

Appendix A

Hillsburgh Storage Alternatives TM



Data:	June 5, 2024
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Project	Erin-Hillsburgh Water System Improvements
Subject	Hillsburgh Storage Alternatives

TECHNICAL MEMORANDUM

1 INTRODUCTION

It is our understanding that the Town of Erin plans to upgrade and integrate their Erin and Hillsburgh water systems to address short and long-term growth needs and improve system operations and redundancy. The long-term upgrades include new supply wells, storage and pumping facilities, and integrating the Erin and Hillsburgh water systems. The proposed upgrades will occur under a phased approach.

- Phase 1 upgrades include constructing a new elevated tank (ET) in east Erin and a new groundwater well north of Erin to supply the Erin water system.
- Phase 2 upgrades consist of Interconnecting the Erin and Hillsburgh water systems, which includes:
 - A 5.1 km 250 mm watermain that generally follows the Elora-Cataract trail supporting the interconnection of the Erin and Hillsburgh water systems;
 - Pumping Station (BSP) allowing the transfer of water from Erin to Hillsburgh;
 - Additional water storage in Hillsburgh; and
 - Supporting watermain upgrades in Hillsburgh to support the interconnection of the new storage.
- Subsequent phases of upgrades will focus on expanding supply capacity and other capacity improvements to meet the system growth needs.

Additionally, major residential developments are expected in:

- Northeast Erin (Solmar Development)
- West Erin (Coscorp, Mattamy, and Empire Developments)
- South Hillsburgh (Ballantry, Carson Reid, and Thomas Field Homes Developments)
- North Hillsburgh (Briarwood Development)

The objective of this memo is to outline the water servicing opportunities and constraints related to the new Hillsburgh storage and the required supporting watermain and pumping upgrades. The water servicing analysis assumes the Phase 1 ET, new Well E9, and new Erin-Hillsburgh BSP and Erin-Hillsburgh watermain have been constructed and are operating in line with the recommendations of the *New Erin Operational Controls - New ET and Well E9 - Technical Memo* (Agile Infrastructure November

2024) and *Erin-Hillsburgh Booster Pumping Station and West Erin Developments – Technical Memo* (Agile Infrastructure January 2025)

1.1 Basis of Analysis

The Town's existing WaterGEMS model of the Erin and Hillsburgh water systems was used as the basis of the system hydraulic performance analysis. The existing model was developed in 2023 by WSP as part of the Erin Water Distribution System Modelling and subsequently updated by Ainley in 2024 with operational controls to allow for Extended Period Simulation as part of the *New Erin Operational Control and New ET and Well E9 analysis*.

The following performance criteria were utilized to evaluate the feasibility of the water operational alternatives:

- Water System Pressure:
 - Maintain a minimum peak hour pressure of 275 kPa.
 - Maintain a maximum average day pressure of 690 kPa.
- Fire Flow:
 - For new development areas in Hillsburgh:
 - 76 L/s for Singles and Detached Homes, as per Town Engineering Standards
 - 200 L/s for Townhouses, based on NFPA calculations

1.2 Limitations

No modifications to the existing system infrastructure or existing system demands were made.

It is noted that the combined growth demands of the proposed Erin and Hillsburgh development exceed the capacity of the existing system supply. Under a separate assignment, Ainley is undertaking a study to identify and implement additional supply to address future demand needs.

For the purposes of the Hillsburgh storage and pressure zone assignment:

- The sizing of the Hillsburgh watermain and peak pumping requirements were governed based on meeting Max Day Demand + Fire Flow based on the assumed independent operation of the Erin and Hillsburgh system, with no transfers from the Erin system via Erin-Hillsburgh BPS supporting fire flow demands.
- The system operational and pressure analysis was completed based on meeting Peak Hour Demand and Min Hour Demand scenarios, assuming that any Hillsburgh supply short-falls would be supplemented with transfers from the Erin system via Erin-Hillsburgh BPS.

As such, the following general modelling assumptions were made when assessing the system capacity needs:

- Developments
 - Review full buildout of Hillsburgh lands, including Briarwood, Ballantry, Carson Reid, and Thomas Field Homes developments.
 - Excluded the buildout of West Erin Development: Mattamy, Coscorp & Empire Developments.
- Max Day Demand & Peak Hour Demand Scenarios:
 - No additional supply in Hillsburgh, with Hillsburgh demands being supported by the Erin Hillsburgh BPS.
- Max Day Demand + Fire Flow Scenarios:
 - Supply being provided by the new storage and new/existing Hillsburgh pump stations.
 - Erin Hillsburgh BPS is offline.

Please refer to *New Erin Operational Controls - New ET and Well E9 - Technical Memo* for details on the model operational control modifications and *Erin-Hillsburgh Booster Pumping Station and West Erin Developments – Technical Memo* for details on the recommended Erin-Hillsburgh BPS location and supporting Erin water system upgrades.

2 WATER SYSTEM OVERVIEW

Figure 1 Provides an overview of the Erin and Hillsburgh water systems.

2.1 Erin Water

The existing Erin water system is currently configured in two (2) pressure zones (PZ):

- The Mid Erin PZ (E-MPZ) is a relatively small pressure zone comprising the lands around 8 Line, Sideroad 17, and Erin Heights Drive.
- The Lower Erin PZ (E-LPZ) comprises the remaining Erin system servicing the extent of the Erin village settlement area.

The Erin water system is supplied via two groundwater wells, Well E7 (located on Sideroad 17) and Well E8 (Located on Eighth Line), located in the E-MPZ Water is supplied to the E-LPZ via a pressure sustaining valve (PSV) at Well E7 and a pressure reducing valve (PRV) on Erin Heights Drive east of Wesley Crescent. Further, the new 32 L/s Well E9 groundwater wells (Well E9) located on Wellington Road 23, approximately 1,100 m north of Pioneer Drive, was assumed to be constructed under this analysis.



FIGURE 1 — OVERVIEW OF EXISTING HILLSBURGH SYSTEM

Pressure is maintained in the E-MPZ managed through pressure tanks located on Delerin Crescent, while pressure in the E-LPZ is managed through the 1.7 ML tank located west of William Street and soon to be commissioned 3.4 ML ET located south of Wellington Road 124 and east of Erin Park Drive.

2.2 Hillsburgh Water System

The existing Hillsburgh water system is configured in two (2) PZs:

- The Upper Hillsburgh PZ (H-UPZ) zone comprises the lands north of Church Street, west of Barker Street and north of Orangeville Street.
- The Lower Hillsburgh PZ (H-LPZ) comprises the remaining Hillsburgh settlement area.

The two Hillsburgh PZs are typically operated independently, with the Well H2 and BPS (Hillsburgh Heights) supplying the H-UPZ and Well H3 (Glendevon) supplying the H-LPZ. Both PZs operate as closed PZs. There is potential to back-feed the H-LPZ from the H-UPZ via PRVs located on Barbour Drive at Orangeville Street and at the Hillsburgh BPS. Meanwhile, the Hillsburgh BPS can pump from the H-LPZ to the H-UPZ.

Limited storage is located in the H-LPZ, with 0.24 ML clearwell at Well H2. In the H-UPZ, 0.54 ML of storage is available at Well H2. The Hillsburgh Heights BPS provides fire flow for the system.

2.3 Proposed Water System Upgrades

2.3.1 Erin Water System Upgrades

The following Phase 1 and Phase 2 upgrades have been assumed to be in place when completing this analysis:

- The new 3.4 ML ET located south of Wellington Road 124 and east of Erin Park Drive, including the new 300 mm PVC watermain along Wellington Road 124 from the ET to Shamrock Road;
- A new 32 L/s groundwater well (Well E9) located on Wellington Road 23 approximately 1,100 m north of Pioneer Drive, including a new 300 mm PVC watermain along Wellington Road 23 to tie into the existing 300 mm watermain at Shamrock Road and Sideroad 17;
- Buildout of the Solmar development consisting of the lands Bounded by Wellington Road 124, Erin Park Drive, Erin Township Sideroad 15, and Settlement Boundary.;
- A new Erin-Hillsburgh BPS connecting the Erin water system to the Hillsburgh system via the Erin-Hillsburgh watermain, located in the vicinity of the Well E7;
- Upsizing of the existing Sideroad 17 watermain to 300 mm from Shamrock Road to the Erin-Hillsburgh BPS.

2.3.2 Hillsburgh Upgrades

The following upgrades are being assessed as part of this review:

- Location of a new 3.74 ML storage in the H-LPZ;
- Potential upgrade and/or replacement of the existing Hillsburgh BPS and Hillsburgh Heights BPS to support system demands and fire flows for the H-UPZ;
- New Hillsburgh watermain upgrades to support the new storage and fire flows;
- Buildout of the Briarwood, Ballantry, Carson Reid, and Thomas Field Homes developments.

2.4 Facility Overview

Tables 1 to 3 provide an overview of the capacity, key geometries, and setpoint of the existing and proposed Erin and Hillsburgh Facilities.

TABLE 1 – STORAGE FACILITY OVERVIEW

Storage Facility	Pressure Zone	Type	Top Water Level (mASL)	Volume (ML)
Well E7 Clearwell	Upper - Erin	Pumped	398.8	0.24 ¹
Well E8 Clearwell	Upper - Erin	Pumped	~401.5	0.16 ¹
Erin ET	Lower - Erin	Floating	447.0	1.7
New Erin ET (New)	Lower - Erin	Floating	447.0	3.4
Well H3 Clearwell	Lower -Hillsburgh	Pumped	436.0	0.24 ¹
Hillsburgh Heights Reservoir	Upper -Hillsburgh	Pumped	476.0	0.54
New Hillsburgh Storage (Phase 2)	Lower -Hillsburgh	Elevated	485.0	3.74

1- Total storage, including contact time. The total available fire flow and emergency storage is assumed to be 50% of available storage.

TABLE 2 - PUMP/WELL FACILITY OVERVIEW

Well/Pump Facility	Pressure Zone	Design Flow (L/min)
Well E7 – High Lift (1 &2)	Upper - Erin	1,800
Well E8 - Utility Pump	Upper - Erin	1,740
Well E8 – Service Pump	Upper - Erin	348
Well 9 – High Lift (New)	Well E9	1,920
Well H3 Clearwell	Hillsburgh - Lower	456
Hillsburgh Heights BPS – Jockey	Hillsburgh - Upper	274
Hillsburgh Heights BPS – Duty	Hillsburgh - Upper	820
Hillsburgh Heights BPS - Fire	Hillsburgh - Upper	2,400
Hillsburgh BPS -	Hillsburgh - Upper	UKN
New Erin-Hillsburgh BPS (New)	Hillsburgh - Lower	1,920

TABLE 3 – CONTROL VALVE OVERVIEW

Control Valve	Type	Upstream Zone	Downstream Zone	Setpoint (kPa)	Setpoint (HGL mASL)
Well E7 PSV	PSV/PRV	Upper - Erin	Lower - Erin	670	467
Well E7 PRV ¹	PSV/PRV	Lower - Erin	Upper - Erin	440	443
Well E7 Re-Circulation	PSV	Upper - Erin	Well E7 Clearwell	690	468
Well E8 Re-Circulation	PSV	Upper - Erin	Well E8 Clearwell	690	468
Well E9 – PSV	PSV	Well E9	Lower - Erin	460	467
Erin Heights Drive PRV	PRV	Upper - Erin	Lower - Erin	340	441.5
Barbour Drive PRV	PRV	Upper - Hillsburgh	Lower - Hillsburgh	414 ²	484.2 ²
Hillsburgh BPS	PRV	Upper - Hillsburgh	Lower - Hillsburgh	414 ²	477.2 ²

- 1- The Well E7 drawing lists the Well E7 valve as a PSV/PRV. The PSV function and set point were confirmed through the SCADA review and OCWA meeting. However, the PRV set point and function are assumed but not confirmed.
- 2- Setpoints not confirmed with operations.

3 PROPOSED HILLSBURGH DEVELOPMENTS

Figure 2 presents the approximate locations of the Briarwood, Ballantry, Carson Reid, and Thomas Field Homes developments.

Briarwood Development: The Briarwood is located west of Trafalgar Road and north of Upper Canada Drive, in the lands comprising 5916 Trafalgar Road. The proposed development comprises 195 single-family homes, 176 townhouses, and a school.

Ballantry Development: The Ballantry development is located east of Trafalgar Road, south of Douglas Crescent, in the areas comprising 63A Trafalgar Road and adjacent south property. The proposed development consists of 383 single-family homes, 282 Townhouse houses, 188 apartments, and 74 senior's residents.

Carson Reid and Thomas Field Homes Development: The Carson Reid and Thomas Field Homes Development are located west of Trafalgar Road and north of Wellington Road 23, in the lands west of the wetland. The proposed development comprises approximately 25 ha of developable lands.

Table 4 summarizes each development's approximate demands, elevations, and required operating HGL.



FIGURE 2 – HILLSBURGH DEVELOPMENTS LOCATIONS

TABLE 4 – WEST ERIN DEVELOPMENT OVERVIEW

	# Units	Max Day Demand (L/s)/(L/min)	Max Fire Flow (L/s)	Elevation Range (mASL)	Min HGL Requirement (mASL)
Briarwood	371	6.6 / 400	Singles & Detached 76 Townhouses 200 ²	457.5 – 475	503 (@ 275 kPa) 510 (@ 345 kPa)
Ballantry	927	16.3 / 980	Singles & Detached 76	432 – 440	468 (@ 275 kPa) 475 (@ 345 kPa)
Carson Reid and Thomas Field Homes	530 ¹	9.5 / 570	Singles & Detached 76 Townhouses 200 ²	417 -440	468 (@ 275 kPa) 475 (@ 345 kPa)
Total	1,828	32.4 / 1950			

1- Units estimated based on 21 units per hectare density.

2- Fire Flows for Townhouses are assumed to be 200L/s per the Fire Underwriters Survey (FUS).

3.1 Pressure Zone Considerations

The current development proposals have the Briarwood development located within the H-UPZ, while the remaining two (2) developments are located within the H-LPZ.

Based on the proposed development grading for the Ballantry Development and existing contours for the Carson Reid and Thomas Field Homes developments, the developments can integrate into the existing H-LPZ (existing operational HGL of 483.5 mASL) without any low-pressure issues. It is noted that there may be higher pressure concerns in the Carson Ried and Thomas Field Homes developments; however, the lands are expected to have pressures below 690 kPa (*note a proposed grading plan for the Carson Ried and Thomas Field Homes developments was not available at the time of this analysis*).

Based on the proposed grading of the Briarwood development and the current operations of the Hillsburgh Heights BPS, the existing operational pressure of the H-UPZ may not be sufficient to maintain the minimum target pressures within the development. The Hillsburgh Heights BPS currently maintains a discharge pressure HGL of 503.5 mASL, which is in line with the 503 mASL needed to support 275 kPa across the entire Briarwood development; however, due to anticipated losses through the system, actual system pressures within the Briarwood development will be below the 275 kPa target under peak hour demands. As such, modifications to the H-UPZ operational pressures and/or the development of an additional Hillsburgh PZ with a higher HGL will be required to support the minimum pressure targets in the Briarwood development.

3.2 Supply Considerations

Table 5 summarizes Hillsburgh's existing supply and pumping capacity relative to the proposed MDD and PHD on a system-wide and individual pressure zone basis.

TABLE 5 – HILLSBURGH SUPPLY OVERVIEW

	Supply Capacity (L/min)			Existing MDD (L/min)	Future	
	PPTW	Well Pump	Pump Station		MDD (L/min)	PHD (L/min)
Lower Hillsburgh	655	456	605	204	1750	2765
Upper Hillsburgh	982	802	1,094 (820 + 274)	60	460	720
Total	1,637	1,258	1,699	264	2,210	3,485

The combined max day demands (MDD) of the developments exceed the existing Hillsburgh wells existing capacity, necessitating additional supply capacity and/or transfer of supply from the Erin system. However, when reviewing the pressure zones independently, the existing Hillsburgh Heights well and BPS have sufficient capacity to support the projected H-UPZ MDD and PHD, notwithstanding the operational pressure issues identified in Section 3.1.

3.3 Fire Flow Considerations

The existing Hillsburgh pumping and storage do not have the capacity to support the required 76 L/s and 200 L/s fire flow requirements. New/upgraded pump stations will be required to support the flow requirements for new development in the H-UPZ. Distribution system upgrades will be required for passive supply of the required 200 L/s fire flow requirement to new development areas within the H-LPZ.

4 WATER SYSTEM ANALYSIS

4.1 New Hillsburgh Storage Site Alternatives

The Town is currently exploring three (3) potential locations for the new Hillsburgh storage consisting of

- Barbour Field
- 5916 Trafalgar Road
- 5952 Trafalgar Road

Figure 3 Highlights the approximate location of each water storage site. 5916 Trafalgar Road and 5952 Trafalgar Road are in close proximity, although differences in site conditions and elevations result in differences in proposed construction configurations and approaches between the two locations; for the purposes of this hydraulic analysis, the system impacts between the two (2) Trafalgar Road locations are assumed to be the same.



FIGURE 3 – ALTERNATIVE LOCATIONS FOR WATER STORAGE

4.1.1 Barbour Field Supporting Infrastructure

To support the Barbour Field location, the following infrastructure will be required to tie in the new storage into the existing Hillsburgh water system:

- New watermain from the new Erin-Hillsburgh to the new storage through the new Ballantry development.
- New watermain from the new storage to the existing Hillsburgh watermain on Currie Drive or Spruce Street via the new Ballantry development.

Further, it is anticipated that the following additional upgrades will be required to support system demands and fire flows to the new development areas:

- Upgrade/new pump station to support fire flow within the H-UPZ.
- Upgrades to the existing watermain to support fire flow in both the H-UPZ and H-LPZ.
- New watermain on Trafalgar Road and/or through the Ballantry Development south of Mill Street to support local developments west of Trafalgar Road.

4.1.2 5916/5952 Trafalgar Road

To support the 5916/5952 Trafalgar Road location, the following infrastructure will be required to tie in the new Storage into the existing Hillsburgh water system:

- New and upgraded watermain from the new Erin-Hillsburgh watermain at the Elora-Cataract Trailway to the storage site along and/or parallel to Trafalgar Road.

Further, it is anticipated that the following additional upgrades will be required to support system demands and fire flows to the new development areas:

- Upgrade/new pump station to support fire flow within the H-UPZ.
- Upgrades to the existing watermain to support fire flow in both the H-UPZ and H-LPZ.

4.2 Hillsburgh Pressure Zone Boundary

The proposed upgrades and development represent a significant expansion to the Hillsburgh water system. As such, there may be an opportunity to review and update the existing boundary between the H-UPZ and H-LPZ.

4.2.1 Pressure Zone Opportunities and Constraints

The Current operational HGLs of the H-UPZ and H-LPZ are 503.5 mASL and 483.5 mASL (as validated through field testing as part of the WSP model development project). The new H-LPZ storage is anticipated to have an approximate TWL of between 482 mASL and 485 mASL.

Table 6 summarizes equivalent operational pressure elevations for the H-UPZ and H-LPZ, while **Figure 4 to 6** graphically presents these figures in relation to the existing and proposed developments.

TABLE 6 – HILLSBURGH PRESSURE ZONES OPERATIONAL ELEVATION TARGETS

	H-UPZ	H-LPZ
Target HGL (mASL)	503	483
275 kPa Elevation (mASL) – Minimum Allowable Pressure	475	455
345 kPa Elevation (mASL) – Desired Minimum Pressure	468	448
550 kPa Elevation (mASL) – Desired Maximum Pressure	447	427
690 kPa Elevation (mASL) – Typical Maximum Allowable Operating Pressure	433	413

A review of the system pressures and elevation identifies the following opportunities and constraints:

- The northwest section of the Briarwood development has elevations above the desired 345 kPa pressure target and approaches the 275 kPa pressure target. Due to system friction losses, without modifications to the operational HGL of the H-UPZ, pressures in the Briarwood development northwest area will be below 275 kPa under peak demand conditions.
- The remaining Briarwood development elevations align well with the existing H-UPZ HGL.
- The following areas in the H-UPZ have high pressures and can potentially be supported by the H-LPZ while maintaining pressures above 345 kPa:
 - Barbour Drive east of Wallace Street
 - Baker Street
 - Church Street
 - Trafalgar Road south of Queen Street
- Barbour Drive east of Wallace Street can be integrated into the H-LPZ without constructing additional watermains or relocating pumping facilities.
- Transitioning Baker Street, Church Street, and/or Trafalgar Road would require the construction of additional watermains to:
 - Maintain Upper Canada Drive within the H-UPZ.
 - Maintain connectivity between the Hillsburgh PS and the H-UPZ.
- Lower elevation lands within the Carson Reid and Thomas Field Homes may exceed the desired 550 kPa maximum pressure; however, they are anticipated to remain below 690 kPa. At this time, we do not have a conceptual servicing or grading plan, so we cannot comment further. However, if high pressures are a major concern, creating a new PZ with localized PRVs may be possible.



FIGURE 4 — OPERATIONAL PRESSURE ELEVATIONS FOR HILLSBURGH PART 1



FIGURE 5 — OPERATIONAL PRESSURE ELEVATIONS FOR HILLSBURGH PART 2

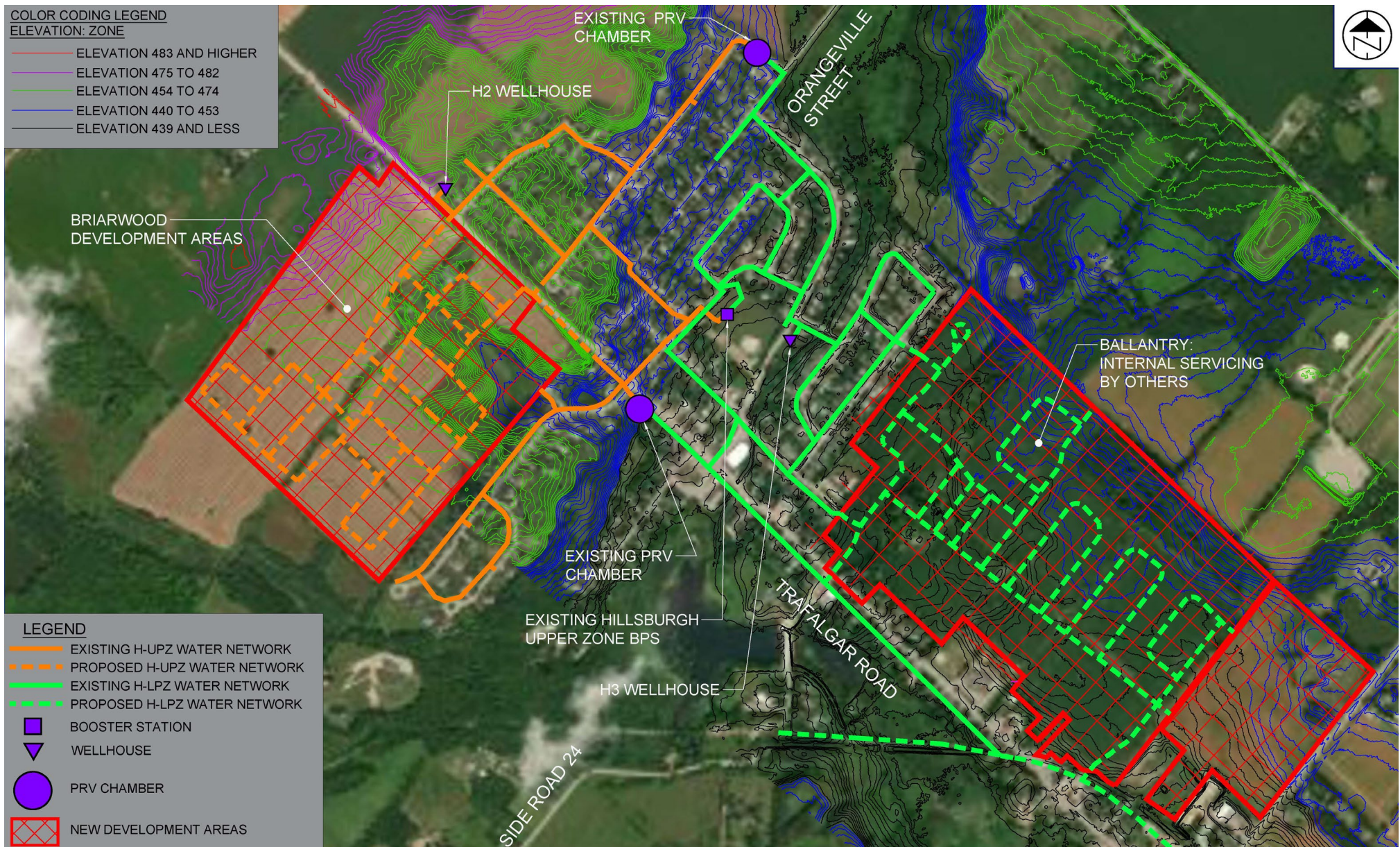


FIGURE 6 — OPERATIONAL PRESSURE ELEVATIONS FOR HILLSBURGH PART 3

4.2.2 Pressure Zone Boundary Alternatives

The following pressure zone boundary Alternatives were considered:

- Scenario 1: Maintain existing H-UPZ operational HLG and zone boundaries.
- Scenario 2: Maintain existing H-UPZ operational HLG and zone boundaries:
 - Construct a new inline BPS to support the northwest Briarwood development.
- Scenario 3: Maintain existing H-UPZ zone boundaries and modify operational HGL:
 - Increase the existing H-UPZ operational HGL.
- Scenario 4: Modify H-UPZ zone boundaries and modify operational HGL:
 - Increase the existing H-UPZ operational HGL;
 - Area A: Minor Boundary Change – Barbour Drive east of Wallace Street;
 - Area B: Major Boundary Change – Barbour Drive, Baker Street and Church Street;
 - Area C: Major Boundary Change – Trafalgar Road.

Scenarios 1, 2, 3, and 4A are unaffected by the difference between the new H-LPZ storage alternatives. While the required infrastructure to accommodate the more extensive PZ boundary changes in Scenario 4B differs depending on the H-LPZ storage alternatives.

4.2.3 Pressure Zone Boundary Alternatives Assessment

- **Scenario 1:** Without increasing the operational HGL of the H-UPZ, the northwest portion of the Briarwood development will experience peak hour pressures below 275 kPa.
 - Resolution: installation of service jet pumps and pressure tanks within individual properties to maintain internal domestic pressure.
- **Scenario 2:** Without increasing the operational HGL of the H-UPZ, the northwest portion of the Briarwood development will experience peak hour pressures below 275 kPa.
 - Resolution: A small booster pump station with a capacity of ~ 1 L/s to support servicing the low-pressure properties in northwest Briarwood.
 - The BPS could be located on the proposed Park Block and service the properties on Street B and C.
 - Fire flow for the new PZ would be provided through a check valve.
- **Scenario 3:** Increase the operational HGL of the H-UPZ by approximately 7 m to target an H-UPZ operating HGL of 510 mASL without changes to the PZ boundaries. Areas within the H-UPZ will experience pressures exceeding the target pressure range.
 - Will provide average day pressures above 345 kPa and maintain peak hour pressure above 275 kPa across the PZ.
 - Increased distribution area within the PZ with pressure above the desired 550 kPa
 - A portion of Barbour Drive and Trafalgar Road will have pressures above 690 kPa.



- **Scenario 4:** Increase the operational HGL of the H-UPZ by approximately 7 m to target an H-UPZ operating HGL of 510 mASL. Transition areas experiencing pressure exceeding the target pressure range into the H-LPZ.
 - All reviewed areas transitioning to the H-LPZ will be able to maintain pressure above 345 kPa.
- **Scenario 4, Area A:** Barbour Drive:
 - The transfer of the Barbour Drive can be accommodated with the construction of a single PRV, can occur at any time, and is not depended on or impacted by other system upgrades.
- **Scenario 4, Area B:** Baker Street and Church Street:
 - Transitioning is subject to the status and sizing of the Trafalgar watermain between Barbour Drive and Upper Canada Drive.
 - The transfer of Baker Street and Church Street to the H-LPZ will disrupt the connectivity between the Hillsburgh BPS and the H-UPZ and negatively impact the Upper Canada Drive area if the transfer is not coordinated with changes to Trafalgar Road.
 - Under both Lower Hillsburgh storage alternatives, upgrades to the watermain along Church Street and Trafalgar Road are required to support either:
 - Fire flow to the Briarwood Development (Barbour Field Storage Alternative)
 - Transmission main to the new storage (5916/5952 Trafalgar Road Storage Alternative).
 - There is an opportunity to maintain the existing watermain along Church Street and construct twin watermain on Trafalgar Road to support the transmission requirements and local pressure zone modifications.
 - Under this approach, the pressure zone modifications can be accomplished largely without constructing new dedicated watermain.
- **Scenario 4, Area C:** Trafalgar Road
 - Transitioning the Trafalgar Road to the H-LPZ will isolate the Upper Canada Drive system from the H-HPZ, resulting in local pressures below 275 kPa and would require the construction of a new inter-connection watermain via the southeast stormwater block in the Briarwood Development to maintain connectivity to the H-HPZ.
 - Transitioning the Trafalgar Road to the H-LPZ will also require the construction of a new PRV on Trafalgar Road north at the new PZ boundary.

4.2.4 Pressure Zone Recommendations

Based on the results of the analysis, it is recommended that upgrades be established following Scenario 4, including transition of Area A and Area B into the H-LPZ:

- The operational HGL of the H-UPZ be increased to 510 mASL to accommodate the minimum pressure requirements of the Briarwood Development.
 - These works should be coordinated with the pumping upgrades required to support new storage, fire flow, and supply requirements for the Hillsburgh System.
- The following areas be transitioned to the H-LPZ to address the potential high pressure resulting from the change in the Upper Hillsburgh PZ HGL.
 - Barbour Drive east of Wallace Street
 - Baker Street and Church Street
 - To be coordinated with watermain upgrades.
- The Trafalgar Road connection to Upper Canada Drive remains within the H-UPZ.
 - Area will have pressures exceeding 690 kPa, however the scope of work required to transition this area exceeds the overall system benefit.
 - The construction of the currently planned, as part of the Briarwood Development, H-UPZ watermain from Howe Street to the existing 150 mm watermain south of Queen Street, is needed to maintain the pressure zone connectivity.

4.3 Storage Alternatives Analysis

The following Storage Site Alternatives were considered:

- Scenario 1: Barbour Drive
- Scenario 2: 5916/5952 Trafalgar Drive

Further to the storage site alternatives, a review of the future storage's TWL was assessed, with consideration of a range between 482 mASL and 485 mASL.

4.3.1 Scenario Barbour Drive:

Figure 7 highlights the upgrades required to support system pressures and fire flows. A summary of the analysis is as follows:

- Fire flow requirement of 200 L/s for multi-family blocks within the Briarwood Development and the Carson Reid and Thomas Field Homes Development are the limiting factors governing supporting watermain sizing/upgrade requirements and pumping upgrades.
- There is insufficient storage and pumping capacity at the Hillsburgh PS and Hillsburgh Heights BPS to support fire flow within the Briarwood development. As such, upgrades to the Hillsburgh PS or construction of a new PS to support fire flow to H-UPZ is required.



- It is understood that the new PS could be constructed at the existing Well H3, the Hillsburgh PS; Feasibility of upgrades within these sites has not been evaluated.
 - Within this review's context, there are negligible differences between the two PS options.
- A 300 mm watermain from the new ET to the PS is insufficient to support 200 L/s fire flow while maintaining minimum pressure of 140 kPa within the local watermain.
- To support 200 L/s to the PS, a minimum of the following is required:
 - New 400 mm watermain from the new ET at Barbour Field to the tie-in to the existing Hillsburgh system at either Currie Drive or Spruce Street.
 - Upgrade the existing watermain from the new 400 mm watermain tie-in to the new PS to a minimum of 300 mm.
 - Upsizing the existing watermain upgrade from 300 mm to 400 mm increases minimum pressures at the new BPS by approximately 100 kPa, resulting in smaller pump sizing and improved operations.
- The existing watermain from the Hillsburgh PS to the Briarwood Development are insufficient to support the 200 L/s to the new development.
- To support 200 L/s fire flow to the Briarwood Development at a minimum, the following is required:
 - Upgrades of the discharge watermain from the PS to Trafalgar Road at Howe Street to a minimum of 300 mm.
 - To Support the transfer of Baker Street and Church Street to the H-LPZ, need to ensure that the existing 150 mm H-UPZ watermain south of Queen Street is connected to the new H-UPZ constructed either as part of the above-identified watermain upgrades or as part of the Briarwood Development watermain works.
 - Construction of a 300 mm loop within the Briarwood Development.
 - Upsizing the existing watermain upgrade from 300 mm to 400 mm would decrease the required fire pump discharge pressure by approximately 100 kPa, resulting in:
 - Smaller pump sizing and improved operations
 - Lower areas experiencing high pressures above 690 kPa when the fire pump is operating.
 - Allowing a portion of the 300 mm loop within the Briarwood Development to be reduced to 250 mm.
- To support 200 L/s within Carson Reid and Thomas Field Homes Development, the following is required:
 - New 400 mm watermain from the new ET at Barbour Field to Spruce Street
 - New 400 mm watermain from the new 400 mm at Spruce Street to the proposed development.
 - 300 mm loop within the Development.
- Lowering the storage TWL from 485 mASL to 482 mASL would have the following Impacts:



- For the minimum upgrade requirements, approximately 200 mm of the watermain upgrade between the new watermain tie-in to the new PS will need to be upsized from 300 mm to 400 mm.
- Potentially required upsizing a portion of the watermain within the Carson Reid and Thomas Field Homes Development from 300 mm to 400 mm.
- Potentially increase the size of new Hillsburgh PS pumps to accommodate the lower suction side operating pressure.

4.3.2 Scenario 2: 5916/5952 Trafalgar Drive

Figure 8 and **Figure 9** highlight the upgrades required to support system pressures and fire flows. A summary of the analysis is as follows:

- Fire flow requirement of 200 L/s for multi-family blocks within the Briarwood Development and the Carson Reid and Thomas Field Homes Development are the limiting factors governing supporting watermain sizing/upgrade requirements and pumping upgrades.
- There is insufficient storage and pumping capacity at the Hillsburgh PS and Hillsburgh Heights BPS to support fire flow within the Briarwood development.
 - Based on the location of the new storage and proposed watermain alignment, there are two potential alternatives:
 - A new pump station to be constructed at the new storage site that would replace the existing Hillsburgh Height BPS, with the Well H2 supply being integrated into the H-LPZ.
 - Upgrade Hillsburgh Heights BPS, with a new connection to the H-LPZ transmission main to allow the fire pump to draw from the new storage.
 - The hydraulic modelling found that both PS upgrade alternatives provide comparable system upgrade needs.
- To support 200 L/s fire flow within the Carson Reid and Thomas Field Homes Development, the following is required:
 - The entirety of the new transmission, from the Elora-Cataract Trailway to the new storage site, will need to be 400 mm.
 - 300 mm loop within the development.
- To support 200 L/s fire flow to the Briarwood Development at a minimum, the following is required:
 - 300 mm watermain from the new/upgraded Upper Hillsburgh PS to Howe Street.
 - Construction of a 250/300 mm loop within the Briarwood Development.
 - There may be an opportunity to decrease the Briarwood watermain loop to 250 mm, but this would require an increase in the new Upper Hillsburgh PS fire pump discharge pressure by approximately 100 kPa; however, this would result in



- Increase areas experiencing high pressures above 690 kPa when the fire pump is operating.
 - Increase the size of the fire pumps and increase the station's operational complexity.
- To Support the transfer of Baker Street and Church Street to the H-LPZ, need to ensure that the existing 150 mm H-UPZ watermain south of Queen Street is connected to the new H-UPZ constructed that tie-into the proposed Briarwood Development watermain network. This will result in parallel H-UPZ (local distribution) and H-LPZ (Transmission to the new storage) along Trafalgar Road.
- Lowering the storage TWL from 485 mASL to 482 mASL would have the following Impacts:
 - Require upsizing of a portion of the watermain within the Carson Reid and Thomas Field Homes Development from 300 mm to 400 mm.
 - Potentially increase the size of new H-UPZ BPS pumps to accommodate the lower suction side operating pressure.



FIGURE 7 — UPGRADES REQUIRED FOR BARBOUR FIELD, ELEVATED STORAGE TANK (ALTERNATIVE 1)



FIGURE 8 — UPGRADES REQUIRED FOR 5952 TRAFALGAR ROAD, IN-GROUND RESERVOIR (ALTERNATIVE 2)

5 RECOMMENDATION

Based on the hydraulic analysis, the following is the preferred system configuration (See **Figure 10**).

The preferred storage location is Scenario 2: 5916/5952 Trafalgar Drive for the following reason:

- Require fewer water system upgrades as compared to Scenario 1.
- Allows for the consolidation pumping and simplification of operations for the H-HPZ by consolidating pumping into a single pumping facility located near the new storage.

The Following operation and pressure zone boundary changes be implemented.

- The operational HGL of the H-UPZ be increased to 510 mASL to accommodate the minimum pressure requirements of the Briarwood Development.
 - These works should be coordinated with the pumping upgrades required to support new storage, fire flow, and supply requirements for the Hillsburgh System.
- The following areas be transitioned to the H-LPZ to address the potential high pressure resulting from the change in the Upper Hillsburgh PZ HGL.
 - Barbour Drive east of Wallace Street
 - Baker Street and Church Street
 - To be coordinated with watermain upgrades.

