
4	22,040	20,140	20,100	21,270	20,450	21,110	19,670	21,610	20,870	18,670	17,840	19,300
5	26,250	20,570	21,760	20,660	19,390	20,190	20,060	19,960	19,790	18,430	18,020	18,980
6	24,240	22,360	21,960	21,380	18,390	20,890	22,220	20,730	19,650	19,360	18,470	20,510
7	22,120	21,290	20,740	21,540	19,370	22,300	19,940	22,140	19,490	18,500	17,970	18,690
8	23,440	22,590	21,640	18,930	20,070	22,100	19,350	22,550	18,930	17,420	17,720	18,500
9	17,740	22,460	20,820	21,100	19,290	23,540	18,990	20,470	20,020	18,400	20,570	18,950
10	24,850	21,820	21,000	18,070	20,310	23,360	19,390	23,500	18,950	18,460	17,830	19,120
11	24,800	21,310	20,960	19,880	19,390	19,310	20,390	23,300	19,720	18,810	18,040	19,150
12	21,000	20,880	20,550	21,160	20,870	19,130	20,370	20,040	19,090	20,050	18,670	17,810
13	23,570	23,020	19,840	20,150	19,990	18,760	18,880	19,470	19,270	16,850	18,330	20,050
14	20,340	22,320	20,100	20,870	18,630	18,640	19,050	16,630	18,000	19,560	17,790	19,110
15	23,110	21,450	20,100	19,570	17,090	20,200	17,930	20,180	18,980	18,350	18,420	19,130
16	22,270	22,610	22,730	17,460	21,930	18,090	19,490	18,660	18,900	18,360	19,250	19,420
17	21,880	22,190	21,810	19,610	19,530	20,970	19,840	19,200	18,910	17,760	18,920	18,540
18	22,220	21,200	20,560	19,450	19,370	18,600	22,060	19,840	20,190	19,790	17,230	20,030
19	22,930	22,420	20,710	20,360	19,720	20,860	19,070	17,400	17,670	19,170	18,220	19,100
20	22,370	22,510	20,560	19,690	20,160	16,790	20,740	21,160	18,600	19,170	17,900	21,230
21	21,470	20,150	21,990	19,160	20,220	20,990	20,600	18,660	20,140	16,350	19,020	19,200
22	23,080	24,110	24,670	19,710	16,520	20,530	21,640	18,890	17,320	17,650	18,840	21,100
23	23,220	19,330	24,410	20,700	22,340	21,440	21,690	19,770	19,250	17,280	19,620	17,800
24	22,160	22,530	21,340	20,490	20,230	18,580	21,660	19,350	18,850	19,020	19,880	19,540
25	23,560	21,080	14,760	18,370	20,190	17,900	22,000	20,520	19,080	17,020	19,000	18,770
26	22,220	21,810	21,300	19,130	20,400	21,300	21,920	20,330	19,080	18,560	14,760	20,970
27	22,630	20,570	20,030	19,880	20,510	19,860	19,930	20,960	18,380	18,480	18,910	20,300
28	23,450	21,290	19,790	19,710	21,770	21,070	19,440	20,460	21,000	18,770	18,090	19,630
29	22,870		19,730	18,330	21,930	19,920	17,710	20,290	18,450	17,180	19,680	21,240
30	21,320		20,910	19,850	20,880	21,180	20,300	20,540	20,950	19,290	17,760	19,700
31	23,490		22,290		22,720		17,730	17,710		18,740		20,200
Total	700,190	612,970	652,240	597,370	617,000	614,590	623,620	625,300	580,410	571,350	551,130	603,250
Average	22,587	21,892	21,040	19,912	19,903	20,486	20,117	20,171	19,347	18,431	18,371	19,460
Min	17,740		14,760	17,460	16,520	16,790	17,710	16,630	17,320	16,350	14,760	17,800
Max	26,250	24,190	24,670	21,540	22,720	23,750	22,220	23,500	21,750	20,050	20,570	21,240

CoA Amount 45,455 m^3 */day*

Yearly Average **20,143**

Yearly Min

Yearly Max **26,250**

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Point Pleasant Water Treatment Plant - **Peak (Treated) Flows** 2014

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	35,200	33,900	34,800	30,700	32,500	34,000	34,400	33,800	32,200	30,500	33,900	31,400
2	33,100	31,700	33,700	32,000	29,900	33,900	31,100	32,400	29,900	34,100	31,300	30,400
3	34,500	33,700	34,400	32,500	34,000	30,800	31,100	33,100	33,700	34,900	31,900	32,000
4	32,500	33,400	35,800	34,600	34,300	33,100	33,600	32,700	32,900	24,400	31,000	30,300
5	34,000	33,800	35,600	35,100	34,100	34,200	31,800	33,500	31,700	29,300	35,700	30,800
6	34,000	36,700	34,000	34,300	33,600	31,000	34,300	36,000	32,400	34,500	32,000	32,700
7	32,500	34,600	32,100	31,700	33,700	29,800	34,700	33,600	33,000	31,500	31,500	32,800
8	33,600	35,700	34,900	33,500	32,100	24,870	30,400	34,900	30,600	31,300	31,500	31,500
9	33,000	35,000	34,100	32,800	30,900	35,200	32,900	32,800	30,700	31,000	34,000	40,200
10	33,500	35,000	30,300	33,100	30,900	34,500	30,800	34,400	32,100	29,400	31,400	33,700
11	34,600	34,100	34,100	33,400	34,100	29,700	31,400	25,100	32,500	34,400	31,700	34,400
12	33,400	36,000	34,500	32,800	33,700	33,500	31,900	30,400	33,000	33,100	30,300	34,600
13	34,000	33,600	30,100	31,600	33,200	33,600	30,000	32,700	30,300	28,800	34,500	32,800
14	34,500	34,700	35,000	34,700	31,900	33,300	32,400	32,100	31,400	29,800	29,100	33,500
15	35,600	34,400	34,700	33,000	28,900	32,500	32,300	32,700	31,000	32,800	34,200	31,400
16	37,400	34,000	34,600	31,800	33,300	31,200	31,400	37,100	31,600	34,800	33,500	34,200
17	33,500	31,800	34,800	31,700	32,200	34,300	28,200	31,900	31,100	33,200	33,900	32,700
18	34,000	33,300	34,200	33,500	34,600	34,100	33,300	31,000	31,200	33,700	28,700	31,800
19	34,700	35,400	34,500	32,900	32,000	33,300	29,900	30,600	33,000	31,600	31,900	33,700
20	34,500	34,400	34,300	34,000	33,400	29,500	33,700	30,700	35,000	34,900	29,100	34,500
21	35,500	34,400	34,700	32,800	31,000	30,800	30,700	30,900	31,400	31,900	32,200	32,800
22	34,200	33,000	33,550	30,400	33,200	31,800	33,300	34,100	28,600	31,500	31,800	32,000
23	34,500	33,400	33,350	31,600	32,200	33,600	33,500	31,100	32,300	29,400	29,800	30,800
24	33,900	34,500	24,500	32,100	33,300	33,200	30,600	31,100	34,400	32,100	29,200	34,600
25	35,200	33,900	34,800	31,300	33,900	34,300	31,100	33,800	34,000	29,200	34,100	32,800
26	32,400	35,800	34,300	30,600	31,300	30,900	33,300	33,400	31,000	29,500	28,700	34,300
27	35,000	32,300	33,100	33,300	33,800	33,700	30,400	31,900	33,200	32,700	34,700	33,000
28	33,600	35,100	32,300	32,300	31,400	32,200	33,600	31,200	34,300	28,300	33,600	35,500
29	34,900		33,100	32,300	31,900	31,200	33,800	32,800	34,400	31,600	32,400	30,700
30	34,400		34,500	31,700	32,900	33,900	32,200	34,000	33,900	31,700	32,900	33,800
31	33,900		30,100		31,000		33,000	31,200		31,100		34,700
Total												
Average												
Min												
Max	37,400	36,700	35,800	35,100	34,600	35,200	34,700	37,100	35,000	34,900	35,700	40,200

CoA Amount 45,455 m^3 */day*

Yearly Average
Yearly Min
Yearly Max **40,200**

Utilities Kingston

1211 John Counter Blvd
P.O. Box 790
Kingston, Ontario
K7L 4X7
(613) 546-1181

Point Pleasant Water Treatment Plant - **Net to Distribution System** 2014

m^3

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21,791	22,961	23,099	20,667	17,503	22,792	20,762	20,598	21,428	17,691	17,110	20,713
2	23,151	24,484	21,945	20,444	18,499	22,941	20,470	19,918	19,840	19,079	19,186	17,646
3	20,067	23,502	22,293	19,563	19,615	20,219	20,101	20,224	18,066	18,308	20,612	18,138
4	24,136	20,649	19,899	21,286	19,263	20,399	19,273	21,014	21,153	18,996	14,899	19,261
5	25,931	19,696	20,701	20,782	19,769	20,737	21,075	20,527	19,387	19,337	18,492	19,311
6	22,837	21,520	21,632	21,352	18,967	21,228	20,718	21,421	19,134	18,481	18,802	21,546
7	21,835	22,569	20,150	22,103	18,672	22,857	20,210	22,183	20,368	17,363	17,805	18,515
8	23,176	22,496	21,627	19,017	20,602	21,597	19,690	22,617	18,221	18,166	18,983	18,059
9	20,597	22,343	21,262	20,157	18,699	23,242	18,832	21,198	20,402	18,465	21,166	18,007
10	22,219	22,117	21,455	19,027	20,362	22,544	20,142	21,736	18,646	18,221	16,783	19,291
11	24,316	21,535	20,417	20,598	20,247	19,737	20,090	23,968	19,221	19,991	17,221	18,768
12	21,339	20,699	20,728	20,555	19,777	19,001	20,586	19,003	19,844	20,560	18,892	19,228
13	23,499	21,776	20,193	20,588	19,552	17,641	19,588	20,149	18,955	17,311	17,842	20,011
14	20,178	22,626	20,778	21,851	19,781	18,993	19,697	17,253	18,600	18,460	17,723	18,465
15	21,974	21,914	20,623	16,795	17,759	20,773	17,656	20,377	18,448	17,755	19,500	18,905
16	23,264	22,803	21,815	17,989	20,605	19,903	18,852	18,525	18,639	17,510	20,418	19,166
17	22,482	22,311	21,269	21,334	18,553	19,719	19,292	18,079	18,995	18,522	17,003	18,625
18	22,163	21,373	20,383	17,585	19,773	17,914	21,084	20,162	21,220	19,987	17,615	20,438
19	23,773	22,737	21,512	20,468	19,891	21,241	20,180	18,661	17,115	18,932	18,196	18,667
20	21,025	21,649	21,454	21,632	20,407	16,741	20,630	20,222	19,628	18,510	17,810	21,638
21	21,961	20,248	21,102	17,630	20,693	20,735	21,636	18,020	20,016	16,842	19,144	19,556
22	22,821	23,402	25,156	20,256	17,914	21,576	21,432	20,539	17,246	17,863	19,332	20,768
23	22,915	20,533	23,799	21,166	20,585	20,797	20,660	18,702	19,526	16,479	19,632	18,424
24	23,278	23,222	20,857	17,773	20,078	19,312	21,831	19,282	17,823	19,809	19,599	18,701
25	23,587	19,700	16,445	19,074	20,862	17,787	21,838	20,418	18,946	17,702	18,002	19,758
26	22,369	21,247	19,077	19,729	20,189	20,289	22,060	20,760	19,125	19,312	15,195	19,904
27	23,153	21,356	20,595	20,387	21,483	20,554	20,469	20,982	19,977	17,649	18,945	19,689
28	21,336	20,386	20,156	19,812	20,951	21,004	20,587	20,048	20,922	18,019	18,120	20,579
29	23,764		21,050	16,789	21,865	20,059	16,770	20,695	17,882	17,302	18,852	22,135
30	21,191		21,700	21,634	20,117	20,948	19,405	20,529	20,902	19,186	19,105	19,404
31	23,666		19,927		24,594		18,336	18,628		18,450		19,801
Total	699,797	611,854	653,099	598,043	617,629	613,280	623,951	626,437	579,674	570,259	551,984	603,119
Average	22,574	21,852	21,068	19,935	19,924	20,443	20,127	20,208	19,322	18,395	18,399	19,455
Min	20,067		16,445	16,789	17,503	16,741	16,770	17,253	17,115	16,479	14,899	17,646
Max	25,931	24,484	25,156	22,103	24,594	23,242	22,060	23,968	21,428	20,560	21,166	22,135
					Yearly Total		**7,349,126**					
					Yearly Average		**20,142**					
					Yearly Min							
					Yearly Max		**25,931**					

Appendix D

LEAKAGE AND BREAK ANALYSIS

1 BREAK AND LEAKAGE

1.1 DATA AVAILABILITY

There are two data sources of leakage, break and repair records from UK.

- Leak repair/report tracking data (2011-2014) – This data includes 500+ recorded events in the Kingston area.
- GIS beak layer in the model (1998-2014) – This data has 500+ break/repair events been recorded.

WSP has compared above data and found out that the GIS break layer has longer record duration (17 years) while the leak repair/report tracking spreadsheet has only 5 years record. However, the trends of both leak and break locations are similar, see Figure 1-1 and Figure 1-2 for details. For statistical analysis, it is decided to use pipe age and material information, the leak repair/report tracking data and GIS break layer to assign the leak and break potentials.

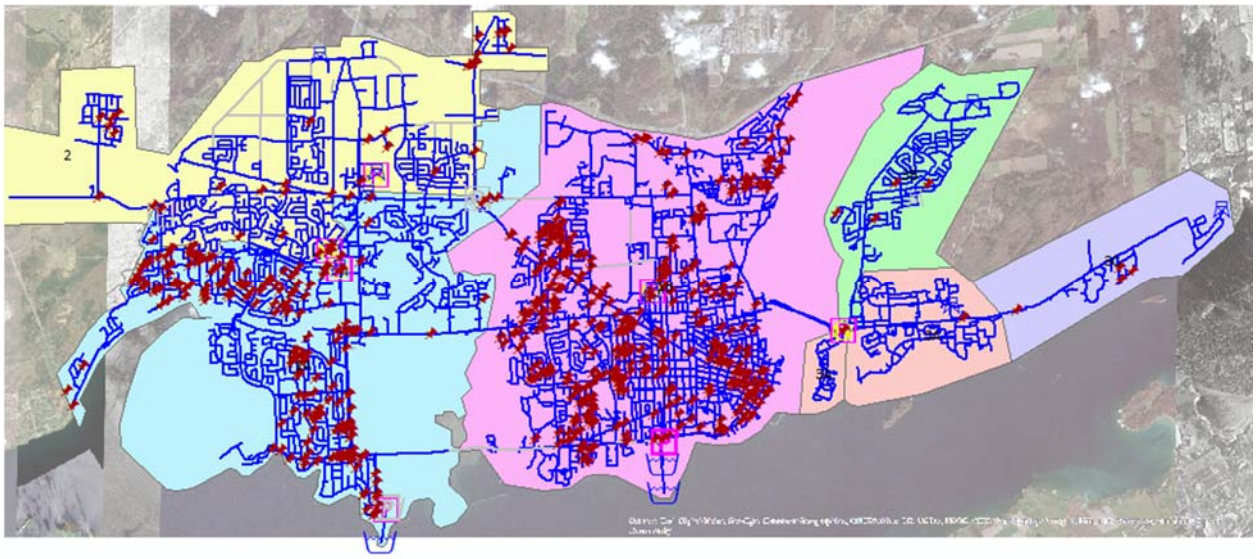


Figure 1-1 GIS Water beak layer within the Pressure Zones in the model (1998-2014)

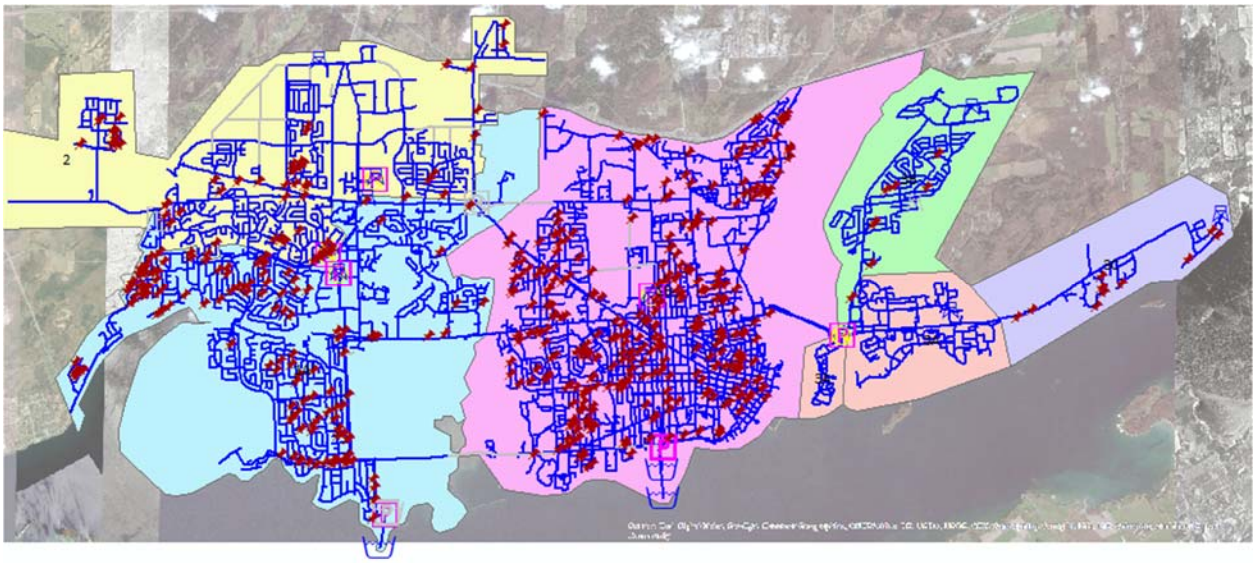


Figure 1-2 Leak repair/report tracking data within the Pressure Zones in the model (2011-2014)

However, the pipe age is not included in the tracking data. Also there is no pipe ID or leakage ID available in the tracking data to match these in the model. To assign the historical leak/repair events in the model, addresses where the leak happened are used. Some addresses has inaccurate information are allocated from Google Earth pro. The proposed pipe groups are based on the pipe ages and materials as shown in the tables below:

Table 1 Pipe age based on the installation year information

Watermain Installation year	Age Group
1981 – 2015	0 – 35
1941 – 1980	35 – 75
1940 and earlier	> 75

Table 2 Key Leak and Break Indicator groups by Pipe Material and Age

Pipe Material /age (year)	Pipe Groups		
	0 – 35	35 – 75	> 75
Metal (DI/CI/SSTL/CU/CIPP)	#1	#2	#3
Plastic (PVC/HDPE)	#4	#5	#6
Concrete (AC/CPP)	#7	#8	#9

We are compiling both pipe and connection (loading/meter node) breaks as an indicator variable of the break and leak potential, in a statistical sense. Consequently, the number of both types of breaks must be calculated and assigned to each individual pipe, then summed for each pipe group. The more breaks/leaks, the more break/leak potential.

1.1.1 LEAKAGE POTENTIAL DETERMINATION

Given the known (or estimated) measured leakage rate for each pipe group, correlate to pipe/connection statistics by regression or some other rigorous means and split the total unaccounted-for-leakage from the water balance according to the indicators most strongly associated with known leakage.

If no leakage data, the pipe group with the most leaks/repairs gets the most leakage %, assigned in categories by using above mentioned method.

Leaks are only a modifier on the fundamental leak driver, which is pipe material and age. Old iron pipes can leak bad, or they may not. New plastic pipes are not expected to leak, but they could. To assign pipe to the age group, the watermain installation year obtained from the UK model.

The secondary modifier that results in breaks/leaks is very cold weather, e.g.: weekly or monthly temperature vs normal/expected temperature. Since this varies from year to year, we will ignore temperature in this analysis and rely on break data only as an indicator of long-term wear-and-tear resulting in leakage on pipe groups.

The known leak and unknown water loss volumes are combine to be assigned as ‘leakage loading rate’. Since the UK’s Leak Tracking record is based on more recent data and has more data points, in addition it has similar trend with the GIS break layer data, to assign unknown water loss based on this data is considered being close to the reality.

Table 3 Leakage

Zone	2014 Total Water Produced (m3/year)	Total Leakage (known Leak + unknown loss) (m3)	% Service Leak Losses (m3/year)	Pipe Length (m)
West	7,349,126	2,264,315	31%	280,558.8
Central	15,571,844	5,003,194	32%	275,001.5

East	1,983,236	336,900	17%	87,293.5

The idea for leak potential determination is that most leak events are related to service connections, pipe age and material. It is considered that the older, longer pipe has higher leak potential. Also pipe material is put in consideration. Based on the UK's Leak repair/report tracking data (2011-2014) recorded leak/repair events for leak potential is determined.

1.1.2 BREAK POTENTIAL DETERMINATION

The idea for break potential determination is that most break events are related to pipe age and material. Similar to the leak potential determination method, the break potential is based on the UK's GIS Break layer in the model data (1998-2014) for break potential. The break potential is determined. The results can be found in the tables below.

It is found that:

1. Central Zone and West Zone pipe groups have similar ratio overall for both break potential and leak potential.
2. Concrete pipe group 7, 8, and 9 have low historic break and leak events recorded.

LEAKAGE POTENTIAL DETERMINATION TABLES

Table 4 Total Kingston Leak Potential Determination

Pipe Group	Length of Pipe (m)	# Known Leak	Weighted Leak Volume (m^3/year)	Leak Potential (%)
1	111807.73	75	0.67	13.2%
2	101342.35	115	1.13	20.2%
3	19799.48	26	1.31	4.6%
4	219598.87	82	0.37	14.4%
5	156338.01	235	1.50	41.2%
6	13321.97	22	1.65	3.9%
7	12166.09	7	0.58	1.2%
8	5028.88	5	0.99	0.9%
9	3399.08	3	0.88	0.5%
Total	642802.47	570	1.13	100%

Table B- 1 West Zone Leakage Potential Determination

Pipe Group	Length of Pipe (m)	# Known Leak	Leakage Volume (m^3/year)	Leakage Rate (m^3/m/year)	Leakage Potential (%)
1	42,237.37	18	304,443.46	7.21	13.4%
2	36,597.84	38	471,243.46	12.88	20.8%
3					
4	132,869.08	41	140,048.08	1.05	6.2%
5	63,702.15	117	833,583.24	13.09	36.8%

6					
7	4,554.52	4	514,996.75	100.45	22.7%
8	572.39				
9					
Total	280,533.36	218	2,264,314.98		

Table B- 2 Central Zone Leakage Potential Determination

Pipe Group	Length of Pipe (m)	# Known Leakage	Leakage Volume (m^3/year)	Leakage Rate (m^3/m/year)	Leakage Potential (%)
1	56,148.82	49	615,852.42	10.97	12.3%
2	53,805.57	77	1,009,914.71	18.77	20.2%
3	19,799.48	26	926,703.34	46.80	18.5%
4	47,372.47	37	551,184.45	11.64	11.0%
5	74,727.59	115	1,098,767.87	12.48	22.0%
6	13,321.97	22	13,321.97		
7	2,119.10		800,771.29	81.71	16.0%
8	4,281.56	5			
9	3,399.08	3			
Total	274,975.65	334	5,003,194.09		

Table B- 3 East Zone Leakage Potential Determination

Pipe Group	Length of Pipe (m)	# Known Leakage	Leakage Volume (m^3/year)	Leakage Rate (m^3/m/year)	Leak Potential (%)
1	13,421.54	8	46,916.75	3.50	13.9%
2	10,938.93	0	79,367.99	7.26	23.6%
3					
4	39,357.32	4	26,116.94	0.66	7.8%
5	17,908.27	3	105,133.66	5.87	31.2%
6					
7	5,492.47	3	79,364.40	14.00	23.6%
8	174.93				
9					
Total	87,293.46	18	336,899.73		

BREAK POTENTIAL DETERMINATION TABLES

Table B- 4 Total Kingston Break Potential Determination

Pipe Group	Length of Pipe (m)	# Known Break	Weighted Break Volume (m^3/year)	Break Potential (%)
1	111807.73	41	0.37	4.0%
2	101342.35	137	1.35	14.9%
3	19799.48	29	1.46	16.1%
4	219598.87	47	0.21	2.4%
5	156338.01	242	1.55	17.0%
6	13321.97	18	1.35	14.9%
7	12166.09	5	0.41	4.5%
8	5028.88	9	1.79	19.7%

9	3399.08	2	0.59	6.5%
Total	642802.47	530	1.27	100%

Table B- 5 West Zone Break Potential Determination

Pipe Group	Length of Pipe (m)	# Known Break	Break Volume (m^3/year)	Break Ratio (m^3/m/year)	Break Potential (%)
1	42,237.37	15	53,418.57	1.26	7.4%
2	36,597.84	43	171,156.44	4.68	23.7%
3					
4	132,869.08	21	23,023.73	0.17	3.2%
5	63,702.15	127	290,422.25	4.56	40.2%
6					
7	4,554.52	3	184,436.75	35.97	25.5%
8	572.39	1			
9					
Total	280,533.36	210	722,457.74		

Table B- 6 Central Zone Break Potential Determination

Pipe Group	Length of Pipe (m)	# Known Break	Break Volume (m^3/year)	Break Ratio (m^3/m/year)	Break Potential (%)
1	56,148.82	23	185,528.82	3.30	6.0%
2	53,805.57	92	774,434.63	14.39	25.1%
3	19,799.48	29	663,389.11	33.51	21.5%
4	47,372.47	22	210,339.52	4.44	6.8%
5	74,727.59	114	680,181.61	7.72	22.0%
6	13,321.97	18			
7	2,119.10		573,444.50	58.52	18.6%
8	4,281.56	8			
9	3,399.08	2			
Total	274,975.65	308	3,087,318.19		

Table B- 7 East Zone Break Potential Determination

Pipe Group	Length of Pipe (m)	# Known Break	Break Volume (m^3/year)	Break Ratio (m^3/m/year)	Break Potential (%)
1	13,421.54	3	281.24	0.02	7.7%
2	10,938.93	2	1,036.80	0.09	28.5%
3					
4	39,357.32	4	164.15	0.00	4.5%
5	17,908.27	1	1,187.18	0.07	32.6%
6					
7	5,492.47	2	971.03	0.17	26.7%
8	174.93				
9					
Total	87,293.46	12	3,640.40		

Appendix E

HYDRANT FLOW TEST CALIBRATION

1 HYDRANT FLOW TEST CALIBRATION

1.1 **DATA PROVIDED**

WSP has requested hydrant flow test from 15 locations cross the City of Kingston. In the first batch of the 15 hydrant flow testing data, 4 of them are only have one (1) flow data, i.e. one static pressure, one flow and one pressure at the flow. The rest 11 have two flow data, which are more proper for the analysis. Therefore the additional nearby hydrant flow tests are required to justify the data gap. Over all 34 hydrant tests data were provided by the City of Kingston. The request hydrant test areas are shown in Figure E- 1. The received data is summarized in Table E-1 below.

Table E- 1 Hydrant flow test data received from UK

Zone	Test	Hydrant #	Testing Date	Testing Time	Near Junction	
					UK Model	WSP Model
Central Zone	1	770	07/16/2012	9:23 AM	J9718	UKJ-8253
	2	2837	05/29/2015	10:23 AM	J3674	UKJ-2675
	3	3326	05/27/2015	9:45 AM	J17128	UKJ-9073
	4	3712	07/31/2012	1:35 PM	J6576	UKJ-750
	5	3935	06/08/2012	1:28 AM	J14526	UKJ-9405
	6	4107	07/18/2013	6:25 AM	J5726	UKJ-2789
	16	3917	07/08/2013	12:55 PM	J14516	UKJ-9400
	17	4093	15/09/2014	1:25 PM	J16572	UKJ-14162
	18	4232	07/04/2013	9:40 AM	J16582	UKJ-8593
	19	4272	09/23/2014	10:50 AM	J14522	UKJ-14417
	20	4415	11/20/2013	9:35 AM	J9782	UKJ-13978
	21	4423	11/20/2013	9:00 AM	J9658	UKJ-13981
	23	1033	5/27/2015	8:40 AM	J17130	UKJ-9074
	24	1035	5/27/2015	8:52 AM	J17134	UKJ-9076
East Zone	7	1276	05/08/2015	11:15 AM	J16376	UKJ-9787
	8	3384	06/05/2015	2:00 PM	J15124	UKJ-10262
West Zone 1	9	1868	05/31/2013	1:20 PM	J14370	UKJ-10723
	10	2122	05/13/2014	1:25 PM	J10458	UKJ-10621
	11	2307	06/06/2014	1:50 PM	J10832	UKJ-11161
	22	1869	5/31/2013	12:00 AM	J14378	UKJ-10727
	25	2308	06/06/2014	11:20 AM	J10830	UKJ-11160
	26	2310	06/02/2014	2:30 AM	J10834	UKJ-11162
	27	2312	06/03/2014	9:40 AM	J10846	UKJ-11168
	28	2313	06/03/2014	9:56 AM	J10836	UKJ-11163
West Zone 2a	12	2648	06/19/2014	1:40 PM	J12208	UKJ-11592
West Zone 2b	13	1645	05/23/2013	2:38 PM	J11216	UKJ-11708
	14	3551	05/09/2014	1:20 PM	J12380	UKJ-11629
	29	1644	05/23/2013	2:26 PM	J11218	UKJ-11709
	30	1629	06/11/2013	10:45 AM	J11210	UKJ-11705
	31	1650	06/11/2013	10:35 AM	J11194	UKJ-11697
West Zone 2c	15	1701	07/08/2013	12:55 PM	J12536	UKJ-12042
	32	1700	07/08/2013	12:45 PM	J12538	UKJ-12043
	33	1702	07/08/2013	12:45 PM	J12534	UKJ-12041
	34	1703	07/09/2013	10:00 AM	J24758	UKWV-2147

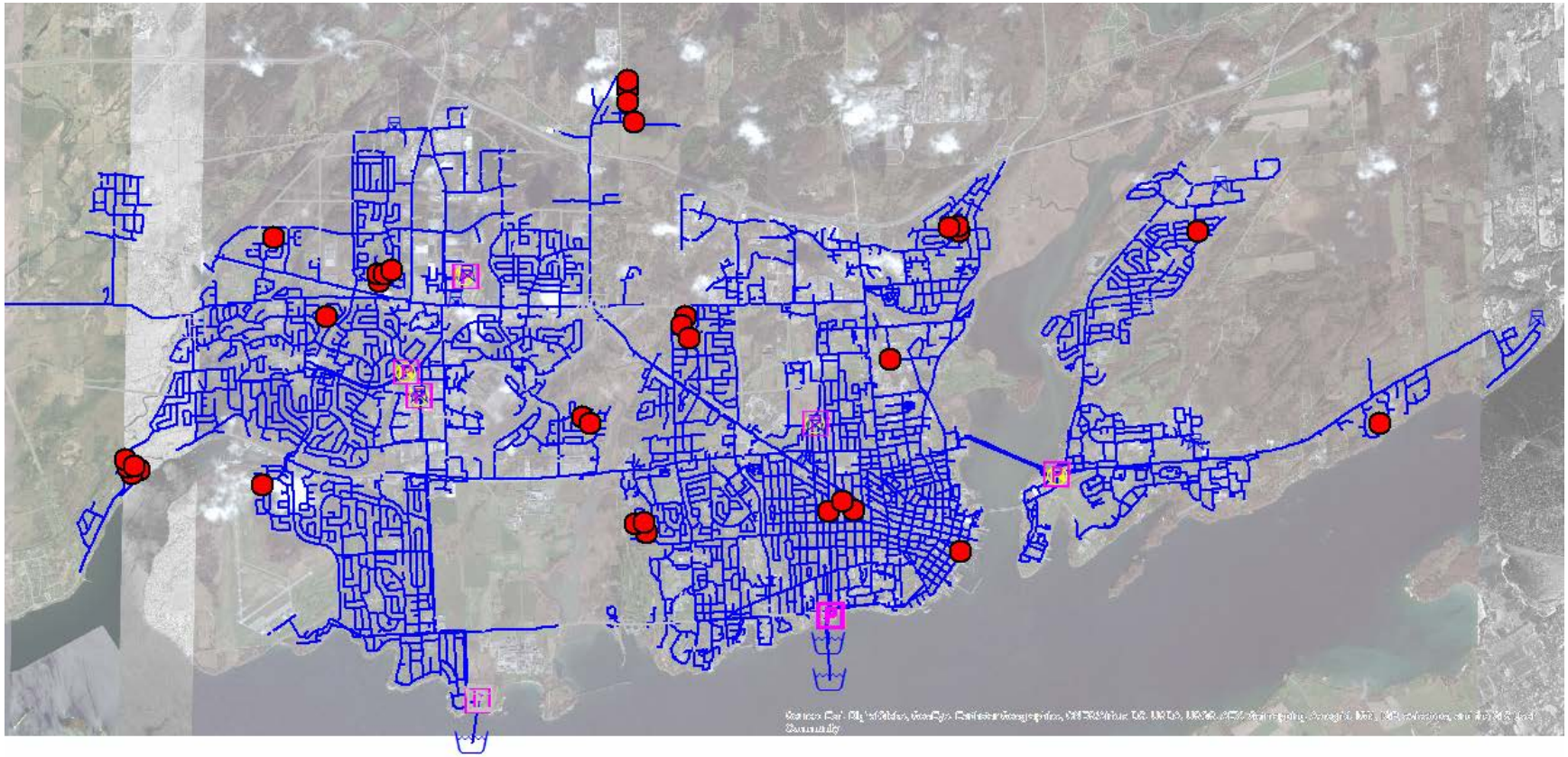


Figure E- 1 UK hydrant flow test locations

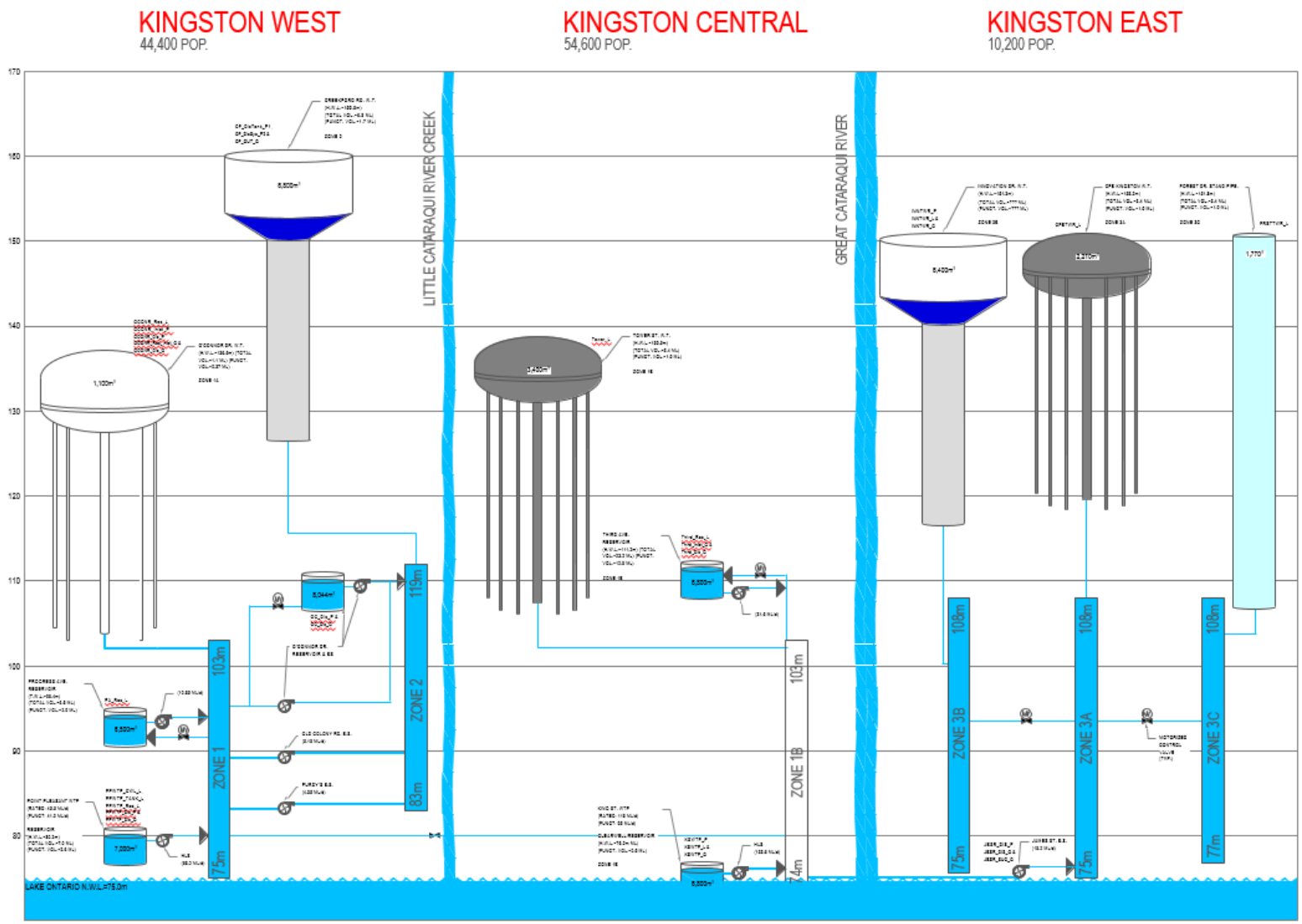


Figure E- 2 Kingston Water Distribution System Schematic

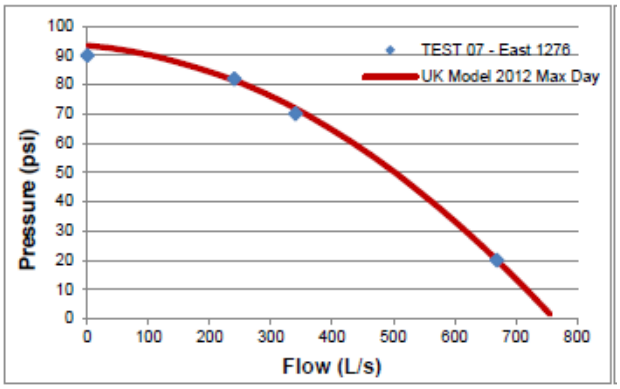
1.2 HYDRANT FLOW TEST VS. MODEL OUTPUT

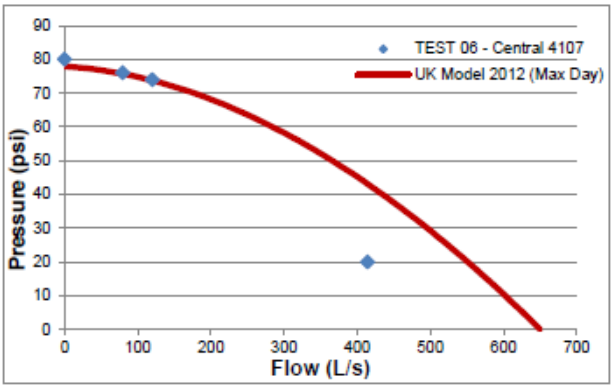
A preliminary model calibration was performed with the existing UK model 2012 loading data. The model output and hydrant test results can be grouped to good match, acceptable match and no match. Some examples are shown in this section.

GOOD MATCH

Good match between the hydrant flow test results and model output means that:

1. The test point extended curve matches the model simulated hydrant curve
2. The rated point at 20 psi is a calculation result, which should not be put in consideration

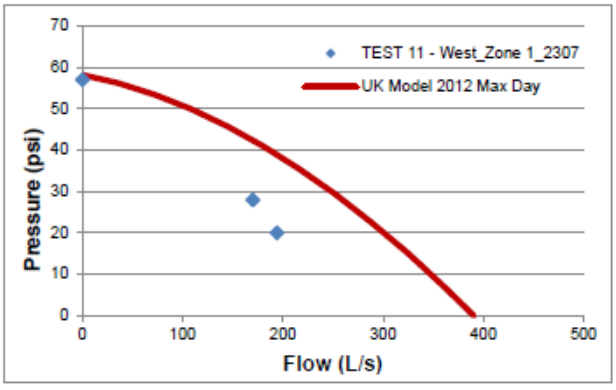


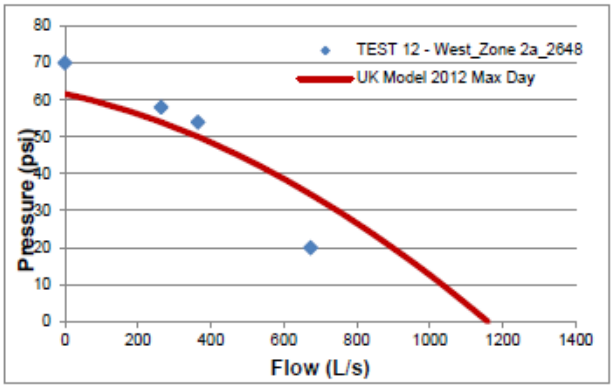


ACCEPTABLE MATCH

This group of hydrant tests shows the below properties. The model simulated hydrant curves may be adjusted to better match by model calibrating with operational data.

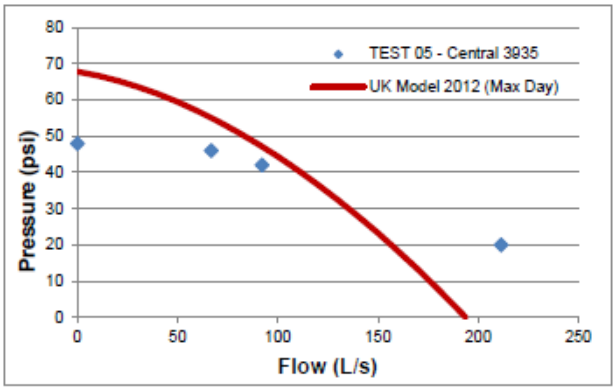
1. Static pressure shows match but other pressures not quit match
2. Hydrant test data and model simulated hydrant curve are parallel shaped

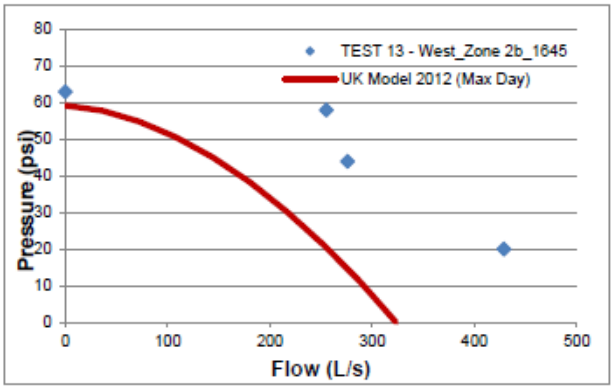




NO MATCHE

This group of the data shows fundamental disagreement between hydrant flow test and model simulation. Additional hydrant flow test data is required to confirm the situation.





1.3 SCADA DATA

To match the SCADA data to the time the hydrant flow tests were performed, addition SCADA data was required and it was provided by UK. However, there are empty data registered in a number of date points.

1.4 C-FACTOR ADJUSTMENT

C-factor adjustment was performed with the same pipe group philosophy as we used for leak and beak factor during water loss loading, which is explain in the Section 4.2 in the report. The factors used for the preliminary global C-factor adjustment is shown in Table E- 2.

Table E- 2 C-Factor calibration factor

Pipe Material /Installation year	Multiply Factor		
	1900-1940	1941-1980	1981-2015
Metal (DI/CI/SSTL/CU/CIPP)	0.65	0.8	1.1
Plastic (PVC/HDPE)	0.95	1.0	1.05
Concrete (AC/CPP)	0.85	1.0	1.15

The model is calibrated with further adjusting the C-factor based on pipe group described previously and pipe diameter. The detailed C-factor ranges post adjustment are shown in Table E- 3. From here, the SCADA data is then used to cross-reference with the observed values and model adjustments are made until the distribution targets are met. The final checks and balances are done at the end of this exercise to compare the results and to complete a water distribution system mass balance which relates the total flow demand simulated with documented flow demand.

Table E- 3 C-factor ranges based on the pipe group and diameter

Pipe Group	Diameter Group	Min Roughness	Max Roughness	Average Roughness
1	<400	70	132	90.60
	<600	80	135	98.69
	>=600	135	135	135.00
2	<400	80.5	138	90.00
	<600	92	130	99.89
	>=600	103.5	135	131.06
3	<400	77	99	77.83
	<600	88	120	88.65
	>=600	135	135	135.00
4	<400	100	132	131.96
	<600	132	140	132.19
	>=600	135	135	135.00
5	<400	120	120	120.00
	<600	120	120	120.00
	>=600	135	135	135.00
7	<400	121	121	121.00
	<600	121	121	121.00
	>=600	135	135	135.00
8	<400	110	110	110.00
	<600	110	120	110.45
	>=600	100	135	133.75

1.5 WATER ALL-PIPE MODEL CALIBRATION

The AWWA M32 standard has sspecified the calibration targets: “Acceptable limits of accuracy depend on how a model is used and the questions to be answered (Walski). For example, models used to design elevated tanks must predict tank HGLs well within 20 ft (6m), because 20 ft (6m) is the difference between an empty tank and a half-full tank. Better goals are HGLs within 5 ft (1.5 m) and flows within 10 percent. Calibration guidelines have not yet been adopted.”

As noted, calibration guidelines are not universal but getting HGL within 1.5m is about 2psi FOR TANKS, not throughout the distribution system. WSP provided both absolute and relative (%) calibration statistics. Generally, the practice is to strive to match steady/static within 5psi or a specific percentage (5%).The water model is calibrated to simulate average daily flow (ADF) and max daily flow (MDF) across the distribution system.

The calibration process includes:

- Meeting established Distribution System Targets
- SCADA Data Comparisons (e.g. Tank/reservoir levels, flow pump status, valve settings, pressure and flows)
- Pump Curve Updates to match flow and pressure monitoring data.

The distribution system targets are:

- Simulated pressure and flow to be within ±10-15% of observed values for ADF.
- Simulated tank/reservoir levels to be within ±10-15% of observed values for ADF.

Three steps were taken for the all pipe calibration and model validation. They are:

STEADY STATE MODELING TO EVALUATE THE MODEL BY HYDRANT CURVES

Use the SCADA date to simulate the hydraulic conditions of the distribution system when the hydrant tests were performed. The parameters taken from the SCADA record include field pressure, tank level, valve status, pump on/off and flow measurements. The model was set based on the SCADA data and steady-state modeling results were used to check if the modeling results meet the SCADA target. Once the targets are met as described earlier, a hydrate curve can be obtained from steady state simulation. To use the steady state simulation the hydraulic conditions are fixed to reflect the hydrant test field conditions.

During this water model calibration step, available hydrant test data is used to compare the initial model simulation results to determine if inputted demands for given regions are within the bounds of the distribution system targets. The WSP model static pressure calibration results are in the AWWA's requirement of less than 5%. Detailed hydrant calibration results and the hydrant curves are shown in Table E- 4, Table E- 5 and Figure E-3 below.

Table E- 4 Calibration Results - Static Pressure

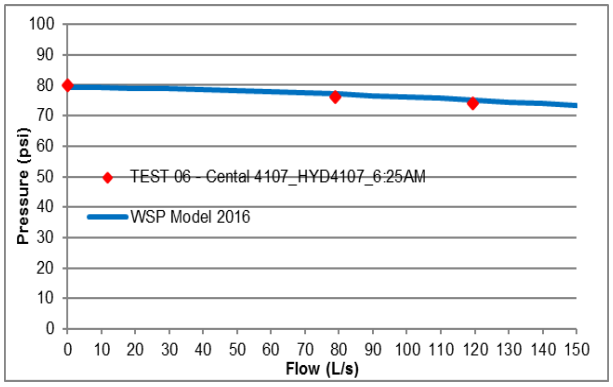
	Hydrant Test No.	Hydrant Test (psi)	Calibrated Model (psi)	Difference (psi)	Percent Difference
East	7	90	90	0.1	0.1%
	8	56	57	0.9	1.6%
			Absolute Average (East)		0.8%
Central	2	56	57	0.6	1.0%
	6	80	79	-0.7	-0.8%
	16	50	52	2.1	4.2%
	18	76	73	-3.5	-4.6%
	20	74	74	-0.3	-0.3%
	24	64	59	-5.2	-8.1%
			Absolute Average (Central)		3.2%
West	9	72	77	4.8	6.6%
	10	75	75	-0.4	-0.5%
	12	64	63	-1.1	-1.7%
	14	62	64	2.3	3.7%
	34	68	68	-0.4	-0.6%
	31	62	61	-1.2	-1.9%
	26	67	68	1.1	1.6%
	29	63	61	-1.8	-2.8%
			Absolute Average (West)		2.4%
		Overall Absolute Average Error			2.6%

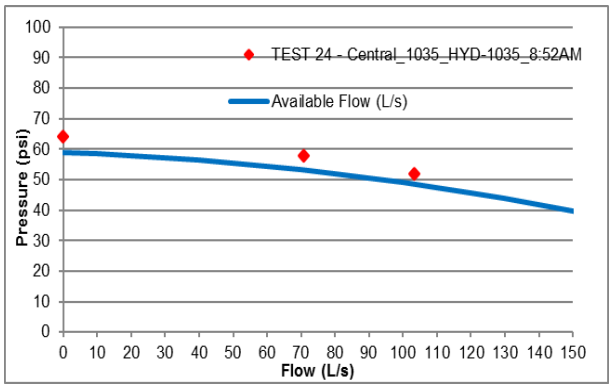
* HGL differences include elevation (1 to 2m) and pressure gauge errors (10%), with a target of 1.5 to 3m absolute difference.

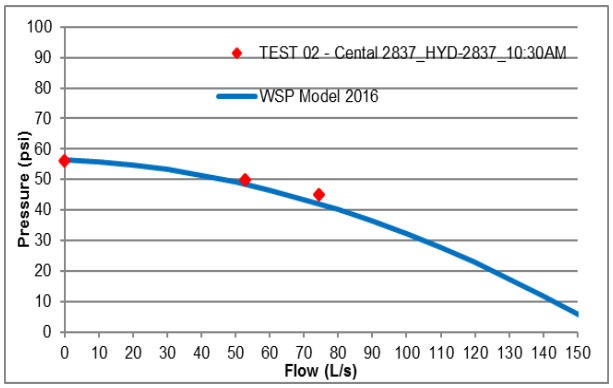
Table E- 5 Calibration Results - High Flow Pressure

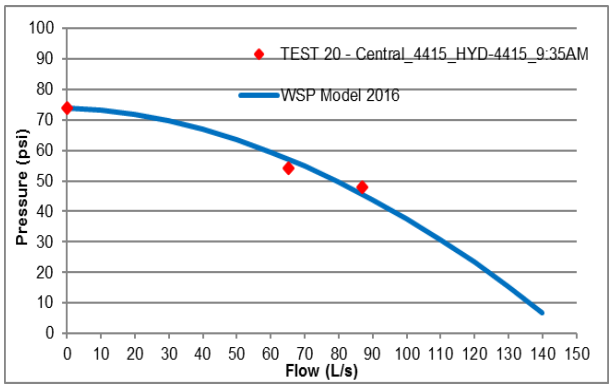
	Hydrant Test No.	Highest Flow Tested	Hydrant Test (psi)	Calibrated Model (psi)	Difference (psi)	Percent Difference
East	7	94.4	70	66	-4.4	-6.3%
	8	80.6	52	50	-1.5	-3.0%
				Absolute Average (East)		4.6%
Central	2	74.3	45	42	-3.0	-6.7%
	6	119.4	74	75	1.1	1.5%
	16	79.1	45	47	2.3	5.0%
	18	59.7	54	58	4.0	7.4%
	20	65.1	54	57	3.2	5.9%
	24	103.5	52	49	-3.3	-6.4%
				Absolute Average (Central)		5.5%
West	9	70.1	61	61	0.3	0.4%
	10	103.2	65	64	-1.3	-2.0%
	12	101.1	54	55	1.2	2.3%
	14	96.8	48	50	1.5	3.2%
	34	59.7	44	37	-6.6	-14.9%
	31	101.3	51	52	1.2	2.3%
	26	55.9	32	31	-1.2	-3.8%
	29	74.7	54	52	-1.6	-3.0%
				Absolute Average (West)		4.0%
				Overall Absolute Average		4.8%

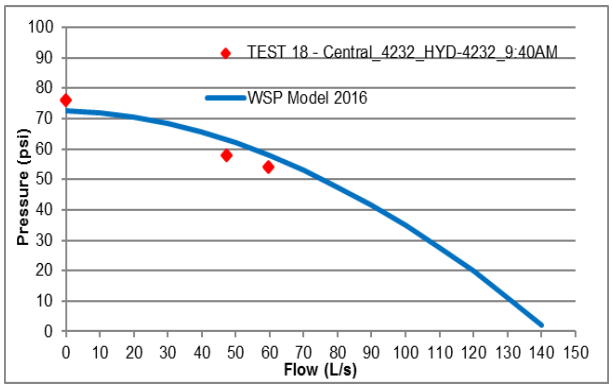
* HGL differences include elevation (1 to 2m) and pressure gauge errors (10%), with a target of 1.5 to 3m absolute difference.

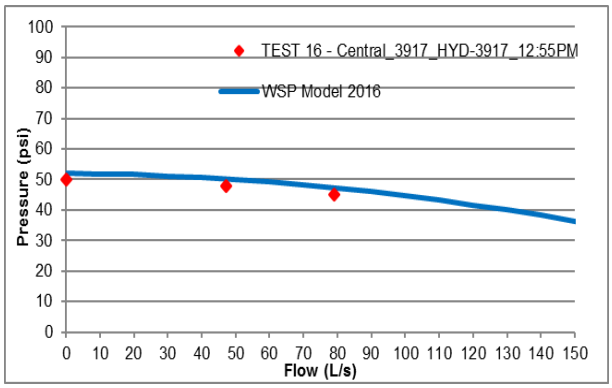


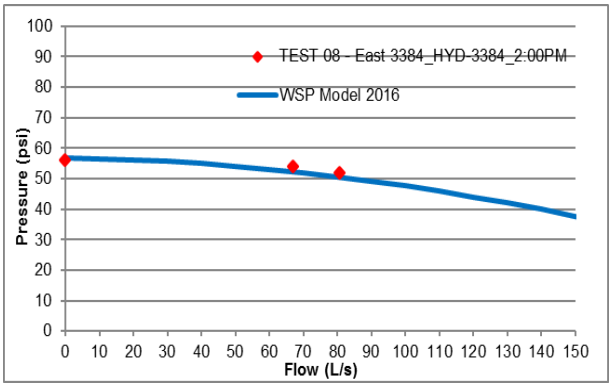












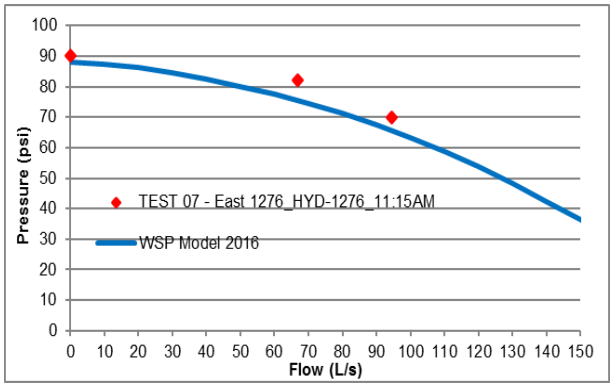
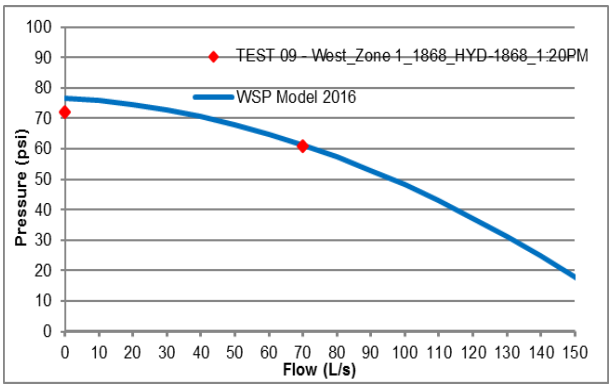
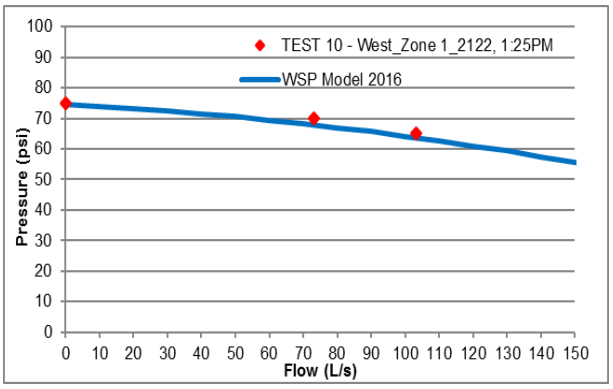
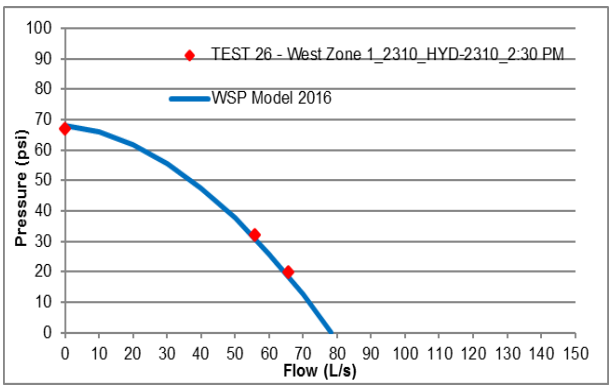
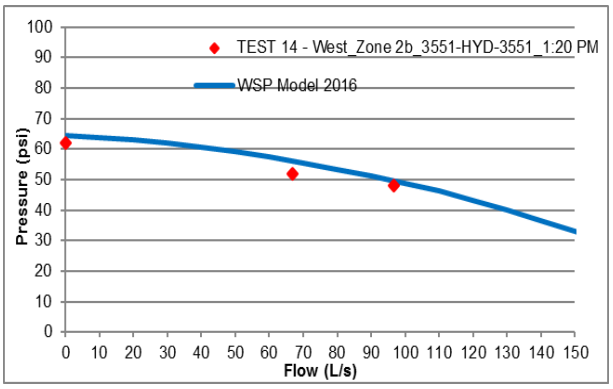


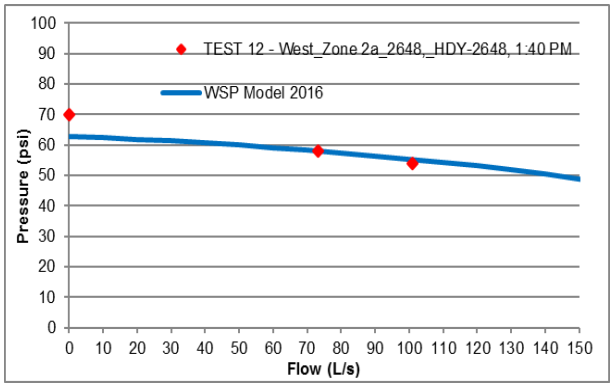
Figure E-3 WSP Model calibration – Hydrant Curves (1)

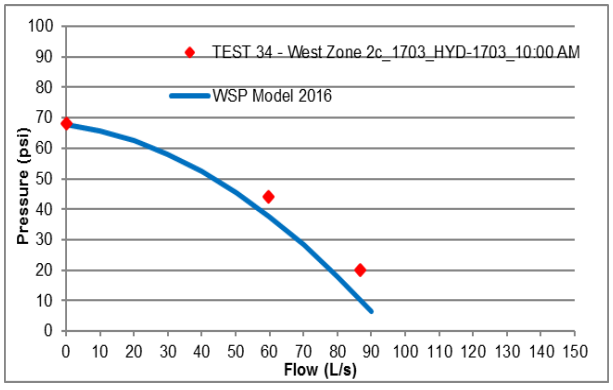


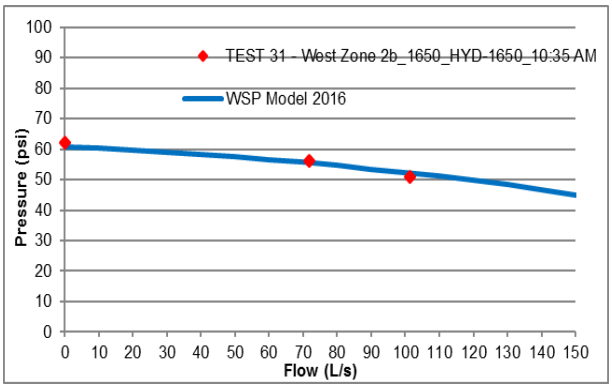












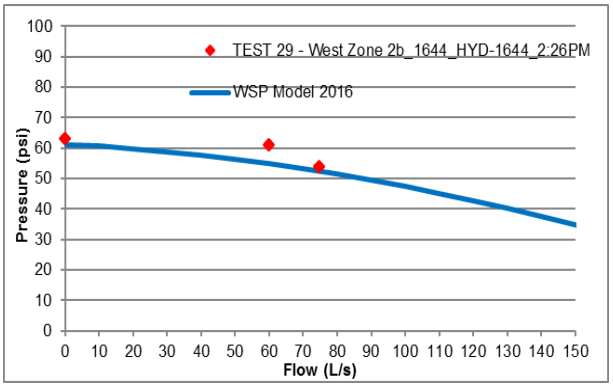


Figure E-3 WSP Model calibration – Hydrant Curves (2)

EPS (EXTENDED PERIOD SIMULATION) MODELING TO SIMULATE THE MODEL PERFORMANCE

To evaluate the WSP model, EPS modeling to simulate the hydrant curves at the same time frame in a day when the hydrant flow tests were performed. The hydraulic conditions of the real system are majorly based on the water usage at the hydrant test moment, which can be impacted by weather, temperature and other random factors. However, the model was built based on the historic statistic data to simulate a representative average conditions of the system. Therefore, a higher errors are expected.

In this step, the performances of the WSP model were evaluated by EPS simulation. The results are shown in Table E- 6 and Table E- 7 below. The results indicated, between hydrant test and model simulation, the difference of overall static pressure of 5.9% and high flow pressure of 8.9% are achieved.

Table E- 6 Calibration Results - Static Pressure

	Hydrant Test	Hydrant Test (psi)	MP Model EPS (psi)	Difference (psi)	Difference Percent
East	7	90	91	1.1	1.3%
	8	56	57	0.9	1.6%
		Absolute Average Difference (East)			1.4%
Central	2	56	57	1.4	2.4%
	6	80	75	-5.4	-6.7%
	16	50	48	-2.0	-3.9%
	18	76	67	-8.6	-11.4%
	20	74	68	-5.9	-8.0%
	24	64	53	-11.4	-17.9%
		Absolute Average Difference (Central)			8.4%
West	9	72	71	-1.3	-1.8%
	10	75	63	-12.3	-16.4%
	12	64	63	-0.5	-0.8%
	14	62	64	2.4	3.9%
	34	68	62	-5.6	-8.3%
	31	62	60	-2.4	-3.8%
	26	67	64	-3.2	-4.7%
	29	63	62	-1.4	-2.1%
		Absolute Average Difference (West)			5.2%
		Overall Absolute Average Difference			5.9%

* HGL differences target 10-15 m absolute difference.

Table E- 7 Calibration Results - High Flow Pressure

	Hydrant Test#	High Flow	Hydrant Test	WSP Model 2016	Difference (m)	%
East	7	94	70	63	-7.3	-10.4%
	8	81	52	51	-0.8	-1.5%
ABS Average						5.9%
Central	2	74	45	40	-5.0	-11.1%
	6	119	74	71	-2.9	-4.0%
	16	79	45	43	-1.6	-3.6%
	18	60	54	53	-1.5	-2.7%
	20	65	54	51	-2.7	-5.1%
	24	103	52	42	-10.2	-19.7%
ABS Average						7.7%
West	9	70	61	56	-5.0	-8.2%
	10	103	65	55	-9.6	-14.8%
	12	101	54	57	2.6	4.7%
	14	97	48	49	0.7	1.5%
	34	60	44	31	-13.2	-30.1%
	31	101	51	52	0.7	1.3%
	26	56	32	25	-7.5	-23.3%
	29	75	54	54	0.3	0.6%
ABS Average						10.6%
Overall ABS Average						8.9%

* HGL differences target 10-15 m absolute difference.

In this step, the performances of the WSP model were evaluated by EPS simulation. Same hydrant tests used for steady-state calibration were validated in this step. The results are shown in Table E- 6 and Table E- 7 below. The results indicated that after the calibration, between hydrant test and model simulation, the difference of overall static pressure of 5.9% and high flow pressure of 8.9% are achieved. Comparing with the steady-state modelled 2.6% and 4.8 %, the WSP model shows an improved simulation results. Validation results are shown in Table E- 6 and Table E- 7 below. The results indicated, between hydrant test and model simulation, the difference of overall static pressure of 3.8% and high flow pressure of 23.5% are achieved The present MP model is well within the AWWA guidelines for water model calibration and validation for multi-zone, large-city models. Even for the high flows, many are not far from the 10 to 15% agreement typically targeted for overall accuracy. The model validation curves are shown in Figure E-3.

SEPARATE HYDRANT FLOW TEST VALIDATION

The final phase of the combined model calibration approach is to validate the model prior to final simulations. This step includes a complete review of the models with documented sources including past results, e.g.: the 2007 MP model predictions. The model was also run to simulate conditions at a separate set of (validation) locations.

This is essentially an overall check on the model's accuracy and there are no steps taken other than to identify the representative locations and to simulate the results there. The detailed results are summarized in Table E- 8 and Table E- 9 below. The results indicated that after the calibration, between hydrant test and model simulation, the difference of overall static pressure of 6.3% and high flow pressure

of 19.9% are achieved. Comparing with the previous model's 8.7% and 45.9 %, the WSP model shows an overall improved simulation results.

Table E- 8 Validation Results - Static Pressure

	Hydrant Test#	Hydrant Test	UK Model	%	WSP Model	%	Improved?
Central	3	66	52.8	-20.1%	59.8	-9.5%	TRUE
	17	73	73.4	0.5%	72.7	-0.5%	TRUE
	19	48	50.5	5.2%	47.9	-0.1%	TRUE
	21	64	52.6	-17.8%	54.7	-14.6%	TRUE
	23	62	54.7	-11.7%	55.4	-10.6%	TRUE
ABS Average				11.1%		7.1%	TRUE
West	15	58	61.3	5.8%	53.9	-7.1%	FALSE
	22	74	71.7	-3.1%	72.4	-2.2%	TRUE
	28	70	64.3	-8.2%	64.4	-8.0%	TRUE
	33	62	58.4	-5.8%	59.5	-4.1%	TRUE
ABS Average				5.7%		5.3%	TRUE
Overall ABS Average				8.7%		6.3%	TRUE

Table E- 9 Validation Results - High Flow Pressure

	Hydrant Test#	High Flow	Hydrant Test	UK Model	%	WSP Model	%	Improved?
Central	3	103.5	56	36.3	-35.2%	51.6	-7.8%	TRUE
	17	99.1	58	35.6	-38.6%	60.5	4.2%	TRUE
	19	96.8	28	27.6	-37.2%	44.5	1.1%	TRUE
	21	92.0	48	18.3	-61.9%	36.0	-25.1%	TRUE
	23	88.1	52	44.3	-14.8%	49.2	-5.5%	TRUE
ABS Average					37.5%		8.7%	TRUE
	15	51.7	30	0.0	-100.0%	14.6	-51.4%	TRUE
	22	105.4	58	57.4	-1.1%	59.9	3.2%	FALSE
	28	59.7	30	41.1	36.9%	44.6	48.7%	FALSE
	33	51.7	36	4.6	-87.1%	24.6	-31.8%	TRUE
ABS Average					56.3%		33.8%	TRUE
Overall ABS Average					45.9%		19.9%	TRUE

It is noticed that the majority of the HGL differences was negative values, which were found being caused by less pumps on at the EPS modeling than the field SCADA data at the hydrant flow testing times. This indicated that the tank levels in reality were lower than these in the model. The potential causes are:

- Water usage was higher during the hydrant test time than the average demand settings in the model, which led more pumps on (our pattern represents average demand)
- Control rule settings based on tank levels were not in agreement with the reality.

The above points will be analysed and addressed in the alternative solution study of this MP.

1.6 **INTERCONNECTION CALIBRATION**

The interconnection test was performed by UK at via rail on sept. 15th at 8:30am and set the flow meter to read flows from the central system to the west. On sept. 16th at around 5pm tower set-point was changed so the central tower was operating in the higher range (7meters on SCADA set-point) and the west end tower in a lower band (6.5 meter range on SCADA set-point) until 8am on sept. 17th to see how a 1 meter change in set-point would affect volumes to west. Figure E-4 and Figure E-5 show the SCADA screen shot to shown the water tank levels and hourly volumes during this period of time. Figure E-6 and Figure E-7 show the comparisons of field observed flow and model simulation at Central Tower setting at 6 and 7 meters respectively.

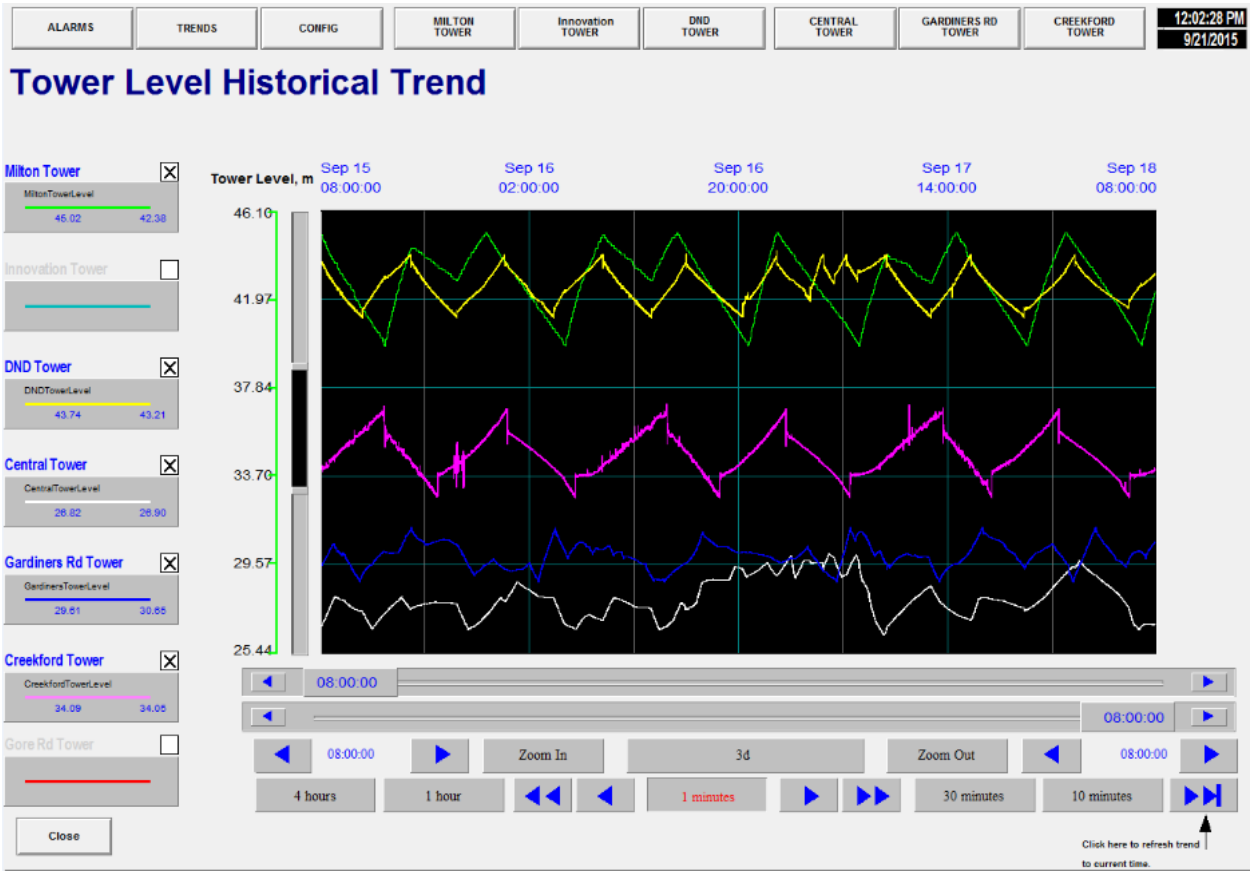


Figure E- 4 SCADA Screen shot to shown the water Tank levels during the test period

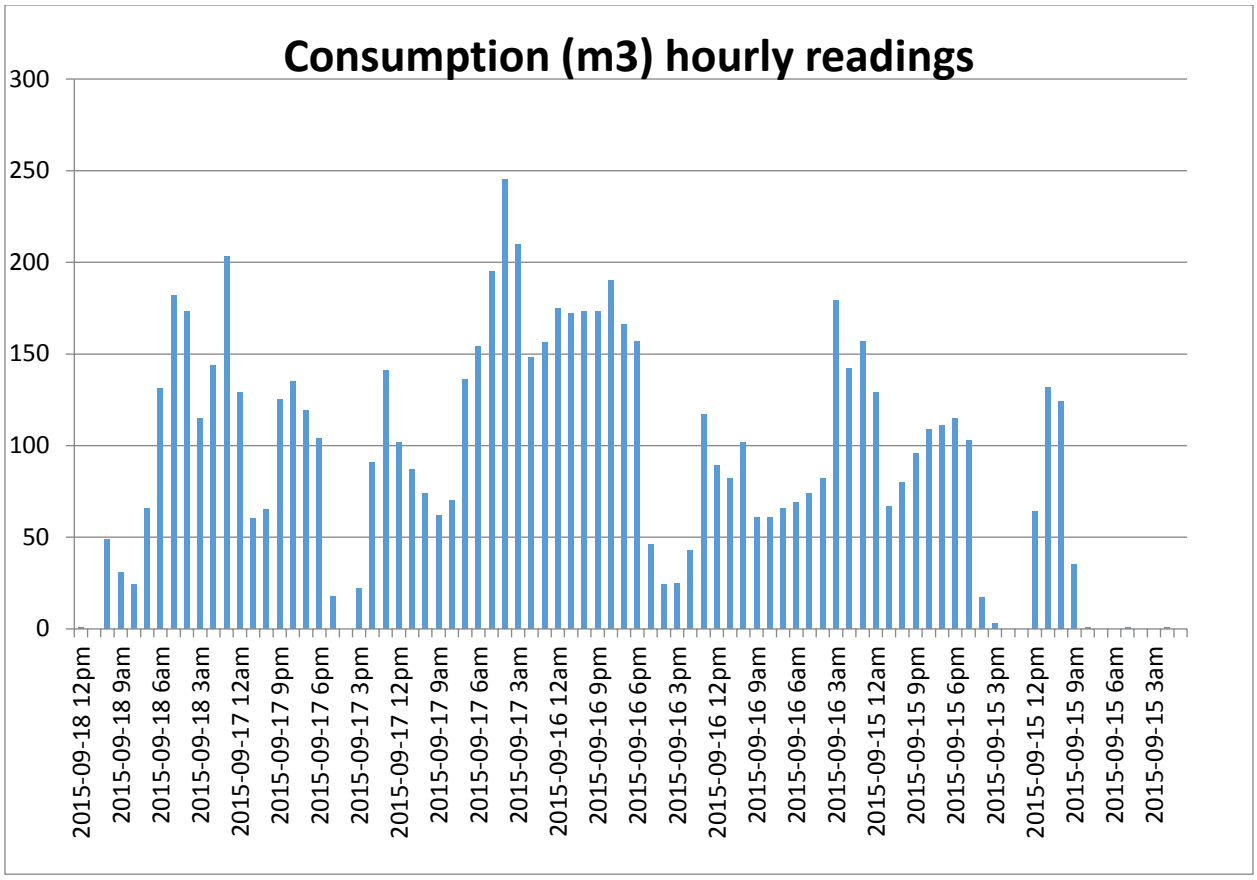


Figure E- 5 Hourly volumes from Central to West during the test period

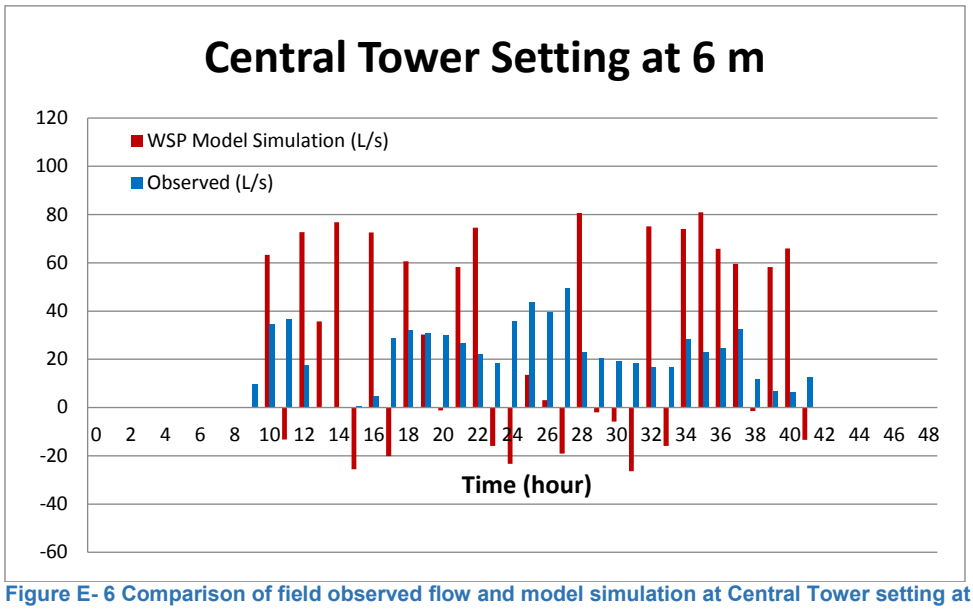


Figure E- 6 Comparison of field observed flow and model simulation at Central Tower setting at 6 meters

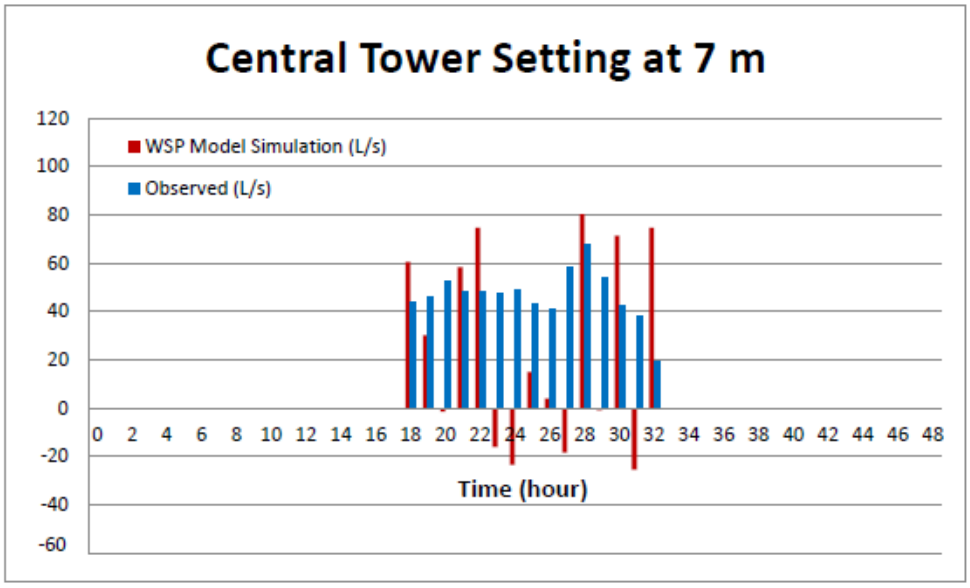
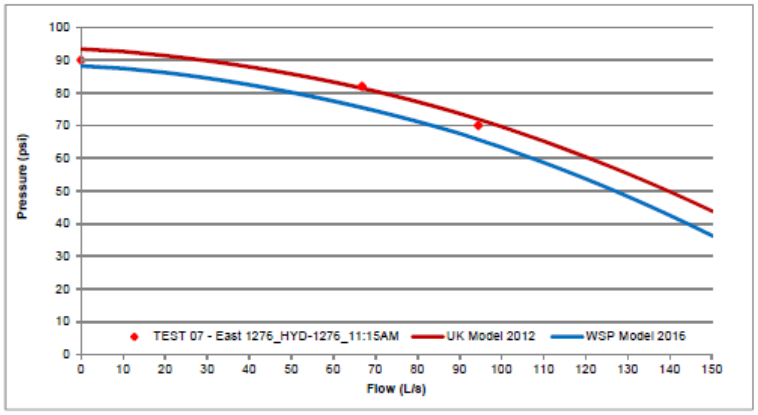


Figure E- 7 Comparison of field observed flow and model simulation at Central Tower setting at 7 meters



SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)	Foundation Elevation (m)
EJI$T01XT$LQ$_Value	DND Tower	CFBTWR_L	m	36.3	107.3
EJI$T02XT$LQ$_Value	Gore Rd Twr	INNTWR_L	m		
EJI$T03XT$LQ$_Value	Milton Twr	FRSTTWR_L	m	128.2	
Innovation$LIT301.PV.Value	Tower Level	INNTWR_L	m	139.2	
EJI$RMCPRESS$$_Value	RMC pressure	JBSR_DIS_P	kPa		
Innovation$PIT302.PV.Value	System pressure	INNTWR_P	psi		
EJI$RMCFLOW$FQ$_Value	RMC Flow	JBSR_DIS_Q	m³/d		
EJI$STNFLOW$$_Value	STATION FLOW NEW METER	JBSR_SUC_Q	m³/d		
Innovation$FIT201.PV.Value	Tower Flow Meter	INNTWR_Q	l/s		

Note: SCADA level at Tforest (Milton) may be an error.

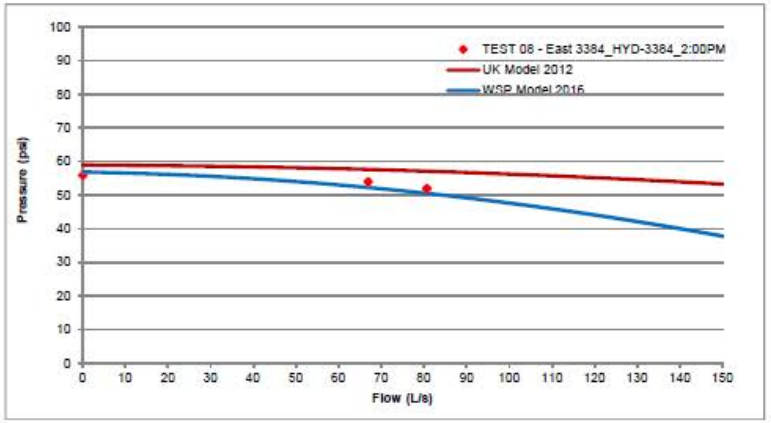
% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	JSP_S	UKJ-3211	0.01	79.3	135.3	79.6	55.7
-5.9%	-4.4	75.0	JSP_D_RMC	UKJ-3212	5.57	78.6	128.2	70.6	
		N/A	JSP_D	UKJ-623	0.01	79.5	148.6	98.2	
12.4%	16.1	129.3	TForest_P	UKJ-9752	0.01	105.3	145.3	57.0	
6.3%	3.4	53.6	TINNOV_P	UKWV-604	0.02	108.2	148.3	56.9	
0.6%	0.9	148.6	TCFB_P	UKWV-264	0.01	107.2	149.5	60.3	
0.0%	0.0	148.3	TINNOV_H						

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	CFBTWR_L	5.1	148.6	m	DND Tower
	INNTWR_L	9.1		m	Gore Rd Twr
	FRSTTWR_L	1.0	129.3	m	Milton Twr
	INNTWR_L	9.1	148.3	m	Inn Twr Level
Pump	JBSR_DIS_P	75.0		psi	RMC pressure
	INNTWR_P	53.6		psi	Inn Pressure
Flow	JBSR_DIS_Q	6.8		l/s	RMC Flow
	JBSR_SUC_Q	-2.4	0.0	l/s	STATION FLOW NEW METER
	INNTWR_Q	31.8		l/s	Inn Twr Flow

Note: SCADA data was taken from 11:15 May 08, 2015 data

			ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
	N/A	TCFB_Q	UKP-9389	UKWV-2649	TCFB	28.3	300	92	92.4	1.31
#DIV/0!	0.0	0.0	JSP_Q_S	UKP-5857B	UKJ-567	UKWV-6017	14.3	400	104	0.0	0.00
	N/A	TForest_Q	UKP-5645B	TFOREST	UKJ-9752	27.8	300	90	-48.4	0.68
	N/A	JSP_Q_D	UKP-5875	UKWV-8237	UKJ-3928	8.4	400	92	-6.8	0.05
0.0%	0.0	6.8	JSP_Q_D-RMC	P30677	VRMC_PRV	UKJ-3212	13.8	247	81	6.8	0.14
-110.1%	-35.0	31.8	TINNOV_Q	UKP-15513	UKJ-12549	UKWV-10225	36.1	300	120	-3.2	0.05

Model Output
Calculated
Meet Target
Data Not Available
Out of Target
manually controled



SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)	Foundation Elevation (m)
EJI$T01XT$LQ$_Value	DND Tower	CFBTWR_L	m	36.3	107.3
EJI$T02XT$LQ$_Value	Gore Rd Twr	INNTWR_L	m		
EJI$T03XT$LQ$_Value	Milton Twr	FRSTTWR_L	m	128.2	
Innovation$LIT301.PV.Value	Tower Level	INNTWR_L	m	139.2	
EJI$RMCPRESS$$_Value	RMC pressure	JBSR_DIS_P	kPa		
Innovation$PIT302.PV.Value	System pressure	INNTWR_P	psi		
EJI$RMCFLOW$FQ$_Value	RMC Flow	JBSR_DIS_Q	m³/d		
EJI$STNFLOW$$_Value	STATION FLOW NEW METER	JBSR_SUC_Q	m³/d		
Innovation$FIT201.PV.Value	Tower Flow Meter	INNTWR_Q	l/s		

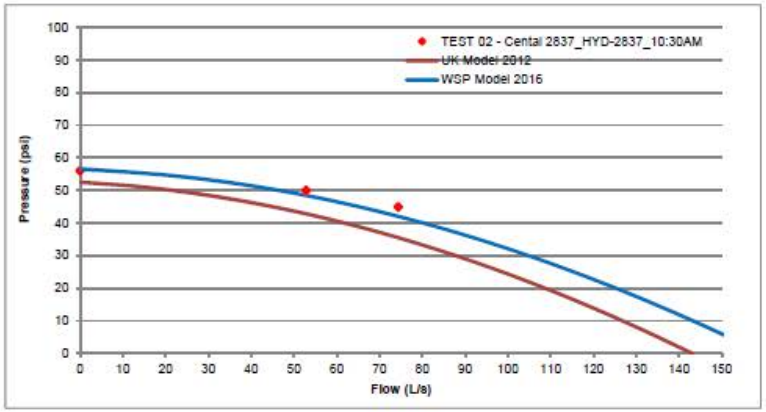
% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	JSP_S	UKJ-3211	0.01	79.3	135.3	79.6	55.7
-5.9%	-4.5	75.1	JSP_D_RMC	UKJ-3212	5.57	78.6	128.2	70.6	
		N/A	JSP_D	UKJ-623	0.01	79.5	148.6	98.2	
10.1%	13.3	132.0	TForest_P	UKJ-9752	0.01	105.3	145.3	57.0	
4.2%	2.3	54.6	INNOV_P	UKWV-604	0.02	108.2	148.3	56.9	
0.4%	0.6	148.9	CFB_P	UKWV-264	0.01	107.2	149.5	60.3	
0.1%	0.1	148.2	INNOV_P						

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	CFBTWR_L	5.3	148.9	m	DND Tower
	INNTWR_L	9.0		m	Gore Rd Twr
	FRSTTWR_L	3.8	132.0	m	Milton Twr
	INNTWR_L	9.0	148.2	m	Inn Twr Level
Pump	JBSR_DIS_P	75.1		psi	RMC pressure
	INNTWR_P	54.6		psi	Inn Pressure
Flow	JBSR_DIS_Q	5.8		l/s	RMC Flow
	JBSR_SUC_Q	179.8		l/s	STATION FLOW NEW METER
	INNTWR_Q	-20.3		l/s	Inn Twr Flow

Note: SCADA data was taken from 11:15 May 08, 2015 data

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
		N/A	CFB_Q	UKP-9389	UKWV-2649	TCFB	28.3	300	92	-67.4	0.95
21.2%	38.1	179.8	JSP_Q_S	UKP-5857	UKJ-567	UKWV-6017	14.3	400	104	217.9	1.73
		N/A	Forest_Q	UKP-5645	TFOREST	UKJ-9752	27.8	300	90	-68.2	0.96
		N/A	JSP_Q_D	UKP-5875	UKWV-8237	UKJ-3928	8.4	400	92	212.0	1.69
0.3%	0.0	5.8	JSP_Q_D-RMC	P30677	VRMC_PRV	UKJ-3212	13.8	247	81	5.8	0.12
109.3%	-22.2	-20.3	INNOV_Q	UKP-1551	UKJ-12549	UKWV-10225	36.1	300	120	-42.4	0.60

Model Output
Calculated
Meet Target
Data Not Available
Out of Target
manually controled



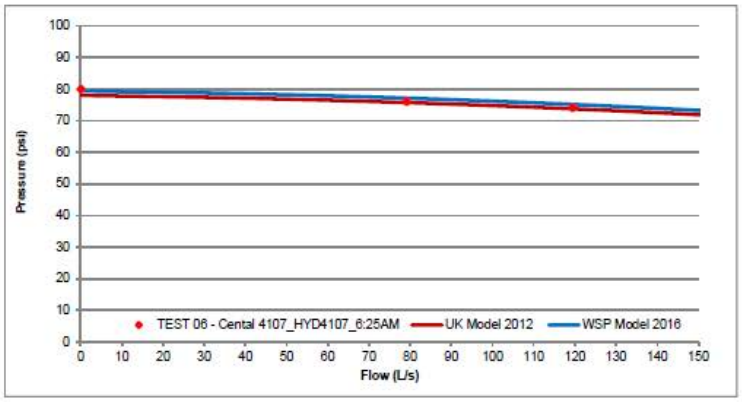
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)
KC2$S71XW$LQ$_Value	CLWELL #1	KSWTP_L		
KC2$S73XW$LQ$_Value	CLWELL #2			
KC4$H01NT$LQ$_Value	Tower St Tower	Tower_L		24.4
TA1$ResLevel.PV.Value	Third_Res_L	Third_Res_L		104.9
KC4$H73OI$PQ$_Value	HL PRESSURE1	KSWTP_P	kPa	
KC4$H74OI$PQ$_Value	HL PRESSURE2		kPa	
KC4$H01OX$FQ$_Value	Discharge Flow East		m³(x1000)/d	
KC4$H02OX$FQ$_Value	Discharge Flow North	KSWTP_Q	m³(x1000)/d	
KC4$H03OX$FQ$_Value	Discharge Flow West		m³(x1000)/d	

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	RThird	UKJ-624	0.03	110.5	135.8	35.9	25.1
1.0%	1.4	134.6	TTower	UKJ-13936	0.00	107.2	136.0	41.0	
		N/A	KWTP_S	UKJ-4220	0.00	79.1	79.9	1.2	
-2.1%	-1.8	86.2	KWTP_D	UKJ-4219	0.55	77.1	136.5	84.4	

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	KSWTP_L	2.7		m	CLWELL #1
		2.9		m	CLWELL #2
	Tower_L	3.1	27.5	m	Tower St Tower
	Third_Res_L	3.8	108.7	m	Third_Res_L
Pump	KSWTP_P	86.4		psi	HL PRESSURE1
		85.9		psi	HL PRESSURE2
Flow	KSWTP_Q	171.0		l/s	Discharge Flow East
		229.2		l/s	Discharge Flow North
		150.0		l/s	Discharge Flow West
	Third_Inlet_Q	0.0		l/s	Third_Inlet_Q
	Third_Dis_Q	0.0		l/s	Third_Dis_Q

				ID	From Node	To Node	Length	Diameter (mm)	Roughness	Flow	Velocity
0.0%	-0.1	0.0	RThird_Q	UKP-9510	UKJ-624	UKWV-4576	9.0	600	135	-0.1	0.00
		N/A	TTower_Q	UKP-4802	UKJ-13936	TTOWER	2.1	750	135	-118.4	0.27
		N/A	KWTP_S_Q	UKP-9777	UKJ-2277	UKJ-4220	103.8	1200	135	539.0	0.48
-2.1%	-11.6	171.0	KWTP_D_Q-N	UKP-9755	UKJ-4219	UKJ-2098	8.9	750	135	223.6	0.51
		229.2	KWTP_D_Q-E	UKP-9756	UKJ-4219	UKJ-2093	8.9	600	135	165.8	0.59
		150.0	KWTP_D_Q-W	UKP-9757	UKJ-4219	UKJ-2089	15.3	600	135	149.1	0.53
		550.1								538.5	

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



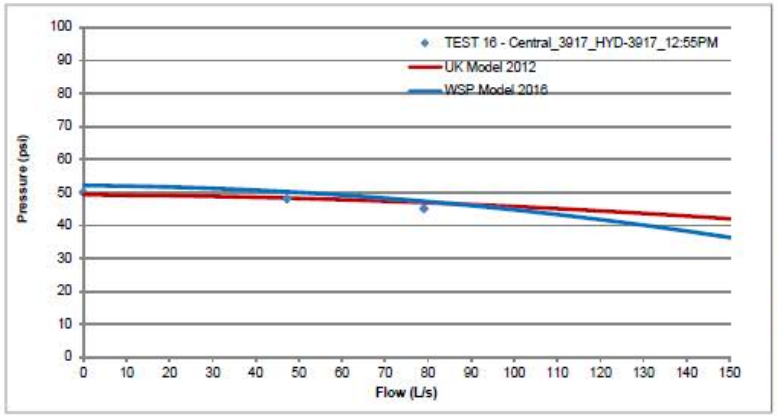
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)
KC2$S71XW$LQ$_Value	CLWELL #1	KSWTP_L		
KC2$S73XW$LQ$_Value	CLWELL #2			
KC4$H01NT$LQ$_Value	Tower St Tower	Tower_L		24.4
TA1$ResLevel.PV.Value	Third_Res_L	Third_Res_L		104.9
KC4$H73OI$PQ$_Value	HL PRESSURE1	KSWTP_P	kPa	
KC4$H74OI$PQ$_Value	HL PRESSURE2		kPa	
KC4$H01OX$FQ$_Value	Discharge Flow East		m³(x1000)/d	
KC4$H02OX$FQ$_Value	Discharge Flow North	KSWTP_Q	m³(x1000)/d	
KC4$H03OX$FQ$_Value	Discharge Flow West		m³(x1000)/d	

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	RThird	UKJ-624	0.03	110.5	136.1	36.3	25.4
0.4%	0.6	135.4	TTower	UKJ-13936	0.00	107.2	136.0	41.0	
		N/A	KWTP_S	UKJ-4220	0.00	79.1	79.9	1.2	
-2.8%	-2.4	86.6	KWTP_D	UKJ-4219	0.55	77.1	136.3	84.2	

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	KSWTP_L	2.8		m	CLWELL #1
		3.0		m	CLWELL #2
	Tower_L	3.9	28.2	m	Tower St Tower
	Third_Res_L	3.6	108.5	m	Third_Res_L
Pump	KSWTP_P	86.7		psi	HL PRESSURE1
		86.6		psi	HL PRESSURE2
Flow	KSWTP_Q	116.5		l/s	Discharge Flow East
		201.2		l/s	Discharge Flow North
		133.3		l/s	Discharge Flow West
	Third_Inlet_Q	0.0		l/s	Third_Inlet_Q
	Third_Dis_Q	183.4		l/s	Third_Dis_Q

				ID	From Node	To Node	Length	Diameter (mm)	Roughness	Flow	Velocity
-7.6%	-13.9	183.4	RThird_Q	UKP-9510	UKJ-624	UKWV-4576	9.0	600	135	169.5	0.60
		N/A	TTower_Q	UKP-4802E	UKJ-13936	TTOWER	2.1	750	135	0.9	0.00
		N/A	KWTP_S_Q	UKP-9777	UKJ-2277	UKJ-4220	103.8	1200	135	488.9	0.43
8.3%	37.4	116.5	KWTP_D_Q-N	UKP-9755	UKJ-4219	UKJ-2098	8.9	750	135	202.8	0.46
		201.2	KWTP_D_Q-E	UKP-9756	UKJ-4219	UKJ-2093	8.9	600	135	150.4	0.53
		133.3	KWTP_D_Q-W	UKP-9757	UKJ-4219	UKJ-2089	15.3	600	135	135.2	0.48
		450.9								488.3	

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



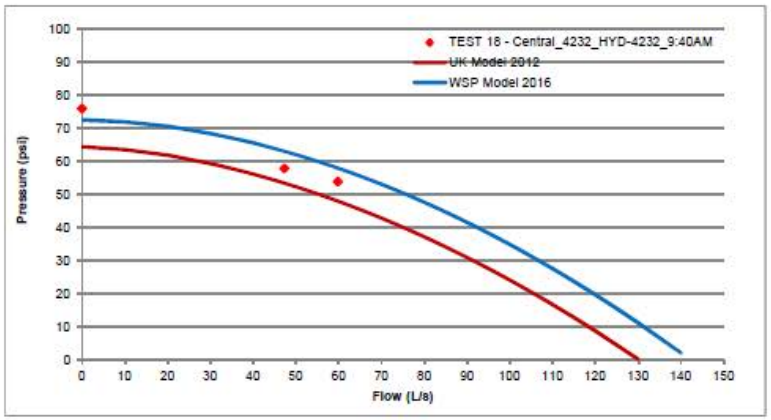
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)
KC2$S71XW$LQ$_Value	CLWELL #1	KSWTP_L		
KC2$S73XW$LQ$_Value	CLWELL #2			
KC4$H01NT$LQ$_Value	Tower St Tower	Tower_L		24.4
TA1$ResLevel.PV.Value	Third_Res_L	Third_Res_L		104.9
KC4$H73OI$PQ$_Value	HL PRESSURE1	KSWTP_P	kPa	
KC4$H74OI$PQ$_Value	HL PRESSURE2		kPa	
KC4$H01OX$FQ$_Value	Discharge Flow East		m³(x1000)/d	
KC4$H02OX$FQ$_Value	Discharge Flow North	KSWTP_Q	m³(x1000)/d	
KC4$H03OX$FQ$_Value	Discharge Flow West		m³(x1000)/d	

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	RThird	UKJ-624	0.05	110.5	135.6	35.6	24.9
0.2%	0.3	135.7	TTower	UKJ-13936	0.00	107.2	136.0	41.0	
		N/A	KWTP_S	UKJ-4220	0.00	79.1	79.9	1.2	
-3.9%	-3.4	87.3	KWTP_D	UKJ-4219	0.83	77.1	136.1	83.9	

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	KSWTP_L	2.6		m	CLWELL #1
		2.8		m	CLWELL #2
	Tower_L	4.2	28.6	m	Tower St Tower
	Third_Res_L	3.1	108.0	m	Third_Res_L
Pump	KSWTP_P	87.3		psi	HL PRESSURE1
		87.3		psi	HL PRESSURE2
Flow	KSWTP_Q	147.3		l/s	Discharge Flow East
		219.8		l/s	Discharge Flow North
		120.1		l/s	Discharge Flow West
	Third_Inlet_Q	0.0		l/s	Third_Inlet_Q
	Third_Dis_Q			l/s	Third_Dis_Q

				ID	From Node	To Node	Length	Diameter (mm)	Roughness	Flow	Velocity
0.0%	-0.1	0.0	RThird_Q	UKP-9510	UKJ-624	UKWV-4576	9.0	600	135	-0.1	0.00
		N/A	TTower_Q	UKP-4802E	UKJ-13936	TTOWER	2.1	750	135	-319.0	0.72
		N/A	KWTP_S_Q	UKP-9777	UKJ-2277	UKJ-4220	103.8	1200	135	490.8	0.43
0.5%	2.7	147.3	KWTP_D_Q-N	UKP-9755	UKJ-4219	UKJ-2098	8.9	750	135	195.8	0.44
		219.8	KWTP_D_Q-E	UKP-9756	UKJ-4219	UKJ-2093	8.9	600	135	155.3	0.55
		120.1	KWTP_D_Q-W	UKP-9757	UKJ-4219	UKJ-2089	15.3	600	135	138.9	0.49

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



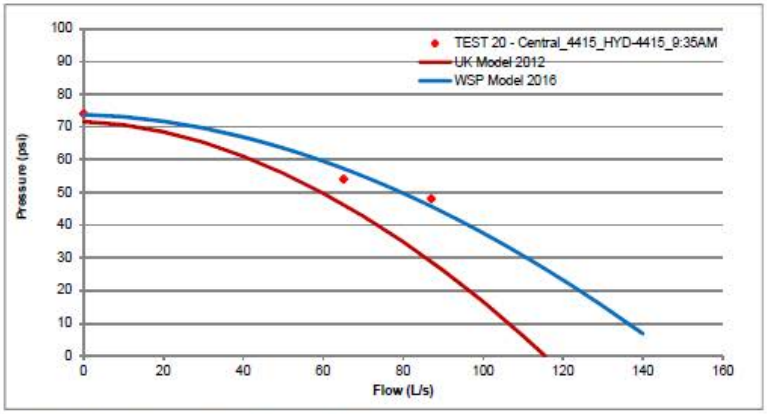
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)
KC2$S71XW$LQ$_Value	CLWELL #1	KSWTP_L		
KC2$S73XW$LQ$_Value	CLWELL #2			
KC4$H01NT$LQ$_Value	Tower St Tower	Tower_L		24.4
TA1$ResLevel.PV.Value	Third_Res_L	Third_Res_L		104.9
KC4$H73OI$PQ$_Value	HL PRESSURE1	KSWTP_P	kPa	
KC4$H74OI$PQ$_Value	HL PRESSURE2		kPa	
KC4$H01OX$FQ$_Value	Discharge Flow East		m³(x1000)/d	
KC4$H02OX$FQ$_Value	Discharge Flow North	KSWTP_Q	m³(x1000)/d	
KC4$H03OX$FQ$_Value	Discharge Flow West		m³(x1000)/d	

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	RThird	UKJ-624	0.03	110.5	136.1	36.3	25.4
0.7%	0.9	135.1	TTower	UKJ-13936	0.00	107.2	136.0	41.0	
		N/A	KWTP_S	UKJ-4220	0.00	79.1	79.9	1.2	
-3.3%	-2.9	87.1	KWTP_D	UKJ-4219	0.55	77.1	136.3	84.2	

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	KSWTP_L	2.7		m	CLWELL #1
		2.9		m	CLWELL #2
	Tower_L	3.6	27.9	m	Tower St Tower
	Third_Res_L	3.4	108.3	m	Third_Res_L
Pump	KSWTP_P	87.3		psi	HL PRESSURE1
		86.9		psi	HL PRESSURE2
Flow	KSWTP_Q	12.7	147.3	l/s	Discharge Flow East
		19.0	219.8	l/s	Discharge Flow North
		10.4	120.1	l/s	Discharge Flow West
	Third_Inlet_Q	0.0		l/s	Third_Inlet_Q
	Third_Dis_Q	183.4		l/s	Third_Dis_Q

				ID	From Node	To Node	Length	Diameter (mm)	Roughness	Flow	Velocity
-7.6%	-13.9	183.4	RThird_Q	UKP-9510	UKJ-624	UKWV-4576	9.0	600	135	169.5	0.60
		N/A	TTower_Q	UKP-4802	UKJ-13936	TTOWER	2.1	750	135	0.9	0.00
		N/A	KWTP_S_Q	UKP-9777	UKJ-2277	UKJ-4220	103.8	1200	135	488.9	0.43
0.2%	1.1	147.3	KWTP_D_Q-N	UKP-9755	UKJ-4219	UKJ-2098	8.9	750	135	202.8	0.46
		219.8	KWTP_D_Q-E	UKP-9756	UKJ-4219	UKJ-2093	8.9	600	135	150.4	0.53
		120.1	KWTP_D_Q-W	UKP-9757	UKJ-4219	UKJ-2089	15.3	600	135	135.2	0.48
		487.3								488.3	

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)
KC2$S71XW$LQ$_Value	CLWELL #1	KSWTP_L		
KC2$S73XW$LQ$_Value	CLWELL #2			
KC4$H01NT$LQ$_Value	Tower St Tower	Tower_L		24.4
TA1$ResLevel.PV.Value	Third_Res_L	Third_Res_L		104.9
KC4$H73OI$PQ$_Value	HL PRESSURE1	KSWTP_P	kPa	
KC4$H74OI$PQ$_Value	HL PRESSURE2		kPa	
KC4$H01OX$FQ$_Value	Discharge Flow East		m³(x1000)/d	
KC4$H02OX$FQ$_Value	Discharge Flow North	KSWTP_Q	m³(x1000)/d	
KC4$H03OX$FQ$_Value	Discharge Flow West		m³(x1000)/d	

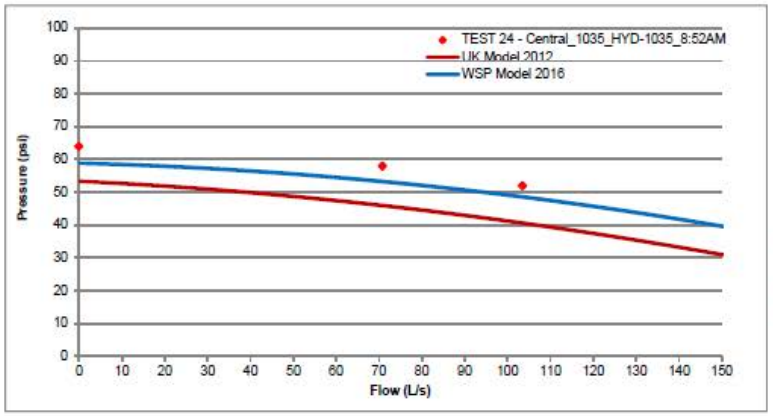
Note: use 65 l/s as high flow value (87 l/s is an outlier).

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	RThird	UKJ-624	0.03	110.5	135.8	35.9	25.1
1.0%	1.4	134.6	TTower	UKJ-13936	0.00	107.2	136.0	41.0	
		N/A	KWTP_S	UKJ-4220	0.00	79.1	79.9	1.2	
-2.4%	-2.0	86.2	KWTP_D	UKJ-4219	0.55	77.1	136.3	84.2	

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	KSWTP_L				CLWELL #1
					CLWELL #2
Pump	Tower_L	3.1	27.5	m	Tower St Tower
	Third_Res_L	3.8	108.7	m	Third_Res_L
Flow	KSWTP_P	86.4		psi	HL PRESSURE1
		85.9		psi	HL PRESSURE2
	KSWTP_Q	171.0		l/s	Discharge Flow East
		229.2		l/s	Discharge Flow North
		150.0		l/s	Discharge Flow West
	Third_Inlet_Q	0.0		l/s	Third_Inlet_Q
	Third_Dis_Q	0.0		l/s	Third_Dis_Q

				ID	From Node	To Node	Length	Diameter (mm)	Roughness	Flow	Velocity
0.0%	-0.1	0.0	RThird_Q	UKP-9510	UKJ-624	UKWV-4576	9.0	600	135	-0.1	0.00
		N/A	TTower_Q	UKP-4802E	UKJ-13936	TTOWER	2.1	750	135	-167.9	0.38
		N/A	KWTP_S_Q	UKP-9777	UKJ-2277	UKJ-4220	103.8	1200	135	489.3	0.43
-11.2%	-61.3	171.0	KWTP_D_Q-N	UKP-9755	UKJ-4219	UKJ-2098	8.9	750	135	202.0	0.46
		229.2	KWTP_D_Q-E	UKP-9756	UKJ-4219	UKJ-2093	8.9	600	135	151.1	0.53
		150.0	KWTP_D_Q-W	UKP-9757	UKJ-4219	UKJ-2089	15.3	600	135	135.7	0.48

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



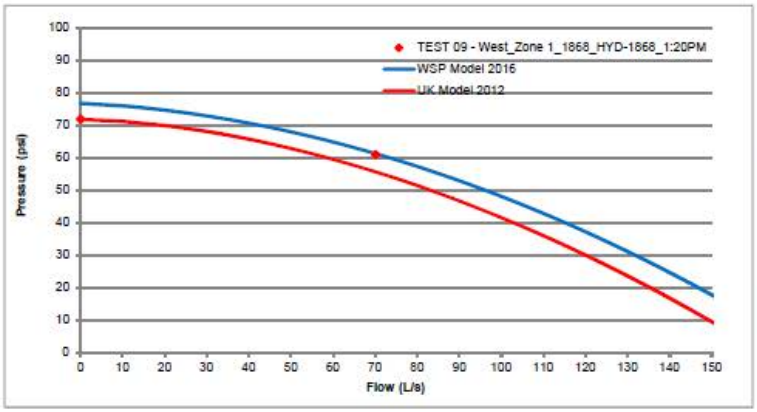
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)
KC2$S71XW$LQ$_Value	CLWELL #1	KSWTP_L		
KC2$S73XW$LQ$_Value	CLWELL #2			
KC4$H01NT$LQ$_Value	Tower St Tower	Tower_L		24.4
TA1$ResLevel.PV.Value	Third_Res_L	Third_Res_L		104.9
KC4$H73OI$PQ$_Value	HL PRESSURE1	KSWTP_P	kPa	
KC4$H74OI$PQ$_Value	HL PRESSURE2		kPa	
KC4$H01OX$FQ$_Value	Discharge Flow East		m³(x1000)/d	
KC4$H02OX$FQ$_Value	Discharge Flow North	KSWTP_Q	m³(x1000)/d	
KC4$H03OX$FQ$_Value	Discharge Flow West		m³(x1000)/d	

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	
		N/A	RThird	UKJ-624	0.03	110.5	135.8	35.9	25.1
1.0%	1.4	134.6	TTower	UKJ-13936	0.00	107.2	136.0	41.0	
		N/A	KWTP_S	UKJ-4220	0.00	79.1	79.9	1.1	
-1.9%	-1.6	86.2	KWTP_D	UKJ-4219	0.55	77.1	136.6	84.5	

	WSP Tag	SCADA Data	Target	Unit	Description
Water Level	KSWTP_L	2.7		m	CLWELL #1
		2.9		m	CLWELL #2
	Tower_L	3.1	27.5	m	Tower St Tower
	Third_Res_L	3.8	108.7	m	Third_Res_L
Pump	KSWTP_P	86.4		psi	HL PRESSURE1
		85.9		psi	HL PRESSURE2
Flow	KSWTP_Q	171.0		l/s	Discharge Flow East
		229.2		l/s	Discharge Flow North
		150.0		l/s	Discharge Flow West
	Third_Inlet_Q	0.0		l/s	Third_Inlet_Q
	Third_Dis_Q	0.0		l/s	Third_Dis_Q

				ID	From Node	To Node	Length	Diameter (mm)	Roughness	Flow	Velocity
0.0%	-0.1	0.0	RThird_Q	UKP-9510	UKJ-624	UKWV-4576	9.0	600	135	-0.1	0.00
		N/A	TTower_Q	UKP-4802B	UKJ-13936	TTOWER	2.1	750	135	-87.8	0.20
		N/A	KWTP_S_Q	UKP-9777	UKJ-2277	UKJ-4220	103.8	1200	135	569.8	0.50
		150.0	KWTP_D_Q-W	UKP-9755	UKJ-4219	UKJ-2098	8.9	750	135	236.7	0.54
		229.2	KWTP_D_Q-E	UKP-9756	UKJ-4219	UKJ-2093	8.9	600	135	175.1	0.62
5.1%	19.2	171.0	KWTP_D_Q-N	UKP-9757	UKJ-4219	UKJ-2089	15.3	600	135	157.5	0.56
		550.1								569.3	

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



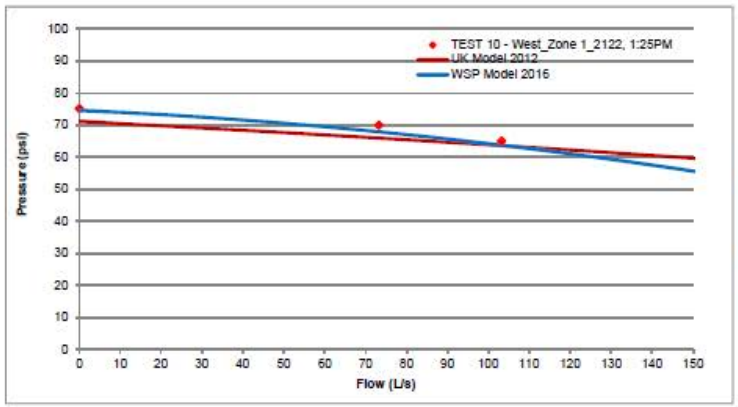
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$$_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$$_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6
PPWTP$KWTP$HLRSLVL$$_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$$_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)		ID		WSP Tag	SCADA Data	Target	Unit	Description
-7.5%	-7.0	93.1	West P_D	UKJ-4218	0.52	80.5	141.1	86.2	60.3	J8278	Water Level	PPWTP_TANK_L	6.8	29.7	m	PPWTP_O'ConnerTANK_L
2.3%	1.8	78.1	West P_S	UKJ-4217	0.00	80.4	79.9	-0.7		J8280		PPWTP_Res_L	3.5	78.1	m	PPWTP_HL-Res_L
0.3%	0.4	132.2	Oconr_H	UKWV-234	0.00	104.2	132.6	40.4		J24070		PA_Res_L	3.5	95.4	m	PA_Res_L
-1.6%	-1.6	95.4	RPROGRESS-suc	UKJ-4176	0.00	93.4	93.8	0.6		J8240		OCONR_Res_L	5.8	113.3	m	OCONR_Res_L
		N/A	RPROGRESS-dis	UKJ-4181	0.01	93.3	138.5	64.3		J4264	Pump	PPWTP_Dis_P	93.1		psi	PPWTP_Dis_P
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	136.3	68.8		J8224		CF_DisTank_P1	9.3	155.3	m	CF_DisTank_P1
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	158.7	100.7		J8222		CF_DisSys_P2	9.5	155.5	m	CF_DisSys_P2
7.5%	5.5	73.7	Oconr_Res-PSDis	UKJ-7076	0.00	107.4	163.1	79.2		J4864		OCONR_Inlet_P	32.3		m	OCONR_Inlet_P
3.7%	4.2	113.3	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0		J4844		OCONR_Dis_P	73.7		psi	OCONR_Dis_P
-0.2%	-0.3	155.3	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0		J28286		OC_Dis_P	102.6		psi	OC_Dis_P (PT1102)
												OC_Dis_P	101.8		psi	OC_Dis_P (PT1202)

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)		WSP Tag	SCADA Data	Target	Unit	Description
29.6%	85.7	289.4	West Q_D	UKP-9833B	UKJ-4218	UKJ-13588	33.9	900	100	375.0	0.59	Flow	PPWTP_Dis_Q	289.4		l/s	PPWTP_Dis_Q
2.2%	6.0	273.2	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	279.2	3.95		CF_OUT_Q			l/s	CF_OUT_Q
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	101.1	3.22		OCONR_Res_Inle	104.3			OCONR_Res_Inlet_Q
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	101.1	2.06		OCONR_Dis_Q	168.9		l/s	OCONR_Dis_Q
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	65.6	0.52		OC_Dis_Q			l/s	OC_Dis_Q (FT1103)
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	65.6	2.09		OC_Dis_Q				OC_Dis_Q (FT1203)
		N/A	OCONR_Res_Inle	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-227.6	0.80						
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00						
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	223.5	1.41						

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



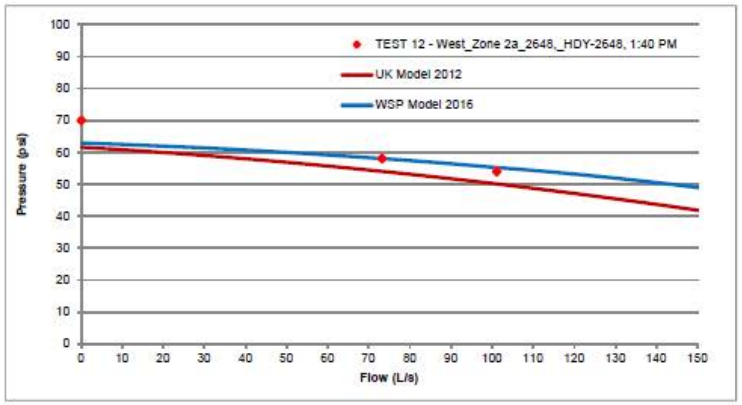
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$$_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$$_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6 Tank base elev
PPWTP$KWTP$HLRSLVL$$_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$$_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)		ID		WSP Tag	SCADA Data	Target	Unit	Description
12.8%	10.0	78.1	West P_S	UKJ-4218	0.35	80.5	142.5	88.1	61.7	J8278	Water Level	PPWTP_TANK_L	7.5	30.3	m	PPWTP_O'ConnerTANK_L
-14.6%	-13.7	93.6	West P_D	UKJ-4217	0.00	80.4	79.9	-0.7		J8280		PPWTP_Res_L	3.5	78.1	m	PPWTP_HL-Res_L
-0.1%	-0.2	132.9	Oconr_H	UKWV-234	0.00	104.2	132.7	40.5		J24070		PA_Res_L	4.3	96.2	m	PA_Res_L
-2.4%	-2.3	96.2	RPROGRESS-suc	UKJ-4176	0.00	93.4	93.9	0.8		J8240		OCONR_Res_L	7.3	114.8	m	OCONR_Res_L
		N/A	RPROGRESS-dis	UKJ-4181	0.00	93.3	139.5	65.8		J4264	Pump	PPWTP_Dis_P	93.6		psi	PPWTP_Dis_P
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	137.3	70.3		J8224		CF_DisTank_P1	9.0	155.0	m	CF_DisTank_P1
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	159.7	102.0		J8222		CF_DisSys_P2	9.6	155.6	m	CF_DisSys_P2
4.9%	3.8	76.2	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	163.6	79.9		J4864		OCONR_Inlet_P	37.6		psi	OCONR_Inlet_P
2.4%	2.7	114.8	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0		J4844		OCONR_Dis_P	76.2		psi	OCONR_Dis_P
0.0%	0.1	155.0	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0		J28286		OC_Dis_P	0.0		psi	OC_Dis_P (PT1102)
												OC_Dis_P	0.0		psi	OC_Dis_P (PT1202)

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)					
36.2%	97.8	270.0	West Q_D	UKP-9833E	UKJ-4218	UKJ-13588	33.9	900	100	367.7	0.58	Flow	PPWTP_Dis_Q	270.0		l/s	PPWTP_Dis_Q
6.3%	18.5	292.6	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	311.1	4.40		CF_OUT_Q				CF_OUT_Q
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	99.2	3.16		OCONR_Res_Inle	110.0		l/s	OCONR_Res_Inlet_Q
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	99.2	2.02		OCONR_Dis_Q	182.5		l/s	OCONR_Dis_Q
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	65.9	0.52		OC_Dis_Q				OC_Dis_Q (FT1103)
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	65.8	2.10		OC_Dis_Q				OC_Dis_Q (FT1203)
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-225.1	0.80						
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00						
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	247.0	1.55						

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



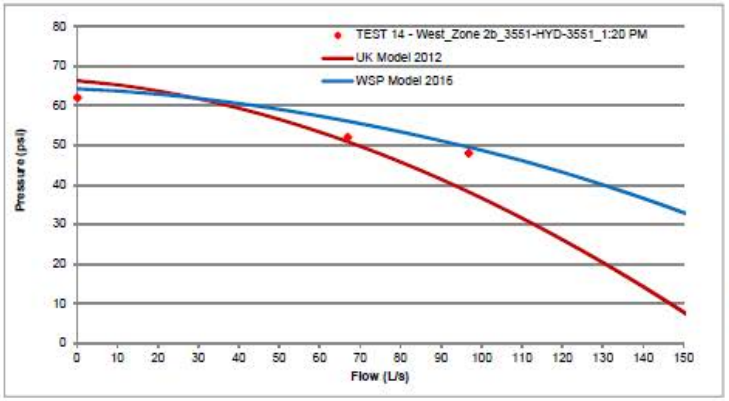
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$$_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$$_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6 Tank base
PPWTP$KWTP$HLRSLVL$$_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVELS_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$$_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)		ID		WSP Tag	SCADA Data	Target	Unit	Description
-2.2%	-1.8	78.1	West P_S	UKJ-4218	0.52	80.5	136.7	79.8	55.9	J8278	Water Level	PPWTP_TANK_L	8.5	31.4	m	PPWTP_O'ConnerTANK_L
-5.5%	-4.6	84.6	West P_D	UKJ-4217	0.00	80.4	80.0	-0.6		J8280		PPWTP_Res_L	3.5	78.1	m	PPWTP_HL-Res_L
-1.1%	-1.4	133.9	Oconr_H	UKWV-234	0.00	104.2	132.5	40.2		J24070		PA_Res_L	4.5	96.4	m	PA_Res_L
-13.1%	-12.6	96.4	RPROGRESS-suc	UKJ-4176	0.00	93.4	83.8	-13.6		J8240		OCONR_Res_L	11.1	118.6	m	OCONR_Res_L
		N/A	RPROGRESS-dis	UKJ-4181	0.01	93.3	140.6	67.3		J4264	Pump	PPWTP_Dis_P	84.6		psi	PPWTP_Dis_P
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	135.0	67.1		J8224		CF_DisTank_P1	10.2	156.2	m	CF_DisTank_P1
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	158.3	100.1		J8222		CF_DisSys_P2	10.9		m	CF_DisSys_P2
0.1%	0.1	78.9	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	163.0	79.0		J4864		OCONR_Inlet_P	39.9		m	OCONR_Inlet_P
-0.9%	-1.1	118.6	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0		J4844		OCONR_Dis_P	78.9		psi	OCONR_Dis_P
-0.8%	-1.2	156.2	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0		J28286		OC_Dis_P	0.0		psi	OC_Dis_P (PT1102)
												OC_Dis_P	0.0		psi	OC_Dis_P (PT1202)

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Flow	PPWTP_Dis_Q	178.0	psi	PPWTP_Dis_Q
11.7%	20.8	178.0	West Q_D	UKP-9833E	UKJ-4218	UKJ-13588	33.9	900	100	198.7	0.31		CF_OUT_Q		l/s	CF_OUT_Q
-6.6%	-16.1	244.1	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	228.0	3.23		OCONR_Res_Inle	49.9		OCONR_Res_Inlet_Q
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	220.3	7.01		OCONR_Dis_Q	194.2	l/s	OCONR_Dis_Q
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	220.2	4.49		OC_Dis_Q		l/s	OC_Dis_Q (FT1103)
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	59.7	0.47		OC_Dis_Q			OC_Dis_Q (FT1203)
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	59.7	1.90					
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-228.1	0.81					
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00					
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	218.0	1.37					

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



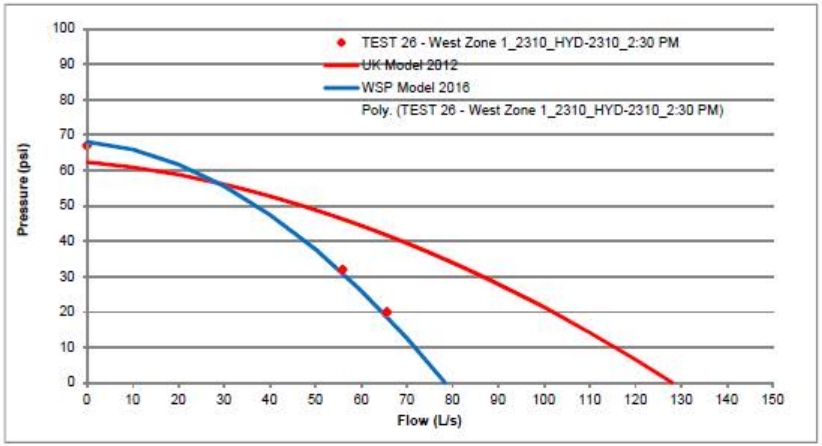
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$S_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$S_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6 Tank base elev
PPWTP$KWTP$HLRSLVL$S_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$S_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	Roughness	Flow (L/	Velocity (m/s)		WSP Tag	SCADA Data	Target	Unit	Description
-18.9%	-17.9	94.7	West P_S	UKJ-4218	0.52	80.5	134.5	76.8	100.0	203.7	0.32	Water Level	PPWTP_TANK_L	8.4	31.3	m	PPWTP_O'ConnerTANK_L
2.5%	2.0	78.0	West P_D	UKJ-4217	0.00	80.4	80.0	-0.6	132.0	130.5	1.85		PPWTP_Res_L	3.4	78.0	m	PPWTP_HL-Res_L
-1.1%	-1.5	133.9	Oconr_H	UKWV-234	0.00	104.2	132.3	40.0	80.5	107.4	3.42		PA_Res_L	3.4	95.3	m	PA_Res_L
-1.9%	-1.8	95.3	RPROGRESS-suc	UKJ-4176	0.00	93.4	93.5	0.1	92.0	107.4	2.19		OCONR_Res_L	9.2	116.7	m	OCONR_Res_L
		N/A	RPROGRESS-dis	UKJ-4181	0.01	93.3	134.8	59.1	103.5	49.4	0.39	Pump	PPWTP_Dis_P	94.7		m	PPWTP_Dis_P
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	133.1	64.4	120.0	49.4	1.57		CF_DisTank_P1	9.0	155.0	psi	CF_DisTank_P1
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	157.6	99.1	135.0	-228.9	0.81		CF_DisSys_P2	9.8		m	CF_DisSys_P2
2.7%	2.1	76.8	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	162.8	78.8	135.0	0.0	0.00		OCONR_Inlet_P	39.9		m	OCONR_Inlet_P
0.7%	0.8	116.7	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0	90.0	208.5	1.31		OCONR_Dis_P	76.8		psi	OCONR_Dis_P
0.0%	0.0	155.0	TCREEKFORD	UKWV-619	0.01	121.3	155.0	47.9		J28286			OC_Dis_P	69.0		psi	OC_Dis_P (PT1102)
													OC_Dis_P	69.2		psi	OC_Dis_P (PT1202)

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Flow	PPWTP_Dis_Q	268.2		l/s	PPWTP_Dis_Q
-24.0%	-64.5	268.2	West Q_D	UKP-9833E	UKJ-4218	UKJ-13588	33.9	900	100	203.7	0.32		CF_OUT_Q			l/s	CF_OUT_Q
-40.6%	-89.3	219.8	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	130.5	1.85		OCONR_Res_Inle	38.3			OCONR_Res_Inlet_Q
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	107.4	3.42		OCONR_Dis_Q	181.6		l/s	OCONR_Dis_Q
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	107.4	2.19		OC_Dis_Q			l/s	OC_Dis_Q (FT1103)
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	49.4	0.39		OC_Dis_Q				OC_Dis_Q (FT1203)
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	49.4	1.57						
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-228.9	0.81						
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00						
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	208.5	1.31						

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



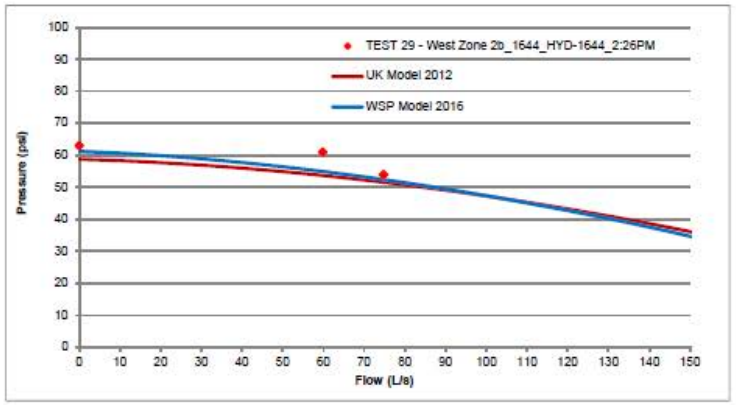
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)	
PPWTP$KWTP$CLWLVL$$_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m		
PPWTP$KWTP$ELTANK$$_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height
PPWTP$KWTP$HLRSLVL$$_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6	
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9	
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5	
PPWTP$KWTP$DISPRES$$_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi		
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0	

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Ex

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)		ID		WSP Tag	SCADA Data	Target	Unit
-0.9%	-0.7	85.2	West P_D	UKJ-4218	0.35	80.5	139.9	84.5	59.1	J8278	Water Level	PPWTP_TANK_L	8.5	31.4	m
-0.2%	-0.1	78.1	West P_S	UKJ-4217	0.00	80.4	77.9	-3.5		J8280		PPWTP_Res_L	3.5	78.1	m
-0.1%	-0.1	133.9	Oconr_H	UKWV-234	0.00	104.2	133.8	42.1		J24070		PA_Res_L	3.8	95.7	m
0.1%	0.1	95.7	RPROGRESS-suc	UKJ-4176	0.00	93.4	95.8	3.5		J8240		OCONR_Res_L	N/A		m
		N/A	RPROGRESS-dis	UKJ-4181	0.00	93.3	135.8	60.5		J4264	Pump	PPWTP_Dis_P	85.2		m
		N/A	OCOLN-suc	UKJ-4163	0.00	87.8	135.2	67.4		J8222		CF_DisTank_P1	8.6	154.6	psi
		N/A	OCOLN_dis	UKJ-4165	0.00	87.9	159.0	101.0		J8224		CF_DisSys_P2	9.1		m
		#VALUE!	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	163.4	79.7		J4864		OCONR_Inlet_P	#VALUE!		m
		N/A	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0		J4844		OCONR_Dis_P	#VALUE!		psi
0.3%	0.4	154.6	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0		J28286		OC_Dis_P	0.0		psi
												OC_Dis_P	0.0		psi

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)				
39.0%	104.0	266.7	West Q_D	UKP-9833B	UKJ-4218	UKJ-13588	33.9	900	100	370.7	0.58	Flow	PPWTP_Dis_Q	266.7	psi
		N/A	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	174.6	2.47		CF_OUT_Q		l/s
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	0.0	0.00		OCONR_Res_Inlet_Q		
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	0.0	0.00		OCONR_Dis_Q		l/s
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	56.1	0.45		OC_Dis_Q		l/s
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	56.1	1.79		OC_Dis_Q		
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-226.0	0.80				
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00				
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	238.0	1.50				

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



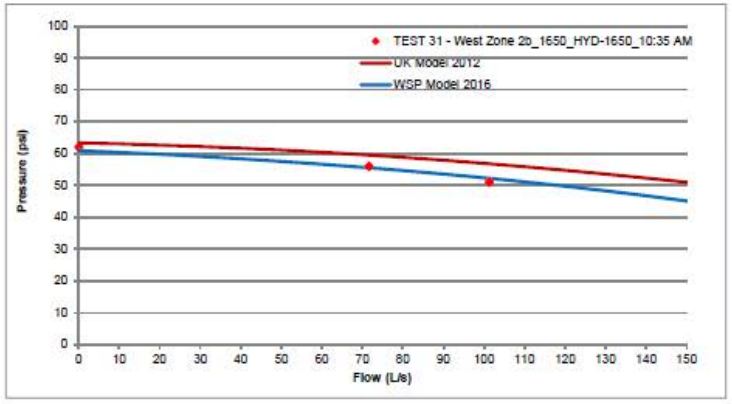
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$S_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$S_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6 Tank base elev
PPWTP$KWTP$HLRSLVL$S_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$S_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)		ID		WSP Tag	SCADA Data	Target	Unit	Description
4.5%	3.5	78.0	West P_S	UKJ-4218	0.35	80.5	137.9	81.6	57.1	J8278	Water Level	PPWTP_TANK_L	8.2	31.0	m	PPWTP_O'ConnerTANK_L
-15.3%	-14.5	94.5	West P_D	UKJ-4217	0.00	80.4	80.0	-0.6		J8280		PPWTP_Res_L	3.4	78.0	m	PPWTP_HL-Res_L
-0.8%	-1.0	133.6	Oconr_H	UKWV-234	0.00	104.2	132.6	40.3		J24070		PA_Res_L	3.6	95.5	m	PA_Res_L
-11.9%	-11.4	95.5	RPROGRESS-suc	UKJ-4176	0.00	93.4	84.1	-13.1		J8240		OCONR_Res_L	9.1	116.6	m	OCONR_Res_L
		N/A	RPROGRESS-dis	UKJ-4181	0.00	93.3	141.5	68.6		J4264	Pump	PPWTP_Dis_P	94.5		m	PPWTP_Dis_P
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	136.0	68.4		J8224		CF_DisTank_P1	10.3	156.3	psi	CF_DisTank_P1
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	159.3	101.4		J8222		CF_DisSys_P2	10.6		m	CF_DisSys_P2
6.4%	4.8	75.0	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	163.5	79.8		J4864		OCONR_Inlet_P	32.7		m	OCONR_Inlet_P
0.8%	0.9	116.6	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0		J4844		OCONR_Dis_P	75.0		psi	OCONR_Dis_P
-0.8%	-1.2	156.3	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0		J28286		OC_Dis_P	101.5		psi	OC_Dis_P (PT1102)
												OC_Dis_P	100.7		psi	OC_Dis_P (PT1202)

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)		WSP Tag	SCADA Data	Unit	Description
-30.8%	-87.1	283.0	West Q_D	UKP-9833E	UKJ-4218	UKJ-13588	33.9	900	100	196.0	0.31	Flow	PPWTP_Dis_Q	283.0	psi	PPWTP_Dis_Q
-10.1%	-29.6	293.2	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	263.6	3.73		CF_OUT_Q		l/s	CF_OUT_Q
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	217.4	6.92		OCONR_Res_Inle	129.1		OCONR_Res_Inlet_Q
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	217.4	4.43		OCONR_Dis_Q	164.1	l/s	OCONR_Dis_Q
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	59.8	0.48		OC_Dis_Q		l/s	OC_Dis_Q (FT1103)
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	59.8	1.90		OC_Dis_Q			OC_Dis_Q (FT1203)
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-225.7	0.80					
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00					
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	241.4	1.52					

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



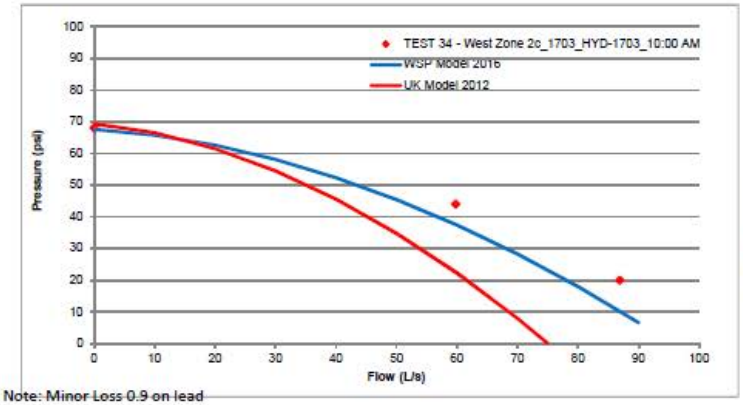
SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$$_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$$_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6 Tank base elev
PPWTP$KWTP$HLRSLVL$$_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$$_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)		ID		WSP Tag	SCADA Data	Target	Unit	Description
2.2%	1.8	78.1	West P_S	UKJ-4218	0.52	80.5	136.7	79.8	55.9	J8278	Water Level	PPWTP_TANK_L	8.5	31.4	m	PPWTP_O'ConnerTANK_L
-5.5%	-4.6	84.6	West P_D	UKJ-4217	0.00	80.4	80.0	-0.6		J8280		PPWTP_Res_L	3.5	78.1	m	PPWTP_HL-Res_L
-1.1%	-1.4	133.9	Oconr_H	UKWV-234	0.00	104.2	132.5	40.2		J24070		PA_Res_L	4.5	96.4	m	PA_Res_L
-13.1%	-12.6	96.4	RPROGRESS-suc	UKJ-4176	0.00	93.4	83.8	-13.6		J8240		OCONR_Res_L	11.1	118.6	m	OCONR_Res_L
		N/A	RPROGRESS-dis	UKJ-4181	0.01	93.3	140.6	67.3		J4264	Pump	PPWTP_Dis_P	84.6		m	PPWTP_Dis_P
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	135.0	67.1		J8224		CF_DisTank_P1	10.2	156.2	psi	CF_DisTank_P1
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	158.3	100.1		J8222		CF_DisSys_P2	10.9		m	CF_DisSys_P2
0.1%	0.1	78.9	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	163.0	79.0		J4864		OCONR_Inlet_P	39.9		m	OCONR_Inlet_P
-0.9%	-1.1	118.6	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0		J4844		OCONR_Dis_P	78.9		psi	OCONR_Dis_P
-0.8%	-1.2	156.2	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0		J28286		OC_Dis_P	0.0		psi	OC_Dis_P (PT1102)
												OC_Dis_P	0.0		psi	OC_Dis_P (PT1202)

				ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)		WSP Tag	SCADA Data	Target	Unit	Description
												Flow	PPWTP_Dis_Q	178.0		psi	PPWTP_Dis_Q
11.7%	20.8	178.0	West Q_D	UKP-9833E	UKJ-4218	UKJ-13588	33.9	900	100	198.7	0.31		CF_OUT_Q	0.0		l/s	CF_OUT_Q
-6.6%	-16.1	244.1	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	228.0	3.23		OCONR_Res_Inle	49.9			OCONR_Res_Inlet_Q
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	220.3	7.01		OCONR_Dis_Q	194.2		l/s	OCONR_Dis_Q
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	220.2	4.49		OC_Dis_Q	0.0		l/s	OC_Dis_Q (FT1103)
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	59.7	0.47		OC_Dis_Q	0.0			OC_Dis_Q (FT1203)
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	59.7	1.90						
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-228.1	0.81						
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00						
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	218.0	1.37						

Model Output
Calculated
Meet Target
Data Not Available
Out of Target



Note: Minor Loss 0.9 on lead

SCADA Tag	Description	WSP Tag	SCADA unit	Datum Elevation (m)		
PPWTP$KWTP$CLWLVL$S_Value	PPWTP_CleanWL_L	PPWTP_CWL_L	m			
PPWTP$KWTP$ELTANK$S_Value	PPWTP_O'ConnerTANK_L	PPWTP_TANK_L	m	22.9	Tank height	102.6 Tank base elev
PPWTP$KWTP$HLRSLVL$S_Value	PPWTP_HL-Res_L	PPWTP_Res_L	m	74.6		
KWTPIPRLEVEL$_VALUE	PA_Res_L	PA_Res_L	m	91.9		
OCONR$PLC101_LIT40016_VALUE	OCONR_Res_L	OCONR_Res_L	m	107.5		
PPWTP$KWTP$DISPRES$S_Value	PPWTP_Dis_P	PPWTP_Dis_P	psi			
TCREEKF_PT1-DISP	CF_DisTank_P1	CF_DisTank_P1	m	146.0		

Totten Sims Drawings M-1 to M-10, M12-15, M-18-20 (1971 PPWTP)
Totten Sims Drawings M-1 to M-6, M8-15 (1988 WTP Expansion, 52-7263)

% to Target		TARGET		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
-3.6%	-3.0	84.6	West P_D	UKJ-4218	0.35	80.5	137.9	81.6
2.4%	1.9	78.1	West P_S	UKJ-4217	0.00	80.4	80.0	-0.6
-1.0%	-1.4	133.9	Oconr_H	UKWV-234	0.00	104.2	132.6	40.3
-12.7%	-12.3	96.4	RPROGRESS-suc	UKJ-4176	0.00	93.4	84.1	-13.1
		N/A	RPROGRESS-dis	UKJ-4181	0.00	93.3	141.5	68.6
		N/A	OCOLN_dis	UKJ-4163	0.00	87.8	136.0	68.4
		N/A	OCOLN-suc	UKJ-4165	0.00	87.9	159.3	101.4
1.0%	0.8	78.9	Oconr_Res-PSDi	UKJ-7076	0.00	107.4	163.5	79.8
-0.9%	-1.1	118.6	ROCONNOR	UKJ-7056	0.00	107.0	117.5	15.0
-0.7%	-1.1	156.2	TCREEKFORD	UKWV-619	0.01	121.3	155.0	48.0

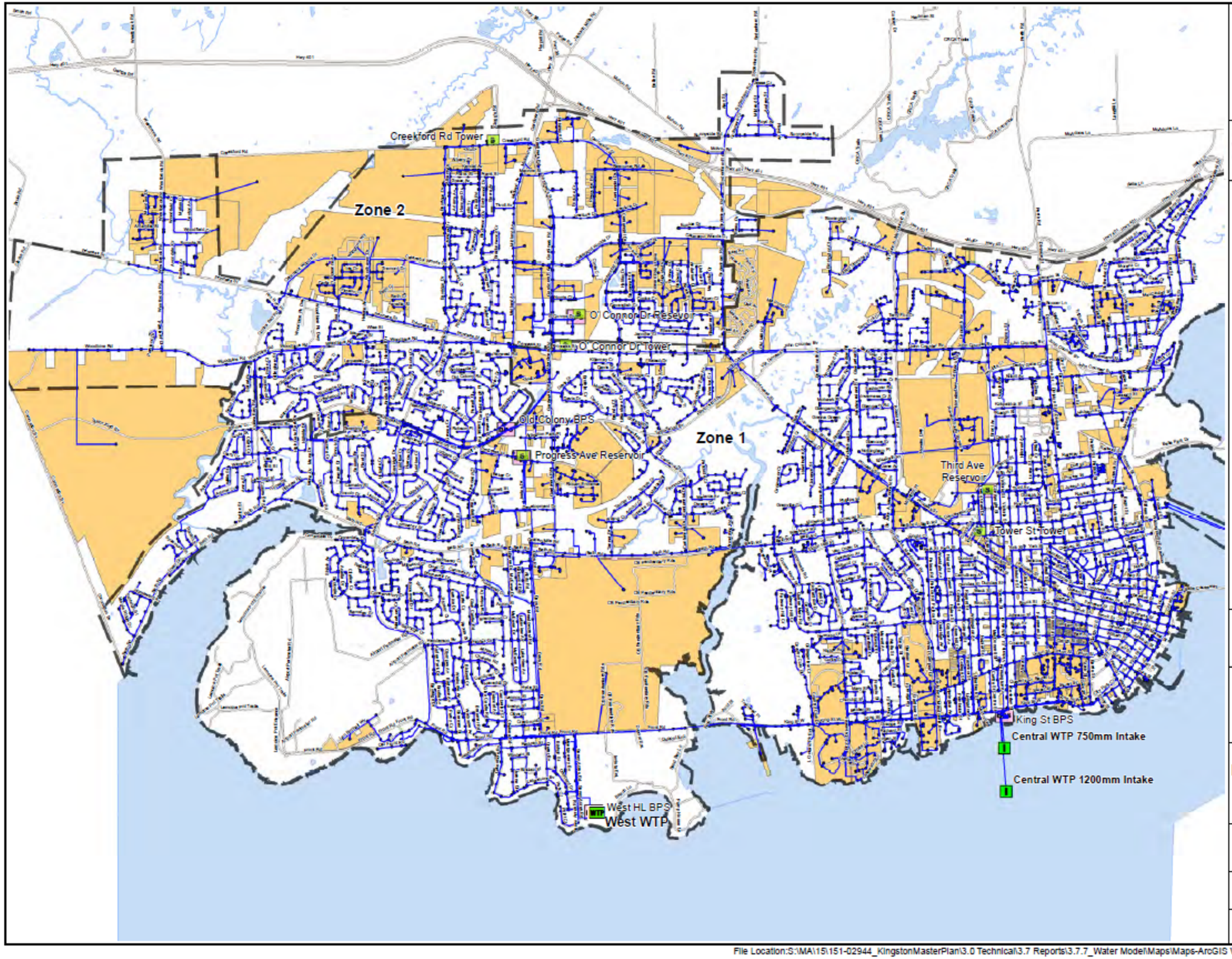
		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
10.1%	18.0	178.0	West Q_D	UKP-9833E	UKJ-4218	UKJ-13588	33.9	900	100	196.0	0.31
8.0%	19.5	244.1	Oconr_Q	UKP-1722	UKWV-2340	TOCONNOR	8.3	300	132	263.6	3.73
		N/A	RPROGRESS-suc	UKP-2045	RPROGRESS	UKJ-4176	19.6	200	81	217.4	6.92
		N/A	RPROGRESS-dis	UKP-2123	UKJ-4181	UKJ-277	12.1	250	92	217.4	4.43
		N/A	OC_Dis_Q	UKP-9744	UKJ-701	UKJ-4163	2.8	400	104	59.8	0.48
		N/A	OC_Dis_Q	UKP-9750	UKJ-4165	UKWV-6189	3.5	200	120	59.8	1.90
		N/A	OCONR_Res_Inl	UKP-13497	UKJ-7091	UKJ-7076	11.7	600	135	-225.7	0.80
		N/A	OCONR_Dis_Q	UKP-13534	UKJ-7056	ROCONNOR	10.6	600	135	0.0	0.00
		N/A	CF_OUT_Q	UKP-5756	UKWV-6193	TCREEKFORD	20.2	450	90	241.4	1.52

	ID		WSP Tag	SCADA Data	Target	Unit	Description
57.1	J8278	Water Level	PPWTP_TANK_L	8.5	31.4	m	PPWTP_O'ConnerTANK_L
	J8280		PPWTP_Res_L	3.5	78.1	m	PPWTP_HL-Res_L
	J24070		PA_Res_L	4.5	96.4	m	PA_Res_L
	J8240		OCONR_Res_L	11.1	118.6	m	OCONR_Res_L
	J4264	Pump	PPWTP_Dis_P	84.6		m	PPWTP_Dis_P
	J8224		CF_DisTank_P1	10.2	156.2	psi	CF_DisTank_P1
	J8222		CF_DisSys_P2	10.9		m	CF_DisSys_P2
	J4864		OCONR_Inlet_P	39.9		m	OCONR_Inlet_P
	J4844		OCONR_Dis_P	78.9		psi	OCONR_Dis_P
	J28286		OC_Dis_P	0.0		psi	OC_Dis_P (PT1102)
			OC_Dis_P	0.0		psi	OC_Dis_P (PT1202)
		Flow	PPWTP_Dis_Q	178.0		psi	PPWTP_Dis_Q
			CF_OUT_Q	0.0		l/s	CF_OUT_Q
			OCONR_Res_Inle	49.9			OCONR_Res_Inlet_Q
			OCONR_Dis_Q	194.2		l/s	OCONR_Dis_Q
			OC_Dis_Q	0.0		l/s	OC_Dis_Q (FT1103)
			OC_Dis_Q	0.0			OC_Dis_Q (FT1203)

Model Output
Calculated
Meet Target
Data Not Available
Out of Target

Appendix F

DIURNAL PATTERNS CREATION



WSP
1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSPGROUP.COM

Utilities Kingston
UTILTIES KINGSTON
P.O. BOX 790,
KINGSTON, ONTARIO,
K7L 4X7

Legend

- Water Treatment Plant (WTP)
- Storage Tank
- Booster Pumping Station (BPS)
- Raw Water Intake
- Pipe
- Future Development
- PressureZone
- Road
- Waterbody

Scale:
0 500 1,000 1,500 m
1:42,500

Project:
Water and Wastewater Master Plan
City of Kingston, Ontario

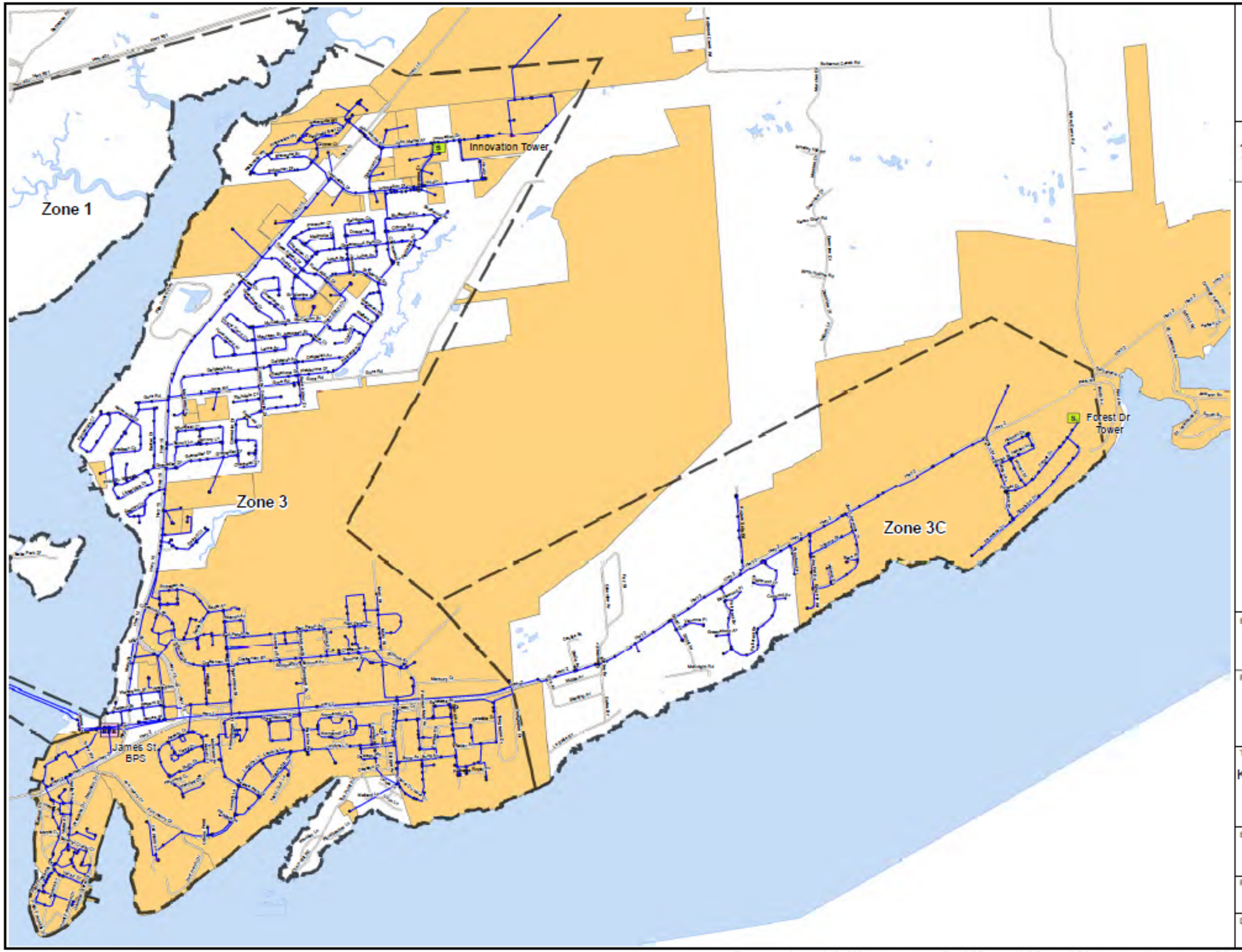
Title:
KINGSTON WATER SYSTEM - FUTURE DEVELOPMENT (ZONES 1 & 2)

Scenario:

Project No.:	Date:
151-02944-00	DECEMBER 2015

Drawn By:	Checked By:	Code:	Map No.:
HC	JLD	WM	10.1

File Location:S:\MA\15\151-02944_KingstonMasterPlan\3.0 Technical\3.7 Reports\3.7.7_Water Model\Maps\Maps-ArcGIS Ver 10.2.2\Map10_1-WC_FutureDevelopment.mxd



WSP
1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSPGROUP.COM

Utilities Kingston
UTILTIES KINGSTON
P.O. BOX 790,
KINGSTON, ONTARIO,
K7L 4X7

Legend

- Water Treatment Plant (WTP)
- Storage Tank
- Booster Pumping Station (BPS)
- Raw Water Intake
- Pipe
- Future Development
- PressureZone
- Road
- Waterbody

Scale:
0 200 400 600 800 m
1:25,000

Project:
Water and Wastewater Master Plan
City of Kingston, Ontario

Title:
KINGSTON WATER SYSTEM - FUTURE DEVELOPMENT (ZONES 3 & 3C)

Scenario:

Project No.:	Date:		
151-02944-00	DECEMBER 2015		
Drawn By:	Checked By:	Code:	Map No.:
HC	JLD	WM	10.2

File Location:S:\MA\15\151-02944_KingstonMasterPlan\3.0 Technical\3.7 Reports\3.7.7_Water Model\Maps\Maps-ArcGIS Ver 10.2.2\Map10_2-East_FutureDevelopment.mxd

KINGSTON HISTORICAL MONTHLY WATER USAGE

The historic daily flow record in the three water distribution zones in Kingston is analyzed. Figure F- 1 shows the 5-year historic and year 2014 daily average flow trends from Point Pleasant WTP (West Zone). Table F- 1 is the summary of the historical daily flow to UK's three water distribution zones. It is noticed that 2013 data is close to the 5 year's average trend for West and Central zones. Due to East Zone has small water demand, the fluctuation of the demand trend is not surprise. It is suggested that 2013 data to be used for water usage patterns creation.

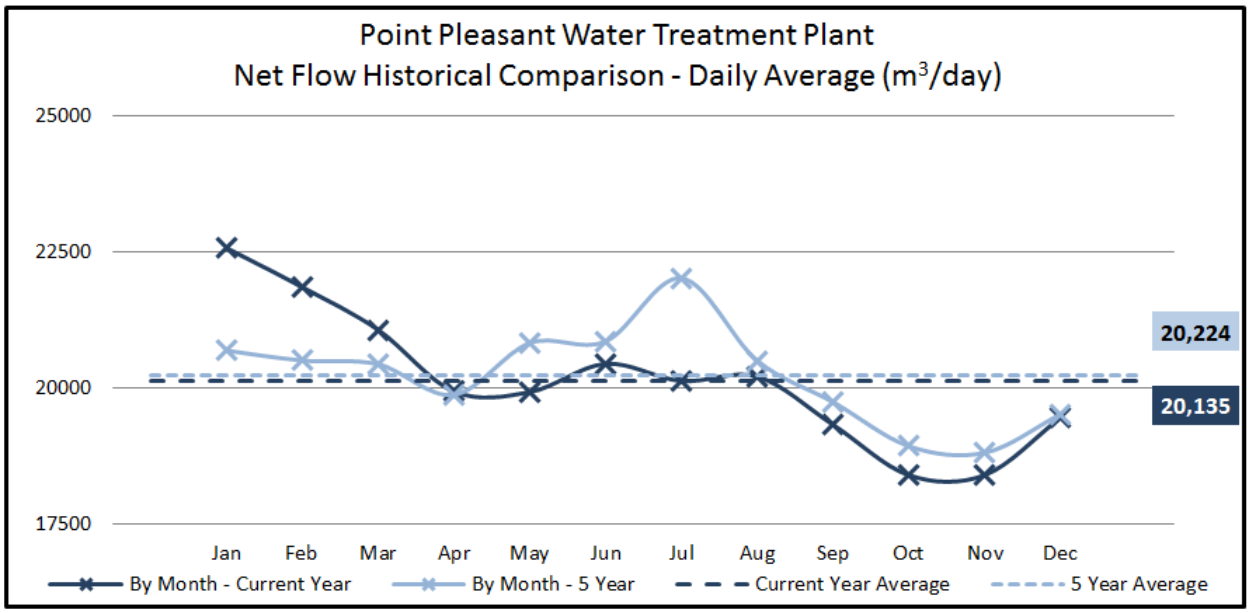


Figure F- 1 Point Pleasant Water Treatment Plant historic

Table F- 1 Summary of historical daily flow to UK's three water distribution zones

	King St. Water Treatment Plant - **Net to Central Distribution System** (Monthly total)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	1,552,586	1,447,609	1,569,390	1,402,721	1,394,225	1,280,839	1,336,613	1,302,149	1,272,852	1,262,316	1,231,909	1,293,245
2011	1,437,020	1,341,122	1,503,635	1,423,423	1,380,548	1,346,025	1,424,409	1,338,465	1,313,944	1,325,410	1,301,617	1,268,295
2012	1,414,293	1,398,765	1,430,981	1,315,448	1,289,904	1,265,657	1,402,138	1,326,464	1,293,582	1,259,802	1,225,870	1,318,971
2013	1,518,903	1,442,011	1,555,195	1,453,273	1,371,263	1,263,092	1,352,530	1,290,199	1,289,898	1,294,992	1,214,837	1,354,056
2014	1,644,084	1,448,306	1,571,373	1,328,117	1,222,040	1,190,309	1,213,599	1,191,847	1,205,509	1,215,704	1,165,921	1,175,035

	Kingston St. Water Treatment Plant - to **East Distribution System** Flows (Monthly total)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	172,912	167,004	182,457	168,973	157,712	126,654	130,795	114,635	100,344	104,535	108,272	123,018
2011	135,492	110,292	117,413	111,454	116,453	123,776	150,894	124,533	120,493	116,150	114,282	109,181
2012	19,130	122,564	132,967	127,967	145,693	142,309	181,447	155,641	140,037	134,734	135,946	140,946
2013	161,095	158,974	171,448	165,640	173,165	152,712	165,590	164,378	140,340	136,552	197,233	208,171
2014	157,560	143,976	185,941	190,032	166,701	154,783	164,832	161,045	157,964	158,722	164,529	177,154

	Point Pleasant Water Treatment Plant - Net to **West Distribution System** (Monthly total)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	630,258	570,871	615,739	590,564	670,914	596,760	644,033	620,571	576,528	563,492	539,421	574,140
2011	590,388	555,989	599,599	581,823	608,383	631,949	697,443	627,244	581,212	593,545	565,548	622,821
2012	644,274	586,294	650,994	612,789	639,277	624,237	754,004	658,305	585,195	581,148	574,893	635,229
2013	716,967	654,763	660,370	641,869	692,403	684,514	754,263	730,601	681,393	661,268	686,520	655,783
2014	699,797	611,854	653,099	598,043	617,629	613,280	623,951	626,437	579,674	570,259	551,984	603,119

1.1.1 AVERAGE WEEK AND MAXIMUM WEEK DETERMINATION

Daily flow data during year 2010 to 2014 from King Street WTP that supplies water to Central Zone and East Zone, and Point Pleasant WTP that supplies water to West Zone is provided by UK. Based on the historical water demand data, 2013 and 2014 data is analyzed for average and maximum week calculation for demand pattern creation.

The steps to determine weekly average daily and weekly maximum flows are:

1. Determine the annual daily average flow, see Table F- 1.
2. Determine the average weekly daily flow in the whole year 2013.
3. Determine the average week daily flow for demand pattern by removing the month(s) with extreme high flows that could be caused by pipe brakes due to land movement during spring draw duration, mostly in March, and comparing the average week daily flow and the annual average daily flow, and
4. Determine the maximum week daily flow by only considering the months between May and November to avoid spring thaw and early frost pipe break impact.
5. Uniform the calculated average week and maximum week in three zones to one representative week by comparing the weekly water flows.

After the flow data analysis Table F- 2 shows that the average week and maximum week water demand periods.

Table F- 2 Average week and maximum week water demand

System	All Zone except Third Ave. Res.	Third Ave. Res.
Average Week	September 9 – 15, 2013	December 9 - 15, 2013
Maximum Week	July 15 – 21, 2013	

However, it is found that there is no data in September 2013 for Third Ave Reservoir. Dec 9 - 15, 2013 SCADA data (real average week before the unification) for Third Ave Reservoir water level is used for the curve plotting.

AVERAGE WEEK AND MAXIMUM WEEK SCADA DATA

The SCADA data of these weeks for all Kingston water facility has been plotted and analysed. The water flow and storage tank water level curves and the curve tag descriptions can be found in figures below.

WEST ZONE

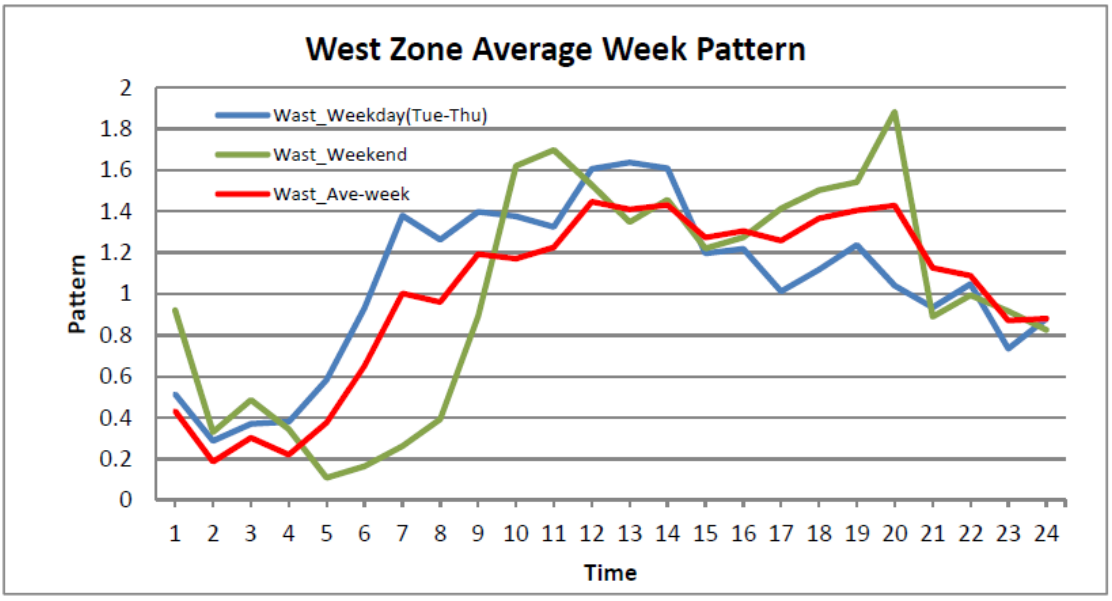


Figure F- 2 West Zone average week pattern

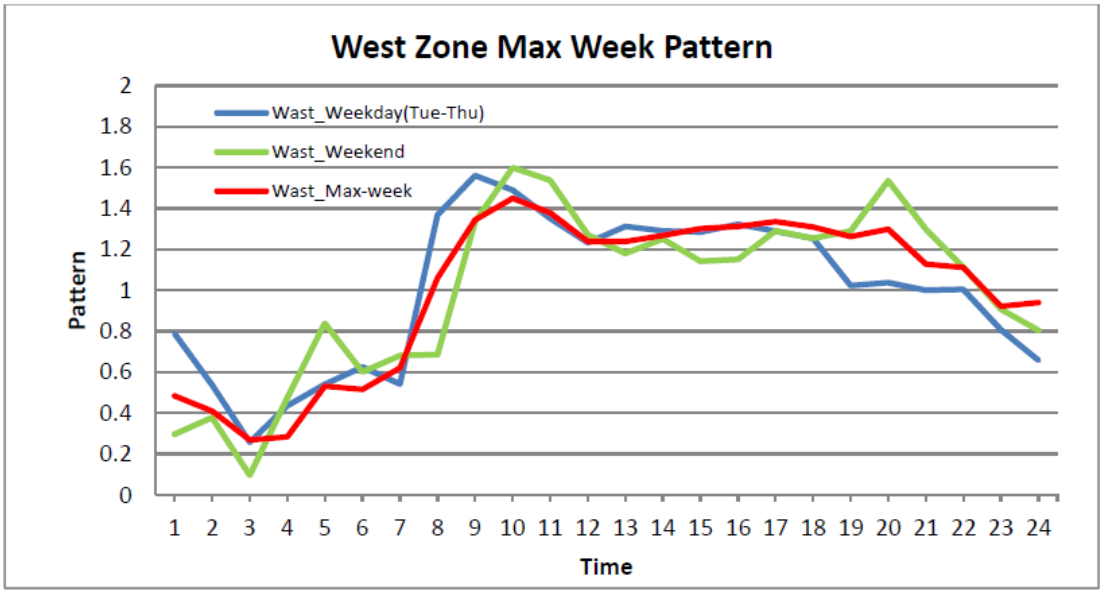


Figure F- 3 West Zone maximum week pattern

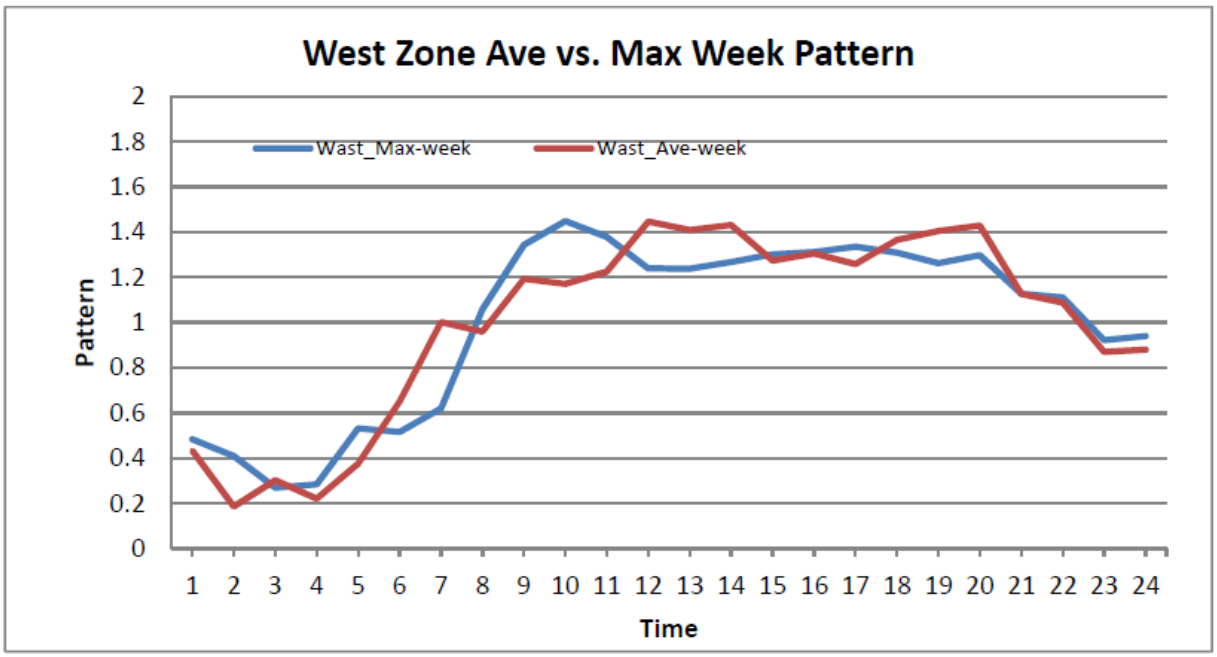


Figure F- 4 Comparison of West Zone average and maximum week patterns

CENTRAL ZONE

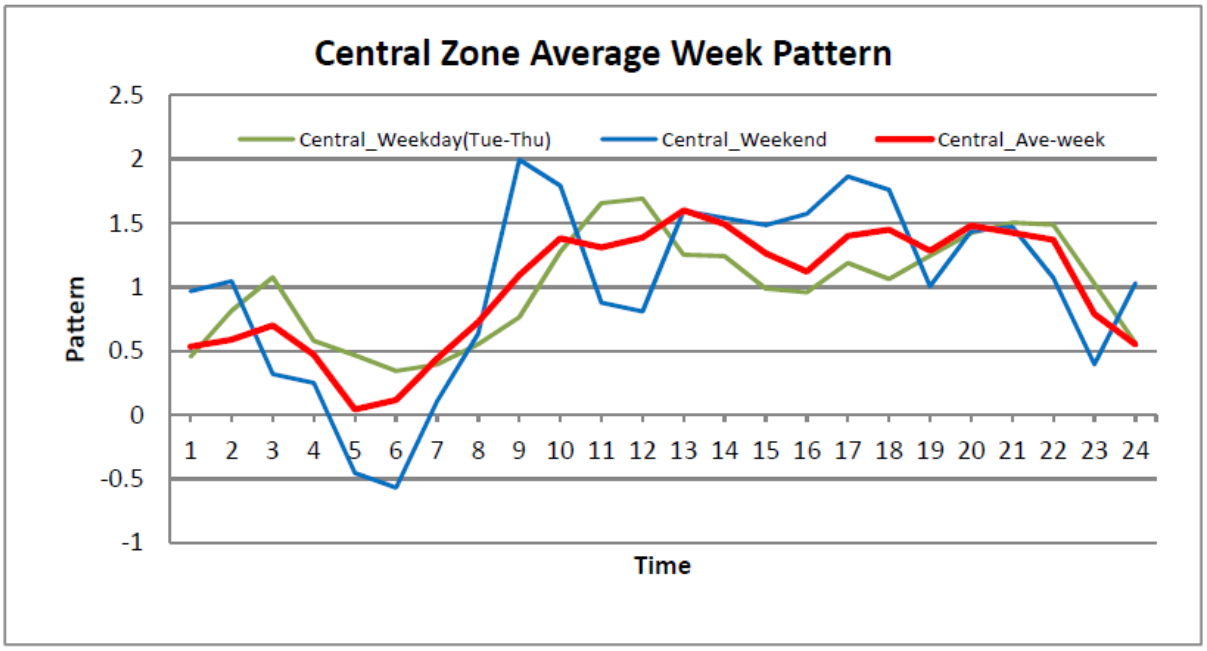


Figure F- 5 Central Zone average week pattern

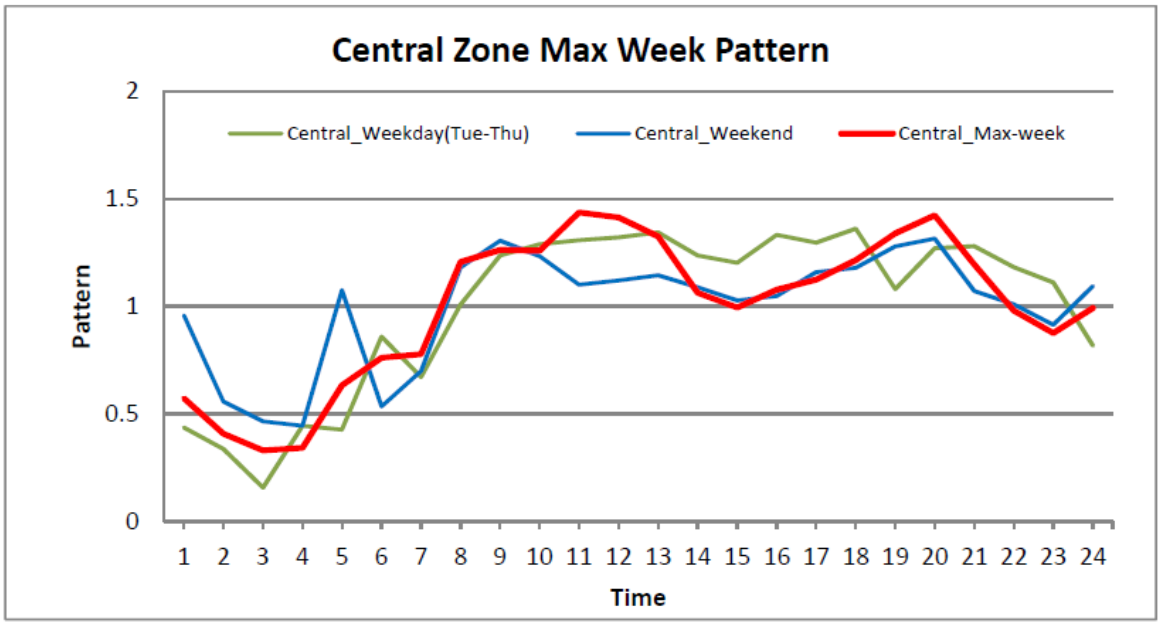


Figure F- 6 Central Zone maximum week pattern

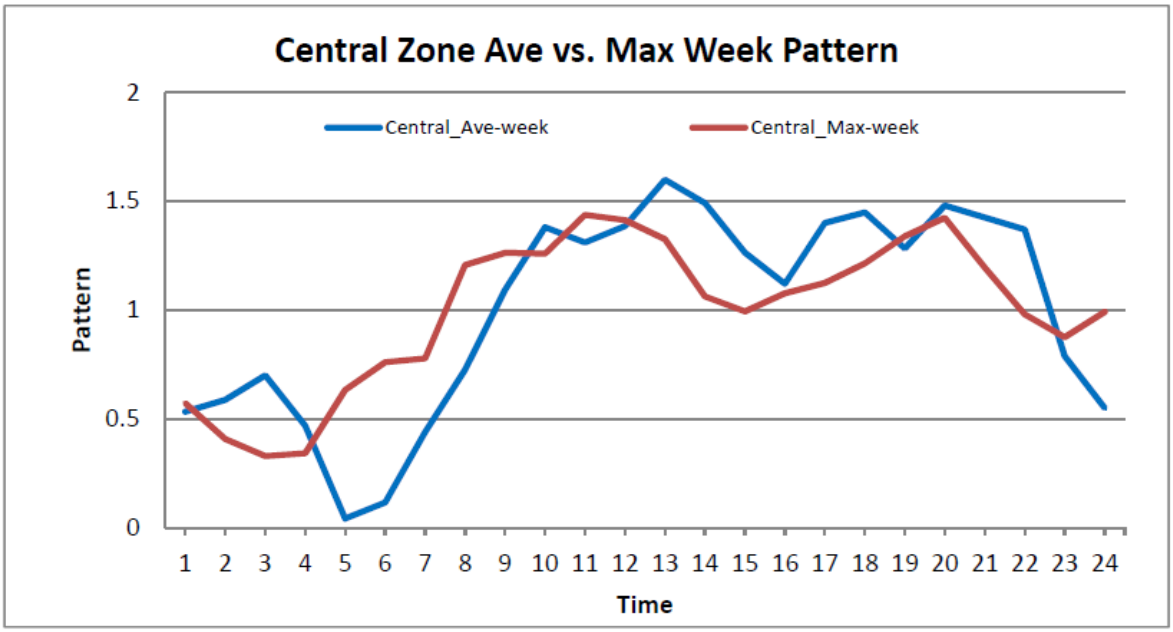


Figure F- 7 Comparison of Central Zone average and maximum week patterns

EAST ZONE

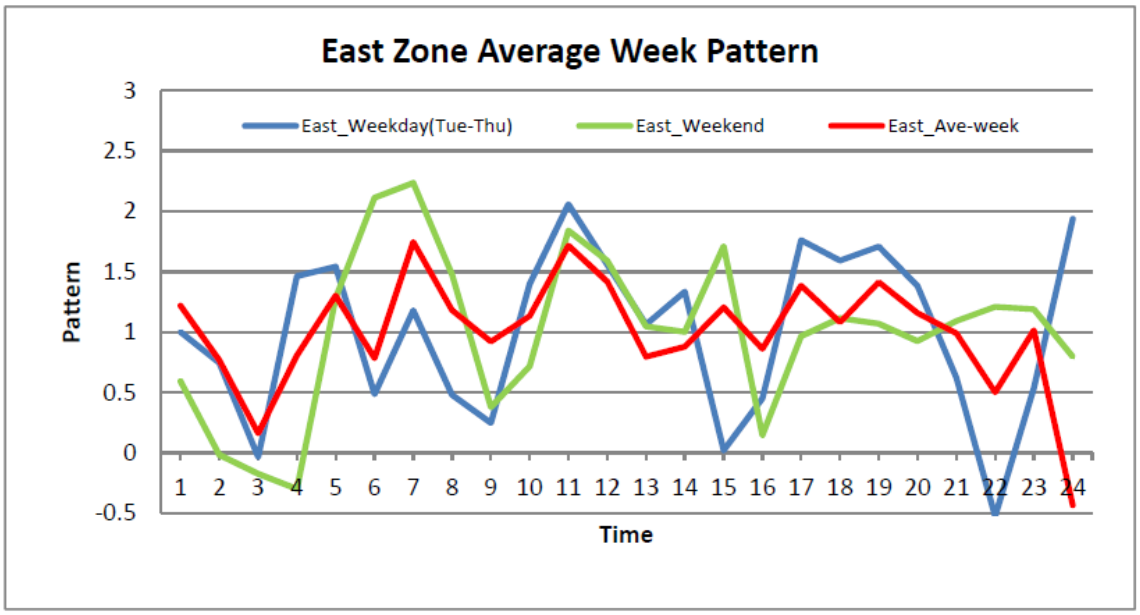


Figure F- 8 East Zone average week pattern

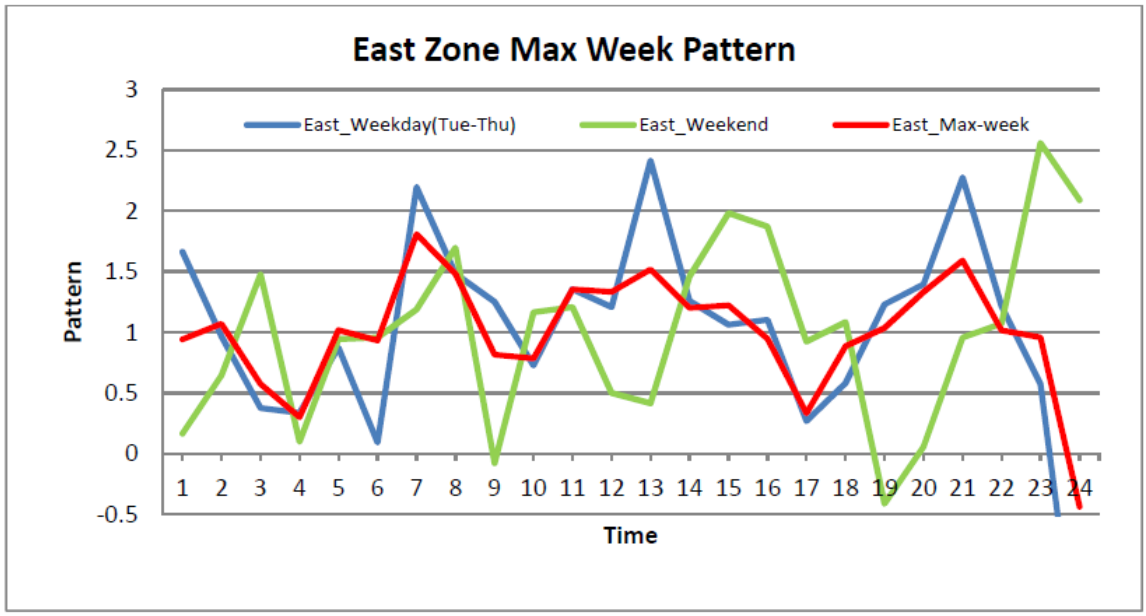


Figure F- 9 East Zone maximum week pattern

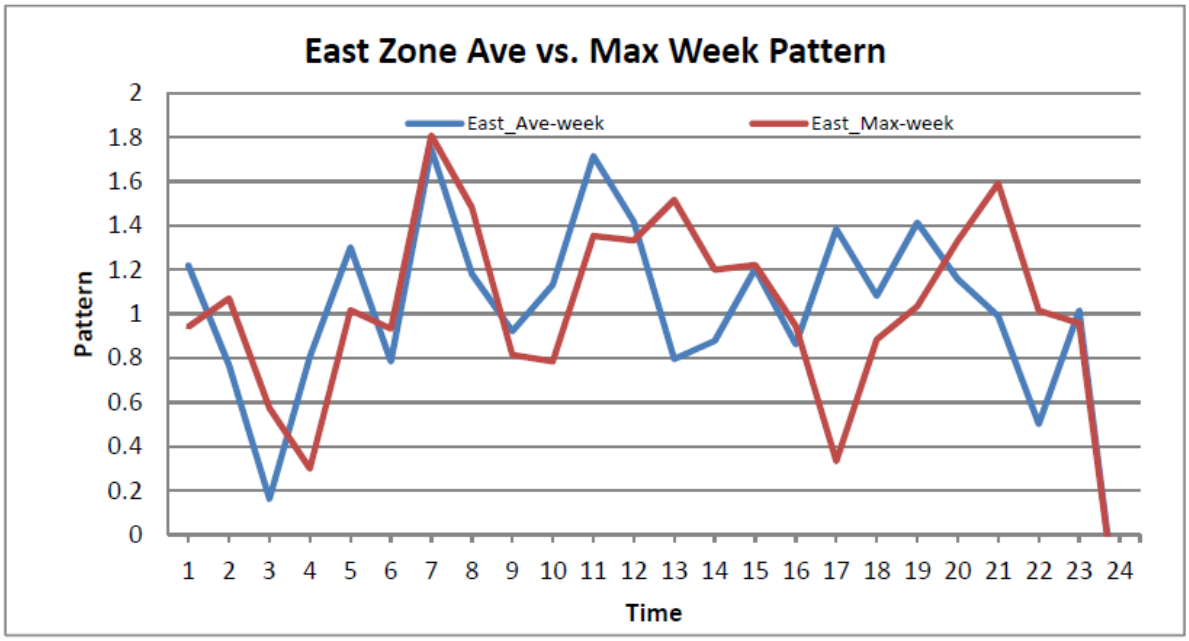


Figure F- 10 Comparison of East Zone average and maximum week patterns

Water Demand Diurnal Pattern for Distribution Zones in Kingston

The daily water demand patterns were created based on the 2013 average and maximum week SCADA data. The explanation of the date used can be found in the previous section. The preliminary diurnal patterns and a note are shown in the previous section. However, the East Zone SCADA data was not able to provide a consistent pattern. It is worth noting that these curves are the combination of residential and other variations land use water demands.

WESTBROOK FOUR WEEK HYDROGRAPH

This hydrograph displays flow monitor data from Westbrook, a residential area recorded over a four week period during June 14 to July 11, 2015. Note that a repeatable daily or *diurnal* pattern is observed.

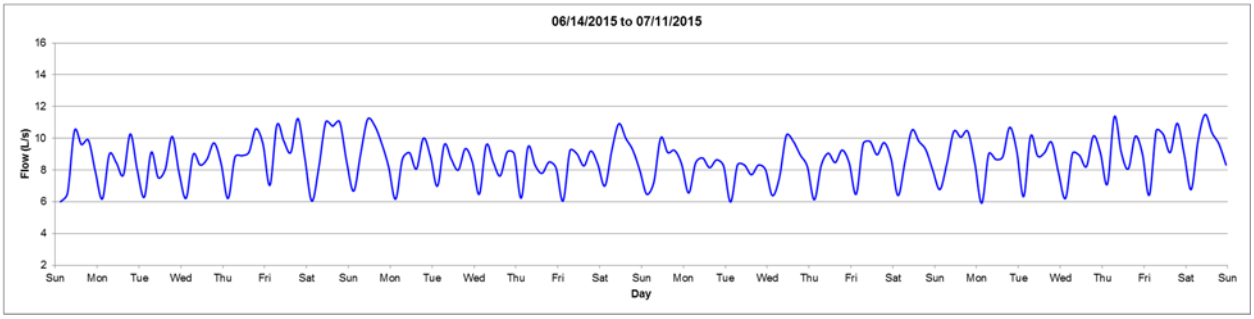


Figure F- 11 Westbrook Four Week Water Demand Pattern

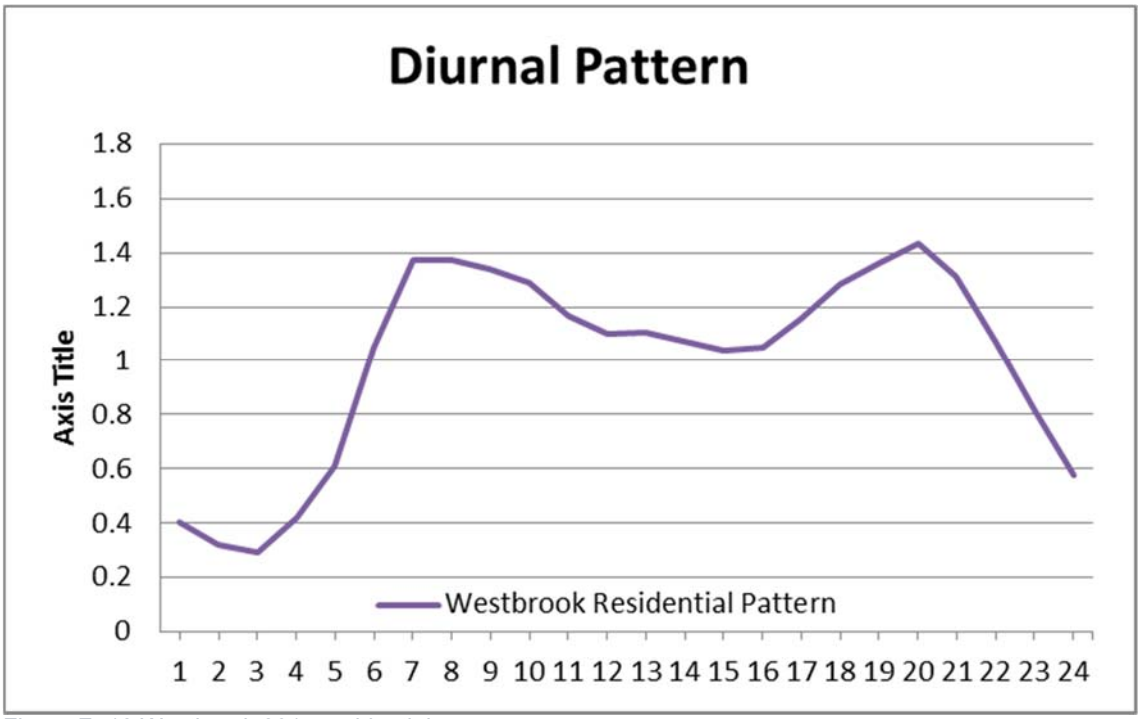


Figure F- 12 Westbrook 2015 residential pattern

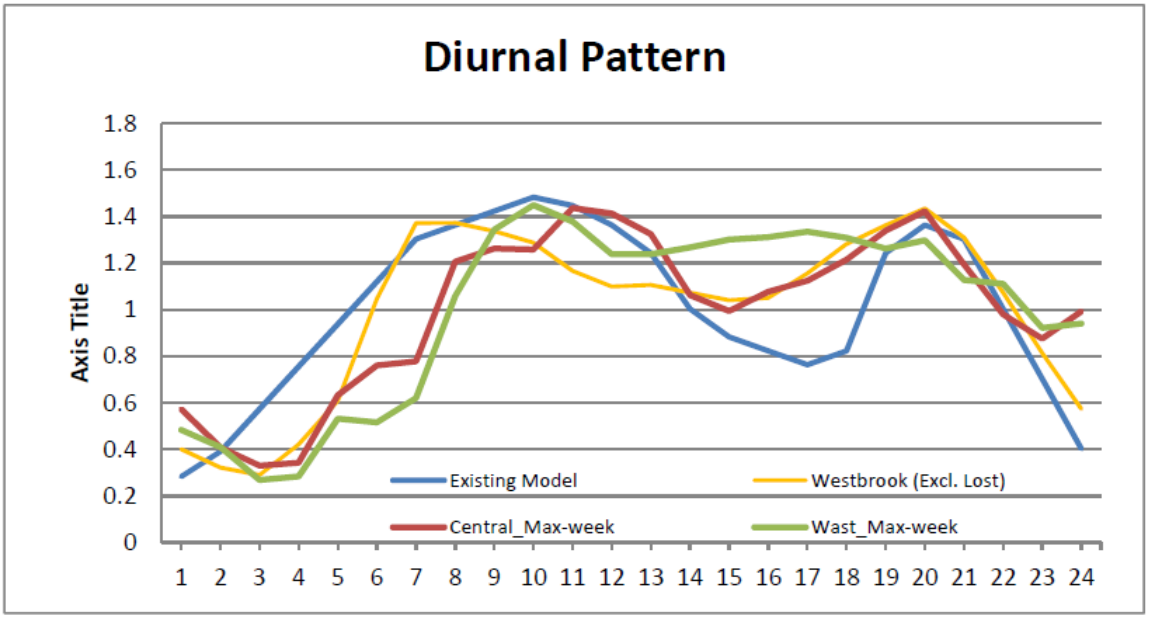


Figure F- 13 Comparison of existing patterns in UK existing model, Westbrook area and maximum week patterns

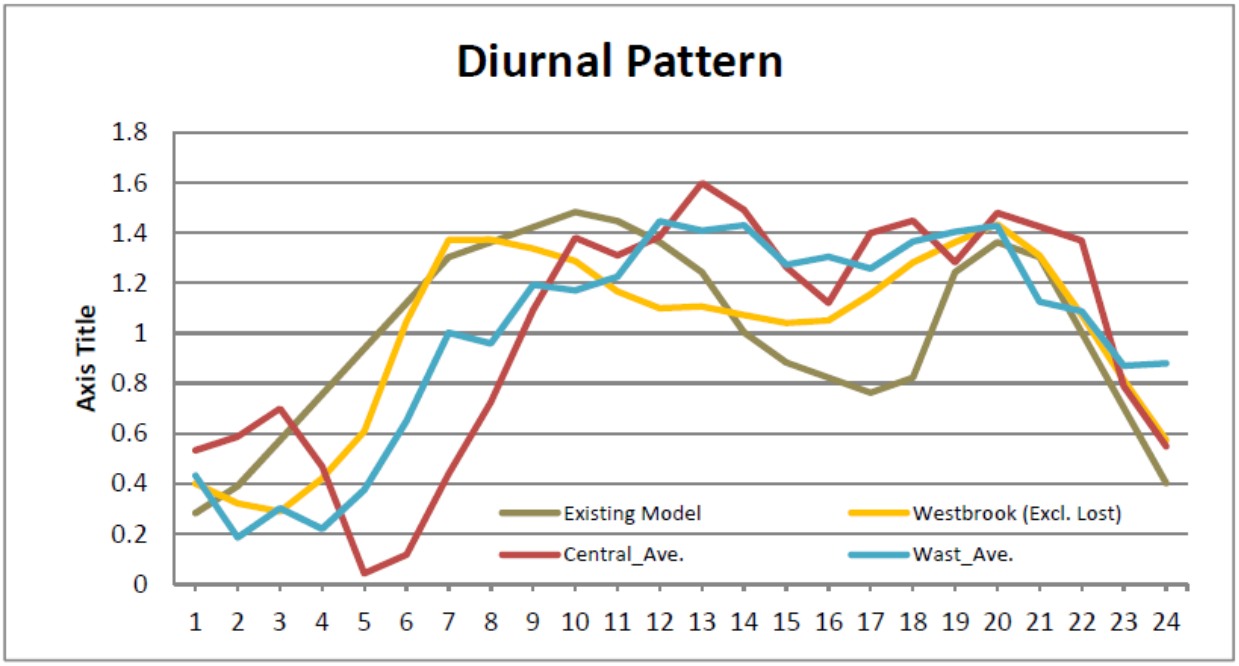


Figure F- 14 Comparison of existing patterns in UK existing model, Westbrook area and average week patterns

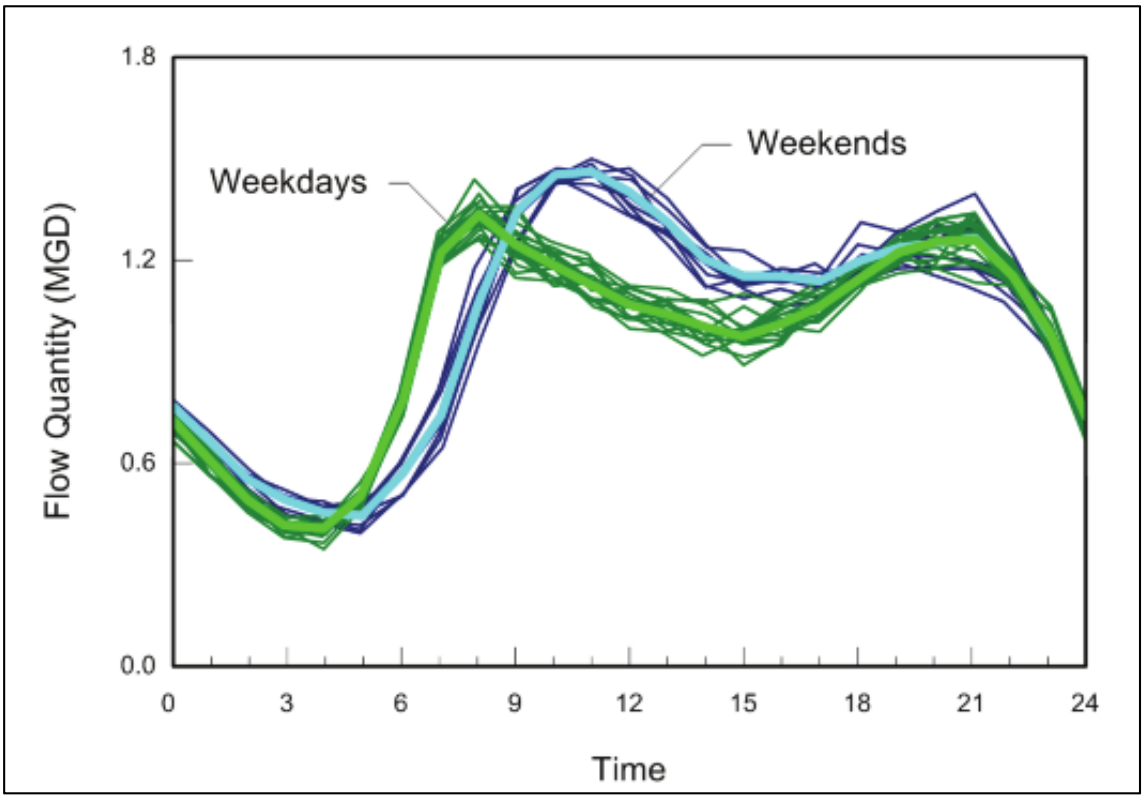


Figure F- 15 Published typical residential diurnal pattern

Land Use Diurnal Pattern Example

Land use within a particular area can impact the shape of the diurnal pattern. Since there is no operational SCADA data for various land use in Kingston area, the examples below represent typical dry weather sewer diurnal patterns from six different land use areas. The residential pattern is the most common. Combinations and variations of these patterns are often observed in mixed land use areas. Industrial patterns are industry specific and come in many varieties.

TYPICAL INDUSTRICAL WATER DEMAND PATTERNS

The industrial example provided here is from an automobile assembly plant that runs production during the first shift (7AM - 3PM).

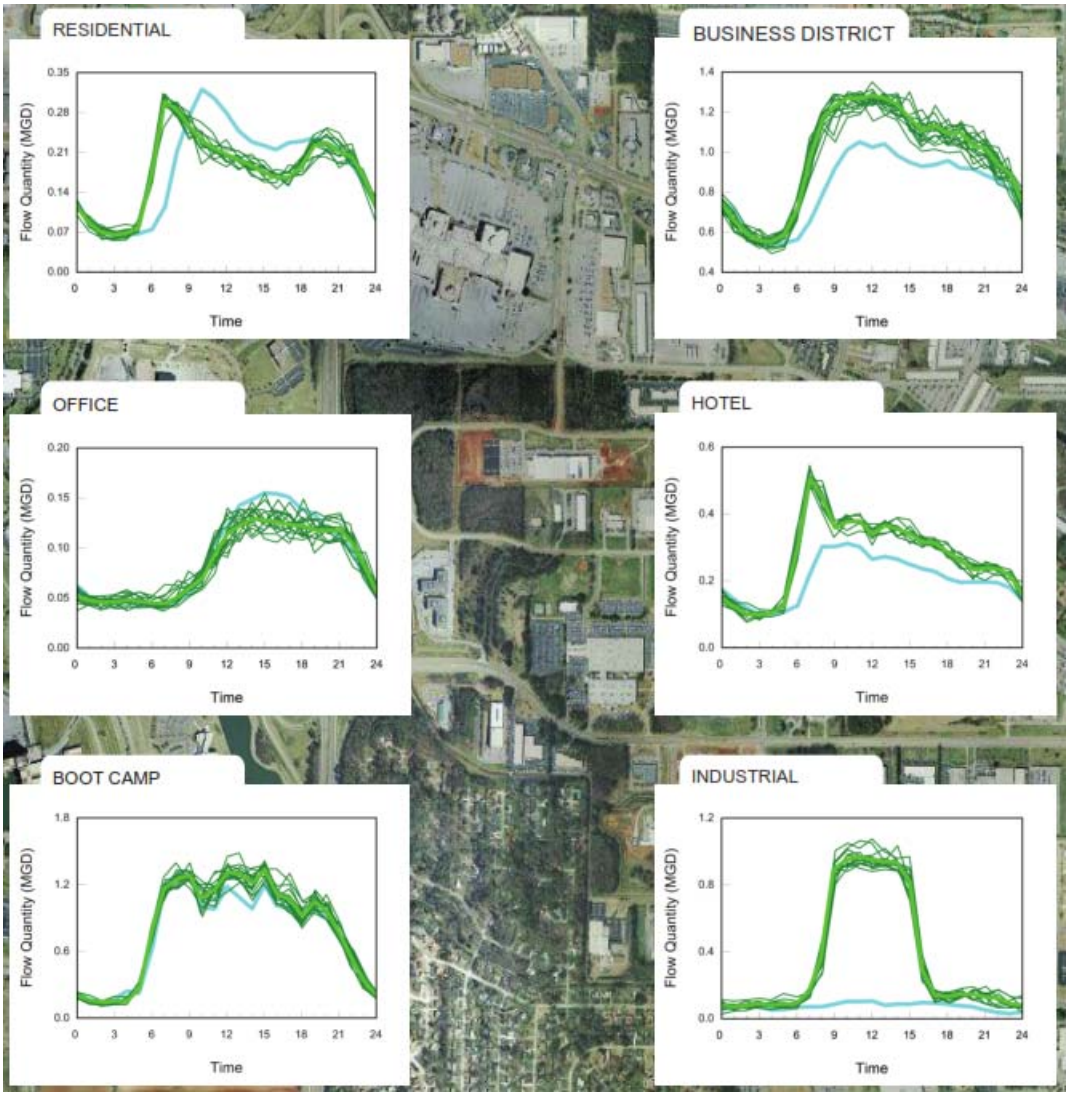


Figure F- 16 Typical water Demand Patterns for Residential and ICI

ICI WATER DEMAND PATTERN FOR KINGSTON

The ICI pattern creation was based on the combination of the typical business district, office, boot camp and industrial patterns shown in Figure F- 16 above. Figure F- 17 shows the ICI pattern to be used in the WSP model.

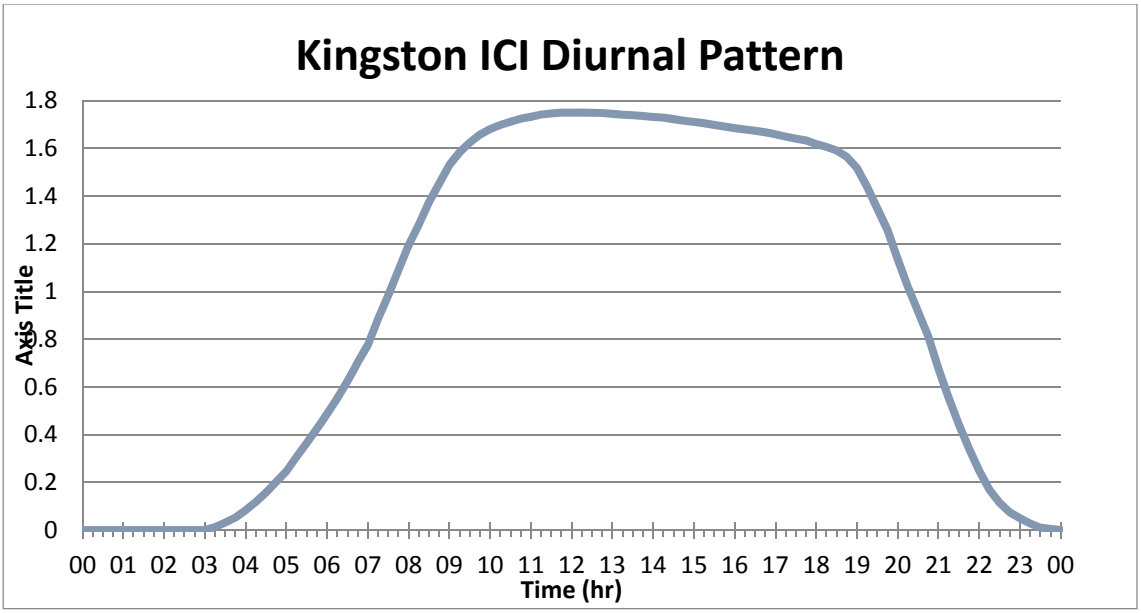


Figure F- 17 Kingston ICI Diurnal Pattern

DIURNAL PATTERNS COMBINATION

Residential and ICI combined patterns for each water supply zone are used for all future scenarios when the land use is not specified. The patterns were developed based on the land-use percentage for each zone. The water demand based on ultimate land-use information provided by UK is applied to determine the residential and ICI water use weight. Table F- 3 and Figure F- 18 show the water use percentage between residential and ICI and the combined diurnal patterns developed based on the Land-use feature for each zone.

Table F- 3 Land-use Percentage for each Water Supply Zone

		West Zone	Central Zone	East Zone
Water Demand	Res (L/s)	102.9	134.4	26.4
	ICI (L/s)	31.4	97.3	10.4
Ratio	Res	77%	58%	72%
	ICI	23%	42%	28%

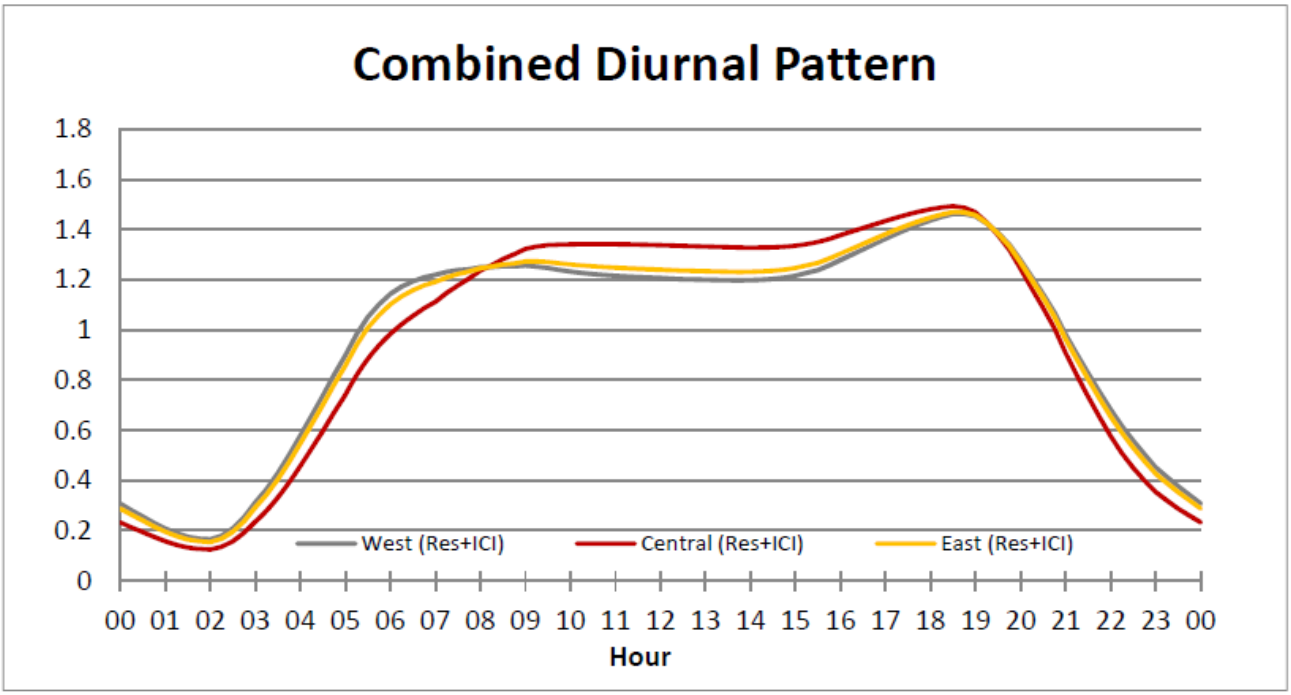


Figure F- 18 Residential and ICI Combined Water Demand Diurnal Pattern Development in this Study

Appendix G

ALTERNATIVE SOLUTION SIMULATION

1 ALTERNATIVE SOLUTION SIMULATION NOTES

1.1 SYSTEM OPTIMIZATION

UK water distribution system optimization and proposed alternatives modeling were performed in the flowing aspects:

1. Pipe layout optimization and alternatives;
2. Control rule settings to optimize the tank/reservoir cycling;
3. Rationalise storage and booster alternatives;
4. System pressure optimization; and
5. Fire flow availability optimization.

The detailed information is provided in the fowling sections.

1.2 DEFINITION OF ALTERNATIVES

1.2.1 EAST ZONE

1. Correct High Pressures West of HWY15 (Cataraqui River) and South of HWY 2 (Lake Ontario)
2. New subzone for Gore Road area
   a. Extend new main along HWY 15 and create new sub-zone in high pressure area with PRV's. (See Figure 1-1)

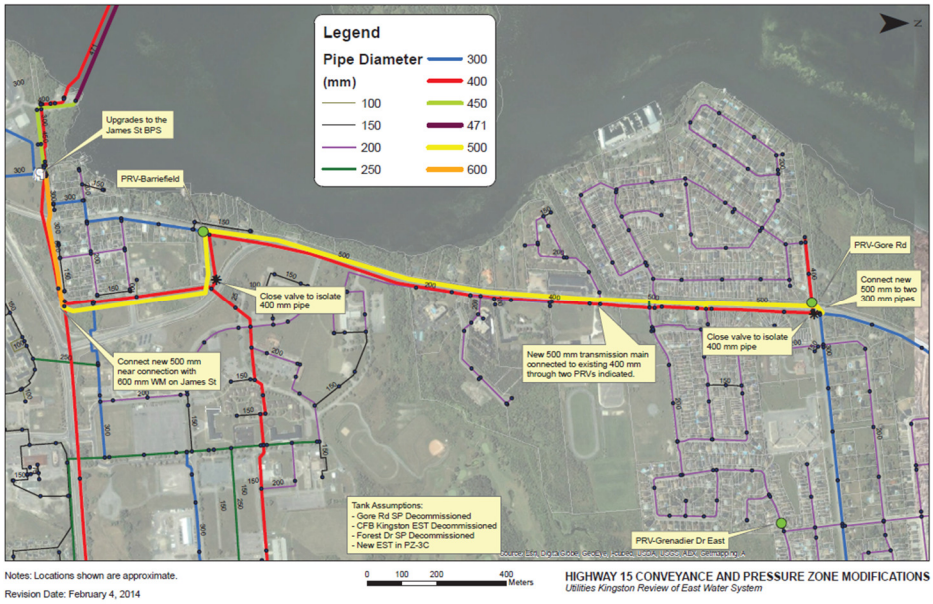


Figure 1-1 New subzone for Gore Road area alternative

3. Functional Storage Deficiency in East (Starting in 2021). Add new storage and operate system similar as today. Storage should be about 6,600 w/ functional storage of 2,500. Can operational levels be adjusted to correct this / minimize this?

a. Eliminate CFB & Forest, new storage at boundary between Zone 3 and Zone 3c. Eliminate Valve between Zones 3 & 3c.

b. Eliminate CFB & Forest, new storage at Forest. Eliminate valve between Zone 3 and Zone 3c

c. Eliminate CFB, new storage at boundary between Zone 3 and Zone 3c.

1.2.2 CENTRAL ZONE: RATIONALISE STORAGES AND BOOSTERS

1. Purdy's Court BS & Old Colony PS - Turn off in 2015;
2. Remove O'Conner Tower by 2021 with Front Rd interconnection is on line (including Purdy's Court BS & Old Colony PS turned off), Pt. Pleasant WTP operates based on Tower St.
3. Functional Storage Deficiency in Zone 1 (2036)
   a. Can operational levels be adjusted to correct this / minimize this?
   b. Adjust Lower level in 3rd Ave. to add 1,500 m^3 of storage.

1.3 **ALTERNATIVE SIMULATION**

1.3.1 ALTERNATIVE USED:

1. 2015 Interconnect ALT1 Scenario:

   2015 Interconnect scenario was run under disable logic control rule. All control rules are manually set, which are saved in the model. Detailed setting information is summarized in Table 1-1.

   Central and West Zones:

   a. Turn off Purdy's Court BS & Old Colony PS
   b. Installed a PRV/PSV combination control valve in Old Colony PS to back feed Zone 1
   c. Pt. Pleasant WTP operates off Tank O'Conner
   d. Progress Reservoir operates off Tank O'Conner.

   East Zone:

   a. Extend new main along HWY 15 (Figure 1-1) create new sub-zone in high pressure area with PRV's. Details are shown in Figure 1-2.
   b. Set new scenarios for East Zone with (ALT2 scenario) and without Forest Tank (ALT1 scenario)

2. 2021 – 2036 ALT2 scenarios:

Scenarios starting from 2021 were run under enabled logic control rules. The control rules include automatic set are manually set, which are saved in the model. Detailed setting information is summarized in Table 1-2 and Table 1-3.

Central and West Zones:

a. Remove O'Conner Tower (including Purdy's Court BS & Old Colony PS turned off),
b. Keep the PRV/PSV combination control valve in Old Colony PS to back feed Zone 1
c. Pt. Pleasant WTP operates off Tower St.

East Zone:

d. New subzone for Gore Road area

e. Remove CFB Tank

f. Set new scenarios for East Zone with (ALT2 scenarios) and without Forest Tank (ALT1 scenarios)

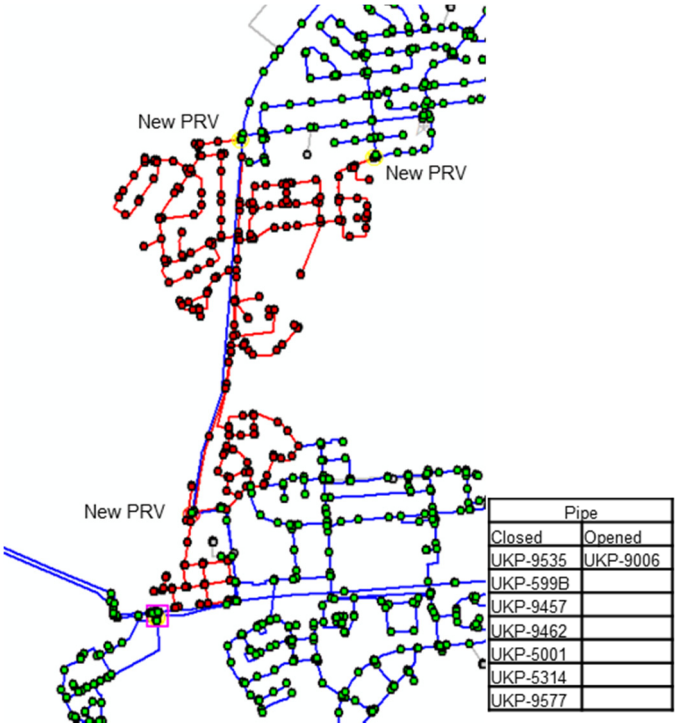


Figure 1-2 Proposed new subzone created in East Zone

3. 2036 MDD+FF ALT Scenario

Based on the gap analysis, there are several areas show fire flow deficiency in West and Central zone.

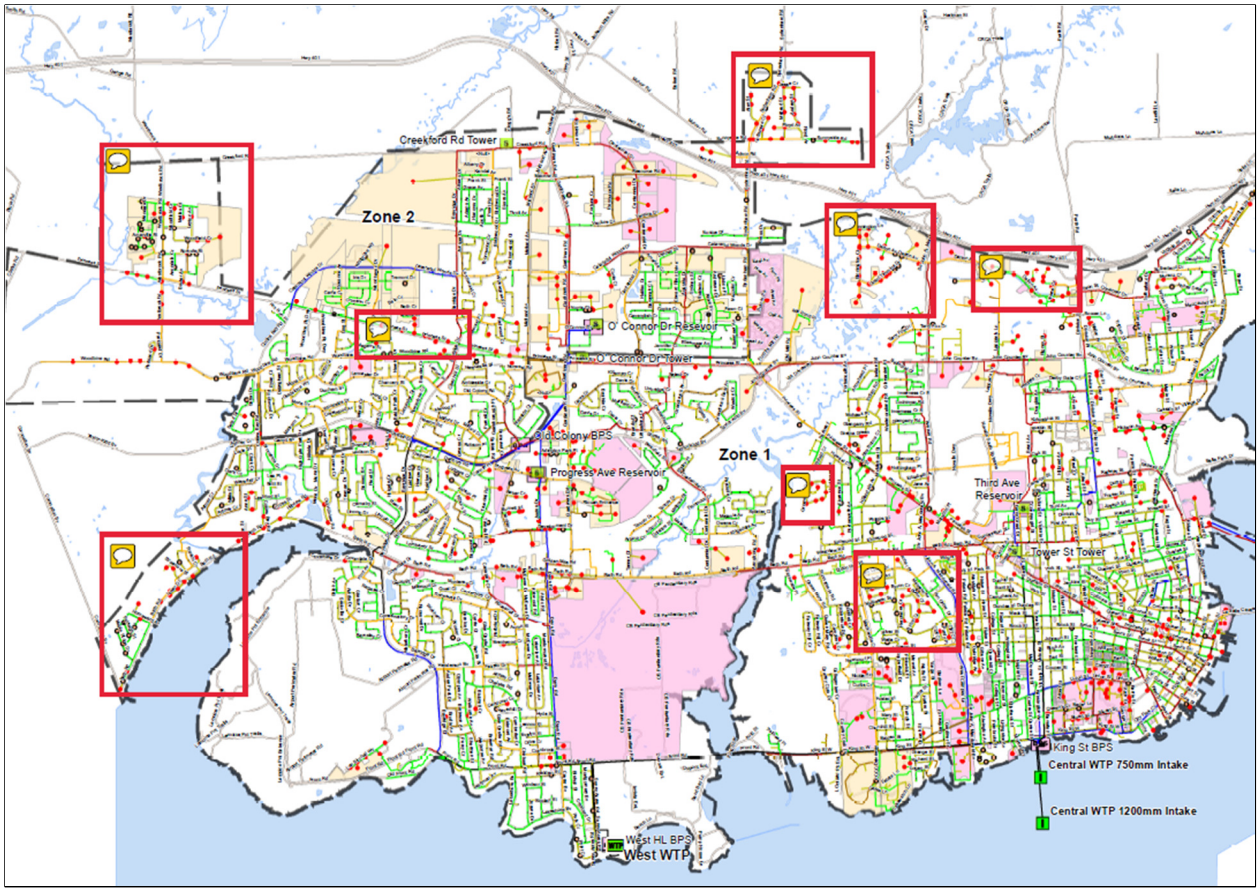


Figure 1-3 Areas Considered for Fire Flow Alternatives

The alternative solutions are proposed including pipe upsize and looping options, which include:

a. Westbrook Area:
    i. New feed along Princess St.
    ii. New feed along Creekford Rd.
b. Princess between Woodhaven and Bayridge: Loop on Holden St from Beth Cr to Tremont Dr.; and upsize Princess
c. Area near Coronation Blvd.: New feed along Bath Rd between Rankin Cr. and Station St.; loop Lower Dr. to Bath Rd.
d. Sydenham Rd. North/South of 401: Twin feed north of 401. Loop Resource Rd to Sydenham Rd. south of 401.
e. Dalton Ave. Area 1:
    i. Twin Feed on Dalton Ave.;
    ii. Upsize Lappans lane to Dalton Ave.
f. Dalton Ave. Area 2 (Kings Crossing Fashion): Upsize Dalton between Division St. and Don St.
g. Balsam Grove: Loop to queen Mary along Rideau Trail
h. Calvin Park: Upsize Norman Rogers Dr. and Roden St. Loops between:
    i. Herchmer Dr. and Norman Rogers Dr.;

ii. Holland Cr. and Norman Rogers Dr.;

iii. Michael Grass Cres. and Van Order Dr.

All these 3 new pipes for looping are through easements.

1.3.2 FINDINGS:

By adjusting the control rules, tank and pump initial settings, all tanks/reservoirs can achieve proper cycling as shown in the attached graphs. The cycling can be tuned further to optimize the operation. The summarized control rule settings are shown in Table 1-1, Table 1-2, and Table 1-3. Example of 2021 scenario modeling results of the tank and reservoir water percentage graphs also are enclosed.

Table 1-1 Node Control Rules_2015 Interconnect Scenario

ID (Char)	Disabled (Boolean)	Sequence (Long)	Status (Int)	Control Method (Int)	Control ID (Char)	Context (Int)	Value (Double)
PSV_ALT-01	No	0	1: Open	1: By Node Level	UKJ-4165	0: Above	500
PSV_ALT-01	No	1	0: Closed	1: By Node Level	UKJ-4165	1: Below	450
UJAMES1	No	0	1: Open	1: By Node Level	TCFB	1: Below	42
UJAMES1	No	1	0: Closed	1: By Node Level	TCFB	0: Above	43.8
UJAMES2	No	0	1: Open	1: By Node Level	TCFB	1: Below	42
UJAMES2	No	1	0: Closed	1: By Node Level	TCFB	0: Above	43.8
UKING-D1	No	0	1: Open	1: By Node Level	TTOWER	1: Below	30.75
UKING-D1	No	1	0: Closed	1: By Node Level	TTOWER	0: Above	31.25
UKING-D10	No	0	1: Open	1: By Node Level	TTOWER	1: Below	25.85
UKING-D10	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.6
UKING-D10	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.1
UKING-D10	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.35
UKING-D2	No	0	1: Open	1: By Node Level	TTOWER	1: Below	27
UKING-D2	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3.3
UKING-D2	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.8
UKING-D2	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	31.05
UKING-D3	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.45
UKING-D3	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3.2
UKING-D3	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.7
UKING-D3	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.95
UKING-D5	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.35
UKING-D5	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3.1
UKING-D5	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.6
UKING-D5	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.85
UKING-D6	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.25
UKING-D6	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3
UKING-D6	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.5
UKING-D6	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.75
UKING-D7	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.15
UKING-D7	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.9
UKING-D7	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.4
UKING-D7	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.65
UKING-D8	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.05
UKING-D8	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.8
UKING-D8	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.3
UKING-D8	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.55
UKING-D9	No	0	1: Open	1: By Node Level	TTOWER	1: Below	25.95
UKING-D9	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.7
UKING-D9	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.2
UKING-D9	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.45
UOCONNOR1	No	0	1: Open	1: By Node Level	TCREEKFORD	1: Below	33.75
UOCONNOR1	No	1	0: Closed	1: By Node Level	TCREEKFORD	0: Above	36.75
UOCONNOR2	No	0	1: Open	1: By Node Level	TCREEKFORD	1: Below	31.25
UOCONNOR2	No	1	0: Closed	1: By Node Level	TCREEKFORD	0: Above	34.75
UPP1	No	0	1: Open	1: By Node Level	TOCONNOR	1: Below	31.15
UPP1	No	1	0: Closed	1: By Node Level	TOCONNOR	0: Above	32.05
UPP2	No	0	1: Open	1: By Node Level	TOCONNOR	1: Below	29.2
UPP2	No	1	0: Closed	1: By Node Level	TOCONNOR	0: Above	31.75
UPP3	No	0	1: Open	1: By Node Level	TOCONNOR	1: Below	28.45
UPP3	No	1	0: Closed	1: By Node Level	TOCONNOR	0: Above	29.95
UPP4_WSP	No	0	1: Open	1: By Node Level	TOCONNOR	1: Below	27.45
UPP4_WSP	No	1	0: Closed	1: By Node Level	TOCONNOR	0: Above	28.95
UPROGRESS1	No	0	1: Open	1: By Node Level	TOCONNOR	0: Above	29.85
UPROGRESS1	No	1	0: Closed	1: By Node Level	TOCONNOR	0: Above	32.35
UPROGRESS1	No	3	0: Closed	1: By Node Level	RPROGRESS	1: Below	3.3
UPROGRESS2	No	0	1: Open	1: By Node Level	TOCONNOR	1: Below	27.85
UPROGRESS2	No	1	0: Closed	1: By Node Level	TOCONNOR	0: Above	29.35
UTHIRDRES1	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.75
UTHIRDRES1	No	1	0: Closed	1: By Node Level	TTOWER	0: Above	28.25
UTHIRDRES2	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.5
UTHIRDRES2	No	1	0: Closed	1: By Node Level	TTOWER	0: Above	27.5
VOCONNOR	No	1	1: Open	1: By Node Level	ROCONNOR	1: Below	8
VOCONNOR	No	2	0: Closed	1: By Node Level	ROCONNOR	0: Above	12
VPROGRESS	No	0	0: Closed	2: By Link Flow	UKP-2123	0: Above	0.1
VPROGRESS	No	1	1: Open	1: By Node Level	RPROGRESS	1: Below	7.1
VTAR	No	0	2: Setting	1: By Node Level	TTOWER	0: Above	29
VTAR	No	1	0: Closed	1: By Node Level	TTOWER	1: Below	27
VTAR	No	2	0: Closed	2: By Link Flow	P16879	0: Above	1

Table 1-2 Logic Control Rules_2021-2036 Scenarios

ID (Char)	Disabled (Boolean)	Sequence (Long)	Clause Type (Int)	Keyword (Int)	Object (Int)	Object ID (Char)	Variable Type (Int)	Operator (Int)	Value (Double)	Status (Int)
RTHIRD2-2	No	0	0: If Clause	0: IF (If Clause)	2: Tank	RTHIRD	3: Level	2: <	2.65	1: Open
RTHIRD2-2	No	1	2: Then Action	3: THEN (Action)	4: Pump	UTHIRDRES2	7: Status	6: IS	0	0: Closed
RTHIRD1	No	0	0: If Clause	0: IF (If Clause)	0: Junction	UKJ-674	2: Pressure	2: <	400	1: Open
RTHIRD1	No	1	1: And/Or Premise	1: AND (Premise)	2: Tank	RTHIRD	3: Level	3: >	4.9	1: Open
RTHIRD1	No	2	2: Then Action	3: THEN (Action)	4: Pump	UTHIRDRES1	7: Status	6: IS	0	1: Open
RTHIRD2	No	0	0: If Clause	0: IF (If Clause)	0: Junction	UKJ-674	2: Pressure	2: <	400	1: Open
RTHIRD2	No	1	1: And/Or Premise	1: AND (Premise)	2: Tank	RTHIRD	3: Level	3: >	4.9	1: Open
RTHIRD2	No	2	2: Then Action	3: THEN (Action)	4: Pump	UTHIRDRES2	7: Status	6: IS	0	1: Open
RTHIRD1-2	No	0	0: If Clause	0: IF (If Clause)	2: Tank	RTHIRD	3: Level	2: <	2.65	1: Open
RTHIRD1-2	No	1	2: Then Action	3: THEN (Action)	4: Pump	UTHIRDRES1	7: Status	6: IS	0	0: Closed
JAMES2-2	No	0	0: If Clause	0: IF (If Clause)	2: Tank	TINNOVATION	3: Level	3: >	45	1: Open
JAMES2-2	No	1	2: Then Action	3: THEN (Action)	4: Pump	UJAMES2	7: Status	6: IS	0	0: Closed
JAMES1-2	No	0	0: If Clause	0: IF (If Clause)	2: Tank	TINNOVATION	3: Level	3: >	45	1: Open
JAMES1-2	No	1	2: Then Action	3: THEN (Action)	4: Pump	UJAMES1	7: Status	6: IS	0	0: Closed
JAMES1	No	0	0: If Clause	0: IF (If Clause)	2: Tank	TINNOVATION	3: Level	2: <	40.5	1: Open
JAMES1	No	1	2: Then Action	3: THEN (Action)	4: Pump	UJAMES1	7: Status	6: IS	0	1: Open
JAMES2	No	0	0: If Clause	0: IF (If Clause)	2: Tank	TINNOVATION	3: Level	2: <	38	1: Open
JAMES2	No	1	2: Then Action	3: THEN (Action)	4: Pump	UJAMES2	7: Status	6: IS	0	1: Open
RPROG2	No	0	0: If Clause	0: IF (If Clause)	0: Junction	UKJ-4181	2: Pressure	2: <	400	1: Open
RPROG2	No	1	1: And/Or Premise	1: AND (Premise)	2: Tank	RPROGRESS	3: Level	3: >	7	1: Open
RPROG2	No	2	2: Then Action	3: THEN (Action)	4: Pump	UPROGRESS2	7: Status	6: IS	0	1: Open
RPROG1	No	0	0: If Clause	0: IF (If Clause)	0: Junction	UKJ-4181	2: Pressure	2: <	400	1: Open
RPROG1	No	1	1: And/Or Premise	1: AND (Premise)	2: Tank	RPROGRESS	3: Level	3: >	7	1: Open
RPROG1	No	2	2: Then Action	3: THEN (Action)	4: Pump	UPROGRESS1	7: Status	6: IS	0	1: Open
RPROG2-2	Yes	0	0: If Clause	0: IF (If Clause)	2: Tank	RPROGRESS	3: Level	2: <	4.9	1: Open
RPROG2-2	Yes	1	2: Then Action	3: THEN (Action)	4: Pump	UPROGRESS2	7: Status	6: IS	0	0: Closed
RPROG1-2	Yes	0	0: If Clause	0: IF (If Clause)	2: Tank	RPROGRESS	3: Level	2: <	4.9	1: Open
RPROG1-2	Yes	1	2: Then Action	3: THEN (Action)	4: Pump	UPROGRESS1	7: Status	6: IS	0	0: Closed

Table 1-3 Node Control Rules_2021-2036 Scenarios

ID (Char)	Disabled (Boolean)	Sequence (Long)	Status (Int)	Control Method (Int)	Control ID (Char)	Control Context (Int)	Control Value (Double)
PSV_ALT-01	No	0	1: Open	1: By Node Level	UKJ-4165	0: Above	450
PSV_ALT-01	No	1	0: Closed	1: By Node Level	UKJ-4165	1: Below	400
UJAMES1	Yes	0	1: Open	1: By Node Level	TINNOVATION	1: Below	44.74
UJAMES1	Yes	1	0: Closed	1: By Node Level	TINNOVATION	0: Above	46.1
UJAMES2	Yes	0	1: Open	1: By Node Level	TINNOVATION	1: Below	44.74
UJAMES2	Yes	1	0: Closed	1: By Node Level	TINNOVATION	0: Above	46.1
UKING-D1	No	0	1: Open	1: By Node Level	TTOWER	1: Below	30.75
UKING-D1	No	1	0: Closed	1: By Node Level	TTOWER	0: Above	31.25
UKING-D10	No	0	1: Open	1: By Node Level	TTOWER	1: Below	25.85
UKING-D10	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.6
UKING-D10	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.1
UKING-D10	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.35
UKING-D2	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.55
UKING-D2	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3.7
UKING-D2	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.8
UKING-D2	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	31.05
UKING-D3	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.45
UKING-D3	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3.5
UKING-D3	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.7
UKING-D3	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.95
UKING-D5	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.35
UKING-D5	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3.1
UKING-D5	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.6
UKING-D5	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.85
UKING-D6	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.25
UKING-D6	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	3
UKING-D6	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.5
UKING-D6	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.75
UKING-D7	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.15
UKING-D7	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.9
UKING-D7	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.4
UKING-D7	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.65
UKING-D8	No	0	1: Open	1: By Node Level	TTOWER	1: Below	26.05
UKING-D8	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.8
UKING-D8	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.3
UKING-D8	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.55
UKING-D9	No	0	1: Open	1: By Node Level	TTOWER	1: Below	25.95
UKING-D9	No	1	1: Open	1: By Node Level	RTHIRD	1: Below	2.7
UKING-D9	No	2	0: Closed	1: By Node Level	RTHIRD	0: Above	4.2
UKING-D9	No	3	0: Closed	1: By Node Level	TTOWER	0: Above	30.45
UOCONNOR1	No	0	1: Open	1: By Node Level	TCREEKFORD	1: Below	33.75
UOCONNOR1	No	1	0: Closed	1: By Node Level	TCREEKFORD	0: Above	36.75
UOCONNOR2	No	0	1: Open	1: By Node Level	TCREEKFORD	1: Below	31.5
UOCONNOR2	No	1	0: Closed	1: By Node Level	TCREEKFORD	0: Above	35.75

ID (Char)	Disabled (Boolean)	Sequence (Long)	Status (Int)	Control Method (Int)	Control ID (Char)	Control Context (Int)	Control Value (Double)
UPP1	Yes	0	1: Open	1: By Node Level	TOCONNOR	1: Below	31.15
UPP1	No	1	1: Open	1: By Node Level	Ttower	1: Below	30.75
UPP1	No	2	0: Closed	1: By Node Level	Ttower	0: Above	31.25
UPP1	Yes	3	1: Open	1: By Node Level	UKJ-1147	1: Below	300
UPP1	Yes	4	0: Closed	1: By Node Level	UKJ-1147	0: Above	560
UPP1	Yes	5	0: Closed	1: By Node Level	TOCONNOR	0: Above	32.05
UPP2	Yes	0	1: Open	1: By Node Level	TOCONNOR	1: Below	29.2
UPP2	No	1	0: Closed	1: By Node Level	Ttower	0: Above	30.95
UPP2	No	2	1: Open	1: By Node Level	Ttower	1: Below	27
UPP2	Yes	3	0: Closed	1: By Node Level	UKJ-1147	0: Above	560
UPP2	Yes	4	1: Open	1: By Node Level	UKJ-1147	1: Below	300
UPP2	Yes	5	0: Closed	1: By Node Level	TOCONNOR	0: Above	31.75
UPP3	Yes	0	1: Open	1: By Node Level	UKJ-1147	1: Below	300
UPP3	Yes	1	0: Closed	1: By Node Level	UKJ-1147	0: Above	560
UPP3	Yes	2	1: Open	1: By Node Level	TOCONNOR	1: Below	28.45
UPP3	No	3	1: Open	1: By Node Level	Ttower	1: Below	26.5
UPP3	No	4	0: Closed	1: By Node Level	Ttower	0: Above	30.75
UPP3	Yes	5	0: Closed	1: By Node Level	TOCONNOR	0: Above	29.95
UPP4_WSP	Yes	0	1: Open	1: By Node Level	TOCONNOR	1: Below	27.45
UPP4_WSP	No	1	1: Open	1: By Node Level	Ttower	1: Below	26.05
UPP4_WSP	No	2	0: Closed	1: By Node Level	Ttower	0: Above	30.55
UPP4_WSP	Yes	3	0: Closed	1: By Node Level	TOCONNOR	0: Above	28.95
UPROGRESS1	No	0	0: Closed	1: By Node Level	RPROGRESS	1: Below	5
UPROGRESS1	Yes	1	2: Setting	1: By Node Level	RPROGRESS	1: Below	5
UPROGRESS1	Yes	2	1: Open	1: By Node Level	UKJ-4181	1: Below	280
UPROGRESS1	Yes	3	0: Closed	1: By Node Level	UKJ-11649	0: Above	300
UPROGRESS1	Yes	4	1: Open	1: By Node Level	Ttower	0: Above	31.5
UPROGRESS1	Yes	5	0: Closed	1: By Node Level	Ttower	1: Below	30
UPROGRESS1	Yes	6	1: Open	1: By Node Level	TOCONNOR	0: Above	31.85
UPROGRESS1	Yes	7	0: Closed	1: By Node Level	TOCONNOR	0: Above	32.35
UPROGRESS1	Yes	8	0: Closed	1: By Node Level	TOCONNOR	1: Below	31.05
UPROGRESS2	Yes	0	1: Open	1: By Node Level	UKJ-1147	1: Below	300
UPROGRESS2	No	1	0: Closed	1: By Node Level	RProgress	1: Below	5
UPROGRESS2	Yes	2	0: Closed	1: By Node Level	UKJ-1147	0: Above	560
UPROGRESS2	Yes	3	1: Open	1: By Node Level	Ttower	0: Above	30.5
UPROGRESS2	Yes	4	0: Closed	1: By Node Level	Ttower	1: Below	29
UPROGRESS2	Yes	5	1: Open	1: By Node Level	UKJ-4181	1: Below	132
UPROGRESS2	Yes	6	1: Open	1: By Node Level	TOCONNOR	1: Below	27.85
UPROGRESS2	Yes	7	0: Closed	1: By Node Level	TOCONNOR	0: Above	29.35
UTHIRDRES1	Yes	0	1: Open	1: By Node Level	TTOWER	1: Below	29.75
UTHIRDRES1	Yes	1	0: Closed	1: By Node Level	TTOWER	0: Above	29.5
UTHIRDRES2	Yes	0	1: Open	1: By Node Level	TTOWER	1: Below	28.25
UTHIRDRES2	Yes	1	0: Closed	1: By Node Level	TTOWER	0: Above	29.5
VOCONNOR	Yes	0	2: Setting	1: By Node Level	ROCONNOR	1: Below	8
VOCONNOR	No	1	1: Open	1: By Node Level	ROCONNOR	1: Below	7
VOCONNOR	No	2	0: Closed	1: By Node Level	ROCONNOR	0: Above	12
VPROGRESS	No	0	0: Closed	2: By Link Flow	UKP-2123	0: Above	0.1
VPROGRESS	Yes	1	1: Open	1: By Node Level	RProgress	1: Below	4
VPROGRESS	Yes	2	0: Closed	1: By Node Level	RProgress	0: Above	7.15
VPROGRESS	No	3	1: Open	1: By Node Level	RProgress	1: Below	7.1
VTAR	No	0	2: Setting	1: By Node Level	TTOWER	0: Above	29
VTAR	No	1	0: Closed	1: By Node Level	TTOWER	1: Below	27
VTAR	No	2	0: Closed	2: By Link Flow	UKP-5892	0: Above	1

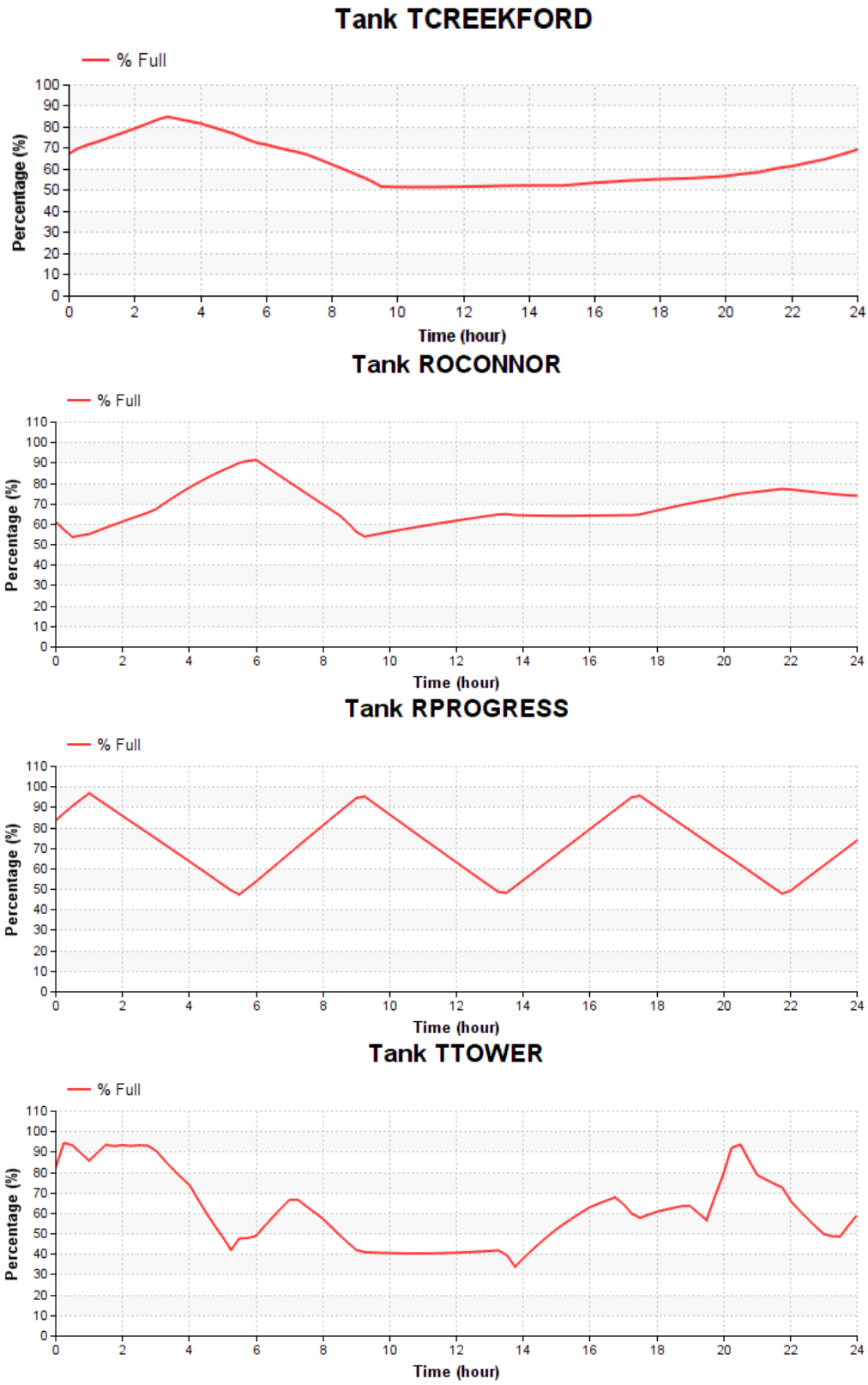


Figure 1-4a Tank and Reservoir Water Percentage Graphs_2021 Scenario (be continued)

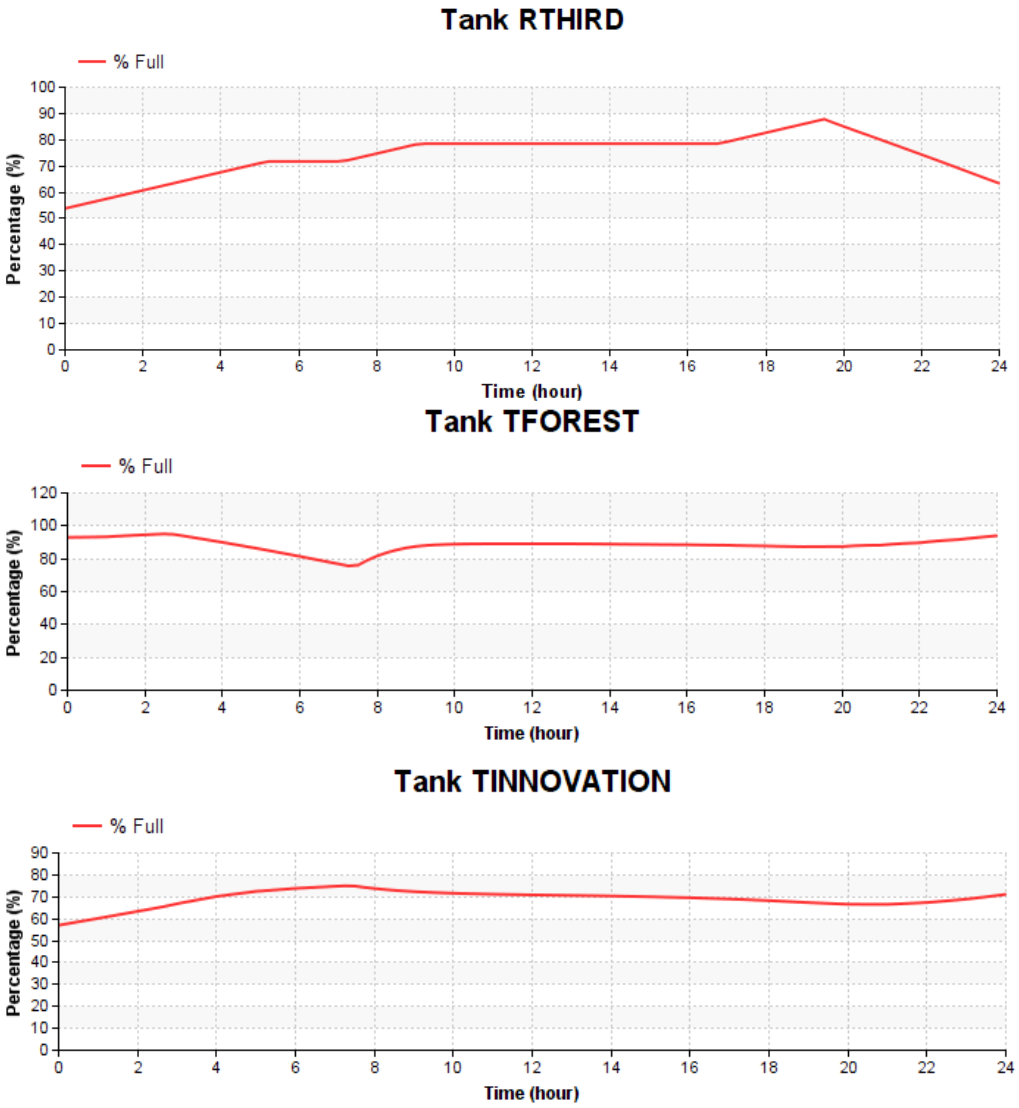


Figure 4b Tank and Reservoir Water Percentage Graphs_2021 Scenario

1. 2015 Interconnection

    a. In ALT 2015 Interconnection scenario with the Purdy's Court BS & Old Colony PS turned off, West Zone 1 pressure appeared with high pressure during even PHD conditions. Figure 1-5 shows the pressure distribution map.

    b. Replace Old Colony PS with PSV/PRV combination control valves to back feed Zone 1. The valve settings are target to the pressures upstream and downstream junctions of the valves in the PS. The settings are:

        i. PSV open at 500 kPa, close at 450 kPa

        ii. PRV open at 500 kPa.

    Figure 5 shows the same 2015 interconnection scenario PHD pressure with PSV/PRV applied.

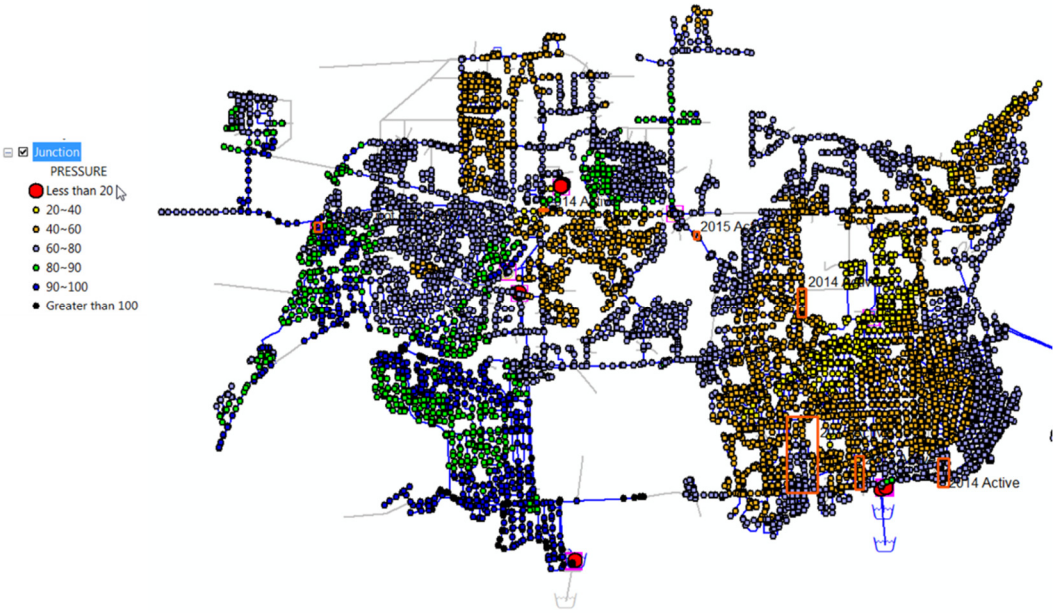


Figure 1-5 2015 interconnection_ALT1 scenario PHD pressure without PRV/PSV control

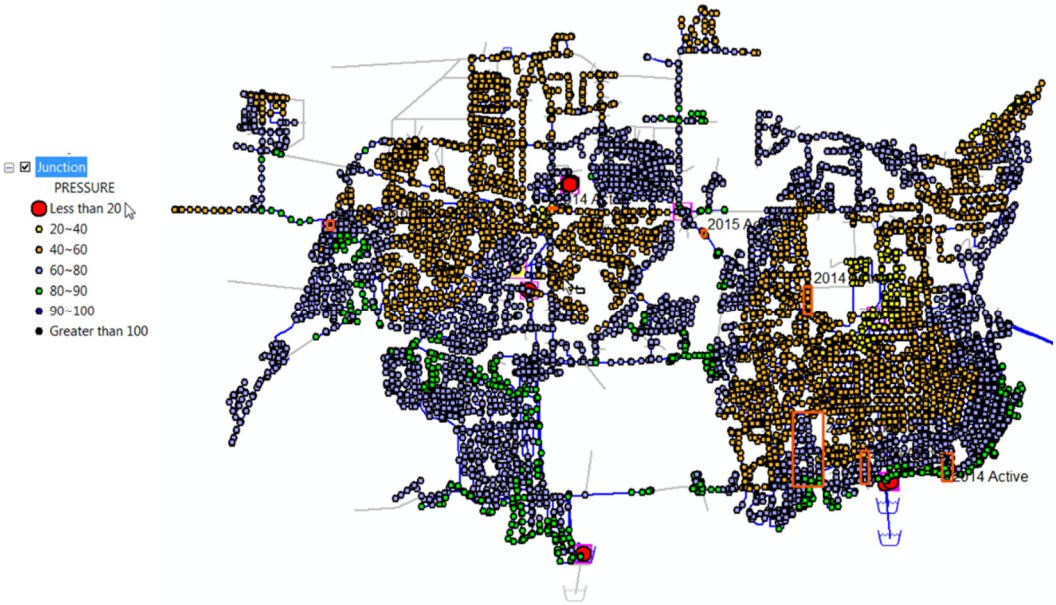


Figure 1-6 2015 interconnection_ALT1 scenario PHD pressure with PRV/PSV control

2. West and Central Zone 2021 – 2036, Front Rd interconnection is implemented.

   After the interconnection on Front Rd is implemented, PPWTP provides more water to Central Zone through the new Front Rd main. A low pressure area just south of the previous Tank O'Conner was created. However, with the application of the PSV/PRV at Old Colony PS these low pressure concerns are amended.

   PSV/PRV combination control valves at Old Colony PS are target to the pressures upstream and downstream junctions of the valves in the PS. The settings are:

   i. PSV open at 450 kPa, close at 400 kPa

ii. PRV open at 550 kPa.

3. Fire Flow Scenarios

   The alternative solutions to improve fire flow availability are provide loops and upsize pipes, which include:

   a. Westbrook Area: New feed along Princess St. with a 300 mm watermain
      i. New feed along Creekford Rd. will achieve the same improvement to the area but the pipe to be added will be about 3 times longer. Therefore, it is not recommended.
   b. Princess between Woodhaven and Bayridge: Loop on Holden St from Beth Cr to Tremont Dr.; and upsize Princess from Collins Bay Rd to Gardiners Rd. with 300 mm watermains.
   c. Area near Coronation Blvd.: New 300 mm feed along Bath Rd between Rankin Cr. and Station St.; loop Lower Dr. to Bath Rd. with a 150 mm pipe.
   d. Sydenham Rd. North/South of 401: Twin feed north of 401 with a 300 mm watermain from north of 401 to Sunnyside Rd. Loop Resource Rd to Sydenham Rd. south of 401 with a 300 mm watermain. This looping will connect the 300 mm watermain on Sydenham Rd to the 400 mm watermain on Centennial Dr.
   e. Dalton Ave. Area 1: Twin Feed on Dalton Ave.;
      i. Upsize Lappans lane to Dalton Ave. It doesn't provide improvement. Therefore, it is not recommended.
   f. Dalton Ave. Area 2 (Kings Crossing Fashion): Upsize Dalton between Division St. and Don St.
   g. Balsam Grove: Loop to queen Mary along Rideau Trail
   h. Calvin Park: Upsize Norman Rogers Dr. and Roden St. Loops between:
      i. Herchmer Dr. and Norman Rogers Dr.;
      ii. Holland Cr. and Norman Rogers Dr.;
      iii. Michael Grass Cres. and Van Order Dr.

      All these 3 new pipes for looping are through easements.

   The fire flow availability in above areas are improved significantly except the Sydenham Rd. North/South of 401 area, which due to the higher elevation and the longer distance to the PS.

4. A higher elevation area near Third Ave Reservoir in Central Zone has low pressure as before.
5. The new sub zone created in East Zone by adding three (3) PRVs and closing pipes can actively reduce the high pressure in the area.
6. Tank Innovation with a design capacity of 6364 m3 (1.4 MIG) can meet the water storage requirement for whole East Zone:
   a. required fire storage =1875m3
   b. equalization = 2821m3
   c. emergency = 1174m3
7. Forest Tank can improve the fire flow availability and system storage redundancy. Therefore, to keep the tank online can be considered.

1.3.3 SCADA DATA COMPARISON

Most recent SCADA data (the month pf August, 2016) was obtained from the City to verify and evaluate the tank cycling improvement resulted from the optimized new control rules. Three sets of data include SCADA data, modeling result from the old control rules used in the earlier UK model and modeling result from the new optimized control rules recommended for future operation. Due to the limitation of the SCADA data, four (4) tanks/reservoirs curves were generated as shown in Figure 18. It is found that the optimized control rules (purple lines) improved tank and reservoir cycling significantly.

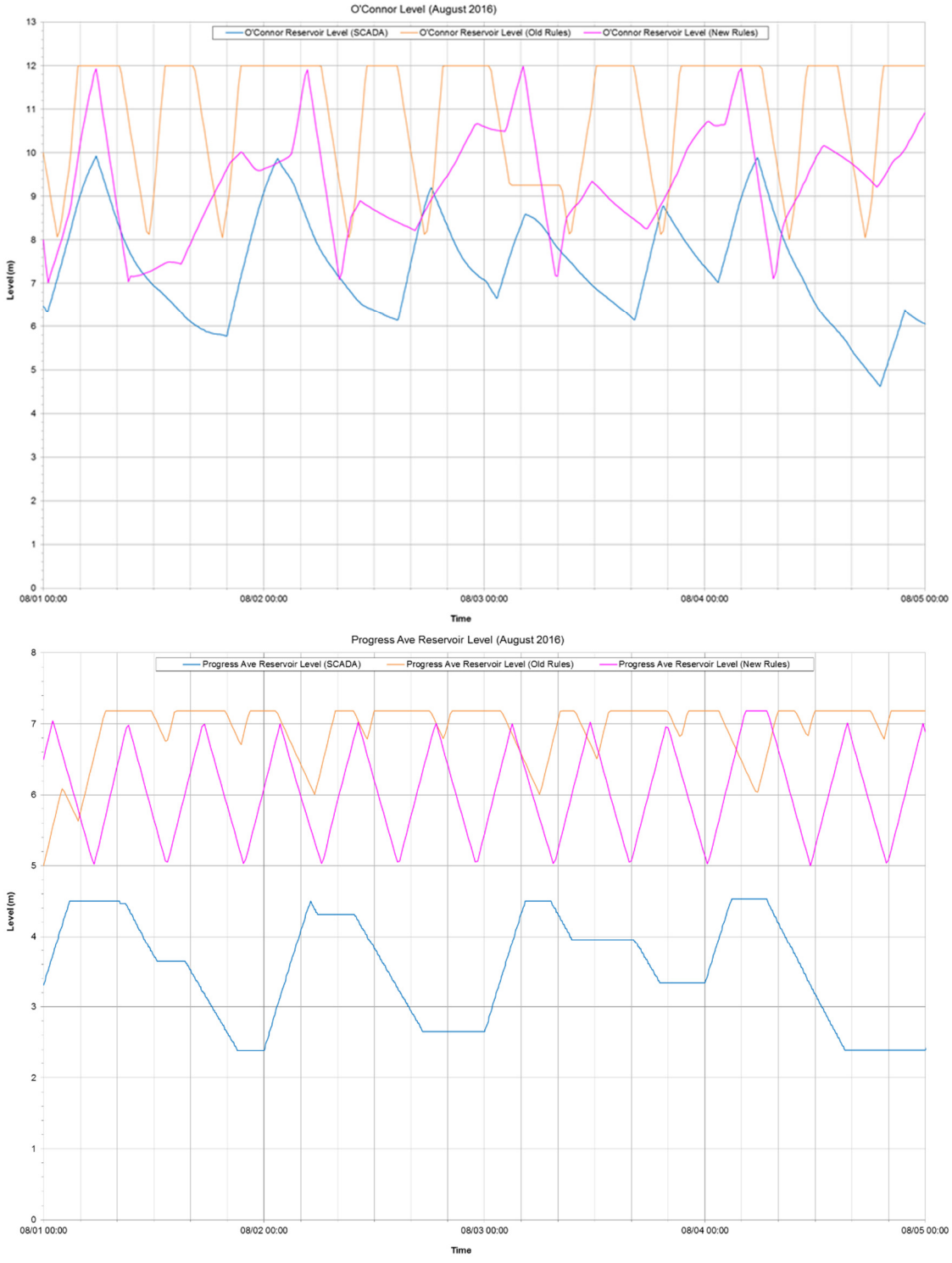
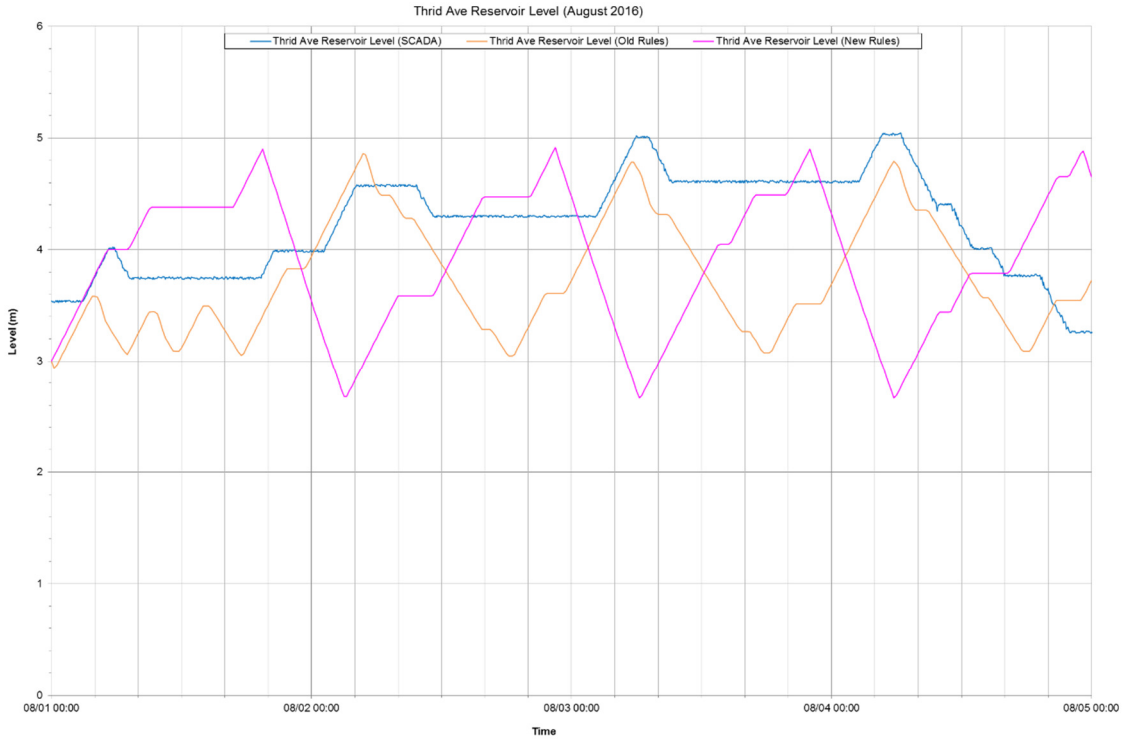


Figure 1-7a SCADA and Model Results on Tank Cycling Profile



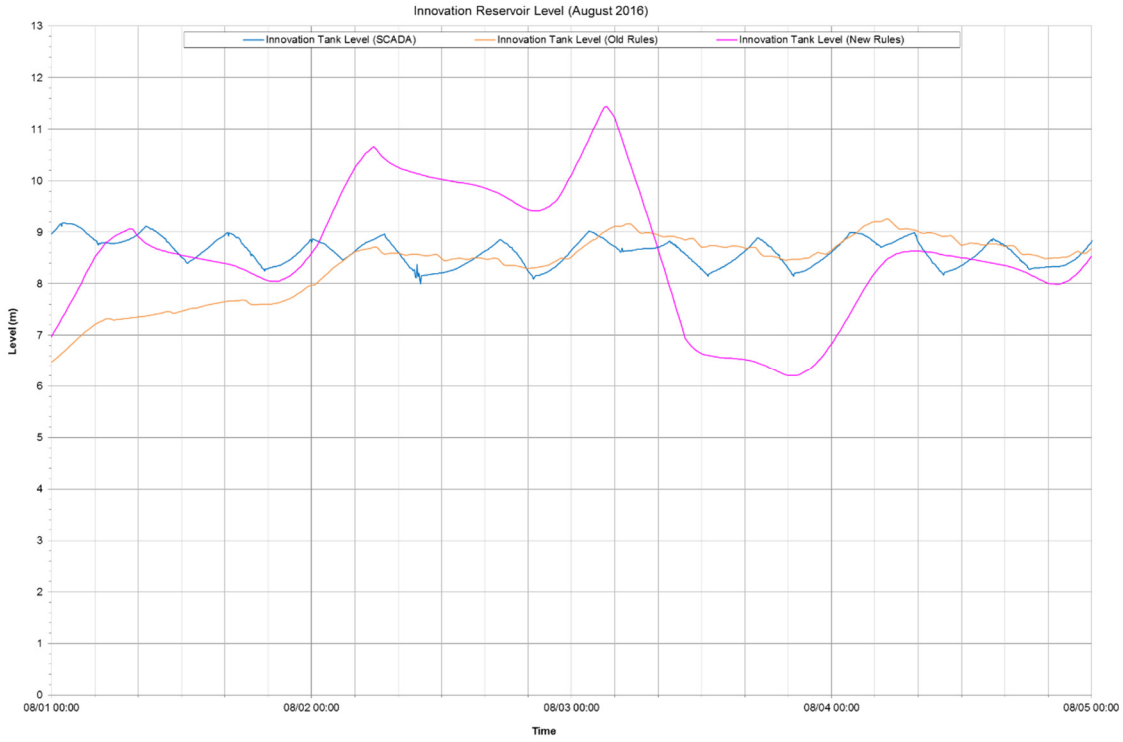


Figure 1-8b SCADA and Model Results on Tank Cycling Profile