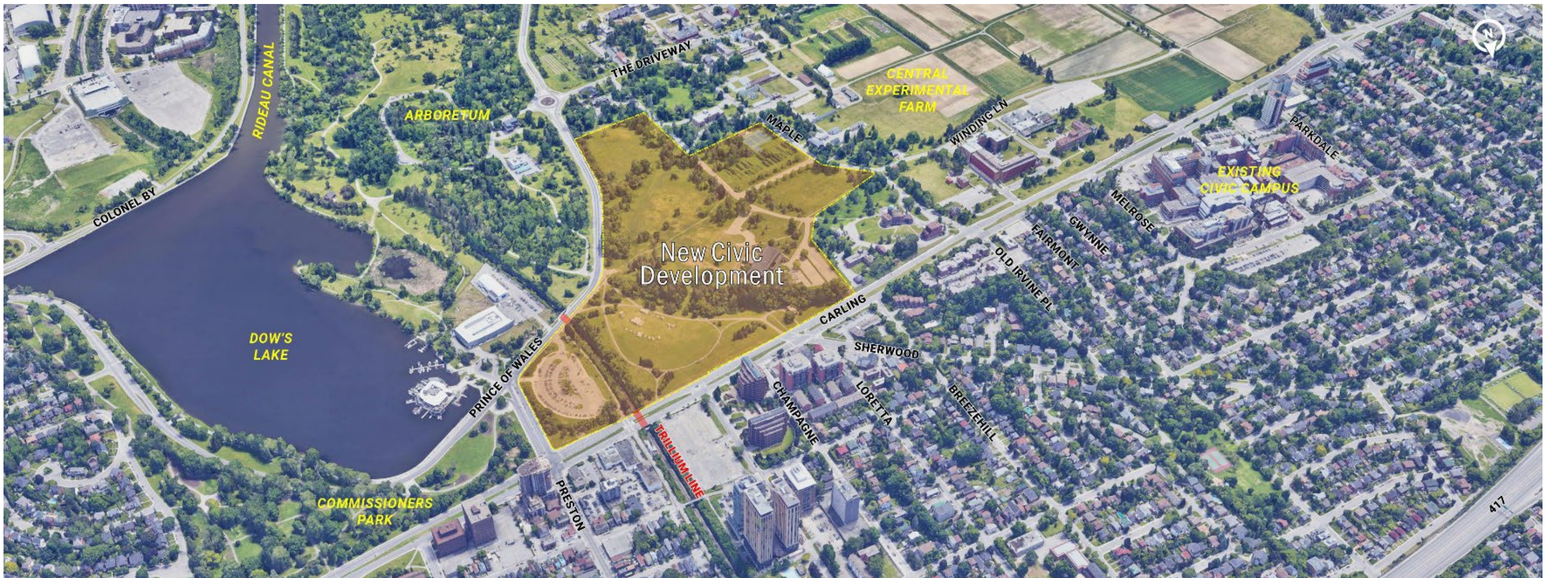

Site Servicing and Stormwater Management Report
New Campus Development for The Ottawa Hospital
Phase 3: Central Utility Plant Project
Phase 4: Main Hospital Project
Ottawa, Ontario
April 2023 (Issued for SPA & FLUDA Approval)

Prepared For:

The Ottawa Hospital

Submitted To:

City of Ottawa

Parson's Project # 477458

PARSONS

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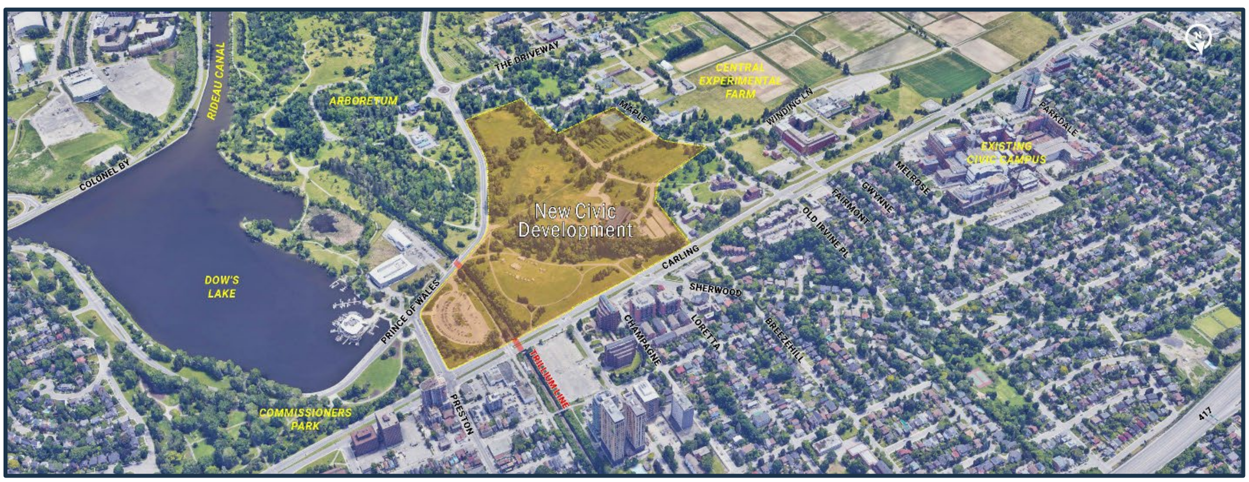
1.0 INTRODUCTION

The Ottawa Hospital has retained Parsons Incorporated to prepare a Site Servicing and Stormwater Management Report in support of a site plan application for the Central Utility Plant (Phase 3) and Hospital Building (Phase 4).

In June 2017, a Federal Land Use Design and Transaction Approval was granted making an approximately 20-hectare property of federal land available for a New Civic Campus of The Ottawa Hospital (**Figure 1-1**). The project is referred to as the New Campus Development (NCD) for The Ottawa Hospital. Further in 2018, the City of Ottawa passed Official Plan and Zoning By-law Amendments to bring the City of Ottawa land use planning policy documents into alignment with the federal land use decision. The amendments resulted in redesignating a portion of the Central Experimental Farm to General Urban Area and recognize the future use of the new campus within the boundary of the farm. The Preston-Carling District Secondary Plan was also amended at that time and introduced a new “Hospital Area” character area policy to specifically guide development of the hospital and its related uses. The associated Zoning By-law Amendment rezoned the lands to Major Institutional Zone and enacted holding provisions to prevent development until such time as a Master Site Plan and supporting plans and reports that addressed servicing requirements, multi-modal transportation options, cultural heritage impacts have been completed and approved by Council.

Figure 1-1: New Civic Development for the Ottawa Hospital

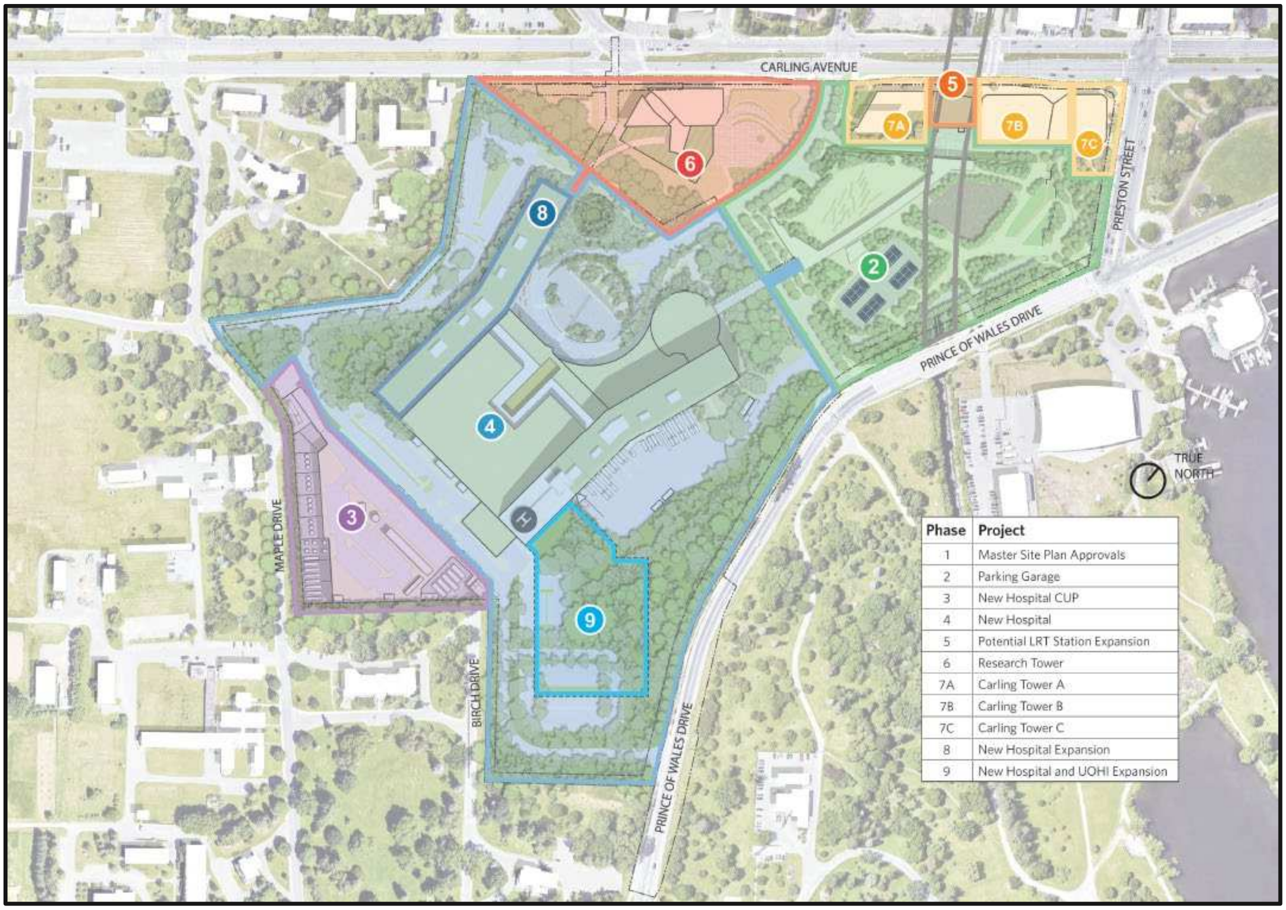


In May 2021, complete applications to approve a Master Site Plan and Lift the Holding Zone were submitted to the City of Ottawa as well as an application to the National Capital Commission for approval of the Master Site Plan. The applications were approved by both parties (the City of Ottawa and the National Capital Commission) in October 2021. The Master Site Plan and its supporting studies guide the future development of a new campus for The Ottawa Hospital.

The New Campus Development is to be implemented in Phases as illustrated in **Figure 1-2.** The first phase of implementation is anticipated to include widening of the Trillium LRT trench to accommodate a second LRT track that would be constructed in the future. The second phase of implementation is the parking garage structure which is still under review by the City of Ottawa and the National Capital Commission. The third phase of implementation is the Central Utility Plant which will be located in the southwest corner of the site adjacent to Maple Drive. The fourth phase of implementation is the Main Hospital Building. The remaining project phases will be completed in the future.

This Site Servicing and Stormwater Management Report has been prepared in support of a Site Plan Control Application for the Phase 3 and Phase 4 Project which includes the Central Utility Plant (Phase 3) and the Main Hospital Building (Phase 4).

Figure 1-2: New Civic Development Project Phasing



1.1 Site Description and Proposed Development

The full site is an approximately 20ha property located to the south and west of the Carling Avenue and Preston Street intersection, on two parcels that are separated by the City of Ottawa's existing O-Train line, refer to **Figure 1-1**. The larger parcel is located to the west of the O-Train line and is mostly vacant green space. The smaller parcel is located to the east of the O-Train line and hosts an asphalt parking lot.

This Site Servicing and Stormwater Management Report is for Phase 3 and Phase 4 of the site development which includes the Central Utility Plant and the Main Hospital Building. Phase 3 and Phase 4 have a combined site area of approximately 14ha. The Central Utility Plan and the Main Hospital Building are bordered by Carling Avenue and the future Research Tower (Phase 6) to the north, the Parking Garage (Phase 2) and Preston Street to the east, Prince of Wales Drive to the south, and the existing Ottawa Central Experimental Farm to the west. The development will include site accesses from proposed Road A, proposed Road B, Prince of Wales Drive, and Maple Drive. The Central Utility Plant is located within the southwest of the site and will be serviced from the main site services.

The Central Utility Plant (Phase 3) will contain electrical, heating, and cooling equipment which will provide services to the Main Hospital Building and possibly future phases of development within the site. The Central Utility Plant will be constructed prior to the construction of the Main Hospital Building to provide electricity and possibly other services to the site during the construction phase. The Central Utility Plant will be sunken into the landscape below the grade of Maple Drive. Landscaped buffers of approximately 7.5m in width will be included between the Central Utility Plant and the adjacent property line with the Ottawa Central Experimental Farm.

The first phase of the Main Hospital Building (Phase 4) includes approximately 227,000m^2 of gross floor area configured via a two-storey Pavilion, two Towers which will house the majority of the patient rooms, and a Podium flanking the main entrance. “Tower A” on the north/west portion of the site is eight (8) storeys, and “Tower B” on the south/east side of the site is twelve (12) storeys. A helipad for air ambulances transporting patients to and from the hospital will be located on the roof of Tower B. The Main Entrance to the Main Hospital Building will include welcome and registration areas, cafes, and a lightwell. The Pavilion, to be constructed using mass timber, will contain meeting and conference rooms, an auditorium, retail spaces, a cafeteria, as well as the connection to the weather-protected highline pathway providing access from the green roof of the Parking Garage (Phase 2) and the Dow’s Lake LRT Station. While the majority of the parking required for the Main Hospital Building was provided as part of the Phase 2 (Parking Garage) project, the Phase 3 and Phase 4 projects include some additional surface parking for staff and large-scale emergency situations at strategic locations to the northwest of Tower A, and to the south of Tower B on the site of the future Heart Institute building. Refer to **Figure 1-3** for the location of the Central Utility Plant and Main Hospital Building.

The topography of the site is quite variable, refer to **Figure 1-4.**A wooded ridge cuts diagonally across the westerly parcel, and there are some landscape undulations to the south and west of the wooded ridge. This results in an upper western plateau that is associated with the relatively flat landscape of the Ottawa Central Experimental Farm, a middle portion that is either ridge or undulating (site of the former Sir. John Carling Building), and a lower relatively flat eastern plateau which slopes gently towards Dow’s Lake. The easterly parcel is more or less flat. The eastern plateau is the location of the Parking Garage (Phase 2).

Figure 1-3: Phase 3 & Phase 4: Main Hospital Building & Central Utility Plant Site Location & Components

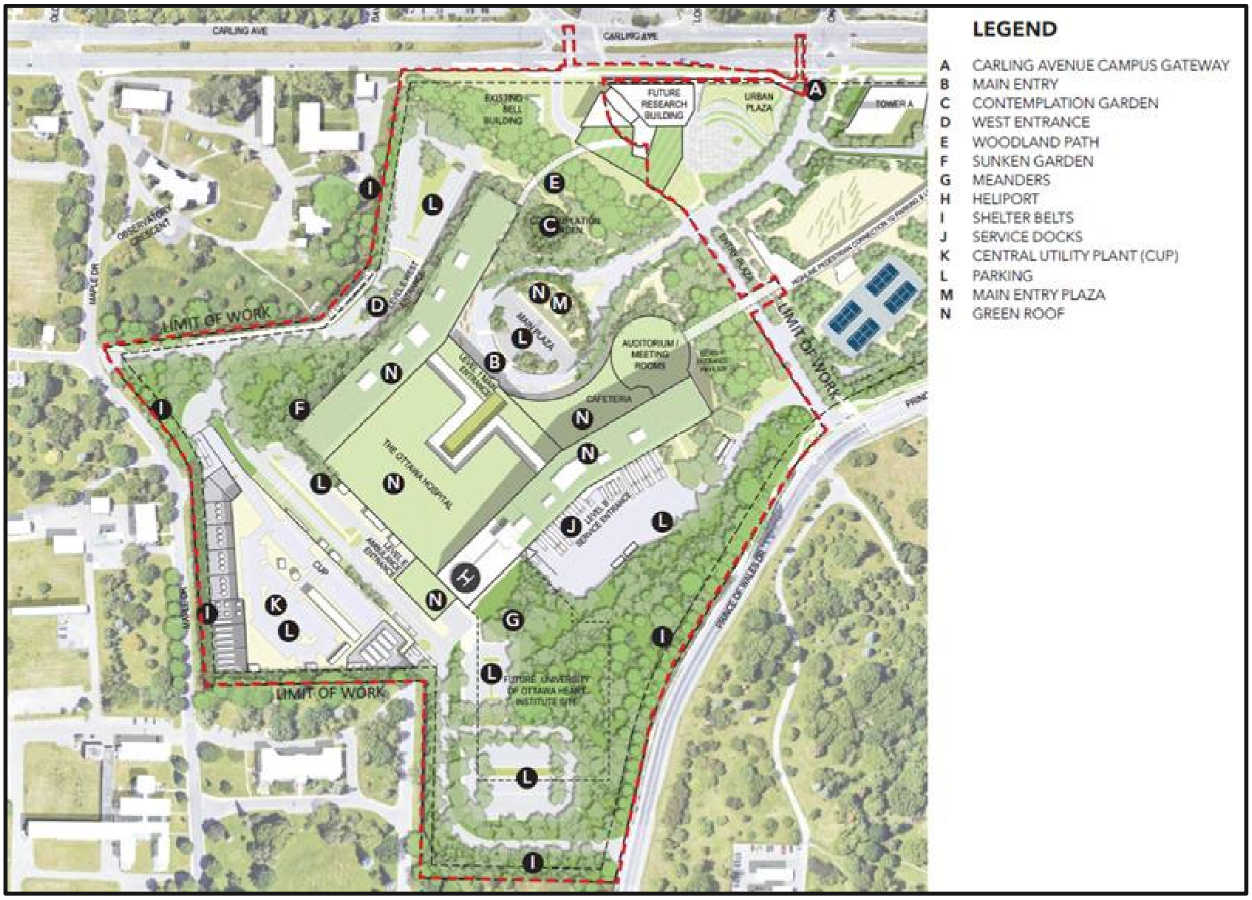
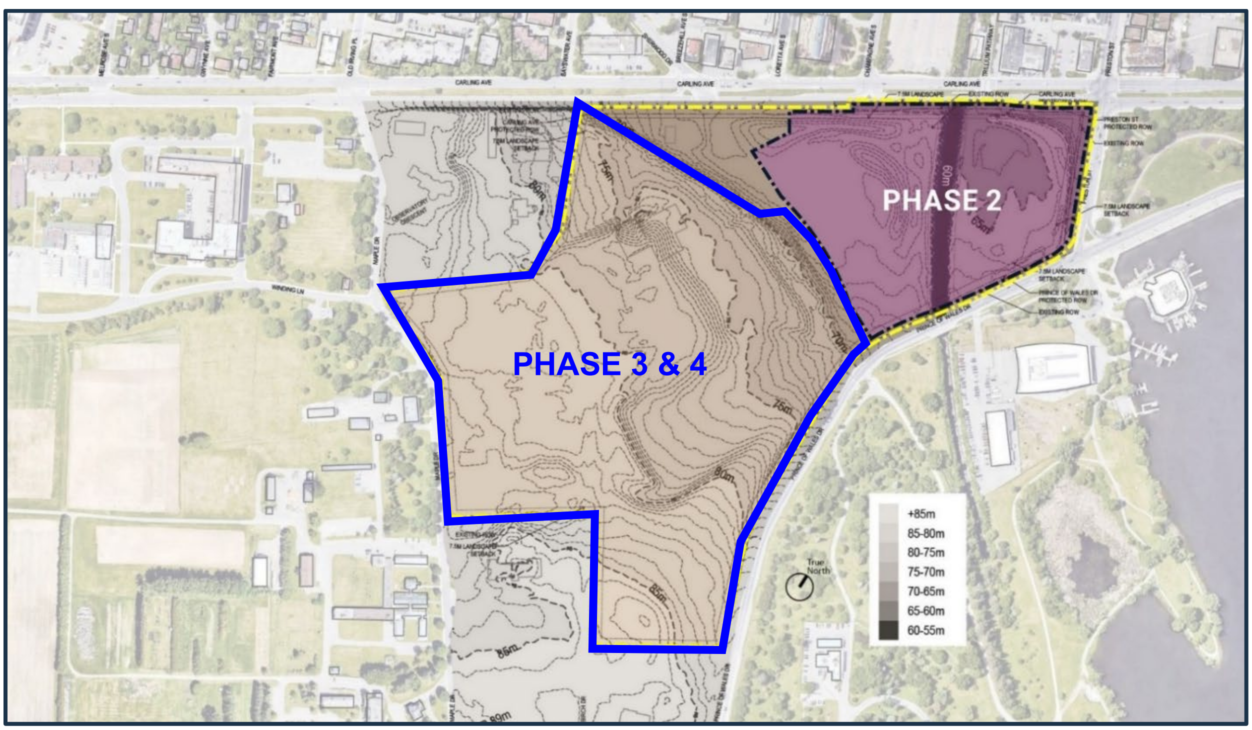


Figure 1-4: Site Topography



2.0 BACKGROUND DOCUMENTS

2.1 Design Guidelines

A list of the design guidelines referenced in the preparation of this report include the following:

- *City of Ottawa Sewer Design Guidelines 2nd Edition*, City of Ottawa, October 2012
  - *Technical Bulletin ISDTB-2012-2*, December 15, 2012
  - *Technical Bulletin ISDTB-2014-01*, City of Ottawa, February 5, 2014
  - *Technical Bulletin PIEDTB-2016-01*, City of Ottawa, September 6, 2016
  - *Technical Bulletin ISTB-2018-01*, City of Ottawa, March 21, 2018
  - *Technical Bulletin ISTB-2019-02*, City of Ottawa, July 08, 2019
  - *Technical Bulletin ISTB-2021-03*, City of Ottawa, August 18, 2021
- *City of Ottawa Design Guidelines – Water Distribution 1st Edition*, City of Ottawa, July 2010
  - *Technical Bulletin ISD-2010-2*, City of Ottawa, December 15, 2010
  - *Technical Bulletin ISDTB-2014-02*, City of Ottawa, May 27, 2014
  - *Technical Bulletin ISTB-2018-02*, City of Ottawa, March 21, 2018
  - *Technical Bulletin ISTB-2021-03*, City of Ottawa, August 18, 2021
- *Design Guidelines for Drinking Water Systems, Ministry of the Environment*, 2008
- *Design Guidelines for Sewage Works, Ministry of the Environment*, 2008
- *Stormwater Management Planning and Design Manual, Ministry of the Environment*, March 2003
- *City of Ottawa Fire Flow Study Survey Report, National Research Council Canada*, June 10, 2016
- *Water Supply for Public Fire Protection*, Fire Underwriters Survey, 2020
- *City of Ottawa Accessibility Design Standards*, City of Ottawa, 2015
  - *Technical Bulletin ISTB-2020-03*, City of Ottawa, September 24, 2020
- *Ottawa Standard Tender Documents*, City of Ottawa, 2022
- *Ontario Provincial Standards for Roads & Public Works*, April 2021
- *Ontario Building Code*, 2017
- *National Capital Commission Stormwater Management Manual*, Spring 2022

2.2 Mapping

A list of the mapping sources referenced in the preparation of this report includes the following:

- City of Ottawa Water Distribution System Interactive Map;
- City of Ottawa Sanitary (Sanitary, Storm, and Combined) Collection System Interactive Map;
- City of Ottawa GeoOttawa;
- City of Ottawa 1:1000 Topography Mapping;
- City of Ottawa Utility Coordinating Committee (UCC) Mapping;
- Public Service and Procurement Canada Utility Mapping; and
- Annis, O'Sullivan, Vollebekk Limited Survey of the New Ottawa Hospital Site Civic Campus.

2.3 Background Reports and Drawings

An information request was sent to the City of Ottawa on February 6, 2020, and a response was received on March 4, 2020. A list of the background drawings and reports received has been included in **Appendix A.**

An information request was sent to Public Services and Procurement Canada (PSPC) and a response was received on May 20, 2020. A list of the background drawings received has been included in **Appendix A.** It should be noted that a Master Servicing Study exists for the PSPC lands but was not available at the time this report was prepared. The Study Team was advised a hard copy of the report exists and due to COVID-19 restrictions, a copy of the report could not be provided. It should also be noted that in 2021 the operation and ownership responsibility of the private servicing was transferred to Agriculture and Agri-Food Canada (AAFC). Parsons and The Ottawa Hospital have continued to reach out to PSPC/AAFC and asked for assistance from the National Capital Commission to obtain the report. To date, the report has not been received.

2.4 Specialist Studies

The following specialist studies have been commissioned by The Ottawa Hospital and form part of the complete application for Site Plan Control Approval and Lifting of the Holding Zone for the Master Site Plan.

- Stage 1 Archaeological Assessment, prepared by Golder Associates Ltd., April 2020, or Latest Version.
- Stage 2 Archaeological Assessment, prepared by Golder Associates Ltd., July 2021, or Latest Version.
- Cultural Heritage Impact Statement, prepared by Golder Associates Ltd., July 2022, or Latest Version.
- Environmental Impact Statement and Tree Conservation Report – Master Site Plan, prepared by Parsons Inc., September 2021, or Latest Version.
- Phase One Environmental Site Assessment, The Ottawa Hospital – New Civic Campus, prepared by Golder Associates Ltd., April 2020, or Latest Version.
- Preliminary Geotechnical Review, prepared by Golder Associates Ltd., March 2021, or Latest Version.
- Environmental Noise & Vibration Assessment, prepared by Gradient Wind Engineers & Scientists, May 2021, or Latest Version.
- Design Brief and Planning Rationale – Master Site Plan, New Civic Development for The Ottawa Hospital, prepared by Parsons Inc., September 2021, or Latest Version
- Master Servicing Plan, The New Civic Development The Ottawa Hospital, prepared by Parsons Inc., July 2021, or Latest Version.
- Shadow Studies, New Civic Development for The Ottawa Hospital, prepared by HDR, August 2021, or Latest Version.
- Transportation Impact Assessment and Mobility Study, prepared by Parsons Inc., July 2021, or Latest Version.
- Pedestrian Level Wind Study, prepared by Gradient Wind Engineers & Scientists, April 2021, or Latest Version.

Reports specific to the Parking Garage were prepared subsequent to submission of the Site Plan Control Application for the Master Site Plan and further inform the application for the Site Plan Control for the Parking Garage:

- Addendum: Cultural Heritage Impact Statement for New Civic Development for the Ottawa Hospital, prepared by Golder Associates Ltd., November 2021, or Latest Version.
- Stage II Archaeological Assessment, prepared by Golder Associates Ltd., September 2021, or Latest Version.
- Phase II Environmental Site Assessment, Ottawa Hospital New Civic Campus Parkade, prepared by Golder Associates Ltd., September 2021, or Latest Version.
- Environmental Effects Analysis, Environmental Impact Assessment and Tree Conservation Report Update - Phase 2 Project: Parking Garage and Green Roof, prepared by Parsons Inc., February 2022 or Latest Version.
- Vegetation Management/Conservation Strategy and Contractor Education Program, prepared by Parsons Inc., February 2022, or Latest Version.
- Geotechnical and Hydrogeological Investigation Report, New Ottawa Hospital Development Phase 1 Parkade, prepared by Golder Associates Ltd., August 2021, or Latest Version.

- Design Brief and Planning Rationale, Phase 2: Parking Garage and Green Roof, prepared by Parsons Inc. with HDR and GBA, February 2022, or Latest Version.
- The Ottawa Hospital New Civic Development Parking Garage Schematic Design Report, prepared by HDR, June 2021, or Latest Version
- Site Servicing and Stormwater Management Report, prepared by Parsons Inc., March 2023, or Latest Version.
- Transportation Impact Assessment: Addendum #1 - Phase 2 Project: Parking Garage and Green Roof, prepared by Parsons Inc., January 2022, or Latest Version.

Reports specific to the Central Utility Plant and Main Hospital Building were prepared subsequent to submission of the Site Plan Control Application for the Master Site Plan and further inform the application for the Site Plan Control for the Central Utility Plant and Main Hospital Building.

- Cultural Heritage Impact Statement - Addendum, prepared by Golder Associates Ltd., November 10, 2022, or Latest Version.
- Phase II Environmental Site Assessment - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Golder Associates Ltd., September 2022, or Latest Version.
- Phase III Environmental Site Assessment, prepared by Paterson, TBD - at time of Developed Design.
- Environmental Effects Evaluation and Tree Conservation Report - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Parsons Inc., November 2022, or Latest Version.
- Vegetation Management/Conservation Strategy and Contractor Education Program - Addendum, prepared by Parsons Inc., TBD - September 2022.
- Geotechnical and Hydrogeological Investigation Report - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Golder Associates Ltd., September 6, 2022, or Latest Version.
- Addendum to Environmental Noise & Vibration Assessment - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Gradient Wind Engineers & Scientists, September 20, 2022, or Latest Version.
- Air Quality Study - New Campus Development, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Gradient Wind Engineers & Scientists, September 30, 2022, or Latest Version.
- Stationary Noise Assessment, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Gradient Wind Engineers & Scientists, September 30, 2022, or Latest Version.
- Pedestrian Level Wind Study and Snow Drift Assessment, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Gradient Wind Engineers & Scientists, October 4, 2022, or Latest Version.
- Planning Rationale - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Parsons Inc., November 2022, or Latest Version.
- Design Brief - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by HDR, November 30, 2022, or Latest Version.
- Site Servicing and Stormwater Management Functional Report - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Parsons Inc., April 2023, or Latest Version.
- Shadow Studies - New Campus Development, Phase 3 and 4, Central Utility Plan and MHB, prepared by HDR, TBD - September 2022.
- Transportation Impact Assessment and Mobility Study - Addendum #2, prepared by Parsons Inc., November 29, 2022, or Latest Version.
- Neighbourhood Traffic Management Strategy, prepared by Parsons Inc., December 2022, or Latest Version.
- Off-Site Parking Strategy, prepared by Parsons Inc., December 2022, or Latest Version.
- Transportation Monitoring Strategy, prepared by Parsons Inc., TBD - September 2022.
- Transportation Demand Management Strategy, prepared by Steer, December 2022, or Latest Version.

2.5 Meetings

The following meetings were held and attended to discuss the existing public and private infrastructure in the vicinity of the NCD:

2.5.1 City of Ottawa Meeting – April 30th, 2020

- A meeting was attended with the City of Ottawa on April 30th, 2020, to discuss the existing public infrastructure in the vicinity of the NCD; and
- Prior to the meeting, the City of Ottawa circulated the potential site's evaluation, **Appendix B**, that was completed during the selection process in 2016. The constraints presented within the potential site's evaluation are summarized in more detail throughout the report.

2.5.2 PSPC Meeting – May 27th, 2020

- A meeting was attended with PSPC on May 27th, 2020, to discuss the existing private infrastructure in the vicinity of the NCD;
- Need to ensure that all private servicing remains functional;
- No easements were reserved during negotiations;
- Further discussion is required on how the existing lands and proposed development will be serviced;
- A Master Servicing Study was previously completed for the PSPS lands. Only a hard copy exists and due to COVID-19 restrictions, a copy of the report could not be provided;
- All private sanitary sewers on PSPC lands have sufficient capacity to accommodate existing demands;
- Further discussion is required regarding how the existing lands and proposed development will outlet to existing public sanitary infrastructure (one connection versus two connections));
- The PSPC lands are currently serviced by two public watermains - one from Carling Avenue and one from Fisher Avenue;
- A bulk meter would be required if the proposed development is to be serviced from the existing private watermain on Maple Drive;
- Servicing the proposed development from the existing private watermain on Maple Drive has associated risks;
- An existing bulk meter is located on the existing watermain at the Carling Avenue and Maple Drive intersection;
- Further discussion with the City of Ottawa would be required regarding redundancy;
- All private storm sewers on PSPC lands have sufficient capacity to accommodate existing demands;
- The storm sewer outlet for the PSPC lands discharges to Dow's Lake/Canal (maintained by Parks Canada) and is owned by PSPC;
- The storm sewer outlet has been rehabilitated; and
- The existing infrastructure might be transferred over to the Central Experimental Farm sometime in the future.

2.5.3 City of Ottawa & National Capital Commission Pre-Consultation Meeting – June 23rd, 2022

- A meeting was attended with the City of Ottawa and National Capital Commission on June 28th, 2022, to kick off Phase 3 and Phase 4: Central Utility Plant and MHB as part of The Ottawa Hospital New Campus Development.
- Between now and about spring 2023, site plan approvals for the Main Hospital Building and Central Utility Plant will be sought.
- The required plans and studies list for the Site Plan Control Application and Federal Land Use Design Approval was provided by the National Capital Commission and the City of Ottawa, **Appendix C**.

2.5.4 City of Ottawa & National Capital Commission Site Servicing & Stormwater Management Meeting – August 25th, 2022

- A meeting was attended with the City of Ottawa and National Capital Commission on August 25th, 2022, to provide an update on the site servicing and stormwater management design of Phase 3 and Phase 4: Central Utility Plant and Main Hospital Building as part of The Ottawa Hospital New Campus Development.

2.5.5 Approving Authority Site Servicing & Stormwater Management Meeting – March 21st, 2023

- A meeting was attended with the City of Ottawa, National Capital Commission, Parks Canada, Agriculture and Agri-Food Canada, and Public Services and Procurement Canada to review comments related to the November 2023 submission and discuss anticipated response/approach to be included in next submission.

3.0 EXISTING INFRASTRUCTURE

The existing site is not serviced by municipal (City of Ottawa) infrastructure. It should be noted that the existing property was previously owned and operated by PSPC. Existing private infrastructure (water, sanitary, and storm) is currently located within the site which is still in operation. In 2021, the operation and ownership responsibility of the private servicing was transferred to AAFC. The existing infrastructure will require relocation for the development of the Central Utility Plant (Phase 3) and the Main Hospital Building (Phase 4) Projects.

3.1 Existing Water Infrastructure

The NCD is located within the 1W and 2W2C pressure zones, south of the Lemieux Island Water Treatment Plant. The easterly parcel is located within the 1W pressure zone, and the westerly parcel is located within the 1W and 2W pressure zones.

The existing municipal watermain infrastructure within the vicinity of the NCD is as follows:

- Carling Avenue → 1067mm diameter watermain;
- Carling Avenue → 406mm diameter watermain;
- Preston Street → 152mm diameter watermain (east); and
- Preston Street → 152mm diameter watermain (west).

There is no existing municipal water infrastructure located within Prince of Wales Drive.

The existing private watermain infrastructure within the vicinity of the NCD is as follows:

- Maple Drive → 406mm diameter private watermain
- Birch Drive → 305mm diameter private watermain
- National Capital Commission Driveway → 406mm/305mm diameter private watermain

The existing municipal and private watermain infrastructure is illustrated in **Figure 3-1**.

3.2 Existing Combined Sewer Infrastructure

The NCD is located within an area of the City of Ottawa that contains a complex network of hydraulic sewer structures including the Preston-Booth Trunk (a combined sewer system).

The existing municipal combined sewer infrastructure within the vicinity of the NCD is as follows:

- Preston-Booth Trunk → 1800mm diameter combined sewer. The Preston Trunk is diverted to the Booth Street sewer at Spruce Street. The Preston Trunk north of Spruce Street was converted to a storm sewer years ago which eventually discharges to the Tailrace; and
- Preston Street → 300mm diameter combined sewer.

The existing municipal combined sewer infrastructure is illustrated in **Figure 3-2**.

3.3 Existing Sanitary Infrastructure

The NCD is located within an area of the City of Ottawa that contains a complex network of hydraulic sewer structures including the Mooney's Bay Collector (a sanitary sewer system).

The existing municipal sanitary sewer infrastructure within the vicinity of the NCD is as follows:

- Mooney's Bay Collector → 1050mm diameter sanitary sewer. The Mooney's Bay Collector is a 1050mm diameter concrete sewer that cuts through the westerly parcel (within an existing easement). This easement borders the western edge of the proposed parking garage structure; and
- Carling Avenue → 225mm/300mm diameter sanitary sewer.

The existing private sanitary sewer infrastructure within the vicinity of the NCD is as follows:

- Maple Drive → 250mm diameter private sanitary sewer
- Birch Drive → 250mm diameter private sanitary sewer
- National Capital Commission Driveway → 250mm diameter private sanitary sewer

The existing municipal and private sanitary sewer infrastructure is illustrated in **Figure 3-2.**

3.4 Existing Stormwater Infrastructure

The western parcel of the NCD is located within the most upstream point of the major tributary drainage area for the Nepean Bay Trunk and the most downstream point of a tributary area for Dows Lake. The eastern portion of the western parcel conveys runoff to the Carling Avenue storm sewers (municipal infrastructure) which discharges into the Champagne Avenue storm sewer. The Champagne Avenue storm sewer continues along Loretta Avenue, north of Gladstone Avenue. This storm sewer discharges into the Nepean Bay Trunk before ultimately discharging to the Ottawa River. The western portion of the western parcel conveys runoff through private AAFC infrastructure from the federal lands (Central Experimental Farm) towards Prince of Wales Drive and eventually to Dow's Lake.

The eastern parcel of the NCD conveys runoff into an onsite storm sewer drainage system that discharges to the Preston Trunk (combined system), located at the intersection of Carling Avenue and Preston Street.

The overland flow for the entire site flows towards Carling Avenue and is part of the Mooney's Bay major tributary drainage area.

The existing municipal storm sewer infrastructure within the vicinity of the site is as follows:

- Carling Avenue → 300mm/375mm/450mm/525mm diameter storm sewers;
- Nepean Bay Trunk → 1800mm diameter storm sewers

The existing private sanitary sewer infrastructure within the vicinity of the site is as follows:

- Maple Drive → 300mm/525mm/600mm diameter private stormwater sewer
- Birch Drive → 900mm diameter private stormwater sewer
- Dow's Lake Outfall →1350mm diameter private stormwater sewer
- Federal Land → 300mm/450mm/600mm diameter private stormwater sewer

The existing municipal and private storm sewer infrastructure is illustrated in **Figure 3-3**. Photographs of the existing Dow's Lake Outfall are shown in **Figure 3-4**, **Figure 3-5**, and **Figure 3-6**.

Figure 3-1: Existing Water Infrastructure

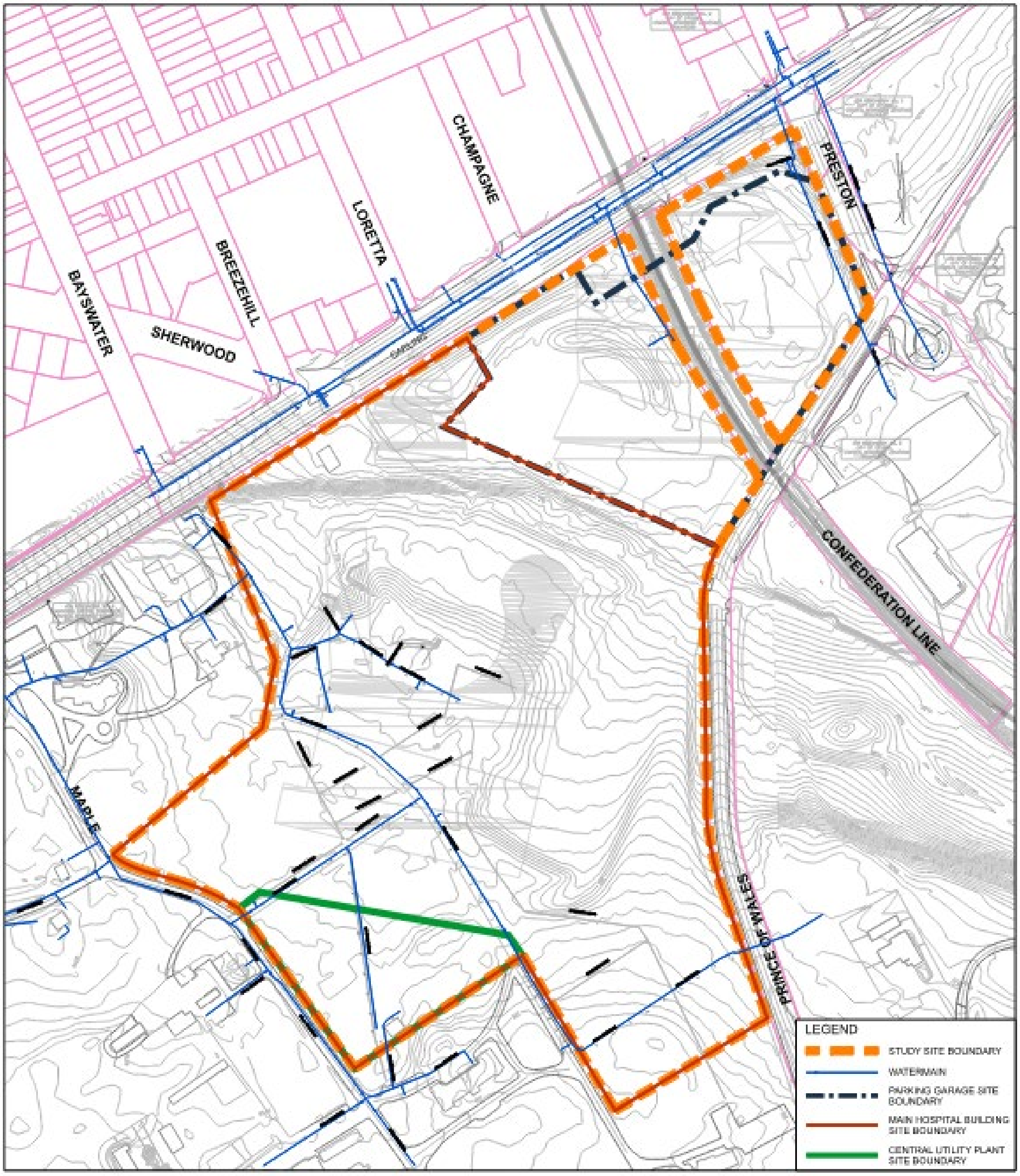


Figure 3-2: Existing Sanitary and Combined Infrastructure

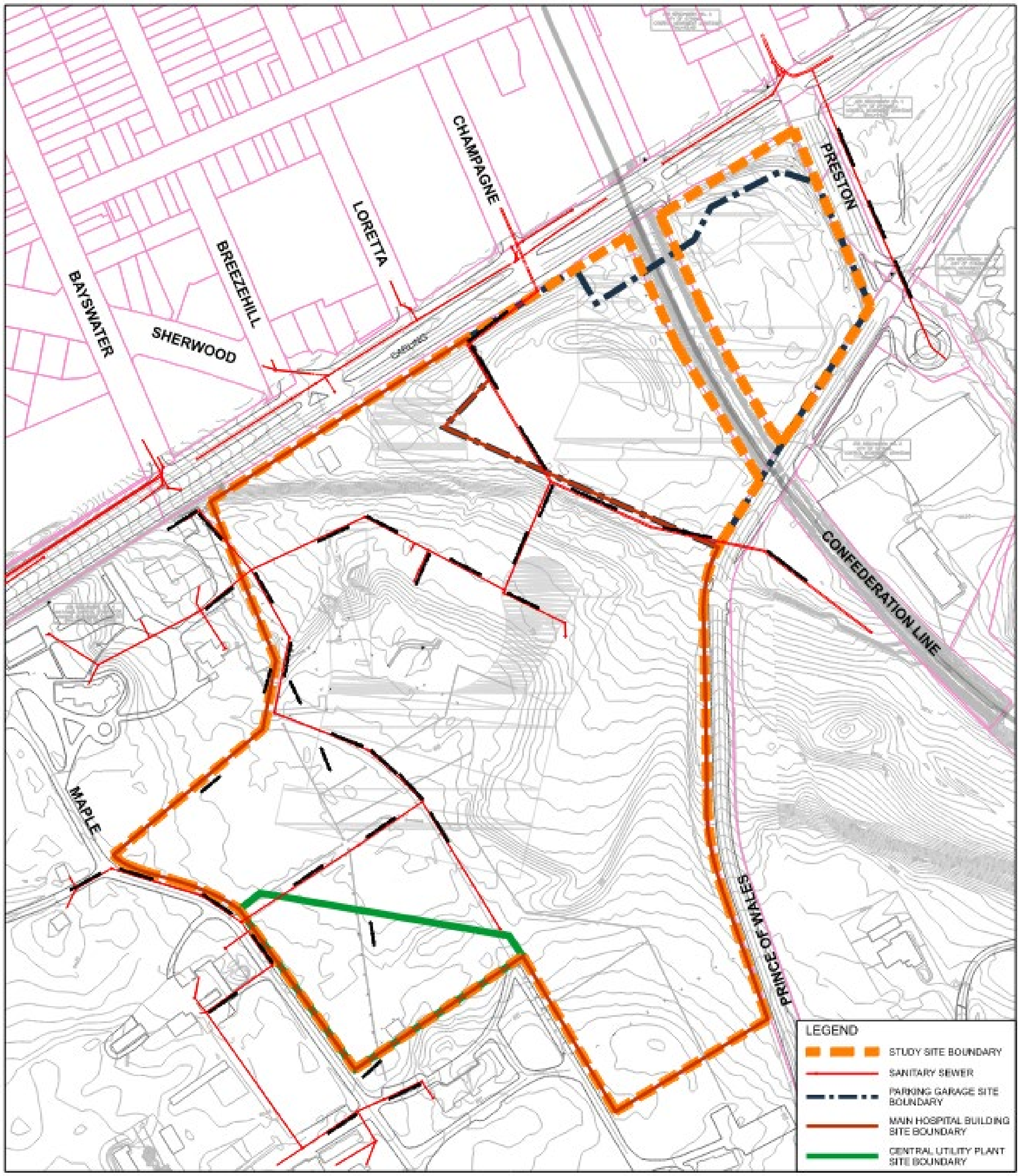


Figure 3-3: Existing Stormwater Infrastructure

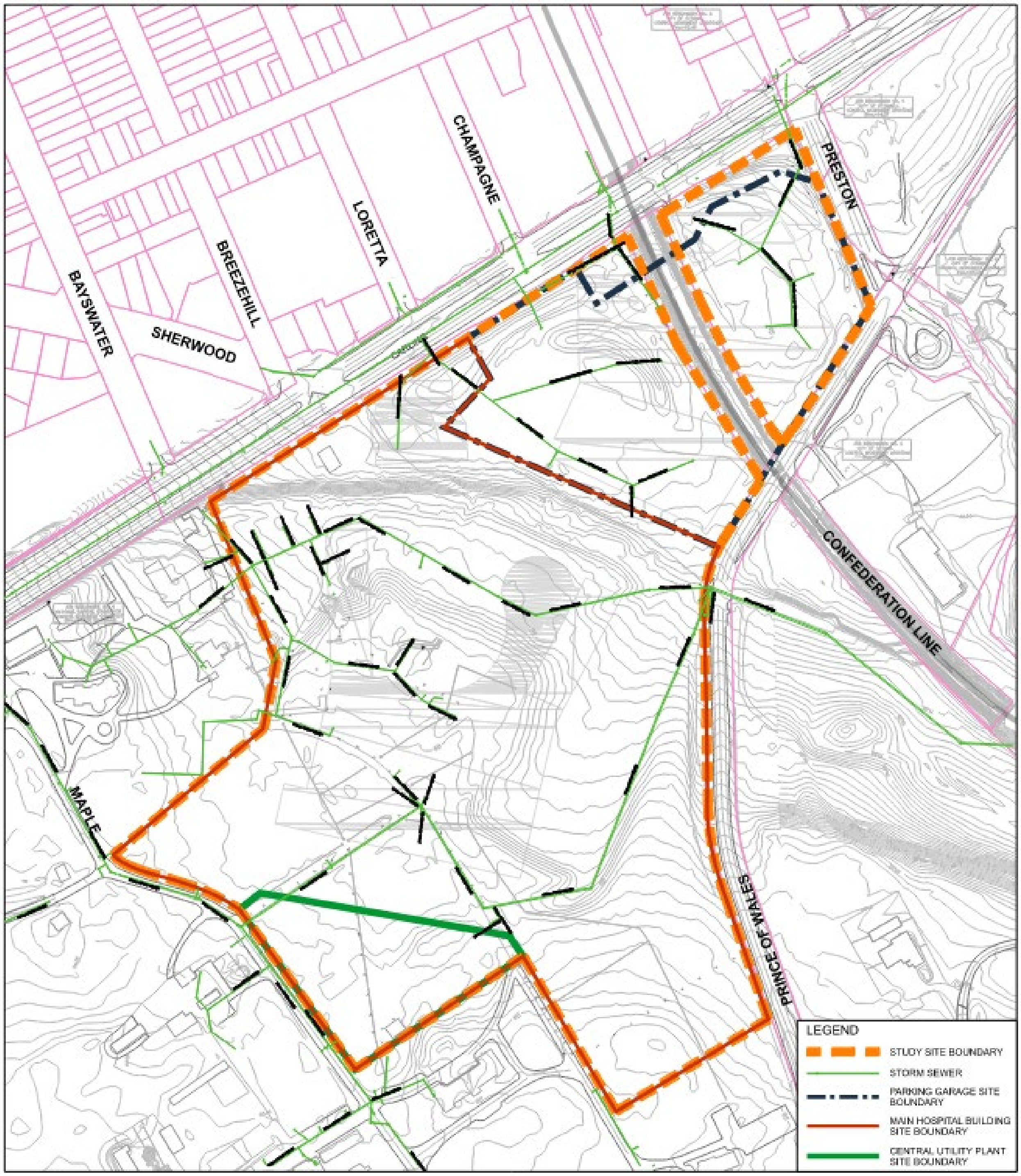


Figure 3-4: Dow's Lake Outfall – July 2022

Figure 3-5: Dow's Lake Outfall – December 2022

Figure 3-6: Dow's Lake Outfall – December 2022

4.0 CONSULTATIONS AND PERMITS

The City of Ottawa and agencies were consulted for this project. A summary of the consultations is provided below; copies of the correspondences and/or minutes are provided in **Appendix C.**

4.1 Consultations

4.1.1 City of Ottawa and National Capital Commission

The following studies and plans were identified by the City of Ottawa and National Capital Commission as being required for the Central Utility Plant (Phase 3) and Main Hospital Building (Phase 4) project site application.

4.1.1.1 Studies

- Design Brief and 3D Renderings;
- Response to National Capital Commission Performance Criteria;
- Planning Rationale;
- Shadow Study;
- Site Servicing and Stormwater Management Functional Report;
- Sky Illumination Study;
- Environmental Impact Assessment/Environmental Effects Evaluation and Tree Conservation Report Update;
- Wildlife Mitigation and Monitoring Plan;
- Vegetation Management Conservation Strategy and Education Program;
- Transportation Impact Assessment;
- Noise and Vibration Analysis;
- Wind Study;
- Geotechnical Report;
- Phase 3 Environmental Site Assessment;
- Cultural Heritage Impact Statement Addendum; and
- High Performance Development Standards.

4.1.1.2 Plans

- Plan of Survey
- Overall Site Plan
- Landscape Plan
- Architectural Elevations/Sections
- Site Lighting Plan
- Engineering Drawings
  - Site Servicing Plan
  - Grade Control and Drainage Plan
  - Stormwater Management Plan
  - Existing Conditions Plan
  - Excavation Plan
  - Building and Site Interfaces with Public Realm and Landscape
  - Views Analysis and Conceptual Renderings
  - Floor Plates
  - Grading and Landscape Integration
  - Exterior Material Selection and Colour Palette
  - Bird Friendly Design
- Composite Utility Plan

- Mechanical and Electrical Drawings
- Road Modification Design

4.1.1.3 Design Review Panel Requirements

- UDRP Design Package
- ACPDR Design Package

Rideau Valley Conservation Authority (RVCA)

RVCA will require enhanced water quality protection (80% Total Suspended Solids (TSS) removal), and best management practices are generally encouraged to maximize on-site quality protection. The communication with the RVCA is included in **Appendix C.**

Ministry of the Environment, Conservation and Parks (MECP)

An Environmental Compliance Approval (ECA) may be required as stormwater will discharge to an existing outlet to Dow's Lake. Need to determine if the existing outlet is an approved or unapproved outlet.

4.2 Permits and Approvals

The City of Ottawa and the various agencies consulted require the approvals and permits listed below. The City of Ottawa Development Servicing Study Checklist is included in **Appendix D.**

City of Ottawa

- Site Plan Agreement
- Road Cut Permit
- Commence Work Order
- Water Permit
- Water Data Card
- Flow Control Roof Drainage Declaration
- Tree Cutting Permit

Ontario Ministry of the Environment, Conservation and Parks

- Environmental Compliance Approval
- Permit to Take Water

National Capital Commission

- Federal Land Use and Design Approval

The following approvals have been granted by the City of Ottawa and the National Capital Commission for the New Campus Development to date, refer to **Appendix D** for approval summary chart:

4.2.1 City of Ottawa

- Site Plan Agreement (D07-12-21-0159) – Master Site Plan (2021-10-27)
- Site Plan Agreement (D07-12-21-0159) – Parking Garage Delegated Authority Report (2022-09-27)

4.2.2 National Capital Commission

- FLUDA (IAMIS #19923) Master Site Plan and Amendment to the Capital Urban Lands Plan (2021-11-22)
- FLUDA (IAMIS #24020) Parking Garage Early Works #1 (2022-03-24)
- FLUDA (IAMIS #23474) Parking Garage Schematic Design (2022-06-24)
- FLUDA (IAMIS #24021) Parking Garage Early Works #2 (2022-10-08)
- FLUDA (IAMIS #24432) Remediation (2022-11-14)

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 Geotechnical and Hydrogeological Investigation

Golder Associates Limited completed a geotechnical report, *Geotechnical and Hydrogeological Investigation New Campus Development Phase 3 and 4 – Central Utility Plant and Main Hospital Building – DRAFT*, provided under separate cover.

The report's recommendations regarding grading, site servicing, and drainage are summarized below. Refer to the report, submitted under separate cover, for further detail.

5.1.1 Site Grading

The development site for the Central Utility Plant and Main Hospital Building has a complex grading scheme which is further complicated by the existing topography.

5.1.1.1 Grade Lowering

- The development site will require grade lowering.
- Significant slopes and/or retaining walls will be required to achieve the current proposed grades.
- Additional geotechnical input will be required based on final grades and locations of the various slopes and retaining walls.
- Grade lowering below the existing groundwater table will be required to achieve the current proposed grades. Significant permanent drainage works will need to be incorporated within these areas.
- Permanent drainage work will need to be further studied during detailed design.

5.1.1.2 Grade Raising

- The development site is underlain by discontinuous fill overlying localized silty clay deposits and native glacial till and silt/sand deposits. The majority of these soils are not expected to be sensitive to typical grades raise.
- The northwest corner of the site encountered unweathered, sensitive silty clay. The extent of this clay is not known with certainty, but it seems to be located at the north end of the Tower A and Tower B. The presence of this layer is not a significant concern for moderate grade changes but significant grade raising will require additional geotechnical inputs based on final grades.
- Topsoil and fill, containing deleterious fill material, should be stripped.
- Compacted engineered fill consisting of Granular B Type I or Type II (City of Ottawa SP F-3147) can be used under hard surfaces or structures where excavations need to be brought up to grade.
- General earth fill can be used under landscaped areas where excavations need to be brought up to grade.
- Engineered fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density under pavements and hard surfaces or 100% of the materials Standard Proctor Maximum Dry Density under foundations and structures.
- Existing granular fill material would need to be reviewed during construction to determine re-use suitability.

5.1.2 Foundations

- The subsurface conditions at the development site are variable deposits of fill, localized deposits of silty clay, with glacial till overlying sand and gravel in some locations over shaley limestone bedrock.
- The Main Hospital Building will most likely be supported on deep foundations piles whereas smaller structures (i.e. retaining walls, standalone structures, etc.) will most likely be supported on shallow foundations.

- Refer to the Geotechnical Report for further discussions related to both foundation types (deep and shallow).

5.1.3 Excavations & Groundwater Control

5.1.3.1 Temporary Excavations

- Excavations will need to be made in a series of permanent and temporary steps, terraces, slopes, etc. Some of which will eventually be backfilled and some of which will be permanent.
- No unusual problems are anticipated with excavating the overburden using conventional hydraulic excavation equipment.
- The condition of the area around the former Sir John Carling Building should be confirmed and documented carefully to aid in construction planning of the new Main Hospital Building.
- Excavations above the groundwater and within the fill, silty sand, native silty clay, and glacial till should be stable at 1H:1V side slopes in the short term. These soils would be classified as Type 3.
- Excavation below the groundwater and within the silty and sandy soils (both fill and native) require minimum 3H:1V side slopes. These soils would be classified as Type 4. If the groundwater is lowered and maintained below the excavation, unsupported side slopes may be steepened to 1H:1V.
- Permanent drainage works will need to be incorporated since grades are expected to be below the groundwater level.
- Height of excavations (up to 12m) exceeds the height for prescriptive design under the Ontario Health and Safety Act. Deeper excavations (even if open cut) will require an engineered design in accordance with relevant regulations.
- Shoring systems can be implemented where sufficient space is not available and/or limiting the area of impact is preferred. Typical shoring includes tied back sheet pile walls or soldier pile and lagging systems.
- The shoring system required for this type of project is typically designed and constructed by a Specialist Contractor. The system needs to support the surrounding soils as well as adjacent structures, roads, utilities, etc.
- Excavations for site services can be completed by sloping excavations where space permits or vertical sides complete with fully braced steel trench boxes or shoring systems.

5.1.3.2 Groundwater Control

- Temporary lowering of the groundwater table will be required during construction.
- Significant groundwater inflow is expected during construction and careful groundwater management will be required.
- Groundwater management will need to include active dewatering from wells and well-points systems in deep excavations. Excavations just below the groundwater table may be able to be controlled by pumping from properly filtered sumps.
- Soils are sensitive to disturbance and failure to control groundwater will result in excessive soil disturbance in the base of excavations as well as potential piping, heave, and other safety concerns for temporary excavations.
- A Ministry of the Environment, Conservation and Parks Environmental Activity and Sector Registration is required for pumping that exceeds 50,000L/day but less than 400,000L/day.
- A Ministry of the Environment, Conservation and Parks Environmental Activity Permit to Take Water is required for pumping that exceeds 400,000L/day and must be supported by a Hydrogeological Report.
- A Permit to Take Water will be required for this project.
- The extents and depths of the required excavations should be reviewed in detail to determine the potential extent of groundwater drawdown as it could extend outside the site boundary.

- Permanent drainage works will be required in exterior areas where the grade is being permanently lowered below the groundwater level.
- Permanent drainage work will need to be further studied during detailed design.

5.1.4 Foundation Wall Backfill and Drainage

- Foundation and basement walls should be backfilled with non-frost susceptible sand or sand and gravel conforming to the City of Ottawa SP F-3147.
- Backfill materials should be placed in 300mm lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density to avoid ground settlement.
- Backfill adjacent to the wall should be placed to form a frost taper in areas where hard surfaces are adjacent to the building to reduce differential frost heaving. Frost taper should be brought up to the pavement subgrade level from 1.5m below the finished exterior grade at a slope of 3H:1V (or flatter) away from the wall. The fill should be placed in maximum 300mm thick lifts and should be compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.
- Foundation wall should be wrapped in a drainage board (Miridrain or similar) and be drained by a perforated pipe subdrain in a surround of 19mm clear stone, fully wrapped in geotextile, which leads via gravity to a storm sewer of pumped from a sump pit.
- Subdrains should be provided below the basement level (perforated pipe drains place on 6m centres) since it will be below the existing groundwater table.
- Long-term flow estimates can be determined based on the final proposed basement layout and depth as part of the hydrogeological study required as part of the Permit to Take Water.

5.1.5 Site Servicing

- Excavations should be conducted in accordance with guidance provided for temporary excavations.
- Existing fill should be reviewed and approved by a qualified geotechnical engineer. It may not be found suitable.
- Engineered fill should consist of imported Granular B Type II (City of Ottawa SP F-3147) or suitable approved materials previously excavated from the site.
- Engineered fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density. It should extend down and away from the bottom of the bedding to the undisturbed native subgrade at a slope of 1H:1V.
- 150mm of Granular A (City of Ottawa SP F-3147) should be used for pipe bedding.
- A sub-bedding layer may be necessary and should consist of 300mm of compacted Granular B Type II (City of Ottawa SP F-3147).
- Bedding should extend to the spring line of the pipe and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.

5.1.6 Trench Backfill

- Trench backfill should conform with City of Ottawa SP F-2120.
- Trench backfill above the pipe cover material may consist of approved excavated material such as the existing fill (provided that it is free of organic matter and other deleterious materials) and non-clayey native soils, where the service pipes will be overlain by pavements or other hard surfacing. The fill that contains organic matter or deleterious materials are not suitable for reuse as trench backfill and should be wasted upon excavation.
- Imported backfill, if required, should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (City of Ottawa SP F-3147).

- It is important for frost heave compatibility that the trench backfill within the frost zone (i.e., between the pavement subgrade level and 1.8m depth below pavement grade) matches the soil exposed on the trench walls.
- Trench backfill should be placed in maximum 300mm loose lifts and be uniformly compacted to at least 95% of the materials Standard Proctor Maximum Dry Density. Backfilling operations during cold weather should avoid inclusions of frozen lumps of material, snow, and ice.
- If the construction schedule allows a delay between service installation/trench backfilling and final paving should be made to allow for settlement of the trench backfill material, which will reduce the magnitude of differential movement (i.e., sagging) of pavements placed over backfilled trenches.

5.1.7 Pavement Design

5.1.7.1 Profile Grade

- No significant post-construction primary consolidation or secondary compression settlements of the subgrade soils are expected.
- Some settlement above the service trenches should be expected due to settlement of backfill. Magnitude of settlement should be within tolerable limits if compaction is conducted in accordance with the geotechnical report.

5.1.7.2 Subgrade Preparation

- Existing fill may need to be removed to accommodate the full depth of the new pavement structure.
- All deleterious material should be removed from all pavement areas.
- It should be feasible to leave the existing inorganic fill in place beneath the pavement structure. In this case, the subgrade should be proof rolled prior to the placement of new fill.
- Areas requiring grade raising to the proposed subgrade level should be filled using acceptable earth borrow (OPSS MUNI 206/221), Select Subgrade Material (OPSS MUNI 1010), or additional granular base if the grade changes are minor.
- Fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.

5.1.7.3 Pavement Drainage

- Subgrade surface should be crowned or sloped to promote drainage of the roadway granular structure.
- Perforated pipes should be provided along the low sides of the roadway along the entire length.
- Geotextile should Class I nonwoven (OPSS 1860) and should have a maximum apparent opening size of 212um.
- Subdrains should be connected to the catchbasins such that the pavement structure will have positive drainage and intercept flows within the subbase.
- Subdrains should drain on existing slopes.
- Backfilling of catchbasin laterals below the subgrade should be completed using acceptable native soils or fill that match the material types expose in the lateral trench walls to reduce potential problems associated with differential frost heaving.

5.1.7.4 Granular Pavement Materials

- Granular base and subbase for new construction should consist of Granular A and Granular B Type II (SP F-3147), respectively.
- Existing fill within the project limit does not meet the requirements for Granular A or Granular B Type II and cannot be reused as general trench backfill or as subgrade material for pavements.

5.1.8 Pavement Design

5.1.8.1 Parking Areas

The pavement structure for parking areas is shown in **Table 5-1**.

Table 5-1: Recommended Pavement Structure – Parking Areas

Thickness (mm)	Material Description
50	Superpave 12.5mm Surface Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 58-34 for Traffic Category B.

5.1.8.2 Local Routes

The pavement structure for local and access roads, not exposed to bus or heavy truck traffic, is shown in Table 5-2.

Table 5-2: Recommended Pavement Structure – Local Routes

Thickness (mm)	Material Description
40	Superpave 12.5mm Surface Course
50	Superpave 19.0mm Binder Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 58-34 for Traffic Category B.

5.1.8.3 Collector Routes

The pavement structure for collector roads, exposed to bus or heavy truck traffic, is shown in Table 5-3.

Table 5-3: Recommended Pavement Structure – Collector Routes

Thickness (mm)	Material Description
50	Superpave 12.5mm FC1 Surface Course
70	Superpave 19.0mm Binder Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 64-34 for Traffic Category C.

5.1.8.4 Rigid Pavement

The pavement structure for rigid pavement (if required) is shown in **Table 5-4.**

Table 5-4: Recommended Pavement Structure – Rigid Pavement

Thickness (mm)	Material Description
200	Portland Cement Concrete
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The Portland cement concrete should meet the requirements of CSA A 23.1 Class C2 exposure. Concrete joint specifications and spacing should be in accordance with OPSD 552.020 and 551.010.

5.1.8.5 Pavement Structure Compaction

- Adequate compaction is essential to the continued acceptable performance of the roadway.
- Compaction should conform with OPSS 501 – Construction Specification for Compacting. Compacted densities of various materials should conform with Subsection 501.08.02 Method A.
- Granular base and subbase materials should be compacted to a least 100% of the Standard Proctor Maximum Dry Density.
- Compaction of the asphaltic concrete should conform OPSS 310 Table 10.
- Placement and compaction of all engineered fill and bedding and backfill for services should be inspected to ensure the materials confirm with the grading and compaction specifications.
- Compaction testing and sampling of the asphaltic concrete should be conducted during construction.

5.1.8.6 Joints, Tie-Ins with Existing Pavements, Pavement Resurfacing

- At intersections, the new pavement structure should be continued at least to the limits of construction of the end of the curb return.
- At these streets, the pavement should be milled back beyond the curb return an additional 300mm to a depth of 40mm to accept the surface course asphaltic concrete.
- Pavement granular and subgrade level should be tapered between new and existing pavements using 10H:1V tapers.
- Tack coat should be provided on all vertical and milled horizontal surfaces.
- Tack coat should consist of SS-1 emulsified asphalt diluted with an equal amount of water.
- Undiluted and emulsified asphalt shall conform with OPSS 1103.

5.1.9 Reuse of Existing Soils

- Native glacial till (given it has suitable water content for compaction) may be reused as backfill within service trenches provided the materials are frost compatible.
- Existing soils are likely suitable for reuse as pavement structure base/subbase materials or engineered fill.
- Heterogeneous fill and buried topsoil would not be considered suitable for reuse and pavement structure base/subbase, but portions may be used for trench backfill and grading if reviewed and approved during excavation.
- Reclaimed asphalt pavement and/or reclaimed concrete material may be used as granular material as stated in OPSS MUNI 1010 Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material.

- Reclaimed asphalt pavement may be used in the asphaltic concrete mixes in accordance with OPSS MUNI 1151.

5.1.10 Corrosion and Cement Type

- Water-soluble sulphate (SO4) content in the tested samples was above 150mg/L and below 1,500mg/L.
- Concrete made with moderate sulfate resistance (S-3) type cement should be acceptable for buried concrete elements.
- Elevated potential for corrosion of exposed ferrous metal should be considered in the design of substructures.
- Corrosion protection systems of steel coating may be required but should be selected by a Structural Engineer.
- Higher chloride content should be considered on the design of substructures.

5.1.11 Additional Considerations

- Golder Associates Limited should be retained to review the final drawings and specifications prior to construction to ensure that the guidance provided within the Geotechnical Report was adequately interpreted.
- All prepared subgrade surfaces for roadways, parking areas, floor slabs, foundations, etc. should be reviewed by Golder Associates Limited to ensure they have been prepared adequately.
- Installation of piled foundations should be reviewed on a full-time basis by Golder Associates Limited.
- Placement and compaction of all engineered fill should be inspected and tested to ensure materials confirm with both the grading and compaction specifications.
- Soil samples collected as part of the Geotechnical Investigation are only maintained for three (3) months following the issuance of the report.
- Ontario Regulation 903 requires abandonment of the monitoring wells installed within the boreholes as part of the Geotechnical Investigation. However, these devices will be useful during construction and should be decommissioned as part of the construction contract.

5.2 Preliminary Groundwater Inflow Estimate

Golder Associates Limited completed a geotechnical technical memorandum, *Preliminary Groundwater Inflow Estimate Ottawa Hospital Expansion.*

The technical memorandum is summarized below. Refer to the technical memorandum, submitted under separate cover, for further detail.

- The groundwater inflow estimates are based on the following information:
  - A finished floor elevation of 70.38m for the MHB.
  - A finished floor elevation of 73.54m for the central utility plant.
  - Groundwater elevation measurements and hydraulic conductivity estimates described within the report titled "Geotechnical and Hydrogeological Investigation, New Campus Development Phase 3 and Phase 4 Central Utility Plant and Main Hospital Building" prepared by Golder, September 2022.
- Groundwater levels at the south end of the hospital building were found to be between 75m and 76m.
- Groundwater levels further to the north were found to be between 72m and 73m.
- It is expected that the excavation for the Main Hospital Building will be below the existing groundwater levels in predominately silty and sandy soils.
- It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction.

- A simplified analytical solution was used to estimate the potential groundwater inflow into the MHB building basement excavation.
    - The estimate assumed the initial groundwater level was 0.5m higher than the values measured in the monitoring wells and that they would need to be lowers to 1.0m below the finished floor elevation of the hospital basement.
    - Dewatering for the excavation is estimated to be between 400,000L/day and 900,000L/day for steady state inflow.
    - Dewatering for the excavation is estimated to be between 5,000,000L/day and 7,000,000L/day for initial inflow
- Groundwater levels at the central utility plant were found to be around 76m.
- It is expected that the excavation for the central utility plant will be below the existing groundwater levels in predominately silty and sandy soils.
- It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction.
- A simplified analytical solution was used to estimate the potential groundwater inflow into the central utility plant excavation.
    - The estimate assumed the initial groundwater level was 0.5m higher than the values measured in the monitoring wells and that they would need to be lowers to 1.0m below the finished floor elevation of the central utility plant.
    - Dewatering for the excavation is estimated to be around 180,000L/day for steady state inflow.
    - Dewatering for the excavation is estimated to be between 1,900,000L/day for initial inflow.
- The estimated radius of influence of the dewatering is estimated to range from around 25m and 75m for the Main Hospital Building and around 40m for the central utility plant.
- The estimated radius of influence does not intersect the heritage buildings located southeast of the central utility plant.
- The estimated radius of influence does intersect the heritage building located west of the central utility plant.
- The amount of drawdown estimated at the heritage building located west of the central utility plant is minimal.
- The slopes of the groundwater levels measured at the site were not able to be represented within the analytical model.
- The assumptions result in a potential overprediction of inflow in areas with less groundwater drawdown.
- Groundwater estimates are preliminary and include several simplified assumptions.
- A numerical model should be completed to better represent the complex geometry of the excavation, the variability in the overburden deposits, and the sloping water table.
- In areas where the grade is being permanently lowered below the groundwater level, permanent drainage works will be required. The volume of groundwater to be managed in the permanent drainage system is anticipated to be similar to the steady-state inflow amounts.
- Permanent drainage works will need to be further studied during detailed design.

6.0 GEOTECHINCAL RECOMMENDATIONS – ROADWAY MODIFICATIONS

Golder Associates Limited completed a geotechnical investigation in support of the proposed road works surrounding the NCD site for The Ottawa Hospital. Full details of the investigation are provided in the geotechnical technical memorandum *“New Ottawa Hospital Development Phase 1, Roadway Modifications and Municipal Infrastructure Improvements Along Carling Avenue, Preston Street, and prince of Wales Drive, Ottawa, Ontario”*, provided under separate cover.

6.1 Excavations

6.1.1 Excavation

- Excavations for municipal services will be through existing asphalt, base/subbase fill, peat/topsoil, variable heterogeneous fill, native glacial till (where present) and into bedrock in many locations.
- Excavations will likely extend below the groundwater level in some location, which was encountered at depths ranging from 1.8m to 2.6m below ground surface.

6.1.2 Overburden

- No unusual problems are anticipated in excavating the majority of the overburden materials using conventional hydraulic excavating equipment.
- Soils above the water table would be classified as a Type 3 soil. Excavations in these materials may be made with side slopes at 1 Horizontal to 1 Vertical (1H:1V).
- Silty and sandy soils (fill and native) below the water table would be classified as a Type 4 soil. Excavations in these materials would require side slopes at a minimum 3H:1V. If groundwater levels are lowered below the depth of excavation, unsupported side slopes may be steepened to 1H:1V.
- Excavation slopes could be steeper with the implementation of fully braced steel trench boxes or shoring systems if sufficient space does not exist.
- Stockpiling beside the excavation should be avoided.

6.1.3 Bedrock

- Bedrock removal is anticipated to achieve the required invert depths.
- Shallow localized bedrock excavation may potentially be carried out using mechanical excavation methos such as hoe ramming, however, more extensive rock excavation will be more economical using drill and blast techniques.
- Rockfall protection (mesh or bolts) may be required for safety at the base on the excavation.
- Rock walls should be inspected at the time of excavation.
- Caution should be exercised in carrying out bedrock removal around services and structures which may be sensitive to vibrations. Bedrock removal should be controlled to limit the peak particle velocities at all adjacent structures and services such that that risk of vibration induced damage will be mitigated.
- If blasting is chosen, a blasting plan designed by a specialist will be required, and the Contractor should be limited to only small, controlled shots.
- Vibration intensive construction activities should commence at the furthest points from sensitive receptor structures or services to assess the ground vibration attenuation characteristics and to confirm that anticipated ground vibration levels.
- Contractor is required to submit a detailed vibration monitoring plan prior to construction activities. The plan should include proposed excavation methods, vibration monitoring equipment, monitoring locations, frequency of readings, etc.

6.1.4 Groundwater Control

- Excavations may extend locally below the level of the groundwater.
- If excavations are below the existing groundwater levels in the predominantly silty and sandy soils, it will be necessary to temporarily lower the groundwater tables below the depth of excavation during construction.
- Soils are expected to be sensitive to disturbance. Failure to adequately control groundwater will likely results in excessive soil disturbance in the base of the excavation, as well as potentially piping, heave, and other safety concerns for temporary excavations.

- An Environmental Activity and Sector Registry (EASR) is required for pumping that exceeds 50,000L/day but is less than 400,000L./day.
- A Permit to Take Water (PTTW) is required for pumping that exceeds 400,000L/day.
- The exact excavation extent and depths should be reviewed in order to determine that potential extent of groundwater drawdown. Due to the sandy subsurface soils, it is possible that the groundwater draw down could extend outside the site boundary.

6.1.5 Impacts to Adjacent Structures

- Where the zone of influences of foundations or critical, movement sensitive, services are within the zone of influences of excavations, it is recommended that any temporary protection systems be designed in accordance with OPSS 539.
- Excavation support and the design of any sloped excavations will need to consider nearby structures/foundations or any existing services that are to be protected during construction.
- Vibration monitoring in conjunction with preconstruction surveys is recommended.

6.2 Site Servicing

- Excavations for site servicing shall be carried out in accordance with the guidelines outline in Section 4.2 of the Geotechnical Investigation.
- Bedding for the service pipes, maintenance holes, or valve chamber structures may be placed on undisturbed native inorganic soil or the limestone bedrock. The existing fill is potentially compressible and is generally considered unsuitable for support of service pipes and structures. Therefore, the existing fill (where present) should be sub-excavated and replaced up to the bottom of the bedding layer using engineered fill. Engineered fill, if required, should consist of either imported Granular B Type II (City of Ottawa SP F-3147) or materials previously excavated at the site (including pavement structure, inorganic sandy fill, or compactable glacial till) can potentially be re-used for this purpose. The suitability of re-using the existing fill and native soil would need to be confirmed at the time of construction by the Geotechnical Engineer. Reuse of excavated materials would also need to take into account soil quality considerations (provided under separate cover within the Phase II ESA report). Engineered fill (either imported or re-used on site) should be placed in maximum 300mm thick lifts and compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment. The engineered fill should extend down and away from the bottom of the bedding to the undisturbed native subgrade at a slope of 1 horizontal to 1 vertical. If this cannot be achieved due to space restrictions, the geotechnical engineer should be consulted to assess potential alternatives.
- At least 150mm of Granular A (OPSS.MUNI 1010) should be used as pipe bedding for sewer and water pipes. Where unavoidable disturbance to the subgrade surface occurs during construction, it may be necessary to place a sub-bedding layer consisting of 300mm of compacted Granular B Type II (S.P. F-3147) beneath the Granular A. The bedding material should in all cases extend to the spring line of the pipe and should be compacted to at least 95% of the material's SPMDD. The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from the sandy backfill materials and native soils could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support. Where the trench will be covered with hard surfaced areas (e.g., pavements and sidewalks), the type of material placed in the frost zone (down to 1.8 m depth) should match the soil exposed on the trench walls for frost heave compatibility.

6.3 Trench Backfill

- Trench backfill shall be in accordance with City of Ottawa specification SP F-2120.
- Trench backfill above the pipe cover material may consist of approved excavated material such as the existing fill (provided that it is free of organic matter and other deleterious materials) and non-clayey native soils, where the service pipes will be overlain by pavements or other hard surfacing. The fill that contains

organic matter or deleterious materials are not suitable for reuse as trench backfill and should be wasted upon excavation.

- Imported backfill, if required, should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (SP F-3147).
- Excavated bedrock may be acceptable as backfill for the lower portion of the trench, provided that the rock fill is broken/crushed to form a well-graded granular material. However, the reuse of such rock fill should be reviewed and approved by the geotechnical engineer at the time of construction once the grading of the material proposed for reuse can be determined. The rock fill should only be placed higher than at least 300mm above the pipe to minimize the potential for damage due to impact or point load. The pieces of the rock fill used as trench backfill should be limited to a maximum of 300mm in nominal size and the rock fill should be disseminated throughout (i.e., nests of large rock pieces should not be permitted).
- It is important for frost heave compatibility that the trench backfill within the frost zone (i.e., between the pavement subgrade level and 1.8m depth below pavement grade) matches the soil exposed on the trench walls. This will require some separation of materials upon excavation. If shallow services are installed within the 1.8m frost zone, frost tapers should be used, as per OPSD 803.030 and 803.031.
- Trench backfill should be placed in maximum 300mm loose lifts and be uniformly compacted to at least 95% of the material's SPMDD. Backfilling operations during cold weather should avoid inclusions of frozen lumps of material, snow, and ice.
- If the construction schedule allows a delay between service installation/trench backfilling and final paving should be made to allow for settlement of the trench backfill material, which will reduce the magnitude of differential movement (i.e., sagging) of pavements placed over backfilled trenches.

6.4 Reuse of Existing Soils

- Native glacial till (provided it has suitable water content to be compactable) may be reused as backfill within service trenched on this project, provided the materials are frost compatible.
- Native glacial till is not suitable for reuse as pavement structure base or subbase materials.
- Heterogeneous still and buried topsoil encountered on site contains organic matter and debris and is not suitable for reuse as base and subbase material.
- Reclaimed asphalt pavement and/or reclaimed concrete material may be used on this project as granular material as stated in OPSS.MUNI 1010.
- Reclaimed asphalt pavement may be used in the asphaltic concrete mixed in accordance with OPSS.MUNI 1151.

6.5 Pavement Design

6.5.1 Subgrade Preparation

- Portions of existing fill will need to be removed to accommodate the new full depth pavement structure.
- All deleterious material should be removed from all pavement areas.
- It should be feasible to leave the existing inorganic fill in place beneath the pavement structure. The subgrade should be proof rolled prior to the placement of new fill.
- Sections requiring grade raising to the proposed subgrade level should be filled using acceptable earth burrow (OPSS.MUNI 206/212), select subgrade material (OPSS.MUNI 1010) or additional granular base if grade changes are minor.
- All fill should be placed in maximum 300mm thick lifts and should be compacted to at least 95% of the material's Standard Proctor Maximum Dry Density using suitable vibratory compaction equipment.

6.5.2 Pavement Drainage

- Subgrade surface should be crowned or sloped to promote drainage of the roadway granular structure.
- Perforated pipe subdrains should be provided along the low sides of the roadway along the entire length.
- Geotextile should be Class I nonwoven in accordance with OPSS 1860 and have a maximum Apparent Opening Size of 212um.
- Subdrains should be connected to the catchbasins such that the pavement structure will be positively drained and intercept flows within the subbase.
- In some areas the existing pavement structure is deeper that the proposed pavement structure. It is important to ensure the new roadway widening does not inadvertently block drainage out of the pavement structure. Consideration should be given to: (i) deepening the proposed pavement thickness with additional granular material to match the top of the existing subgrade; and/or (ii) provide sufficient drainage at the underside of the new/widened pavement structure to ensure positive drainage between the existing and proposed pavement structure.
- Backfilling of catchbasin laterals located below subgrade level should be competed using acceptable native soils or fill which match the material types exposed on the lateral trench walls.

6.5.3 Granular Pavement Materials

- Granular base for new construction should be Granular A (S.P. F-3147).
- The existing fill within the project limits does not generally meet the requirements for Granular A or Granular B Type II.
- Existing fill material could be re-used as general trench backfill or as subbase material for pavement structures.

6.5.4 Traffic Data

- The Annual Average Daily Traffic (AADT) on Carling Avenue between Road A and Trillium LRT Corridor is 21,516 with 3% trucks.
- The AADT on Preston Street between Carling Avenue and Prince of Wales Drive is 18,515 with 2% trucks.
- The AADT on Prince of Wales Drive between Road B and NCC Driveway is 16,272 with 3% trucks.

6.5.5 Existing Pavement Structure

- Carling Avenue: the existing pavement structure consists of 130mm to 150mm of asphaltic concrete over 200mm to 460mm of concrete over a 690mm to 760mm thick combined base/subbase layer.
- Preston Street: the existing pavement structure consists of 130mm to 150mm of asphaltic concrete over 210mm to 230mm of concrete over a 630mm to 730mm thick combined base/subbase layer.
- Prince of Wales: the existing pavement structure consists of 150mm to 300mm of asphaltic concrete over 200mm to 510mm thick combined base/subbase layer.

6.5.6 Recommended Pavement Design

The flexible pavement structures are shown in **Table 6-1**.

Table 6-1: Recommended Flexible Pavement Design

Road	Thickness (mm)	Material Description
Carling Avenue (between Road A and Trillium)	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	500	S.P. F-3147 Granular B Type II Subbase

Road	Thickness (mm)	Material Description
Preston Street (between Carling Avenue and Prince of Wales Drive)	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Prince of Wales Drive (between Road B and NCC Driveway)	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Commercial Entrances	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 64-34 for Traffic Category C.

The rigid pavement structures are shown in Table 6-2.

Table 6-2: Recommended Rigid Pavement Design

Road	Thickness (mm)	Material Description
Carling Avenue (between Road A and Trillium)	225	Portland Cement Concrete
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Preston Street (between Carling Avenue and Prince of Wales Drive)	200	Portland Cement Concrete
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Prince of Wales Drive (between Road B and NCC Driveway)	200	Portland Cement Concrete
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase

The Portland cement concrete should meet the requirements of CSA A 23.1 Class C@ exposure. Concrete joint specifications and spacing should be in accordance with OPSD 552.020 and OPSD 551.010.

6.5.7 Pavement Structure Compaction

- Compaction shall conform with OPSS 501 Construction Specification for Compacting.
- Granular base and subbase material should be uniformly compacted to at least 100% of the Standard Proctor Maximum Dry Density using suitable vibratory compaction equipment.
- Compaction of the asphaltic concrete should be in accordance with OPSS 310 Table 10.
- Placement and compaction of engineered fill and sewer/watermain bedding and backfill should be inspected to ensure conformance.
- Compaction testing and sampling of the asphaltic concrete should be carried out.

6.5.8 Joints, Tie-ins with Existing Pavement, Pavement Resurfacing

- Pavement should be milled back beyond the curb return an additional 300mm to a depth of 40mm to accept the surface course asphaltic concrete.
- Pavement granular and subgrade level should be tapers between the new and existing pavements using a 10H:1V tapers.
- Tack coat should be provided on all vertical and milled horizontal surfaces.
- Tack coat should consist of SS-1 emulsified asphalt diluted with an equal amount of water. The undiluted and emulsified asphalt shall conform with OPSS 1103.

6.5.9 Corrosion and Cement Type

- Concrete made with type GU Portland cement is considered acceptable for buried concrete elements.
- Elevated potential for corrosion of exposed ferrous metal (steel, iron, etc.) which should be considered in the design of substructures and buried utilities.
- Corrosion protection systems or steels coating may be required but should be selected by a Structural Engineer.

7.0 GROUNDWATER SEWER DISCHARGE RECOMMENDATIONS

Golder Associates Limited completed a sewer discharge memorandum, *Future Ottawa Hospital Site – Sewer Discharge Results Comparison.*

The technical memorandum is summarized below. Refer to the technical memorandum, submitted under separate cover, for further detail. Additional samples are currently being collected by Golder Associates Limited and the technical memorandum will be updated accordingly once the additional investigation is complete.

- The review included sixty-two groundwater samples collected from the site between 2016 and 2021.
- When compared to the City of Ottawa sanitary/combined sewer discharge criteria the following is noted:
  - No exceedances of any of the analyzed parameters compared to the applicable sanitary/combined sewer discharge criteria.
- When compared to the City of Ottawa storm sewer discharge criteria the following is noted:
  - Concentration of manganese in several samples including the average of all results was in excess of the storm sewer discharge criteria. The average concentration of manganese was 189ug/L compared to the discharge criteria of 50ug/L. Manganese is known to be naturally elevated regionally.
  - Total Suspended Solids (TSS) were in excess of the storm sewer discharge criteria with an average concentration of 84ug/L compared to the discharge criteria of 15ug/L. The TSS is a reflection of the amount of solids in the sample and can be reduced by filtration or settlement. Elevated concentrations are most likely due to the method of sample collection from a monitoring well.
  - Copper was in excess of the storm sewer discharge criteria in one (1) monitoring well with a concentration of 177ug/L compared to the discharge criteria of 40ug/L. It is understood that the location of the monitoring well has been excavated as part of the ongoing remediation work in the area.
  - Toluene was in excess of the storm sewer discharge criteria in one (1) monitoring well with a concentration of 4.1ug/L compared to the discharge criteria of 2.0ug/L. Although present at other locations it did not exceed the criteria. The average concentration was less than half of the discharge criteria.
- Dewatering monitoring program should be implemented during construction to monitor the groundwater quality.
- An exemption for naturally elevated manganese would be required from the City of Ottawa.
- Total metals analysis would be required to supplement the dissolved metals concentrations completed to date.

8.0 WATER SERVICING

8.1 Proposed Water Servicing

A 300mm diameter watermain loop is proposed around the Main Hospital Building that will connect to the existing 406mm diameter watermain on Carling Avenue at the Carling Avenue and Road B/Champagne Avenue South intersection and Carling Avenue and Sherwood Drive. The proposed 300mm diameter watermain loop will also connect to the proposed 300mm diameter watermain at the Road A and Road B intersection within the site.

The Main Hospital Building will be serviced with two (2) 200mm diameter water services at the east end of Tower B, extended from the 300mm diameter watermain loop. The Central Utility Plant will be serviced with two (2) 200mm diameter water services extended from the 300mm diameter watermain loop located within Road E.

The design drawings, in **Appendix E**, show the existing and proposed water distribution network.

8.2 Design Criteria

The proposed watermain distribution system for the Central Utility Plant and Main Hospital Building has been designed in general conformance with the City of Ottawa Water Design Guideline as amended by its Technical Bulletins.

The system pressure criteria under normal and various operating conditions are listed in **Table 8-1**.

Table 8-1: Water System Pressure – Criteria

Operating Conditions	Pressure Criteria	
	kPa	psi
Average Daily Demand		
Minimum to Maximum	276-552	40-80
Desirable Range	350-480	50-70
Peak Hourly Demand		
Minimum to Maximum	276-552	40-80
Desirable Range	350-480	50-70
Maximum Daily Demand + Fire Flow		
Minimum	140	20

During the design of the Parking Garage (Phase 2), the City of Ottawa provided boundary conditions for the existing 406mm diameter watermain on Carling Avenue, as shown in **Table 8-2** and **Table 8-3**. A copy of the correspondence is included in **Appendix F**.

Table 8-2: Boundary Conditions - 406mm Watermain on Carling Avenue (Parking Garage)

Minimum HGL	Maximum HGL	Maximum Day + Fire Flow
107.1m	114.6m	107.8m
60psi	71psi	61psi
414KPa	487KPa	421KPa

**The associated pressures in psi and kPa are based on a ground elevation at the connection location of 64.84m.*

Table 8-3: Boundary Conditions - 406mm Watermain on Carling Avenue (Parking Garage & Hospital)

Minimum HGL	Maximum HGL	Maximum Day + Fire Flow
107.1m	114.6m	107.6m
60psi	71psi	61psi
414KPa	487KPa	419KPa

**The associated pressures in psi and kPa are based on a ground elevation at the connection location of 64.84m.*

The boundary conditions provided demonstrate that the available pressure ranges from approximately 60psi to 71psi during normal operating conditions.

Revised boundary conditions will be requested from the City of Ottawa as the design moves forward and additional accuracy is provided from the design team regarding actual demands for the Central Utility Plant and Main Hospital Building.

The fire flow will be calculated using the Fire Underwriters Survey (FUS) *(2020 Version)*.

The City of Ottawa Water Design Guideline requires that *"Service areas with a basic day demand greater than 50 m³/day (about 50 homes) shall be connected with a minimum of two watermains, separated by an isolation valve, to avoid the creation of a vulnerable service area. Individual residential facilities with a basic day demand greater than 50 m³/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area."* The proposed basic day demand is greater than 50 m³/day, therefore; two water services to the Central Utility Plant and Main Hospital Building are required.

The new water services will be installed with a minimum depth of cover of 2.4m where possible. Should there be less than 2.4m cover or separation from an open structure, the pipes will be insulated in accordance with City of Ottawa Standard Drawings W22 and W23.

High pressure is not an issue on this site as the boundary conditions are below 80psi. Therefore, pressure reducing valves will not be required.

8.3 Water Calculations

8.3.1 Fire Demand

The fire flow for the Central Utility Plant, Main Hospital Building, and Pavilion were calculated using the *Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 2020*. These fire flow estimates will need to be refined as the design moves forward.

The required fire flow is determined by the following formula:

$$F = 220C\sqrt{A}$$

Where,

F = the required fire flow in litres per minute (L/min)

C = coefficient related to the type of construction

= 1.5 for **Type V** Wood Frame Construction

= 0.8 for **Type IV-A** Mass Timber Construction

= 0.9 for **Type IV-B** Mass Timber Construction

= 1.0 for **Type IV-C** Mass Timber Construction

= 1.5 for **Type IV-D** Mass Timber Construction

= 1.0 for **Type III** Ordinary Construction

= 0.8 for **Type II** Non-Combustible Construction

= 0.6 for **Type I** Fire Resistive Construction

A = total effective area is the largest floor area in square metres plus the following percentages of the total area of the other floors:

- Building classified with a Construction Coefficient from 1.0 to 1.5
  - 100% of all floor areas are considered in determining the total effective area to be used in the formula.
- Building classified with a Construction Coefficient below 1.0
  - If any vertical openings in the building are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to the maximum of eight (8).
  - If all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest floor are plus 25% of each of the two (2) immediately adjoining floors.
- Basement floor area is excluded from the total effective area when the basement is at least 50% below grade in the building being considered.
- For open parking garages, use the area of the largest floor as the total effective area.

Central Utility Plant

The required fire flow is **167L/s** based on the following parameters, refer **Appendix G** to for detailed calculations:

- Construction Coefficient (C)
  - A construction coefficient of **0.6** was selected as the structure will have a fire rating of 2 hours.
- Floor Area (A)
  - The total effective floor area for the central utility plant was assumed to be **24,000m^2** (this is approximately two (2) times the floor area).
  - The total effective floor area for the central utility plant will need to be calculated and adjusted accordingly based on the interior architectural floor plans.
- Occupancy Factor
  - An occupancy factor of **0% (combustible)** was selected for the proposed Central Utility Plant.
- Sprinkler Factor
  - A total reduction factor of **50%** (automatic sprinklers NFPA standards, standard water supply, and full supervision) was selected for the proposed Central Utility Plant.
- Exposure Factor
  - A percentage of **0%** was selected as the separation to existing and proposed buildings is greater than 30m.

Main Hospital Building

The required fire flow is **250L/s** based on the following parameters, refer **Appendix G** to for detailed calculations:

- Construction Coefficient (C)
  - A construction coefficient of **0.6** was selected as the structure will have a fire rating of 2 hours.
- Floor Area (A)
  - The total effective floor area for the Main Hospital Building was calculated to be **61,518m^2** (this includes the largest floor and additional two (2) adjoining floors at 25%).
  - The largest floor is Level 01 at 42,266m^2 (30,266m^2 for the Main Hospital Building + 12,000m^2 assumed for the future Heart Institute).

    - The adjoining floor below is Emergency at 41,737m² (29,737m² for the Main Hospital Building + 12,000m² assumed for the future Heart Institute).
    - The adjoining floor above is Level 02 at 36,860m² (24,860m² for the Main Hospital Building + 12,000m² assumed for the future Heart Institute).
- Occupancy Factor
    - An occupancy factor of **-15% (limited combustible)** was selected for the proposed Main Hospital Building.
- Sprinkler Factor
    - A total reduction factor of **50%** (automatic sprinklers NFPA standards, standard water supply, and full supervision) was selected for the proposed Main Hospital Building.
- Exposure Factor
    - A percentage of **+5%** was selected to account for the Pavilion which will be located within the Main Hospital Building but subdivided with a firewall(s).
    - The Pavilion will be located within 0m to 3m from the north side and west side of the Main Hospital Building.
    - The following three (3) assumptions were made:
        - The length-height factor of the exposing building (future towers) will be over 100;
        - The construction type of the exposing building (future towers) will be Type I-II[3]; and
        - The exposing building will be fully protected with an automatic sprinkler system.

<u>Pavilion</u>

The required fire flow is **250L/s** based on the following parameters, refer **Appendix G** to for detailed calculations:

- Construction Coefficient (C)
    - A construction coefficient of **1.5** was selected as the structure will be mass timber.
- Floor Area (A)
    - The total effective floor area for the Pavilion was calculated to be **6,825m²** (this includes 100% of all floor area)
- Occupancy Factor
    - An occupancy factor of **0% (combustible)** was selected for the proposed Pavilion.
- Sprinkler Factor
    - A total reduction factor of **50%** (automatic sprinklers NFPA standards, standard water supply, and full supervision) was selected for the proposed Pavilion.
- Exposure Factor
    - A percentage of **+5%** was selected to account for the Pavilion which will be located within the Main Hospital Building but subdivided with a firewall(s).
    - The Pavilion will be located within 0m to 3m from the north side and west side of the Main Hospital Building.
    - The following three (3) assumptions were made:
        - The length-height factor of the exposing building (future towers) will be over 100;
        - The construction type of the exposing building (future towers) will be Type I-II[3]; and
        - The exposing building will be fully protected with an automatic sprinkler system.

8.3.2 Water Demand

The anticipated water demand for the Central Utility Plant and Main Hospital Building are shown in **Table 8-4**, refer to **Appendix G** for detailed calculations.

Table 8-4: Estimated Water Demands

Building	Average Day Demand (ADD) L/s	Maximum Daily Demand (MDD) L/s	Peak Hourly Demand (PHD) L/s	Fire Flow Demand (FF) L/s	MDD + FF L/s
Main Hospital	22.82	34.22	61.60	250 250(1)	285 285
Central Utility Plant	11.00	28.33	51.00	167	246

(1) Fire flow required for the Pavilion (proposed timber construction)

The demands for the Central Utility Plant and Main Hospital Building will need to be revisited/revised during detail design when additional accuracy is obtained from the design team and interior architectural floor plans.

8.4 Water Results

The pressures were determined for the average day demand (ADD), maximum daily demand (MDD), peak hourly demand (PHD), and maximum daily demand plus fire flow (MDD+FF) based on the boundary conditions provided by the City of Ottawa.

The following scenarios were modelled in WaterCAD, and the pressures are shown in **Table 8-5.**

Table 8-5: WaterCAD Pressures

Scenario	Total Demand(1) L/s	Minimum Pressure kPa	Minimum Pressure psi	Maximum Pressure kPa	Minimum Pressure psi
Scenario 1 – Average Day Demand	35.06	235(2)	34(2)	421	61
Scenario 2 – Maximum Daily Demand	62.56	233(3)	34(3)	421	61
Scenario 3 – Peak Hourly Demand	115.67	226(3)	33(3)	421	61
Scenario 4 – Fire @ Back Hospital/CUP	314.26	156	22	421	61
Scenario 5 – Fire @ West Side of Hospital	314.26	181	26	421	61
Scenario 6 – Fire @ Future Heart Institute	314.26	139	20	421	61
Scenario 7 – Fire @ East Side of Hospital (Loading Dock)	314.26	156	22	421	61
Scenario 8 – Fire @ Pavilion	314.26	184	26	421	61

(1) Demands include Phase 2 (Parking Garage), Phase 3 (Central Utility Plant), Phase 4 (Main Hospital Building)

(2) The minimum pressure falls below 40 psi (minimum City of Ottawa requirement) at proposed Road E and Prince of Wales Drive intersection (junctions J-34 to J-36). There is a significant elevation difference between Carling Avenue and this area (approximately 17.5m) which is required to tie the site into Maple Drive and Prince of Wales Drive. No buildings services are proposed within this area. All other junctions within the site are above the minimum City of Ottawa requirement of 40psi. Discussion required with the City of Ottawa as the site is within two (2) water pressure zones.

(3) The minimum pressure falls below 40 psi (minimum City of Ottawa requirement) at proposed Road E and Prince of Wales Drive intersection (junctions J-34 to J-36). There is a significant elevation difference between Carling Avenue and this area (approximately 17.5m) which is required to tie the site into Maple Drive and Prince of Wales Drive. No buildings services are proposed within this area. All other junctions within the site are above the minimum City of Ottawa requirement of 40psi. Discussion required with the City of Ottawa as the site is within two (2) water pressure zones.

The model results indicate that adequate domestic water supply is available for the site with the exception of the pressures falling below the City of Ottawa minimum requirement of 40psi at the proposed Road E and Prince of Wales Drive intersection during the average day demand, maximum daily demand, and peak hourly demand scenarios. The pressure loose is a result of the natural topography of the site (approximately 17.5m elevation different between this intersection and Carling Avenue). Building services for the Central Utility Plant and Main Hospital Building are not proposed this area of the site. The pressures at all proposed building services are above the City of Ottawa minimum requirement of 40psi during the average day demand, maximum daily demand, and peak hourly demand scenarios. Discussion required with the City of Ottawa as the site is within two (2) water pressure zones.

The above demonstrates that the proposed 300mm diameter watermain can adequately provide the domestic flows and required fire flow.

The WaterCAD output files for the model are provided in **Appendix G.** This model will need to be refined as the design moves froward.

8.4.2 Fire Protection

Fourteen (14) AA (blue) hydrants are proposed within 75m of the Main Hospital Building. The hydrant locations and the length of the hose travel are presented in **Figure 8-1**.

Hydrant 3, Hydrant 11, and Hydrant 14 are located within 75m of the Central Utility Plant and south side of the Main Hospital Building. These three (3) hydrants have a maximum flow contribution of **250L/s**, and all have a pressure over 20psi.

Hydrant 4, Hydrant 7, and Hydrant 15 are located within 75m of the west side of the Main Hospital Building. These three (3) hydrants have a maximum flow contribution of **250L/s**, and all have a pressure over 20psi.

Hydrant 9, Hydrant 10, and Hydrant 11 are located within 75m of the Future Heart Institute. These three (3) hydrants have a maximum flow contribution of **250L/s**, and all have a pressure over 20psi.

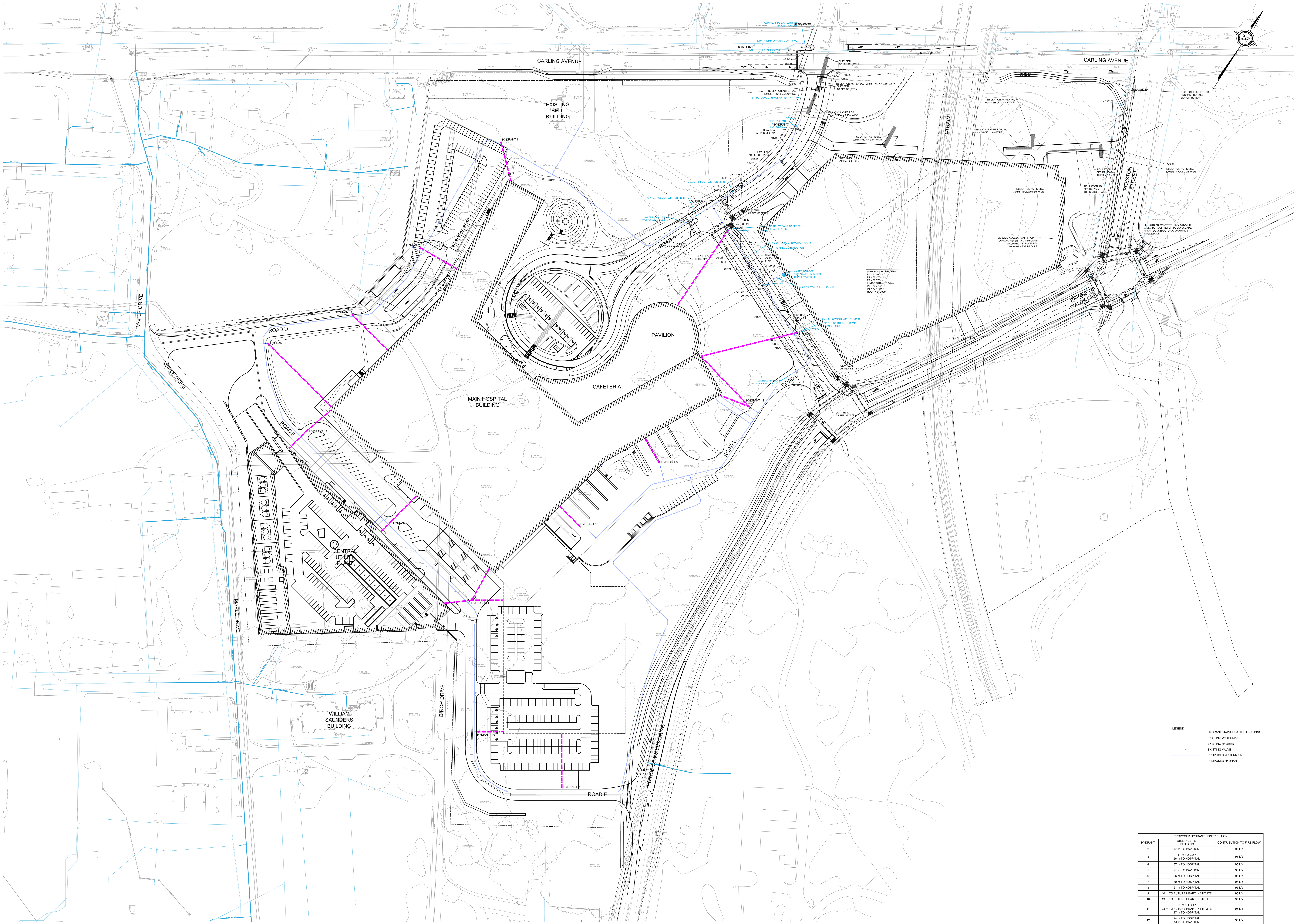
Hydrant 8, Hydrant 12, and Hydrant 13 are located within 75m of the east side of the Main Hospital Building. These three (3) hydrants have a maximum flow contribution of **250L/s**, and all have a pressure over 20psi.

Hydrant 2, Hydrant 5, and Hydrant 12 are located within 75m of the front of the Main Hospital Building and Pavilion. These three (3) hydrants have a maximum flow contribution of **250L/s**, and all have a pressure over 20psi.

8.5 Summary and Conclusions

A 300mm diameter watermain loop is proposed around the Main Hospital Building that will connect to the existing 406mm diameter watermain on Carling Avenue at the Carling Avenue and Road B intersection and Carling Avenue and Sherwood Drive. The proposed 300mm diameter watermain loop will also connect to the proposed 300mm diameter watermain at the Road A and Road B intersection.

The main hospital building will be serviced with two (2) 200mm diameter water services at the east end of Tower B, extended from the 300mm diameter watermain loop. The central utility plant will be serviced with two (2) 200mm diameter water services extended from the 300mm diameter watermain loop located within Road E. The model results indicate that adequate domestic water supply and fire flow demand is available for the site with the exception of the pressures falling below the City of Ottawa minimum requirement of 40psi at the proposed Road E and Prince of Wales Drive intersection during the average day demand, maximum daily demand, and peak hourly demand scenarios. The pressure loose is a result of the natural topography of the site (approximately 17.5m elevation different between this intersections and Carling Avenue). Building services for the Central Utility Plant and Main Hospital Building are not proposed within these two (2) areas of the site. The pressures at all proposed building services are above the City of Ottawa minimum requirement of 40psi during the average day demand, maximum daily demand, and peak hourly demand scenarios.



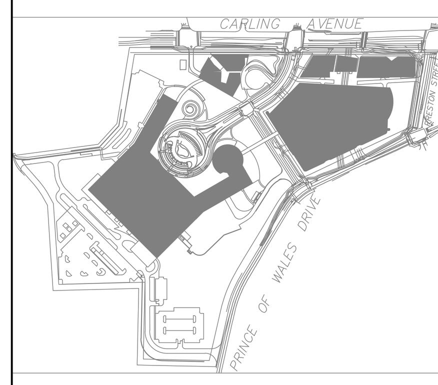
PROPOSED HYDRANT CONTRIBUTION		
HYDRANT	DISTANCE TO BUILDING	CONTRIBUTION TO FIRE FLOW
2	66 m TO PAVILION	95 L/s
3	11 m TO CUP 26 m TO HOSPITAL	95 L/s
4	37 m TO HOSPITAL	95 L/s
5	73 m TO PAVILION	95 L/s
6	66 m TO HOSPITAL	95 L/s
7	30 m TO HOSPITAL	95 L/s
8	21 m TO HOSPITAL	95 L/s
9	40 m TO FUTURE HEART INSTITUTE	95 L/s
10	19 m TO FUTURE HEART INSTITUTE	95 L/s
11	21 m TO CUP 23 m TO FUTURE HEART INSTITUTE 27 m TO HOSPITAL	95 L/s
12	24 m TO HOSPITAL 51 m TO PAVILION	95 L/s
13	21 m TO HOSPITAL	95 L/s
14	19 m TO CUP 23 m TO HOSPITAL	95 L/s
15	31 m TO HOSPITAL	95 L/s
TOTAL		1425 L/s

10m 0 10 20 30m
SCALE: 1:750

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

MARK	DATE	DESCRIPTION
01	2022-09-23	ISSUED FOR PRE-CONSULTATION
02	2022-10-28	DRAFT FOR 90% SD
03	2022-11-30	ISSUED FOR SPC & FLUDA - 1ST SUBMISSION
04	2022-12-02	ISSUED FOR 3A1-2
05	2023-02-24	ISSUED FOR RFP VERSION 1.0
06	2023-04-12	RE-ISSUED FOR SITE PLAN CONTROL/FEDERAL LAND USE APPROVAL

Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name

HYDRANT CONTRIBUTION

Sheet Number

Figure 8-1

Project Status

STAGE 3

D07-12-22-0

The proposed watermain design will need to be refined as the design moves forward and discussions with the City of Ottawa are required as the NCD site is within two (2) water pressure zones.

9.0 SANITARY SERVICING

9.1 Proposed Sanitary Servicing

There are ten (10) sanitary service connections are assumed for the Main Hospital Building and two (2) sanitary service connections are assumed for the Central Utility Plant. The service connection(s) for the future Heart Institute will be provided in a future phase. All sanitary service connections will connect to the proposed 300mm/375mm/450mm diameter sanitary sewer that extends around the Main Hospital Building. The proposed 300mm/375mm/450mm will connect into the Mooney's Bay Collector at the proposed Road B and Road L intersection. The proposed sanitary service connections and sewer will need to be refined as the design moves forward.

A 450mm diameter sanitary sewer will be extended from the stub provided at Road B and Road L. This stub is connected to the Mooney's Bay Collector trunk sewer within Road B. At MHSA10 this sewer will extend west and south to service both sides of the Main Hospital Building and the Central Utility Plant.

The southern portion of Tower B of the Main Hospital Building is assumed to have one (1) 250mm diameter sanitary service connection that will connect to the proposed 300mm diameter sanitary sewer in the loading dock off of Road L. A 375mm diameter sewer will extend west from MHSA10 and service the remainder of the Main Hospital Building and the Central Utility Plant.

The middle portion of Tower B of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection that will connect to the proposed 300mm diameter sanitary sewer in the loading dock off of Road L. A 375mm diameter sewer will extend west from MHSA10 and service the remainder of the Main Hospital Building and the Central Utility Plant.

The northern portion of Tower B of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the east side of Road A.

The Pavilion of the Main Hospital Building is assumed to have one (1) 150mm diameter sanitary service connection that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the east side of Road A.

The underground parking garage at the front of the Main Hospital Building, for emergency parking, is assumed to have one (1) 150mm diameter sanitary service connection that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the west side of Road A. The sanitary flows for the parking garage are considered to be negligible as the only contribution to the network is through snow melt from the parked vehicles. The internal floor drainage system for all floors and the ground floor, with the exception of the roof, are considered to be sanitary drains. A series of maintenance holes and sanitary sewers will provide the necessary drainage from the snow melt from the parked vehicles as well as any water drips from the vehicles.

The northern portion of Tower A of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connections that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the west side of Road A.

The middle portion of Tower A of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connections that will connect to the proposed 300mm diameter sanitary sewer on the west side of the hospital off of Road D.

The southern portion of Tower A of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection that will connect to the proposed 300mm diameter sanitary sewer on the west side of the hospital off of Road D.

The Podium of the Main Hospital Building is assumed to have two (2) 250mm diameter sanitary service connections that will connect to the proposed 300mm diameter sanitary sewer in Road E on the east side of the underground tunnel between the Main Hospital Building and the Central Utility Plant.

The Central Utility Plant is assumed to have two (2) 200mm diameter sanitary service connections that will connect to the proposed 300mm diameter sanitary sewer in Road E.

The future Heart Institute will connect to the proposed 300mm diameter sanitary sewer in Road E.

The design drawings, in **Appendix E**, shows the existing and proposed sanitary distribution network. These drawings will need to be refined as the design moves forward.

9.2 Design Criteria

The proposed sanitary sewer system for the Central Utility Plant and Main Hospital Building has been designed in general conformance with the *City of Ottawa Sewer Design Guidelines* as amended by its *Technical Bulletins*.

The sanitary design flow rate is the peak flow plus the peak extraneous flow. The values for the average flow, peak factor and peak extraneous flows used in the sanitary servicing calculations for the development are presented in **Table 9-1.**

Table 9-1: Sanitary Design Flow Criteria

Development Type	Average Sanitary Flow	Unit	Peak Factor	Peak Extraneous Flow
Main Hospital Building	5.40(1)	L/m2/day	1.5	0.33 L/s/gross ha
Central Utility Plant	5.0(2)	L/s	1.5	0.33 L/s/gross ha
Parking Garage	1.0(3)	L/s	1.0	0.33 L/s/gross ha

(1) Based on water records from the Ottawa Hospital Civic Campus
(2) Assumed value as the Central Utility Plant is in the feasibility design stage.
(3) Considered negligible as the only contribution is through snow melt from the parked vehicles.

The sanitary sewer system is designed with a pipe roughness coefficient of 0.013.

The proposed sanitary sewer system should be installed with a minimum cover of 2.0m, where this is not possible insulation will be provided.

Based on the Master Servicing Plan, the City of Ottawa confirmed that the existing Mooney's Bay Collector has sufficient capacity to accommodate the estimated peak of **34.24L/s** for the Main Hospital Building. The City of Ottawa will need to confirm if the Mooney's Bay Collector has sufficient capacity to accommodate the revised estimated peak flow for the Main Hospital Building and Central Utility Plant. The revised estimated peak flow is presented in the section below.

9.3 Calculations and Results

The Central Utility Plant is assumed to have two (2) sanitary service connections that will connect to the proposed sanitary sewer in Road E. A total peak flow of **7.90L/s** (divided equally (3.95L/s) between the two (2) service connections) is currently assumed for the Central Utility Plant. The peak flow will need to be refined as the design of the Central Utility Plant moves into the preliminary/detail stages.

The underground parking garage for emergency is assumed to have one (1) sanitary service connection that will connect to the proposed sanitary sewer along the front of the hospital on the west side of Road A. A peak flow of **1.26L/s** was applied even though the flow is considered negligible as the only contribution to the network is through snow melt from parked vehicles.

The northern, central, and southern portions of Tower A of the Main Hospital Building are assumed to have three (3) sanitary service connections. One (1) sanitary service connection will connect to the proposed sanitary sewer along the front of the hospital on the west side of Road A and two (2) sanitary service connections will connect to the proposed sanitary sewer on the west side of the hospital off of Road D. A peak flow of **3.17L/s, 3.50L/s,** and **7.74L/s** is estimated for the connections, respectively. It should be noted that the gross floor area for the proposed future expansion along the west side of Tower A was estimated and accounted for in the peak flow estimates but is not part of the proposed Phase 3 and Phase 4 works. The peak flows and future expansion plans will need to be refined as the design of the Main Hospital Building moves forward.

The middle portion of Podium of the Main Hospital Building is assumed to have two (2) sanitary service connections that will connect to the proposed sanitary sewer in Road E on the east side of the underground tunnel between the Main Hospital Building and the Central Utility Plant. A peak flow of **9.01L/s** (divided equally (4.51L/s) between the two (2) service connections) is estimated for the connections and will need to be refined as the design of the Main Hospital Building moves forward.

The northern, central, and southern portions of Tower B of the Main Hospital Building are assumed to have (3) sanitary service connections. One (1) sanitary service connection will connect to the proposed sanitary sewer along the front of the hospital on the east of Road A and two (2) sanitary service connections will connect to the proposed sanitary sewer in the loading dock off of Road L. A peak flow of **2.51L/s, 2.43L/s,** and **5.96L/s** is estimated for the connections, respectively. The peak flows will need to be refined as the design of the Main Hospital Building moves forward.

The Pavilion of the Main Hospital Building is assumed to have one (1) sanitary service connection that will connect to the proposed sanitary sewer along the front of the hospital on the east side of Road A. A peak flow of **1.05L/s** is estimated for the connection and will need to be refined as the design of the Main Hospital Building moves forward.

The future Heart Institute is assumed to be serviced from the proposed sanitary sewer along Road E. A peak flow of **11.43L/s** is estimated for the connection. It should be noted that the gross floor area for the proposed future expansion was estimated but is not part of the proposed Phase 3 and Phase 4 works. The peak flow and future expansion plans will need to be refined as the design of the Main Hospital Building moves forward.

Based on the Master Servicing Plan, the City of Ottawa confirmed that the existing Mooney's Bay Collector has sufficient capacity to accommodate the estimated peak of **34.24L/s** for the Main Hospital Building. The City of Ottawa will need to confirm is the Mooney's Bay Collector has sufficient capacity to accommodate the revised estimated peak flow of **55.95L/s** for the Main Hospital Building and Central Utility Plant.

The sanitary design flows and sewer pipe design spreadsheets are included in **Appendix H.**

9.4 Summary and Conclusions

The proposed sanitary sewer system for the Main Hospital Building and the Central Utility Plant will be divided (at MHSA10) into a south and west system. There are ten (10) sanitary service connections assumed for the Main Hospital Building and two (2) sanitary service connections assumed for the Central Utility Plant. The service connection(s) for the future Heart Institute will be provided in a future phase. The proposed 300mm/375mm/450mm will connect into the Mooney's Bay Collector at the proposed Road B and Road L intersection.

The proposed sanitary sewer design will need to be refined as the design moves forward.

10.0 STORM SERVICING AND STORMWATER MANAGEMENT

10.1 Existing Storm Servicing

The pre-development drainage areas for the entire NCD, developed as part of the Master Site Plan, were reviewed when determining the pre-development drainage area for the Central Utility Plant and the Main Hospital Building. The Central Utility Plant and the Main Hospital Building consists of drainage areas STM-01E, STM-02E, STM-03E, STM-04E, and STM-05E within the Master Site Plan. The majority of this land within the NCD drains through the Agriculture and Agri-Food Canada (AAFC) privately owned storm sewer system that outlets to Dow's Lake. The AAFC is responsible for the operation of the private servicing within the site.

The pre-development drainage areas for the Central Utility Plant and Main Hospital Building are shown in and **Figure 10-1** and **Figure A**, included in **Appendix I**, a brief description is included below. It should be noted that Drainage Areas STM-01E, STM-02E, STM-03E, STM-04E, STM-05E, STM-06E, STM-09E, and STM-11E are described within the Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, March 2023 that was prepared for Phase 2: Parking Garage.

Drainage Area - STM-07E

Drainage area STM-07E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.10ha with a runoff coefficient of 0.28.

Drainage Area - STM-08E

Drainage area STM-08E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.09ha with a runoff coefficient of 0.26.

Drainage Area - STM-10E

Drainage area STM-10E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.30ha with a runoff coefficient of 0.27.

Drainage Area - STM-12E

Drainage area STM-12E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.35ha with a runoff coefficient of 0.30.

Drainage Area - STM-13E

Drainage area STM-13E contains an open grass area with trees, asphalt pathways, and a small utility building and sheet flows to Carling Avenue. The area is approximately 0.50ha with a runoff coefficient of 0.34.

Drainage Area - STM-14E

Drainage area STM-14E contains an open grass area with trees, asphalt pathways, and an asphalt parking lot. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 2.68ha with a runoff coefficient of 0.40.

Drainage Area - STM-15E

Drainage area STM-15E is adjacent to Maple Drive (east side) and contains an open grass area with trees and the existing DARA Tennis Club. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 2.88ha with a runoff coefficient of 0.34.

Drainage Area - STM-16E

Drainage area STM-16E is adjacent to Birch Drive (east side) and contains an open grass area with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 3.68ha with a runoff coefficient of 0.22.

Drainage Area - STM-17E

Drainage area STM-17E is adjacent to Prince of Wales Drive and contains an open grass area with trees. This area sheet flows to Prince of Wales Drive. The area is approximately 1.46ha with a runoff coefficient of 0.27.

Drainage Area - STM-18E

Drainage area STM-18E is adjacent to Carling Avenue and contains asphalt roadways and parking areas, buildings, and open grass areas with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 1.19ha with a runoff coefficient of 0.55.

Drainage Area - STM-19E

Drainage area STM-19E is adjacent to Maple Drive and contains asphalt roadways and parking areas, buildings, and open grass areas with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 1.52ha with a runoff coefficient of 0.32.

Drainage Area - STM-20E

Drainage area STM-20E contains asphalt roadways and parking areas, buildings, and open grass areas with trees and the east and west sides of Maple Drive. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 9.99ha with a runoff coefficient of 0.45.

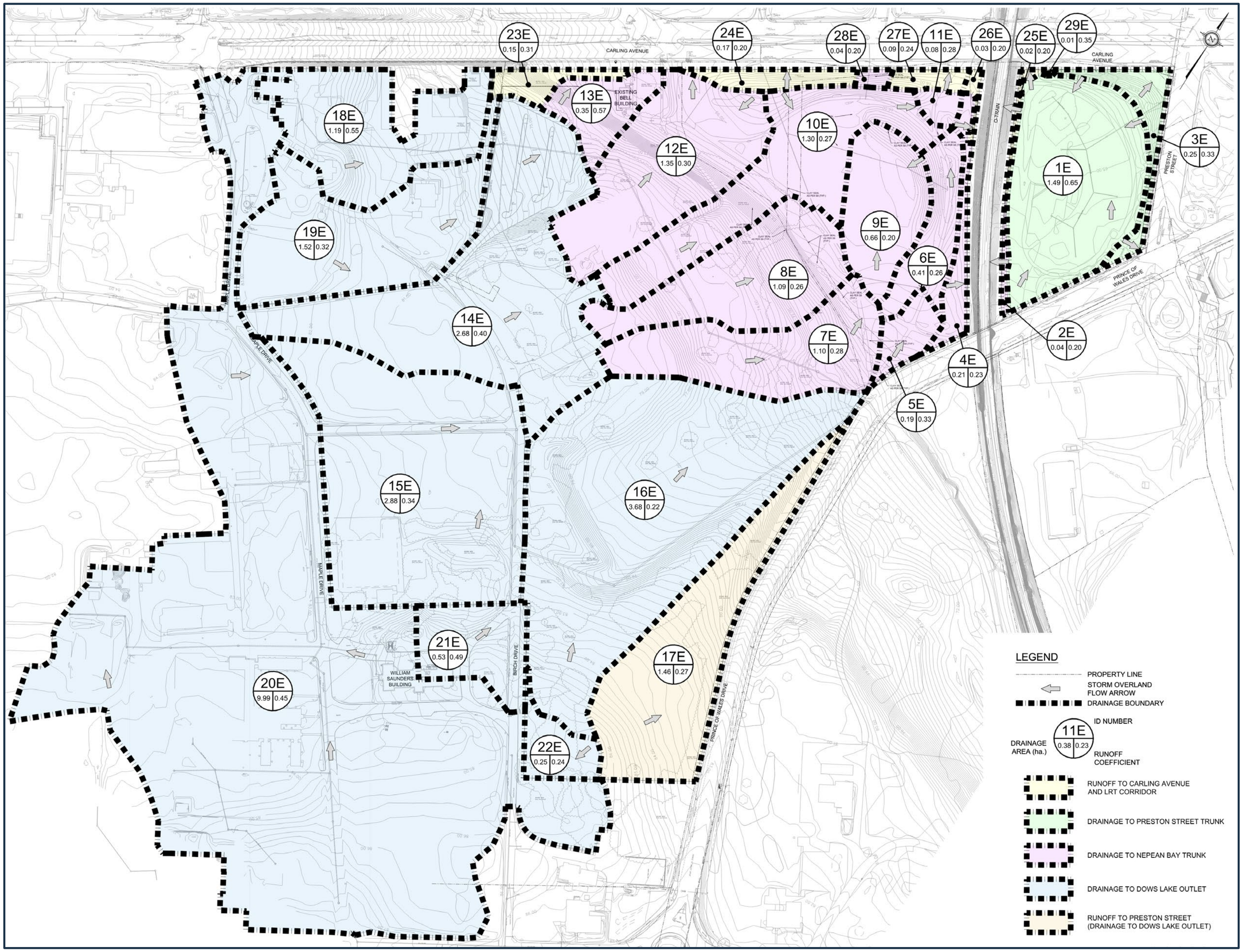
Drainage Area - STM-21E

Drainage area STM-21E is adjacent to Birch Drive and contains asphalt roadways and parking areas and open grass areas with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 0.53ha with a runoff coefficient of 0.49.

Drainage Area - STM-22E

Drainage area STM-22E is adjacent to Birch Drive (east side) and contains an open grass area with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 0.25ha with a runoff coefficient of 0.24.

Figure 10-1: Pre-Development Drainage Areas



A summary of the composite runoff coefficients and flows for the pre-development drainage areas are presented in **Table 10-1**.

Table 10-1: Pre-Development Runoff Summary

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	Minor Storm Peak Flows (L/s)	Major Storm Peak Flow (L/s)
DRAINAGE TO PRESTON TRUNK (EAST OF LRT)				2-YEAR	100-YEAR
STM01E	1.49	0.40	STM01E	1.49	0.40
STM03E	0.25	0.33	STM03E	0.25	0.33
TOTAL PRESTON TRUNK	1.74			TOTAL PRESTON TRUNK	1.74
DRAINAGE UNCONTROLLED TO DOW'S LAKE (TO DOW'S LAKE OUTLET)				2-YEAR	100-YEAR
STM17E	1.46	0.27	0.34	84.11	244.44
TOTAL UNCONTROLLED TO DOW'S LAKE	1.46			84.11	244.44
DRAINAGE TO NEPEAN BAY TRUNK (WEST OF LRT)				2-YEAR	100-YEAR
STM02E	0.04	0.20	0.25	1.58	4.60
STM04E	0.21	0.23	0.29	10.32	29.98
STM05E	0.19	0.33	0.42	10.85	31.38
STM06E	0.41	0.26	0.33	15.71	45.27
STM07E	1.10	0.28	0.35	38.44	110.46
STM08E	1.09	0.26	0.33	36.04	103.57
STM09E	0.66	0.20	0.25	19.09	55.02
STM10E	1.30	0.27	0.34	44.32	127.39
STM11E	0.08	0.28	0.35	4.69	13.62
STM12E	1.35	0.30	0.38	55.81	160.65
STM13E	0.35	0.50	0.71	26.99	88.98
STM28E	0.04	0.20	0.25	1.50	4.35
TOTAL NEPEAN BAY TRUNK	7.30		265.34	775.28	1230.31
DRAINAGE TO DOW'S LAKE (DOW'S LAKE OUTLET)				5-YEAR	100-YEAR
STM14E	2.68	0.40	0.50	308.24	660.30
STM15E	2.88	0.34	0.42	283.54	607.38
STM16E	3.69	0.22	0.28	237.40	508.56
STM18E	1.19	0.50	0.68	171.82	401.29
STM19E	1.52	0.32	0.39	139.27	298.34
STM20E	9.99	0.45	0.56	1299.90	2784.60
STM21E	0.53	0.49	0.61	75.64	162.03
STM22E	0.25	0.24	0.30	17.53	37.55
TOTAL DOW'S LAKE	22.73			2533.33	5460.05

10.2 Proposed Storm Servicing

The existing 300mm diameter storm sewer located on the west side of proposed Road A will be utilized to collect flows from the existing landscape areas (Drain Areas STM21B, STM46, and STM58) on an interim basis until the Research Building is constructed in a future phase. One (1) proposed 200mm diameter storm pipe will extend the network west in order to capture Drainage Area STM58. This storm sewer will connect to the existing 375mm diameter storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk. The flow will be released at a controlled rate into the existing system.

An oversized storm sewer (1200mm/1500mm diameter) is proposed within Road A and Road B to capture the flow within the roadway and the Parking Garage entrance(s) (Phase 2) along the west sides. Catchbasins will capture the majority of the 100-year runoff with minimal spill over. One (1) ditch inlet catchbasin is proposed to collect the landscape area (Drainage Areas STM 26B) southwest of Road B. Surface storage will be provided using an inlet control device on the catchbasin. The controlled flow will drain to the 1200mm/1500mm diameter oversized storm sewer network. The flow will further be controlled with an inlet control device prior to discharging into the existing 900mm diameter storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk.

A ditch inlet is proposed to collect the landscape area located on the east side of the Main Hospital Building (Drainage Area STM60). Surface storage will be provided using an inlet control device. The controlled flow will drain to the 1350mm diameter storm sewer that ultimately outlets to Dow's Lake.

Three (3) storm service connections for the Central Utility Plant and ten (10) storm service connections for the Main Hospital Building are assumed. The service connection(s) for the future Heart Institute will be provided in a future phase. The proposed storm service connections will need to be refined as the design moves forward.

The Central Utility Plant is assumed to have two (2) 375mm diameter storm service connections that will connect to the proposed 750mm/1050mm diameter oversized storm sewer in Road E and one (1) 200mm diameter storm service connection that will connect to the proposed 600mm diameter storm sewer located on the south side of the Central Utility Plant. The 600mm diameter storm sewer will connect into the proposed 750mm/1050mm diameter oversized storm sewer in Road E. Rooftop storage or underground cistern(s) within the Central Utility Plant will be required detain to provide the required storage volumes necessary to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The underground parking garage for emergency is assumed to have one (1) 450mm diameter storm service connection that will connect to the proposed 1200mm diameter oversized storm sewer along the front of the hospital on the west side of Road A. It is assumed the stormwater will be directed to an underground cistern. The design of this structure needs to adhere to the quantity control requirements.

The northern and middle portion of Tower A of the Main Hospital Building are assumed to have two (2) 300mm diameter storm service connections. One (1) 300mm diameter storm service connection will connect to the proposed 1200mm diameter oversized storm sewer along the front of the hospital on the west side of Road A and one (1) 300mm diameter storm service connection will connect to the proposed 1500mm diameter oversized storm sewer on the west side of the hospital by the parking lot (Zone 1 Parking) and Road D. Rooftop storage or underground cistern(s) within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The southern portion of Tower A of the Main Hospital Building is assumed to have one (1) 450mm diameter storm service connection that will connect to the proposed 1500mm diameter oversized storm sewer on the west side of the hospital by the parking lot (Zone 1 Parking) and Road D. Rooftop storage or underground cistern(s) within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The Podium of the Main Hospital Building is assumed to have two (2) 450mm diameter storm service connections that will connect to the proposed 750mm/1050mm diameter oversized storm sewer in Road E on the east side of the underground tunnel between the Main Hospital Building and the Central Utility Plant. Rooftop storage or underground cistern(s) within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The southern portion of Tower B of the Main Hospital Building is assumed to have one (1) 525mm diameter storm service connection that will connect to the proposed 750mm diameter oversized storm sewer in the loading dock off of Road L. Rooftop storage or underground cistern(s) within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The northern and middle portion of Tower B of the Main Hospital Building are assumed to have two (2) 300mm diameter storm service connections. One (1) 300mm diameter storm service connection will connect to the proposed 1350mm diameter oversized storm sewer along the front of the hospital on the east of Road A and one (1) 300mm storm service connection will connect to the proposed 750mm diameter oversized storm sewer in the loading dock off of Road L. Rooftop storage or underground cistern(s) within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The Pavilion of the Main Hospital Building is assumed to have one (1) 450mm diameter storm service connection that will connect to the proposed 1350mm diameter oversized storm sewer along the front of the hospital on the east side of Road A.

Prior to construction of the future Heart Institute (Phase 10), servicing will be installed for the two southern parking lots (Zone 4 Parking and Zone 6B Parking). Stormwater will be captured by a series of three (3) catchbasins, seven (7) catchbasin maintenance holes, and 300mm/525mm diameter storm sewers. The stormwater will be controlled using an inlet control device at both parking lot connections. The stormwater will be detained using underground storage in each parking lot. The storm sewer network will connect to the proposed 375mm/750mm diameter storm sewer in Road E.

The main storm sewer network for the Main Hospital Building and Central Utility Plant begins at the Road E and Prince of Wales Drive intersection and wraps around the Main Hospital Building to the Road B and Prince of Wales intersection where is ultimately discharges to Dow's Lake. Catchbasins will capture the majority of the 100-year runoff within the roads and parking lots.

The external private storm servicing will connect into the proposed storm sewer system for the hospital at the Maple Drive and Road D intersection and in the vicinity of the western packing lot (Zone 1 Parking). Underground storage will be provided to detain the stormwater.

The design drawings, in **Appendix E**, shows the existing and proposed storm distribution network.

10.3 Design Criteria

The proposed storm sewer system has been designed in general conformance with the City of Ottawa Sewer Design Guidelines and its technical bulletins, plus more specific requirements from the City of Ottawa.

The design criteria from the City of Ottawa Sewer Design Guidelines and City of Ottawa staff for the site includes the following:

- The capacity of the downstream receiving system must be assessed and approved by the City of Ottawa;
- A detailed major system analysis using dynamic models must be undertaken to assess the impact of additional flow on the major system if inlet control devices are implemented;
- Proposed developments draining to an existing system that does not have stormwater treatment is subject to on-site treatment (i.e., best management practice, oil grit separators, etc.);
- Stormwater management for the portion of the site that outlets to the Nepean Bay Trunk and the Preston Trunk combined sewer shall be based on the 2-year storm event using the IDF information derived from

the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;

- Stormwater management for the portion of the site that outlets to Dow's Lake shall be based on the 5-year storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;
- Pre-development runoff coefficient to be determined as per existing conditions but shall not exceed 0.4 when discharging to a combined City system;
- Pre-development runoff coefficient to be determined as per existing conditions but shall not exceed 0.5 when discharging to a storm City system;
- A calculated time of concentration cannot be less than 10 minutes;
- Storm flows to the Preston Trunk and Nepean Bay Trunk in excess of the 2-year storm release rate, up to and including the 100-year storm event, must be detained on site;
- Storm flows to Dow's Lake in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site;
- IDF curve equations used with the Rational formula:
  - 2-year =$732.951/(Tc+6.199)^{0.810}$
  - 5-year =$998.071/(Tc+6.053)^{0.814}$
  - 100-year = $1735.688/(Tc+6.014)^{0.820}$
- The rational method uses runoff coefficients (C) for various surfaces. The runoff coefficient for a 100-year storm event is increased by 25% in accordance with the *City of Ottawa Sewer Design Guidelines* to a maximum of 1.0. The following C values were used in within this study:
  - 5-year runoff coefficient asphalt/concrete/buildings = 0.90
  - 100-year runoff coefficient asphalt/concrete/buildings = 1.00
  - 5-year runoff coefficient grass = 0.20
  - 100-year runoff coefficient grass = 0.25
  - 5-year runoff coefficient forest = 0.40
  - 100-year runoff coefficient forest = 0.50

The design criteria from the National Capital Commission FLUDTA File (CP2299-18853) includes the following:

- Integrated best management practices for a sustainable stormwater management on site;
- Achieve improved water quality by controlling rainwater at its point of impact, managing infiltration and conveying any excess off-site by systems (such as swales, ditches and storm sewers;
- Respect the hydraulic capacity and erosion thresholds of receiving watercourses with an appropriate water quantity peak flow discharge rate;
- Seek to adhere to the following design strategies when possible:
  - Infiltration;
  - Bio-Retention/Bio-Filtration: Rainwater Harvesting (cisterns and rain barrels);
  - Water quality enhancement: oil and grit separators;
  - Detention ponds and permanent check dams in swales; and
  - Green roofs, rooftop gardens, and green walls.

The design criteria from the National Capital Commission Stormwater Management Manual - Draft, Spring 2022, includes the following:

- Water Quality – to minimize or improve surface water and groundwater quality, minimize sediment loading to surface water and groundwater, maintain or enhance the quality of drinking water sources, and maintain or enhance existing thermal watercourse regimes.
- Water Quantity – to ensure the development manages peak flows so that it does not increase risk to the environment, public safety, property, and infrastructure.

- Volume Control – to control the overall volume of stormwater runoff that leave a project site in post-development conditions and promote the adoption of love impact development approaches to stormwater management.
- Floodplain Management – to ensure that continues function of natural floodplain areas from a hydrologic and hydraulic perspective, and to guide development away from flood prone areas.
- Erosion Control – to reduce impacts of erosion on aquatic and terrestrial habitats through the appropriate implementation of stormwater management practices.
- Drainage to Federal Land – to ensure that common law and Loi sur la Qualite de l'Environnement principles are applied fairly and consistently in matters regarding the management of drainage between the National Capital Commission and neighbouring landowners.
- Water Balance – to minimize the impacts of urbanization activities on alteration of the natural hydrologic cycle and existing water balance.

10.4 Allowable Release Rate

The allowable release rates for the site were calculated using the rational method formula based on the 2-year and 5-year flow and the existing runoff coefficient that shall not exceed 0.4 when discharging to a City of Ottawa combined sewer system and 0.5 when discharging to a City of Ottawa storm sewer system.

$$Q = 2.78\ CiA$$

where

Q = Flow rate (L/s)
C = Runoff coefficient
i = Rainfall intensity (mm/hr)
A = Area (ha)

The resultant allowable release rate is **134.95L/s** to the Preston Trunk (City combined system), **265.34L/s** to the Nepean Bay Trunk (City storm system), and **2533.33L/s** to Dow's Lake (private storm system). The allowable release rates are presented in **Table 10-2**.

Table 10-2: Allowable Release Rate

Storm Event	Total Area (ha)	Runoff Coefficient 2 Year	Allowable Release Rate	Outlet
2 Year	1.74	(Table 8-1)	145.00	Preston Trunk(1)
		sanitary flow deduction 10.05L/s(1)	134.95	
2 Year	7.30	(Table 8-1)	265.34	Nepean Bay Trunk
5 Year	22.73	(Table 8-1)	2533.33	Dow's Lake

(1) Preston Trunk Outlet is only relevant to the Phase 2: Parking Garage Project. Refer to the report 'Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, March 2023 for additional details.

10.5 Storm Sewer Design

Calculations showing the storm sewer design are included in **Appendix I**. The storm sewer design spreadsheet is based on the Rational Method and Manning Formula and was used to calculate the design flow and required pipe sizes. Intensity Duration Frequency (IDF) Curve information for the 2-year, 5-year, and 100-year design storms were obtained from the City of Ottawa Sewer Design Guideline and used to calculate the peak flows.

Figure B in **Appendix I** shows the drainage areas and the sewer layout with catch basin and maintenance hole locations indicated. Details including pipe lengths, sizes, materials, inverts elevations and structure types are shown on the drawings in **Appendix E.**

10.6 Stormwater Management

The on-site storm water management has been designed to attenuate the 2-year/5-year and 100-year post-development flow rates to the pre-development flow rate as shown in the stormwater calculations included in **Appendix I** and summarized below.

The total development area has been divided into four (4) main drainage areas, with one (1) drainage area located on the east side of the LRT corridor, one (1) drainage area located on the west side of the LRT corridor and adjacent to Carling Avenue, one (1) drainage area on the northwest side of Prince of Wales Drive, and one (1) drainage area to the southwest of the LRT corridor, including external area from Maple Drive. The areas have then been divided into smaller site areas as shown in the **Figure B** in **Appendix I**. The eastern area will outlet to the Preston Street Trunk Sewer, the area northwest to Prince of Wales Drive will continue flowing to Prince of Wales Drive and ultimately outlets to Dow's Lake, the western area will outlet to the Carling Avenue storm sewer which ultimately outlets to the Nepean Bay Trunk Sewer, and the southwestern area will outlet to a private storm network that leads to Dow's Lake.

10.6.1 Post-Development Drainage Areas –Preston Trunk

The east post-development area will outlet to the Preston Street Trunk Sewer and will be controlled to the 2-year pre-development flow rate of **134.95L/s** or less. Preston Trunk Sewer focuses on areas relevant to the Phase 2: Parking Garage that are under separate contract. For additional details regarding their design please refer to Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, March 2023.

10.6.2 Post-Development Drainage Areas –Nepean Bay Trunk

The west post-development area will outlet to the Nepean Bay Trunk Sewer and will be controlled to the 2-year pre-development flow rate of **265.34L/s** or less.

<u>Drainage Area - STM01</u>

Drainage Area STM01 represents the west portion of the rooftop that will drain through uncontrolled roof drains. This flow will be directed to a cistern(s) on the west side of the LRT corridor that will be connected to the storm sewer on Road A/Road B. This area will ultimately outlet to the Nepean Bay Trunk.

The cistern(s) will be pumped at a maximum allowable flow rate of **60.0L/s.** The required storage volume of the cistern is 239m^3 and 506m^3 during the 5-year and 100-year storms, respectively. The cistern is being sized to accommodate the 100-year storm which results in a required volume of **506m^3**.

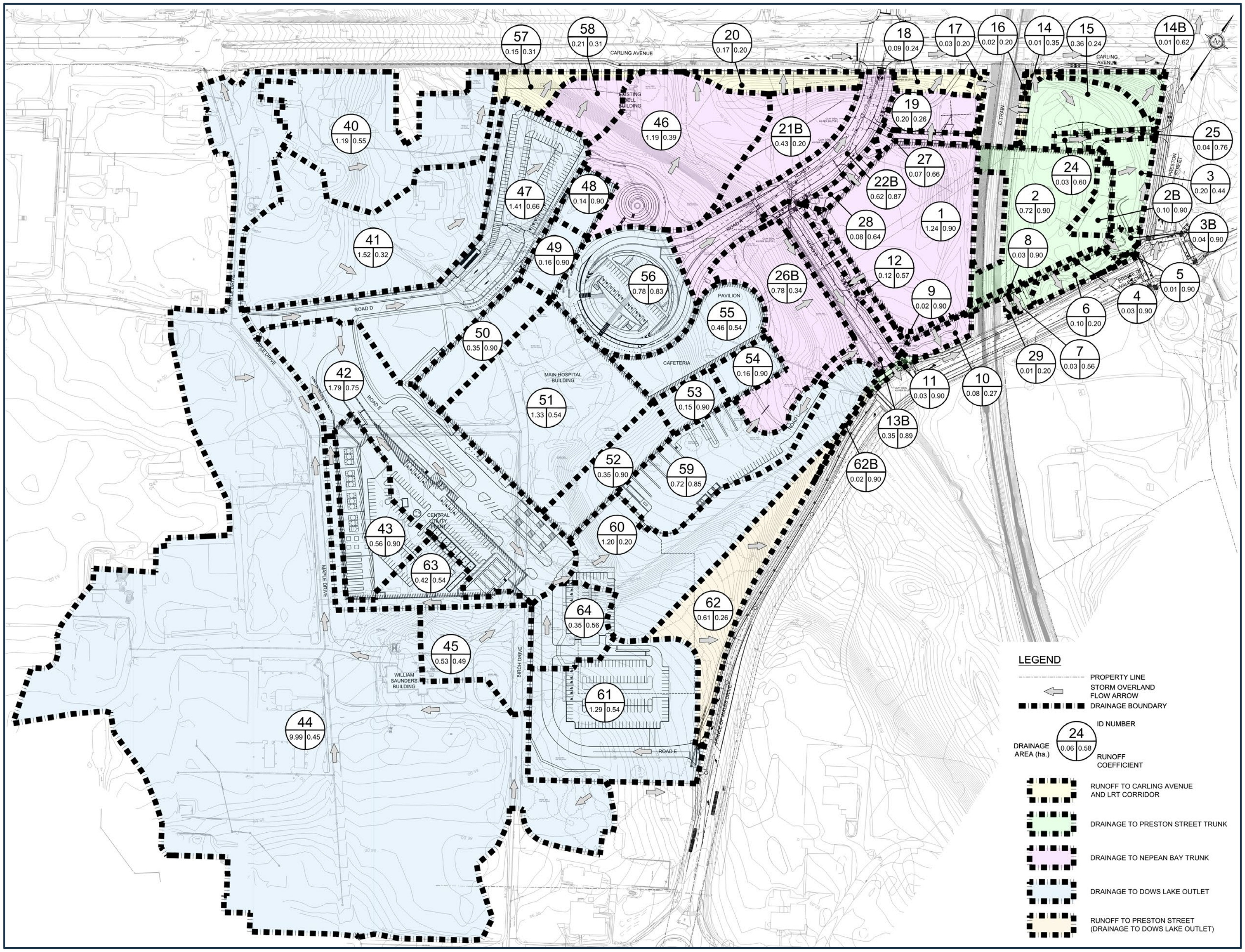
The cistern(s) will be located inside the parking garage on the west side. Four (4) 35,000-gallon cisterns are proposed that will provide a volume of **530m^3**. Therefore, the volume required for the 100-year storm can be accommodated within the cisterns. These cisterns will be pumped at a controlled rate and will have an overflow.

Drainage Area STM01 and STM09 will also be controlled with Drainage Areas STM10, STM12, STM13B, STM19, STM22B, STM26B, STM27, and STM28 prior to discharging into the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

<u>Drainage Area - STM09</u>

This proposed garden bed located on parking level four (P4) of the parking garage that will drain through uncontrolled drains. This flow will be directed internally through the building structure and combine with the flow from Drainage Area STM01 which will be directed to the underground cistern(s). Refer to the Drainage Area STM01 section for further details.

Figure 10-2: Post Development Drainage Areas



Drainage Area – STM10

The flow from the proposed landscape area along the south side of the parking garage will be captured with landscape drains. The landscape drains will drain to the oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

Drainage Area STM10 will be controlled with Drainage Areas STM12, STM13B, STM19, STM22B, STM26B, STM27, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26B prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM12

The proposed landscape area along the west side of the parking garage will sheet flow to the proposed catchbasins along Road B. The catchbasins will drain to an oversized 1200mm/1500mm diameter storm sewer within Road A/Road B. The flow will be controlled with a **300mm** diameter orifice plate prior to discharging into the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk.

Drainage Area STM12 will be controlled with Drainage Areas STM10, STM13, STM19, STM22B, STM26, STM27, and STM28 to **149.85L/s** for the 5-year and **187.83L/s** for the 100-year. The oversized 1200mm/1500mm diameter storm sewer can accommodate the 5-year and 100-year storms as well as the 100-year storm plus a 20% stress test. Refer to the PCSWMM output files with **Appendix J** for further details.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26B prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk.

Drainage Area - STM13B

This area represents the majority of Road B. The proposed asphalt road will drain via catchbasins that will be directed to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B. The catchbasins will capture the majority of the 100-year runoff with minimal spill over to Prince of Wales and ultimately Carling Avenue (Preston Trunk Outlet).

Drainage Area STM13B will be controlled with Drainage Areas STM10, STM12, STM19, STM22B, STM26, STM27, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26B prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk.

Drainage Area – STM19

This area is a proposed landscape area adjacent to the service road on the west side of the LRT corridor. A catchbasin will capture the flow and release it at a controlled rate to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

The controlled flow from this drainage area will be **3.65L/s** for the 5-year and **3.78L/s** for the 100-year. A vortex type ICD (Hydrovex Model No. 50 VHV-1 or equivalent) is proposed in CB37 to control the flow. The required storage volume is 14m^3 and 60m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **84m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **84m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated within the temporary dry pond.

It should be noted that this is a temporary surface storage area that will be removed when the Carling Towers are constructed. These buildings will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM21B

This area is located west of Road A. This existing open grass area with trees will remain as existing conditions. A catchbasin will capture the flow and release it at a controlled rate to the existing storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk.

The controlled flow from this drainage area will be **2.64L/s** for the 5-year and **3.17L/s** for the 100-year. A vortex type ICD (Hydrovex Model No. 50 VHV-1 or equivalent) is proposed in CB35 to control the flow. The required storage volume is 324m^3 and 1168m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **1608m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **1608m^3** is available within the landscape area**.** Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated within the temporary dry pond.

It should be noted that this is a temporary surface storage area that will be removed when the Research Tower is constructed. The building will require on-site storm water management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area – STM22B

This area represents Road A. The proposed asphalt road will drain via catchbasins that will be directed to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B. The catchbasins will capture the majority of the 100-year runoff with minimal spill over to Carling Avenue (Nepean Bay Trunk Outlet).

Drainage Area STM22B will be controlled with Drainage Areas STM10, STM13B, STM12, STM19, STM26B, STM27, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26B prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12I section for the release rate and storage details.

Drainage Area – STM26B

This existing open grass area with trees, located west of Road B, will remain as in existing conditions. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

The controlled flow from this drainage area will be **7.95L/s** for the 5-year and **8.45L/s** for the 100-year. A vortex type ICD (Hydrovex Model No.75 VHV-1 or equivalent) is proposed in DICB2 to control the flow. The required storage volume is 20m^3 and 110m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **157m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **157m^3** is available within the landscape area**.** Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated within the temporary dry pond.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26B prior to discharging to the existing 900mm diameter storm sewer on

Carling Avenue that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM27

The proposed service road along the north side of the parking garage, west of the LRT corridor, will be asphalt. The service road will include a catchbasin that will direct flow to the oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

Drainage Area STM27 will be controlled with Drainage Areas STM10, STM13B, STM12, STM19, STM22B, STM26B, and STM28.

Drainage Area STM10, STM12, STM13, STM22, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26. prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM28

The proposed landscape area along the west side of the parking garage will sheet flow to the proposed catchbasins along Road A. The catchbasins will drain to an oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

Drainage Area STM28 will be controlled with Drainage Areas STM10, STM13B, STM12, STM19, STM22B, STM26B, and STM27.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19 and Drainage Area STM26B. prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM46

This area is adjacent to Carling Avenue and west of Road A. The existing tree embankments and pedestrian pathways shall remain while a small ditch is to be graded to reroute drainage to the temporary dry pond in Drainage Area STM21B.

Drainage Area STM46 will be controlled with Drainage Area STM21B, prior to discharging to the existing storm sewer in Carling Avenue. Refer to the Drainage Area STM21B section for the release rate and storage details.

It should be noted that this is a temporary surface storage area that will be removed when the Future Research Building is constructed. This building will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area – STM58

This area is adjacent to Carling Avenue, west of the existing Bell building. The existing tree embankment is to drain to a proposed ditch area. A catchbasin is proposed to capture the flow controlled by an ICD and direct it to the proposed 300mm diameter storm sewer. The 300mm diameter storm sewer will connect to the existing storm sewer in Drainage Area STM46, which drains to Carling Avenue and ultimately Nepean Bay Trunk.

The controlled flow from this drainage area will be **12.65L/s** for the 5-year and **15.07L/s** for the 100-year. The required storage volume is 5m^3 and 42m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **53m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **53m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

10.6.3 Post Development Quantity Control –Nepean Bay Trunk

The 100-year stormwater flows are controlled with the post-development 100-year flows being controlled to the pre-development 2-year flows. The 2-year pre-development flow is **265.34L/s** and the 100-year post-development flow will be controlled to **263.23L/s.** The required onsite storage is provided (surface and underground) to control to the pre-development 2-year flow. Refer to **Table 10-4** for the post development restricted and unrestricted flow and **Table 10-5** for the required and available storage volumes.

Table 10-3: Post Development Unrestricted & Restricted Flows – Nepean Bay Trunk

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 2/5 Year	5 Year Unrestricted Flow (L/s)	5 Year Restricted Flow (L/s)	100 Year Unrestricted Flow (L/s)	100 Year Restricted Flow (L/s)
DRAINAGE TO NEPEAN BAY TRUNK (WEST OF LRT)							
STM1	1.24	0.90	1.00	355.26	60.00	618.81	60.00
STM9	0.02	0.90	1.00	6.98		11.95	
STM10	0.08	0.27	0.34	13.87	149.85	36.00	187.83
STM12	0.12	0.57	0.71	30.46		56.18	
STM13B	0.31	0.88	1.00	94.25		181.89	
STM22B	0.36	0.85	1.00	99.56		177.03	
STM27	0.07	0.66	0.82	18.86		34.09	
STM28	0.08	0.64	0.80	19.82		36.00	
STM19	0.20	0.26	0.33	24.94	3.65	78.44	3.78
STM21B	2.14	0.27	0.34	104.56	2.64	389.02	3.17
STM46	1.19	0.39	0.49	135.28		395.45	
STM58	0.21	0.31	0.39	26.59		84.9	
STM26B	0.41	0.36	0.45	38.54	7.95	143.66	8.45
TOTAL NEPEAN BAY TRUNK	6.28			968.97	224.09	2243.42	263.23

Table 10-4: Storage Volume Summary – Nepean Bay Trunk

Drainage Area ID	5 Year Storage Volume (m³)	100 Year Storage Volume (m³)	100 Year + 20% Stress Factor Storage Volume (m³)	Available Storage (m³)
STM1I & STM9I	239	506	646	530* (Underground Cistern(s))
STM19I	14	60	84	84 (Temporary Dry Pond)
STM 21I, STM23I, STM33AI	324	1168	1608	1608 (Temporary Dry Pond)
STM26I	20	110	157	157 (Ponding in Ditch)

10.6.4 Post-Development Drainage Areas – Dow's Lake Outlet

The southwestern post-development area will outlet to a private storm sewer and ultimately to Dow's Lake. This will be controlled to the 5-year pre-development flow rate of **2533.33L/s** or less.

<u>Drainage Area – STM40</u>

Drainage Area STM40 is an external drainage area located within the Ottawa Experimental Farm. It is adjacent to Carling Avenue, east of Maple Drive, and contains existing asphalt roadways and parking areas, buildings, and open grass areas with trees. This area drains through a private storm sewer system that outlets to Dow's Lake. Overland flow will remain as existing conditions and go to Carling Avenue.

Drainage Area STM40 will be controlled with Drainage Areas STM41, STM42, and STM47, prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Drainage Area – STM41

Drainage Area STM41 is an external drainage area located within the Ottawa Experimental Farm. It is adjacent to Maple Drive and Road D and contains existing asphalt roadways and parking areas, buildings, and open grass areas with trees. Overland flow will be directed to a proposed ditch, located on Ottawa Experimental Farm property, which drains into the proposed oversized storm sewer system for the Main Hospital Building and Central Utility Plant. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM41 will be controlled with Drainage Areas STM40, STM42, and STM47, prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Drainage Area – STM42

This drainage area includes the western portion of Road E, the ambulance entrance and garage, parking lot for hospital staff (Zone 6A Parking), and the northern portion of the Central Utility Plant building. A network of catchbasins and catchbasin maintenance holes will capture the stormwater within the proposed oversized storm sewer system for the Main Hospital Building and Central Utility Plant. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

The Central Utility Plant building is assumed to have two (2) service connections that tie into the proposed oversized storm sewer system for the Main Hospital Building and Central Utility Plant along Road E. It is also assumed that the northern portion of the Central Utility Plant roof will be uncontrolled and directed to these two (2) services connections.

The storm sewer system within Drainage Area STM42 will receive controlled flow from Drainage Areas STM45, STM51, STM61, STM63, and STM64. Refer to the various Drainage Area sections for the release rate and storage details.

Drainage Area STM42 will be controlled with Drainage Areas STM40, STM41, and STM47, prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Permanent groundwater dewatering for the Central Utility Plant/Main Hospital Building is estimated to **12.73L/s**. The groundwater estimates are preliminary and include several simplified assumptions. A numerical model should be completed to better represent the complex geometry of the excavation, the variability in the overburden deposits, and the sloping water table. Based on the groundwater samples collected from the site to date and the City of Ottawa sewer discharge criteria, it is assumed that the groundwater will discharge to the proposed storm sewer system. The discharge location is assumed to be MHST158, located on Road E, and will need to be refined as the design of the Central Utility Plant/Main Hospital Building moves into the preliminary/detail stages.

Drainage Area – STM43

This area represents the southwestern portion of the Central Utility Plant. The Central Utility Plant will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. The building is assumed to have one (1) service connection adjacent to Maple Drive that ties into the proposed oversized storm sewer for the Main Hospital Building and Central Utility Plant along Road E. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

A maximum allowable release rate of **50L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is $65m^3$ and $161m^3$ during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **$214m^3$** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Central Utility Plant.

<u>Drainage Area – STM44</u>

Drainage Area STM44 includes the full external drainage of the Ottawa Experimental Farm that is serviced by the existing Maple Drive private storm sewer network. It contains asphalt roadways and parking areas, buildings, open grass areas with trees, and Maple Drive. The existing private storm sewer within Maple Drive will connect into the proposed oversized storm sewer network for the Main Hospital Building and Central Utility Plant at Road D. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

The controlled flow from this drainage area, including the reduced flow from Drainage Area STM45 will be **142L/s** for the 5-year and **484L/s** for the 100-year. The required storage volume is $353m^3$ and $1058m^3$ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **$1307m^3$** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of **$1500m^3$** is available within the proposed off-site underground storage chamber, located on the northeast corner of the Maple Drive and Road D intersection. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the proposed off-site underground storage chamber.

<u>Drainage Area – STM45</u>

Drainage Area STM45 is an external drainage area located within the Ottawa Experimental Farm. This area includes a portion of the existing William Saunders Building and adjacent asphalt laneway and severed portion of Birch Drive. The area is to remain as existing where stormwater flows northward. A proposed ditch, located on the hospital site, will surround the Central Utility Plant to convey the stormwater away from the building and allow ponding for storage. Stormwater will be captured by a proposed catchbasin equipped with an inlet control device that connects to the proposed storm sewer system for the Main Hospital Building and Central Utility Plant at Road E. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM45 will be controlled with STM63 prior to discharging into the proposed oversized storm sewer system, within Road E, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM63 section for the release rate and storage details.

<u>Drainage Area – STM47</u>

This area represents Road D and the most western parking lot (Zone 1 Parking). The proposed asphalt road and parking lot will drain via catchbasins that will be controlled by an inlet control device. Stormwater will be detained by an underground storage chamber and oversized 1050mm/1500mm diameter storm sewer. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM47 will be controlled with Drainage Areas STM40, STM41, and STM42 to **338L/s** for the 5-year and **921L/s** for the 100-year. The required storage volume is $791m^3$ and $2049m^3$ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **$2821m^3$** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of **$3000m^3$** is available within the underground storage chamber Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the underground chamber and oversized pipe network.

Drainage Area STM47, STM40, STM41, and STM42 will receive controlled flow from Drainage Areas STM43, STM44, STM45, STM49, STM50, STM51, STM 61, STM63 and STM64, prior to discharging to the oversized storm sewer that ultimately outlets to Dow's Lake.

<u>Drainage Area – STM48</u>

This area represents the northern roof portion of Tower A (traditional roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **10L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 19m^3 and 44m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **58m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM49</u>

This area represents the central roof portion of Tower A (traditional roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **10L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 25m^3 and 57m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **74m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM50</u>

This area represents the southern roof portion of Tower A (traditional roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **10L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 76m^3 and 158m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **201m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM51</u>

This area represents the Podium roof (green roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have two (2) service connections that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **280L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 6m^3 and 15m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **35m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM52</u>

This area represents the southern roof portion of Tower B (traditional roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **10L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 77m^3 and 159m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **201m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM53</u>

This area represents the central roof portion of Tower B (traditional roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **20L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 11m^3 and 33m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **45m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM54</u>

This area represents the northern roof portion of Tower B (traditional roof) of the Main Hospital Building. The Main Hospital Building will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **10L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 23m^3 and 53m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **69m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Main Hospital Building.

<u>Drainage Area – STM55</u>

This area represents the Pavilion roof (green roof) of the Main Hospital Building. Since this structure is proposed to be constructed out of timber, no storage was accounted for stormwater quantity control. The stormwater flow will be collected and discharge at an uncontrolled rate. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized sewer that ultimately outlets to Dow's Lake.

The uncontrolled flow from this drainage area will be **9L/s** for the 5-year and **56L/s** for the 100-year.

<u>Drainage Area – STM56</u>

This area represents the underground emergency parking garage located at the front of the Main Hospital Building. The parking structure will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. The parking structure is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

A maximum allowable release rate of **30L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 135m^3 and 311m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **403m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the design of the underground emergency parking structure for the Main Hospital Building.

Drainage Area – STM59

This area represents the loading dock of the Main Hospital Building. Stormwater will be collected through catchbasins and directed (uncontrolled) into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

The uncontrolled flow from this drainage area will be **195L/s** for the 5-year and **347L/s** for the 100-year.

Drainage Area – STM60

This area is west of Prince of Wales Drive, southwest of Road B, and adjacent to the proposed hospital loading dock. Proposed to incorporate a bioswale for quantity storage that also provides the major overland flow route for western drainage. A ditch inlet is proposed to capture the flow controlled by an ICD and direct it to the oversized storm sewer that ultimately outlets to Dow's Lake.

The controlled flow from this drainage areas will be **73L/s** for the 5-year and **139L/s** for the 100-year. The required storage volume is $3m^3$ and $92m^3$ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **160m³** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **185m³** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

It should be noted that this is a temporary design that will be removed when the future Heart Institute is constructed. This building will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area – STM61

This area is the southern parking lot (Zone 4 Parking) adjacent to Prince of Wales Drive and southwestern portion of Road E. The proposed parking lot will drain via a network of catchbasins and catchbasin maintenance holes that will be controlled by an inlet control device. Stormwater will be detained in an underground storage chamber within the parking lot. This area will discharge into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

The controlled flow from this drainage areas will be **28L/s** for the 5-year and **37L/s** for the 100-year. The required storage volume is $231m^3$ and $528m^3$ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **684m³** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of **824m³** is available within the underground storage chamber. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the underground storage chamber.

Drainage Area – STM62

This area is located adjacent to Prince of Wales Drive. This existing open grass area with trees will remain as in existing conditions. The surface flow will continue to drain uncontrolled to Prince of Wales Drive and ultimately drain to Dow's Lake.

The uncontrolled flow from this drainage area will be **17.89L/s** for the 5-year and **87.14L/s** for the 100-year.

Drainage Area – STM62B

This area is located adjacent to Prince of Wales Drive. This existing asphalt area will remain as in existing conditions. The surface flow will continue to drain uncontrolled to Prince of Wales Drive and ultimately drain to Dow's Lake.

The uncontrolled flow from this drainage area will be **5.04L/s** for the 5-year and **8.63L/s** for the 100-year.

Drainage Area – STM 63

This area represents the southeastern portion of the Central Utility Plant. This portion of the Central Utility Plant will be directed to the proposed ditch adjacent to the south side of the Central Utility Plant. Stormwater will be captured by a proposed catchbasin equipped with an inlet control device that connects to the proposed storm sewer system for the Main Hospital Building and Central Utility Plant at Road E. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM63 will be controlled with STM45 prior to discharging into the proposed oversized storm sewer system, within Road E, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM45 section for the release rate and storage details.

The controlled flow from this drainage area will be **64L/s** for the 5-year and **229L/s** for the 100-year. The required storage volume is 60m³ and 135m³ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **148m³** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **148m³** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area – STM64

This area represents the smaller southern parking lot (Zone 6B Parking) adjacent to the ambulance garage. and a portion of Road E. The proposed asphalt road and parking lot will drain via a network of catchbasins and catchbasin maintenance holes that will be controlled by an inlet control device. Stormwater will be detained in an underground storage chamber within the parking lot. This area will discharge into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

The controlled flow from this drainage areas will be **46L/s** for the 5-year and **39L/s** for the 100-year. The required storage volume is 45m³ and 108m³ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **140m³** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of **202m³** is available within the underground storage chamber. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the underground storage chamber.

10.6.5 Post Development Quantity Control – Dow's Lake Outlet

The 100-year stormwater flows are controlled with the post-development 100-year flows being controlled to the pre-development 5-year flows. The 5-year pre-development flow is **2533.33L/s** and the 100-year post-development flow will be controlled to **2019L/s.** The required storage volume of **6560m³** to control the pre-development 5-year flow is provided through surface and underground storage (**7159m³**). Refer to Table 10-6 for the post development restricted and unrestricted flow and Table 10-7 for the required and available storage volumes.

Table 10-5: Post Development Unrestricted & Restricted Flows – Southwest Outlet

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	5 Year Unrestricted Flow (L/s)	5 Year Restricted Flow (L/s)	100 Year Unrestricted Flow (L/s)	100 Year Restricted Flow (L/s)
STM40	1.19	0.55	0.68	202	1267	454	2019
STM41	1.52	0.32	0.39	99		290	
STM42	1.79	0.75	0.94	461		857	
STM43	0.56	0.90	1.00	161		278	
STM44	9.99	0.45	0.56	1294		3217	
STM45	0.53	0.49	0.61	91		220	
STM47	1.41	0.66	0.83	320		638	
STM48	0.14	0.90	1.00	40		68	
STM49	0.16	0.90	1.00	47		81	
STM50	0.35	0.90	1.00	95		167	
STM51	1.33	0.54	0.68	25		155	

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	5 Year Unrestricted Flow (L/s)	5 Year Restricted Flow (L/s)	100 Year Unrestricted Flow (L/s)	100 Year Restricted Flow (L/s)
STM52	0.35	0.90	1.00	95		168	
STM53	0.15	0.90	1.00	43		74	
STM54	0.16	0.90	1.00	45		77	
STM55	0.46	0.54	0.68	9		56	
STM56	0.78	0.83	1.00	199		373	
STM59	0.72	0.85	1.00	195		347	
STM60	1.20	0.20	0.25	77		338	
STM61	1.29	0.54	0.67	213		467	
STM63	0.42	0.54	0.67	187		406	
STM64	0.35	0.56	0.69	74		158	
TOTAL	24.84			3972	1267	8889	2019
DRAINAGE UNCONTROLLED TO CARLING AVENUE/LRT CORRIDOR							
STM62*	0.61	0.26	0.32	6.39	-	13.92	-
STM62B*	0.02	0.90	1.00	5.04	-	8.63	-

*Uncontrolled sheet flow as existing conditions – will be captured in a future phase of development.

Table 10-6: Storage Volume Summary – Southwest Outlet

Drainage Area ID	5 Year Storage Volume (m^3)	100 Year Storage Volume (m^3)	100 Year + 20% Stress Factor Storage Volume (m^3)	Available Storage (m^3)
STM43	65	161	214	214 (Building Rooftop or Underground Cistern Storage)*
STM44	353	1058	1307	1500 (Underground Storage)
STM48	19	44	58	58 (Building Rooftop or Underground Cistern Storage)*
STM49	25	57	74	74 (Building Rooftop or Underground Cistern Storage)*
STM50	76	158	201	201 (Building Rooftop or Underground Cistern Storage)*
STM51	6	15	35	35 (Building Rooftop or Underground Cistern Storage)*
STM52	77	159	201	201 (Building Rooftop or Underground Cistern Storage)*

Drainage Area ID	5 Year Storage Volume (m³)	100 Year Storage Volume (m³)	100 Year + 20% Stress Factor Storage Volume (m³)	Available Storage (m³)
STM53	11	33	45	45 (Building Rooftop or Underground Cistern Storage)*
STM54	23	53	69	69 (Building Rooftop or Underground Cistern Storage)*
STM56	135	311	403	403 (Parking Structure Rooftop or Underground Cistern)*
STM 60	3	92	160	185 (Ponding in Ditch)
STM61	231	528	684	824 (Underground Storage)
STM63	60	135	148	148 (Ponding in Ditch)
STM64	45	108	140	202 (Underground Storage)
STM40, STM41, STM42, & STM47	791	2049	2821	3000 (Underground Storage)
TOTAL	1920	4961	6560	7159

*Storage will need to be provided within the building and will need to be refined at the design moves forward.

10.7 Stormwater Quality

Enhanced water quality protection (80% TSS removal) is required, and best management practices are generally encouraged to maximize on-site quality protection.

The quality control measures for the site will be provided through a treatment train approach; promoting sheet runoff from impervious areas (asphalt/concrete) to low impact development (LID) systems (bioswales, infiltration trenches, etc.), underground storage systems will promote infiltration, and ultimately an oil and grit separator system. Potential locations for LID systems are indicated on the site grading drawings. The oil and grit separator will be placed at the downstream side of the proposed 1350mm diameter storm sewer that will outlet to the Dow's Lake. The sizing of the oil and grit separators will be completed within the detailed design phase.

Permanent groundwater dewatering will be required for the site. It is currently anticipated that the groundwater will be pumped into the proposed storm sewer system which would assist with lowering the temperature of the stormwater. In addition, the site has been designed with significant tree canopy and best efforts will be provided to promote shading of impervious areas (asphalt/concrete). The lowering of groundwater and discharge locations will be studied further within the detailed design phase.

Temperature mitigation for stormwater runoff off the roof of Main Hospital Building will be provided through a purple and/or green roof design. The purple/green roof design will be studied further within the detailed design phase.

10.8 Major Overland Flow

The major overland flow route for a portion of the Ottawa Experimental Farm is towards the existing Maple Drive/Birch Drive intersection. A ditch is proposed on the west side of the Central Utility Plant to capture and direct overland flow in a northwest direction around the Central Utility Plant towards Road E. At this point, the overland flow route is directed east on Road E until the southeastern corner of the Main Hospital Building. The overland flow route is then directed to the proposed bioswale along the east side of the Main Hospital Building and adjacent to the loading dock. A berm is proposed on the east side of the loading dock to ensure overland flow is directed to the Road B/Prince of Wales Drive intersection and divert it away from the loading dock. The overland flow continues down Prince of Wales Drive and north along Preston Street towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

Major overland flow route from the Road E and Prince of Wales Drive intersection heads northwest along Road E until it is directed into the proposed bioswale adjacent to the loading dock.

The major overland flow route for Road D starts at the Maple Drive and Road D intersection. It continues northeast along Road D until reaching the proposed parking lot (Zone 1 Parking) along the west side of the Main Hospital Building and down the existing forest embankment to Carling Avenue. The overland flow route continues east along Carling Avenue to Preston Street. At Preston Street it heads north towards Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The major overland flow route for Road L and Road B heads west towards the Road B and Prince of Wales Drive intersection and then along Prince of Wales Drive. At Prince of Wales Drive it heads north along Preston Street towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The major overland flow route for Road A is north towards the Road A and Carling Avenue intersection. It continues along Carling Avenue to Preston Street. At Preston Street it heads north towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

10.9 Summary and Conclusions

The proposed stormwater system will consist of controlled stormwater release from the Central Utility Plant, Main Hospital Building, and Parking Garage for Emergency. The stormwater will need to be detained using rooftop storage and/or underground cistern(s) within the buildings/structures. The building/structures designs will need to account and provide the necessary quantity control requirements. There are three (3) storm service connections for the Central Utility Plant, ten (10) storm service connections for the Main Hospital Building, and temporary storm services in the southern parking lots (Zone 4 Parking and Zone 6B Parking) prior to the construction of the future Heart Institute. The stormwater sewer network wraps around the Main Hospital Building and is sized to capture the for 100-year flow.

Two (2) underground storage chambers are proposed in the southern interim parking lots (Zone 4 Parking and Zone 6B Parking).

An oversized storm sewer (750mm/1350mm diameter) is proposed within Road D and Road E and along the front of the Main Hospital Building. An underground storage chamber is proposed in the western parking lot (Zone 1 Parking).

Four (4) surface ponding areas (within Drainage Area STM21B, STM26, STM58, and STM60) are proposed on the west side of Road A/Road B.

An oversized storm sewer (1200mm/1500mm diameter) is proposed within Road A/Road B. This will service works within the Phase 3 & 4 (Central Utility Plant and Main Hospital Building) project and Phase 2 (Parking Garage) project. This storm sewer will connect into the existing 900mm storm sewer at Carling Avenue and Champagne Avenue South.

External drainage from Maple Drive will be controlled to the total external 5-year flow prior to entering the proposed oversized storm sewer network for the Central Utility Plant and Main Hospital Building. An offsite (outside the lease boundary) underground storage chamber will need to be provided on the Ottawa Experimental Farm property to provide the required quantity control.

The stormwater flows are controlled with the post development 100-year flows being controlled to the pre-development 2-year flow for networks heading to the Preston Street Trunk and Nepean Bay Trunk and to the 5-year flow for the private system that outlets to Dow's Lake.

The major overland flow route for the site is in the northerly direction towards Carling Avenue to Preston Street intersection where it continues north towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The proposed storm sewer and stormwater management design will need to be refined as the design moves forward.

11.0 SEDIMENT AND EROSION CONTROL

To mitigate the impacts due to erosion and sedimentation during construction, erosion and sediment control measures shall be installed and maintained throughout the duration of construction. Measures shall only be removed once the construction activities are complete, and the site has stabilized.

The measures will include:

- Siltsack® shall be installed between the frame and cover of existing and new catchbasins and maintenance holes, to minimize sediments entering the storm drainage system. These shall remain in place until construction is complete;
- A mud mat shall be provided where equipment will be leaving the site;
- Cori matting shall be provided along the temporary berm;
- Light Duty Silt Fence Barriers shall be placed along the north border of the site. The barriers shall be installed and maintained according to OPSS 577 and OPSD 219.110;
- A visual inspection shall be completed daily to identify any erosion and sediment control measures that may require repair;
- Erosion and sediment control measures shall be cleaned as required; and
- Additional erosion and sediment control measures may need to be installed by the Contractor during construction as requested by the Engineer.

In addition, the oil and grit separator will accumulate sediment from the site during runoff events and will require periodic cleaning. It is recommended to be cleaned on at least a yearly basis, or as per manufacturer's recommendations.

12.0 CONCLUSION

This report outlines the proposed servicing and stormwater management design for the Main Hospital Building and Central Utility Plant within the NCD for TOH.

12.1 Water

A 300mm diameter watermain loop is proposed around the Main Hospital Building that will connect to the existing 406mm diameter watermain on Carling Avenue at the Carling Avenue and Road B intersection and Carling Avenue and Sherwood Drive. The proposed 300mm diameter watermain loop will also connect to the proposed 300mm diameter watermain at the Road A and Road B intersection.

The main hospital building will be serviced with two (2) 200mm diameter water services at the east end of Tower B, extended from the 300mm diameter watermain loop. The central utility plant will be serviced with two (2) 200mm diameter water services extended from the 300mm diameter watermain loop located within Road E.

The model results indicate that adequate domestic water supply and fire flow demand is available for the site with the exception of the pressures falling below the City of Ottawa minimum requirement of 40psi at the proposed Road E and Prince of Wales Drive intersection during the average day demand, maximum daily demand, and peak hourly demand scenarios. The pressure loose is a result of the natural topography of the site (approximately 17.5m elevation different between this intersections and Carling Avenue). Building services for the Central Utility Plant and Main Hospital Building are not proposed within these two (2) areas of the site. The pressures at all proposed building services are above the City of Ottawa minimum requirement of 40psi during the average day demand, maximum daily demand, and peak hourly demand scenarios.

The proposed watermain design will need to be refined as the design moves forward and discussions with the City of Ottawa are required as the NCD site is within two (2) water pressure zones.

12.2 Sanitary

The proposed sanitary sewer system for the Main Hospital Building and the Central Utility Plant will be divided (at MHSA10) into a south and west system. There are ten (10) sanitary service connections assumed for the Main Hospital Building and two (2) sanitary service connections assumed for the Central Utility Plant. The service connection(s) for the future Heart Institute will be provided in a future phase. The proposed 300mm/375mm/450mm will connect into the Mooney's Bay Collector at the proposed Road B and Road L intersection.

The proposed sanitary sewer design will need to be refined as the design moves forward.

12.3 Storm

The proposed stormwater system will consist of controlled stormwater release from the Central Utility Plant, Main Hospital Building, and Parking Garage for Emergency. The stormwater will need to be detained using rooftop storage and/or underground cistern(s) within the buildings/structures. The building/structures designs will need to account and provide the necessary quantity control requirements. There are three (3) storm service connections for the Central Utility Plant, ten (10) storm service connections for the Main Hospital Building, and temporary storm services in the southern parking lots (Zone 4 Parking and Zone 6B Parking) prior to the construction of the future Heart Institute. The stormwater sewer network wraps around the Main Hospital Building and is sized to capture the for 100-year flow.

The stormwater flows are controlled with the post development 100-year flows being controlled to the pre-development 2-year flow for networks heading to the Preston Street Trunk and Nepean Bay Trunk and to the 5-year flow for the private system that outlets to Dow's Lake.

The required storage will be provided through a combination of surface storage, rooftop storage, and underground storage.

Treatment train quality control measures such as low impact developments, bioswales, and rain gardens will be implemented at the detailed design stage.

The major overland flow route for the site is in the northerly direction towards Carling Avenue to Preston Street intersection where it continues north towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The proposed storm sewer and stormwater management design will need to be refined as the design moves forward.

Prepared By:	Reviewed By:
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APPENDIX A | LIST OF BACKGROUND REPORTS AND DRAWINGS

Background Reports & Drawings

City of Ottawa Information Request

An information request was sent to the City of Ottawa on February 6, 2020 and a response was received on March 4, 2020.

A list of the background drawings provided include the following:

- Carling Avenue Reconstruction & Widening from Bronson Avenue to Kirkwood Contract No. 56-28, 1956;
    - 1000p&p03.pdf
    - 1000p&p04.pdf
    - 1000p&p05.pdf
    - 1000p&p06.pdf
    - 1000p&p07.pdf
- Carling Avenue Storm and Sanitary Sewer and Convert Combined to Storm Sewer from Sherwood Drive to Champagne Street Contract No. 96C2929, 1996;
    - 2929p&p1.pdf
    - 2929p&p2.pdf
- Dow's Lake Visitor Parking Facility – Electrical, Light Standards & Irrigation Contract No. 6136, 1982;
    - 4434plan.pdf
- Mooney's Bay Sanitary Collector Sewer Phase 'A' Contract No. 65-180, 1965;
    - 6580p&p01.pdf
    - 6580p&p02.pdf
    - 6580p&p03.pdf
- Carling Avenue 42" Watermain from Loretta Avenue to East of Rochester Street Contract No. 6944, 1961;
    - 6944p&p1.pdf
- Preston Street Watermain from Carling Avenue to Dow's Lake Contract No. 3067, 1984;
    - 7232p&p.pdf
- Fire Sprinkler Systems for Buildings 76, 88, 91 & 91A Central Experimental Farm Ottawa New Water Service to Building #88 and Dry Pipe Sprinkler Connection to Building #91A Contract No. 653069, 1997;
    - 9086p&p01
- Dow's Lake Watermain Replacement Contract No. RD2800-64E, 2000;
    - 9580p&p01
- Carling Avenue Rehabilitation Watermain Irving Place/Maple Drive Contract No. ISB08-5037, 2008;
    - 14869p&p10.tif
- Central Experimental Farm Site Services Rehabilitation Phase 1A New Watermain and Storm Sewer Contract No. R.010222.002, 2008;
    - 15055p&p04.pdf
    - 15055p&p05.pdf
    - 15055p&p06.pdf
- Central Experimental Farm Site Services Rehabilitation Phase 1B Contract No. R.010223.002, 2009;
    - 15238p&p10.pdf
    - 15238plan01.pdf
    - 15238plan02.pdf
- Central Experimental Farm Site Service Reconstruction Phase 2 Contract No. R.010223.002, 2009;
    - 15395.tif
    - 15395p&p11.tif
    - 15395p&p12.tif
    - 15395p&p13.tif
    - 15395p&p14.tif

    - 15395p&p15.tif
    - 15395p&p16.tif
    - 15395p&p17.tif
    - 15395p&p20.tif
    - 15395p&p21.tif
    - 15395plan09.tif
    - 15395plan10.tif
- Loretta Avenue South Reconstruction Contract No. ISD16-5029, 2017;
    - 17416p&p20.pdf
- C.P.R Relocation Prescott Line Contract B2-Grade Separations and Approaches, 1964;
    - B12j-2.pdf
- Carling Avenue Reconstruction & Widening from Bronson Avenue to Kirkwood Avenue Contract No, 56-88, 1936;
    - B01931000-01.tif
    - B01931000-02.tif
    - B01931000-03.tif
    - B01931000-04.tif
    - B01931000-05.tif
- Proposed Conduit for Fire Cable Under CPR Tracks at Carling Avenue, 1957;
    - J-29-3.pdf
    - J-29-4.pdf
    - J-29-5.pdf
- Central Experimental Farm Site Service Reconstruction Phase 3, 2011;
    - key.pdf
    - p&pC-3.pdf
    - p&pC-4.pdf
    - p&pC-5.pdf
    - p&pC-6.pdf
    - p&pC-7.pdf
    - p&pC-8.pdf
    - p&pC-9.pdf
    - p&pC-10.pdf
    - p&pC-11.pdf
    - p&pC-12.pdf
    - p&pC-13.pdf
    - p&pC-14R.tif
    - p&pC-15R.tif
    - p&pC-16R.pdf
    - planC-2.pdf
    - planC-17R.pdf
    - planC-18R.pdf
    - planC-19R.pdf
    - planC-20R.pdf
    - planC-21R.pdf
    - planC-22R.pdf
- Water Distribution System Mapping 366-028, 2019; and
- Wastewater Collection System Mapping 366-028, 2019;

A list of the background reports provided include the following:

- City of Ottawa Report of Subsurface Investigation Carling Avenue from Sherwood Drive to Champagne Street Ottawa, Ontario prepared by John D. Patterson & Associates Limited Consulting Geotechnical & Environmental Engineers, December 15, 1995;
  - B-0298.pdf
- Transportation Department Test Laboratory Roan Plan and Borehole Log Carling Avenue from Bronson Avenue to Kirkwood Avenue, September 1992;
  - B-1772.pdf
- Geotechnical Investigation Carling Avenue Rehabilitation Kirkwood Avenue to Bronson Avenue Ottawa, Ontario prepared by Golder Associates Limited, March 17, 2007; and
  - B-2226.pdf
- Measurement of Sewage Flow from the Experimental Farm, February 1964.
  - R-0048.pdf

Public Services and Procurement Canada (PSPC) Information Request

An information request was sent to Public Services and Procurement Canada (PSPC) and a response was received on May 20, 2020.

A list of the background drawings provided include the following:

- Sir John Carling Building – Annex Storm Sewer Relining Contract No. R.083619.002, 2017;
  - C-1-Plan-Relining.pdf
- Central Experimental Farm Site Services Reconstruction Phase 2 Contract No. R010223.002, 2009
  - CEF 2C – C9.pdf
  - CEF 2C – C12.pdf
  - CEF 2C – C13.pdf
  - CEF 2C – C14.pdf
  - CEF 2C – C15.pdf
  - CEF 2C – C16.pdf
  - CEF 2C – C17.pdf
- Central Experimental Farm Site Services Reconstruction Phase 3 Contract No. R010222.002, 2011
  - CEF_3-As Builts-C-14.pdf
  - CEF_3-As Builts-C-15.pdf

APPENDIX B | CITY OF OTTAWA SITE EVALUATION AND CONSTRAINTS

		Servicing Comments											
Option	Site	Street	Storm Mains			Sanitary Mains		Water Mains					
			Sewer Size	Subwatershed	SWM Criteria	Sewer Size	Constraints	Pressure Zone	Size	Current Pressure (Psi)	Redundany for Critical Customer (Requirement)	Redundant Feeds	Additional Comments
G	CEF - Carling East (AAFC)	Carling Ave.	300mm-375mm	City Core [Rideau Valley Conservation]	1. Maintain sewer capacity for new connections to Carling Ave 2. Onsite swm to contain 1:100 year onsite (major system control)	225mm-300mm	1. Partially separated. 2. MBC sewershed, basement flooding potential. 3. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 4. Significant concerns related to basement flooding.	2W	406mm	70-92	No?	406mm Carling Avenue, 203mm Gwynne Avenue	Depending on demands 203mm might not be sufficient to be a redundant feed
		Prince of Wales Dr.	No Storm Main		1. Depends on outlet. Need more information to comment.	No Sanitay Main	No existing SAN.	N/A	No Water Main				
		Proposed Site	Existing private sewers with outlet to Dow's Lake.		1. Note: Dow's Lake connection in existing condition is via Private sewers. No comments provided on private sewers. 2. Maintain pre-development storm sewer flows for existing sewer connections 3. Onsite swm to contain 1:100 year onsite (major system control)	1050mm Mooney's Bay Trunk Collector (North-Western Corner of Site)	1. Partially separated. 2. MBC sewershed, basement flooding potential. 3. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 4. Significant concerns related to basement flooding.						
I	Dow's Lake Parking (NCC)	Carling Ave.	450mm	City Core East & Rideau Canal [Rideau Valley Conservation)	[Drains to Preston combined sewer, which goes to Booth Street sewer.] 1. Significant concerns due to connection to combined sewer, CSO risk, basement flooding risk 2. No increase in existing flows to combined sewer	300mm	1. Preston Street Trunk sewershed. CSO risk. Basement flooding risk. 2. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 3. Significant concerns related to CSO and basement flooding risk.	1W	127mm	62-78		406mm Carling Avenue, Check Valve between 2W & 1W, 406mm on Preston Street	
								1W	406mm				
								1W	1067mm				
		Preston St.	No Storm Main		Depends on outlet. More information required to comment.	300mm	1. This is a private sewer. No comments provided for private sewers. 2. Preston Street Trunk sewershed. CSO risk. Basement flooding risk. 3. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 4. Significant concerns related to CSO and basement flooding risk.	1W	152mm				
		Prince of Wales Dr.	No Storm Main		Depends on outlet. More information required to comment.	No Sanitary Main	Depends on outlet. Need more information to comment.	N/A	No Water Main				

Notes:

1. For Pinecrest Creek Criteria, please consult Planning and Growth Management Staff. Please see the "PINECREST CREEK/WESTBORO STORMWATER MANAGEMENT RETROFIT STUDY - FINAL REPORT" for more information
2. CCC refers to the Cave Creek Collector
3. MBC refers to the Mooney's Bay Collector
4. WNC refers to the West Nepean Collector
5. It is assumed that additional development criteria will apply including stormwater management criteria for most sites. The information above are preliminary comments on existing storm, sanitary, and water services only.
8. Additional comments will be required once additional details are available
9. Due to the critical nature of the proposed customer, no redundancy is a significant water servicing concern. [Column N]
11. Comments dated August 5, 2016 based on information provided (site locations and proposed connection points only)
12. Option A did not contain any information and a site location was not provided. No comment provided.
13. PSPC (PSPC) site not listed in table and proposed connections not provided. No comments provided.

APPENDIX C | CORRESPONDENCE

July 6, 2022

JOINT CITY AND NCC APPLICATION REQUIREMENTS
Phase 3 - Central Utility Plant and Phase 4 - Main Hospital Building

ENGINEERING
Civil Engineering

Reports
- Site Servicing / Stormwater Management Functional Report
- Geotechnical / Slope Stability
- Site Lighting plan/report addressing sky illumination
- Noise / Vibration Impact Analysis
  - Helicopter pad and flight path
  - Loading dock
  - Other noise generators on site (such as the Central Utility Plant?)
  - Confirm coordination with the Dominion Observatory (seismic equipment)

Plans
- Grading and Drainage / Servicing / Stormwater Management / Existing Conditions
- Erosion and Sediment Control Plan
- Composite Utility Plan

Mechanical and Electrical Engineering
- Mechanical & Electrical Drawings and Equipment details for exterior installations including access shafts, vents, etc.

Transportation Engineering
Reports
- Transportation Impact Assessment which includes:
  - Off-site Parking Strategy
  - Neighbourhood Traffic Management Study
  - Transportation Monitoring Strategy
  - Transportation Demand Management Plan
  - Present the alternatives to Maple Drive as Ambulance Access

Plans
- Roadway Modification Design Plans

DESIGN: Planning / Architecture / Landscape
Reports
- Planning Rationale, to include:
  i. Project Vision, Design Vision, and Design Principles (Urban Design, Landscape and Architecture)
  ii. Description of Functional Program Requirements, Options Analysis and Test fits.
  iii. City / Federal policy framework (such as Zoning, Official Plan, Secondary Plan, Heritage Designations (City/Federal), NCC Plans including Plan for Canada's Capital, Capital Urban Lands Plan, Federal Heritage Designations, National Historic Site Management Plan etc.)

DRAFT

iv. Sustainability Strategy / High Performance Design Standards
v. Consultation Reports (consultations, stakeholder meetings and summary of feedback and responses to feedback received) Stakeholder engagement documented should include Aboriginal groups, AAFC, Accessibility advocates etc
vi. Describe design response to achieve compliance with the applicable conditions of the NCC FLUA granted for the Site Master Plan that apply to the part of the site affected during this phase of development.
vii. Describe design response to achieve compliance with the NCC Project Specific Design Criteria
viii. Site and Landscape Lighting Strategy, Drawings and Specifications
ix. Public art strategy and locations
x. Exterior Material Samples and Colour Palette (Including future mock-ups)

- Design brief / 3D renderings
- Cultural Heritage Impact Statement – refer to section below
- Heritage Protection Plan – refer to section below
- Wind Study – should take into account snow drifting
- Shadow Study – take into account the Dominion Observatory Complex

Perspectives/ 3D Renderings should include:

- Views from Prince of Wales Scenic Entry – Include views toward proposed loading dock
- Views from entrance to Queen Elizabeth Drive (at Preston / Prince of Wales)
- Views from Carling Avenue both east and west of the main hospital building
- Views identified in Commemorative Integrity Statement for Central Experimental Farm
- Views from adjacent CEF heritage buildings (e.g. Dominion Observatory Complex, Saunders Building, along Commissioners Drive / and or Maple Drive)
- Include night and winter renderings for all
- Interior views from public areas of hospital (e.g., cafeteria, main lobby)

Plans

- Landscape plans
    - 40% canopy target plans (at 40 year maturity)
    - To include detailed landscape design and grading information site boundary interface with the Central Experimental Farm
- Site plans
- Excavation Drawings
- Drawings showing plan, elevation and cross-section views of each building
- Structural Drawings of Architecturally Exposed Components

i. Building and site interfaces with public realm and landscape (plan and cross-sections)
ii. Views analysis and conceptual renderings (Refer to views identified in Commemorative Integrity Statement for Central Experimental Farm and NCC Visual Assessment Views Analysis (2009 and 2013)
iii. Floor plates
iv. Grading / Landscape integration
v. Exterior Material Selection and Colour Palette
vi. Bird Friendly Design (CSA Standard)

- UDRP package for the formal review of the Main Hospital Building Site Plan
- Plan of Survey

HERITAGE

Cultural Heritage Impact Statement Requirements
Prepared by: Lesley Collins (City of Ottawa), Heather Thomson (NCC), Susan Millar (Parks Canada), Jennifer Drew (Parks Canada)

A Heritage Impact Statement (CHIS) is required to specifically address issues related to this phase of project. The CHIS will be considered jointly by both the City and the NCC in their review of the proposal. The CHIS should be prepared according to the City of Ottawa's "A Guide to Preparing Cultural Heritage Impact Statements"

This phase of the development of the new hospital campus has the greatest potential to impact the cultural heritage landscape of the Central Experimental Farm National Historic Site of Canada and adjacent heritage resources including the Rideau Canal National Historic Site of Canada and UNESCO World Heritage Site, the Federal Heritage Buildings of the Dominion Observatory Complex and other adjacent Federal Heritage Buildings.

Further to comments provided on the CHIS submitted as part of the Master Site Plan application and conditions included as part of the Master Site Plan approval, the following items should be considered and addressed as part of the CHIS:

- Landscape Plan
    - One of the conditions of Master Site Plan approval was to ensure that the CHIS addendums consider how the proposal "protects the Central Experimental Farm's rural picturesque character and value as a 'farm within the city' through its landscaping on its east, west and south borders using trees or other landscape features to reduce the impact to existing views of the CEF National Historic Site of Canada (NHSC) from the Rideau Canal NHSC and World Heritage Site (WHS), Prince of Wales Drive section of the Queen Elizabeth Driveway cultural landscape, and the William Saunders Building Recognized Federal Heritage Building"

- Transportation and Parking
    - Use of Maple Drive
        - Detailed consideration of the potential impacts that will result from the use of Maple Drive as an ambulance route should be provided. These are considered in the CHIS for the Master Site Plan but should be further detailed in the addendum. These considerations should articulate the impact of the speed and frequency of ambulance traffic on the co-located Federal Heritage Buildings, including but not limited to vibration, road maintenance requirements; and salt spray.
    - Location and visual screening of surface parking

- Consideration of impacts on the Dominion Observatory Complex
    - Detailed consideration of potential impacts including, but not limited to:
        - Potential construction impacts that could cause physical damage to the buildings
        - Isolation of the Dominion Observatory Complex from its surrounding environment in ways that would affect the access to or user/visitor experience of the site
        - Obstruction or diminishment of significant views of the Dominion Observatory dome as a landmark

        - Obstruction or impacts to views of the night sky from the Dominion Observatory dome
        - Impacts of the lighting plan as directed by Planning Committee on approval of the Master Site Plan on October 1, 2022:
            - *That Planning Committee direct staff to review site lighting for the future implementing site plan for the main hospital building. The site lighting shall be in accordance with Council approved lighting conditions, that include designing with only fixtures that meet the criteria for full cut-off (sharp cut-off) classification, as recognized by the illuminating Engineering Society of North America; and meeting minimal light spillage onto adjacent properties. That Planning Committee further direct staff to ensure that potential impacts of the site lighting on the Dominion Observatory Complex are considered through addendums to the Cultural Heritage Impact Statement, with consideration of guidelines prepared by the International Dark Sky Association and with direct/open communication with the Royal Astronomical Society of Canada.*

- Consideration of impacts to the following views
    - Views from Prince of Wales Scenic Entry – Include views toward proposed loading dock
    - Views from entrance to Queen Elizabeth Drive/Dows Lake (at Preston / Prince of Wales)
    - Views from Dows Lake to main hospital building
    - Views from Carling Avenue both east and west of the main hospital building
    - Views identified in Commemorative Integrity Statement for Central Experimental Farm
    - Views from adjacent CEF heritage buildings (e.g. Dominion Observatory Complex, Saunders Building, along Commissioners Drive / and or Maple Drive)
    - Views identified in NCC Visual Assessment Views Analysis (2009 and 2013
    - Views from/along the Rideau Canal including from Commissioner's Park, Hartwells Lockstation and Colonel By Drive (that were assessed for the Campus Master Plan and parking garage applications)

Heritage Protection Plan

- A Heritage Protection Plan is required to ensure appropriate conservation of adjacent heritage buildings during construction.
- The Protection Plan must include an evaluation of potential risks to nearby heritage buildings through the construction process and a detailed plan for protection and mitigation of these risks, including but not limited to:
    - Pre-construction building condition survey and documentation (consider baseline 3D Laser scanning of all designated buildings)
    - Vibration and crack monitoring
    - Monitoring reports
    - Implementation of physical protection for designated buildings
    - Management of construction dust, debris etc.
    - Post-construction building condition survey and documentation

ENVIRONMENTAL

Reports

▪ Phase 3 Environmental Site Assessment (ESA)

- Conduct any environmental site assessments required to appropriately and fully assess site conditions to guide remediation and site preparation as per federal and provincial requirements, including but not limited to Ontario Regulation 406 – On Site and Excess Soil Management. A Qualified Person (QP) as defined in O. Reg 153/04 should be engaged early on to guide environmental site assessments and to develop soil management plans.

▪ Tree Conservation Report

▪ Environmental Impact Assessment (on species at risk / significant wildlife species on the property and significant environmental features)

▪ Wildlife Mitigation and Monitoring Plan

▪ Vegetation Management / Conservation Strategy and Education Program

Phase 3 and 4 of the TOH project are subject to an Environmental Determination pursuant to the *Impact Assessment Act*, 2019 (*IAA*) prior to the initiation of any works. The Proponent is responsible for preparing an Environmental Effects Evaluation (EEE) document and completing any associated supporting studies.

1. **Format**
    a. Harmonize the federal and municipal environmental review process by producing one report that meets all requirements.
    b. Use the same format as the EEE for the Phase 2 – Parking Garage project
    c. To be confirmed once the proponent provides the proposed timeline for project approval, but, one EEE will be approved for the first approval of Phase 3 and 4, with addendums being prepared for subsequent approvals under Phase 3 and 4

2. **Guidance**
    a. Adhere to the Impact Assessment Agency of Canada guidance on Section 81-91 of the *IAA* (https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/projects-federal-lands-outside-canada/guidance-sections-81-to-91-impact-assessment-act.html)

3. **Canadian Impact Assessment Registry (CIAR)**
    a. The proponent will prepare the text for the CIAR posting
    b. The NCC/PSPC will post one Notice of Intent on the CIAR
    c. The Notice of Intent should include information related to greenhouse gas (GHG) emissions and carbon sinks of the project which might include:
        i. Information on the project's estimated GHG emissions and impacts on carbon sinks and any design measures
        ii. How the project might mitigate GHG emissions or impacts on carbon sinks
        iii. See Section 8 GHG Emissions & Climate Change Considerations for more information.

The following are additional, special considerations, but is not an exhaustive list of all requirements:

4. **Trees:**

a. Review tree inventories to ensure that all expected future changes to federal and provincial Species At Risk laws and regulations are considered (e.g., Black Ash may be uplisted in January 2023).
b. Information from the NCC's document: A Living Legacy: Remarkable Trees of Canada's Capital. Impacts to remarkable trees located within the study area, and identified in the NCC document as remarkable, will be evaluated.
c. Tree Compensation
    i. Tree Compensation that continues to target a 40% tree canopy cover
d. The proponent will submit the following plans, among others:
    i. Ridge Management Plan
    ii. Landscape Plans
    iii. Updated Long Term Tree Canopy Adaptive Management Plan
    iv. Tree Canopy Cover Plan
    v. Landscape Plans
e. Bird and Bat protection measures will be implemented again which will include restrictions on tree removals during the active bird and bat seasons.
f. Continue to collaborate with Central Experimental Farm (CEF) and Arboretum staff on tree/hedge preservation efforts
    i. Document specific Old Hedge Collection and tree preservation and conservation efforts in the EEE, including any graftings and cuttings that may be used to preserve genetic material.
    ii. Document pertinent consultations with CEF and Arboretum staff
g. Butternut
    i. Confirm that there are no butternut trees located within the project footprint or area of disturbance
    ii. If the butternut is located within the project footprint or area of disturbance, address the need to conduct a Butternut Health Assessment
h. Kentucky Coffee-trees:
    i. Evaluate potential impacts to Kentucky Coffee-trees
    ii. If Kentucky Coffee-trees will be impacted by Phase 3 and 4:
        1. Consult with Arboretum staff to determine origins of the Kentucky Coffee-trees
        2. Consult with Arboretum staff to determine conservation value of the trees, depending on their origin
        3. Consult with ECCC, if necessary, to assess conservation value.

5. Targeted Wildlife Surveys:

a. As per the Environmental Impact Statement and Tree Conservation Report for the Master Site Plan (August 3, 2021), the following Species At Risk Assessments and targeted field studies are required:
    i. Acoustic Bat Surveys
    ii. Breeding Bird Surveys
    iii. Raptor Nesting Surveys
b. Identify any other surveys that may be required.
c. Ensure that all targeted wildlife surveys required for the EEE consider any recent and expected future changes to federal and provincial laws and regulations.

6. **Wetland:**
   a. Review impacts to wetlands within the Project area and zone of influence around the Project area.
   b. Follow the Federal Policy on Wetland Conservation (authorized by Environment Canada, 1991): https://publications.gc.ca/collections/Collection/CW66-116-1991E.pdf

7. **Permitting:**
   a. The EEE must include discussion on all permitting required for project implementation and facility operation, which may include, but is not limited to:
      i. Provincial Environmental Compliance Approval for stormwater discharge to the Rideau Canal.
      ii. Any Certificates of Authorisation
         1. Which may be related to incinerators, and any other hospital-specific equipment requiring authorisation.
   b. The EEE will recommend the preparation of a Regulatory Compliance Plan. This discussion will be included in the mitigation measures and will also be included in the "Future Commitments" section.

8. **Public Engagement and Communications Log:**
   a. The proponent will update the previously prepared Communications log as many comments received during Phase 2 (parking garage) of the project apply to Phase 3 and 4 of the project.
   b. All new public comments/questions/concerns raised during the Phase 3 and 4 environmental review will be addressed in the Communications log and EEE

9. **Cumulative Effects Evaluation:**
   a. The environmental effects determination must consider cumulative effects that could result from (a) Phase 3 and 4, (b) Phase 2 and (c) future phases.
   b. Evaluate how the *Vegetation Management/Conservation Strategy and Education Program* may be a tool to mitigate cumulative effects of tree and vegetation removal for all phases of the project.

10. **Gender Based Analysis + (GBA+)**
    a. Environmental effects must be considered through a GBA+ lens.
    b. The proponent can refer to this guidance to inform the process for conducting a GBA+: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/gender-based-analysis.html
    c. Evaluate potential barriers or impacts for under-represented groups that require identification and mitigation
    d. Specific to public engagement, will disaggregated data be made available (by gender, sex, age, region, economic status, social class, ancestry, religion, household status, immigration status, literacy, internet access, ethnicity or disability)?

11. **Universal Accessible Strategy**
    a. Provide general overview and describe strategies that exceed requirements

12. **Stormwater Management**
    a. Stormwater management best practices including infiltration beds, rain gardens, bioswales and storage solutions will be incorporated into the landscape design.
    b. If storm sewer outlets will connect/interact with Dow's Lake, Parks Canada requirements may include:
        i. Discharged water quality to be better than 80% Total Suspended Solids
        ii. Monitoring for CCME Turbidity, PM parameters, and could include others.
        iii. Monitoring Plan (note: Parks Canada already requests this for new developments that discharge to the Rideau Canal)
    c. If stormwater discharge outlets to Rideau Canal, then the MECP will review for Environmental Compliance Approval (ECA)
    d. This approval can take up to 6 months to receive.Skateway – maintain integrity of the ice surfaces. Baseline temperature and salt data from 2021-22 is available – no increase in thermal load above background will be permitted (NCC).
    e. Low Impact Development – mitigating increases in runoff volume will support maintaining thermal load.
    f. Without limiting the specific items included above, proponents are to refer to the NCC's Stormwater Management Manual (Spring 2022, draft) for NCC's policy and technical requirements when reviewing stormwater management submissions.

13. **Snow Management**
    a. Temporary storage locations
    b. Operations – analyze alternatives for ice/snow melting (minimize salt use in areas that drain to the canal), mitigation of potential impacts

14. **Sustainable Development**
    a. Ensure that core sustainable design principles commitments established in the Master Site Plan including a hybrid of leading sustainability models including One Planet Living framework, LEED and the WELL building standard.
    b. Provide discussion on how Phase 3 and 4 will be a net zero carbon project.
    c. Provide discussion on LEED goals for the project and energy modelling required to meet these goals.
    d. Use the Strategic Assessment of Climate Change (SACC) to:
        i. Consider climate change in the determination of adverse environmental effects for the Phase 3 and 4 project
        ii. Make a decision about whether the carrying out of a project is likely to cause significant adverse environmental effects
        iii. The SACC can be found here: https://www.canada.ca/en/services/environment/conservation/assessments/strategic-assessments/climate-change.html or by contacting: ec.escc-sacc.ec@canada.ca.
    e. Complete a Carbon Intensity Analysis in line with Environmental and Climate Change Canada's (ECCC's) Quantification of net GHG emissions, upstream GHG emissions, and carbon sinks and GHG mitigation measures as part of the EEE. Consultation with ECCC may be required to determine approaches to reduce GHG emissions, upstream and downstream.
    f. Evaluate how energy modelling required for LEED goals align with the SACC and Carbon Intensity Analysis.Use Bird friendly design, which includes design for glazing and lighting

g. City Site Plan Control By-law provisions to enable the High Performance Development Standards will be presented to Planning Committee and ARAC on 23 June 2022 and it is anticipated this report will be forwarded to Council for approval in the near future. The applicant should follow this initiative and the HPDS because the future phases may be subject to those provisions and standards. The City will work with the applicant and Federal partners to avoid any duplications of sustainability requirements and to develop a submission that satisfies both requirements.

15. **Archaeology**

a. Though the 2021 Golder Stage 2 Archaeological Assessment concludes that no further archaeological assessment is required for the project area, should landscape disturbance extend beyond the area assessed by Golder, additional archaeological assessment may be required.

Additional NCC SPECIFIC REQUIREMENTS

Committee Submission Documents

- ACPDR support materials and presentation (refer to details provided previously) – Scheduling and deliverables to be coordinated with the FLUDA manager.
- BOARD meeting support materials – Scheduling and deliverables to be coordinated with the FLUDA manager.
- Include Report and Drawing list with each submission (Format YYYY-MMM-DD Name of Document)

Construction

- Construction Hoarding and Staging Plan
- Temporary Construction Brief and Drawings
- Temporary Construction Signage Drawings
- Temporary Service Relocation Drawings
- Operations/ Maintenance Plan
- Construction Schedule for all works

Mitchelson, Sarah [NN-CA]

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Thursday, September 22, 2022 2:31 PM
To: Mitchelson, Sarah [NN-CA]
Cc: Paradis, Kelly [NN-CA]; Sterling, Sharra [NN-CA]
Subject: [EXTERNAL] RE: RVCA - The Ottawa Hospital - New Campus Development

Follow Up Flag: Follow up
Flag Status: Completed

Hi Sarah,

I don't believe the RVCA has significant concerns with the design, provided that enhanced water quality protection (80% TSS Removal) is being maintained either on-site or downstream prior to outlet.

Cheers,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: Thursday, September 22, 2022 1:03 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Kelly.Paradis@parsons.com; Sharra.Sterling@parsons.com
Subject: RE: RVCA - The Ottawa Hospital - New Campus Development

Hi Eric,

I wanted to follow up with the email below.

Please advise if the RVCA has any initial requirements and/or comments related to the proposed central utility plant and main hospital building as part of the new Ottawa Hospital Development.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons / LinkedIn [linkedin.com] / Twitter [twitter.com] / Facebook [facebook.com] / Instagram [instagram.com]

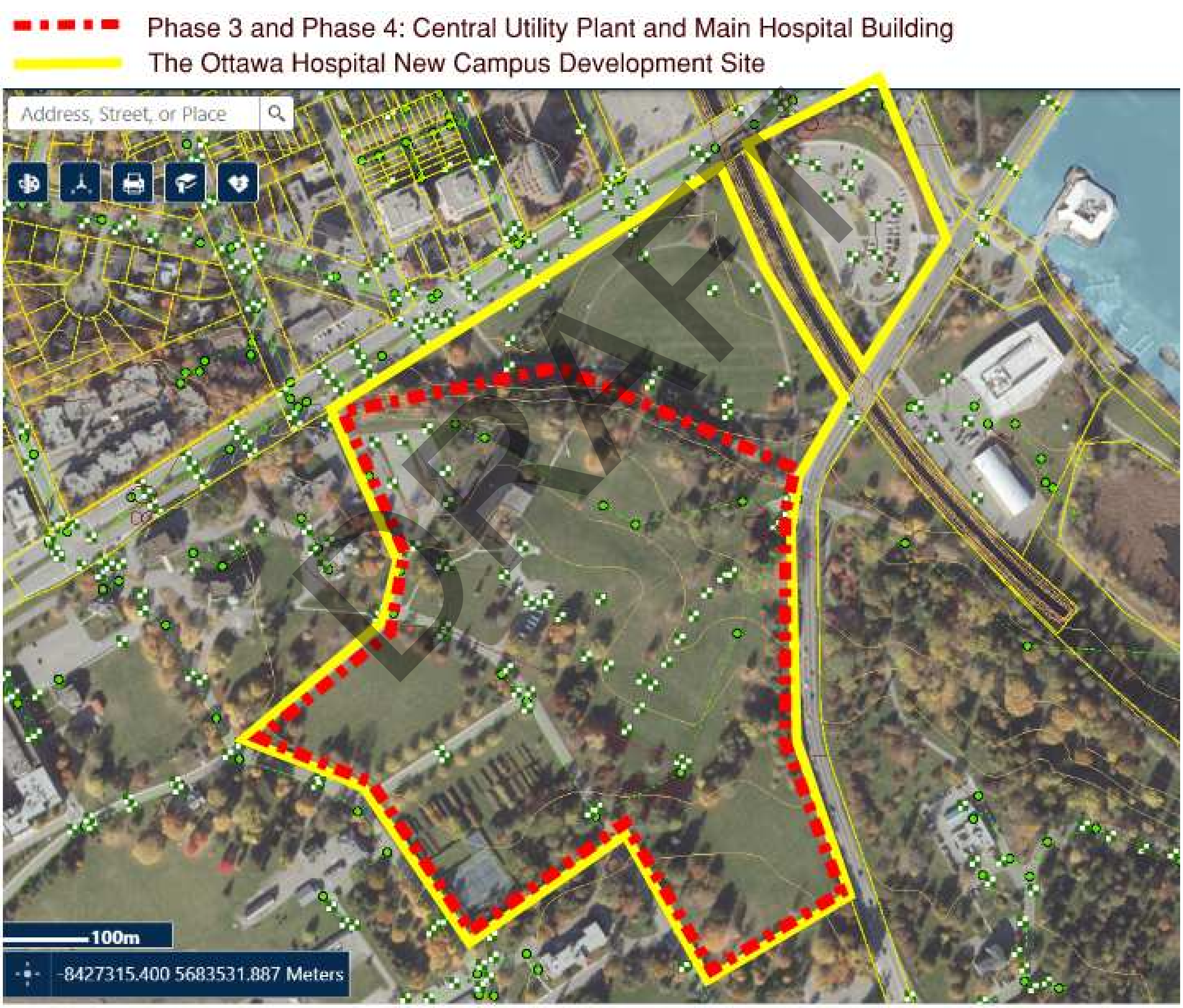
PARSONS

From: Mitchelson, Sarah [NN-CA]
Sent: Friday, July 29, 2022 7:35 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Sterling, Sharra [NN-CA] <Sharra.Sterling@parsons.com>
Subject: RVCA - The Ottawa Hospital - New Campus Development

Hi Eric,

We would like to request any RVCA requirements and/or comments related to the proposed central utility plat and main hospital building as part of the new Ottawa Civic Hospital Development.

We are working with GBA Group towards a Site Plan Approval from the City of Ottawa, for the construction of a multi-level hospital as well as a central utility plant that will service the hospital. As you can see from the existing aerial image below, the existing development area consists of grass, parking areas, pedestrian pathways, and roadways.



Stormwater is conveyed to existing City of Ottawa infrastructure within Carling Avenue as well as private infrastructure that outlets to Dow's Lake.

Access to the central utility plant and main hospital building will be provided from Carling Avenue, Prince of Wales, and Maple Drive. The footprint of the central utility plant is approximately 11,500m2 with a floor to height of approximately 8m and the footprint of the main hospital building is approximately 32,000m2 and consist of 14 levels.

Please advise if any further information is required and/or you have any questions/comments.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons / LinkedIn [linkedin.com] / Twitter [twitter.com] / Facebook [facebook.com] / Instagram [instagram.com]

APPENDIX D | SERVICING CHECKLIST

TOH NCD Approvals

DRAFT: 2022-11-15

LEGEND

- Approval granted
- YYYY-MM-DD Date of approval
- Approval submitted and under review
- YYYY-MM-DD Expected date of approval (subject to change)
- Future application (not yet submitted)

Ottawa

Site Plan Agreement
Between TOH and City
Master Site Plan
2021-10-27

Site Plan Agreement
Between TOH and City
Parking Garage
DAR approved: 2022-09-27
(Submitted October, 2021)

Site Plan Agreement
Between TOH and City
Main Hospital Building & CUP
2023-XX-XX
(Pre-consult held June 23, 2022)

NCC
CCN

FLUDA
(IAMIS #14383)
Proponent: PSPC
Deconstruction of the Sir John Carling Building
2013-01-22

FLUDA
(IAMIS #16638)
Proponent: PSPC, AAFC
Landscaping Amendments for Deconstruction of the Sir John Carling Building
2014-12-02

FLUTA
(IAMIS #18853)
Proponent: PSPC, AAFC, NCC
Land Transfer and Lease
2017-06-01
Capital Realm Design Principles for TOH

FLUDA
(IAMIS #21707)
Proponent: PSPC
Demolition of the Sir John Carling West Annex
2021-02-03

FLUA
(IAMIS #19923)
Proponent: TOH
Master Site Plan and Amendment to the Capital Urban Lands Plan
2021-11-22
NCC Performance Criteria

FLUDA
(IAMIS #24020)
Proponent: TOH
Parking Garage – Early Works #1
2022-03-24

FLUDA
(IAMIS #23474)
Proponent: TOH
Parking Garage – Schematic Design
2022-06-24

FLUDA
(IAMIS #24021)
Proponent: TOH
Parking Garage – Early Works #2
2022-10-08

FLUDA
(IAMIS #24432)
Proponent: TOH (for PSPC)
Remediation
2022-11-14

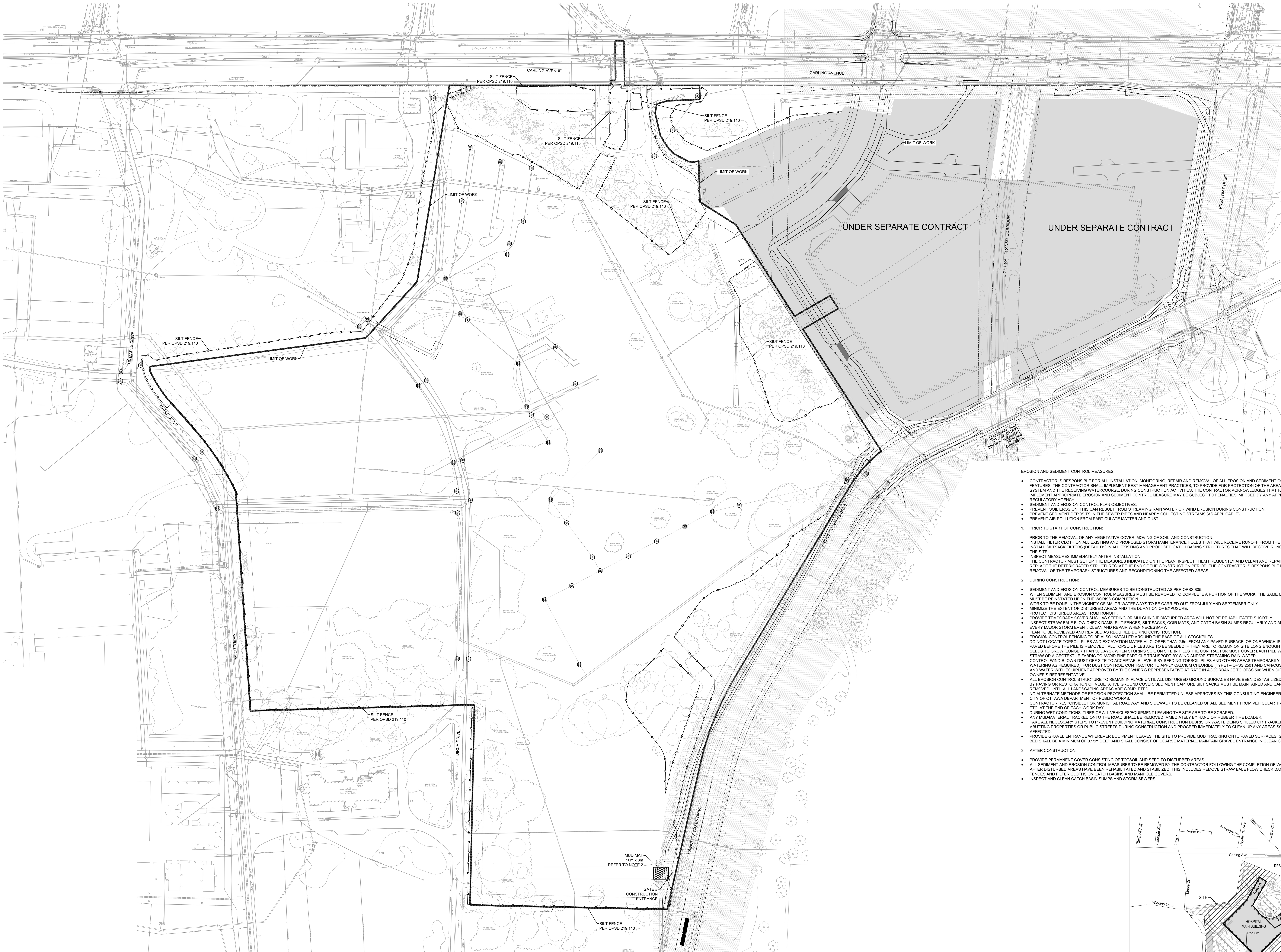
FLUDA
(IAMIS #XXXX)
Proponent: TOH
Parking Garage – Developed Design
2023-04-XX

FLUDA
(IAMIS #XXXX)
Proponent: TOH
Road Widening + Intersections
2023-XX-XX

FLUDA
(IAMIS #XXXX)
Proponent: TOH
Main Hospital Building + CUP – Schematic Design
2023-XX-XX

FLUDA
(IAMIS #XXXX)
Proponent: TOH
Main Hospital Building + CUP – Developed Design
2023-XX-XX

APPENDIX E | DRAWINGS



LEGEND

- BELL
- GAS
- HYDRO
- STREETLIGHT
- TELUS
- TRAFFIC
- STORM
- SANITARY
- WATER
- TREE PRESERVATION FENCE (BY OTHER)
- CONSTRUCTION FENCE
- EXISTING PROPERTY LINE
- LIMIT OF WORK
- SILT FENCE
- SILT SACK
- FILTER FABRIC
- STRAW BALE CHECK DAM
- ROCK FLOW CHECK DAM
- CONTRACTOR PARKING + CONSTRUCTION STAGING AND LAYDOWN AREA
- CONSTRUCTION STAGING AND LAYDOWN AREA
- LIGHT VEHICLE / WORKER ACCESS ROAD
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATE CONTRACT)
- PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS

EROSION AND SEDIMENT CONTROL MEASURES:

- CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURE MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
- SEDIMENT AND EROSION CONTROL PLAN OBJECTIVES:
- PREVENT SOIL EROSION. THIS CAN RESULT FROM STREAMING RAIN WATER OR WIND EROSION DURING CONSTRUCTION,
- PREVENT SEDIMENT DEPOSITS IN THE SEWER PIPES AND NEARBY COLLECTING STREAMS (AS APPLICABLE),
- PREVENT AIR POLLUTION FROM PARTICULATE MATTER AND DUST.

1. PRIOR TO START OF CONSTRUCTION:

PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL AND CONSTRUCTION:

- INSTALL FILTER CLOTH ON ALL EXISTING AND PROPOSED STORM MAINTENANCE HOLES THAT WILL RECEIVE RUNOFF FROM THE SITE.
- INSTALL SILTSACK FILTERS (DETAIL D1) IN ALL EXISTING AND PROPOSED CATCH BASINS STRUCTURES THAT WILL RECEIVE RUNOFF FROM THE SITE.
- INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.
- THE CONTRACTOR MUST SET UP THE MEASURES INDICATED ON THE PLAN, INSPECT THEM FREQUENTLY AND CLEAN AND REPAIR OR REPLACE THE DETERIORATED STRUCTURES. AT THE END OF THE CONSTRUCTION PERIOD, THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF THE TEMPORARY STRUCTURES AND RECONDITIONING THE AFFECTED AREAS

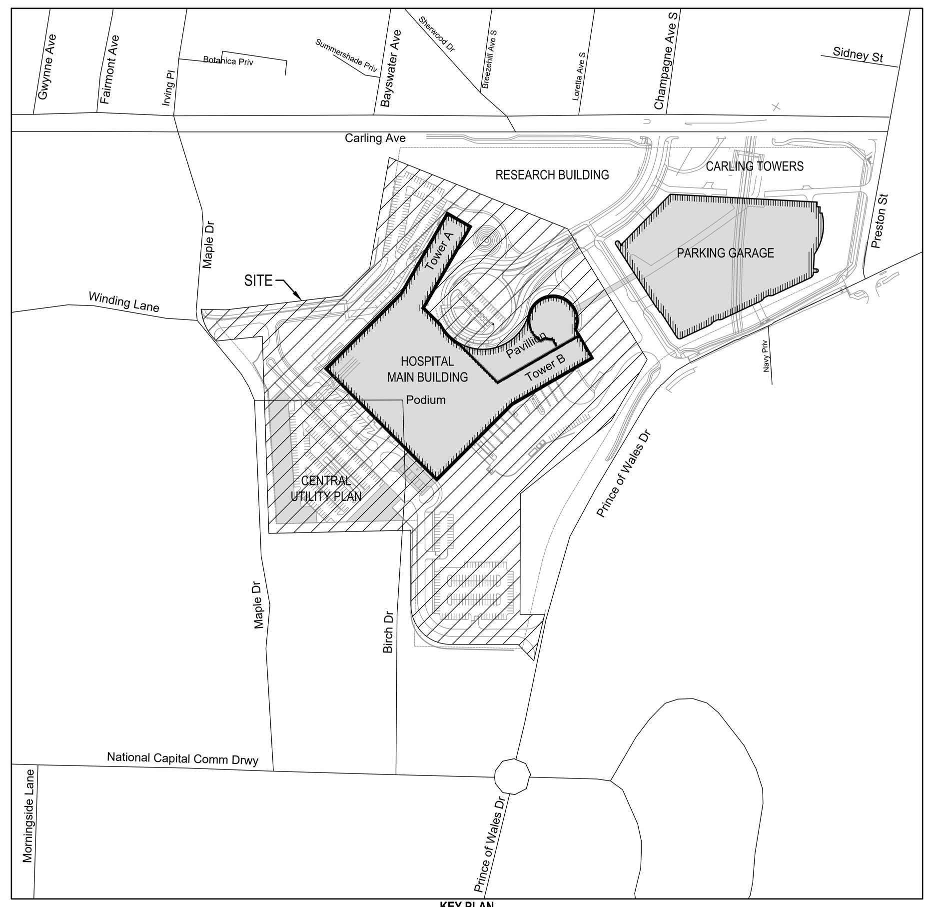
2. DURING CONSTRUCTION:

- SEDIMENT AND EROSION CONTROL MEASURES TO BE CONSTRUCTED AS PER OPSS 805.
- WHEN SEDIMENT AND EROSION CONTROL MEASURES MUST BE REMOVED TO COMPLETE A PORTION OF THE WORK, THE SAME MEASURES MUST BE REINSTATED UPON THE WORK'S COMPLETION.
- WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY AND SEPTEMBER ONLY.
- MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
- PROTECT DISTURBED AREAS FROM RUNOFF.
- PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED SHORTLY.
- INSPECT STRAW BALE FLOW CHECK DAMS, SILT FENCES, SILT SACKS, COIR MATS, AND CATCH BASIN SUMPS REGULARLY AND AFTER EVERY MAJOR STORM EVENT. CLEAN AND REPAIR WHEN NECESSARY.
- PLAN TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION.
- EROSION CONTROL FENCING TO BE ALSO INSTALLED AROUND THE BASE OF ALL STOCKPILES.
- DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE THE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS). WHEN STORING SOIL ON SITE IN PILES THE CONTRACTOR MUST COVER EACH PILE WITH TARPS, STRAW OR A GEOTEXTILE FABRIC TO AVOID FINE PARTICLE TRANSPORT BY WIND AND/OR STREAMING RAIN WATER.
- CONTROL WIND-BLOWN DUST OFF SITE TO ACCEPTABLE LEVELS BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED). FOR DUST CONTROL, CONTRACTOR TO APPLY CALCIUM CHLORIDE (TYPE I – OPSS 2501 AND CAN/CGSB-15-1) AND WATER WITH EQUIPMENT APPROVED BY THE OWNER’S REPRESENTATIVE AT RATE IN ACCORDANCE TO OPSS 506 WHEN DIRECTED BY OWNER’S REPRESENTATIVE.
- ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN DESTABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER. SEDIMENT CAPTURE SILT SACKS MUST BE MAINTAINED AND CANNOT BE REMOVED UNTIL ALL LANDSCAPING AREAS ARE COMPLETED.
- NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVES BY THIS CONSULTING ENGINEER AND THE CITY OF OTTAWA DEPARTMENT OF PUBLIC WORKS.
- CONTRACTOR RESPONSIBLE FOR MUNICIPAL ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING ETC. AT THE END OF EACH WORK DAY.
- DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
- ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
- TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ABUTTING PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.
- PROVIDE GRAVEL ENTRANCE WHEREVER EQUIPMENT LEAVES THE SITE TO PROVIDE MUD TRACKING ONTO PAVED SURFACES. GRAVEL BED SHALL BE A MINIMUM OF 0.15m DEEP AND SHALL CONSIST OF COARSE MATERIAL. MAINTAIN GRAVEL ENTRANCE IN CLEAN CONDITION.

3. AFTER CONSTRUCTION:

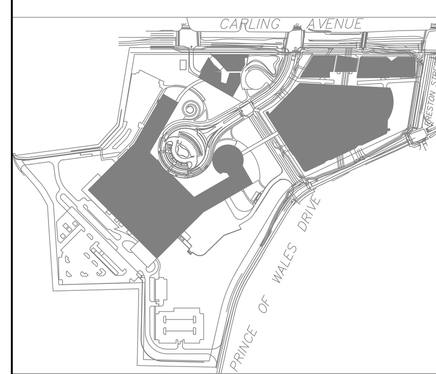
- PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
- ALL SEDIMENT AND EROSION CONTROL MEASURES TO BE REMOVED BY THE CONTRACTOR FOLLOWING THE COMPLETION OF WORK AND AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED, THIS INCLUDES REMOVE STRAW BALE FLOW CHECK DAMS, SILT FENCES AND FILTER CLOTHS ON CATCH BASINS AND MANHOLE COVERS.
- INSPECT AND CLEAN CATCH BASIN SUMPS AND STORM SEWERS.

SCALE: 1:750



KEY PLAN

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

MARK	DATE	DESCRIPTION
01	2022-09-23	ISSUED FOR PRE-CONSULTATION
02	2022-10-28	DRAFT FOR 90% SD
03	2022-11-30	ISSUED FOR SPC & FLUDA - 1ST SUBMISSION
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05	2023-02-24	ISSUED FOR RFP VERSION 1.0
06	2023-04-12	RE-ISSUED FOR SPC & FLUDA

Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name

EROSION AND SEDIMENT CONTROL PLAN

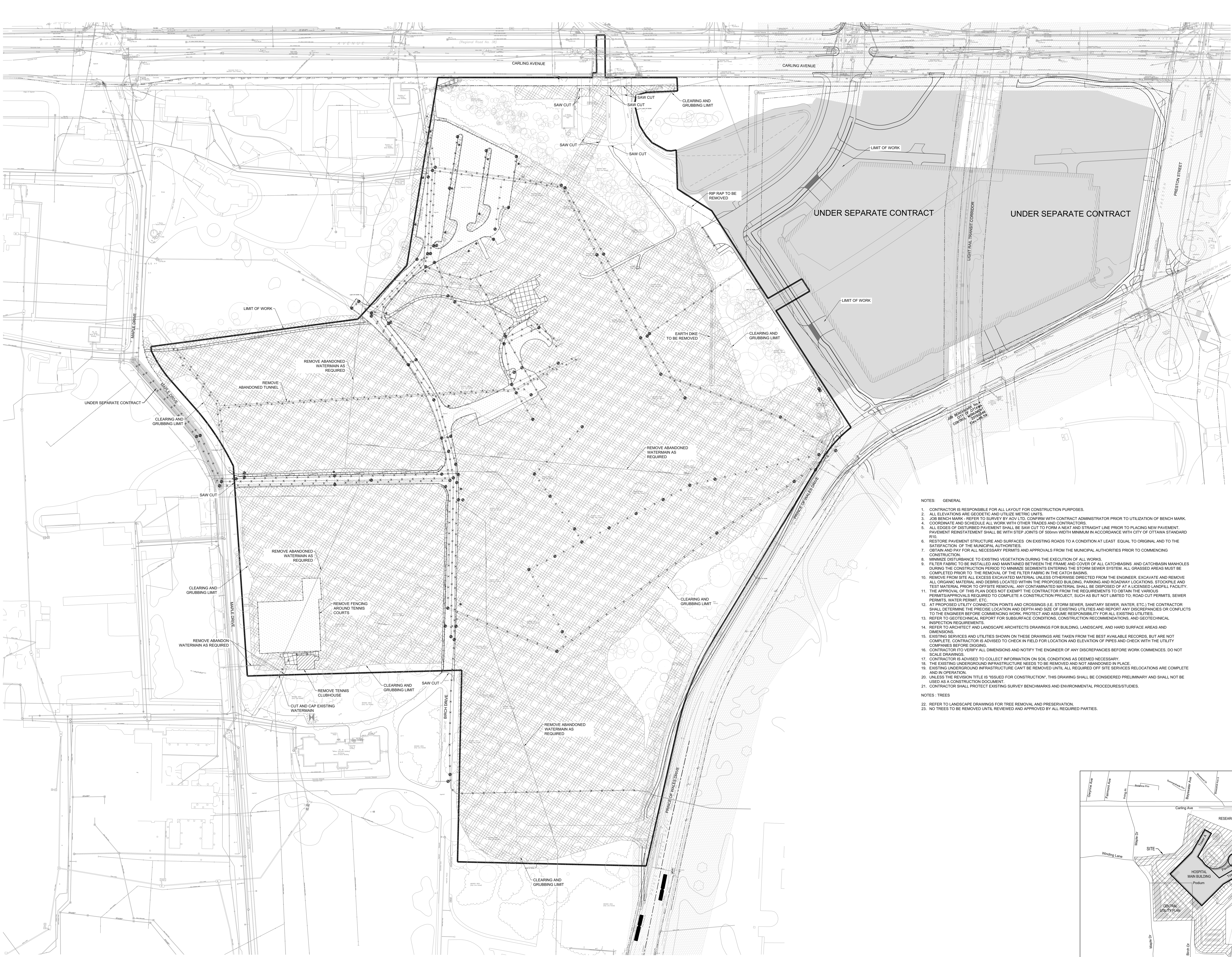
Sheet Number

C001

Project Status

STAGE 3

D07-12-22



NOTES: GENERAL

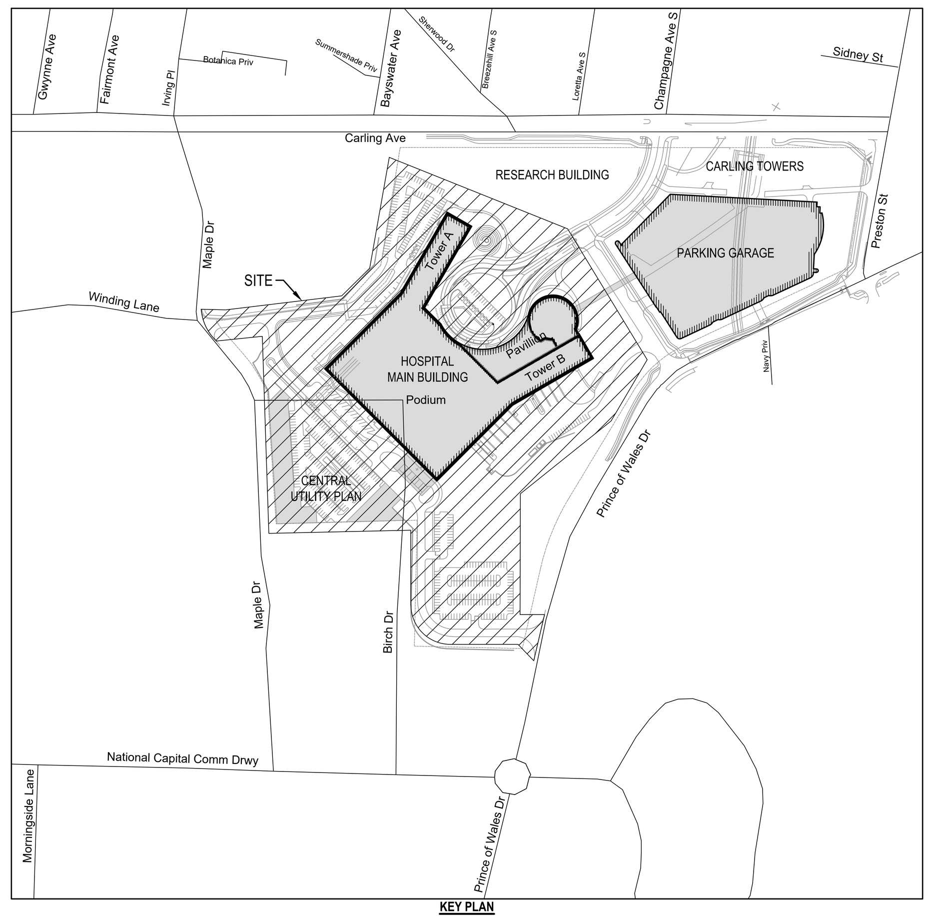
1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
5. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R10.
6. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
7. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
8. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
9. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
10. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. STOCKPILE AND TEST MATERIAL PRIOR TO OFFSITE REMOVAL. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
11. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
12. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
13. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
14. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.
15. EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT ARE NOT COMPLETE. CONTRACTOR IS ADVISED TO CHECK IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING.
16. CONTRACTOR ITO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.
17. CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS AS DEEMED NECESSARY.
18. THE EXISTING UNDERGROUND INFRASTRUCTURE NEEDS TO BE REMOVED AND NOT ABANDONED IN PLACE.
19. EXISTING UNDERGROUND INFRASTRUCTURE CAN'T BE REMOVED UNTIL ALL REQUIRED OFF SITE SERVICES RELOCATIONS ARE COMPLETE AND IN OPERATION.
20. UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.
21. CONTRACTOR SHALL PROTECT EXISTING SURVEY BENCHMARKS AND ENVIRONMENTAL PROCEDURES/STUDIES.

NOTES : TREES

22. REFER TO LANDSCAPE DRAWINGS FOR TREE REMOVAL AND PRESERVATION.
23. NO TREES TO BE REMOVED UNTIL REVIEWED AND APPROVED BY ALL REQUIRED PARTIES.

LEGEND

- EXISTING PROPERTY LINE
- LIMIT OF WORK
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATE CONTRACT)
- PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS
- BELL
- GAS
- HYDRO
- STREETLIGHT
- TELUS
- TRAFFIC
- STORM
- SANITARY
- WATER
- REMOVE
- ADJUSTMENT CATCHBASIN
- ADJUSTMENT MAINTENANCE HOLE
- REMOVE SEWER OR WATERMAIN
- ABANDON SEWER OR WATERMAIN
- CURB REMOVAL
- FENCE REMOVAL
- CONCRETE REMOVALS
- ASPHALT REMOVAL
- AREA TO BE CLEARED AND GRUBBED
- BUILDING TO BE REMOVED



HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

MARK	DATE	DESCRIPTION
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02	2022-10-28	DRAFT FOR 90% SD
03	2022-11-30	ISSUED FOR SPC & FLUDA - 1ST SUBMISSION
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Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
REMOVALS

Sheet Number
C002

Project Status
STAGE 3

D07-12-22-016_

NOTES: GENERAL

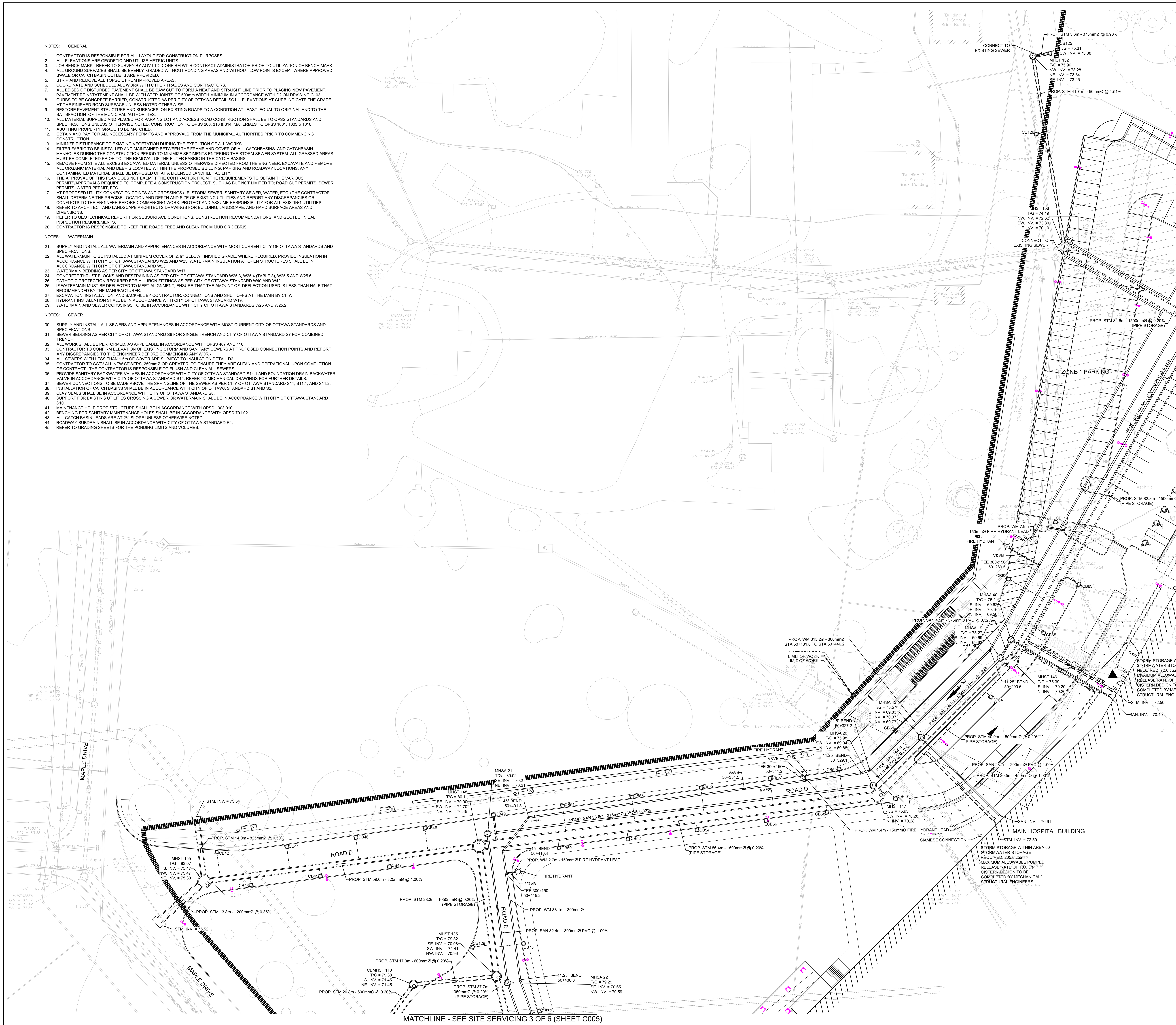
1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
6. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
7. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH D2 ON DRAWING C103.
8. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
12. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
13. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
16. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
17. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
18. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.
19. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
20. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.

NOTES: WATERMAIN

21. SUPPLY AND INSTALL ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
22. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE REQUIRED, PROVIDE INSULATION IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W22 AND W23. WATERMAIN INSULATION AT OPEN STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W23.
23. WATERMAIN BEDDING AS PER CITY OF OTTAWA STANDARD W17.
24. CONCRETE THRUST BLOCKS AND RESTRAINING AS PER CITY OF OTTAWA STANDARD W25.3, W25.4 (TABLE 3), W25.5 AND W25.6.
25. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER CITY OF OTTAWA STANDARD W40 AND W42.
26. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
27. EXCAVATION, INSTALLATION, AND BACKFILL BY CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY.
28. HYDRANT INSTALLATION SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W19.
29. WATERMAIN AND SEWER CORSSINGS TO BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W25 AND W25.2.

NOTES: SEWER

30. SUPPLY AND INSTALL ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
31. SEWER BEDDING AS PER CITY OF OTTAWA STANDARD S6 FOR SINGLE TRENCH AND CITY OF OTTAWA STANDARD S7 FOR COMBINED TRENCH.
32. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407 AND 410.
33. CONTRACTOR TO CONFIRM ELEVATION OF EXISTING STORM AND SANITARY SEWERS AT PROPOSED CONNECTION POINTS AND REPORT ANY DISCREPANCIES TO THE ENGINNEER BEFORE COMMENCING ANY WORK.
34. ALL SEWERS WITH LESS THAN 1.5m OF COVER ARE SUBJECT TO INSULATION DETAIL D2.
35. CONTRACTOR TO CCTV ALL NEW SEWERS, 250mmØ OR GREATER, TO ENSURE THEY ARE CLEAN AND OPERATIONAL UPON COMPLETION OF CONTRACT. THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS.
36. PROVIDE SANITARY BACKWATER VALVES IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14.1 AND FOUNDATION DRAIN BACKWATER VALVE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14. REFER TO MECHANICAL DRAWINGS FOR FURTHER DETAILS.
37. SEWER CONNECTIONS TO BE MADE ABOVE THE SPRINGLINE OF THE SEWER AS PER CITY OF OTTAWA STANDARD S11, S11.1, AND S11.2.
38. INSTALLATION OF CATCH BASINS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S1 AND S2.
39. CLAY SEALS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S8.
40. SUPPORT FOR EXISTING UTILITIES CROSSING A SEWER OR WATERMAIN SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S10.
41. MAINENANCE HOLE DROP STRUCTURE SHALL BE IN ACCORDANCE WITH OPSD 1003.010.
42. BENCHING FOR SANITARY MAINTENANCE HOLES SHALL BE IN ACCORDANCE WITH OPSD 701.021.
43. ALL CATCH BASIN LEADS ARE AT 2% SLOPE UNLESS OTHERWISE NOTED.
44. ROADWAY SUBDRAIN SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R1.
45. REFER TO GRADING SHEETS FOR THE PONDING LIMITS AND VOLUMES.



LEGEND:

	EXISTING PROPERTY LINE
	PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATE CONTRACT)
	PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS
Concrete Curb	EXISTING CONCRETE CURB
	PROPOSED CONCRETE CURB
DC	PROPOSED DEPRESSED CURB
	PROPOSED BUILDING OR STRUCTURE
300mm WATERMAIN	EXISTING WATERMAIN
	EXISTING VALVE CHAMBER
	EXISTING VALVE & VALVE BOX
	EXISTING FIRE HYDRANT
	PROPOSED WATERMAIN
	PROPOSED VALVE & VALVE BOX
	PROPOSED FIRE HYDRANT
	EXISTING SANITARY SEWER AND MANHOLE
	PROPOSED SANITARY SEWER AND MANHOLE
	EXISTING STORM SEWER AND MANHOLE
	PROPOSED STORM SEWER AND MANHOLE
	PROPOSED CATCH BASIN AND LANDSCAPE DRAIN
	PROPOSED TRENCH DRAIN
	PROPOSED SUBDRAIN
	PROPOSED PIPE INSULATION
BV	PROPOSED BACKWATER VALVE
R	PROPOSED REMOTE METER
M	PROPOSED WATER METER
	PROPOSED LIGHT STANDARD (BY OTHERS)
	PROPOSED BOLLARD (BY OTHERS)
	EXISTING TREE AND CRITICAL ROOT ZONE

5m 0 5 10m
SCALE: 1:250

KEY PLAN

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
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Wayfinding	
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Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name

SERVICING PLAN
1 OF 6

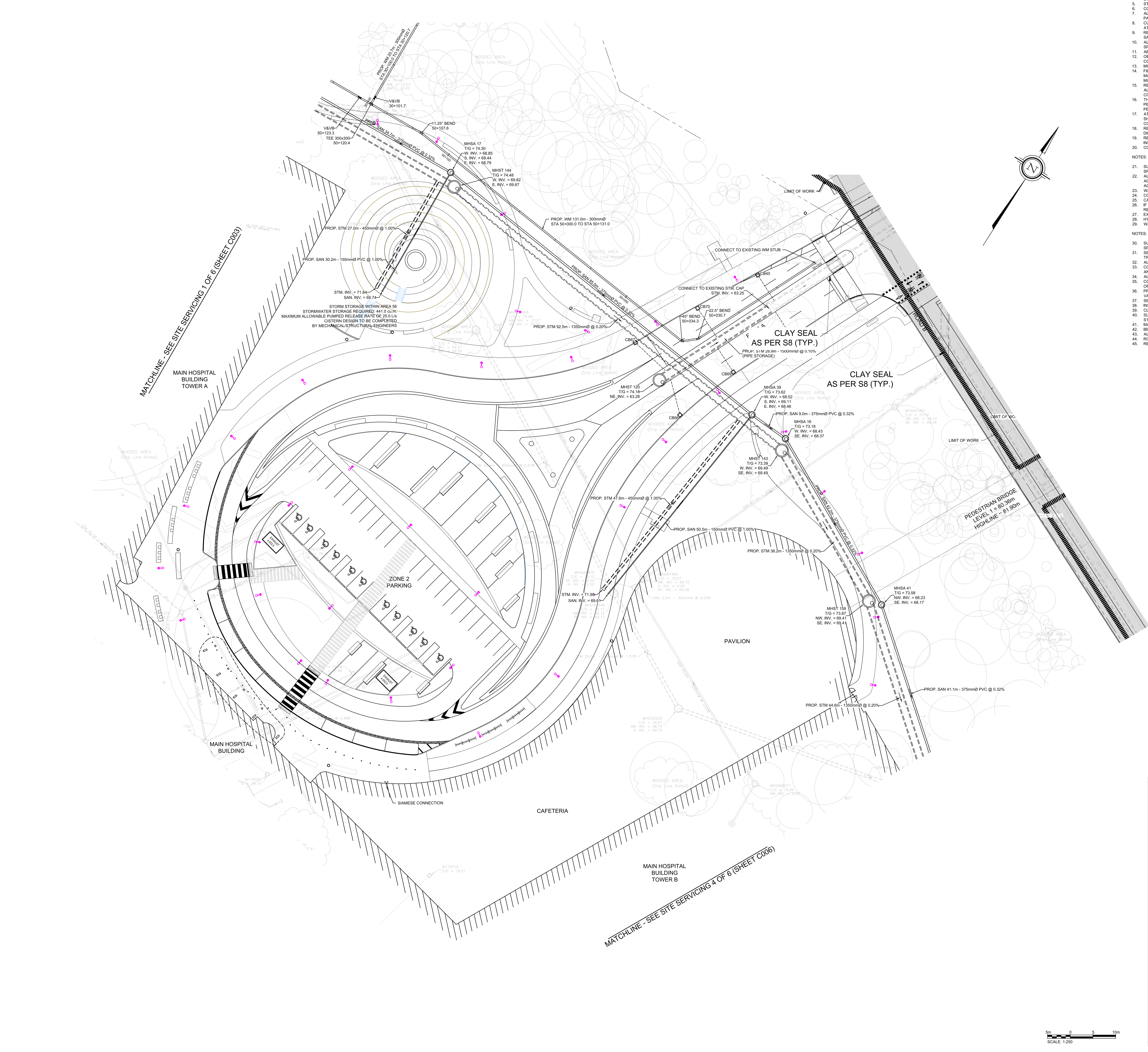
Sheet Number

C003

Project Status

STAGE 3

D07-12-22-0



NOTES: GENERAL

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5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
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9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
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14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
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20. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.

NOTES: WATERMAIN

21. SUPPLY AND INSTALL ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
22. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE REQUIRED, PROVIDE INSULATION IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W22 AND W23. WATERMAIN INSULATION AT OPEN STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W23.
23. WATERMAIN BEDDING AS PER CITY OF OTTAWA STANDARD W17.
24. CONCRETE THRUST BLOCKS AND RESTRAINING AS PER CITY OF OTTAWA STANDARD W25.3, W25.4 (TABLE 3), W25.5 AND W25.6.
25. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER CITY OF OTTAWA STANDARD W40 AND W42.
26. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
27. EXCAVATION, INSTALLATION, AND BACKFILL BY CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY.
28. HYDRANT INSTALLATION SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W19.
29. WATERMAIN AND SEWER CORSSINGS TO BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W25 AND W25.2.

NOTES: SEWER

30. SUPPLY AND INSTALL ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
31. SEWER BEDDING AS PER CITY OF OTTAWA STANDARD S6 FOR SINGLE TRENCH AND CITY OF OTTAWA STANDARD S7 FOR COMBINED TRENCH.
32. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407 AND 410.
33. CONTRACTOR TO CONFIRM ELEVATION OF EXISTING STORM AND SANITARY SEWERS AT PROPOSED CONNECTION POINTS AND REPORT ANY DISCREPANCIES TO THE ENGINNEER BEFORE COMMENCING ANY WORK.
34. ALL SEWERS WITH LESS THAN 1.5m OF COVER ARE SUBJECT TO INSULATION DETAIL D2.
35. CONTRACTOR TO CCTV ALL NEW SEWERS, 250mmØ OR GREATER, TO ENSURE THEY ARE CLEAN AND OPERATIONAL UPON COMPLETION OF CONTRACT. THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS.
36. PROVIDE SANITARY BACKWATER VALVES IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14.1 AND FOUNDATION DRAIN BACKWATER VALVE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14. REFER TO MECHANICAL DRAWINGS FOR FURTHER DETAILS.
37. SEWER CONNECTIONS TO BE MADE ABOVE THE SPRINGLINE OF THE SEWER AS PER CITY OF OTTAWA STANDARD S11, S11.1, AND S11.2.
38. INSTALLATION OF CATCH BASINS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S1 AND S2.
39. CLAY SEALS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S8.
40. SUPPORT FOR EXISTING UTILITIES CROSSING A SEWER OR WATERMAIN SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S10.
41. MAINENANCE HOLE DROP STRUCTURE SHALL BE IN ACCORDANCE WITH OPSD 1003.010.
42. BENCHING FOR SANITARY MAINTENANCE HOLES SHALL BE IN ACCORDANCE WITH OPSD 701.021.
43. ALL CATCH BASIN LEADS ARE AT 2% SLOPE UNLESS OTHERWISE NOTED.
44. ROADWAY SUBDRAIN SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R1.
45. REFER TO GRADING SHEETS FOR THE PONDING LIMITS AND VOLUMES.

LEGEND:

- EXISTING PROPERTY LINE
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATE CONTRACT)
- PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS
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- PROPOSED WATERMAIN
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- PROPOSED SANITARY SEWER AND MANHOLE
- EXISTING STORM SEWER AND MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED CATCH BASIN AND LANDSCAPE DRAIN
- PROPOSED TRENCH DRAIN
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- PROPOSED LIGHT STANDARD (BY OTHERS)
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- EXISTING TREE AND CRITICAL ROOT ZONE

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

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Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

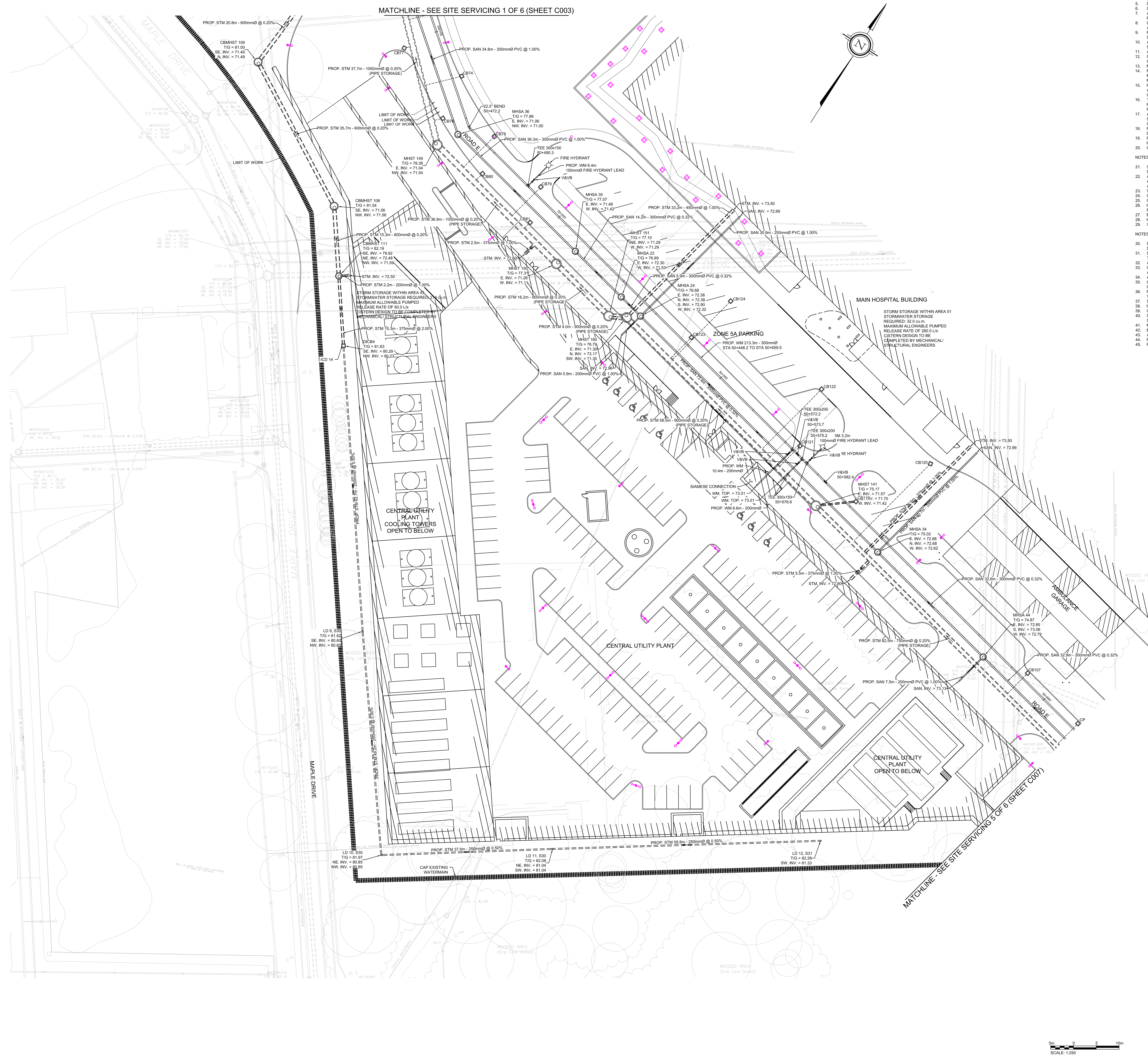
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
SITE SERVICING PLAN 2 OF 6

Sheet Number
C004

Project Status
STAGE 3

D07-12-22-0168



NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
6. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
7. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH D2 ON DRAWING C103.
8. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
12. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
13. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
16. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
17. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
18. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.
19. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
20. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.

NOTES: WATERMAIN

21. SUPPLY AND INSTALL ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
22. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE REQUIRED, PROVIDE INSULATION IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W22 AND W23. WATERMAIN INSULATION AT OPEN STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W23.
23. WATERMAIN BEDDING AS PER CITY OF OTTAWA STANDARD W17.
24. CONCRETE THRUST BLOCKS AND RESTRAINING AS PER CITY OF OTTAWA STANDARD W25.3, W25.4 (TABLE 3), W25.5 AND W25.6.
25. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER CITY OF OTTAWA STANDARD W40 AND W42.
26. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
27. EXCAVATION, INSTALLATION, AND BACKFILL BY CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY.
28. HYDRANT INSTALLATION SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W19.
29. WATERMAIN AND SEWER CORSSINGS TO BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W25 AND W25.2.

NOTES: SEWER

30. SUPPLY AND INSTALL ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
31. SEWER BEDDING AS PER CITY OF OTTAWA STANDARD S6 FOR SINGLE TRENCH AND CITY OF OTTAWA STANDARD S7 FOR COMBINED TRENCH.
32. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407 AND 410.
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34. ALL SEWERS WITH LESS THAN 1.5m OF COVER ARE SUBJECT TO INSULATION DETAIL D2.
35. CONTRACTOR TO CCTV ALL NEW SEWERS, 250mmØ OR GREATER, TO ENSURE THEY ARE CLEAN AND OPERATIONAL UPON COMPLETION OF CONTRACT. THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS.
36. PROVIDE SANITARY BACKWATER VALVES IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14.1 AND FOUNDATION DRAIN BACKWATER VALVE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14. REFER TO MECHANICAL DRAWINGS FOR FURTHER DETAILS.
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41. MAINENANCE HOLE DROP STRUCTURE SHALL BE IN ACCORDANCE WITH OPSD 1003.010.
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43. ALL CATCH BASIN LEADS ARE AT 2% SLOPE UNLESS OTHERWISE NOTED.
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PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATE CONTRACT)
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PROPOSED LIGHT STANDARD (BY OTHERS)
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EXISTING TREE AND CRITICAL ROOT ZONE

KEY PLAN

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

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Plan	18891

PRELIMINARY
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Sheet Name

SITE SERVICING PLAN 3 OF 6

Sheet Number

C005

Project Status

STAGE 3

D07-12-22-0168

NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
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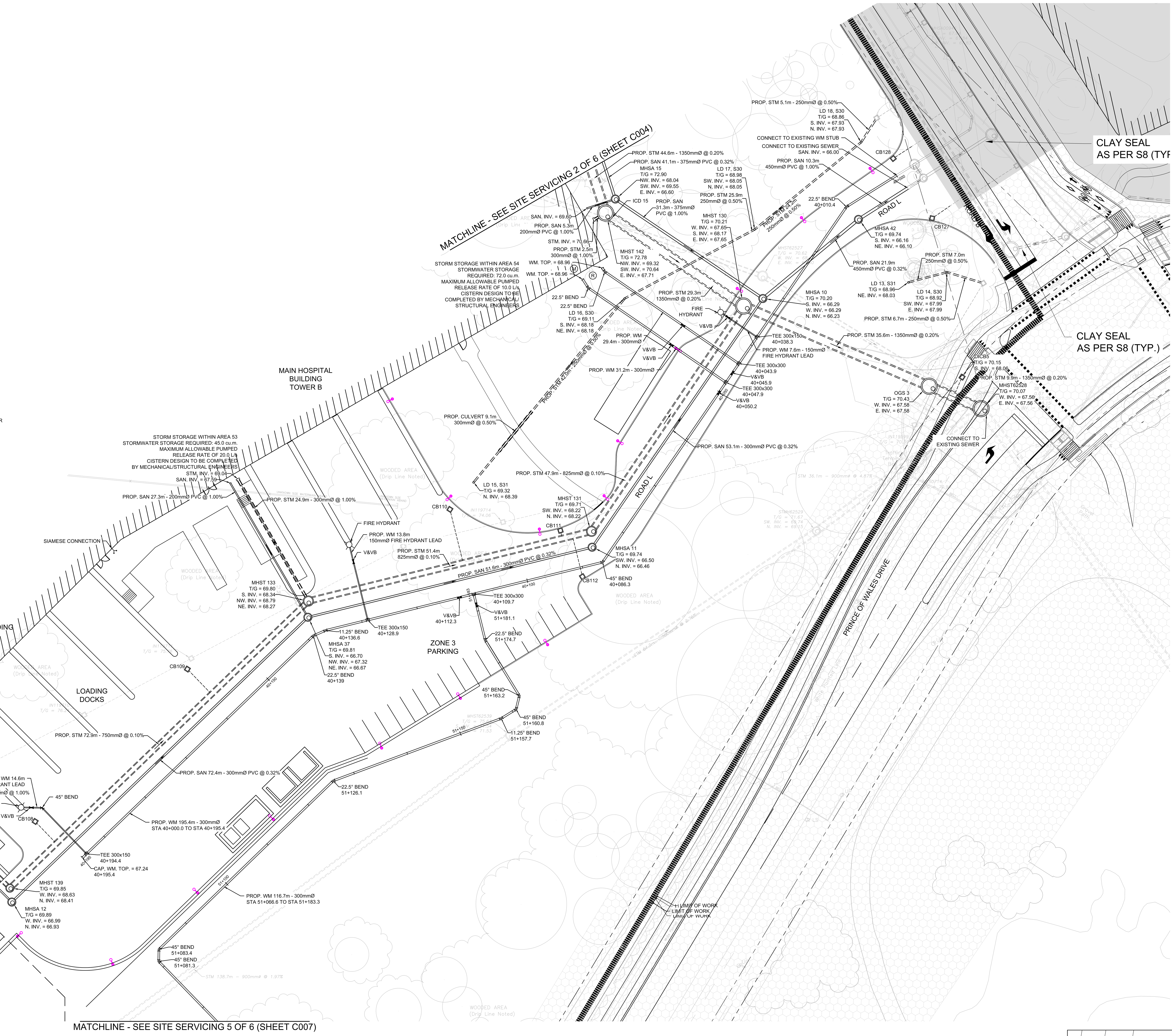

LEGEND:

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- EXISTING TREE AND CRITICAL ROOT ZONE

5m 0 5 10m
SCALE: 1:250

KEY PLAN

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

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Wayfinding	
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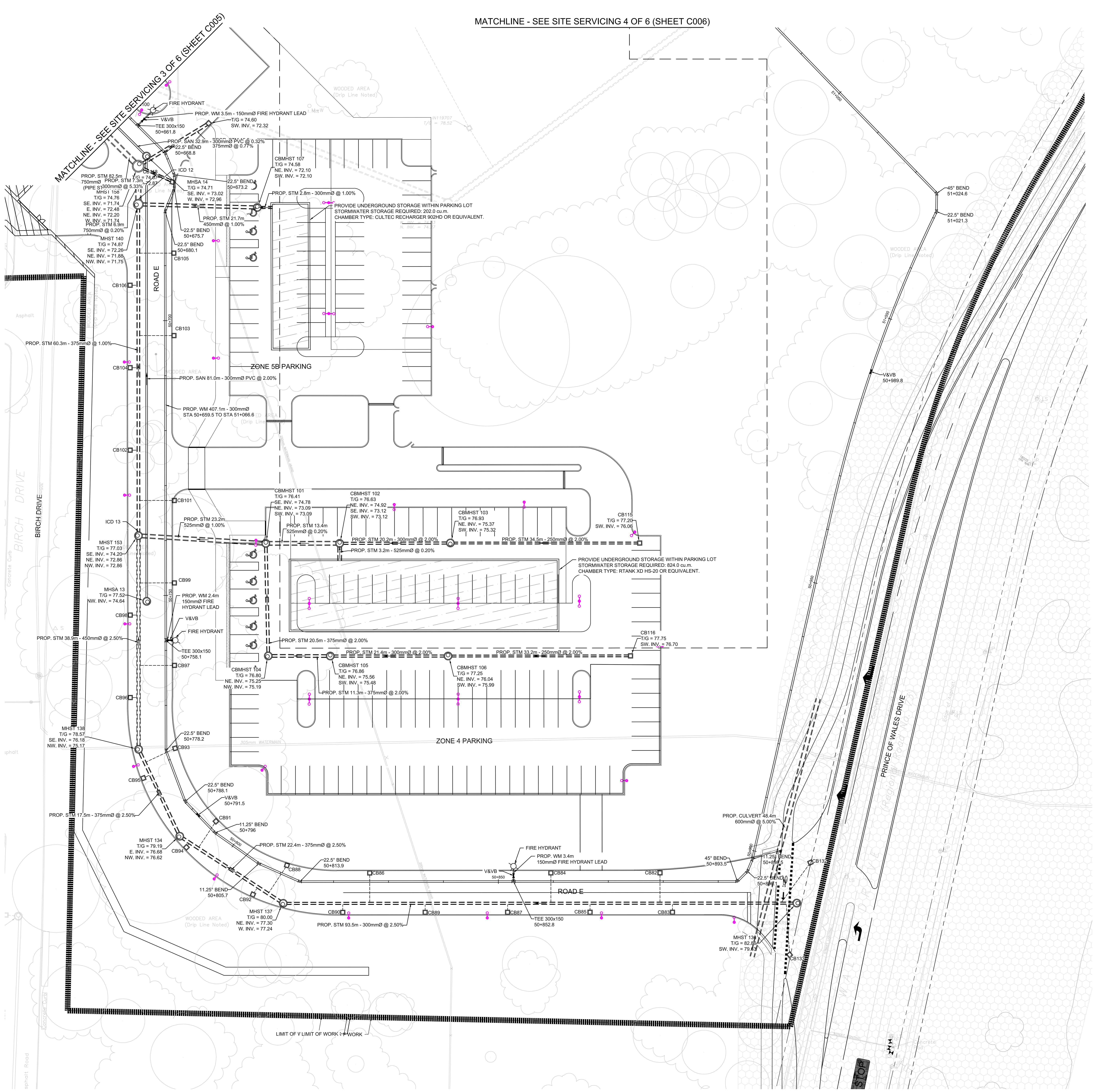
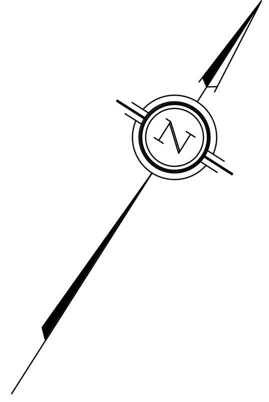
Sheet Name
SITE SERVICING PLAN
4 OF 6

Sheet Number
C006

Project Status
STAGE 3

D07-12-22-0168





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5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
6. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
7. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH D2 ON DRAWING C103.
8. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
12. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
13. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
16. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
17. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
18. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.
19. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
20. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.

NOTES: WATERMAIN

21. SUPPLY AND INSTALL ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
22. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE REQUIRED, PROVIDE INSULATION IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W22 AND W23. WATERMAIN INSULATION AT OPEN STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W23.
23. WATERMAIN BEDDING AS PER CITY OF OTTAWA STANDARD W17.
24. CONCRETE THRUST BLOCKS AND RESTRAINING AS PER CITY OF OTTAWA STANDARD W25.3, W25.4 (TABLE 3), W25.5 AND W25.6.
25. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER CITY OF OTTAWA STANDARD W40 AND W42.
26. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
27. EXCAVATION, INSTALLATION, AND BACKFILL BY CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY.
28. HYDRANT INSTALLATION SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W19.
29. WATERMAIN AND SEWER CORSSINGS TO BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W25 AND W25.2.

NOTES: SEWER

30. SUPPLY AND INSTALL ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
31. SEWER BEDDING AS PER CITY OF OTTAWA STANDARD S6 FOR SINGLE TRENCH AND CITY OF OTTAWA STANDARD S7 FOR COMBINED TRENCH.
32. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407 AND 410.
33. CONTRACTOR TO CONFIRM ELEVATION OF EXISTING STORM AND SANITARY SEWERS AT PROPOSED CONNECTION POINTS AND REPORT ANY DISCREPANCIES TO THE ENGINNEER BEFORE COMMENCING ANY WORK.
34. ALL SEWERS WITH LESS THAN 1.5m OF COVER ARE SUBJECT TO INSULATION DETAIL D2.
35. CONTRACTOR TO CCTV ALL NEW SEWERS, 250mmØ OR GREATER, TO ENSURE THEY ARE CLEAN AND OPERATIONAL UPON COMPLETION OF CONTRACT. THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS.
36. PROVIDE SANITARY BACKWATER VALVES IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14.1 AND FOUNDATION DRAIN BACKWATER VALVE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S14. REFER TO MECHANICAL DRAWINGS FOR FURTHER DETAILS.
37. SEWER CONNECTIONS TO BE MADE ABOVE THE SPRINGLINE OF THE SEWER AS PER CITY OF OTTAWA STANDARD S11, S11.1, AND S11.2.
38. INSTALLATION OF CATCH BASINS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S1 AND S2.
39. CLAY SEALS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S8.
40. SUPPORT FOR EXISTING UTILITIES CROSSING A SEWER OR WATERMAIN SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S10.
41. MAINENANCE HOLE DROP STRUCTURE SHALL BE IN ACCORDANCE WITH OPSD 1003.010.
42. BENCHING FOR SANITARY MAINTENANCE HOLES SHALL BE IN ACCORDANCE WITH OPSD 701.021.
43. ALL CATCH BASIN LEADS ARE AT 2% SLOPE UNLESS OTHERWISE NOTED.
44. ROADWAY SUBDRAIN SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R1.
45. REFER TO GRADING SHEETS FOR THE PONDING LIMITS AND VOLUMES.

LEGEND:

- EXISTING PROPERTY LINE
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATE CONTRACT)
- PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS
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- PROPOSED SANITARY SEWER AND MANHOLE
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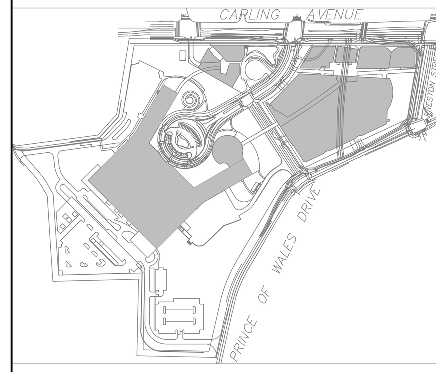
- PROPOSED BACKWATER VALVE
- PROPOSED REMOTE METER
- PROPOSED WATER METER
- PROPOSED LIGHT STANDARD (BY OTHERS)
- PROPOSED BOLLARD (BY OTHERS)
- EXISTING TREE AND CRITICAL ROOT ZONE

5m 0 5 10m
SCALE: 1:250

KEY PLAN

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

MARK	DATE	DESCRIPTION
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Plan	18891

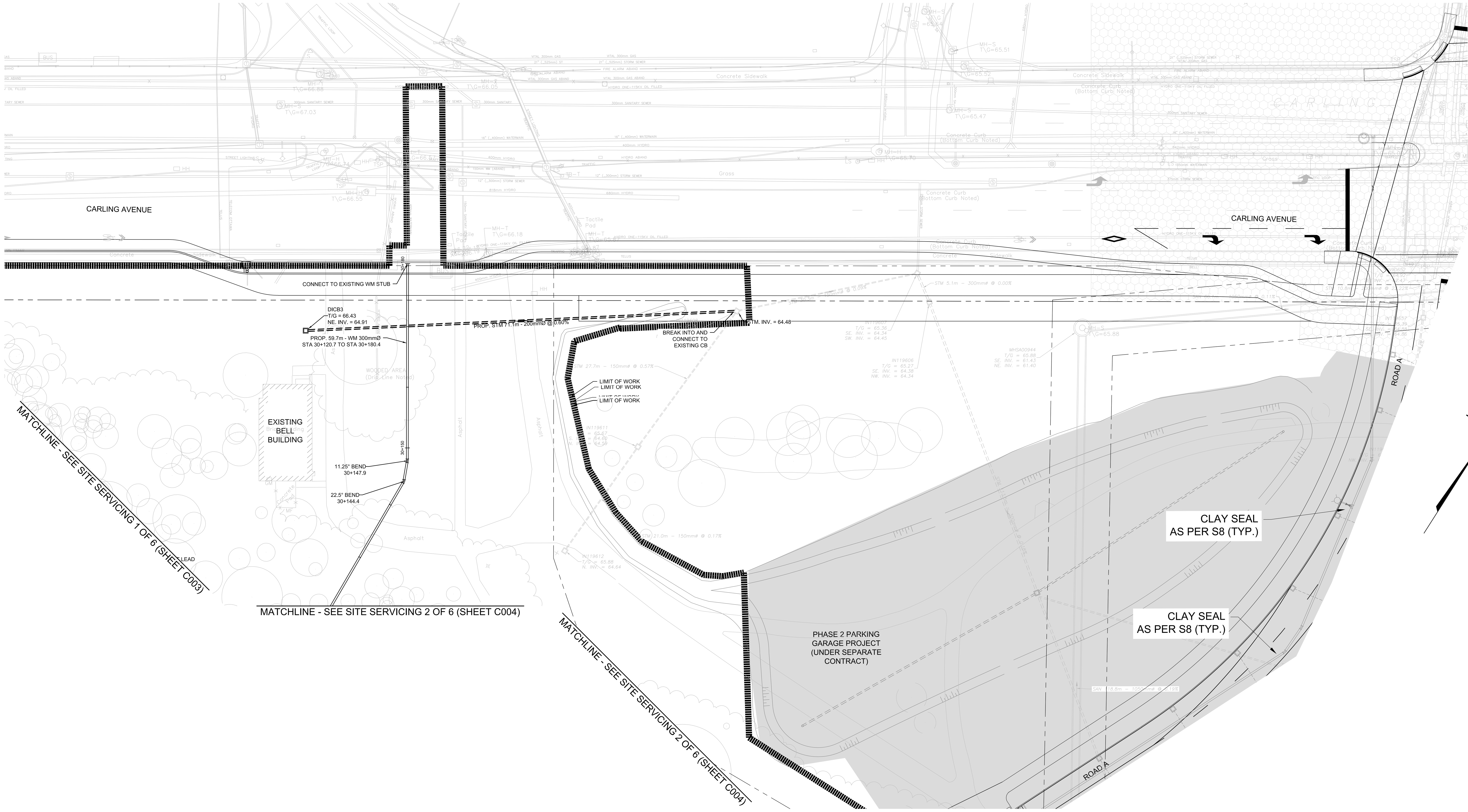
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
SITE SERVICING PLAN 5 OF 6

Sheet Number
C007

Project Status
STAGE 3

D07-12-22-0168



NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
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LEGEND:

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- PROPOSED LIGHT STANDARD (BY OTHERS)
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- EXISTING TREE AND CRITICAL ROOT ZONE

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

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05	2023-02-24	ISSUED FOR RFP VERSION 1.0
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Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name

SITE SERVICING PLAN
6 OF 6

Sheet Number

C008

Project Status

STAGE 3

D07-12-22-0168

NOTES: GRADING

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
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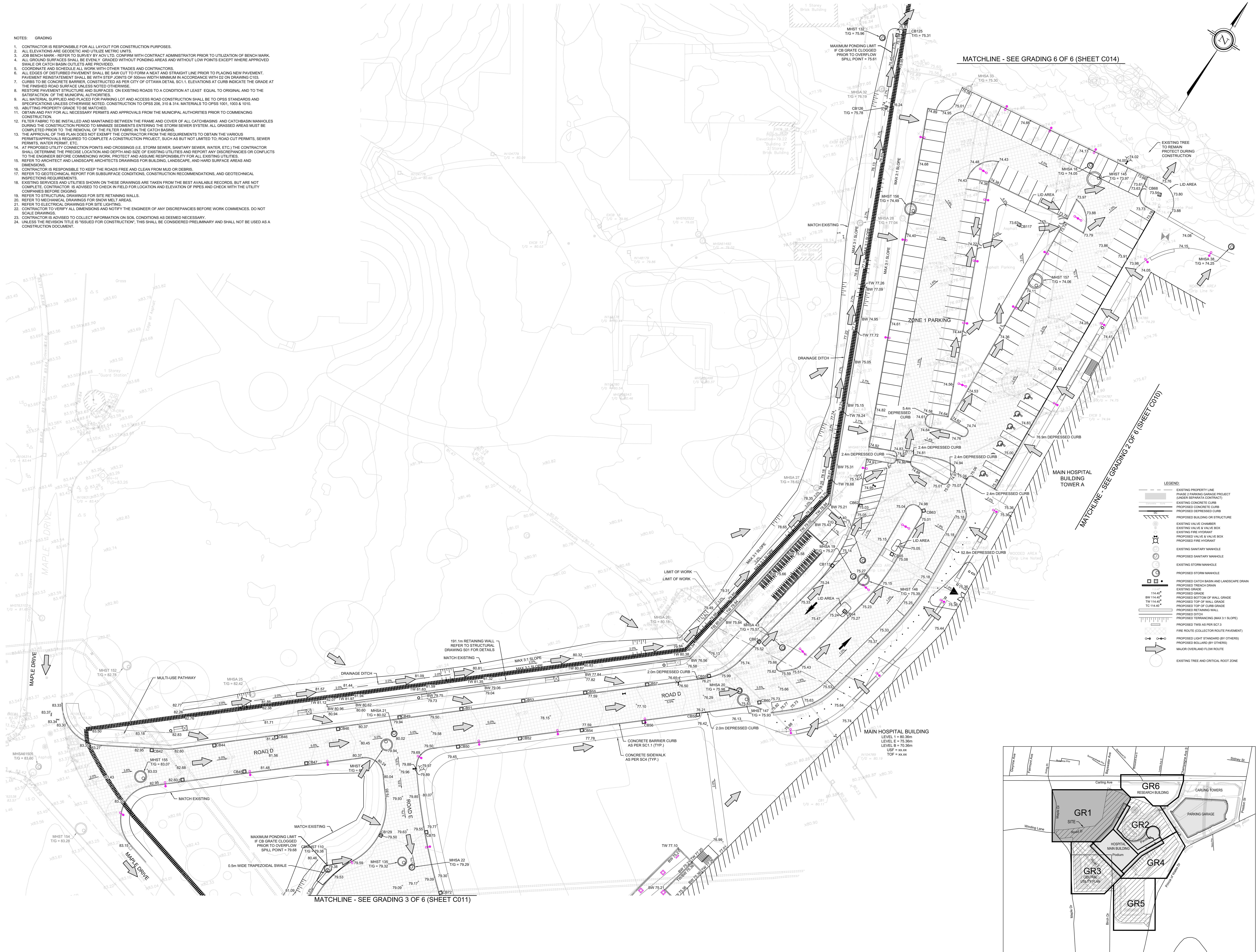
17. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTIONS REQUIREMENTS.
18. EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT ARE NOT COMPLETE. CONTRACTOR IS ADVISED TO CHECK IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING
19. REFER TO STRUCTURAL DRAWINGS FOR SITE RETAINING WALLS.
20. REFER TO MECHANICAL DRAWINGS FOR SNOW MELT AREAS.
21. REFER TO ELECTRICAL DRAWINGS FOR SITE LIGHTING.
22. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.
23. CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS AS DEEMED NECESSARY.
24. UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.



RECOMMENDED PAVEMENT STRUCTURE – PARKING AREAS	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm SURFACE COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – LOCAL ROUTES	
THICKNESS(mm)	MATERIAL DESCRIPTION
40	SUPERPAVE 12.5mm SURFACE COURSE
50	SUPERPAVE 19.0mm BINDER COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – COLLECTOR ROUTES	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm FC1 SURFACE COURSE
70	SUPERPAVE 19.0mm BINDER COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – RIGID PAVEMENT	
THICKNESS(mm)	MATERIAL DESCRIPTION
200	PORTLAND CEMENT CONCRETE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

HDR

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PARSONS

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Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

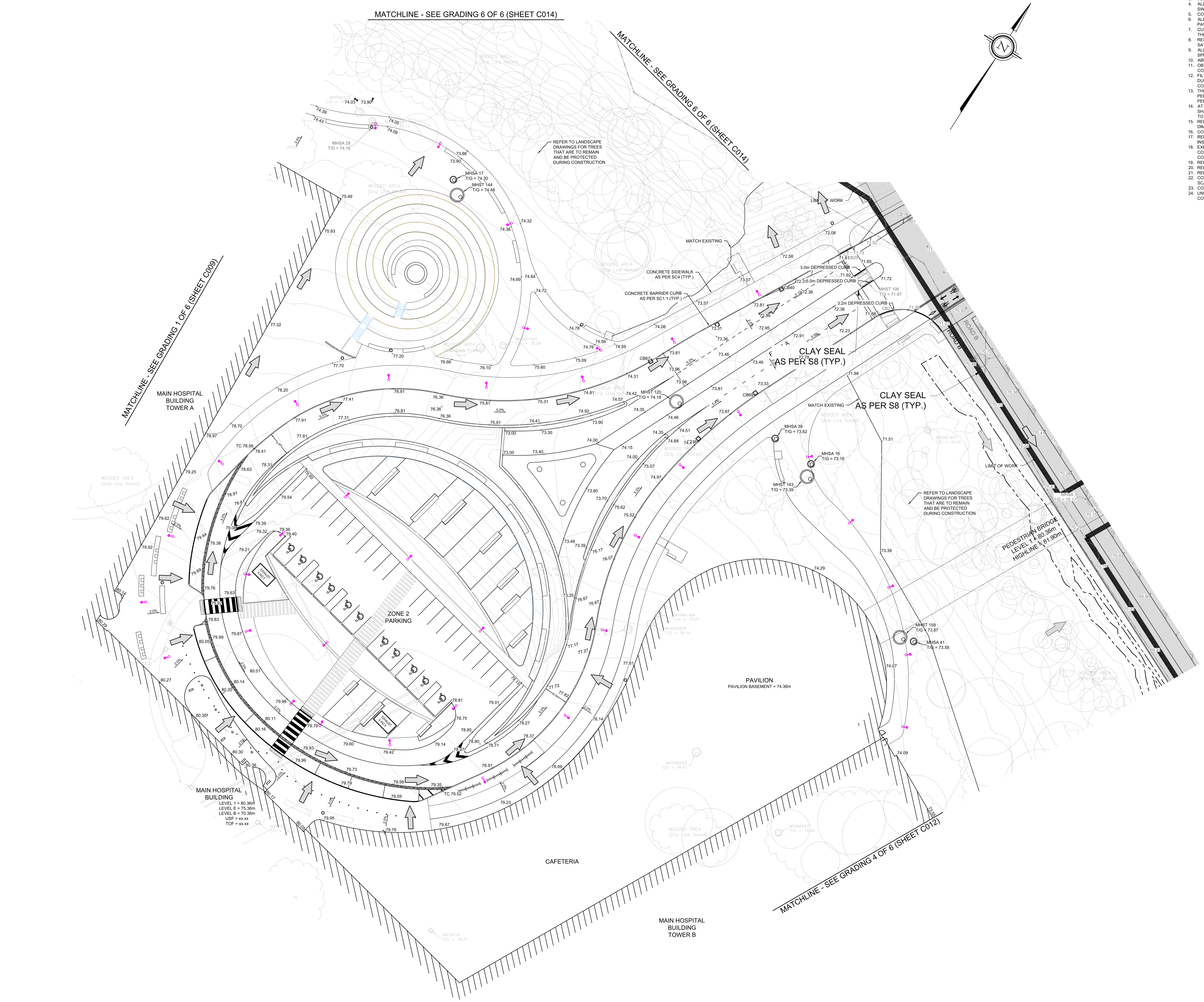
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
GRADING PLAN 1 OF 6

Sheet Number
C009

Project Status
STAGE 3

D07-12-22-016_



NOTES: GRADING

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
6. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH D2 ON DRAWING C103.
7. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
8. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
9. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
10. ABUTTING PROPERTY GRADE TO BE MATCHED.
11. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
12. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
13. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
14. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
15. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.
16. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.
17. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTIONS REQUIREMENTS.
18. EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT ARE NOT COMPLETE. CONTRACTOR IS ADVISED TO CHECK IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING
19. REFER TO STRUCTURAL DRAWINGS FOR SITE RETAINING WALLS.
20. REFER TO MECHANICAL DRAWINGS FOR SNOW MELT AREAS.
21. REFER TO ELECTRICAL DRAWINGS FOR SITE LIGHTING.
22. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.
23. CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS AS DEEMED NECESSARY.
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LEGEND:

- EXISTING PROPERTY LINE
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATA CONTRACT)
- EXISTING CONCRETE CURB
- PROPOSED CONCRETE CURB
- DC PROPOSED DEPRESSED CURB
- PROPOSED BUILDING OR STRUCTURE
- EXISTING VALVE CHAMBER
- EXISTING VALVE & VALVE BOX
- EXISTING FIRE HYDRANT
- PROPOSED VALVE & VALVE BOX
- PROPOSED FIRE HYDRANT
- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN AND LANDSCAPE DRAIN
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- 113.45 EXISTING GRADE
- 114.40 PROPOSED GRADE
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- FIRE ROUTE (COLLECTOR ROUTE PAVEMENT)
- PROPOSED LIGHT STANDARD (BY OTHERS)
- PROPOSED BOLLARD (BY OTHERS)
- MAJOR OVERLAND FLOW ROUTE
- EXISTING TREE AND CRITICAL ROOT ZONE

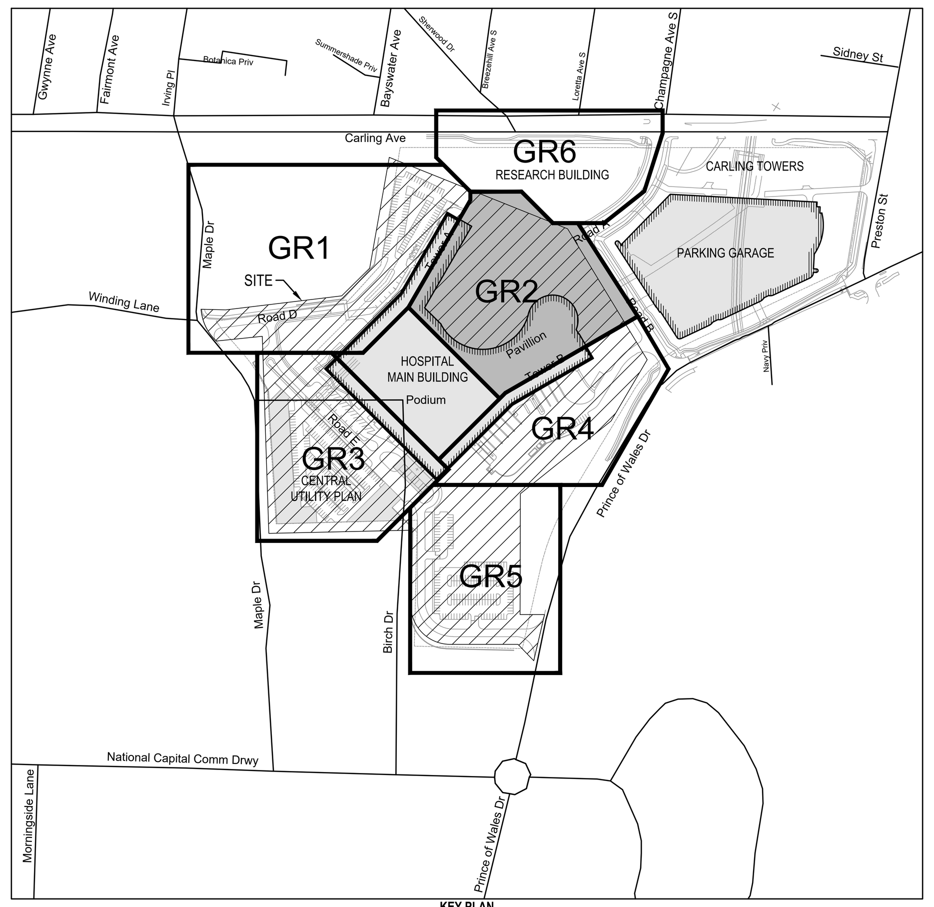
5m 0 5 10m
SCALE: 1:250

RECOMMENDED PAVEMENT STRUCTURE – PARKING AREAS	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm SURFACE COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – LOCAL ROUTES	
THICKNESS(mm)	MATERIAL DESCRIPTION
40	SUPERPAVE 12.5mm SURFACE COURSE
50	SUPERPAVE 19.0mm BINDER COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – COLLECTOR ROUTES	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm FC1 SURFACE COURSE
70	SUPERPAVE 19.0mm BINDER COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – RIGID PAVEMENT	
THICKNESS(mm)	MATERIAL DESCRIPTION
200	PORTLAND CEMENT CONCRETE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

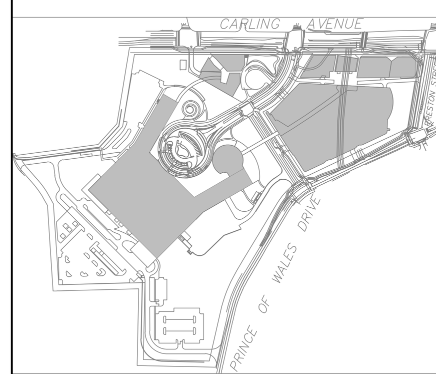


KEY PLAN

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

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05	2023-02-24	ISSUED FOR RFP VERSION 1.0
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Sheet Name
GRADING PLAN 2 OF 5

Sheet Number
C010

Project Status
STAGE 3

D07-12-22-0168

RECOMMENDED PAVEMENT STRUCTURE – PARKING AREAS	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm SURFACE COURSE
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THICKNESS(mm)	MATERIAL DESCRIPTION
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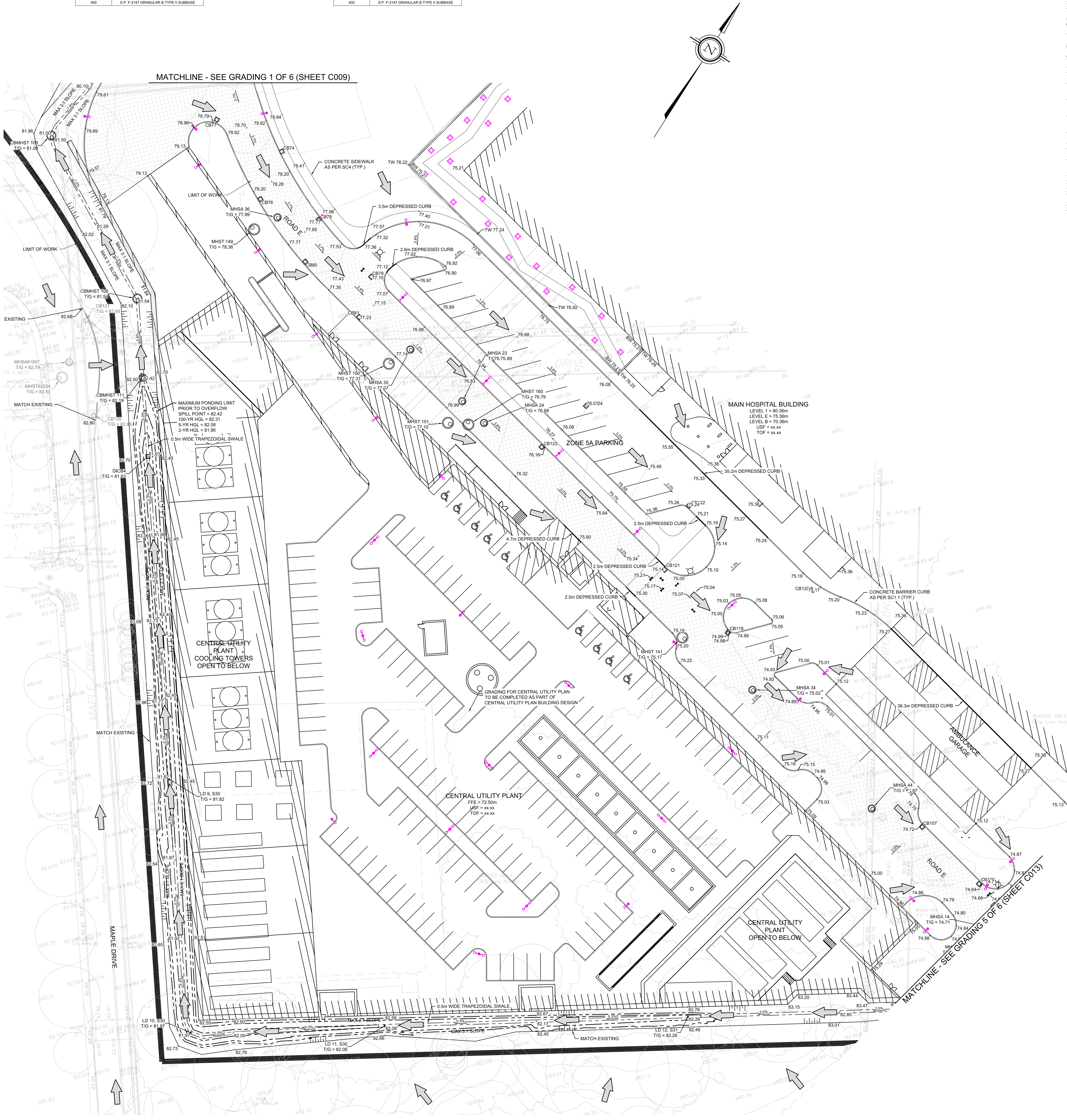

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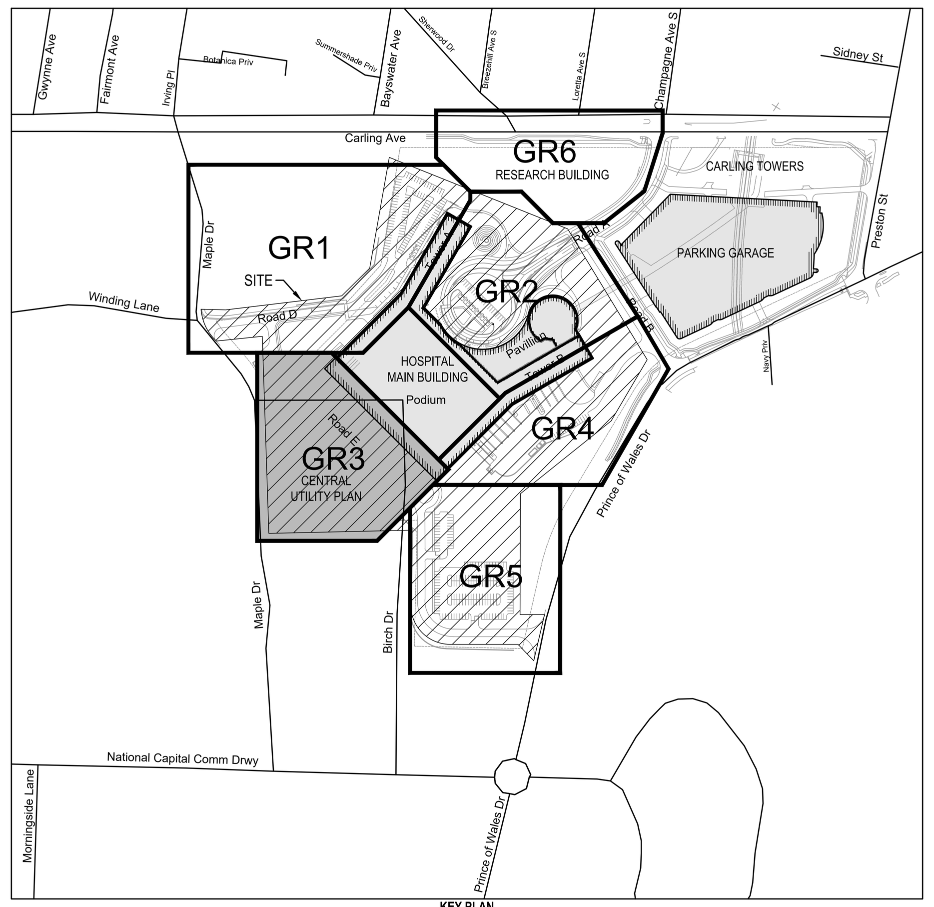
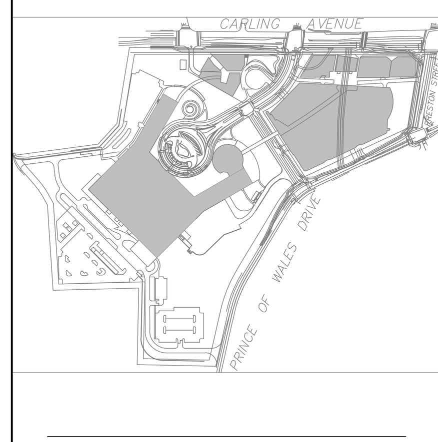


KEY PLAN

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

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Project Designer	JEG
Project Architect	JEG
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Sheet Name
GRADING PLAN 3 OF 5

Sheet Number
C011

Project Status
STAGE 3

D07-12-22-0168

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LEGEND:

- EXISTING PROPERTY LINE
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATA CONTRACT)
- PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS
- EXISTING CONCRETE CURB
- PROPOSED CONCRETE CURB
- PROPOSED DEPRESSED CURB
- PROPOSED BUILDING OR STRUCTURE
- EXISTING VALVE CHAMBER
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RECOMMENDED PAVEMENT STRUCTURE – LOCAL ROUTES	
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RECOMMENDED PAVEMENT STRUCTURE – RIGID PAVEMENT	
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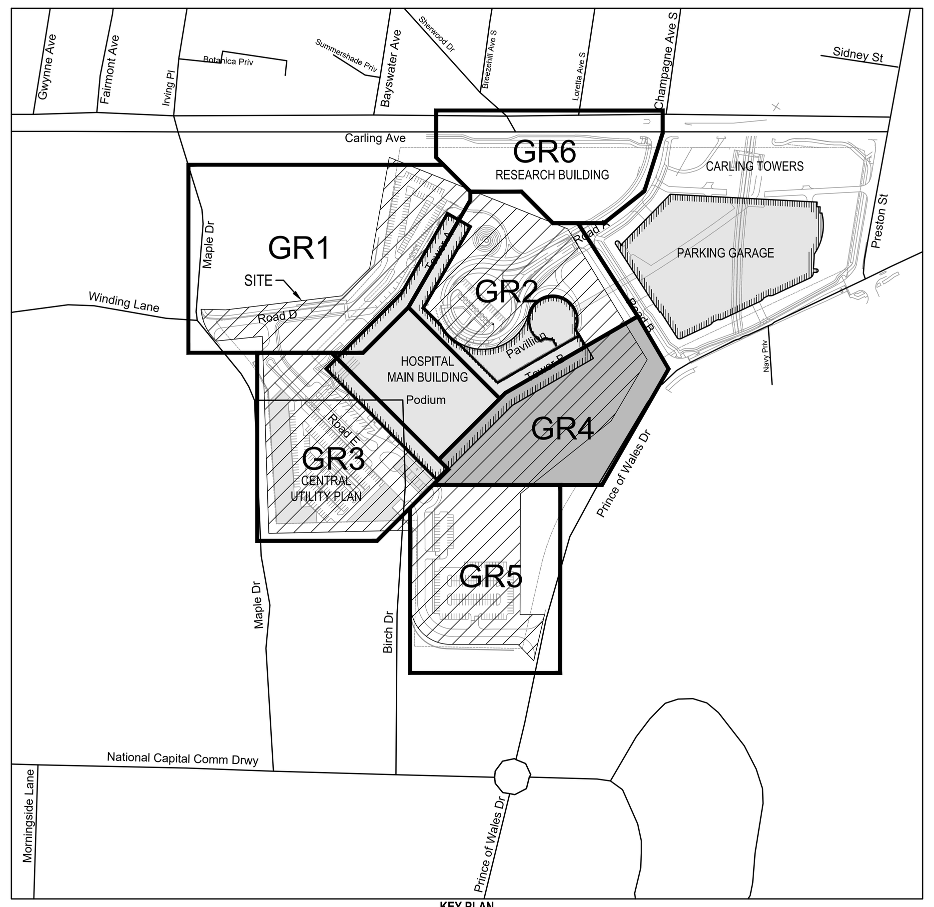

KEY PLAN

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PARSONS

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Plan	18891

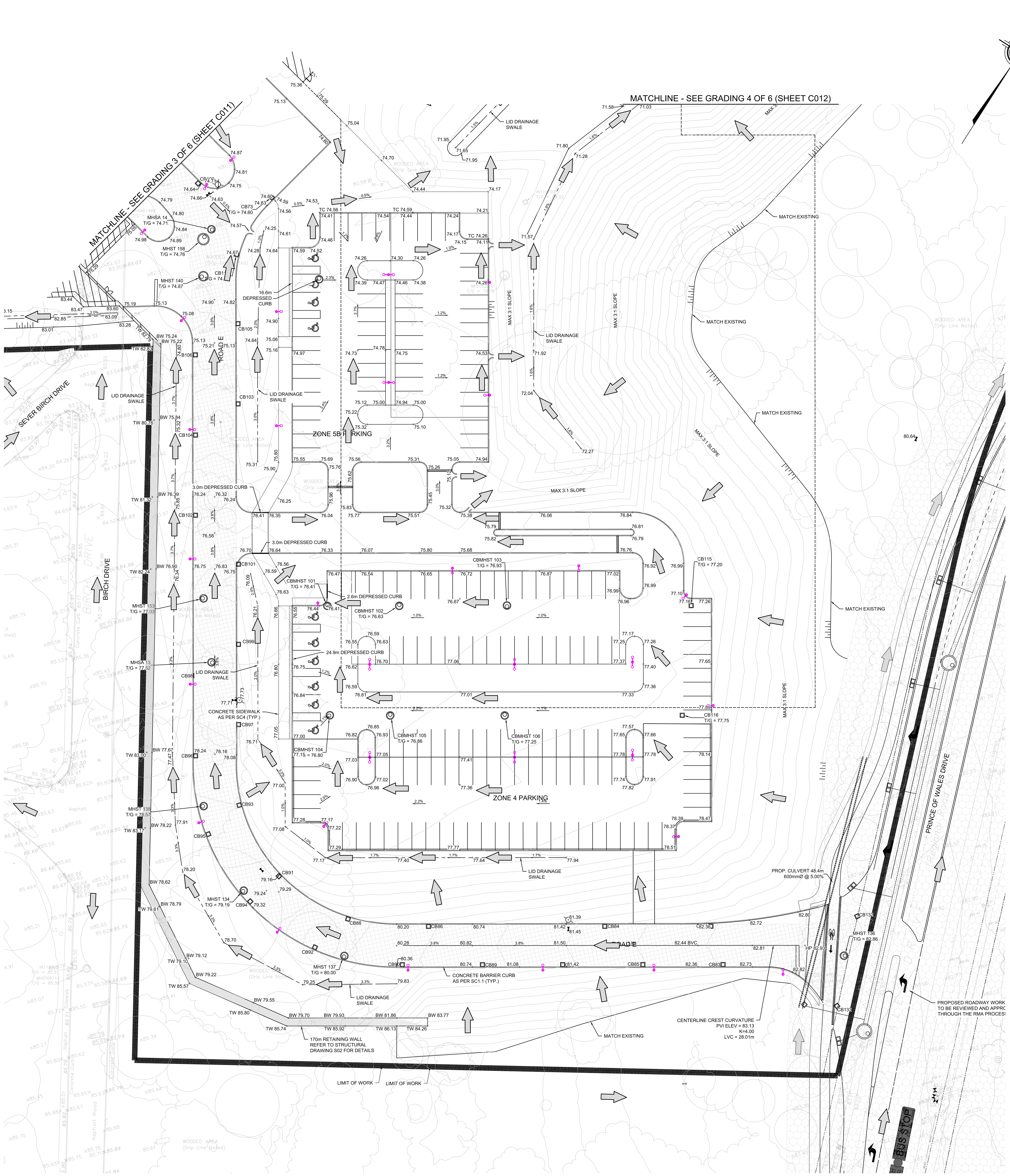
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
GRADING PLAN 4 OF 5

Sheet Number
C012

Project Status
STAGE 3

D07-12-22-0168



NOTES: GRADING

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
6. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH D2 ON DRAWING C103.
7. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
8. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
9. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
10. ABUTTING PROPERTY GRADE TO BE MATCHED.
11. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
12. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
13. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
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15. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.
16. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.
17. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTIONS REQUIREMENTS.
18. EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT ARE NOT COMPLETE. CONTRACTOR IS ADVISED TO CHECK IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING
19. REFER TO STRUCTURAL DRAWINGS FOR SITE RETAINING WALLS.
20. REFER TO MECHANICAL DRAWINGS FOR SNOW MELT AREAS.
21. REFER TO ELECTRICAL DRAWINGS FOR SITE LIGHTING.
22. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.
23. CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS AS DEEMED NECESSARY.
24. UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

LEGEND:

- EXISTING PROPERTY LINE
- PHASE 2 PARKING GARAGE PROJECT (UNDER SEPARATA CONTRACT)
- PROPOSED ROADWAY WORKS TO BE REVIEWED AND APPROVED THROUGH RMA PROCESS
- EXISTING CONCRETE CURB
- PROPOSED CONCRETE CURB
- PROPOSED DEPRESSED CURB (DC)
- PROPOSED BUILDING OR STRUCTURE
- EXISTING VALVE CHAMBER
- EXISTING VALVE & VALVE BOX
- EXISTING FIRE HYDRANT
- PROPOSED VALVE & VALVE BOX
- PROPOSED FIRE HYDRANT
- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN AND LANDSCAPE DRAIN
- PROPOSED TRENCH DRAIN
- 113.45 EXISTING GRADE
- 114.40 PROPOSED GRADE
- BW 114.40 PROPOSED BOTTOM OF WALL GRADE
- TW 114.40 PROPOSED TOP OF WALL GRADE
- TC 114.40 PROPOSED TOP OF CURB GRADE
- PROPOSED RETAINING WALL
- PROPOSED DITCH
- PROPOSED TERRANCING (MAX 3:1 SLOPE)
- PROPOSED TWSI AS PER SC7.3
- FIRE ROUTE (COLLECTOR ROUTE PAVEMENT)
- PROPOSED LIGHT STANDARD (BY OTHERS)
- PROPOSED BOLLARD (BY OTHERS)
- MAJOR OVERLAND FLOW ROUTE
- EXISTING TREE AND CRITICAL ROOT ZONE

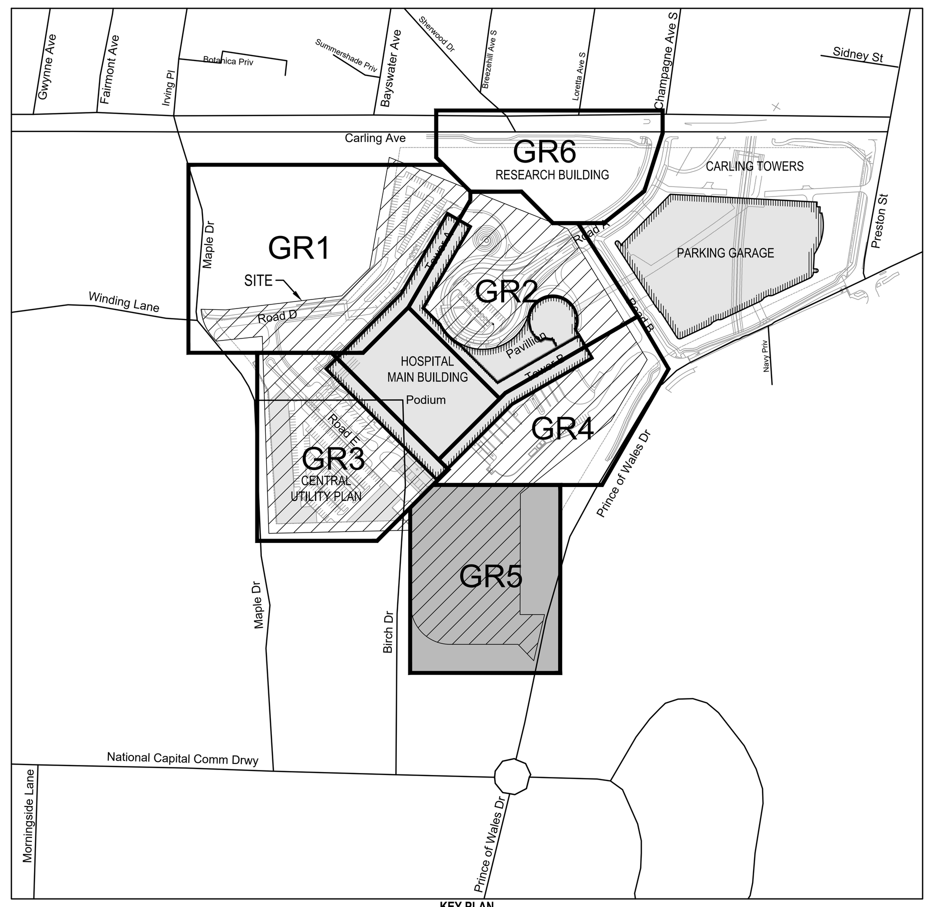
RECOMMENDED PAVEMENT STRUCTURE – PARKING AREAS	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm SURFACE COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – LOCAL ROUTES	
THICKNESS(mm)	MATERIAL DESCRIPTION
40	SUPERPAVE 12.5mm SURFACE COURSE
50	SUPERPAVE 19.0mm BINDER COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – COLLECTOR ROUTES	
THICKNESS(mm)	MATERIAL DESCRIPTION
50	SUPERPAVE 12.5mm FC1 SURFACE COURSE
70	SUPERPAVE 19.0mm BINDER COURSE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

RECOMMENDED PAVEMENT STRUCTURE – RIGID PAVEMENT	
THICKNESS(mm)	MATERIAL DESCRIPTION
200	PORTLAND CEMENT CONCRETE
150	S.P. F-3147 GRANULAR A BASE
400	S.P. F-3147 GRANULAR B TYPE II SUBBASE

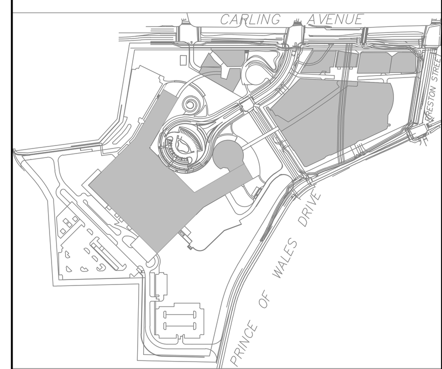
SCALE: 1:250



KEY PLAN

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL / NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

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06	2023-04-12	RE-ISSUED FOR SPC & FLUDA

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Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
GRADING PLAN 5 OF 5

Sheet Number
C013

Project Status
STAGE 3

D07-12-22-0168

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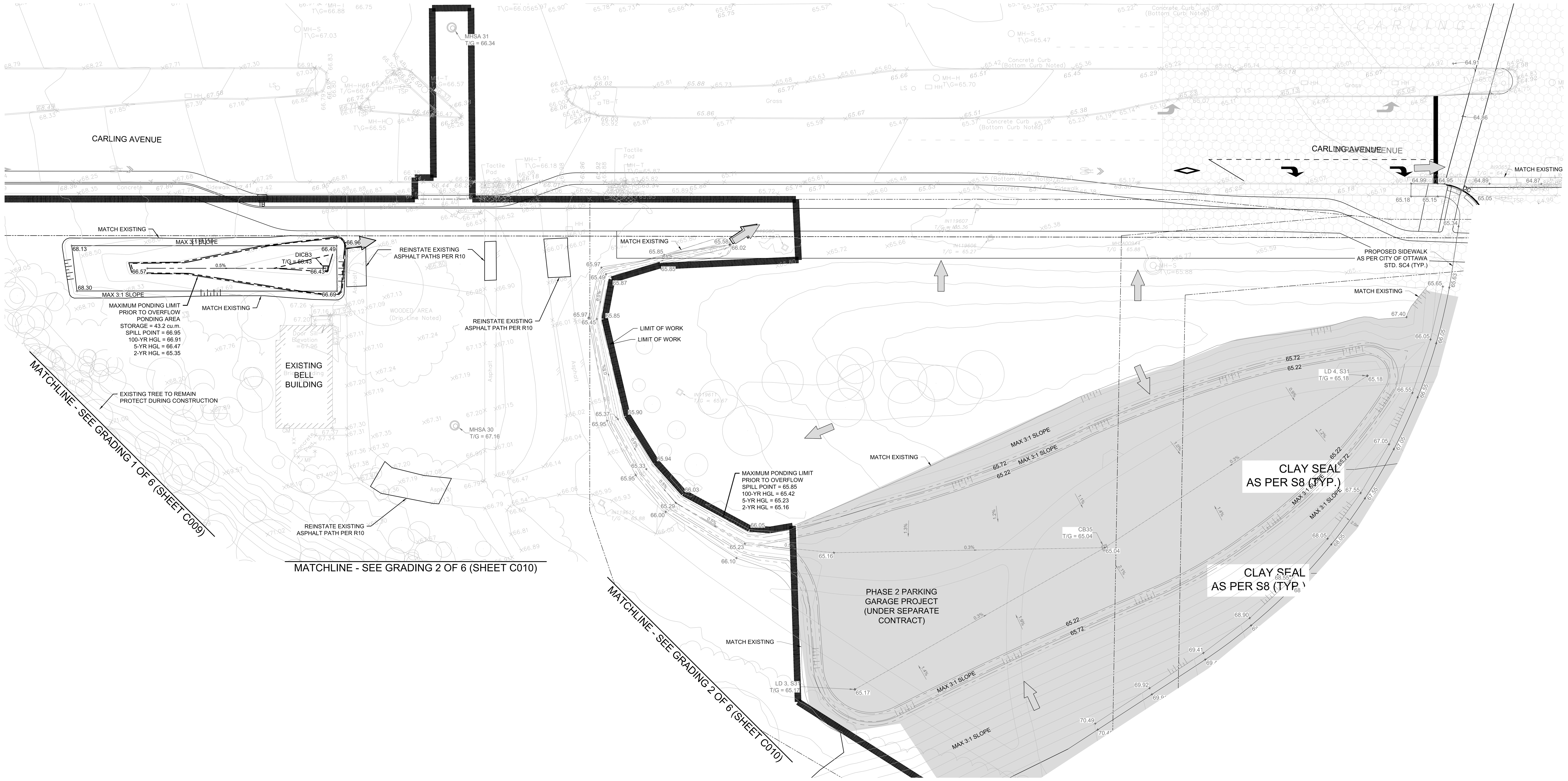

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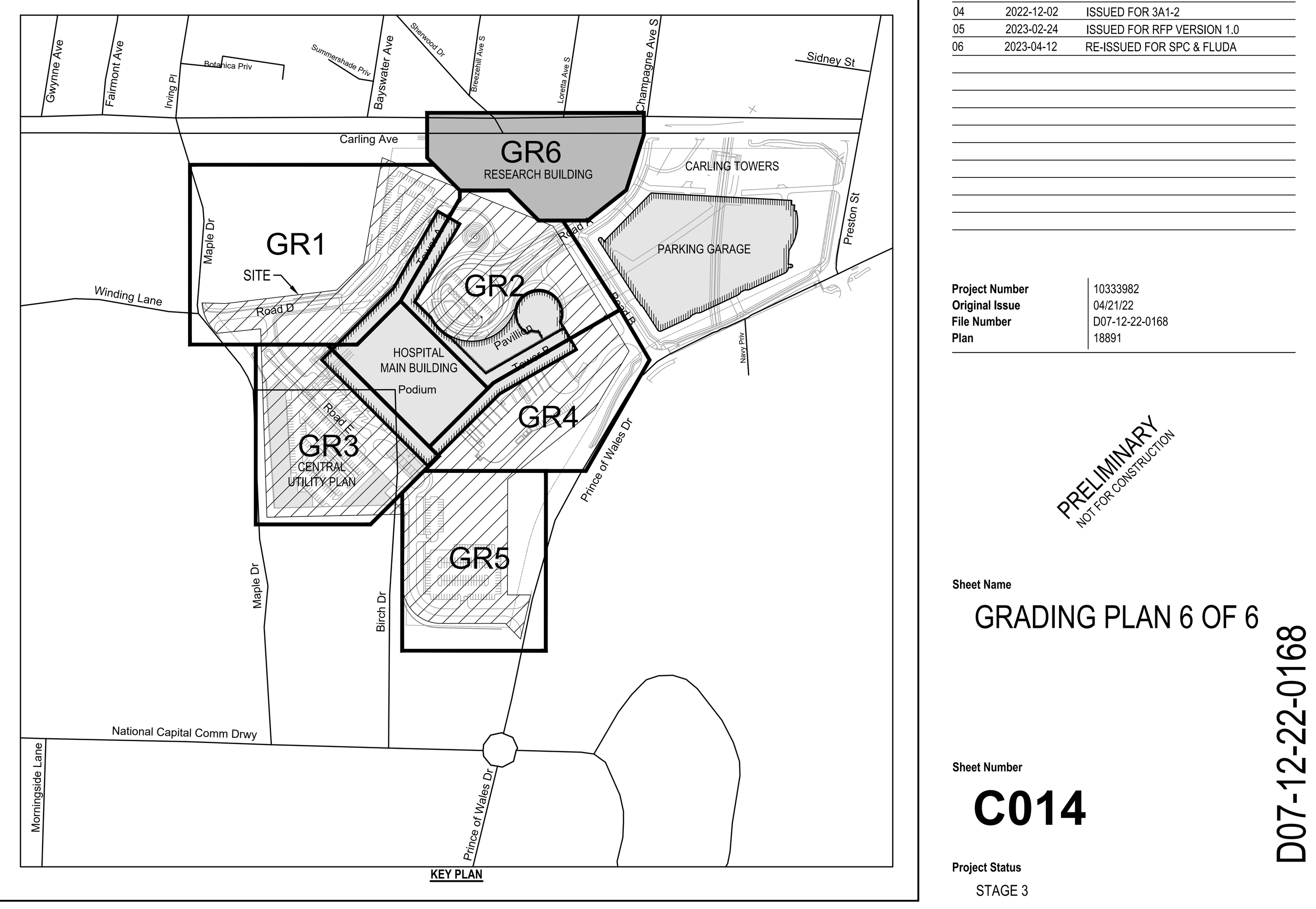

HDR Architecture Associates Inc.
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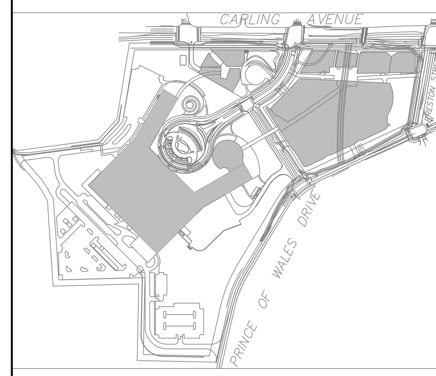
PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

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Project Architect	JEG
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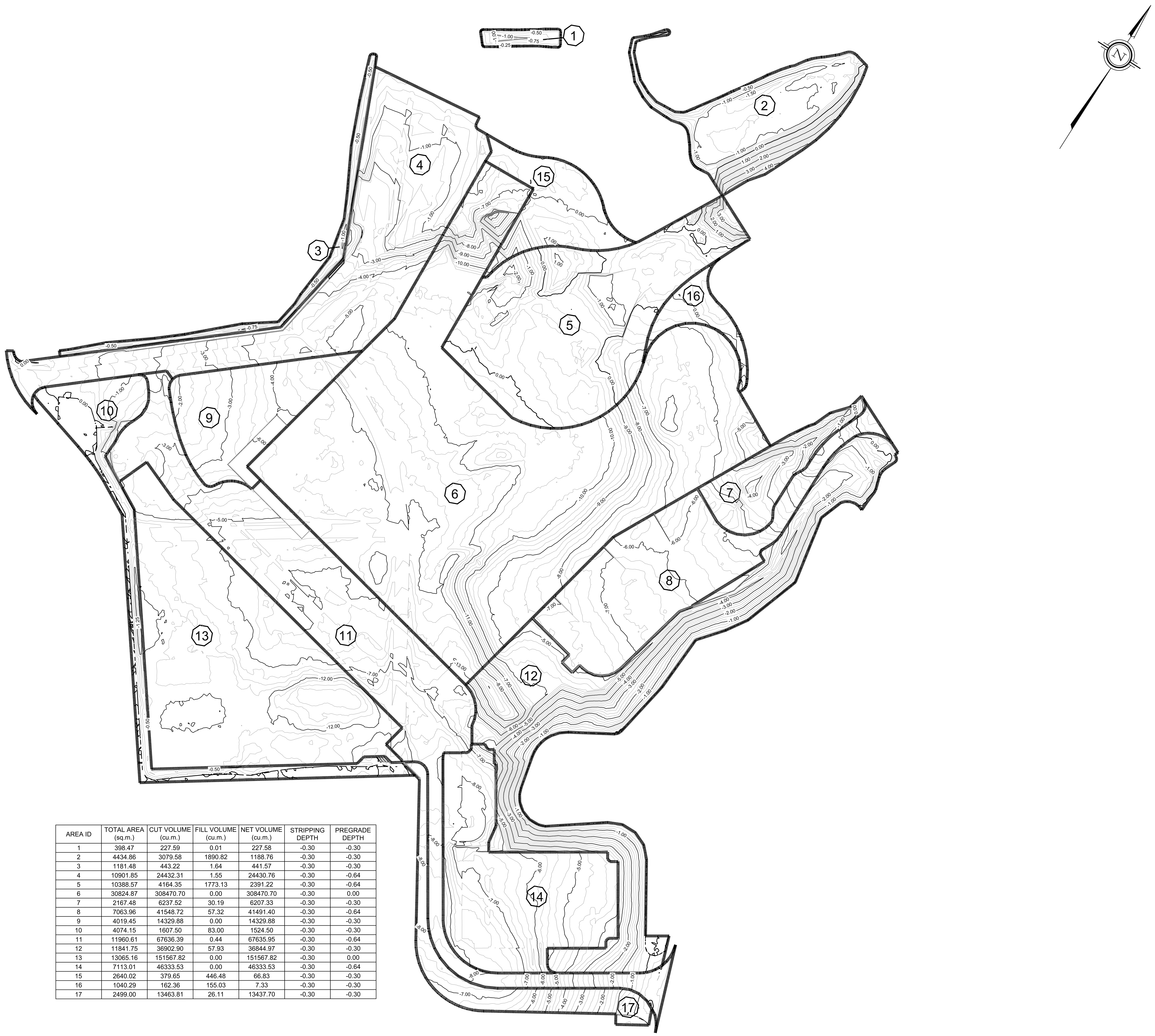
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
GRADING PLAN 6 OF 6

Sheet Number
C014

Project Status
STAGE 3

D07-12-22-0168



AREA ID	TOTAL AREA (sq.m.)	CUT VOLUME (cu.m.)	FILL VOLUME (cu.m.)	NET VOLUME (cu.m.)	STRIPPING DEPTH	PREGRADE DEPTH
1	398.47	227.59	0.01	227.58	-0.30	-0.30
2	4434.86	3079.58	1890.82	1188.76	-0.30	-0.30
3	1181.48	443.22	1.64	441.57	-0.30	-0.30
4	10901.85	24432.31	1.55	24430.76	-0.30	-0.64
5	10388.57	4164.35	1773.13	2391.22	-0.30	-0.64
6	30824.87	308470.70	0.00	308470.70	-0.30	0.00
7	2167.48	6237.52	30.19	6207.33	-0.30	-0.30
8	7063.96	41548.72	57.32	41491.40	-0.30	-0.64
9	4019.45	14329.88	0.00	14329.88	-0.30	-0.30
10	4074.15	1607.50	83.00	1524.50	-0.30	-0.30
11	11960.61	67636.39	0.44	67635.95	-0.30	-0.64
12	11841.75	36902.90	57.93	36844.97	-0.30	-0.30
13	13065.16	151567.82	0.00	151567.82	-0.30	0.00
14	7113.01	46333.53	0.00	46333.53	-0.30	-0.64
15	2640.02	379.65	446.48	66.83	-0.30	-0.30
16	1040.29	162.36	155.03	7.33	-0.30	-0.30
17	2499.00	13463.81	26.11	13437.70	-0.30	-0.30

HDR

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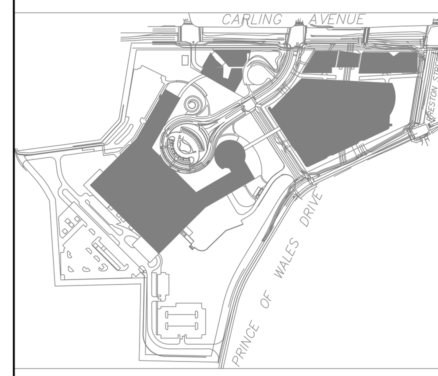

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

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Plan	18891

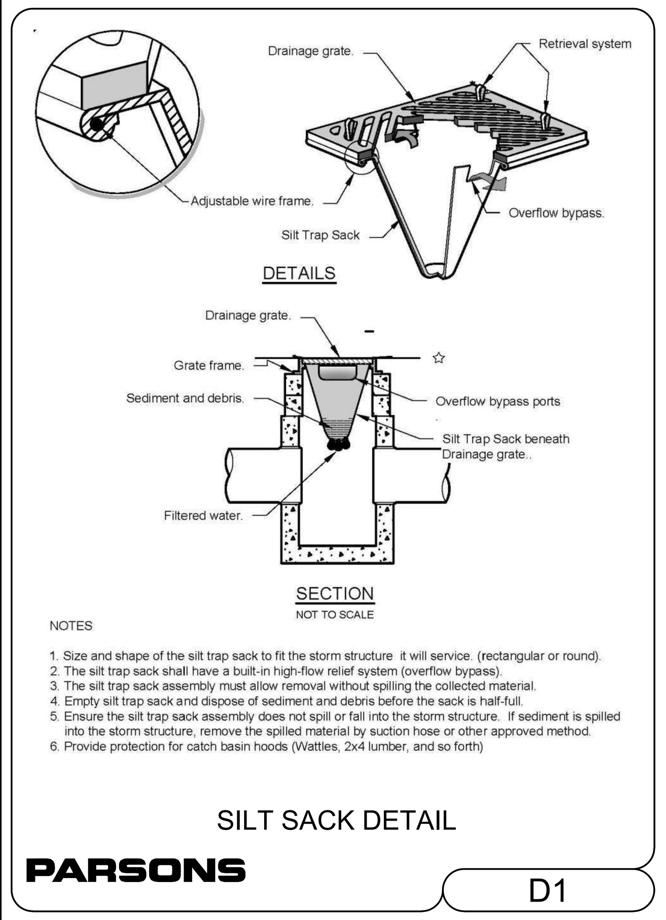
PRELIMINARY
NOT FOR CONSTRUCTION

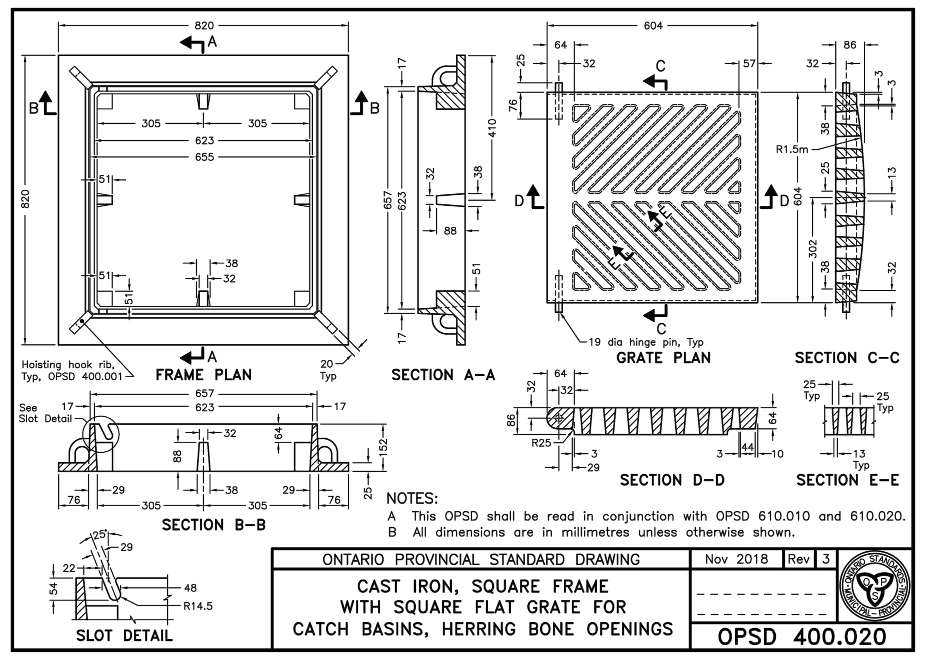
Sheet Name
CUT-FILL PLAN

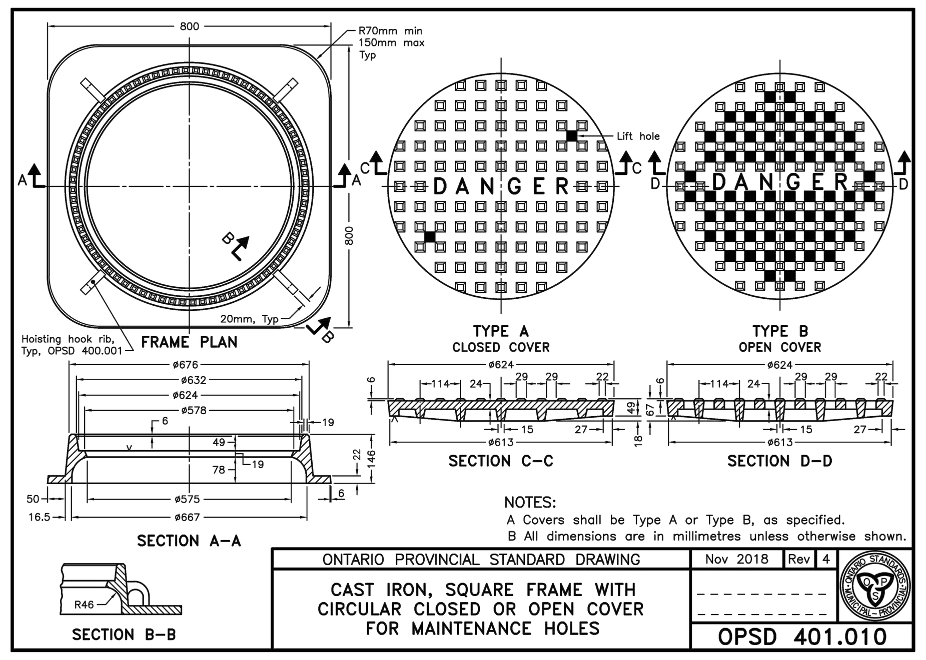
Sheet Number
C015

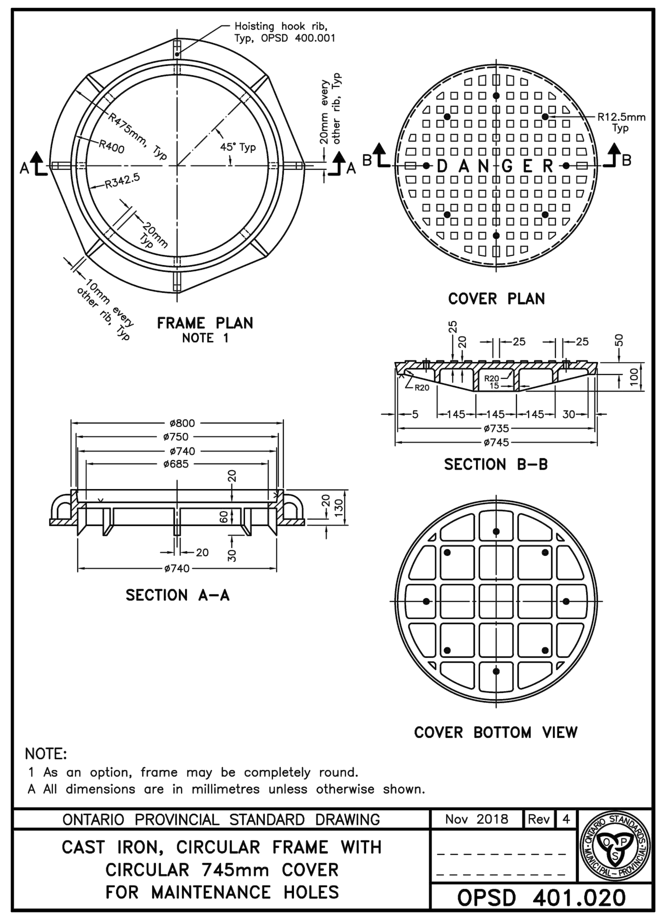
Project Status
STAGE 3

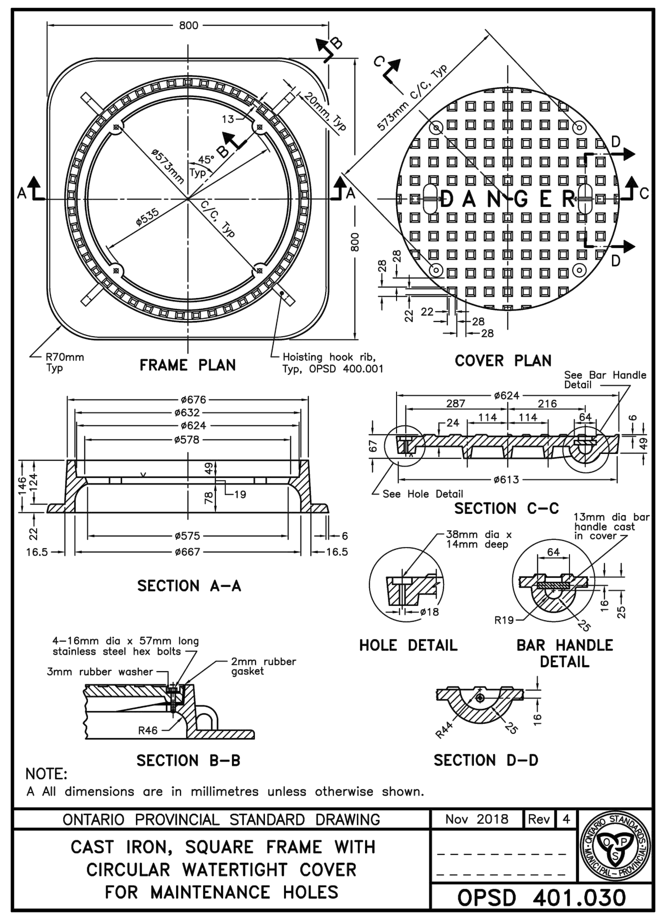
D07-12-22-0

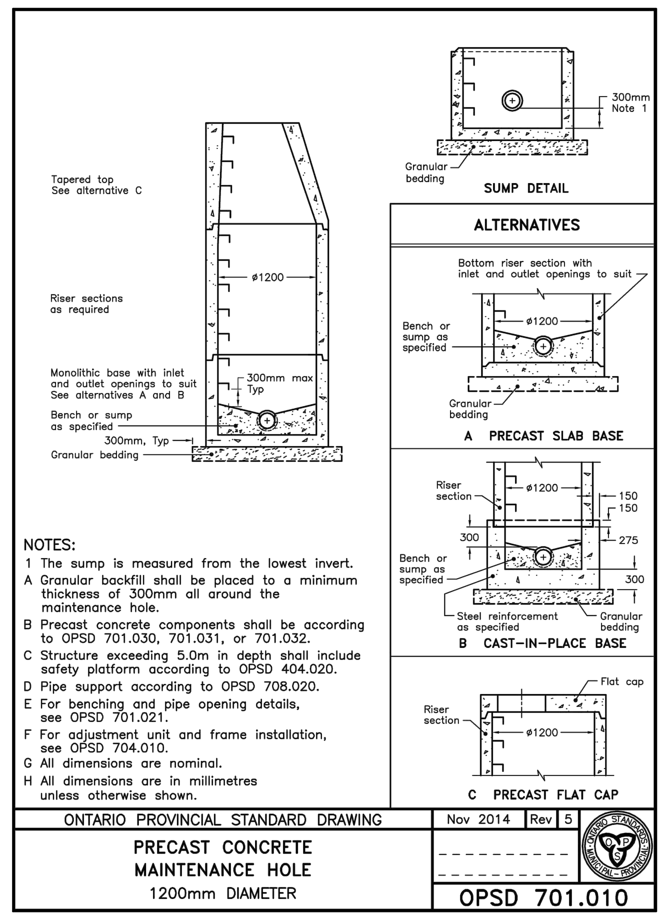


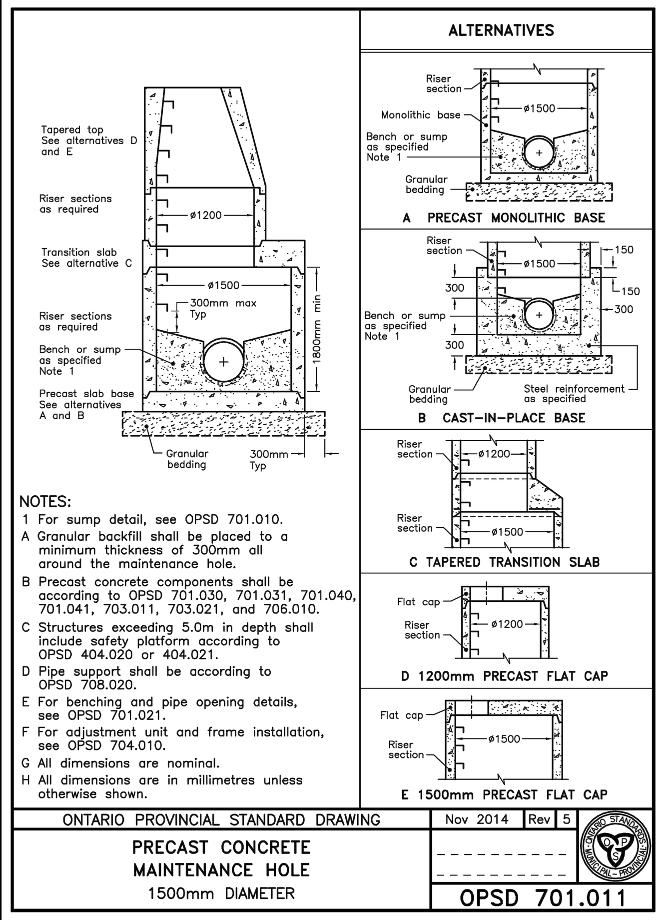


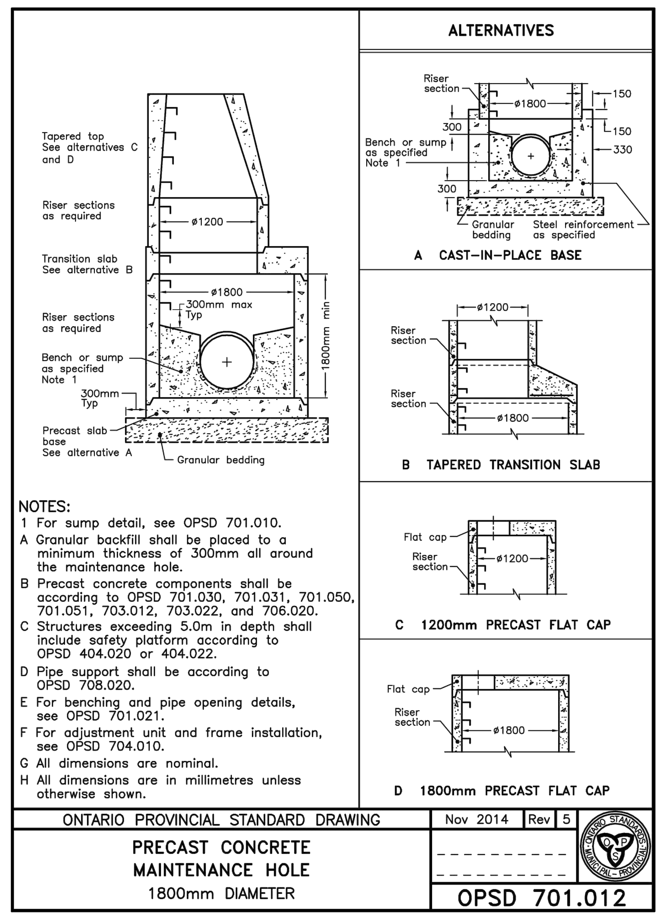


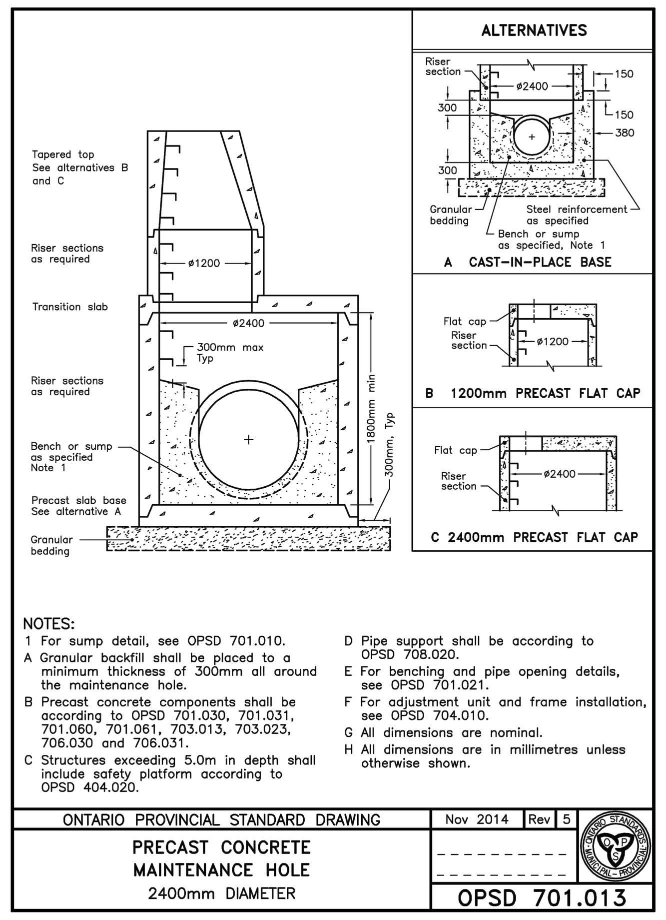


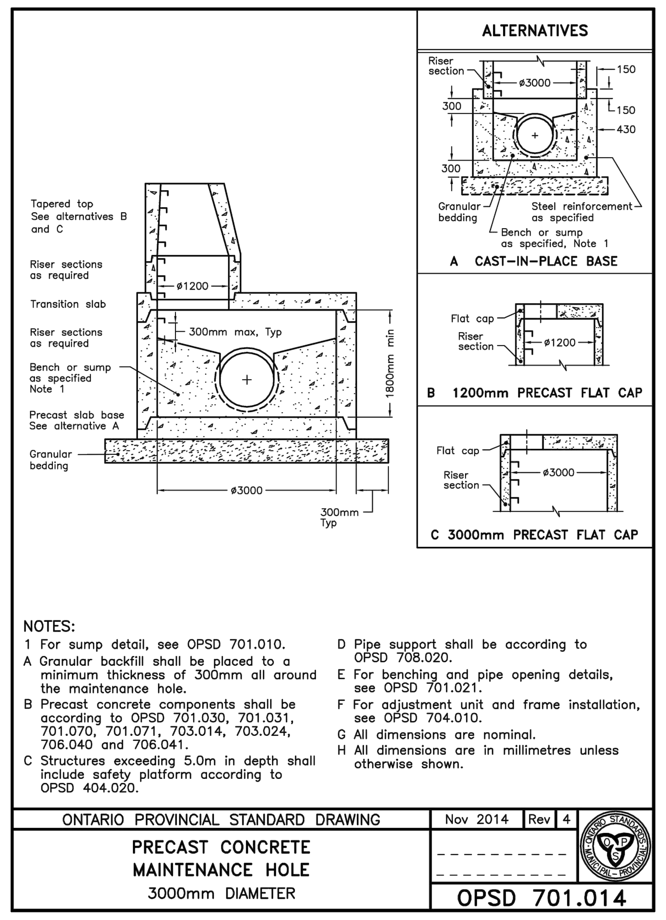


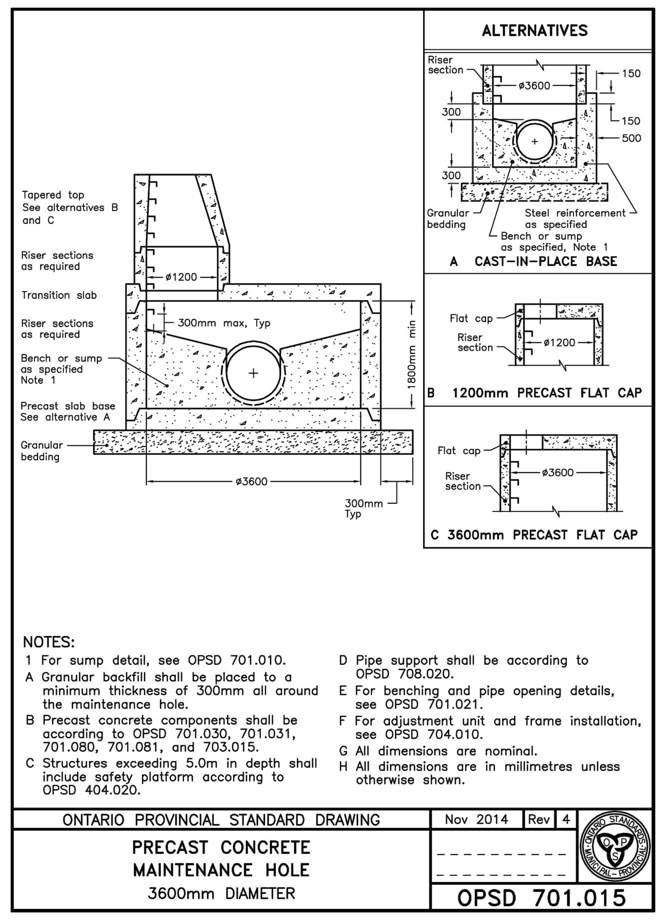


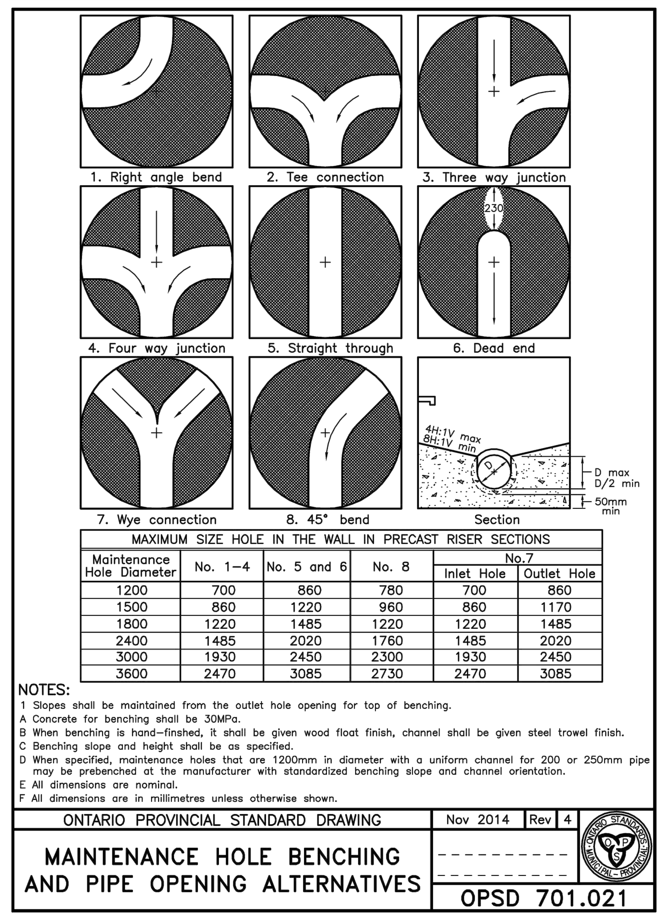


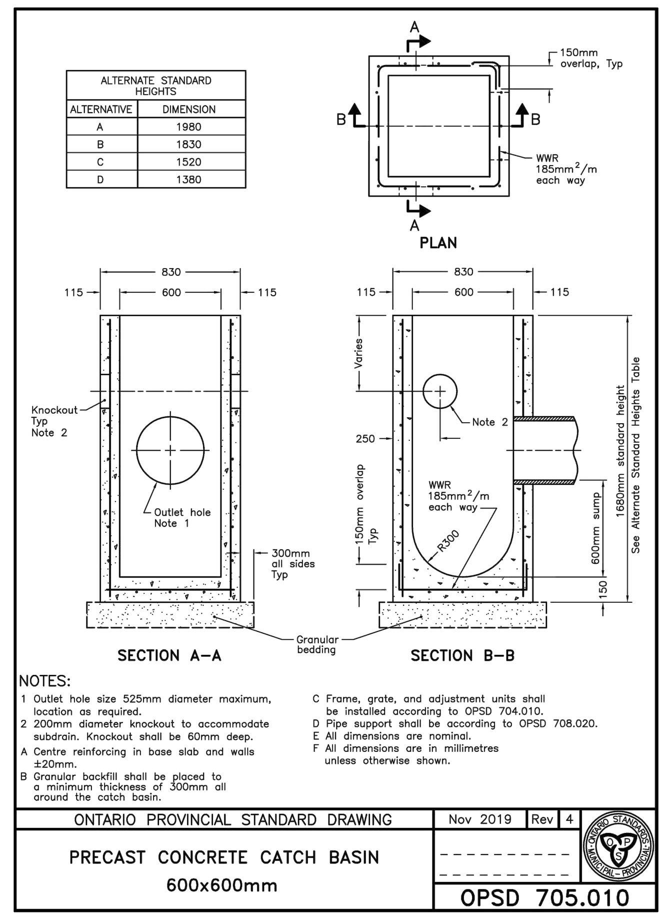


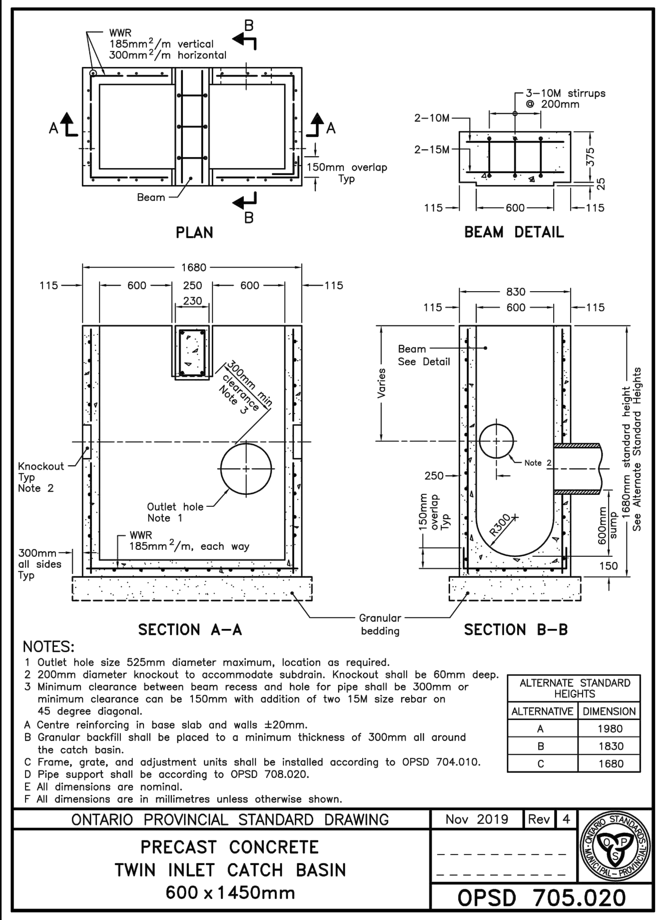


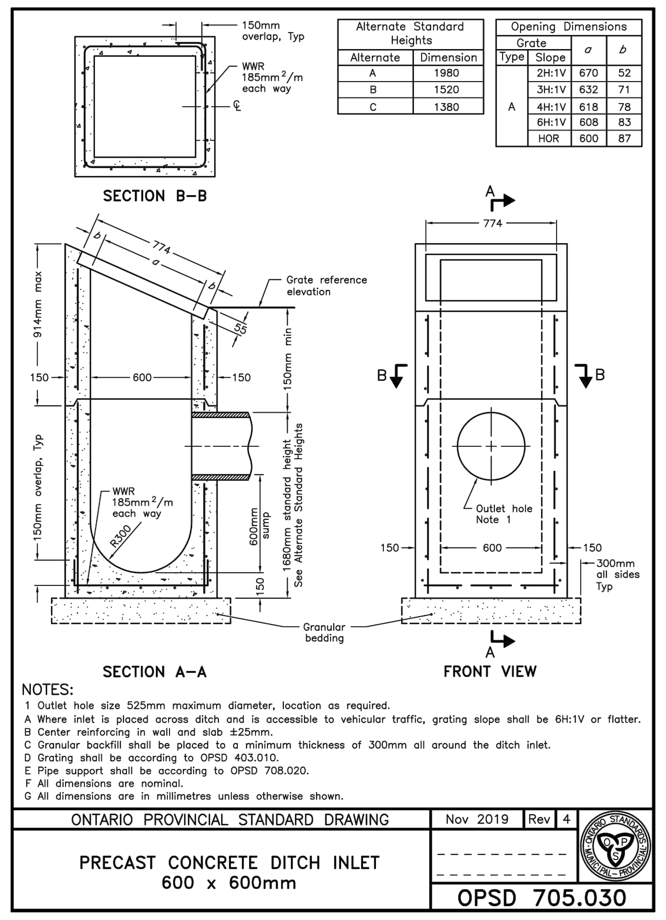


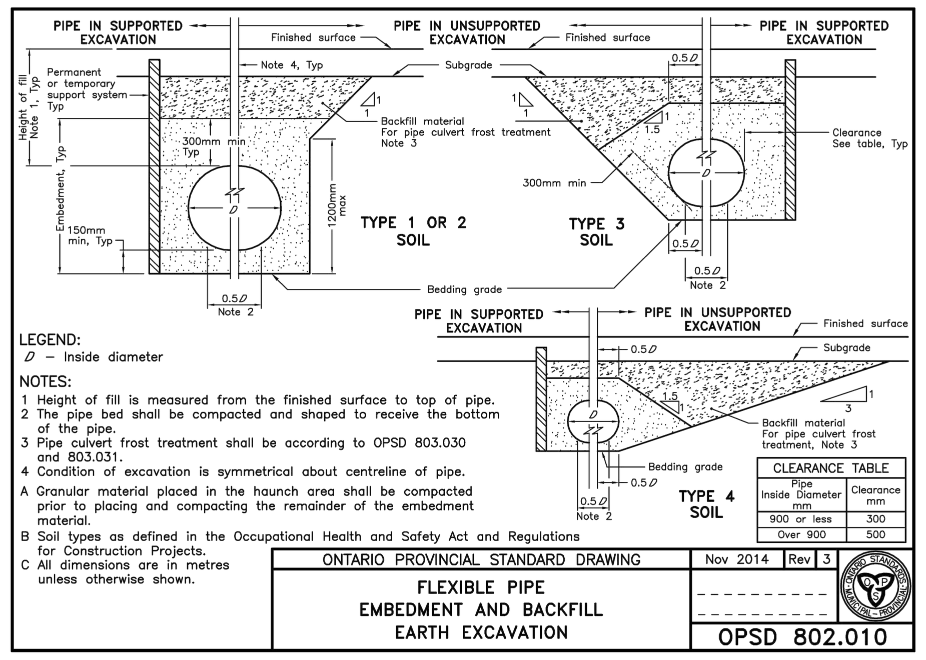


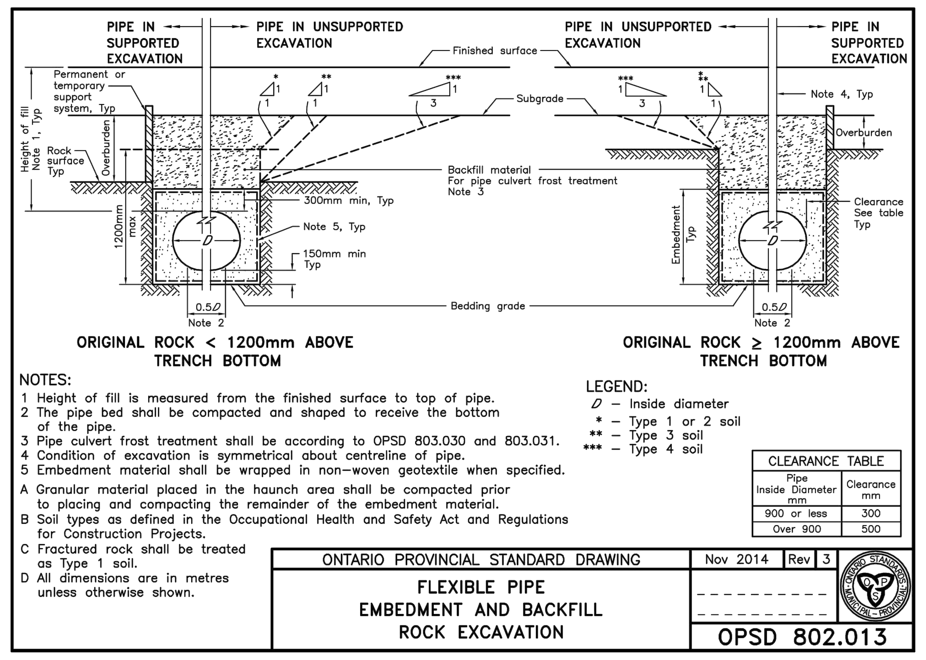


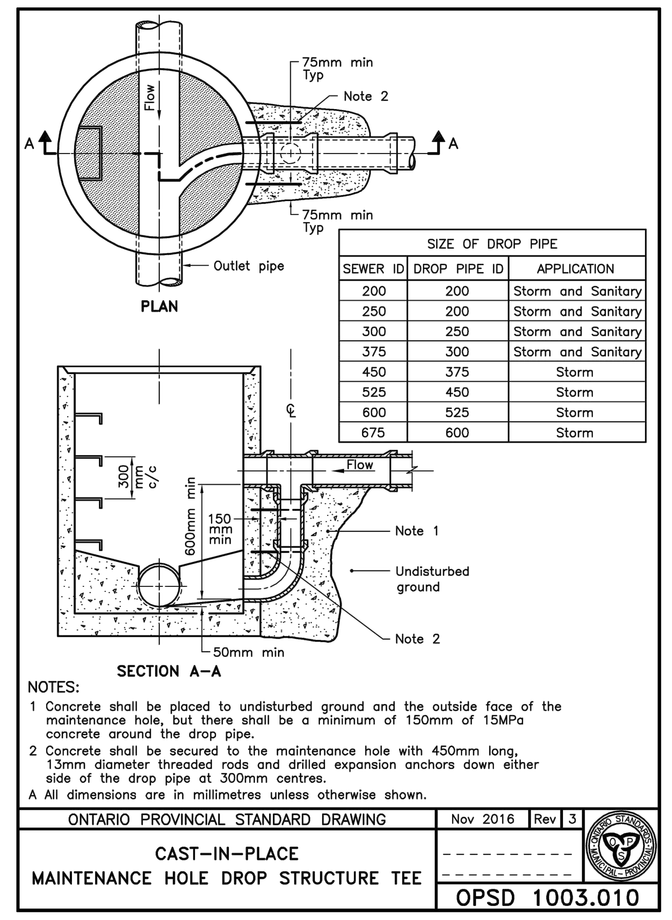


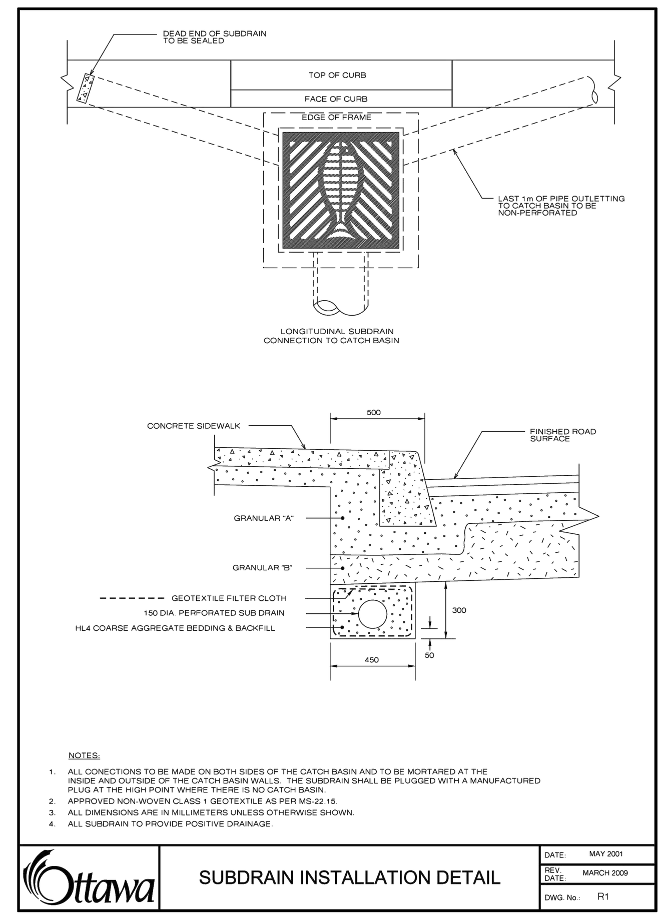


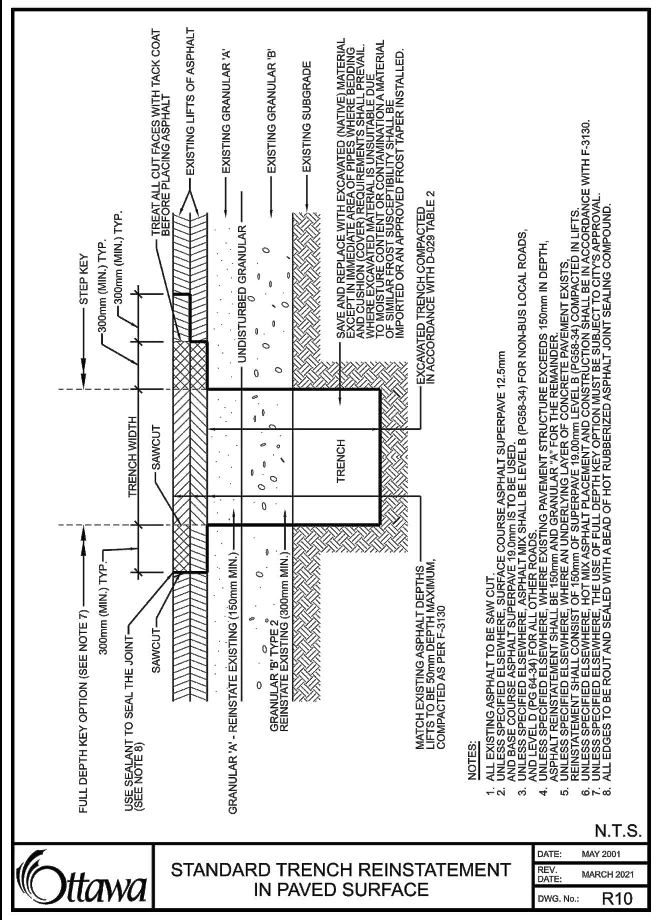


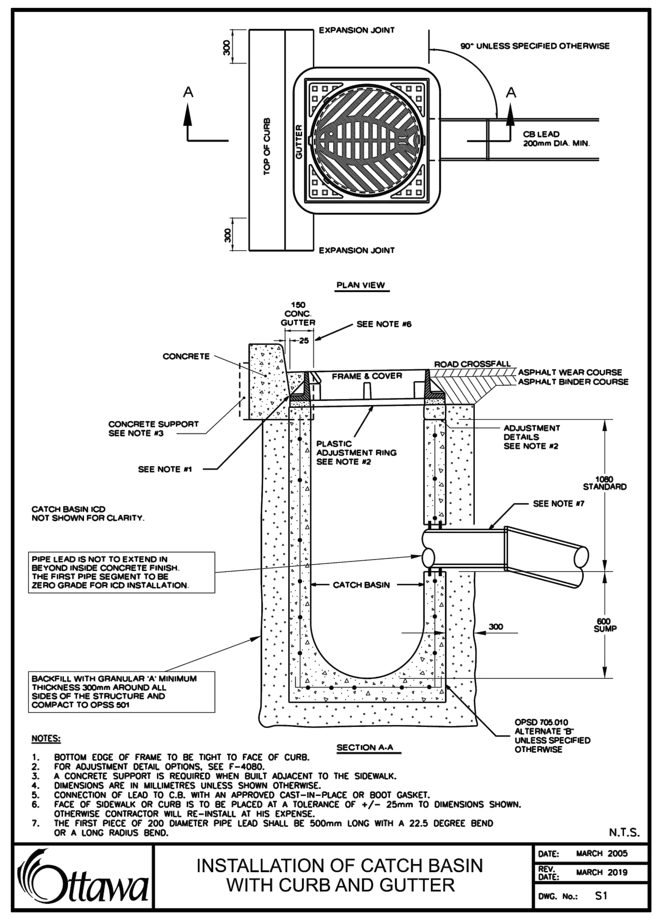


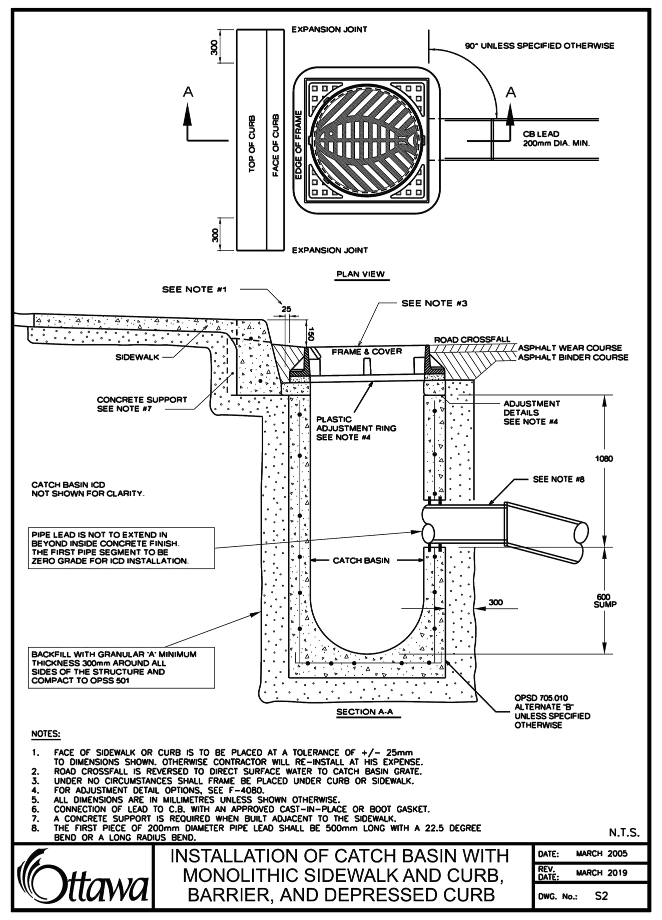


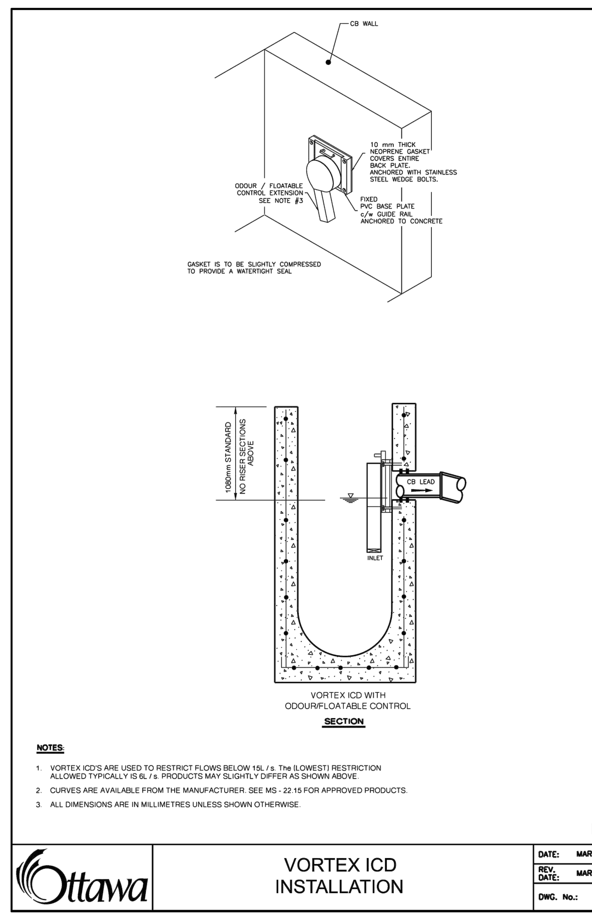


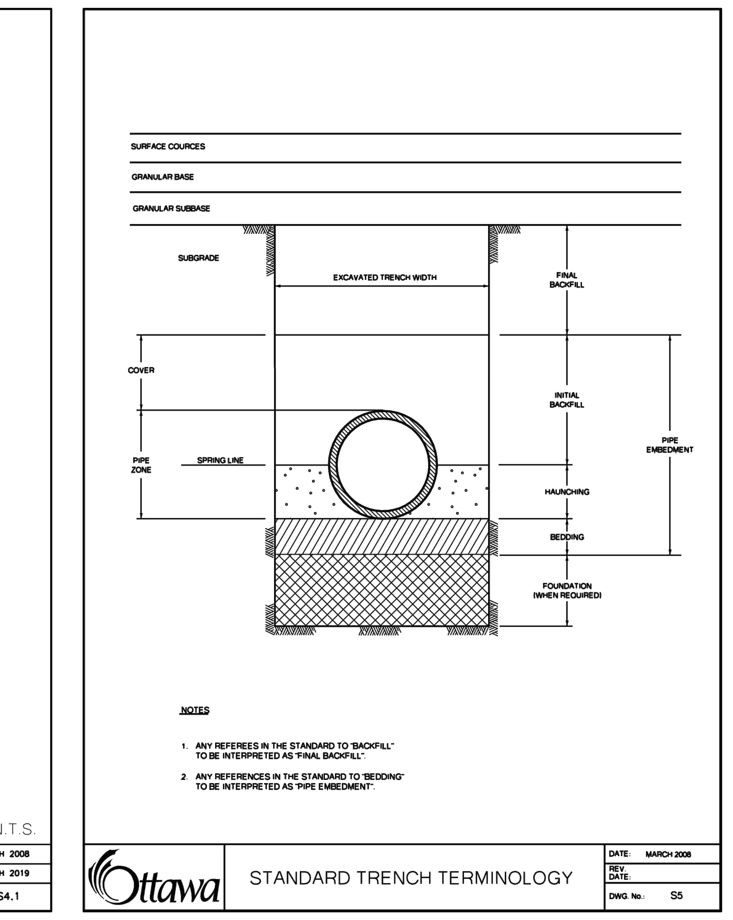


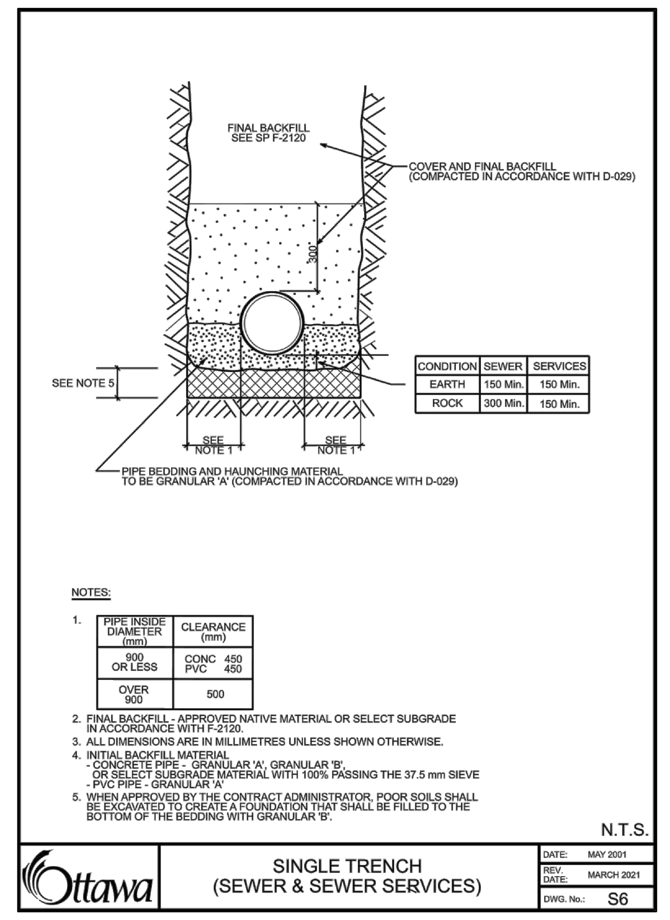


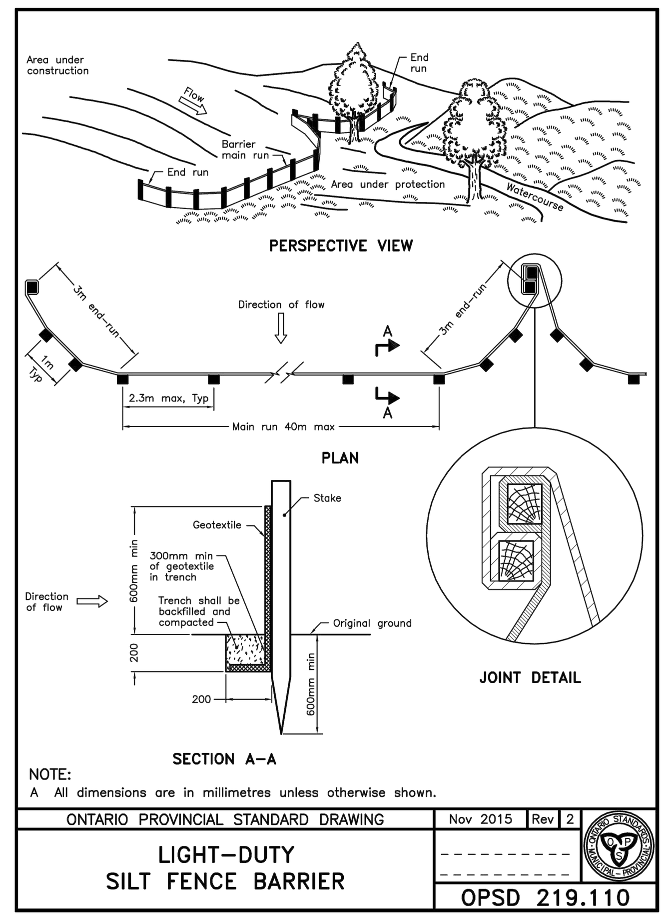












HDR

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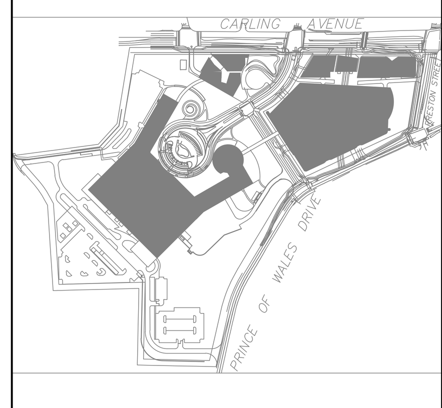
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS



THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

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Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	

Sheet Reviewer: PARSONS

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06	2023-04-12	RE-ISSUED FOR SPC & FLUDA

Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

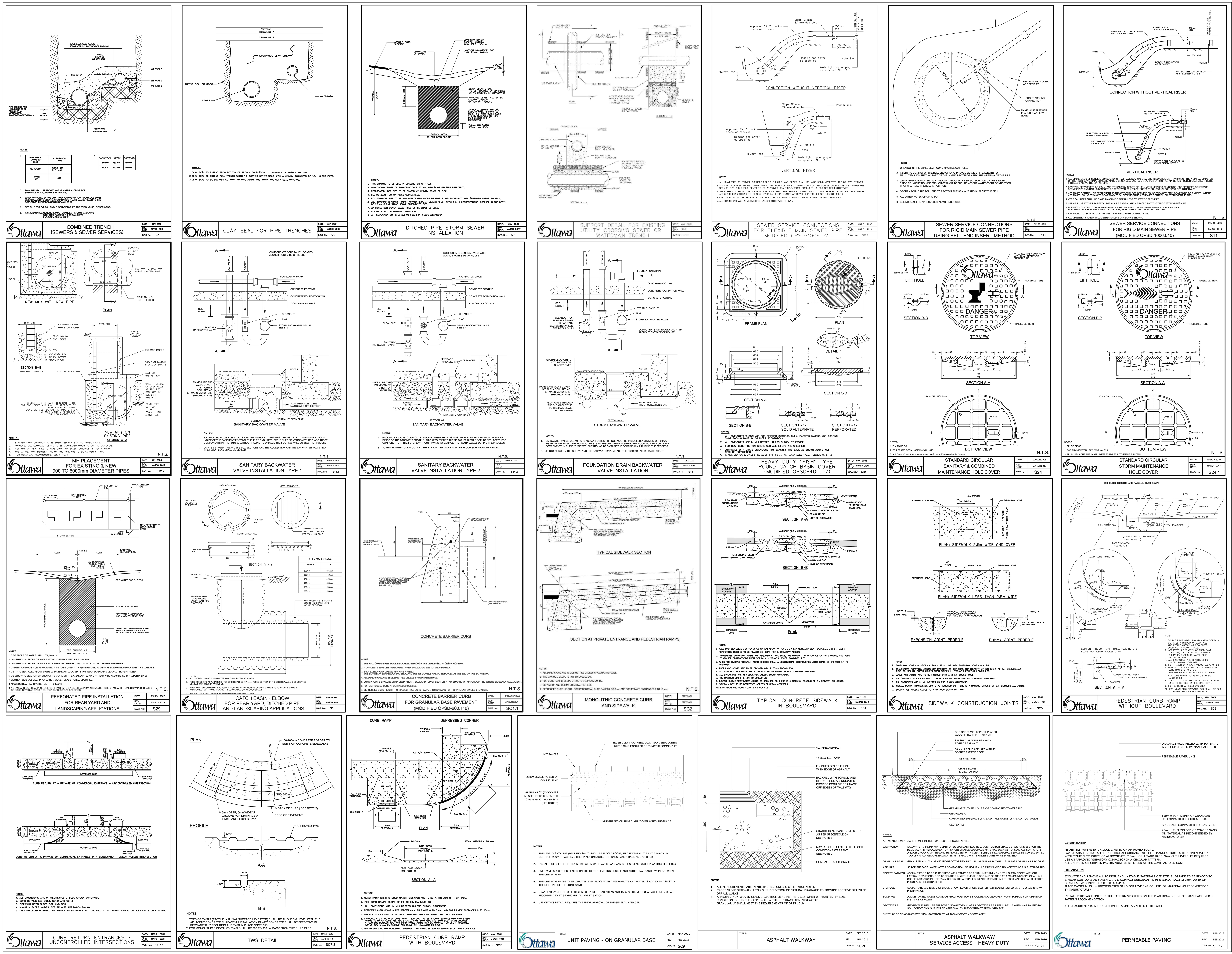
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
DETAILS 1

Sheet Number
C016

Project Status
STAGE 3

D07-12-22-016



HDR

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Ottawa, Ontario K1Z 6X6

PARSONS

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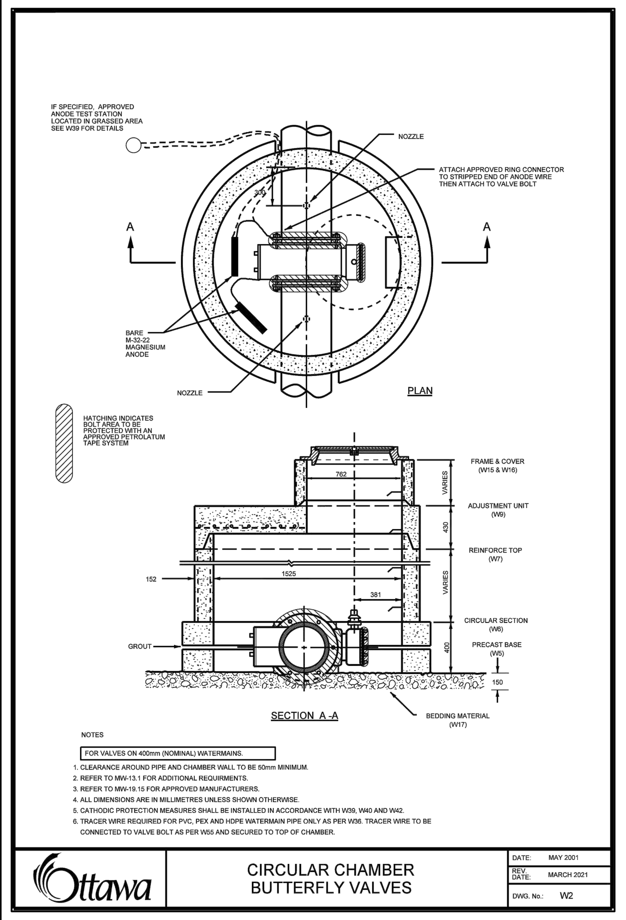
NOT FOR CONSTRUCTION

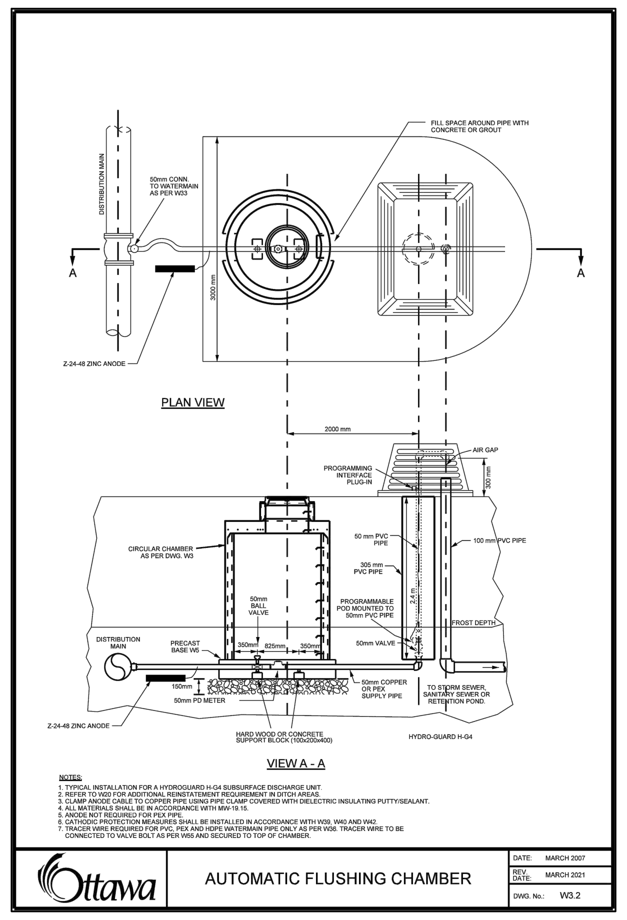
Sheet Name
DETAILS 2

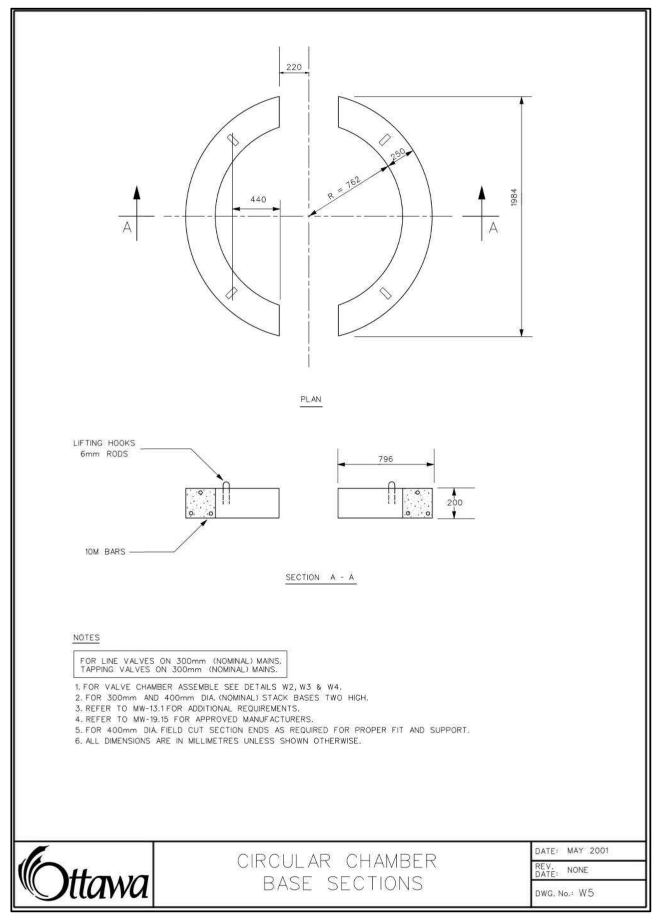
Sheet Number
C017

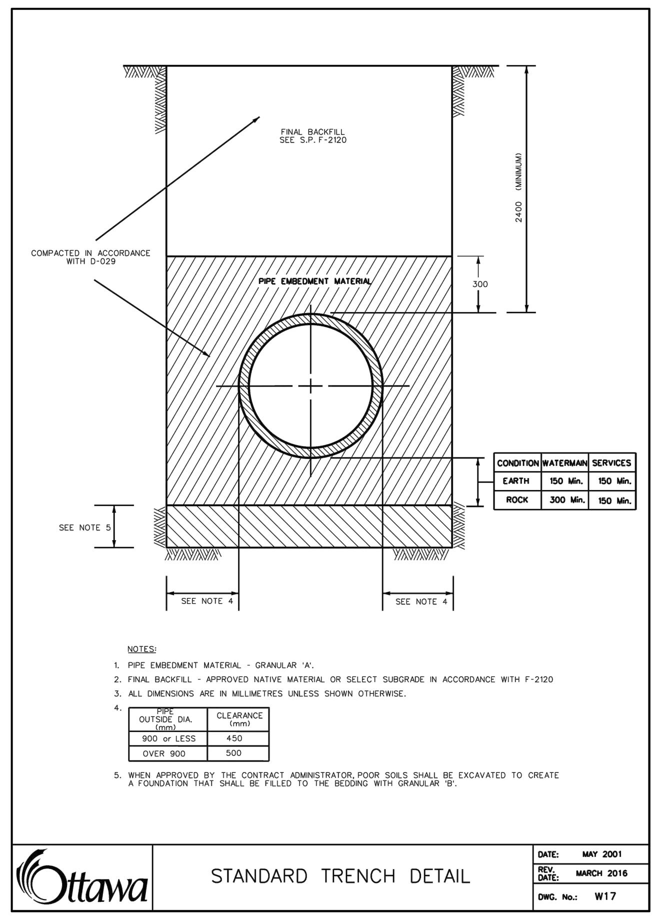
Project Status
STAGE 3

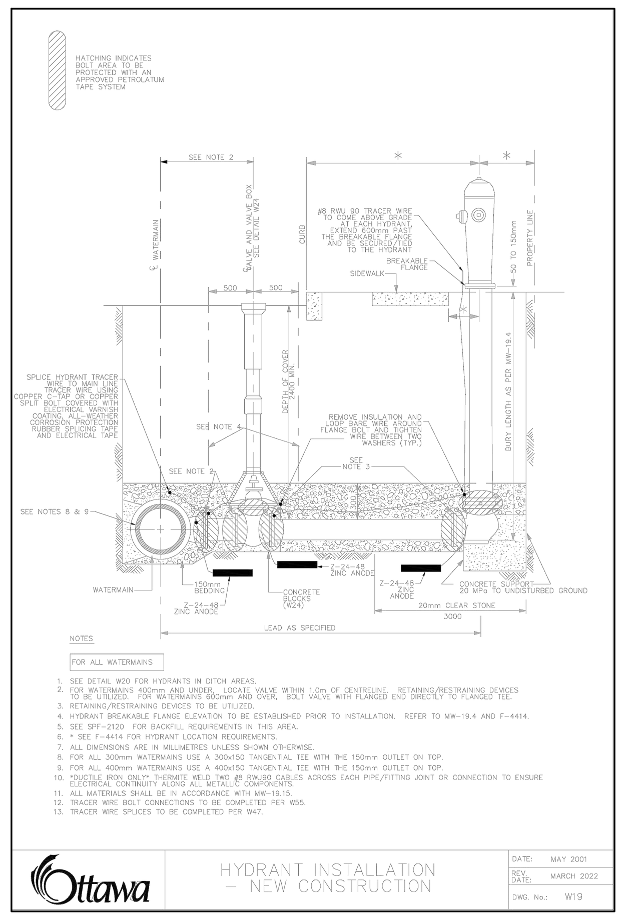
D07-12-22-016_

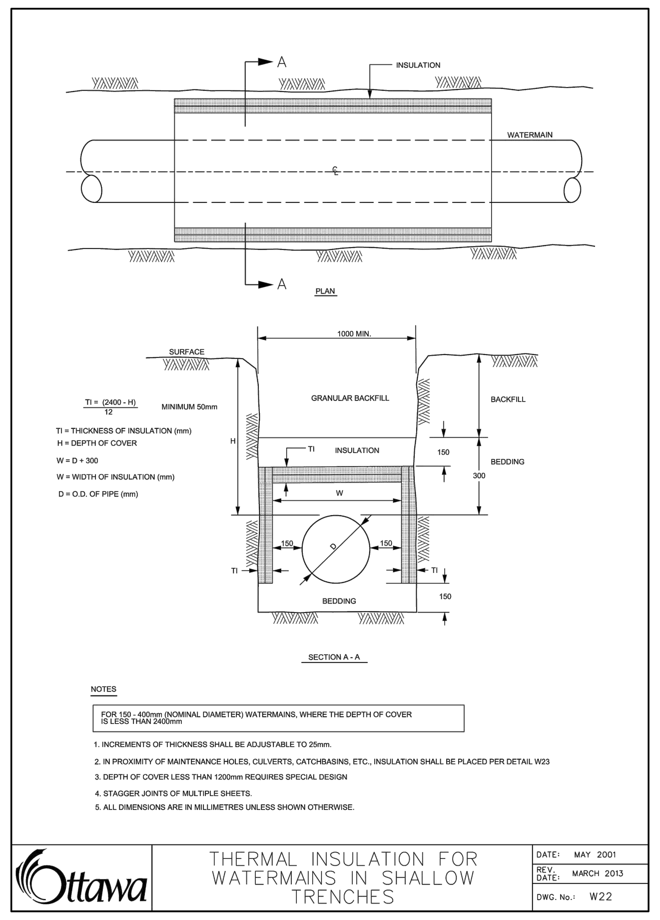


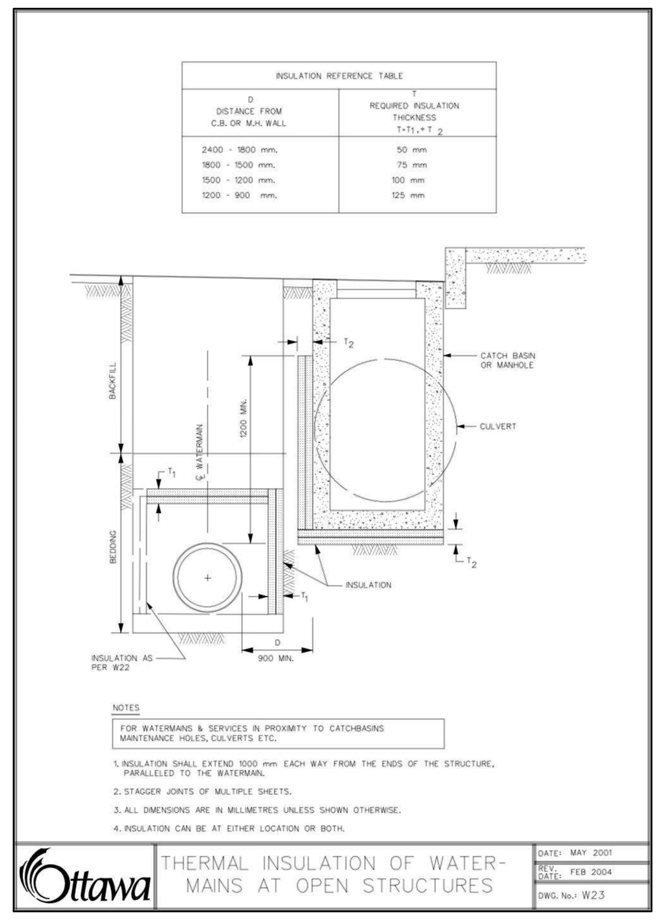


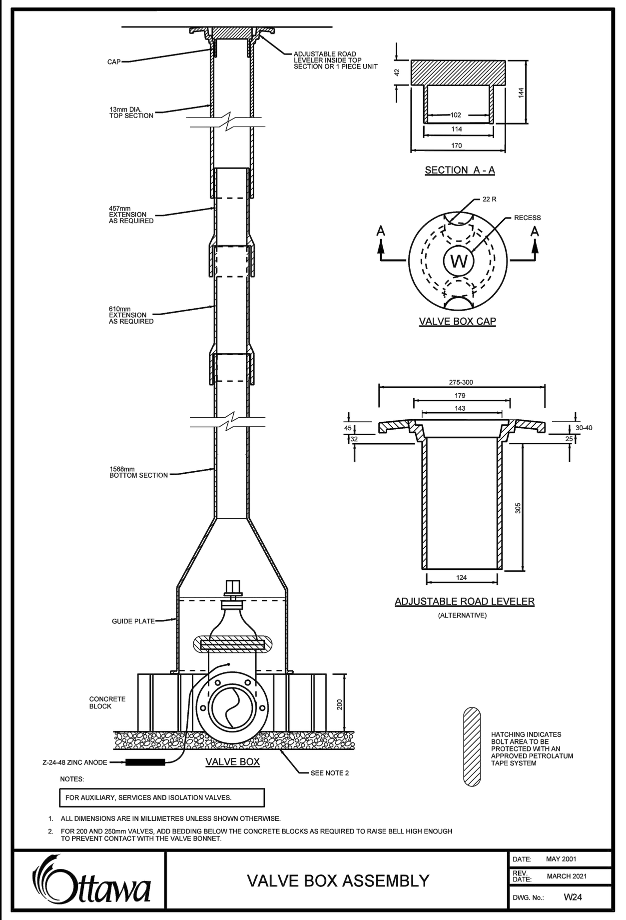


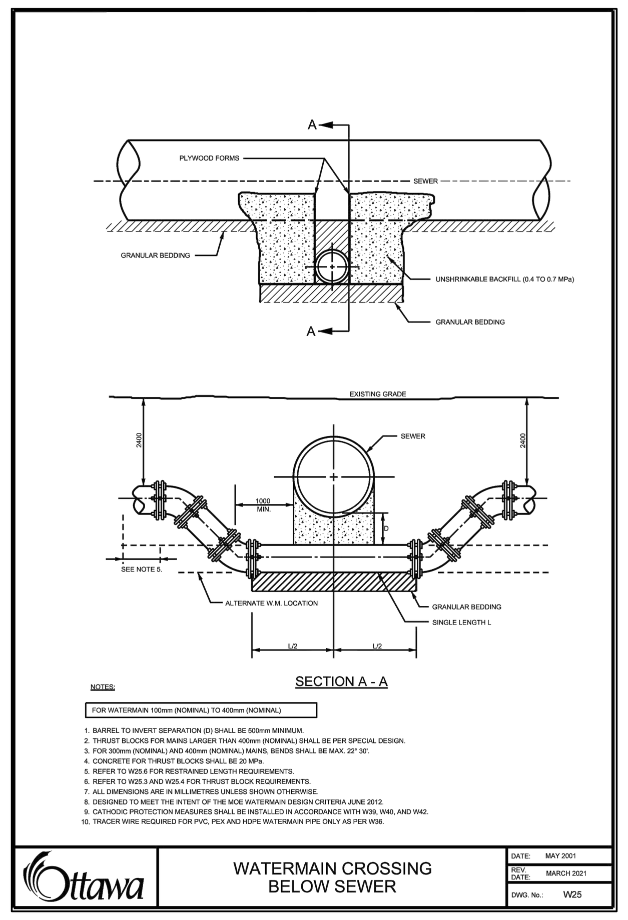


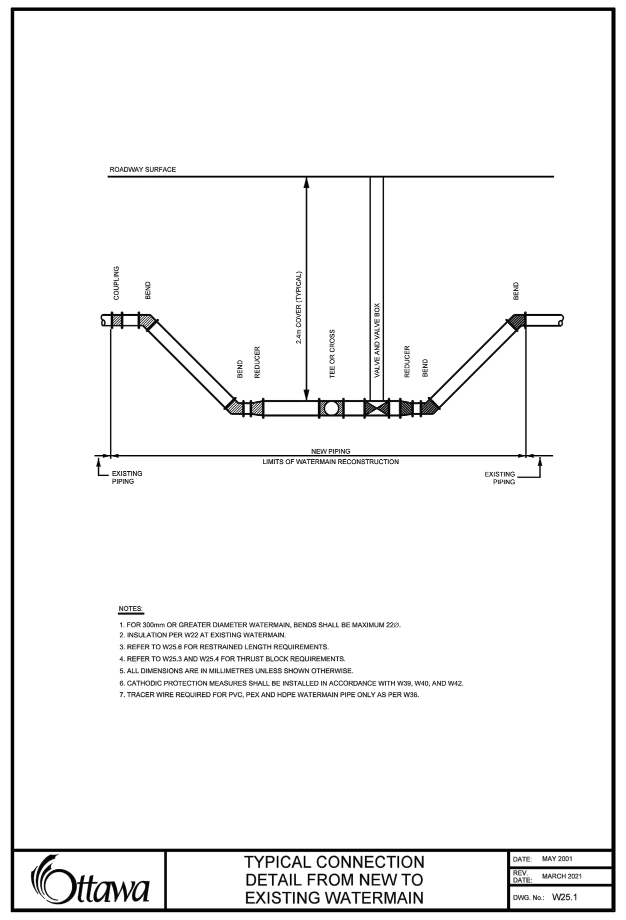


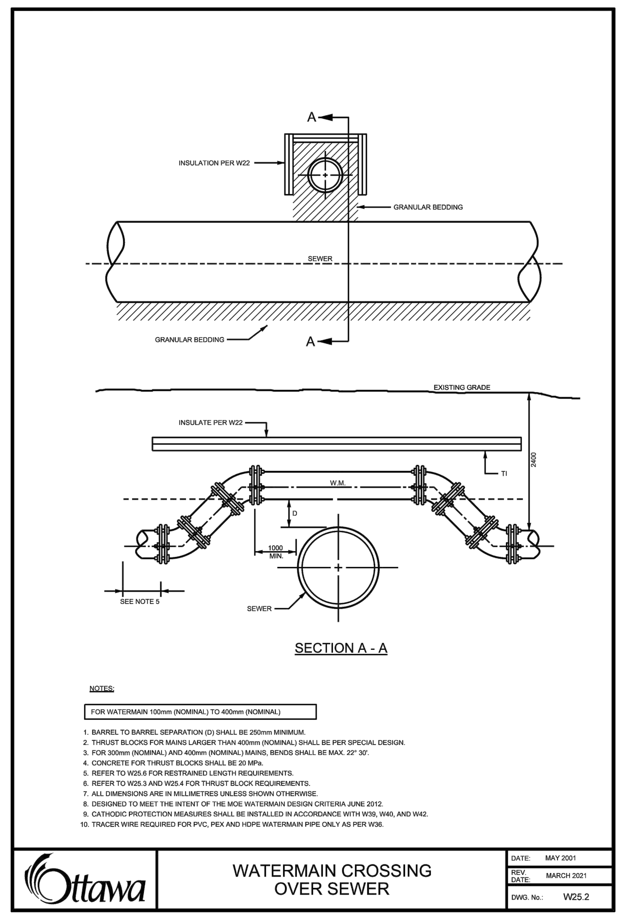


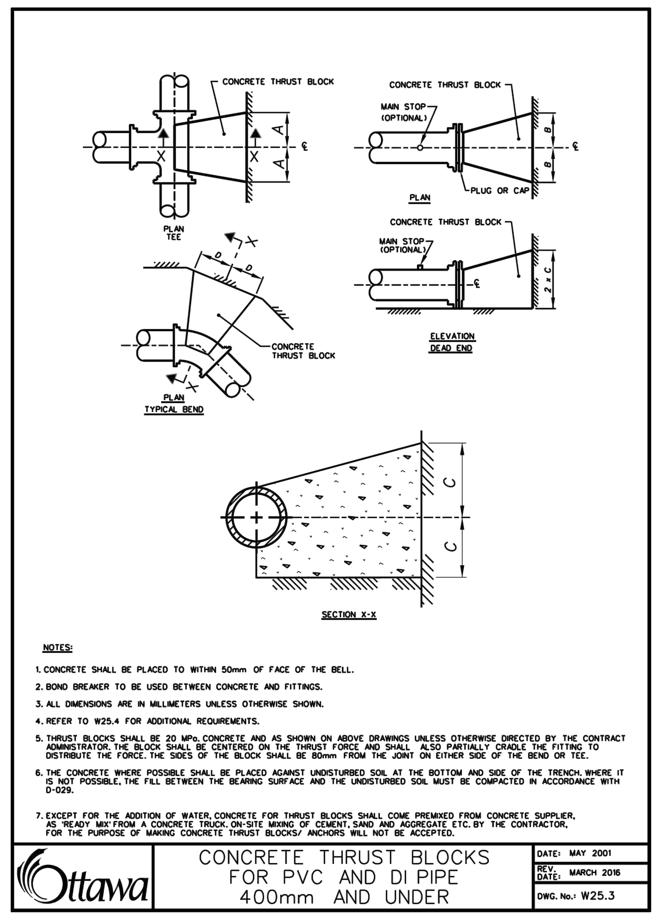


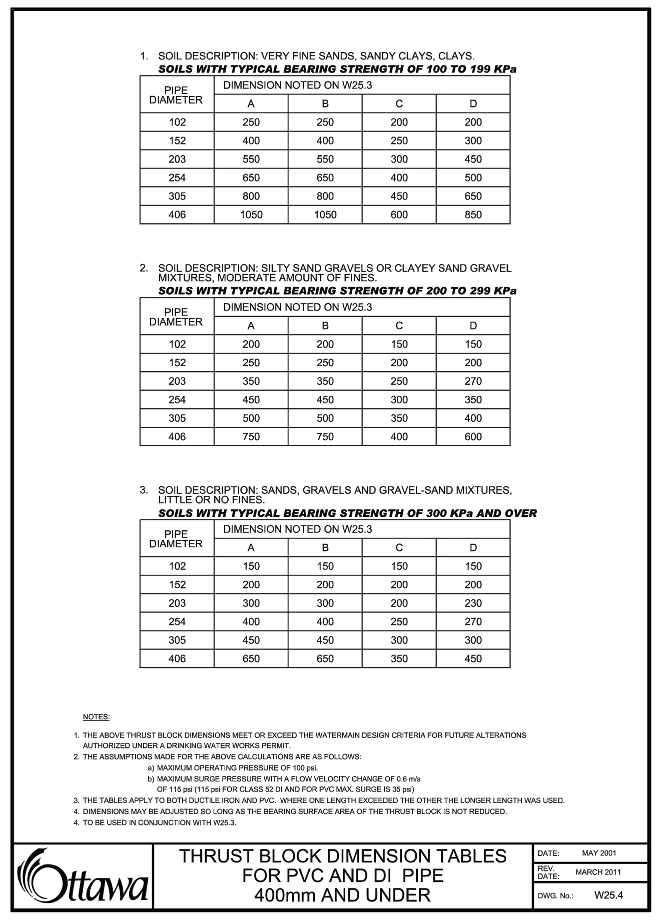


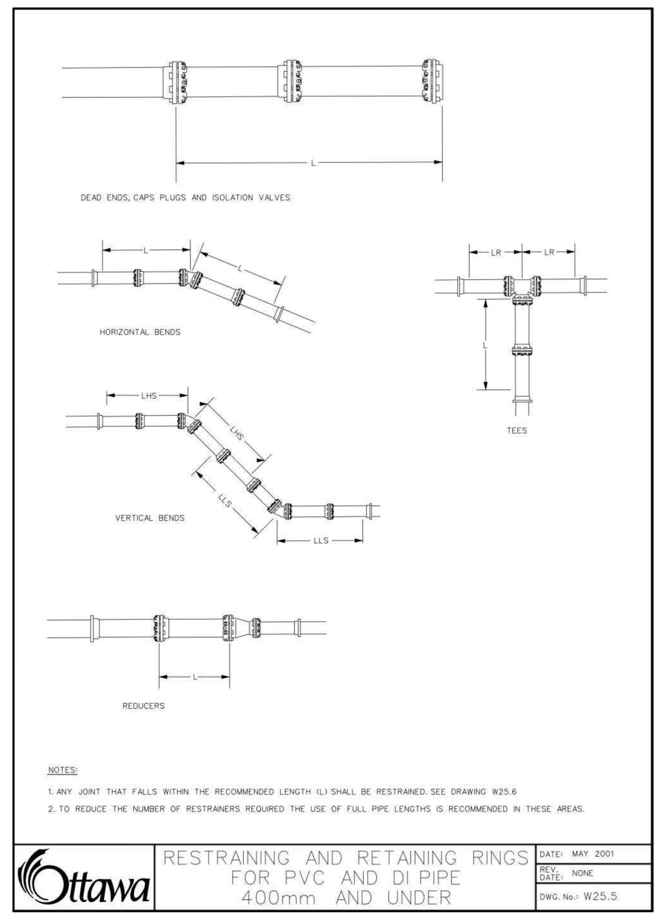


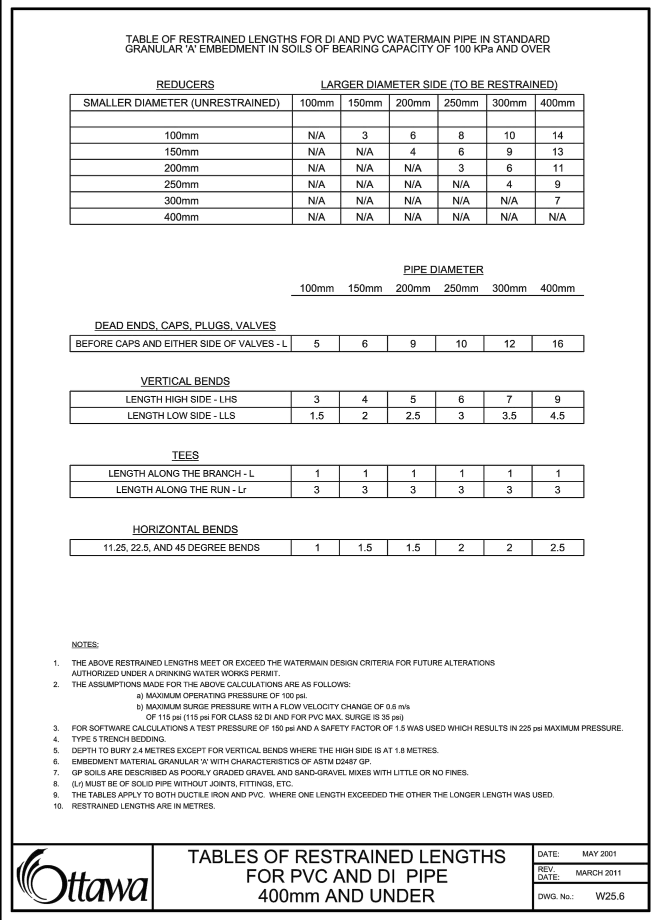


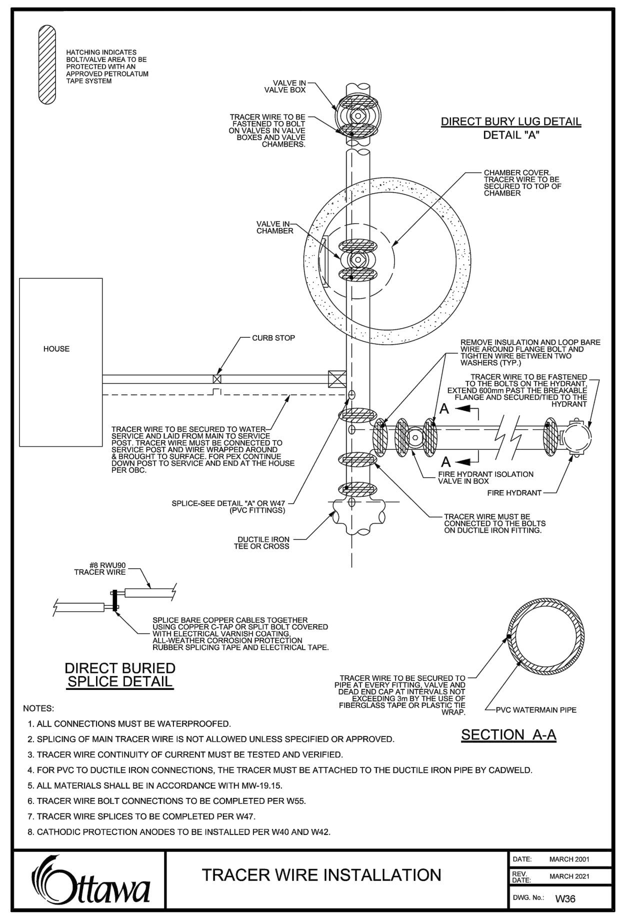


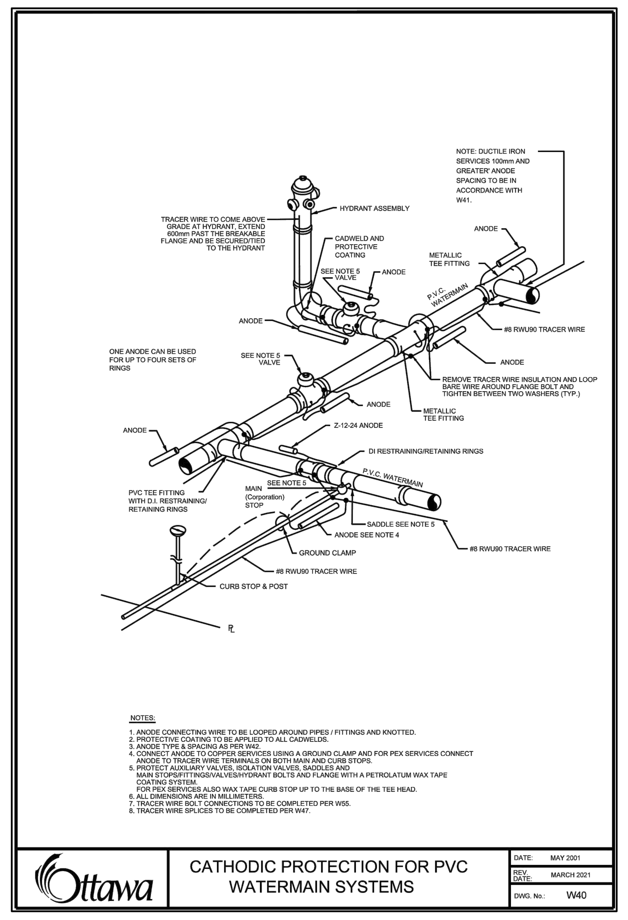


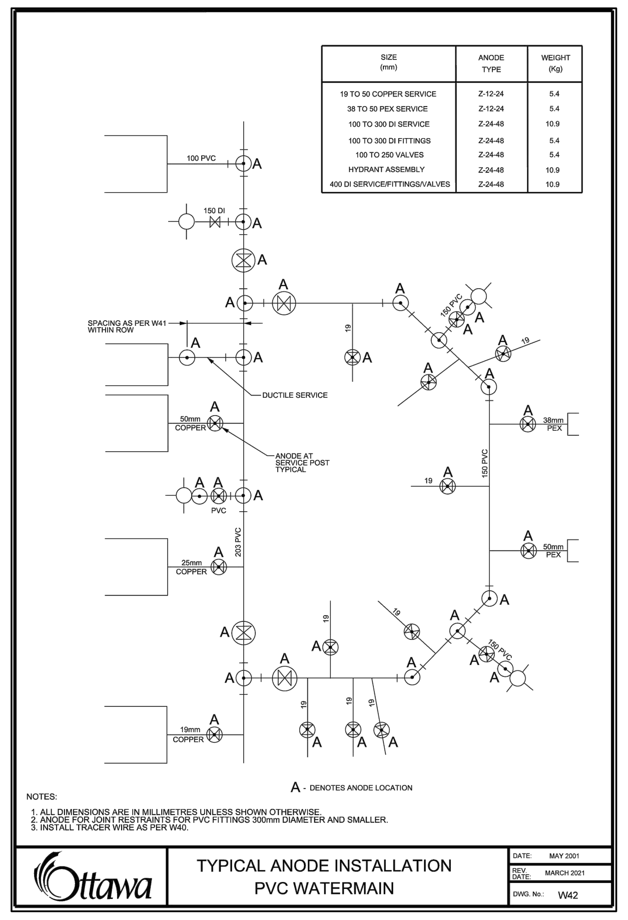


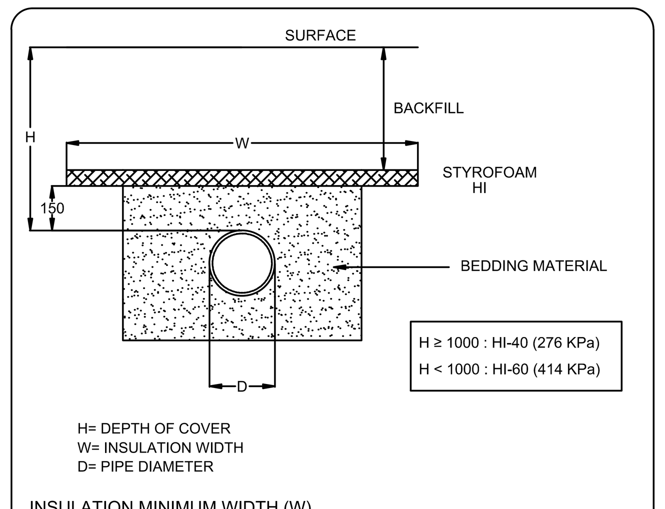












H ≥ 1000 : HI-40 (276 KPa)
H < 1000 : HI-60 (414 KPa)

H= DEPTH OF COVER
W= INSULATION WIDTH
D= PIPE DIAMETER

INSULATION MINIMUM WIDTH (W)

H \ D	≤150	200	250	300	400	500	600
750	2250	2300	2350	2400	2500	2600	2700
1000	1750	1800	1850	1900	2000	2100	2200
1250	1250	1300	1350	1400	1500	1600	1700
1500	750	800	850	900	1000	1100	1200
1750	600	600	600	600	600	600	700

INSULATION THICKNESS
100
90
80
70
60

ALL DIMENSIONS IN MILLIMETERS

THERMAL INSULATION FOR
SEWER IN SHALLOW TRENCHES

PARSONS

D2

HDR

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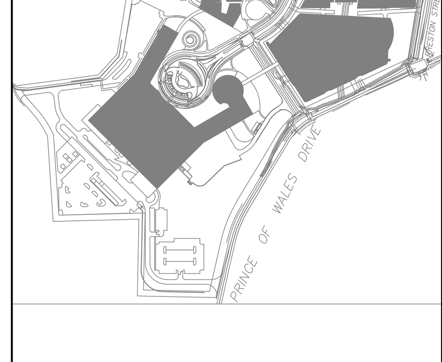
Ottawa, Ontario K1Z 6X6

PARSONS



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PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
DETAILS 3

Sheet Number
C018

Project Status
STAGE 3

D07-12-22-0168

APPENDIX F | BOUNDARY CONDITIONS

Mitchelson, Sarah [NN-CA]

From:	Steele, Matt <Matt.Steele@ottawa.ca>
Sent:	Tuesday, May 17, 2022 11:06 AM
To:	Mitchelson, Sarah [NN-CA]; Shillington, Jeffrey
Cc:	Paradis, Kelly [NN-CA]; Moore, Sean; Evans, Allan
Subject:	[EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

All demands were applied at connection 1B – this is a more conservative approach.

If you are drawing from both 1A & 1B connections, the HGL may be slightly higher.

You can assume connection 1A will be 107.6m as well.

Matt

Matt Steele, P.Eng.
Senior Water Resources Engineer
Infrastructure and Water Services
City of Ottawa
P: 613-580-2424 Ext. 16024

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: 2022/05/16 12:42 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

For Scenario 2, can we assume Connection 1A and 1B will be the same (107.6m)?

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
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Direct: +1 613.691.1609 / Mobile: +1 613.698.6705

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From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Friday, May 6, 2022 10:24 AM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Whyte, Pamela [NN-CA] <Pamela.Whyte@parsons.com>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

The 2020 FUS guidelines are to be used, subject to the modifications of Technical Bulletin ISTB-2018-02. As you can appreciate, we are still reviewing the new FUS guidelines and there will likely be further technical bulletins for clarifications. We will review your FUS calculations and advise if we have any comments.

The following are boundary conditions, HGL, for hydraulic analysis at the Ottawa Hospital Parking Garage (zone 1W) assumed to be connected to the 406 mm on Carling Avenue (see attached PDF for location).

Both Connections:

Minimum HGL = 107.1 m

Maximum HGL = 114.6 m

Scenario 1 Ottawa Parking Garage Only:

Connection 1B - Max Day + Fire Flow (367 L/s) = 107.8 m

Scenario 2 Includes Hospital Domestic Demands:

Connection 1B - Max Day + Fire Flow (367 L/s) = 107.6 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Let me know if you have any questions or wish to discuss anything.

Regards,

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: May 03, 2022 5:00 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

Is the City approving moving forward with the 2020 FUS guideline?

The demands for the parking garage are as follows:

Average Day = 1.3L/s
Max Day = 2.0L/s
Peak Hour = 3.5L/s
Fire Flow = 367L/s (based on Scenario 2 in email below)
Max Day + Fire = 369L/s

The City indicated in the last round of comments that they would like the domestic and fire demands for the parking garage and hospital provided. The demands for the hospital were previously estimated at a master plan level. These demands will be revisited and revised accordingly during detail design of the site services to align with the hospital building design.

The demands for the hospital are as follows:

Average Day = 17.8L/s
Max Day = 26.6L/s
Peak Hour = 47.8L/s
Fire Flow = 217L/s

- According to the *"City of Ottawa 2013 Water Master Plan"* prepared by Stantec Consulting Limited (September 20, 2013), the City of Ottawa's existing water supply and distribution systems can provide a fire demand level of service of 13,000L/min (217L/s) in core areas.
- This value will be used as a place holder for the time being. The previously estimated fire of 750L/s (presented in the latest version of the Master Servicing Report) will need to be adjusted to align with the 2020 FUS guideline, if the City is approving moving forward with the new guideline.

Max Day + Fire = 243.6L/s

Can we obtain boundary conditions for the following two scenario:

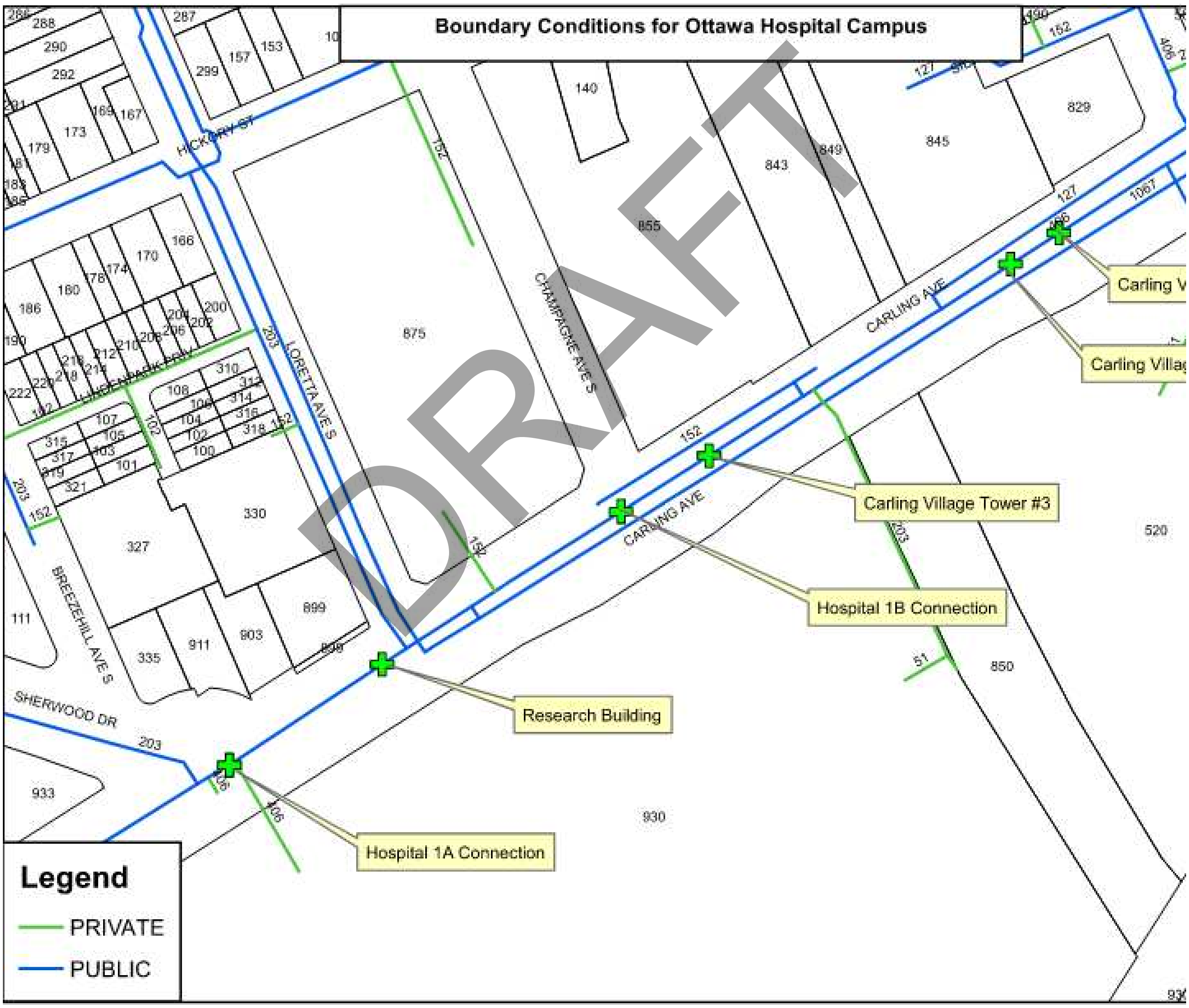
Scenario #1 – Parking Garage with 1 Connection to Carling Avenue (Hospital 1B Connection on Figure)

Average Day = 1.3L/s
Max Day = 2.0L/s
Peak Hour = 3.5L/s
Fire Flow = 367L/s
Max Day + Fire = 369L/s

Scenario #2 – Parking Garage and Hospital with 2 Connections to Carling Avenue (Hospital 1A and 1B Connections on Figure)

Average Day = 19.1L/s
Max Day = 28.6L/s
Peak Hour = 51.3L/s
Fire Flow = 367L/s
Max Day + Fire = 395.6L/s

The values for this Scenario #2 will need to be adjusted as the detail design for the hospital moves forward.



Regards,
Sarah

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PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Monday, May 2, 2022 2:36 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Whyte, Pamela [NN-CA] <Pamela.Whyte@parsons.com>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

We can provide you with boundary conditions for this, can you confirm that the other demands have not changed since your previous request for BC's?

Thanks,

Jeff

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: April 25, 2022 11:23 AM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

We've started reviewing the 2020 Edition of the Water Supply for Public Fire Protection and have calculated the following (attached for reference);

- Scenario 1: Parking Garage Fire Flow (Present)

- C = 0.6 (Fire Resistive Construction – Minimum 2 Hour Fire Rating)
- A = 22,210m² (Area of the Largest Floor)
- O = 0% (Combustible)
- S = 0% (Even though levels P0 and P1 will be sprinklered, we've been conservative and applied a sprinkler factor of 0%)
- E = 0% (Once the parking garage is constructed, no buildings will be located within 30m)
- Fire Flow = 333L/s

- Scenario 2: Parking Garage Fire Flow (Ultimate Build Out)
  - C = 0.6 (Fire Resistive Construction – Minimum 2 Hour Fire Rating)
  - A = 22,210m² (Area of the Largest Floor)
  - O = 0% (Combustible)
  - S = 0% (Even though levels P0 and P1 will be sprinklered, we've been conservative and applied a sprinkler factor of 0%)
  - E = 8% (The Carling Towers will eventually be located within 3.1m to 10m from the north side of parking garage building face)
    - The following assumptions were applied:
      - Length-Height Factor of Exposing Building (Carling Towers) = Over 100
      - Construction Type of Exposing Building Face (Carling Towers) = Type III-IV[2] (this assumption is conservative as it most likely will be Type I or Type II)
      - Exposing Building (Carling Towers) will be fully protected with an automatic sprinkler system (based on the current planned usage mixed use (commercial/residential) these buildings will require sprinklers)
  - Fire Flow = 367L/s

We would proceed with the estimated fire flow based on the ultimate build out (Scenario 2 – 367L/s).

Once reviewed, please advise of the City's direction for moving forward. If approval is given to move forward with the 2020 Edition of the Water Supply for Public Fire Protection, we will need to obtain revised boundary conditions from the City.

Please reach out if you would like to discuss the calculations further.

Regards,
Sarah

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PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Thursday, April 21, 2022 3:46 PM

To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Whyte, Pamela [NN-CA] <Pamela.Whyte@parsons.com>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

Thanks for this. This does come as a bit of a surprise as we were not expecting these guidelines to be released. Quickly reviewing the new guidelines it does appear that fire flow requirements for the parking structure will be significantly reduced should no longer be an issue.

We will get back to you shortly with further direction.

Regards,

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: April 20, 2022 9:03 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

We have been advised by the FUS that they have released the 2020 Edition of the Water Supply for Public Fire Protection (attached for your reference).

Can you please advise if the City will accept/approve the estimated fire flow for the parking garage based on this document?

We are starting to review the document and can update the calculations for the parking garage accordingly.

Regards,
Sarah

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PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Wednesday, March 23, 2022 2:57 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

We've met again internally to discuss the fire flow requirements for the parking garage and we've come up with the following options:

1. Provide a full engineering analysis from a fire protection engineer (signed/stamped). We do not want this analysis to rely on the 2019 Draft FUS, but provide an independent review / analysis on the fire flow needs for this structure to justify lower flows. The analysis would be submitted and reviewed by the City to determine our acceptance of it. It is our understanding that there are professionals that complete these reviews. The review may justify lower flows by taking into account other fire protection measures.
2. Reduce the 1999 FUS required flow rates by adding additional sprinkler coverage.

Should you wish to discuss the above, please do not hesitate to contact me.

Jeff Shillington, P.Eng.
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City of Ottawa
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email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February 25, 2022 4:00 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

Here's the building classification information (it has been included in our responses that will be issued to the City on Monday).

The parking garage is required to be designed to Article 3.2.2.73, Group F, Division 3, Any Area, Any Height. A parking garage is classified in the Ontario Building Code as a Group F, Division 3 low hazard industrial occupancy.

We will circle back with you on Monday to discuss further.

Regards,
Sarah

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From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Friday, February 25, 2022 3:48 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean

<sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

Thanks for your email. We've discussed and consulted with many at the City on the 2019 draft of the FUS and at this time we can not be considering a draft format that has not been finalized and not reviewed by the City of Ottawa.

Matt provided the following:

If you recall, we requested the building classification of the building so that our Building Code Services could advise whether every floor would be required to be sprinklered as this would drop the required fire flow. It appears the designer is reluctant to reduce the fire demands for the structure.

> Please note the City of Ottawa design objective in the Water Master Plan is 13,000 L/min or 217 L/s. Even though the infrastructure around the site and proposed hydrants can deliver more than the City of Ottawa design objectives.

It was also discussed at our meeting a few weeks ago that consultation with a fire expert should be completed to verify if there could be exceptions to the FUS given that most of the building is an open air building. Has this been completed?

If you feel another meeting is required. Please let me know and we will set it up.

Regards,

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
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email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February 23, 2022 9:15 AM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>; Steele, Matt <Matt.Steele@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>
Subject: FW: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff and Matt,

We have been advised by the Fire Underwriters Survey that the proposed changes in the construction coefficient and terms of reference were update (2019 draft version) to align better with the National Building Code of Canada and Provincial Buildings.

They advised that the updated proposed within the 2019 draft version are reasonable and can be used in reviewing and determining required fire flows for new and existing buildings.

Based on the response received from the Fire Underwriters Survey, Parsons plans to apply the 2019 draft version to calculate the required fire flow for TOH Parking Garage project.

Please advise as soon as possible if the City of Ottawa will approve this approach as we have a planned submission on Monday February 28th.

Regards,
Sarah

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PARSONS

From: Michael King <michael.j.king@scm.ca>
Sent: Tuesday, February 22, 2022 3:11 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Fire Underwriters Survey <admin@fireunderwriters.ca>
Subject: [EXTERNAL] 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

The proposed changes in for Construction Coefficient and terms of reference was to update and align better with the National Building Code of Canada and Provincial Buildings.

The updates proposed in the 2019 draft version are reasonable and can be used in reviewing and determining Required Fire Flows for new buildings and existing buildings. FUS will have the new version released soon. FUS is actively working on reviewing final submissions received in 2021 from key stakeholders from across Canada in the engineering, fire service and insurance industry. Your contact information will be added to a list to notify once the new document is ready for release.

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From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February-22-22 7:56 AM
To: Michael King <michael.j.king@scm.ca>
Cc: Mathew.Theiner@parsons.com; Kelly.Paradis@parsons.com
Subject: RE: Water Supply for Public Fire Protection in Canada Feedback

CAUTION - EXTERNAL EMAIL / ATTENTION - COURRIEL EXTERNE

Hi Michael,

Just following up with your email below – do you think you will have a response early this week?

Regards,
Sarah

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PARSONS

From: Michael King <michael.j.king@scm.ca>
Sent: Tuesday, February 15, 2022 7:14 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Theiner, Mathew [NN-CA] <Mathew.Theiner@parsons.com>; Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>
Subject: [EXTERNAL] RE: Water Supply for Public Fire Protection in Canada Feedback

Received and should have a review/response by the end of the week.

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From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February-11-22 6:14 AM
To: Michael King <michael.j.king@scm.ca>
Cc: Mathew.Theiner@parsons.com; Kelly.Paradis@parsons.com
Subject: FW: Water Supply for Public Fire Protection in Canada Feedback

CAUTION - EXTERNAL EMAIL / ATTENTION - COURRIEL EXTERNE

Hi Michael,

My colleague Mathew Theiner spoke with you earlier this week regarding our fire flow calculations for a proposed parking garage within the City of Ottawa.

Please find attached a memo outlining the fire flow calculation three (3) different ways (Fire Underwriters Survey 1999, Fire Underwriters Draft 2019, Ontario Building Code) for your review and comment.

A key difference between the Fire Underwriters Survey current version (1999) and draft version (2019) is the definition of fire resistive construction has changed from a minimum 3-hour fire resistance rating (current version) to a minimum 2-hour fire resistive rating (draft version). This change aligns with the Ontario Building Code requirements and significantly reduces fire flow calculation (can apply a construction coefficient of 0.6 (fire resistive) instead of 0.8 (non-combustible)).

Our main goal is to confirm that assumptions presented within the fire flow calculations and usage of the draft version of the Fire Underwriters Survey are reasonable.

If you could provide a response early to mid-next week it would be greatly appreciated as we are trying to obtain approval from the City of Ottawa and meet a tight project schedule.

Please reach out if any other information is required and/or you would like to discuss further.

Thanks,
Sarah

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From: Michael King <michael.j.king@scm.ca>
Sent: Tuesday, September 28, 2021 2:32 PM
To: Theiner, Mathew <Mathew.Theiner@parsons.com>
Cc: Michael Currie <michael.currie@scm.ca>
Subject: [EXTERNAL] RE: Water Supply for Public Fire Protection in Canada Feedback

Hi Mathew,

FUS will have the new version released as soon. FUS is actively working on reviewing final submissions received this year from key stakeholders from across Canada in the engineering, fire service and insurance industry. You contact information will be added to a list to notify once the new document is released.

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From: Theiner, Mathew <Mathew.Theiner@parsons.com>
Sent: September-28-21 9:57 AM
To: Fire Underwriters Survey <admin@fireunderwriters.ca>
Subject: Water Supply for Public Fire Protection in Canada Feedback

CAUTION - EXTERNAL EMAIL / ATTENTION - COURRIEL EXTERNE

Hi,

Any news when the 2019 version will be approved?

Mathew Theiner, P.Eng., ing. (ON, QC, AB)
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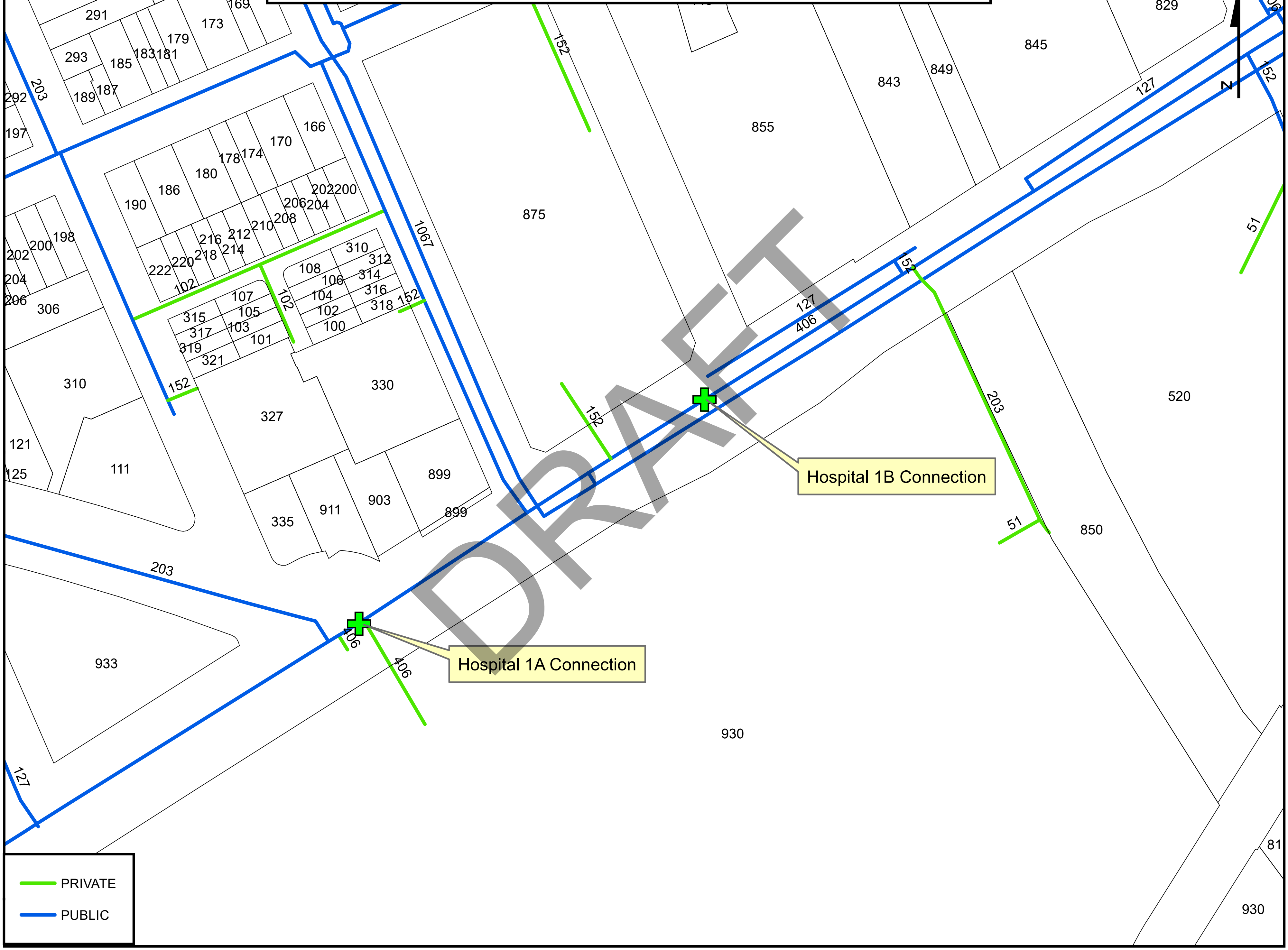
Boundary Conditions for Ottawa Hospital Parking Garage



APPENDIX G | WATER CALCULATIONS

Table1 : Water Demands

Building	Population	Gross Floor Area (m2)	Average Daily Demand (ADD) L/s	Maximum Daily Demand (MDD) 1.5*ADD L/s	Peak Hourly Demand (PHD) 1.8*MDD L/s	Fire Flow (FF) L/s	MDD + FF L/s
Hospital			22.82	34.22	61.60	250	284.2
Fire in Main Hospital Building		*364715*	*22.82*	*34.22*	*61.60*	*250*	*284.2*
Fire in Pavilion		*364715*	*22.82*	*34.22*	*61.60*	*250*	*284.2*
Central Utility Plant*			11.00	28.33	51.00	167	195.3
Fire in Central Utility Plant		*24000*	*11.00**	*28.33**	*51.00**	*167*	*195.3*

Average Daily Demands

Based on Ottawa Design Guidelines - Water Distribution, 2010 and MOE Design Guidelines for Drinking-Water Systems, 2008

Amenity Space Flow = 5.0 L/m2/d

Existing Water Use Water Use = 2.0 m3/m2/year (Existing water usage for The Ottawa Civic Campus)

* Please note that the demands for the central utility plant and hospital were provided by the design team during the feasibility/schematic design stage and will need to be revisited/revised during detail design. The fire flow calculations for the central utility plant and hospital will need to be revisited/revised during detail design design as the internal building designs progress.

Table 2: Fire Flow Calculation for the Parking Garage (2020 FUS)

Building	Type of Construction	Total Floor Area	Fire Flow (min. 2,000)	Adjusted (nearest 1,000)	Occupancy Factor	Reduction / Increase due to Occupancy	Fire Flow with Occupancy (min. 2,000)	Sprinklers Factor	Reduction due to Sprinklers	Exposure Factor	Increase due to Exposure	Fire Flow	Roof Contribution	Required Fire Flow: Adjusted to the nearest 1000	
		m^2	L/min	L/min			L/min		L/min	%	L/min	L/min	L/min	L/min	L/s
	C	A	F		O			S		E			R	F	
Pavilion	1.5	6,825	27,262	27,000	0%	0	27,000	50%	13,500	5%	1,350	15,000	0	15,000	250
CUP	0.6	24,000	20,449	20,000	0%	0	20,000	50%	10,000	0%	0	10,000	0	10,000	167
Hospital	0.6	61,518	32,740	33,000	-15%	-4,950	28,050	50%	14,025	5%	1,403	15,000	0	15,000	250

Reference: References
Water Supply for Public Fire Protection , 2020 by Fire Underwriters Survey (FUS) and
Ottawa Design Guidelines - Water Distribution, July 2010 and Subsequent Technical Bulletins

C Type of Construction

Wood Frame (Type V)	1.5
Mass Timber (Type IV-A) - Encapsulated Mass Timber	0.8
Mass Timber (Type IV-B) - Rated Mass Timber	0.9
Mass Timber (Type IV-C) - Ordinary Mass Timber	1.0
Mass Timber (Type IV-D) - Unrated Mass Timber	1.5
Ordinary Construction (Type III also known as joisted masonry)	1.0
Non-Combustible Construction (Type II - minimum 1 hour fire resistance rating)	0.8
Fire resistive Construction (Type I - minimum 2 hour fire resistance rating)	0.6

A Total Effective Floor Area (m^2)

Buildings Classified with a Construction Coefficient from 1.0 to 1.5
100% of all Floor Areas

Buildings Classified with a Construction Coefficient below 1.0
Vertical Openings Unprotected
Two (2) Largest Adjoining Floor Areas
Additional Floors (up to eight (8)) at 50%

Vertical Openings Properly Protected
Single Largest Floor
Additional Two (2) Adjoining Floors at 25%

High One Story Building
When a building has a large single story space exceeding 3m in height, the number of storeys to be used in determining the total effective area depends upon the use being made of the building.

Subdividing Buildings (Vertical Firewalls)
Minimum two (2) hour fire resistance rating and meets National Building Code requirements.

- Up to 10% can be applied if there is severe risk of fire on the exposed side of the firewall due to hazard conditions.
- An exposure charge of up to 10% can be applied if there are unprotected openings in the firewall

Basement
Basement floor excluded when it is at least 50% below grade.

Open Parking Garages
Use the area of the largest floor.

O Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

- Table 3 provides recommended Occupancy and Contents Adjustment Factors for Example Major Occupancies from the National Building Code of Canada.
- Adjustment factors should be adjusted accordingly to the specific fore loading and situation that exists in the subject building.
- Values can be interpolated from the examples given considering fire loading and expected combustibility of contents if the subject building is not listed.
- Values can be modified by up to 10% (+/-) depending on the extent to which the fire loading is unusual for the building.
- Buildings with multiple major occupancies should use the most restrictive factor or interpolate based on the percentage of each occupancy and its associated fire loading.

Table 3 Values for Parking Garage

Group:	F
Division:	3
Description of Occupancy:	Storage Garage including Open Air Parking Garage
Occupancy and Contents:	Combustible
Adjustment Factor:	0%

Table 3 Values for Pavilion

Group:	A
Division:	2
Description of Occupancy:	Assembly Occupancies Not Elsewhere Classified in Group A
Occupancy and Contents:	Combustible
Adjustment Factor:	0%

Table 3 Values for CUP

Group:	F
Division:	3
Description of Occupancy:	Power Plant
Occupancy and Contents:	Combustible
Adjustment Factor:	0%

Table 3 Values for Hospital

Group:	B
Division:	2
Description of Occupancy:	Care and Treatment Occupancies
Occupancy and Contents:	Limited
Adjustment Factor:	-15%

S Sprinklers

	Complete Coverage	Partial Coverage
Automatic Sprinklers NFPA Standards	30%	30% * x%
Standard Water Supply	10%	10% * x%
Full Supervision	10%	10% * x%

(x%: percentage of total protected floor area)

Additional Reductions for Community Level Automatic Sprinkler Protection of Area
Buildings located within communities or subdivisions that are completely sprinkler protected may apply up to a maximum additional 25% reduction in required fire flows beyond the normal maximum of 50% reduction for sprinkler protection of an individual building.

Adjustment of Sprinkler Reductions for Community Level Oversight of Sprinkler Maintenance, Testing, and Water Supply Requirements
The reduction in required fire flow for sprinkler protection may be reduced of eliminated if:
- The community does not have a Fire Prevention Program that provides a system of ensuring that the fire sprinkler systems are inspected, tested, and maintained in accordance with NFPA 25
- The community does not maintain the pressure and flow rate requirements for fire sprinkler installations, or otherwise allows the flow rates and pressure levels that were available during sprinkler system design to significantly degrade, increasing the probability of inadequate water supply for effective sprinkler operation.

E Exposure
The maximum exposure adjustment that can be applied to a building is 75% when summing the percentages of all sides of the building.

Separation Distance (m)	Maximum Exposure Adjustment	N	E	S	W
0 to 3	25%				
3.1 to 10	20%	6m			
10.1 to 20	15%				
20.1 to 30	10%				
Greater than 30	0%		>30m		

Table 6: Exposure Adjustment Charges for Subject Building Considering Construction Type of Exposed Building Face

Distance to the Exposure (m)	Length-Height Factor of Exposing Building Face	Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30m	All Sizes	0%	0%	0%	0%	0%

[2] with unprotected openings
[3] without unprotected openings

Automatic Sprinkler Protection in Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), the exposure adjustment charge determined from Table 6 may be reduced by up to 50% of the value determined.

Automatic Sprinkler Protection in both Subject and Exposed Buildings
- If both the subject building and the exposed building are fully protected with automatic sprinkler systems (see note Recognition of Automatic Sprinkler), no exposure adjustment charge should be applied.

Exposure Protection of Area Between Subject and Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), and the area between the buildings is protected with an exterior automatic sprinkler system, no exposure adjustment charge should be applied.

Reduction of Exposure Charge for Type V Buildings
- If the exposed building face of a Type V building has an exterior cladding assembly with a minimum 1 hour fire resistive rating, then the exposure charge may be treated as a Type III/IV building for the purposes of looking up the appropriate exposure charge in Table 6.

R Roof

Shake Roof	2,000 to 4,000 L/min	additional should be added to the fire flow
Wood Shingle	2,000 to 4,000 L/min	additional should be added to the fire flow

F Fire Flow (L/Min)
220*C*(A^0.5)

Table 3: Worst Case Residual Pressures Under Each Demand

Connection	Average Daily Demand (ADD)			Peak Hourly Demand (PHD)			Max Daily Demand (MDD) + Fire Flow		
	m	psi	kPa	m	psi	kPa	m	psi	kPa
Connection 1B (400mm on Carling Avenue at Champagne Avenue) *Parking Garage Only	42.26	60	414	49.76	71	487	42.96	61	421
Connection 1B /1A (400mm on Carling Avenue at Champagne Avenue) *Parking Garage and Hospital	42.26	60	414	49.76	71	487	42.76	61	419

Scenerio: Average Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	7.25	0.01	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	7.25	0.06	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	7.25	0.06	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	7.25	0.06	432	427
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	427	410
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	7.25	0.06	427	416
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	416	417
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	417	412
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	7.25	0.06	416	416
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	7.25	0.06	416	412
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	412	407
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	7.25	0.06	412	413
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	8.32	0.07	411	413
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	8.32	0.07	407	411
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	407	402
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	8.32	0.07	398	407
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	27.71	0.04	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	15.57	0.22	413	399
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	15.57	0.22	399	391
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	15.57	0.22	391	380
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	15.57	0.22	380	352
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-6.1	0.09	352	344
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	21.67	0.31	352	351
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	21.67	0.31	351	361
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.14	0.06	361	357
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	20.53	0.29	361	364
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-20.53	0.29	369	364
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-20.53	0.29	364	366
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-20.53	0.29	360	364
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	13.29	0.19	290	311
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	13.29	0.19	283	290
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	13.29	0.19	297	266
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	13.29	0.19	305	297
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	13.29	0.19	311	305
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	13.29	0.19	312	311
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	13.29	0.19	322	312
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	13.29	0.19	323	322
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	13.29	0.19	323	323

Scenerio: Average Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	19.39	0.27	391	323
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	19.39	0.27	397	391
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	300	PVC	120	19.39	0.27	398	397
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-5.5	0.18	310	311
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	6.1	0.09	323	322
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	6.1	0.09	322	327
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	6.1	0.09	327	344
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	13.29	0.19	266	265
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	13.29	0.19	265	272
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	13.29	0.19	272	283
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	7.79	0.11	311	311
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	7.79	0.11	311	314
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	2.29	0.03	314	315
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	2.29	0.03	315	316
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-5.5	0.18	312	314
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	2.29	0.03	316	297
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	2.29	0.03	297	287
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	2.29	0.03	287	271
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	2.29	0.03	271	252
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	2.29	0.03	252	236
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	2.29	0.03	236	235
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	2.29	0.03	235	258
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	2.29	0.03	258	268
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	2.29	0.03	268	349
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	2.29	0.03	349	362
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	2.29	0.03	362	351
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	2.29	0.03	351	364
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	365	367
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	367	363
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	363	365
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	365	364
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	2.29	0.03	364	365
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	2.29	0.03	365	361
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	11.41	0.16	361	348
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-9.12	0.13	361	361
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-20.53	0.29	361	360
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	11.41	0.16	361	347
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-20.53	0.29	366	369

Scenerio: Average Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	107.09	397
J-2	67.16	0	107.08	391
J-3	74.01	0	107.06	323
J-4	74.19	0	107.05	322
J-5	75.23	0	107.03	311
J-6	75.85	0	107.03	305
J-7	79.82	0	107.01	266
J-8	79.26	0	107.01	272
J-9	78.04	0	107.00	283
J-10	74.92	0	106.98	314
J-11	70.11	0	106.98	361
J-12	69.75	0	106.99	364
J-13	69.56	0	106.99	366
J-14	69.27	0	107.00	369
J-15	71.95	0	107.06	344
J-16	71.11	0	107.06	352
J-17	68.21	0	107.07	380
J-18	66.29	0	107.08	399
J-19	64.04	0	107.10	421
J-20	65.25	0	107.10	410
J-21	65.48	0	107.10	407
J-22	66.02	0	107.10	402
J-23 (Hospital Service)	71.48	11.41	106.97	347
J-24	75.18	0	106.98	311
J-25	70.16	0	107.03	361
J-26 (PG Service)	70.54	1.14	107.03	357
J-27 (CUP Service)	75.32	5.5	106.98	310
J-28	73.62	0	107.06	327
J-29	74.17	0	107.06	322
J-30 (CUP Service)	75.09	5.5	106.98	312
J-31	74.74	0	106.98	316
J-32	77.67	0	106.98	287
J-33	79.29	0	106.98	271
J-34	82.85	0	106.98	236

Scenerio: Average Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	82.93	0	106.98	235
J-36	79.58	0	106.98	268
J-37	71.33	0	106.98	349
J-38	70.02	0	106.98	362
J-39	69.78	0	106.98	364
J-40	71.09	0	106.98	351
J-41	69.84	0	106.98	363
J-42	69.64	0	106.98	365
J-43	69.68	0	106.98	365
J-44	80.64	0	106.98	258
J-45 (Hospital Service)	71.37	11.41	106.97	348
J-46	70.07	0	106.98	361
J-E1	66.39	0	107.10	398
J-E2	65.50	0	107.10	407
J-E3	64.89	0	107.09	413
J-E4	65.00	0	107.10	412
J-E5	64.50	0	107.10	417
J-E6	64.55	0	107.10	416
J-E7	63.50	0	107.10	427
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Peak Hour (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	23.87	0.03	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	23.87	0.19	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	23.87	0.19	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	23.87	0.19	432	427
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	427	409
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	23.87	0.19	427	416
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	416	417
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	417	412
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	23.87	0.19	416	415
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	23.87	0.19	415	412
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	412	407
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	23.87	0.19	412	413
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	27.39	0.22	411	413
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	27.39	0.22	407	411
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	407	402
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	27.39	0.22	398	407
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	91.8	0.12	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	51.26	0.73	413	398
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	51.26	0.73	398	390
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	51.26	0.73	390	378
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	51.26	0.73	378	349
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-18.98	0.27	349	340
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	70.25	0.99	349	347
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	70.25	0.99	347	355
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	3.07	0.17	355	351
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	67.18	0.95	355	357
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-67.18	0.95	362	357
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-67.18	0.95	356	358
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-67.18	0.95	350	356
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	45.42	0.64	281	301
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	45.42	0.64	275	281
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	45.42	0.64	291	259
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	45.42	0.64	299	291
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	45.42	0.64	306	299
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	45.42	0.64	307	306
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	45.42	0.64	318	307
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	45.42	0.64	320	318
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	45.42	0.64	321	320

Scenerio: Peak Hour (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	64.41	0.91	389	321
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	64.41	0.91	396	389
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	300	PVC	120	64.41	0.91	398	396
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-25.5	0.81	300	301
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	18.98	0.27	321	319
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	18.98	0.27	319	324
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	18.98	0.27	324	340
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	45.42	0.64	259	258
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	45.42	0.64	258	264
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	45.42	0.64	264	275
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	19.92	0.28	301	301
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	19.92	0.28	301	304
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-5.58	0.08	304	305
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-5.58	0.08	305	306
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-25.5	0.81	302	304
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-5.58	0.08	306	287
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-5.58	0.08	287	277
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-5.58	0.08	277	261
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-5.58	0.08	261	243
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	-5.58	0.08	243	226
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	-5.58	0.08	226	226
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	-5.58	0.08	226	248
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-5.58	0.08	248	258
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-5.58	0.08	258	339
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-5.58	0.08	339	352
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-5.58	0.08	352	342
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-5.58	0.08	342	354
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	356	357
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	357	354
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	354	355
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	355	354
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-5.58	0.08	354	355
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-5.58	0.08	355	352
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	30.8	0.44	352	339
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-36.38	0.51	352	351
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-67.18	0.95	351	350
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	30.8	0.44	351	338
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-67.18	0.95	358	362

Scenerio: Peak Hour (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	107.03	396
J-2	67.16	0	106.91	389
J-3	74.01	0	106.77	321
J-4	74.19	0	106.67	318
J-5	75.23	0	106.47	306
J-6	75.85	0	106.41	299
J-7	79.82	0	106.28	259
J-8	79.26	0	106.22	264
J-9	78.04	0	106.16	275
J-10	74.92	0	105.97	304
J-11	70.11	0	106.00	351
J-12	69.75	0	106.13	356
J-13	69.56	0	106.15	358
J-14	69.27	0	106.22	362
J-15	71.95	0	106.73	340
J-16	71.11	0	106.72	349
J-17	68.21	0	106.85	378
J-18	66.29	0	106.93	398
J-19	64.04	0	107.10	421
J-20	65.25	0	107.09	409
J-21	65.48	0	107.06	407
J-22	66.02	0	107.07	402
J-23 (Hospital Service)	71.48	30.8	105.98	338
J-24	75.18	0	105.98	301
J-25	70.16	0	106.45	355
J-26 (PG Service)	70.54	3.07	106.44	351
J-27 (CUP Service)	75.32	25.5	105.94	300
J-28	73.62	0	106.74	324
J-29	74.17	0	106.76	319
J-30 (CUP Service)	75.09	25.5	105.93	302
J-31	74.74	0	105.97	306
J-32	77.67	0	105.98	277
J-33	79.29	0	105.98	261
J-34	82.85	0	105.98	226

Scenerio: Peak Hour (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	82.93	0	105.98	226
J-36	79.58	0	105.99	258
J-37	71.33	0	105.99	339
J-38	70.02	0	105.99	352
J-39	69.78	0	105.99	354
J-40	71.09	0	105.99	342
J-41	69.84	0	105.99	354
J-42	69.64	0	105.99	356
J-43	69.68	0	105.99	355
J-44	80.64	0	105.99	248
J-45 (Hospital Service)	71.37	30.8	105.97	339
J-46	70.07	0	105.99	352
J-E1	66.39	0	107.10	398
J-E2	65.50	0	107.07	407
J-E3	64.89	0	107.04	413
J-E4	65.00	0	107.06	412
J-E5	64.50	0	107.07	417
J-E6	64.55	0	107.07	416
J-E7	63.50	0	107.09	427
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Max Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	13.26	0.02	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	13.26	0.11	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	13.26	0.11	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	13.26	0.11	432	427
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	427	410
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	13.26	0.11	427	416
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	416	417
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	417	412
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	13.26	0.11	416	415
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	13.26	0.11	415	412
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	412	407
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	13.26	0.11	412	413
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	15.21	0.12	411	413
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	15.21	0.12	407	411
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	407	402
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	15.21	0.12	398	407
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	51	0.06	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	28.48	0.40	413	399
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	28.48	0.40	399	391
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	28.48	0.40	391	380
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	28.48	0.40	380	351
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-10.55	0.15	351	343
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	39.02	0.55	351	350
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	39.02	0.55	350	359
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	359	356
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	37.32	0.53	359	362
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-37.32	0.53	367	362
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-37.32	0.53	362	364
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-37.32	0.53	357	362
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	25.24	0.36	288	309
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	25.24	0.36	281	288
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	25.24	0.36	296	264
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	25.24	0.36	304	296
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	25.24	0.36	310	304
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	25.24	0.36	311	310
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	25.24	0.36	321	311
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	25.24	0.36	322	321
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	25.24	0.36	323	322

Scenerio: Max Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	35.78	0.51	390	323
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	35.78	0.51	397	390
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	300	PVC	120	35.78	0.51	398	397
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	307	309
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	10.55	0.15	323	321
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	10.55	0.15	321	326
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	10.55	0.15	326	343
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	25.24	0.36	264	263
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	25.24	0.36	263	270
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	25.24	0.36	270	281
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	11.07	0.16	309	308
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	11.07	0.16	308	311
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-3.1	0.04	311	313
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-3.1	0.04	313	313
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	309	311
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-3.1	0.04	313	294
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-3.1	0.04	294	284
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-3.1	0.04	284	268
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-3.1	0.04	268	250
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	-3.1	0.04	250	234
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	-3.1	0.04	234	233
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	-3.1	0.04	233	255
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-3.1	0.04	255	266
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-3.1	0.04	266	346
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-3.1	0.04	346	359
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-3.1	0.04	359	349
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-3.1	0.04	349	362
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	363	365
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	365	361
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	361	362
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	362	362
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-3.1	0.04	362	363
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-3.1	0.04	363	359
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	359	346
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-20.21	0.29	359	358
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-37.32	0.53	358	357
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	358	345
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-37.32	0.53	364	367

Scenerio: Max Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	107.08	397
J-2	67.16	0	107.04	390
J-3	74.01	0	106.99	323
J-4	74.19	0	106.96	321
J-5	75.23	0	106.89	310
J-6	75.85	0	106.87	304
J-7	79.82	0	106.83	264
J-8	79.26	0	106.80	270
J-9	78.04	0	106.78	281
J-10	74.92	0	106.72	311
J-11	70.11	0	106.73	358
J-12	69.75	0	106.77	362
J-13	69.56	0	106.78	364
J-14	69.27	0	106.80	367
J-15	71.95	0	106.97	343
J-16	71.11	0	106.97	351
J-17	68.21	0	107.02	380
J-18	66.29	0	107.04	399
J-19	64.04	0	107.10	421
J-20	65.25	0	107.10	410
J-21	65.48	0	107.09	407
J-22	66.02	0	107.09	402
J-23 (Hospital Service)	71.48	17.11	106.72	345
J-24	75.18	0	106.72	309
J-25	70.16	0	106.88	359
J-26 (PG Service)	70.54	1.7	106.88	356
J-27 (CUP Service)	75.32	14.17	106.71	307
J-28	73.62	0	106.98	326
J-29	74.17	0	106.99	321
J-30 (CUP Service)	75.09	14.17	106.70	309
J-31	74.74	0	106.72	313
J-32	77.67	0	106.72	284
J-33	79.29	0	106.72	268
J-34	82.85	0	106.72	234

Scenerio: Max Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	82.93	0	106.72	233
J-36	79.58	0	106.73	266
J-37	71.33	0	106.73	346
J-38	70.02	0	106.73	359
J-39	69.78	0	106.73	362
J-40	71.09	0	106.73	349
J-41	69.84	0	106.73	361
J-42	69.64	0	106.73	363
J-43	69.68	0	106.73	363
J-44	80.64	0	106.72	255
J-45 (Hospital Service)	71.37	17.11	106.72	346
J-46	70.07	0	106.73	359
J-E1	66.39	0	107.10	398
J-E2	65.50	0	107.09	407
J-E3	64.89	0	107.08	413
J-E4	65.00	0	107.09	412
J-E5	64.50	0	107.09	417
J-E6	64.55	0	107.09	416
J-E7	63.50	0	107.10	427
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	98.84	0.13	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	98.84	0.79	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	98.84	0.79	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	98.84	0.79	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	98.84	0.79	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	98.84	0.79	412	411
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	98.84	0.79	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	98.84	0.79	406	405
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	113.39	0.90	405	405
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	113.39	0.90	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	113.39	0.90	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	215.42	0.27	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	212.23	3.00	405	376
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	212.23	3.00	376	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	212.23	3.00	366	347
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	212.23	3.00	347	300
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	0.09	0.00	300	292
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	212.14	3.00	300	294
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	212.14	3.00	294	289
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	289	286
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	210.44	2.98	289	281
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-210.44	2.98	279	281
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-210.44	2.98	267	271
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-210.44	2.98	254	267
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	102.12	1.44	211	226
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	102.12	1.44	206	211
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	102.12	1.44	229	194
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	102.12	1.44	238	229
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	102.12	1.44	247	238
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	102.12	1.44	250	247
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	102.12	1.44	266	250
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	102.12	1.44	269	266
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	102.12	1.44	272	269

Scenerio: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	102.03	1.44	342	272
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	102.03	1.44	351	342
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	102.03	5.77	398	351
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	225	226
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-0.09	0.00	272	270
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	-0.09	0.00	270	276
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-0.09	0.00	276	292
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	102.12	1.44	194	192
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	102.12	1.44	192	197
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	102.12	1.44	197	206
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	87.95	1.24	226	225
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	87.95	1.24	225	227
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	73.78	1.04	227	226
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	73.78	1.04	226	226
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	225	227
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	73.78	1.04	226	203
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	73.78	1.04	203	193
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	73.78	1.04	193	206
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	73.78	1.04	206	181
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	73.78	1.04	181	167
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	73.78	1.04	167	167
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	73.78	1.04	167	156
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	73.78	1.04	156	164
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	73.78	1.04	164	242
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	73.78	1.04	242	253
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	73.78	1.04	253	241
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	73.78	1.04	241	253
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	248	249
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	-83.34	1.18	249	249
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	-83.34	1.18	249	251
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	-166.67	2.36	251	253
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-92.89	1.31	253	256
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-92.89	1.31	256	254
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	254	242
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-110	1.56	254	254
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-127.11	1.80	254	254
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	254	241
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-210.44	2.98	271	279

Scenerio: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.47	366
H-2	71.15	0	101.16	294
H-3	75.25	0	98.24	225
H-4	76.65	0	100.10	229
H-5	69.80	0	98.48	281
H-6	79.91	0	99.53	192
H-7	74.02	0	101.47	269
H-8	69.69	83.33	95.31	251
H-9	78.61	0	97.06	181
H-10	76.68	0	97.47	203
H-11	74.78	0	97.88	226
H-12	70.21	83.33	94.81	241
H-13	69.47	83.34	92.72	228
H-14	77.38	0	98.95	211
H-15	75.14	0	100.68	250
H-E1	65.10	0	106.48	405
H-E2	65.00	0	106.65	408
H-E3	64.64	0	106.62	411
H-E4	63.00	0	107.10	432
H-E5	66.30	0	107.10	399

Scenerio: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.43	351
J-2	67.16	0	102.15	342
J-3	74.01	0	101.81	272
J-4	74.19	0	101.39	266
J-5	75.23	0	100.49	247
J-6	75.85	0	100.21	238
J-7	79.82	0	99.64	194
J-8	79.26	0	99.36	197
J-9	78.04	0	99.09	206
J-10	74.92	0	98.12	227
J-11	70.11	0	96.11	254
J-12	69.75	0	97.03	267
J-13	69.56	0	97.27	271
J-14	69.27	0	97.80	279
J-15	71.95	0	101.81	292
J-16	71.11	0	101.81	300
J-17	68.21	0	103.68	347
J-18	66.29	0	104.72	376
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.51	402
J-22	66.02	0	106.75	399
J-23 (Hospital Service)	71.48	17.11	96.10	241
J-24	75.18	0	98.29	226
J-25	70.16	0	99.72	289
J-26 (PG Service)	70.54	1.7	99.72	286
J-27 (CUP Service)	75.32	14.17	98.27	225
J-28	73.62	0	101.81	276
J-29	74.17	0	101.81	270
J-30 (CUP Service)	75.09	14.17	98.11	225
J-31	74.74	0	97.85	226
J-32	77.67	0	97.39	193
J-33	76.14	0	97.23	206
J-34	79.82	0	96.90	167

Scenerio: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	79.85	0	96.88	167
J-36	79.58	0	96.35	164
J-37	71.33	0	96.09	242
J-38	70.02	0	95.91	253
J-39	69.78	0	95.67	253
J-40	71.09	0	95.76	241
J-41	69.84	0	95.25	249
J-42	69.64	0	94.96	248
J-43	69.68	0	95.82	256
J-44	80.64	0	96.55	156
J-45 (Hospital Service)	71.37	17.11	96.06	242
J-46	70.07	0	96.06	254
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.75	404
J-E3	64.89	0	106.31	405
J-E4	65.00	0	106.51	406
J-E5	64.50	0	106.65	413
J-E6	64.55	0	106.65	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	99.21	0.13	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	99.21	0.79	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	99.21	0.79	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	99.21	0.79	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	99.21	0.79	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	99.21	0.79	412	411
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	99.21	0.79	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	99.21	0.79	406	405
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	113.82	0.91	405	405
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	113.82	0.91	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	113.82	0.91	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	215.05	0.27	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	213.04	3.01	405	376
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	213.04	3.01	376	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	213.04	3.01	366	347
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	213.04	3.01	347	300
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-30.09	0.43	300	292
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	243.13	3.44	300	292
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	159.8	2.26	292	293
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	293	289
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	158.1	2.24	293	289
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-74.77	1.06	293	289
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-74.77	1.06	288	290
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-74.77	1.06	282	288
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	71.13	1.01	226	244
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	71.13	1.01	220	226
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	71.13	1.01	238	205
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	71.13	1.01	247	238
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	71.13	1.01	254	247
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	71.13	1.01	256	254
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	71.13	1.01	269	256
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	71.13	1.01	271	269
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	71.13	1.01	273	271

Scenerio: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	101.22	1.43	343	273
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	101.22	1.43	352	343
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	101.22	5.73	398	352
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	242	244
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	30.09	0.43	273	271
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	30.09	0.43	271	276
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	30.09	0.43	276	292
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	71.13	1.01	205	204
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	71.13	1.01	204	209
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	71.13	1.01	209	220
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	56.96	0.81	244	243
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	56.96	0.81	243	246
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	42.79	0.61	246	246
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	42.79	0.61	246	246
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	244	246
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	42.79	0.61	246	226
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	42.79	0.61	226	216
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	42.79	0.61	216	230
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	42.79	0.61	230	206
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	42.79	0.61	206	193
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	42.79	0.61	193	193
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	42.79	0.61	193	184
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	42.79	0.61	184	194
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	42.79	0.61	194	273
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	42.79	0.61	273	286
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	42.79	0.61	286	275
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	42.79	0.61	275	287
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	288	290
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	290	287
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	287	288
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	288	287
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	42.79	0.61	287	288
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	42.79	0.61	288	283
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	283	271
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	25.68	0.36	283	283
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	8.57	0.12	283	282
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	283	269
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-74.77	1.06	290	293

Scenerio: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.45	366
H-2	71.15	83.33	100.33	286
H-3	75.25	0	100.06	243
H-4	76.65	0	101.01	238
H-5	69.80	83.33	98.56	281
H-6	79.91	0	100.72	204
H-7	74.02	0	101.71	271
H-8	69.69	0	99.12	288
H-9	78.61	0	99.62	206
H-10	76.68	0	99.77	226
H-11	74.78	0	99.92	246
H-12	70.21	83.34	97.65	269
H-13	69.47	0	99.12	290
H-14	77.38	0	100.42	226
H-15	75.14	0	101.31	256
H-E1	65.10	0	106.47	405
H-E2	65.00	0	106.65	408
H-E3	64.64	0	106.62	411
H-E4	63.00	0	107.10	432
H-E5	66.30	0	107.10	399

Scenerio: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	66.53	0	102.50	352
J-2	67.16	0	102.22	343
J-3	74.01	0	101.89	273
J-4	74.19	0	101.67	269
J-5	75.23	0	101.21	254
J-6	75.85	0	101.07	247
J-7	79.82	0	100.77	205
J-8	79.26	0	100.63	209
J-9	78.04	0	100.50	220
J-10	74.92	0	100.01	246
J-11	70.11	0	99.02	283
J-12	69.75	0	99.14	288
J-13	69.56	0	99.18	290
J-14	69.27	0	99.26	293
J-15	71.95	0	101.79	292
J-16	71.11	0	101.77	300
J-17	68.21	0	103.66	347
J-18	66.29	0	104.70	376
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.51	402
J-22	66.02	0	106.74	399
J-23 (Hospital Service)	71.48	17.11	99.01	269
J-24	75.18	0	100.08	244
J-25	70.16	0	100.09	293
J-26 (PG Service)	70.54	1.7	100.09	289
J-27 (CUP Service)	75.32	14.17	100.07	242
J-28	73.62	0	101.82	276
J-29	74.17	0	101.88	271
J-30 (CUP Service)	75.09	14.17	100.00	244
J-31	74.74	0	99.91	246
J-32	77.67	0	99.74	216
J-33	76.14	0	99.68	230
J-34	79.82	0	99.56	193

Scenerio: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	79.85	0	99.56	193
J-36	79.58	0	99.36	194
J-37	71.33	0	99.27	273
J-38	70.02	0	99.20	286
J-39	69.78	0	99.12	287
J-40	71.09	0	99.15	275
J-41	69.84	0	99.12	287
J-42	69.64	0	99.12	288
J-43	69.68	0	99.08	288
J-44	80.64	0	99.43	184
J-45 (Hospital Service)	71.37	17.11	99.01	271
J-46	70.07	0	99.02	283
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.74	404
J-E3	64.89	0	106.30	405
J-E4	65.00	0	106.51	406
J-E5	64.50	0	106.65	413
J-E6	64.55	0	106.65	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	95.15	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	95.15	0.76	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	95.15	0.76	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	95.15	0.76	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	409
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	95.15	0.76	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	95.15	0.76	412	411
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	95.15	0.76	411	407
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	407	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	95.15	0.76	407	406
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	109.16	0.87	405	406
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	109.16	0.87	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	109.16	0.87	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	219.11	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	204.31	2.89	406	378
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	204.31	2.89	378	367
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	204.31	2.89	367	349
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	204.31	2.89	349	304
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	104.13	1.47	304	294
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	100.17	1.42	304	302
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	100.17	1.42	302	308
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	308	304
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	98.47	1.39	308	309
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-98.47	1.39	312	309
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-98.47	1.39	306	308
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-98.47	1.39	299	306
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	-35.91	0.51	206	229
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	-35.91	0.51	200	206
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	-35.91	0.51	212	181
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	47.42	0.67	220	212
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	47.42	0.67	227	220
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	47.42	0.67	228	227
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	130.75	1.85	248	228
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	130.75	1.85	251	248
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	214.09	3.03	264	251

Scenerio: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	109.95	1.56	335	264
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	109.95	1.56	345	335
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	109.95	6.22	398	345
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	227	229
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-104.13	1.47	264	264
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	-104.13	1.47	264	275
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-104.13	1.47	275	294
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	-35.91	0.51	181	181
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	-35.91	0.51	181	187
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	-35.91	0.51	187	200
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	-50.08	0.71	229	228
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	-50.08	0.71	228	232
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-64.25	0.91	232	235
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-64.25	0.91	235	236
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	230	232
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-64.25	0.91	236	220
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-64.25	0.91	220	211
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-64.25	0.91	211	227
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-64.25	0.91	227	204
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	-64.25	0.91	204	193
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	-64.25	0.91	193	193
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	-64.25	0.91	193	188
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-64.25	0.91	188	200
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-64.25	0.91	200	282
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-64.25	0.91	282	297
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-64.25	0.91	297	287
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-64.25	0.91	287	301
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	302	304
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	304	300
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	300	302
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	302	301
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-64.25	0.91	301	302
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-64.25	0.91	302	300
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	300	287
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-81.36	1.15	300	300
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-98.47	1.39	300	299
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	300	286
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-98.47	1.39	308	312

Scenerio: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.65	367
H-2	71.15	0	102.01	302
H-3	75.25	0	98.57	228
H-4	76.65	83.33	97.69	206
H-5	69.80	0	101.34	309
H-6	79.91	0	98.37	181
H-7	74.02	83.34	99.06	245
H-8	69.69	0	100.51	302
H-9	78.61	0	99.43	204
H-10	76.68	0	99.12	220
H-11	74.78	0	98.80	235
H-12	70.21	0	100.78	299
H-13	69.47	0	100.51	304
H-14	77.38	0	98.46	206
H-15	75.14	83.33	97.69	221
H-E1	65.10	0	106.52	405
H-E2	65.00	0	106.68	408
H-E3	64.64	0	106.66	411
H-E4	63.00	0	107.10	432
H-E5	66.30	0	107.10	399

Scenerio: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	101.73	345
J-2	67.16	0	101.42	335
J-3	74.01	0	101.02	264
J-4	74.19	0	99.55	248
J-5	75.23	0	98.38	227
J-6	75.85	0	98.32	220
J-7	79.82	0	98.36	181
J-8	79.26	0	98.40	187
J-9	78.04	0	98.44	200
J-10	74.92	0	98.61	232
J-11	70.11	0	100.74	300
J-12	69.75	0	100.99	306
J-13	69.56	0	101.05	308
J-14	69.27	0	101.18	312
J-15	71.95	0	102.00	294
J-16	71.11	0	102.17	304
J-17	68.21	0	103.91	349
J-18	66.29	0	104.88	378
J-19	64.04	0	107.10	421
J-20	65.25	0	106.99	409
J-21	65.48	0	106.55	402
J-22	66.02	0	106.77	399
J-23 (Hospital Service)	71.48	17.11	100.73	286
J-24	75.18	0	98.55	229
J-25	70.16	0	101.65	308
J-26 (PG Service)	70.54	1.7	101.65	304
J-27 (CUP Service)	75.32	14.17	98.54	227
J-28	73.62	0	101.72	275
J-29	74.17	0	101.13	264
J-30 (CUP Service)	75.09	14.17	98.60	230
J-31	74.74	0	98.82	236
J-32	77.67	0	99.18	211
J-33	76.14	0	99.30	227
J-34	79.82	0	99.56	193

Scenerio: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	79.85	0	99.58	193
J-36	79.58	0	99.98	200
J-37	71.33	0	100.18	282
J-38	70.02	0	100.33	297
J-39	69.78	0	100.51	301
J-40	71.09	0	100.44	287
J-41	69.84	0	100.51	300
J-42	69.64	0	100.51	302
J-43	69.68	0	100.59	302
J-44	80.64	0	99.83	188
J-45 (Hospital Service)	71.37	17.11	100.70	287
J-46	70.07	0	100.71	300
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.77	404
J-E3	64.89	0	106.36	406
J-E4	65.00	0	106.55	407
J-E5	64.50	0	106.68	413
J-E6	64.55	0	106.68	412
J-E7	63.50	0	106.99	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	98.02	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	98.02	0.78	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	98.02	0.78	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	98.02	0.78	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	98.02	0.78	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	98.02	0.78	412	411
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	98.02	0.78	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	98.02	0.78	406	405
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	112.45	0.89	405	405
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	112.45	0.89	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	112.45	0.89	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	216.24	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	210.47	2.98	405	376
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	210.47	2.98	376	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	210.47	2.98	366	348
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	210.47	2.98	348	301
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	45.82	0.65	301	293
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	164.66	2.33	301	297
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	164.66	2.33	297	298
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	298	294
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	162.96	2.31	298	294
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-162.96	2.31	295	294
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-162.96	2.31	285	289
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-162.96	2.31	276	285
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	149.6	2.12	181	189
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	149.6	2.12	177	181
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	149.6	2.12	211	170
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	149.6	2.12	221	211
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	149.6	2.12	232	221
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	149.6	2.12	237	232
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	149.6	2.12	260	237
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	149.6	2.12	264	260
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	149.6	2.12	270	264

Scenerio: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	103.79	1.47	341	270
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	103.79	1.47	350	341
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	103.79	5.87	398	350
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	188	189
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-45.82	0.65	270	269
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	-45.82	0.65	269	276
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-45.82	0.65	276	293
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	149.6	2.12	170	168
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	149.6	2.12	168	170
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	149.6	2.12	170	177
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	135.43	1.92	189	187
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	135.43	1.92	187	188
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	121.26	1.72	188	183
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	37.93	0.54	183	184
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	186	188
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	37.93	0.54	184	164
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-45.41	0.64	164	154
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-45.41	0.64	154	170
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-45.41	0.64	170	146
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	-128.74	1.82	146	139
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	-128.74	1.82	139	139
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	-128.74	1.82	139	141
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-128.74	1.82	141	156
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-128.74	1.82	156	244
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-128.74	1.82	244	262
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-128.74	1.82	262	256
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-128.74	1.82	256	271
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	272	274
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	274	270
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	270	272
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	272	271
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-128.74	1.82	271	275
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-128.74	1.82	275	275
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	275	262
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-145.85	2.06	275	276
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-162.96	2.31	276	276
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	276	262
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-162.96	2.31	289	295

Scenerio: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.51	366
H-2	71.15	0	101.48	297
H-3	75.25	0	94.40	187
H-4	76.65	0	98.17	211
H-5	69.80	0	99.81	294
H-6	79.91	0	97.02	168
H-7	74.02	0	100.95	264
H-8	69.69	0	97.47	272
H-9	78.61	83.33	93.55	146
H-10	76.68	83.34	93.39	164
H-11	74.78	83.33	93.51	183
H-12	70.21	0	98.38	276
H-13	69.47	0	97.47	274
H-14	77.38	0	95.84	181
H-15	75.14	0	99.34	237
H-E1	65.10	0	106.49	405
H-E2	65.00	0	106.66	408
H-E3	64.64	0	106.63	411
H-E4	63.00	0	107.10	432
H-E5	66.30	0	107.10	399

Scenerio: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.28	350
J-2	67.16	0	101.99	341
J-3	74.01	0	101.64	270
J-4	74.19	0	100.78	260
J-5	75.23	0	98.96	232
J-6	75.85	0	98.40	221
J-7	79.82	0	97.23	170
J-8	79.26	0	96.67	170
J-9	78.04	0	96.13	177
J-10	74.92	0	94.13	188
J-11	70.11	0	98.27	276
J-12	69.75	0	98.91	285
J-13	69.56	0	99.06	289
J-14	69.27	0	99.39	295
J-15	71.95	0	101.85	293
J-16	71.11	0	101.89	301
J-17	68.21	0	103.73	348
J-18	66.29	0	104.75	376
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.52	402
J-22	66.02	0	106.75	399
J-23 (Hospital Service)	71.48	17.11	98.26	262
J-24	75.18	0	94.50	189
J-25	70.16	0	100.59	298
J-26 (PG Service)	70.54	1.7	100.58	294
J-27 (CUP Service)	75.32	14.17	94.48	188
J-28	73.62	0	101.79	276
J-29	74.17	0	101.66	269
J-30 (CUP Service)	75.09	14.17	94.11	186
J-31	74.74	0	93.50	184
J-32	77.67	0	93.42	154
J-33	76.14	0	93.49	170
J-34	79.82	0	94.02	139

Scenerio: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	79.85	0	94.08	139
J-36	79.58	0	95.55	156
J-37	71.33	0	96.27	244
J-38	70.02	0	96.79	262
J-39	69.78	0	97.47	271
J-40	71.09	0	97.20	256
J-41	69.84	0	97.47	270
J-42	69.64	0	97.47	272
J-43	69.68	0	97.75	275
J-44	80.64	0	95.01	141
J-45 (Hospital Service)	71.37	17.11	98.18	262
J-46	70.07	0	98.19	275
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.75	404
J-E3	64.89	0	106.32	405
J-E4	65.00	0	106.52	406
J-E5	64.50	0	106.66	413
J-E6	64.55	0	106.66	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	97.36	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	97.36	0.77	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	399	432
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	402	399
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	97.36	0.77	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	97.36	0.77	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	97.36	0.77	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	97.36	0.77	412	411
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	97.36	0.77	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	97.36	0.77	406	406
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	111.7	0.89	405	406
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	111.7	0.89	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	111.7	0.89	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	216.9	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	209.07	2.96	406	377
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	209.07	2.96	377	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	209.07	2.96	366	348
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	209.07	2.96	348	302
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	63.09	0.89	302	293
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	145.97	2.07	302	298
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	145.97	2.07	298	301
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	301	297
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	144.27	2.04	301	298
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-144.27	2.04	300	298
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-144.27	2.04	292	295
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-144.27	2.04	283	292
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	84.96	1.20	166	182
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	168.29	2.38	163	166
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	168.29	2.38	201	159
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	168.29	2.38	212	201
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	168.29	2.38	224	212
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	168.29	2.38	230	224
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	168.29	2.38	257	230
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	168.29	2.38	261	257
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	168.29	2.38	269	261

Scenerio: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	105.2	1.49	340	269
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	105.2	1.49	349	340
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	105.2	5.95	398	349
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	181	182
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-63.09	0.89	269	268
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	-63.09	0.89	268	276
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-63.09	0.89	276	293
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	168.29	2.38	159	155
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	168.29	2.38	155	157
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	168.29	2.38	157	163
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	70.79	1.00	182	181
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	-12.55	0.18	181	185
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-26.72	0.38	185	186
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-110.05	1.56	186	187
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	183	185
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-110.05	1.56	187	176
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-110.05	1.56	176	168
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-110.05	1.56	168	186
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-110.05	1.56	186	166
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	-110.05	1.56	166	157
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	-110.05	1.56	157	157
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	-110.05	1.56	157	156
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-110.05	1.56	156	171
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-110.05	1.56	171	257
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-110.05	1.56	257	273
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-110.05	1.56	273	266
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-110.05	1.56	266	281
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	282	284
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	284	280
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	280	282
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	282	281
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-110.05	1.56	281	284
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-110.05	1.56	284	283
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	283	270
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-127.16	1.80	283	283
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-144.27	2.04	283	283
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	283	270
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-144.27	2.04	295	300

Scenerio: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.54	366
H-2	71.15	0	101.63	298
H-3	75.25	83.34	92.97	173
H-4	76.65	0	97.19	201
H-5	69.80	0	100.29	298
H-6	79.91	0	95.76	155
H-7	74.02	0	100.64	261
H-8	69.69	0	98.46	282
H-9	78.61	0	95.53	166
H-10	76.68	0	94.68	176
H-11	74.78	83.33	93.83	186
H-12	70.21	0	99.15	283
H-13	69.47	0	98.46	284
H-14	77.38	83.33	93.42	157
H-15	75.14	0	98.64	230
H-E1	65.10	0	106.50	405
H-E2	65.00	0	106.66	408
H-E3	64.64	0	106.64	411
H-E4	63.00	0	107.10	432
H-E5	66.30	0	107.10	399

Scenerio: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.16	349
J-2	67.16	0	101.86	340
J-3	74.01	0	101.50	269
J-4	74.19	0	100.43	257
J-5	75.23	0	98.17	224
J-6	75.85	0	97.47	212
J-7	79.82	0	96.02	159
J-8	79.26	0	95.32	157
J-9	78.04	0	94.65	163
J-10	74.92	0	93.79	185
J-11	70.11	0	99.06	283
J-12	69.75	0	99.57	292
J-13	69.56	0	99.69	295
J-14	69.27	0	99.96	300
J-15	71.95	0	101.89	293
J-16	71.11	0	101.95	302
J-17	68.21	0	103.77	348
J-18	66.29	0	104.78	377
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.53	402
J-22	66.02	0	106.76	399
J-23 (Hospital Service)	71.48	17.11	99.05	270
J-24	75.18	0	93.82	182
J-25	70.16	0	100.91	301
J-26 (PG Service)	70.54	1.7	100.91	297
J-27 (CUP Service)	75.32	14.17	93.81	181
J-28	73.62	0	101.78	276
J-29	74.17	0	101.54	268
J-30 (CUP Service)	75.09	14.17	93.78	183
J-31	74.74	0	93.88	187
J-32	77.67	0	94.85	168
J-33	76.14	0	95.19	186
J-34	79.82	0	95.88	157

Scenerio: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	79.85	0	95.92	157
J-36	79.58	0	97.02	171
J-37	71.33	0	97.57	257
J-38	70.02	0	97.96	273
J-39	69.78	0	98.46	281
J-40	71.09	0	98.26	266
J-41	69.84	0	98.46	280
J-42	69.64	0	98.46	282
J-43	69.68	0	98.67	284
J-44	80.64	0	96.62	156
J-45 (Hospital Service)	71.37	17.11	98.99	270
J-46	70.07	0	99.00	283
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.76	404
J-E3	64.89	0	106.33	406
J-E4	65.00	0	106.53	406
J-E5	64.50	0	106.66	413
J-E6	64.55	0	106.66	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

Scenerio: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	149.16	0.19	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	149.16	1.19	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	H-E4	150	Cast iron	40	12	0.68	435	419
5 - Ex WM 150mm Preston St	169.09	H-E5	H-E4	150	Cast iron	40	0	0.00	386	419
5A - Ex WM 150mm Preston St	45.26	J-E11	H-E5	150	Cast iron	40	0	0.00	389	386
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	137.16	1.09	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	137.16	1.09	432	425
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	425	407
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	137.16	1.09	425	408
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	12	0.68	408	406
12 - Ex WM 150mm Carling Ave	90.95	J-E5	H-E2	150	Cast iron	40	12	0.68	406	372
13 - Ex WM 400mm Carling Ave	7.73	J-E6	H-E3	400	Cast iron	80	125.16	1.00	408	407
14 - Ex WM 400mm Carling Ave	29.23	H-E3	J-E4	400	Cast iron	80	113.16	0.90	407	402
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	402	397
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	113.16	0.90	402	401
17 - Ex WM 400mm Carling Ave	35.1	H-E1	J-E3	400	Cast iron	80	136.96	1.09	401	401
18 - Ex WM 400mm Carling Ave	54.49	J-E2	H-E1	400	Cast iron	80	148.96	1.19	401	401
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	401	396
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	148.96	1.19	398	401
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	248.1	0.32	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	250.12	3.54	401	366
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	250.12	3.54	366	355
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	155.12	2.19	355	339
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	155.12	2.19	339	301
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-44.57	0.63	301	293
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	199.69	2.83	301	295
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	104.69	1.48	295	301
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	301	297
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	102.99	1.46	301	301
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-7.99	0.11	306	301
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-7.99	0.11	301	303
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-7.99	0.11	297	301
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	54.57	0.77	233	253
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	54.57	0.77	227	233
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	54.57	0.77	244	211
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	54.57	0.77	252	244
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	54.57	0.77	259	252
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	54.57	0.77	260	259
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	54.57	0.77	272	260
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	54.57	0.77	274	272
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	54.57	0.77	275	274

Scenerio: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)

Pipe Table

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	99.14	1.40	345	275
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	99.14	1.40	354	345
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	99.14	5.61	398	354
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	251	253
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	44.57	0.63	275	273
48 - Prop WM 300mm Hospital	73.73	J-29	J-28	300	PVC	120	44.57	0.63	273	277
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	44.57	0.63	277	293
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	54.57	0.77	211	210
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	54.57	0.77	210	216
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	54.57	0.77	216	227
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	40.4	0.57	253	252
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	40.4	0.57	252	255
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	26.23	0.37	255	256
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	26.23	0.37	256	256
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	253	255
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	26.23	0.37	256	236
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	26.23	0.37	236	227
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	26.23	0.37	227	241
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	26.23	0.37	241	217
62 - Prop WM 300mm Rd E	39.47	H-9	J-34	300	PVC	120	26.23	0.37	217	205
63 - Prop WM 300mm Rd E	4.32	J-34	J-35	300	PVC	120	26.23	0.37	205	205
64 - Prop WM 300mm Hospital	78.34	J-35	J-44	300	PVC	120	26.23	0.37	205	196
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	26.23	0.37	196	207
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	26.23	0.37	207	287
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	26.23	0.37	287	299
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	26.23	0.37	299	289
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	26.23	0.37	289	301
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	303	304
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	304	301
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	301	302
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	302	301
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	26.23	0.37	301	302
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	26.23	0.37	302	298
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	298	285
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	9.12	0.13	298	298
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-7.99	0.11	298	297
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	298	284
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-7.99	0.11	303	306

Scenerio: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	95	102.37	345
H-2	71.15	95	100.48	287
H-3	75.25	0	100.97	252
H-4	76.65	0	101.55	244
H-5	69.80	95	99.52	291
H-6	79.91	0	101.37	210
H-7	74.02	0	101.98	274
H-8	69.69	0	100.58	302
H-9	78.61	0	100.79	217
H-10	76.68	0	100.84	236
H-11	74.78	0	100.90	256
H-12	70.21	0	100.54	297
H-13	69.47	0	100.58	304
H-14	77.38	0	101.19	233
H-15	75.14	0	101.73	260
H-E1	65.10	12	106.07	401
H-E2	65.00	12	103.04	372
H-E3	64.64	12	106.23	407
H-E4	63.00	12	105.78	419
H-E5	66.30	0	105.78	386

Scenerio: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.67	354
J-2	67.16	0	102.41	345
J-3	74.01	0	102.08	275
J-4	74.19	0	101.95	272
J-5	75.23	0	101.67	259
J-6	75.85	0	101.58	252
J-7	79.82	0	101.40	211
J-8	79.26	0	101.32	216
J-9	78.04	0	101.23	227
J-10	74.92	0	100.94	255
J-11	70.11	0	100.54	298
J-12	69.75	0	100.54	301
J-13	69.56	0	100.54	303
J-14	69.27	0	100.55	306
J-15	71.95	0	101.88	293
J-16	71.11	0	101.85	301
J-17	68.21	0	102.89	339
J-18	66.29	0	103.67	366
J-19	64.04	0	107.09	421
J-20	65.25	0	106.88	407
J-21	65.48	0	106.09	397
J-22	66.02	0	106.51	396
J-23 (Hospital Service)	71.48	17.11	100.53	284
J-24	75.18	0	100.98	253
J-25	70.16	0	100.88	301
J-26 (PG Service)	70.54	1.7	100.88	297
J-27 (CUP Service)	75.32	14.17	100.97	251
J-28	73.62	0	101.94	277
J-29	74.17	0	102.06	273
J-30 (CUP Service)	75.09	14.17	100.93	253
J-31	74.74	0	100.90	256
J-32	77.67	0	100.83	227
J-33	76.14	0	100.81	241
J-34	79.82	0	100.76	205

Scenerio: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	79.85	0	100.76	205
J-36	79.58	0	100.68	207
J-37	71.33	0	100.64	287
J-38	70.02	0	100.62	299
J-39	69.78	0	100.58	301
J-40	71.09	0	100.59	289
J-41	69.84	0	100.58	301
J-42	69.64	0	100.58	303
J-43	69.68	0	100.57	302
J-44	80.64	0	100.71	196
J-45 (Hospital Service)	71.37	17.11	100.53	285
J-46	70.07	0	100.54	298
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.51	401
J-E3	64.89	0	105.83	401
J-E4	65.00	0	106.09	402
J-E5	64.50	0	106.03	406
J-E6	64.55	0	106.28	408
J-E7	63.50	0	106.88	425
J-E8	63.00	0	107.09	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	105.78	389

APPENDIX H | SANITARY CALCULATIONS

Table 1: Sanitary Flows for the Parking Garage

Area	PARKING GARAGE		COMMERCIAL				TOTAL	INFILTRATION			Total
	Area (m^2)	Peak Flow (L/s)	Area (m^2)	Average Flow L/s	Peak Factor	Peak Flow (L/s)	Total Peak Flow (L/s)	Site Area (ha)	Infiltration Allowance (L/s/ha)	Infiltration Flow (L/s)	Total Peak Flow (L/s)
Main Hospital Underground Parking Garage											
Area 56 (Parking Garage)			8000	1.0	1.0	1.00	1.00	0.80	0.33	0.26	1.26
Main Hospital Building											
Area 48 (Tower A)			25995	1.95	1.50	2.93	2.93	0.74	0.33	0.24	3.17
Area 49 (Tower A)			30590	2.30	1.50	3.44	3.44	0.16	0.33	0.05	3.50
Area 50 (Tower A)			63549	4.77	1.50	7.16	7.16	1.76	0.33	0.58	7.74
Area 51 (Podium)			72227	5.42	1.50	8.13	8.13	2.65	0.33	0.87	9.01
Area 52 (Tower B)			47063	3.53	1.50	5.30	5.30	2.01	0.33	0.66	5.96
Area 53 (Tower B)			21108	1.58	1.50	2.38	2.38	0.15	0.33	0.05	2.43
Area 54 (Tower B)			21808	1.64	1.50	2.46	2.46	0.16	0.33	0.05	2.51
Area 55 (Pavilion)			6825	0.51	1.50	0.77	0.77	0.85	0.33	0.28	1.05
Central Utility Plant											
Central Utility Plant			13000	5.0	1.50	7.5	7.50	1.22	0.33	0.40	7.90
Future Heart											
Future Heart Institute			112500	7.0	1.50	10.6	10.56	2.64	0.33	0.87	11.43
									Total - Mooney's Bay Collector		55.95

Average Daily Demands

(Based on City of Ottawa *Sewer Design Guidelines 2012* and *MOE Water Design Guidelines*)

Average Residential Daily Flow =	280	L/p/d
Institutional Flow =	28,000	L/gross ha/d
Commercial Flow =	28,000	L/gross ha/d
Light Industrial Flow =	35,000	L/gross ha/d
Heavy Industrial Flow =	55,000	L/gross ha/d
Hotel Daily Flow =	225	L/bed/d
Office/Warehouse Daily Flow =	75	L/person/d
Office/Warehouse Daily Flow =	8.06	L/m2/day
Restaurant (Ordinary not 24 Hours) =	125	L/seat/d
Restaurant (24 Hours)	200	L/seat/d
Shopping Centres =	2,500	L/(1000m^2/d)
Amenity Area =	5	L/m2/d
Medical Office Buildings, Dental Office and Medical Clinics		
Doctors, Nurses & Medical Staff =	275	L/person/day
Office Staff =	75	L/person/day
Patients =	25	L/person/day
Hospitals - Including Laundry =	1,400	L/bed/day
Civic Hospital - Average Water Use =	5.40	L/m2/day
Nursing Homes & Rest Homes =	450	L/bed/day

Peak Factors

Commercial =	1.5	if commercial contribution > 20%, otherwise	1.0
Institutional =	1.5	if institutional contribution > 20%, otherwise	1.0
Industrial =		per Appendix 4-B.0 Graph	
Residential =	Harmon	1 + (14/(4+(Capita/1000) ^ 0.5))*0.8	
		Minimum =	2.0
		Maximum =	4.0

Infiltration Allowance

Infiltration allowance (dry)	0.05	L/s/ha
Infiltration allowance (wet))	0.28	L/s/ha
Infiltration allowance (total)	0.33	L/s/ha

* (75L/person per 9.3m2 of floor space (OBC))

Design:	SS	Project:	The New Civic Development
Check :	SM	Location:	Ottawa, Ontario
		Project # :	477458
		Date:	November 2022
		Sheet:	1 of 1

Population Densities

Average Suburban Residential Dev.	60	p/ha
Single Family	3.4	p./unit
Semi-Detached	2.7	p./unit
Duplex	2.3	p./unit
Townhouse	2.7	p./unit
Apartment Average	1.8	p./unit
Bachelor	1.4	p./unit
1 Bedroom	1.4	p./unit
2 Bedrooms	2.1	p./unit
3 Bedrooms	3.1	p./unit
Hotel Room, 18 m2	1	p./unit
Restaurant, 1 m2	1	p./unit
Office	1	p/25m^2

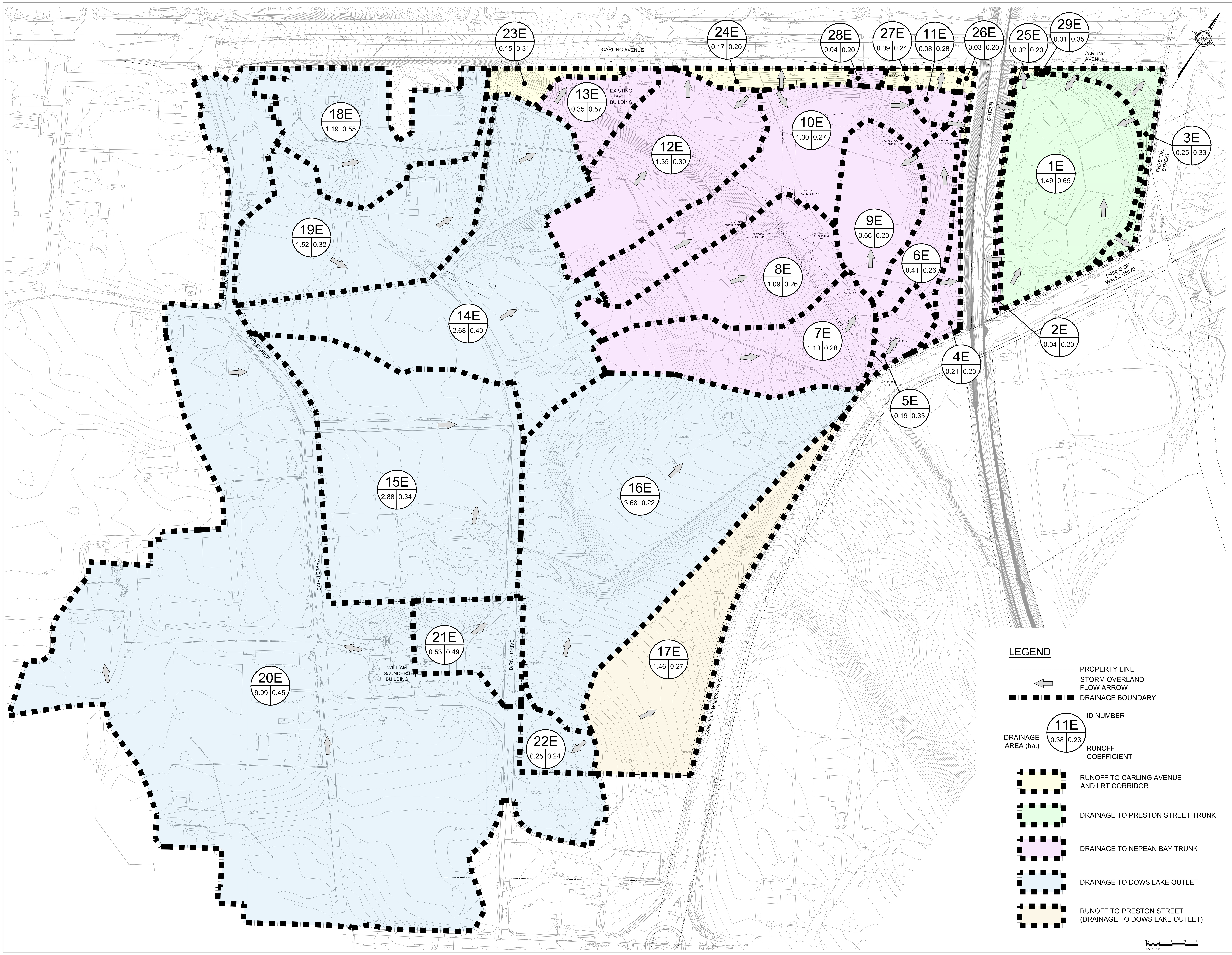
Table 2: Sanitary Sewer Computations for the Hospital

Drainage Area	From	To	Peak Flow Q (L/sec)	Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope* (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
Future Heart Institute	MHSA 13	MHSA 14	11.43	Transite	300	300	2.00	81.0	136.8	1.93	1.04	1.29	0.08	
	MHSA 14	MHSA 44	11.43	Transite	300	300	0.32	32.9	54.7	0.77	0.53	2.33	0.21	
Central Utility Plant	CAP	MHSA 44	3.95	Transite	200	200	1.00	7.5	32.8	1.04	0.62	0.20	0.12	
	MHSA 44	MHSA 34	15.38	Transite	300	300	0.32	32.6	54.7	0.77	0.56	3.31	0.28	
Area 51 (Podium)	CAP	MHSA 34	4.50	Transite	250	250	1.00	30.7	59.5	1.21	0.65	0.78	0.08	
	MHSA 34	MHSA 24	19.88	Transite	300	300	0.32	73.4	54.7	0.77	0.60	5.34	0.36	
Area 51 (Podium)	CAP	MHSA 24	4.50	Transite	250	250	1.00	30.9	59.5	1.21	0.65	0.79	0.08	
Central Utility Plant	CAP	MHSA 23	3.95	Transite	200	200	1.00	5.9	32.8	1.04	0.62	0.16	0.12	
	MHSA 24	MHSA 23	28.34	Transite	300	300	0.32	5.9	54.7	0.77	0.67	5.49	0.52	
	MHSA 23	MHSA 35	28.34	Transite	300	300	0.32	14.2	54.7	0.77	0.67	5.84	0.52	
	MHSA 35	MHSA 36	28.34	Transite	300	300	1.00	36.3	96.7	1.37	1.00	6.45	0.29	
	MHSA 36	MHSA 22	28.34	Transite	300	300	1.00	34.8	96.7	1.37	1.00	7.03	0.29	
	MHSA 22	MHSA 21	28.34	Transite	300	300	1.00	32.4	96.7	1.37	1.00	7.57	0.29	
	MHSA 21	MHSA 20	28.34	Transite	375	375	0.32	83.6	99.2	0.90	0.66	9.70	0.29	
	MHSA 20	MHSA 43	28.34	Transite	375	375	0.32	14.6	99.2	0.90	0.66	10.07	0.29	
Area 50 (Tower A)	CAP	MHSA 43	7.74	Transite	200	200	1.00	23.7	32.8	1.04	0.73	0.54	0.24	
	MHSA 43	MHSA 19	36.07	Transite	375	375	0.32	24.1	99.2	0.90	0.70	10.27	0.36	
	MHSA 19	MHSA 40	36.07	Transite	375	375	0.32	4.5	99.2	0.90	0.70	10.38	0.36	
Area 49 (Tower A)	CAP	MHSA 40	3.50	Transite	200	200	1.00	24.5	32.8	1.04	0.61	0.67	0.11	
	MHSA 40	MHSA 18	39.57	Transite	375	375	0.32	109.5	99.2	0.90	0.72	12.92	0.40	
	MHSA 18	MHSA 38	39.57	Transite	375	375	0.32	39.1	99.2	0.90	0.72	13.83	0.40	
Area 48 (Tower A)	CAP	MHSA 38	3.17	Transite	200	200	1.00	14.0	32.8	1.04	0.60	0.39	0.10	
	MHSA 38	MHSA 17	42.74	Transite	375	375	0.32	34.7	99.2	0.90	0.74	14.62	0.43	
Area 56 (Parking Garage)	CAP	MHSA 17	1.26	Transite	150	150	1.00	30.2	15.2	0.86	0.47	1.08	0.08	
	MHSA 17	MHSA 39	44.00	Transite	375	375	0.32	85.0	99.2	0.90	0.75	16.52	0.44	
Area 55 (Pavilion)	CAP	MHSA 39	1.05	Transite	150	150	1.00	50.5	15.2	0.86	0.46	1.84	0.07	
	MHSA 39	MHSA 16	45.05	Transite	375	375	0.32	9.0	99.2	0.90	0.75	16.72	0.45	
	MHSA 16	MHSA 41	45.05	Transite	375	375	0.32	42.2	99.2	0.90	0.75	17.66	0.45	
	MHSA 41	MHSA 15	45.05	Transite	375	375	0.32	41.1	99.2	0.90	0.75	18.58	0.45	
Area 54 (Tower B)	CAP	MHSA 15	2.51	Transite	200	200	1.00	5.3	32.8	1.04	0.56	0.16	0.08	
	MHSA 15	MHSA 10	47.56	Transite	375	375	1.00	31.3	175.3	1.59	1.14	19.04	0.27	
Area 52 (Tower B)	CAP	MHSA 12	5.96	Transite	250	250	1.00	30.5	59.5	1.21	0.69	0.74	0.10	
	MHSA 12	MHSA 37	5.96	Transite	300	300	0.32	72.4	54.7	0.77	0.45	2.69	0.11	
Area 53 (Tower B)	CAP	MHSA 37	2.43	Transite	200	200	1.00	27.3	32.8	1.04	0.55	0.82	0.07	
	MHSA 37	MHSA 11	8.39	Transite	300	300	0.32	51.6	54.7	0.77	0.48	4.48	0.15	
	MHSA 11	MHSA 10	8.39	Transite	300	300	0.32	53.1	54.7	0.77	0.48	6.32	0.15	
	MHSA 10	MHSA 42	55.95	Transite	450	450	0.32	21.9	161.3	1.01	0.78	19.51	0.35	
	MHSA 42	CAP	55.95	Transite	450	450	1.00	10.3	285.1	1.79	1.20	19.65	0.20	

Manning's n = 0.013
* Min slope for cleansing velocities is 0.32%

Design:	SS	**Project Name:**	New Civic Development Hospital
Check:	SM		
Date:	April 2023	**Parsons Project #:**	477458

APPENDIX I | STORM CALCULATIONS



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Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	PARSONS

MARK	DATE	DESCRIPTION
01	2022-09-23	ISSUED FOR PRE-CONSULTATION
02	2022-10-28	DRAFT FOR 90% SD
03	2022-11-30	ISSUED FOR SPC & FLUDA - 1ST SUBMISSION
04	2022-12-02	ISSUED FOR 3A1-2
05	2023-02-24	ISSUED FOR RFP VERSION 1.0
06	2023-04-12	RE-ISSUED FOR SITE PLAN CONTROL/FEDERAL LAND USE APPROVAL

Project Number	10333982
Original Issue	04/21/22
File Number	D07-12-22-0168
Plan	18891

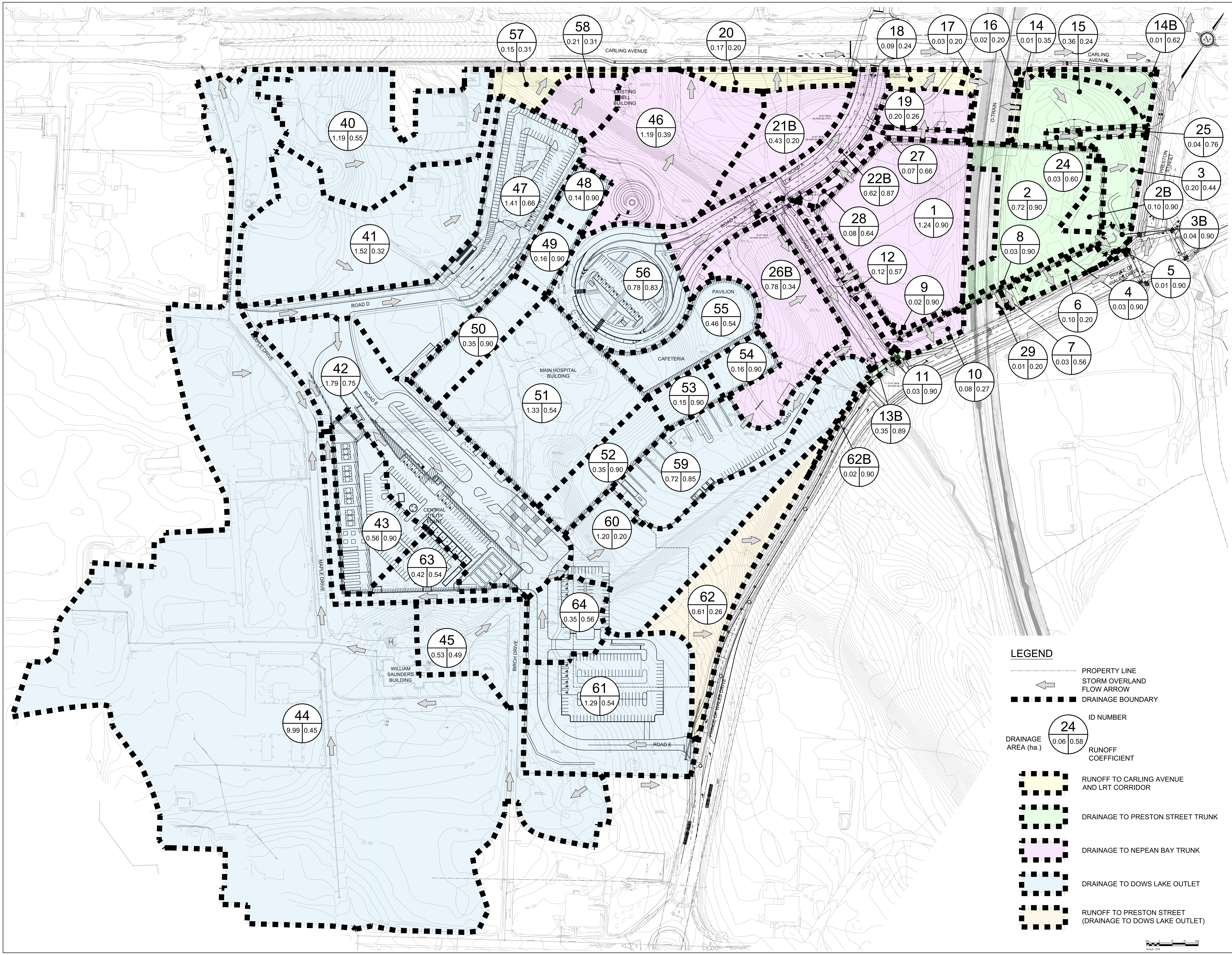
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
PRE-DEVELOPMENT DRAINAGE AREAS

Sheet Number
Figure A

Project Status
STAGE 3

D07-12-22-0...



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NEW CAMPUS DEVELOPMENT FOR THE OTTAWA HOSPITAL | NOUVEAU CAMPUS DE L'HÔPITAL D'OTTAWA

Project Manager	MR
Project Designer	JEG
Project Architect	JEG
Landscape Architect	Jeff Fahs
Civil Engineer	PARSONS
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	Interior Designer
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Project Number	10333982
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File Number	D07-12-22-0168
Plan	18891

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
POST-DEVELOPMENT DRAINAGE AREAS

Sheet Number
Figure B

Project Status
STAGE 3

D07-12-22-0...

TABLE 1 - PRE-DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (ha)	A * $C_{ASPH/ROOF}$	Pervious Grass Areas (ha)	A * C_{GRASS}	Pervious Forest Areas (ha)	A * C_{FOREST}	Pervious Greenroof Areas (ha)	A * $C_{GREENROOF}$	Sum AC	Total Area (ha)	$C_{AVG (5yr)}$	$C_{AVG(100yr)}$
STM01E	0.94	0.85	0.48	0.10	0.06	0.02	0.00	0.00	0.97	1.49	0.65	0.81
STM02E	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.20	0.25
STM03E	0.02	0.02	0.14	0.03	0.09	0.04	0.00	0.00	0.08	0.25	0.33	0.42
STM04E	0.01	0.01	0.20	0.04	0.00	0.00	0.00	0.00	0.05	0.21	0.23	0.29
STM05E	0.04	0.03	0.15	0.03	0.00	0.00	0.00	0.00	0.06	0.19	0.33	0.42
STM06E	0.04	0.03	0.37	0.07	0.00	0.00	0.00	0.00	0.11	0.41	0.26	0.33
STM07E	0.05	0.05	0.80	0.16	0.25	0.10	0.00	0.00	0.31	1.10	0.28	0.35
STM08E	0.00	0.00	0.75	0.15	0.34	0.14	0.00	0.00	0.29	1.09	0.26	0.33
STM09E	0.00	0.00	0.66	0.13	0.00	0.00	0.00	0.00	0.13	0.66	0.20	0.25
STM10E	0.08	0.07	1.04	0.21	0.18	0.07	0.00	0.00	0.35	1.30	0.27	0.34
STM11E	0.01	0.01	0.07	0.01	0.00	0.00	0.00	0.00	0.02	0.08	0.28	0.35
STM12E	0.13	0.12	0.97	0.19	0.25	0.10	0.00	0.00	0.41	1.35	0.30	0.38
STM13E	0.19	0.17	0.16	0.03	0.00	0.00	0.00	0.00	0.20	0.35	0.57	0.71
STM14E	0.75	0.68	1.92	0.38	0.01	0.00	0.00	0.00	1.06	2.68	0.40	0.50
STM15E	0.50	0.45	2.11	0.42	0.27	0.11	0.00	0.00	0.98	2.88	0.34	0.42
STM16E	0.02	0.02	3.33	0.67	0.34	0.13	0.00	0.00	0.82	3.68	0.22	0.28
STM17E	0.09	0.08	1.18	0.24	0.19	0.08	0.00	0.00	0.39	1.46	0.27	0.34
STM18E	0.56	0.50	0.54	0.11	0.08	0.03	0.00	0.00	0.65	1.19	0.55	0.68
STM19E	0.23	0.21	1.21	0.24	0.08	0.03	0.00	0.00	0.48	1.52	0.32	0.39
STM20E	3.34	3.01	5.90	1.18	0.76	0.30	0.00	0.00	4.49	9.99	0.45	0.56
STM21E	0.20	0.18	0.26	0.05	0.08	0.03	0.00	0.00	0.26	0.53	0.49	0.61
STM22E	0.02	0.01	0.23	0.05	0.00	0.00	0.00	0.00	0.06	0.25	0.24	0.30
STM23E	0.01	0.01	0.08	0.02	0.06	0.03	0.00	0.00	0.05	0.15	0.31	0.39
STM24E	0.00	0.00	0.17	0.03	0.00	0.00	0.00	0.00	0.03	0.17	0.20	0.25
STM25E	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.20	0.25
STM26E	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.20	0.25
STM27E	0.01	0.01	0.09	0.02	0.00	0.00	0.00	0.00	0.02	0.09	0.24	0.30
STM28E	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.20	0.25
STM29E	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.35	0.43
Total	**7.22**		**22.96**		**3.04**		**0.00**		**12.31**	**33.23**		

2-Year/5-Year Storm $C_{ASPH/ROOF/CONC}$ = 0.90 C_{GRASS} = 0.20 C_{FOREST} = 0.40 $C_{GREENROOF}$ = 0.54

100-Year Storm $C_{ASPH/ROOF/CONC}$ = 1.00 C_{GRASS} = 0.25 C_{FOREST} = 0.50 $C_{GREENROOF}$ = 0.68

TABLE 2 - ALLOWABLE RUNOFF CALCULATIONS BASED ON PRE-EXISTING CONDITIONS

Area Description	Area (ha)	Time of Conc, Tc (min)	Minor Storm				Major Storm			
				$I_{2,5}$ (mm/hr)	C_{AVG}	$Q_{ALLOWABLE}$ (L/s)		I_{100} (mm/hr)	C_{AVG}	$Q_{ALLOWABLE}$ (L/s)
STM01E	1.489	10	Storm = 2 yr	76.81	0.40	127.17	Storm = 100 yr	178.56	0.81	601.80
STM02E	0.037	10	Storm = 2 yr	76.81	0.20	1.58	Storm = 100 yr	178.56	0.25	4.60
STM03E	0.250	10	Storm = 2 yr	76.81	0.33	17.83	Storm = 100 yr	178.56	0.42	51.80
STM04E	0.210	10	Storm = 2 yr	76.81	0.23	10.32	Storm = 100 yr	178.56	0.29	29.98
STM05E	0.190	15	Storm = 2 yr	61.77	0.33	10.85	Storm = 100 yr	142.89	0.42	31.38
STM06E	0.410	20	Storm = 2 yr	52.03	0.26	15.71	Storm = 100 yr	119.95	0.33	45.27
STM07E	1.101	25	Storm = 2 yr	45.17	0.28	38.44	Storm = 100 yr	103.85	0.35	110.46
STM08E	1.091	25	Storm = 2 yr	45.17	0.26	36.04	Storm = 100 yr	103.85	0.33	103.57
STM09E	0.660	20	Storm = 2 yr	52.03	0.20	19.09	Storm = 100 yr	119.95	0.25	55.02
STM10E	1.300	25	Storm = 2 yr	45.17	0.27	44.32	Storm = 100 yr	103.85	0.34	127.39
STM11E	0.079	10	Storm = 2 yr	76.81	0.28	4.69	Storm = 100 yr	178.56	0.35	13.62
STM12E	1.349	22	Storm = 2 yr	49.02	0.30	55.81	Storm = 100 yr	112.88	0.38	160.65
STM13E	0.350	18	Storm = 2 yr	55.49	0.50	26.99	Storm = 100 yr	128.08	0.71	88.98
STM14E	2.682	10	Storm = 5 yr	104.19	0.40	308.24	Storm = 100 yr	178.56	0.50	660.30
STM15E	2.882	10	Storm = 5 yr	104.19	0.34	283.54	Storm = 100 yr	178.56	0.42	607.38
STM16E	3.685	10	Storm = 5 yr	104.19	0.22	237.40	Storm = 100 yr	178.56	0.28	508.56
STM17E	1.462	10	Storm = 2 yr	76.81	0.27	84.11	Storm = 100 yr	178.56	0.34	244.44
STM18E	1.186	10	Storm = 5 yr	104.19	0.50	171.82	Storm = 100 yr	178.56	0.68	401.29
STM19E	1.523	10	Storm = 5 yr	104.19	0.32	139.27	Storm = 100 yr	178.56	0.39	298.34
STM20E	9.994	10	Storm = 5 yr	104.19	0.45	1299.90	Storm = 100 yr	178.56	0.56	2784.60
STM21E	0.532	10	Storm = 5 yr	104.19	0.49	75.64	Storm = 100 yr	178.56	0.61	162.03
STM22E	0.250	10	Storm = 5 yr	104.19	0.24	17.53	Storm = 100 yr	178.56	0.30	37.55
STM23E	0.152	10	Storm = 2 yr	76.81	0.31	10.21	Storm = 100 yr	178.56	0.39	29.68
STM24E	0.171	10	Storm = 2 yr	76.81	0.20	7.32	Storm = 100 yr	178.56	0.25	21.27
STM25E	0.023	10	Storm = 2 yr	76.81	0.20	0.98	Storm = 100 yr	178.56	0.25	2.84
STM26E	0.031	10	Storm = 2 yr	76.81	0.20	1.32	Storm = 100 yr	178.56	0.25	3.84
STM27E	0.092	10	Storm = 2 yr	76.81	0.24	4.76	Storm = 100 yr	178.56	0.30	13.85
STM28E	0.035	10	Storm = 2 yr	76.81	0.20	1.50	Storm = 100 yr	178.56	0.25	4.35
STM29E	0.014	10	Storm = 2 yr	76.81	0.35	1.03	Storm = 100 yr	178.56	0.43	2.98
$Q_{ALLOWABLE}$ (L/s) LRT & Carling =						**25.62**				
$Q_{ALLOWABLE}$ (L/s) Nepean Bay Trunk =						**265.34**				
$Q_{ALLOWABLE}$ (L/s) Preston Trunk =						145.00				
$Q_{ALLOWABLE}$ (L/s) Preston Trunk (deduct additional proposed sanitary 10.05L/s) =						**134.95**				
$Q_{ALLOWABLE}$ (L/s) Prince of Wales =						**84.11**				
$Q_{ALLOWABLE}$ (L/s) Dows Lake =						**2533.33**				

Allowable Capture Rate is based on the 2-year storm at T_c=10 mins

TABLE 5 - POST DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (ha)	A * $C_{ASPH/ROOF}$	Pervious Grass Areas (ha)	A * C_{GRASS}	Pervious Forest Areas (ha)	A * C_{FOREST}	Pervious Greenroof Areas (ha)	A * $C_{GREENROOF}$	Sum AC	Total Area (ha)	$C_{AVG\ (5yr)}$	$C_{AVG(100yr)}$
STM01	1.24	1.11	0.00	0.00	0.00	0.00	0.00	0.00	1.11	1.24	0.90	1.00
STM02	0.72	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.72	0.90	1.00
STM02B	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.10	0.90	1.00
STM03	0.07	0.06	0.13	0.03	0.00	0.00	0.00	0.00	0.09	0.20	0.44	0.55
STM03B	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.90	1.00
STM04	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.90	1.00
STM05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.90	1.00
STM06	0.00	0.00	0.10	0.02	0.00	0.00	0.00	0.00	0.02	0.10	0.20	0.25
STM07	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.56	0.70
STM08	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.90	1.00
STM09	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.90	1.00
STM10	0.01	0.01	0.07	0.01	0.00	0.00	0.00	0.00	0.02	0.08	0.27	0.34
STM11	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.90	1.00
STM12	0.06	0.06	0.06	0.01	0.00	0.00	0.00	0.00	0.07	0.12	0.57	0.71
STM13B	0.34	0.31	0.01	0.00	0.00	0.00	0.00	0.00	0.31	0.35	0.89	1.00
STM14	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.35	0.43
STM14B	0.01	0.01	0.08	0.02	0.04	0.02	0.00	0.00	0.04	0.13	0.30	0.37
STM15	0.01	0.01	0.31	0.06	0.03	0.01	0.00	0.00	0.09	0.36	0.24	0.31
STM16	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.20	0.25
STM17	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.20	0.25
STM18	0.01	0.00	0.09	0.02	0.00	0.00	0.00	0.00	0.02	0.09	0.24	0.30
STM19	0.02	0.02	0.19	0.04	0.00	0.00	0.00	0.00	0.05	0.20	0.26	0.33
STM20	0.00	0.00	0.17	0.03	0.00	0.00	0.00	0.00	0.03	0.17	0.20	0.25
STM21B	0.00	0.00	0.43	0.09	0.00	0.00	0.00	0.00	0.09	0.43	0.20	0.25
STM22B	0.59	0.53	0.03	0.01	0.00	0.00	0.00	0.00	0.54	0.62	0.87	1.00
STM24	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.60	0.75
STM25	0.03	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.76	0.94
STM26B	0.07	0.06	0.40	0.08	0.31	0.12	0.00	0.00	0.26	0.78	0.34	0.43
STM27	0.05	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.66	0.82
STM28	0.05	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.05	0.08	0.64	0.80
STM29	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.20	0.25
STM40	0.56	0.50	0.54	0.11	0.08	0.03	0.00	0.00	0.65	1.19	0.55	0.68
STM41	0.23	0.21	1.21	0.24	0.08	0.03	0.00	0.00	0.48	1.52	0.32	0.39
STM42	1.36	1.22	0.33	0.07	0.00	0.00	0.10	0.05	1.34	1.79	0.75	0.94
STM43	0.56	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.56	0.90	1.00
STM44	3.34	3.01	5.90	1.18	0.76	0.30	0.00	0.00	4.49	9.99	0.45	0.56
STM45	0.20	0.18	0.26	0.05	0.08	0.03	0.00	0.00	0.26	0.53	0.49	0.61
STM46	0.25	0.22	0.67	0.13	0.27	0.11	0.00	0.00	0.47	1.19	0.39	0.49
STM47	0.93	0.84	0.48	0.10	0.00	0.00	0.00	0.00	0.94	1.41	0.66	0.83
STM48	0.14	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.14	0.90	1.00
STM49	0.16	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.16	0.90	1.00
STM50	0.35	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.35	0.90	1.00
STM51	0.00	0.00	0.00	0.00	0.00	0.00	1.33	0.72	0.72	1.33	0.54	0.68
STM52	0.35	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.35	0.90	1.00
STM53	0.15	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.15	0.90	1.00
STM54	0.16	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.16	0.90	1.00
STM55	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.25	0.25	0.46	0.54	0.68
STM56	0.62	0.56	0.00	0.00	0.00	0.00	0.16	0.09	0.65	0.78	0.83	1.00
STM57	0.01	0.01	0.08	0.02	0.06	0.03	0.00	0.00	0.05	0.15	0.31	0.39
STM58	0.00	0.00	0.09	0.02	0.12	0.05	0.00	0.00	0.07	0.21	0.31	0.39
STM59	0.67	0.60	0.05	0.01	0.00	0.00	0.00	0.00	0.61	0.72	0.85	1.00
STM60	0.00	0.00	1.18	0.24	0.01	0.01	0.00	0.00	0.24	1.20	0.20	0.25
STM61	0.62	0.56	0.67	0.13	0.00	0.00	0.00	0.00	0.70	1.29	0.54	0.67
STM62	0.00	0.00	0.44	0.09	0.17	0.07	0.00	0.00	0.16	0.61	0.26	0.32
STM62B	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.90	1.00
STM63	0.21	0.18	0.22	0.04	0.00	0.00	0.00	0.00	0.23	0.42	0.54	0.67
STM64	0.18	0.16	0.17	0.03	0.00	0.00	0.00	0.00	0.19	0.35	0.56	0.69
Total	**14.61**		**14.52**		**2.02**				**17.97**	**33.20**		

5-year Storm	$C_{ASPH/ROOF/CONC}$ =	0.90	C_{GRASS} =	0.20	C_{FOREST} =	0.40	$C_{GREENROOF}$ =	0.54
100-year Storm	$C_{ASPH/ROOF/CONC}$ =	1.00	C_{GRASS} =	0.25	C_{FOREST} =	0.50	$C_{GREENROOF}$ =	0.68

STORM SEWER DESIGN SHEET

Rational Method	
	Q = Flow (L/sec)
Q = 2.78*A*I*R	A = Area (ha)
	I = Rainfall Intensity (mm/h)
	R = Ave. Runoff Coefficient

Ottawa IDF Curve - 5-y (MacDonald Cartier Airport)

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area* (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Controlled Flow* Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
STM10I	LD 27	LD 26	0.083	0.27	0.06	0.06	10.00	104.19		6.43	250	254	0.50	14.2	43.87	0.87	0.54	0.27	0.15	
	LD 26	LD 25				0.06	10.27	102.79		6.34	250	254	0.50	3.0	43.87	0.87	0.53	0.06	0.14	
	LD 25	LD 21				0.06	10.33	102.48		6.32	250	254	0.50	20.2	43.87	0.87	0.53	0.39	0.14	
	LD 21	LD 20				0.06	10.72	100.54		6.20	250	254	0.50	19.9	43.87	0.87	0.53	0.38	0.14	
	LD 20	LD 19				0.06	11.10	98.72		6.09	250	254	0.50	7.5	43.87	0.87	0.53	0.14	0.14	
	LD 19	CBMHST 112				0.06	11.24	98.07		6.05	250	254	0.50	12.9	43.87	0.87	0.53	0.25	0.14	
STM13I	CBMHST 112	MHST 105	0.307	0.88	0.76	0.82	11.49	96.93		79.26	300	305	1.00	10.3	100.88	1.38	1.37	0.12	0.79	
STM09I			0.024	0.90	0.06	0.06														
STM01I	PARKING GARAGE	TEE	1.236	0.90	3.09	3.15	10.00	104.19	60.0	60.00	250	254	2.00	62.5	87.74	1.73	1.64	0.60	0.68	Building Pump Release Rate
STM26I			0.407	0.36	0.41	0.41			8.0	7.95										Reduced Flow, refer to ICD 7
STM12I	MHST 105	MHST 104	0.118	0.57	0.19	1.01	11.61	96.39	**68.0**	164.86	1200	1219	0.10	126.2	1286.19	1.10	0.66	1.91	0.13	
	MHST 104	MHST 103				1.01	13.52	88.67	**68.0**	157.09	1200	1219	0.10	32.6	1286.19	1.10	0.65	0.49	0.12	
STM22I	CAP	MHST 106	0.363	0.85	0.85	0.85	10.00	104.19		89.03	1500	1524	0.10	17.1	2332.02	1.28	0.61	0.22	0.04	
	MHST 106	MHST 103				0.85	10.22	103.04		88.05	1500	1524	0.10	29.4	2332.02	1.28	0.61	0.38	0.04	
STM28I	MHST 103	MHST 102	0.075	0.64	0.13	1.99	14.01	86.90	**68.0**	241.13	1500	1524	0.10	53.1	2332.02	1.28	0.73	0.69	0.10	
	MHST 102	MHST 101				1.99	14.70	84.54	**68.0**	236.42	1500	1524	0.10	27.3	2332.02	1.28	0.73	0.36	0.10	
STM19I	CB 37	MHST 109	0.204	0.26	0.15	0.15	10.00	104.19	3.7	3.65	300	305	0.50	17.5	71.33	0.98	0.49	0.30	0.05	Reduced Flow, refer to ICD 2
STM27I	MHST 109	MHST 108	0.071	0.66	0.13	0.13	10.30	102.63	**3.7**	16.99	300	305	0.50	38.0	71.33	0.98	0.68	0.65	0.24	
	MHST 108	MHST 101				0.13	10.95	99.43	**3.7**	16.57	300	305	0.50	25.2	71.33	0.98	0.67	0.43	0.23	
	MHST 101	MHST 100				2.12	15.06	83.36	**71.6**	248.57	900	914	0.10	27.5	597.22	0.91	0.75	0.50	0.42	
	MHST 100	OGS 2				2.12	15.56	81.79	149.9	149.85	900	914	0.30	6.0	1034.42	1.58	0.96	0.06	0.14	Reduced Flow, refer to ICD 6
	OGS 2	STMH01882					15.62	81.61	**149.9**	149.85	900	914	1.30	21.6	2153.31	3.28	1.74	0.11	0.07	
STM23I			0.895	0.20	0.50	0.50														
STM21I	CB 35	IN119606	2.138	0.27	1.62	2.12	10.00	104.19	2.6	2.64	300	305	0.18	51.1	42.80	0.59	0.29	1.45	0.06	Reduced Flow, refer to ICD 5
STM20I	IN119606	IN119607	0.171	0.20	0.10	0.10	10.00	104.19	**2.6**	12.57	300	305	0.10	5.1	31.90	0.44	0.35	0.19	0.39	
STM07I	CB 31	CAP at BLDG	0.029	0.56	0.05	0.05	10.00	104.19		4.75	200	203	2.00	7.7	48.39	1.49	0.85	0.09	0.10	
STM06I	LD 22	LD 23	0.101	0.20	0.06	0.06	10.00	104.19		5.83	250	254	0.50	59.9	43.87	0.87	0.52	1.15	0.13	
	LD 23	LD 24				0.06	11.15	98.49		5.51	250	254	0.50	25.6	43.87	0.87	0.52	0.49	0.13	
STM03IB	LD 24	LD 2	0.043	0.90	0.11	0.16	11.64	96.26		15.79	250	254	0.50	7.0	43.87	0.87	0.68	0.13	0.36	
	LD 2	DITCH				0.16	11.77	95.69		15.69	250	254	0.50	15.3	43.87	0.87	0.68	0.29	0.36	
STM14IB	IN82661	MHCH 2	0.128	0.30	0.10	0.10	10.00	104.19	18.9	18.94	250	254	0.50	59.9	43.87	0.87	0.71	1.15	0.43	Reduced Flow, refer to ICD 1
STM24I	CB 32	MHST 107	0.034	0.60	0.06	0.06	10.00	104.19		5.91	200	203	2.00	20.0	48.39	1.49	0.88	0.22	0.12	
STM15I	CB 36	MHST 107	0.360	0.24	0.25	0.25	10.00	104.19	7.2	7.15	200	203	2.15	10.4	50.17	1.55	0.94	0.11	0.14	Reduced Flow, refer to ICD 4
STM08I			0.026	0.90	0.06	0.06														
STM04I			0.027	0.90	0.07	0.07														
STM02IB			0.103	0.90	0.26	0.26														
STM02I	PARKING GARAGE	MHST 107	0.723	0.90	1.81	2.20	10.00	104.19	7.0	7.00	200	203	2.00	10.7	48.39	1.49	0.91	0.12	0.14	Building Pump Release Rate
STM03I			0.198	0.44	0.24	0.41			24.0	24.04										Reduced Flow, refer to ICD 3
STM25I	MHST 107	OGS 1	0.044	0.76	0.09	0.15	10.22	103.04	**38.2**	53.51	300	305	1.50	52.5	123.55	1.69	1.39	0.52	0.43	
	OGS 1	MHCH 1				0.15	10.74	100.44	**38.2**	53.12	300	305	1.50	9.3	123.55	1.69	1.39	0.09	0.43	
	MHCH 1	MHCH 2				0.15	10.83	100.00	**38.2**	53.06	300	305	1.50	21.9	123.55	1.69	1.39	0.22	0.43	

Design:	S. Sterling	**Project:**	The Ottawa Hospital New Civic Development Parking Garage
Check:	S. Mitchelson	**Project #:**	477458 & 478340
Date:	March 14, 2023	**Client:**	

PCSWMM Report

24 Hour - 2year - Partial Green Roof

Model Permanent Dewatering.inp

March 6, 2023

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Summaries

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Summary 1: Inflows

Name	Permanent Dewatering
Time series inflows	1
Dry weather	0
Groundwater	0
RDII inflows	0

Summary 2: Runoff quantity continuity

Name	Permanent Dewatering
Initial LID storage (mm)	0.160
Initial snow cover (mm)	n/a
Total precipitation (mm)	48.408
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	24.461
Surface runoff (mm)	21.019
LID drainage (mm)	0.501
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.601
Continuity error (%)	-0.027

Summary 3: Flow routing continuity

Name	Permanent Dewatering
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	7.144
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.100
External outflow (ML)	8.591
Flooding loss (ML)	0.000
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	0.426
Continuity error (%)	-9.379

Summary 4: Results statistics

Name	Permanent Dewatering
Max. subcatchment total runoff (ML)	1.63
Max. subcatchment peak runoff (L/s)	769.62
Max. subcatchment runoff coefficient	0.976
Max. subcatchment total precip (mm)	48.41
Min. subcatchment total precip (mm)	48.41
Max. node depth (m)	2.52
Num. nodes surcharged	2
Max. node surcharge duration (hours)	24
Max. node height above crown (m)	1.295
Min. node depth below rim (m)	0
Num. nodes flooded	0
Max. node flooding duration (hours)	0
Max. node flood volume (ML)	0
Max. node ponded volume or depth (ha-mm/1000 m^3/m)	0
Max. storage volume (1000 m^3)	0.355
Max. storage percent full (%)	23
Max. outfall flow frequency (%)	98.38
Max. outfall peak flow (L/s)	956.42
Max. outfall total volume (ML)	6.601
Total outfall volume (ML)	8.591
Max. link peak flow (L/s)	1083.7
Max. link peak velocity (m/s)	19.28
Min. link peak velocity (m/s)	0
Num. conduits surcharged	2
Max. conduit surcharge duration (hours)	20.14
Max. conduit capacity limited duration (hours)	0.01

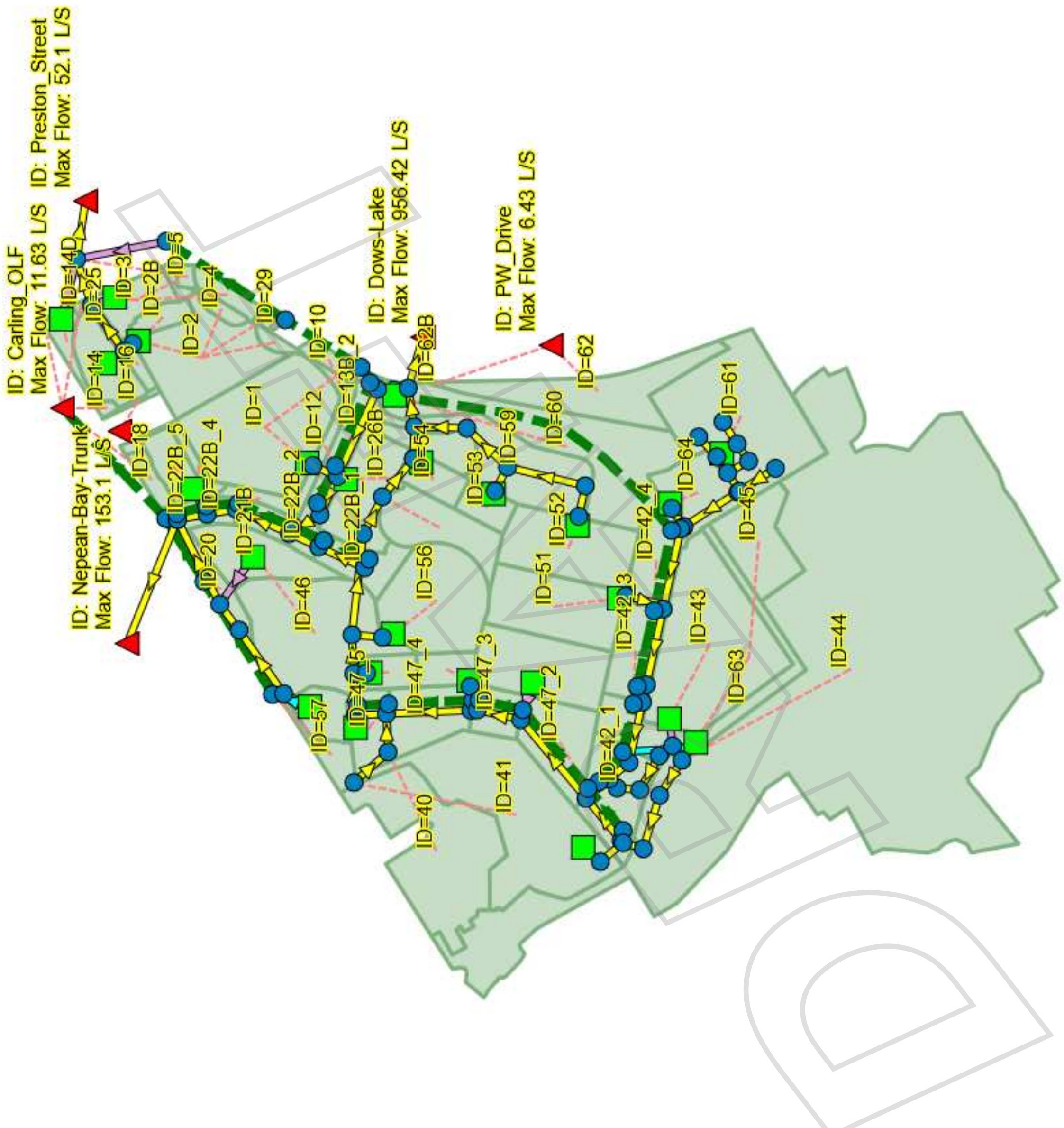

Figure 1: Extent 1

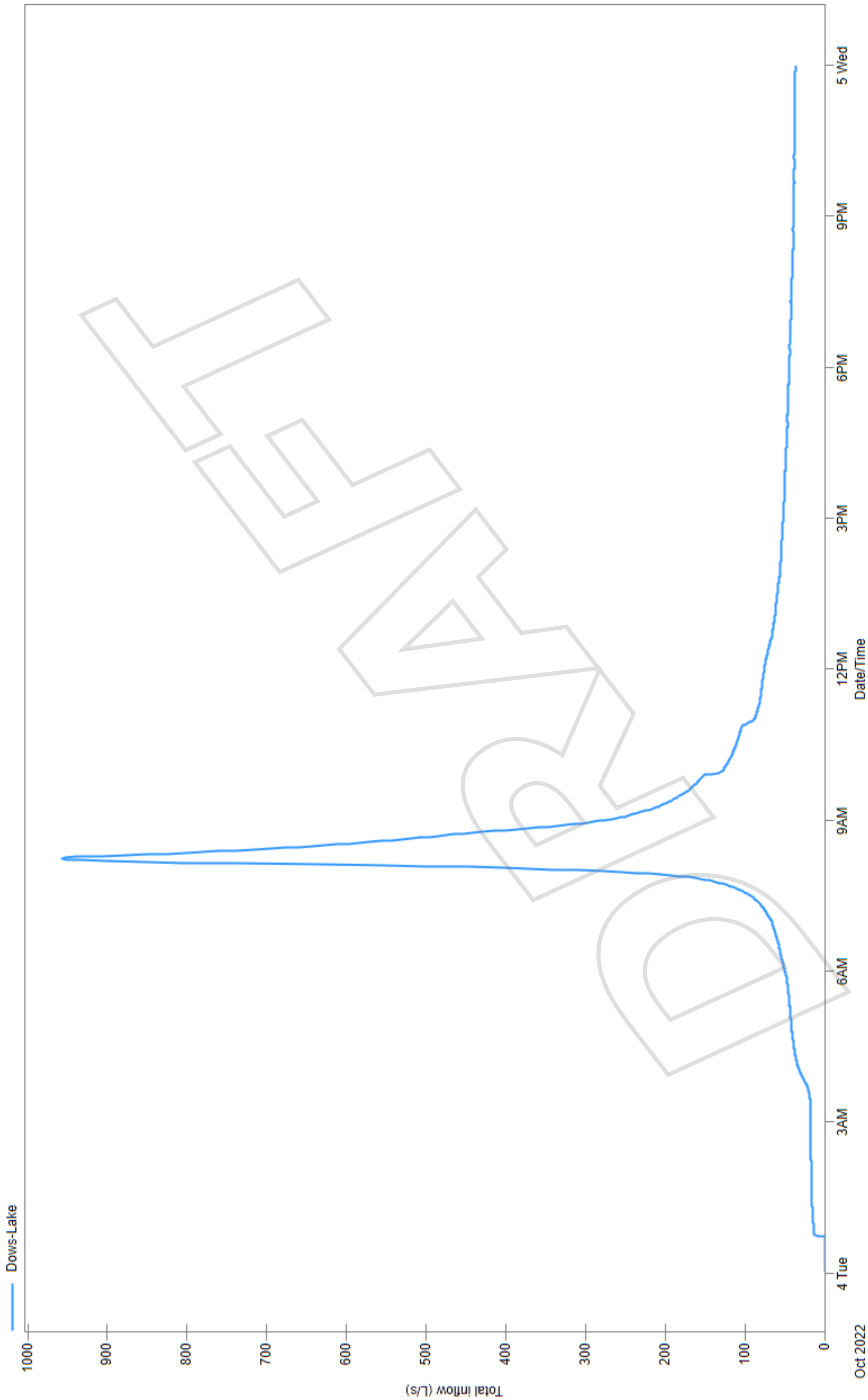

Figure 2: Dows Lake

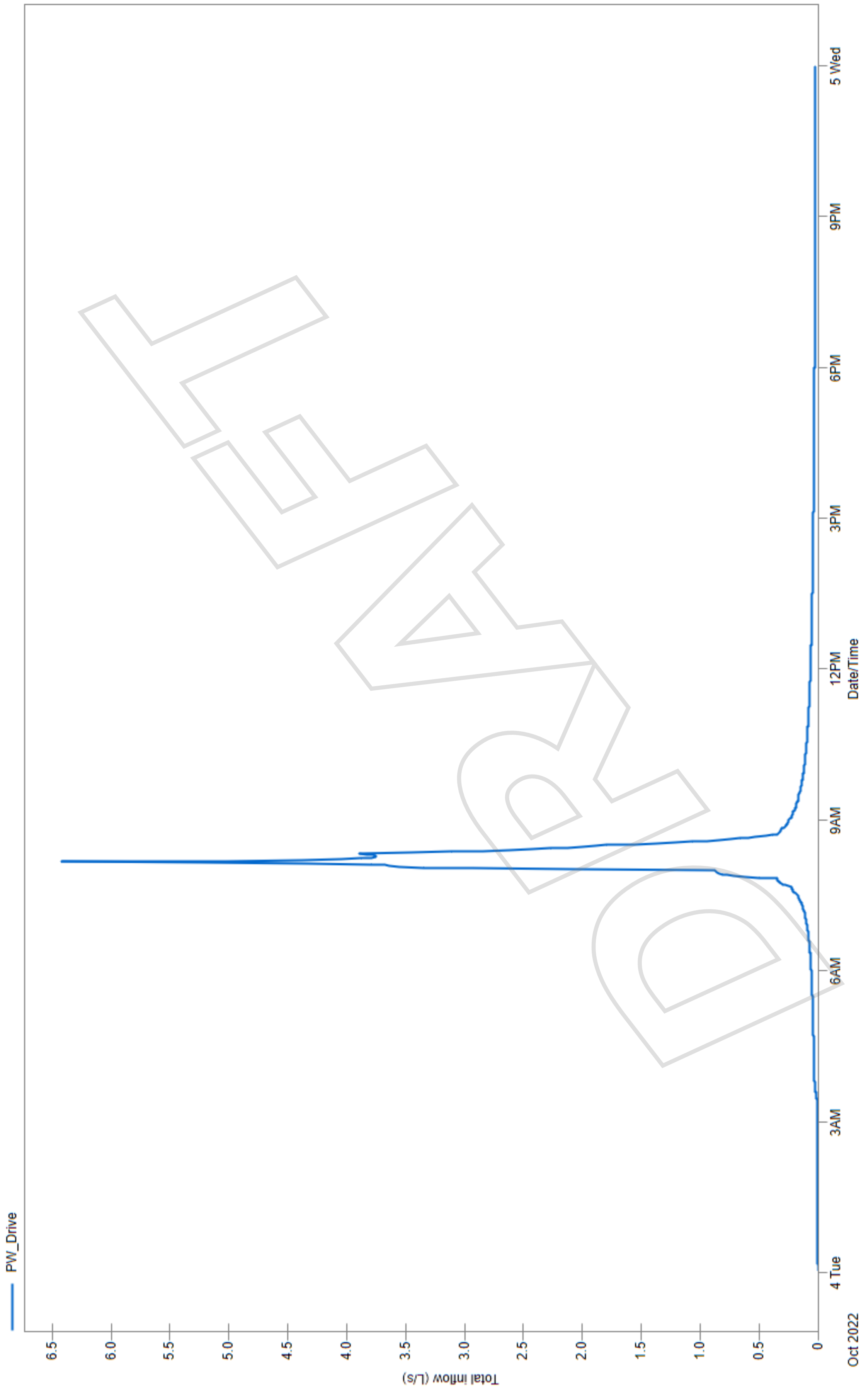

Figure 3: Prince of Wales

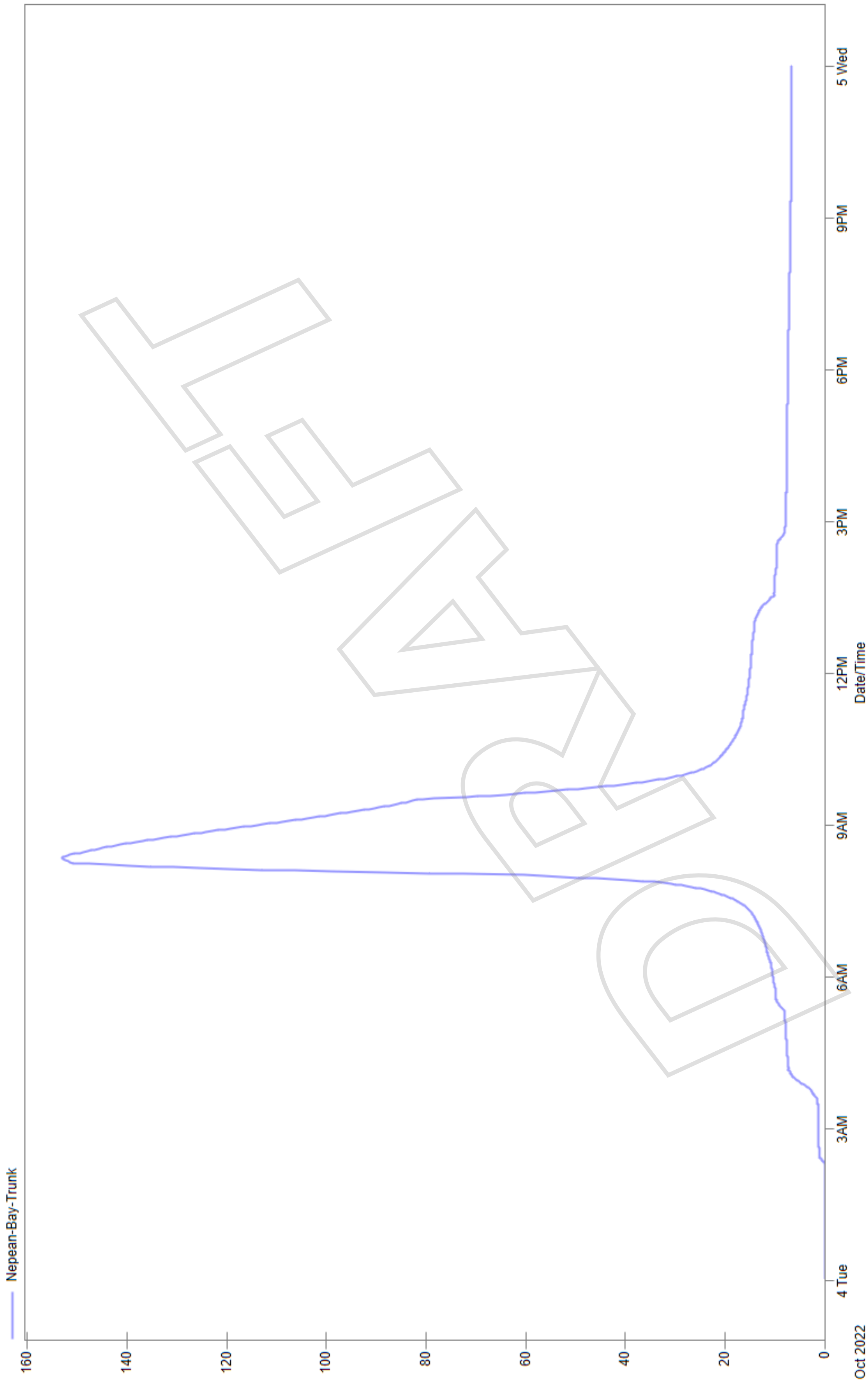

Figure 4: Nepean Bay Trunk

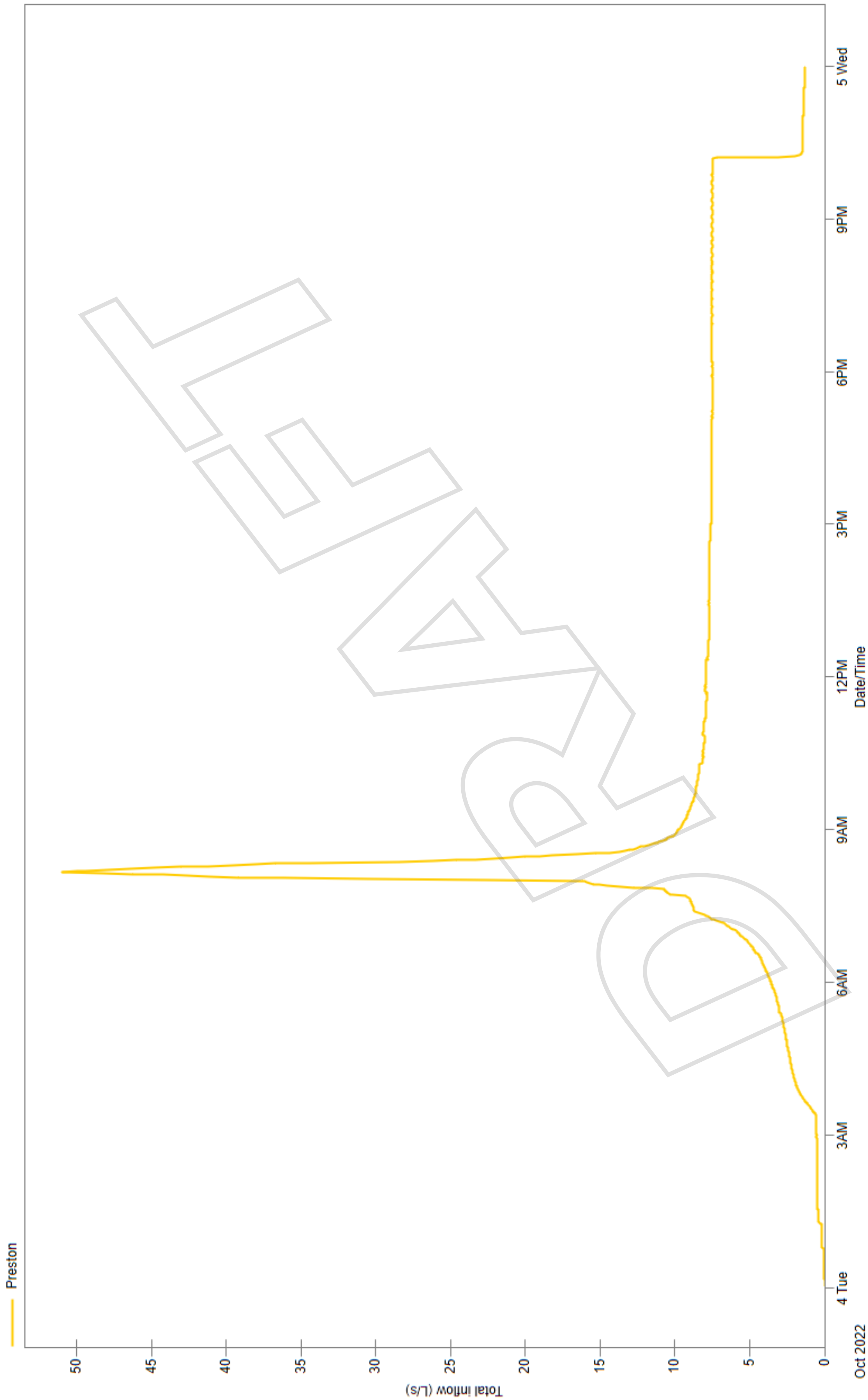

Figure 5: Preston Street

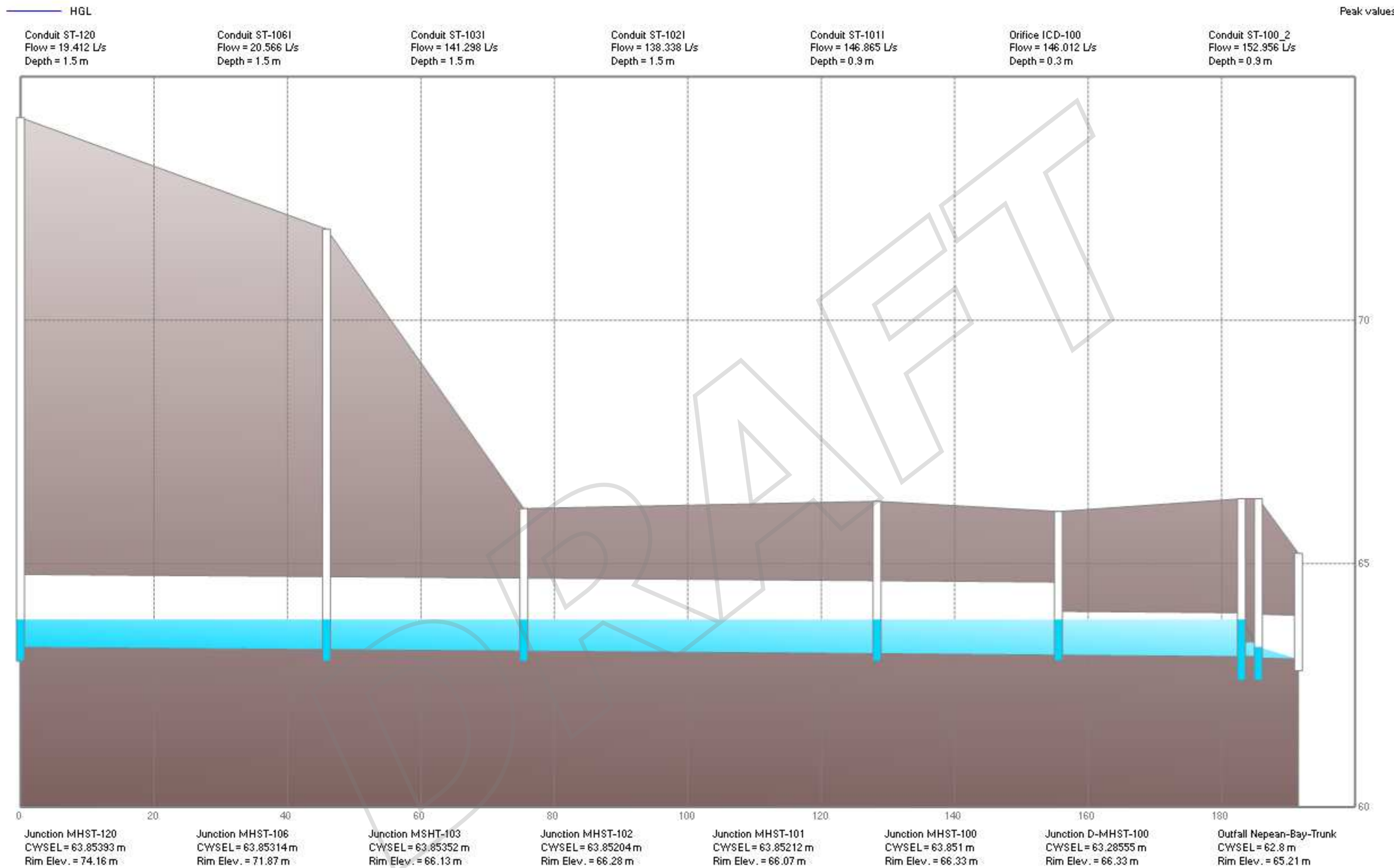

Figure 6: Road A

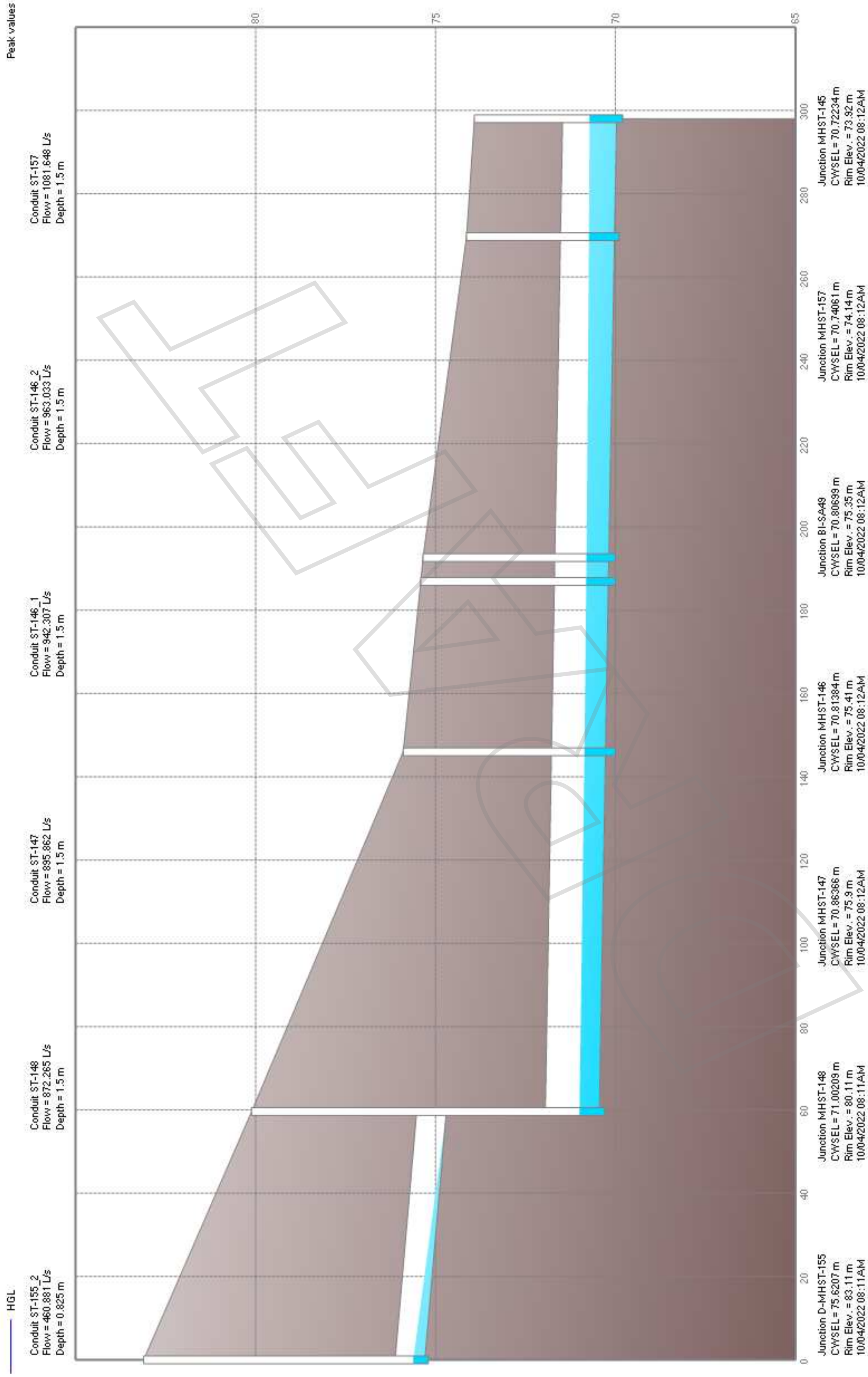

Figure 7: Road D

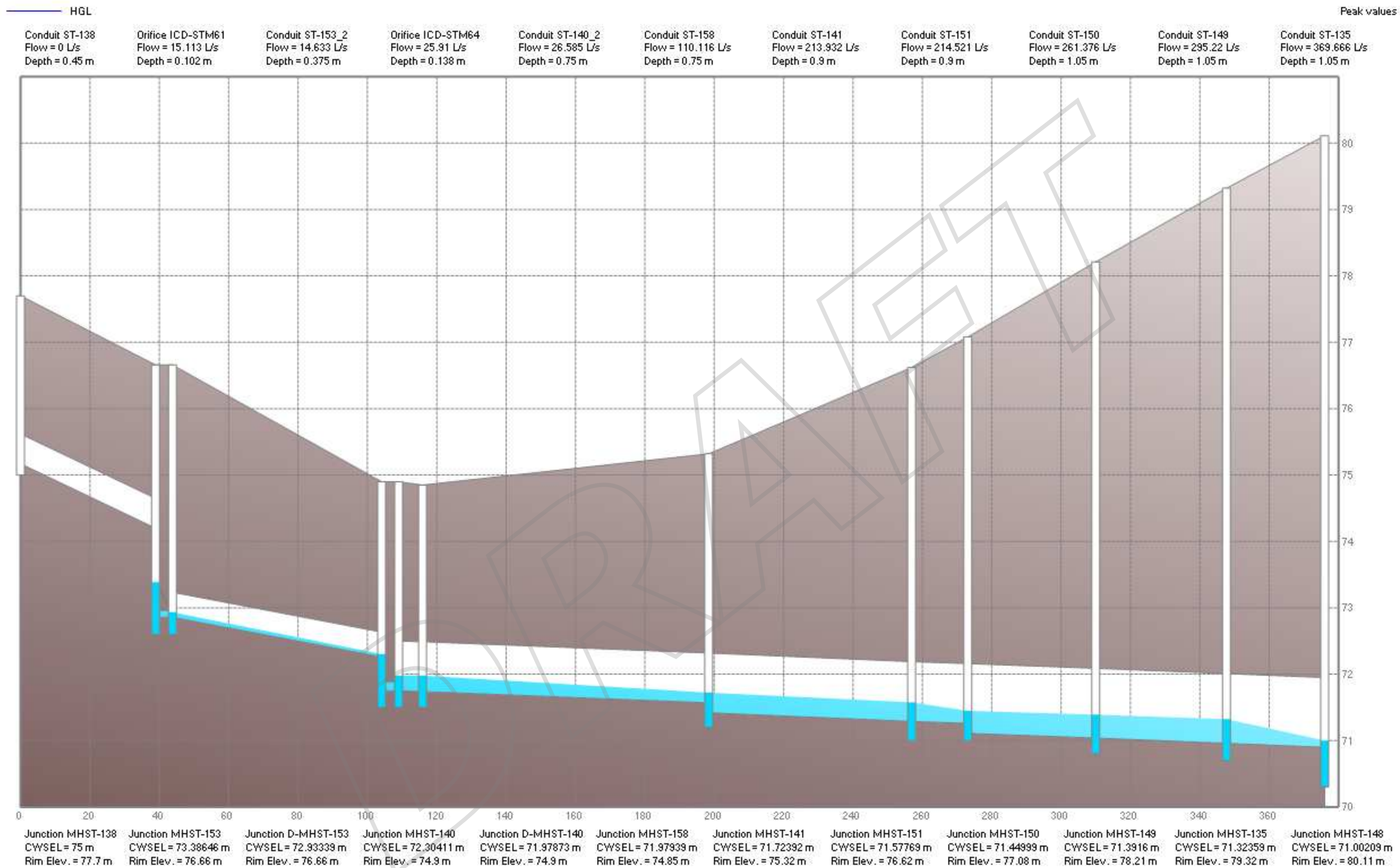

Figure 8: Road E

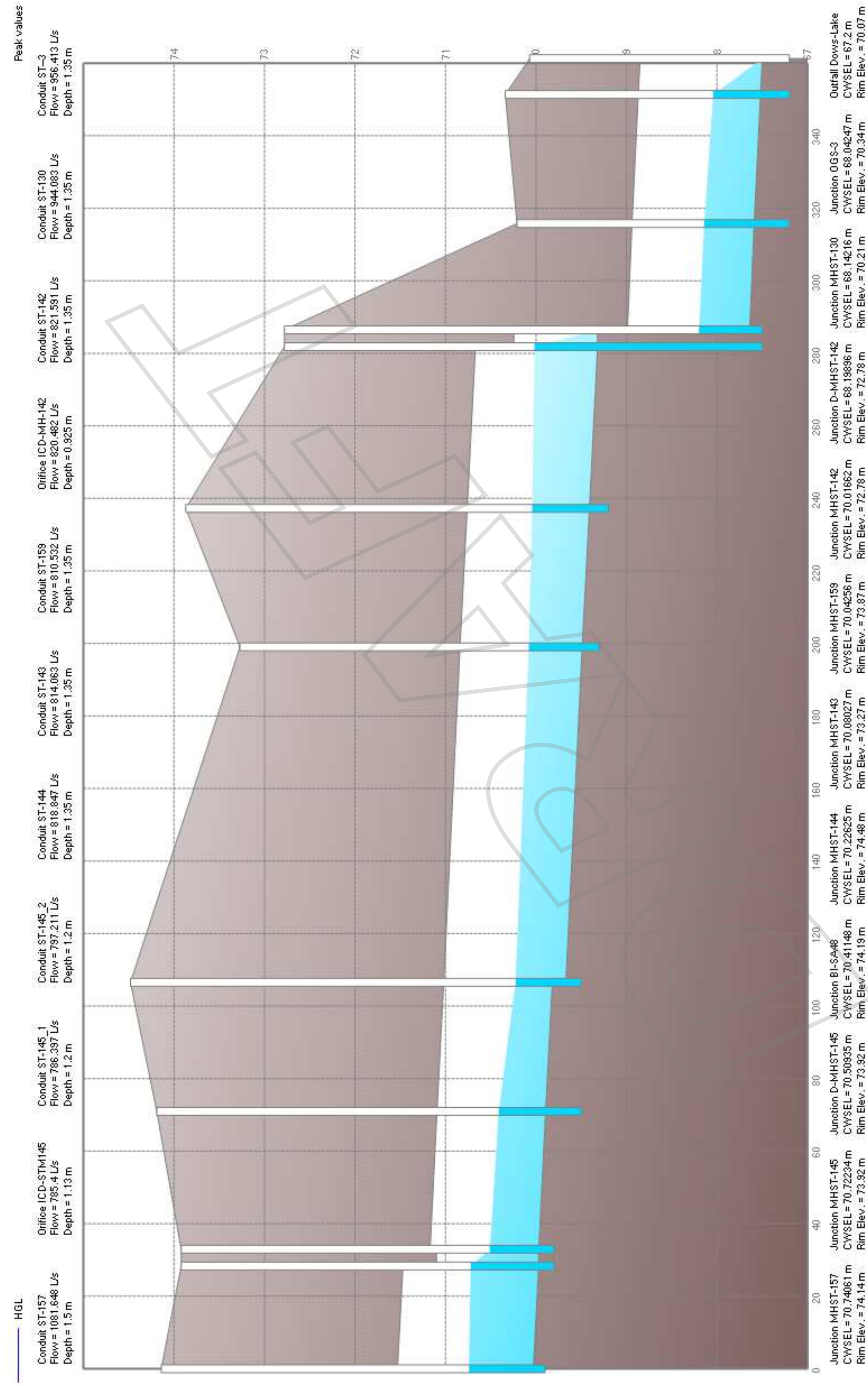

Figure 9: Road D to Dows Lake Outfall

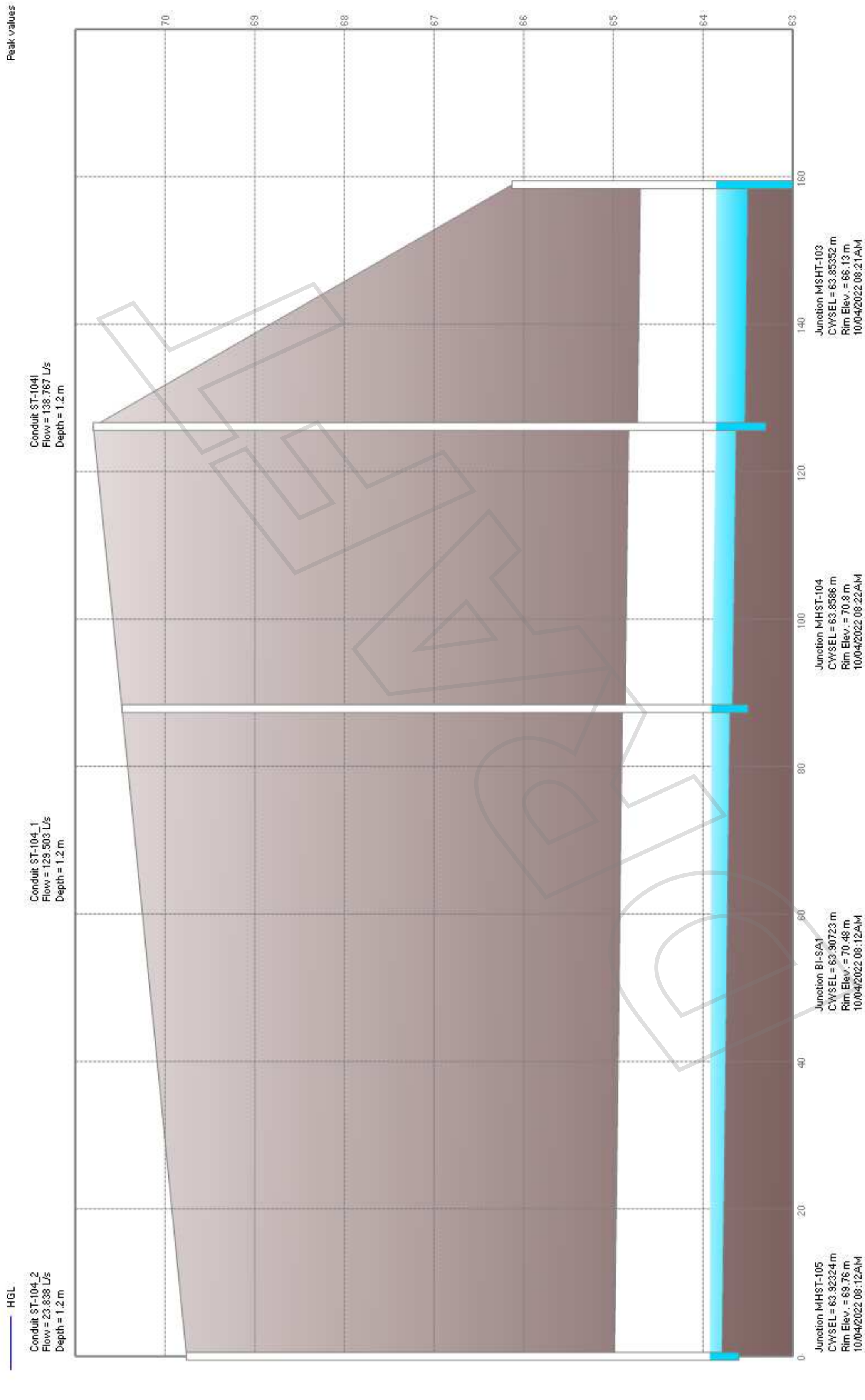

Figure 10: Road B

Table 1: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
1	24Hour-2Year-City	SA-1	1.2364	3	100	0.016	0.15	1.57	4.67	25	48.41	0	257.92
10	24Hour-2Year-City	13B_2	0.0828	3	9.73	0.016	0.15	1.57	4.67	25	48.41	41.92	4.61
11	24Hour-2Year-City	Wales-OLF-N03	0.03	3	100	0.016	0.15	1.57	4.67	25	48.41	0	6.4
12	24Hour-2Year-City	BI-SA1-S	0.1182	5	53.01	0.016	0.15	1.57	4.67	25	48.41	21.5	18.81
13B_1	24Hour-2Year-City	MHST-104-S	0.13	5	98.08	0.016	0.15	1.57	4.67	25	48.41	0.87	27.39
13B_2	24Hour-2Year-City	BI-SA1-S	0.22	5	98.08	0.016	0.15	1.57	4.67	25	48.41	0.9	48
14	24Hour-2Year-City	Carling_OLF	0.014	3	15.98	0.016	0.15	1.57	4.67	25	48.41	38.94	1
14B	24Hour-2Year-City	S-14B	0.0986	3	0	0.016	0.15	1.57	4.67	25	48.41	46.07	6.23
14C	24Hour-2Year-City	Carling_OLF	0.0104	3	59.6	0.016	0.15	1.57	4.67	25	48.41	18.52	1.69
14D	24Hour-2Year-City	Carling_OLF	0.0185	3	100	0.016	0.15	1.57	4.67	25	48.41	0	3.95
15	24Hour-2Year-City	S-15	0.36	3	3.65	0.016	0.15	1.57	4.67	25	48.41	45.45	7.98
16	24Hour-2Year-City	LRT-Corridor	0.023	3	0	0.016	0.15	1.57	4.67	25	48.41	45.79	2.14
17	24Hour-2Year-City	LRT-Corridor	0.031	3	0	0.016	0.15	1.57	4.67	25	48.41	45.96	2.27
18	24Hour-2Year-City	Carling_OLF	0.0913	3	5.91	0.016	0.15	1.57	4.67	25	48.41	43.81	3.98
19	24Hour-2Year-City	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	48.41	42.77	7.93
2	24Hour-2Year-City	SA-2	0.7231	3	100	0.016	0.15	1.57	4.67	25	48.41	0	166.49
20	24Hour-2Year-City	Carling_OLF_N01_1	0.1714	8	0	0.016	0.15	1.57	4.67	25	48.41	46.12	10.11
21B	24Hour-2Year-City	S-21B	0.434	10	0	0.016	0.15	1.57	4.67	25	48.41	62.04	49.95
22B_1	24Hour-2Year-City	MHST-120-S	0.262	5	95.43	0.016	0.15	1.57	4.67	25	48.41	2.09	53.54
22B_2	24Hour-2Year-City	MHST-106-S	0.061	5	95.43	0.016	0.15	1.57	4.67	25	48.41	2.08	12.8
22B_3	24Hour-2Year-City	MSHT-103-S	0.132	5	95.43	0.016	0.15	1.57	4.67	25	48.41	2.08	27.55
22B_4	24Hour-2Year-City	MHST-102-S	0.071	5	95.43	0.016	0.15	1.57	4.67	25	48.41	2.08	14.89
22B_5	24Hour-2Year-City	MHST-101-S	0.091	5	95.43	0.016	0.15	1.57	4.67	25	48.41	2.08	19.06
24	24Hour-2Year-City	MHST-107	0.034	3	56.98	0.016	0.15	1.57	4.67	25	48.41	19.94	4.76
25	24Hour-2Year-City	OGS1	0.0438	3	79.37	0.016	0.15	1.57	4.67	25	48.41	9.56	7.8
26B	24Hour-2Year-City	S-26B	0.776	9.406	8.78	0.016	0.15	1.57	4.67	25	48.41	43.18	22.96
27	24Hour-2Year-City	MHST-101-S	0.071	3	65.62	0.016	0.15	1.57	4.67	25	48.41	15.73	12.31

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
28	24Hour-2Year-City	MHST-102-S	0.075	5	62.44	0.016	0.15	1.57	4.67	25	48.41	17.19	12.73
29	24Hour-2Year-City	7	0.008	3	0	0.016	0.15	1.57	4.67	25	48.41	46.53	0.27
2B	24Hour-2Year-City	SA-2	0.103	3	100	0.016	0.15	1.57	4.67	25	48.41	0	21.97
3	24Hour-2Year-City	S-3	0.198	3	34.51	0.016	0.15	1.57	4.67	25	48.41	34.25	30.96
3B	24Hour-2Year-City	3	0.0431	3	100	0.016	0.15	1.57	4.67	25	48.41	0	9.19
4	24Hour-2Year-City	2	0.0269	3	100	0.016	0.15	1.57	4.67	25	48.41	0	5.74
40	24Hour-2Year-City	MHST-156	1.186	6.77	47.28	0.016	0.15	1.57	4.67	25	48.41	24.95	126.55
41	24Hour-2Year-City	MHST-132	1.523	3	14.99	0.016	0.15	1.57	4.67	25	48.41	40.73	54.14
42_1	24Hour-2Year-City	MHST-135-S	0.4	5	75.88	0.016	0.15	1.57	4.67	25	48.41	11.11	71.08
42_2	24Hour-2Year-City	MHST-149-S	0.31	5	75.88	0.016	0.15	1.57	4.67	25	48.41	11.13	54.45
42_3	24Hour-2Year-City	MHST-150-S1	0.61	2	75.88	0.016	0.15	1.57	4.67	25	48.41	11.27	101.52
42_4	24Hour-2Year-City	MHST-141-S	0.47	2	75.88	0.016	0.15	1.57	4.67	25	48.41	11.2	80.11
43	24Hour-2Year-City	SA-CUP	0.56	2	100	0.016	0.15	1.57	4.67	25	48.41	0	118.6
44	24Hour-2Year-City	MHST-62534	9.994	3	33.41	0.016	0.15	1.57	4.67	25	48.41	31.65	769.62
45	24Hour-2Year-City	63	0.532	4	37.33	0.016	0.15	1.57	4.67	25	48.41	29.41	49.21
46	24Hour-2Year-City	21B	1.188	10	21.02	0.016	0.15	1.57	4.67	25	48.41	37.36	64.99
47_1	24Hour-2Year-City	D-MHST-155-S	0.11	3	65.85	0.016	0.15	1.57	4.67	25	48.41	15.77	17.49
47_2	24Hour-2Year-City	MHST-148-S	0.46	3	65.85	0.016	0.15	1.57	4.67	25	48.41	16.09	66.12
47_3	24Hour-2Year-City	MHST-147-S	0.19	3	65.85	0.016	0.15	1.57	4.67	25	48.41	15.88	28.97
47_4	24Hour-2Year-City	MHST-146-S	0.4	3	65.85	0.016	0.15	1.57	4.67	25	48.41	16.06	58.09
47_5	24Hour-2Year-City	MHST-157-S	0.25	3	65.85	0.016	0.15	1.57	4.67	25	48.41	15.95	37.43
48	24Hour-2Year-City	SA-48	0.138	2	100	0.016	0.15	1.57	4.67	25	48.41	0	29.21
49	24Hour-2Year-City	SA-49	0.164	2	100	0.016	0.15	1.57	4.67	25	48.41	0	34.53
5	24Hour-2Year-City	preston	0.00928	3	100	0.016	0.15	1.57	4.67	25	48.41	0	1.98
50	24Hour-2Year-City	SA-50	0.345	2	100	0.016	0.15	1.57	4.67	25	48.41	0	68.42
51	24Hour-2Year-City	SA-51	1.33	2	0	0.016	0.15	1.57	4.67	25	48.41	4.54	4.85
52	24Hour-2Year-City	SA-52	0.346	2	100	0.016	0.15	1.57	4.67	25	48.41	0	68.59

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
53	24Hour-2Year-City	SA-53	0.15	2	100	0.016	0.15	1.57	4.67	25	48.41	0	31.67
54	24Hour-2Year-City	SA-54	0.155	2	100	0.016	0.15	1.57	4.67	25	48.41	0	32.7
55	24Hour-2Year-City	MHST-159	0.455	2	0	0.016	0.15	1.57	4.67	25	48.41	4.8	1.76
56	24Hour-2Year-City	SA-56	0.784	2	79.52	0.016	0.15	1.57	4.67	25	48.41	9.56	135.14
57	24Hour-2Year-City	Carling_OLF_N01	0.152	15	4.5	0.016	0.15	1.57	4.67	25	48.41	43.89	12.18
58	24Hour-2Year-City	S-58	0.212	16	0	0.016	0.15	1.57	4.67	25	48.41	46.69	5.92
59	24Hour-2Year-City	MHST-133	0.715	2	93.37	0.016	0.15	1.57	4.67	25	48.41	3.06	136.87
6	24Hour-2Year-City	3	0.1007	3	0	0.016	0.15	1.57	4.67	25	48.41	46.49	3.64
60	24Hour-2Year-City	S-60	1.197	25	0	0.016	0.15	1.57	4.67	25	48.41	47.33	14.29
61	24Hour-2Year-City	UGS_Z4P	1.292	3	48.3	0.016	0.15	1.57	4.67	25	48.41	24.57	137.43
62	24Hour-2Year-City	PW_Drive	0.609	6	0	0.016	0.15	1.57	4.67	25	48.41	47.88	2.72
62B	24Hour-2Year-City	PW_Drive	0.0174	6	100	0.016	0.15	1.57	4.67	25	48.41	0	3.71
63	24Hour-2Year-City	S-63	0.423	2	48.45	0.016	0.15	1.57	4.67	25	48.41	29.8	111.18
64	24Hour-2Year-City	UGS_Z6BP	0.351	6	50.72	0.016	0.15	1.57	4.67	25	48.41	23	42.95
7	24Hour-2Year-City	2	0.0291	3	51.85	0.016	0.15	1.57	4.67	25	48.41	22.32	4.05
8	24Hour-2Year-City	2	0.0255	3	100	0.016	0.15	1.57	4.67	25	48.41	0	5.44
9	24Hour-2Year-City	1	0.0241	3	100	0.016	0.15	1.57	4.67	25	48.41	0	5.14

Table 2: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.09	0.62	146.01	3.555	2.443
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	820.68	22.432	9.606
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.13	69.97	0.62	787.16	20.9	8.689
ICD-STM155	MHST-155	D-MHST-155	SIDE	CIRCULAR	0.75	75.47	0.62	449.57	10.949	3.743
ICD-STM61	MHST-153	D-MHST-153	SIDE	CIRCULAR	0.102	72.86	0.62	15.14	1.292	0.624
ICD-STM64	MHST-140	D-MHST-140	SIDE	CIRCULAR	0.138	71.75	0.62	26.46	1.643	0.802

Table 3: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	0	0
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	0	0
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	52.1	1.54
CA-OLF_2	Carling_OLF_N01	Carling_OLF_N01_1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	8.07	0.39
CA-OLF_3	Carling_OLF_N03	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	7.9	0.28
CA-OLF_4	Carling_OLF_N01_1	Carling_OLF_N03	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	11.76	0.48
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	8.13	0.13
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	153.1	1.24
ST-100-S	MHST-100-S	Carling_OLF_N03	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101	CBMHST-101	MHST-153	23.2	0.013	73.09	72.86	CIRCULAR	0.525	0.00991	48.47	0.47
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	147.46	0.46
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-102	CBMHST-101	13.4	0.013	73.12	73.09	CIRCULAR	0.525	0.00224	23.77	0.71
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	138.48	0.34
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	5.89	0.14

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom 1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-103	CBMHST-103	CBMHST-102	20.2	0.013	75.32	74.92	CIRCULAR	0.3	0.01981	0	0
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	145.75	0.44
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	3.57	0.13
ST-104	CBMHST-104	CBMHST-101	20.5	0.013	75.19	74.78	CIRCULAR	0.375	0.02	0	0
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	129.77	0.96
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	24	0.25
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	139.7	0.97
ST-105	CBMHST-105	CBMHST-104	11.3	0.013	75.48	75.25	CIRCULAR	0.375	0.02036	0	0
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	31.04	0.51
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	12.52	0.28
ST-106	CBMHST-106	CBMHST-105	21.4	0.013	76	75.56	CIRCULAR	0.3	0.02057	0	0
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	20.81	0.09
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	24.93	0.93
ST-107	CBMHST-107	MHST-140	21.7	0.013	72.1	71.88	CIRCULAR	0.45	0.01014	24.3	0.69
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	50.3	0.75
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	50.57	0.81
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	50.67	0.91
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	50.1	0.75
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	20.97	0.15
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	16.41	0.75
ST-130	MHST-130	OGS-3	35.6	0.013	67.59	67.52	CIRCULAR	1.35	0.00197	944.23	1.78
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	161.09	1.07
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	53.55	1.6
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	162.52	0.87
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	369.94	1.47
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	0	0
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	17.5	0.4

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-140_2	D-MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	27.24	0.45
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	214.51	1.17
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	108.14	0.8
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.64	67.59	CIRCULAR	1.35	0.00171	821.59	1.49
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	814.15	1.35
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	820.5	1.43
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	787.37	1.64
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	797.4	1.79
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	942.57	1.38
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	27.17	0.5
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	965.39	1.28
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	15.69	0.29
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	896.89	1.36
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	27.7	0.44
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	877.23	1.43
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	17.26	0.41
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	295.44	1.13
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	43.08	0.62
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	263.68	1.06
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	63.02	0.48
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	214.55	1.3
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	109.24	0.96
ST-152	MHST-152	MHST-155	14	0.013	75.6	75.47	CIRCULAR	0.825	0.00929	365.62	1.41
ST-153_2	D-MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	14.64	0.96
ST-154	MHST-154	MHST-155	19	0.013	75.54	75.47	CIRCULAR	1.2	0.00368	819.68	1.69
ST-155_2	D-MHST-155	MHST-148	59.6	0.013	75.3	74.7	CIRCULAR	0.825	0.01007	460.89	2.4
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	2.52	0.22

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	173.33	0.31
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	1083.7	1.26
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	30.56	0.34
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	110.13	1.03
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	77.98	0.54
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	812.47	1.19
ST--3	OGS-3	Dows-Lake	9.877	0.013	67.52	67.5	CIRCULAR	1.35	0.00202	956.42	1.9
ST-62534	MHST-62534	MHST-62537	38	0.013	76.42	76.29	CIRCULAR	1.2	0.00342	827.37	1.89
ST-62537	MHST-62537	MHST-154	50.921	0.013	76.29	76.11	CIRCULAR	1.2	0.00353	820.15	1.9
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	15.82	1.1
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	43.92	1.55
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	3.93	0.6
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	3.93	0.42
ST-S41	UGS_Exp_Farm	MHST-152	4	0.013	75.62	75.6	CIRCULAR	0.825	0.005	364.29	3.62
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.35	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	10.11	0.93
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	10	0.9
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	20.16	19.28
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	10	0.84
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	20.03	1.1
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	10.13	0.87
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	25.01	1.13
ST-UGS4	UGS_Z4P	CBMHST-102	3.2	0.013	73.13	73.12	CIRCULAR	0.525	0.00313	27.7	0.67
ST-UGS6B	UGS_Z6BP	CBMHST-107	2.8	0.013	72.13	72.1	CIRCULAR	0.3	0.01071	33.45	1.12
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.4	69.97	CIRCULAR	0.9	0.04437	321.19	0.97
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.02	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	6.4	0.48

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	6.46	0.58

Table 4: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-14B	61.65	63.3	1.65	0.86	62.51	6.23	0	0	0	1	0	2	3
S-15	62.1	63.9	1.8	0.68	62.78	7.98	0	0	0	0	0.001	1	4.73
S-19	64	66	2	1.24	65.24	7.93	0	0	0	0	0.002	1	3.24
S-21B	63.54	65.7	2.16	1.62	65.16	49.95	0	0	0	1	0.057	4	3.75
S-26B	67.33	69.62	2.29	1.72	69.05	22.96	0	0	0	0	0.009	3	7.68
S-3	62.2	64.26	2.06	1.3	63.5	30.96	0	0	0	0	0.003	4	21.22
S-58	64.93	66.95	2.02	0.42	65.35	5.92	0	0	0	0	0	0	4.57
S-60	67.69	69.34	1.65	0.61	68.3	14.29	0	0	0	0	0.001	0	13.14
S-63	80.3	82.16	1.86	1.56	81.86	111.18	0	0	0	0	0.017	11	60.01
SA-1	69.5	72.5	3	0.68	70.18	257.92	0	0	0	2	0.15	23	60
SA-2	62.6	65.6	3	0.7	63.3	188.46	0	0	0	10	0.211	23	7
SA-48	72.01	75.01	3	0.51	72.52	29.21	0	0	0	1	0.011	17	10
SA-49	73.6	76.6	3	0.59	74.19	34.53	0	0	0	1	0.015	20	10
SA-50	72.82	75.82	3	0.7	73.52	68.42	0	0	0	3	0.049	23	10
SA-51	73.5	76.5	3	0.04	73.54	283.39	0	0	0	1	0.004	1	280
SA-52	69.5	72.5	3	0.7	70.2	68.59	0	0	0	3	0.049	23	10
SA-53	69.08	72.08	3	0.29	69.37	31.67	0	0	0	0	0.005	10	20
SA-54	70.76	73.76	3	0.53	71.29	32.7	0	0	0	1	0.013	18	10
SA-56	72.04	75.04	3	0.52	72.56	135.14	0	0	0	1	0.078	17	25
SA-CUP	72.5	75.5	3	0.07	72.57	118.6	0	0	0	0	0.035	2	50

Table 4: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	75.62	78.02	2.4	0.36	75.98	364.29	0	0	0	1	0.207	15	141.25
UGS_Z1P	70.07	72.07	2	0.24	70.31	321.19	0	0	0	8	0.355	12	0
UGS_Z4P	73.13	74.48	1.35	0.23	73.36	137.43	0	0	0	5	0.14	18	27.7
UGS_Z6BP	72.13	73.35	1.22	0.18	72.31	50.91	0	0	0	2	0.025	16	33.45

Table 5: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Overflow-58	S-58	Carling_OLF_N01	TRANSVERSE	0.3	0	66.91	1.65	0	0.212	0
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.25	1.65	0	3.942	1.762
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.65	0	0.955	0.404
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.6	1.84	0	3.555	2.443
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.85	1.84	0	22.432	9.606
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.6	1.84	0	20.9	8.689
Weir6	MHST-155	D-MHST-155	TRANSVERSE	0.8	0	77.3	1.65	0	10.949	3.743
Weir7	MHST-153	D-MHST-153	TRANSVERSE	0.3	0	74.5	1.84	0	1.292	0.624
Weir8	MHST-140	D-MHST-140	TRANSVERSE	0.3	0	73.3	1.84	0	1.643	0.802

Table 6: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.03	64.63	10/04/2022 08:18 AM	11.63	11.63	0.028	1.433	0.721
Dows-Lake	NO	67.2	70.07	NORMAL	0	67.2	10/04/2022 00:00 AM	956.42	956.42	6.601	24.84	10.769
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	4.4	4.4	0.001	0.054	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	153.1	153.1	1.41	5.389	2.692
Preston_Street	NO	60.9	63.76	NORMAL	0.15	61.05	10/04/2022 08:10 AM	52.1	52.1	0.54	2.384	1.526
PW_Drive	NO	65.5	65.8	FREE	0	65.5	10/04/2022 00:00 AM	6.43	6.43	0.011	0.626	0.017

PCSWMM Report

24 Hour - 5year - Partial Green Roof

Model Permanent Dewatering.inp

March 6, 2023

Table of Contents

Summary 1: Inflows

Name	Permanent Dewatering
Time series inflows	1
Dry weather	0
Groundwater	0
RDII inflows	0

Summary 2: Runoff quantity continuity

Name	Permanent Dewatering
Initial LID storage (mm)	0.160
Initial snow cover (mm)	n/a
Total precipitation (mm)	64.034
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	29.103
Surface runoff (mm)	31.242
LID drainage (mm)	1.242
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.630
Continuity error (%)	-0.035

Summary 3: Flow routing continuity

Name	Permanent Dewatering
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	10.784
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.100
External outflow (ML)	11.923
Flooding loss (ML)	0.000
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	0.664
Continuity error (%)	-5.917

Summary 4: Results statistics

Name	Permanent Dewatering
Max. subcatchment total runoff (ML)	2.58
Max. subcatchment peak runoff (L/s)	1294.39
Max. subcatchment runoff coefficient	0.982
Max. subcatchment total precip (mm)	64.03
Min. subcatchment total precip (mm)	64.03
Max. node depth (m)	2.63
Num. nodes surcharged	2
Max. node surcharge duration (hours)	24
Max. node height above crown (m)	1.658
Min. node depth below rim (m)	0
Num. nodes flooded	0
Max. node flooding duration (hours)	0
Max. node flood volume (ML)	0
Max. node ponded volume or depth (ha-mm/1000 m^3/m)	0
Max. storage volume (1000 m^3)	0.791
Max. storage percent full (%)	40
Max. outfall flow frequency (%)	98.5
Max. outfall peak flow (L/s)	1266.18
Max. outfall total volume (ML)	9.134
Total outfall volume (ML)	11.922
Max. link peak flow (L/s)	1663.35
Max. link peak velocity (m/s)	14.61
Min. link peak velocity (m/s)	0
Num. conduits surcharged	5
Max. conduit surcharge duration (hours)	20.83
Max. conduit capacity limited duration (hours)	0.01

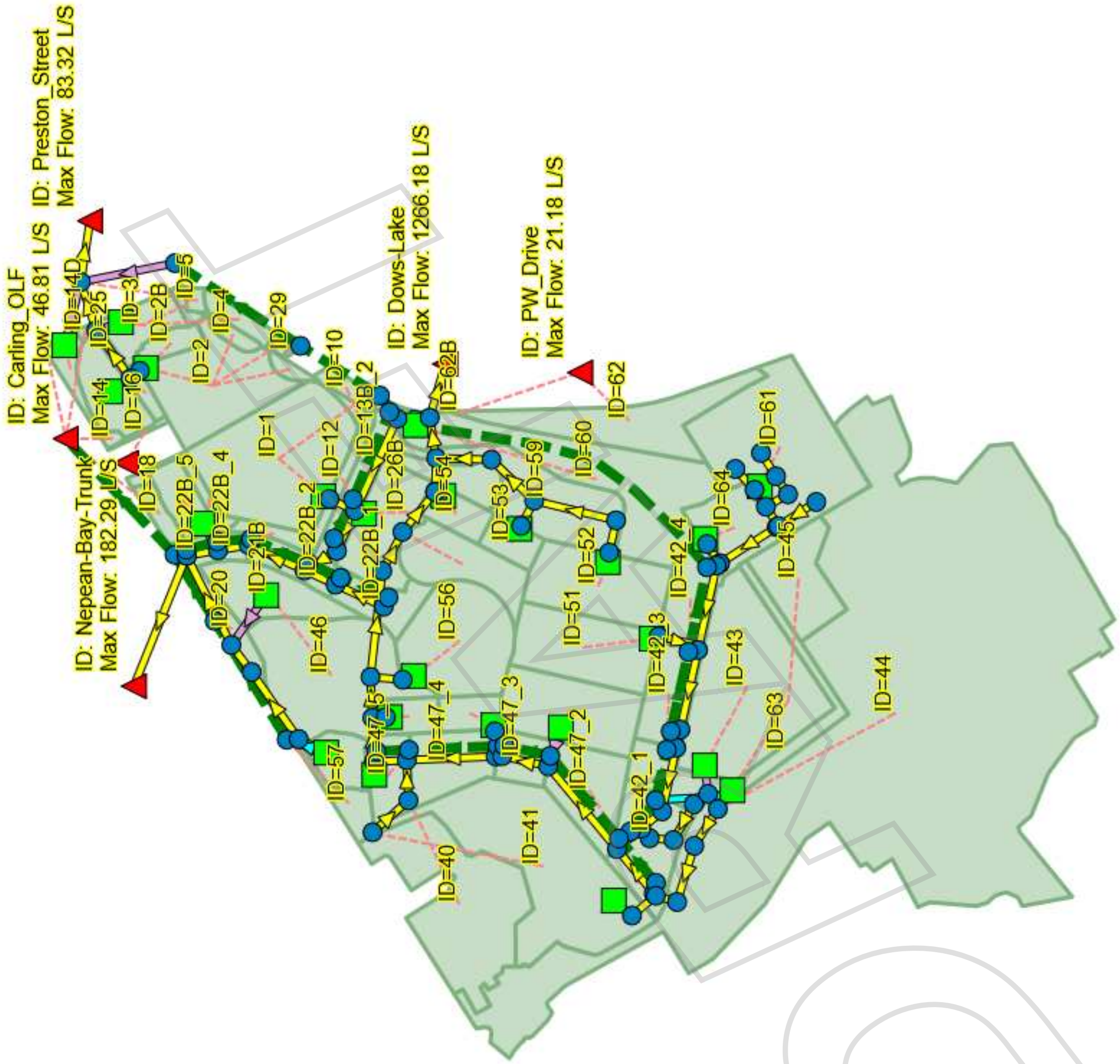

Figure 1: Extent 1

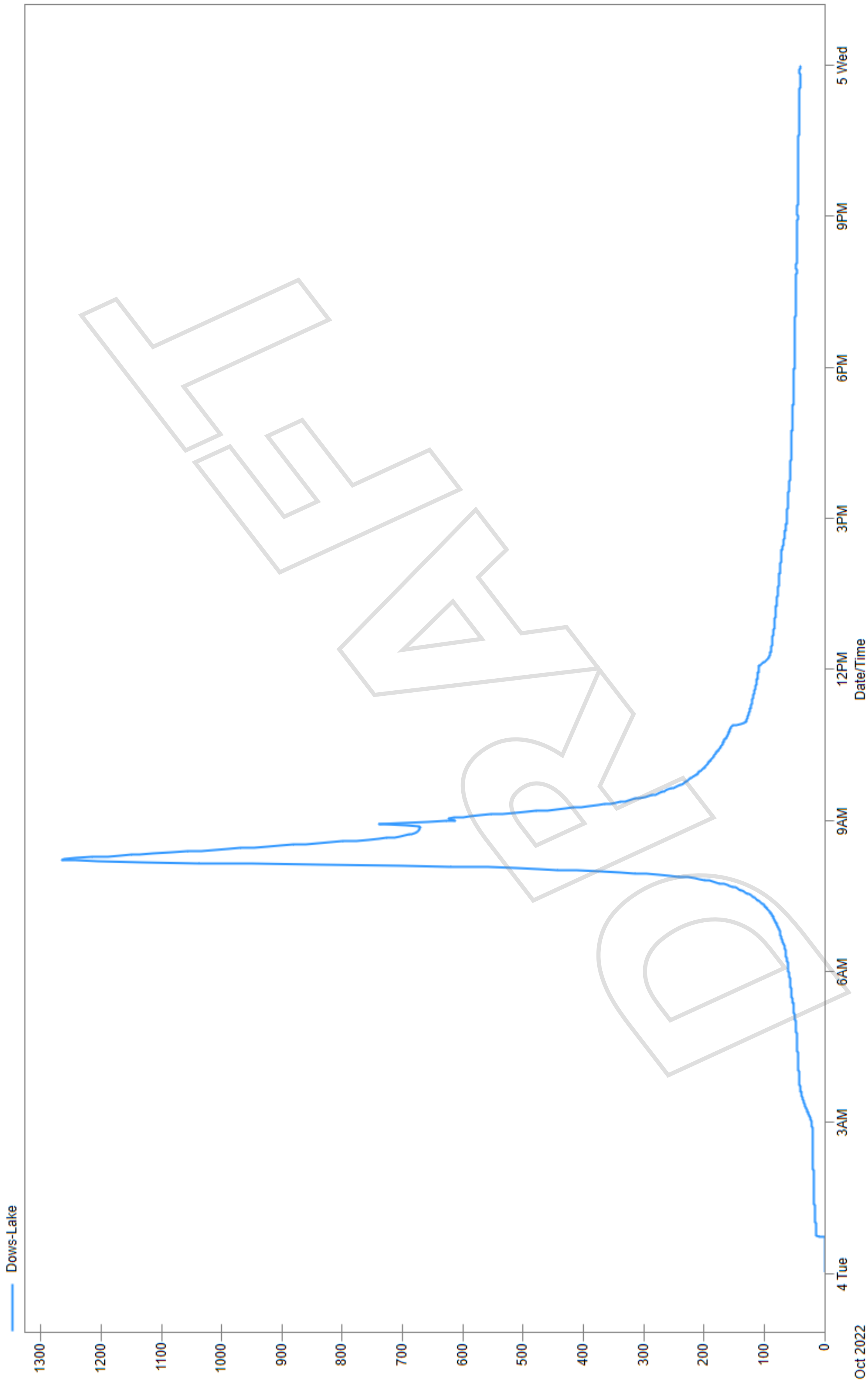

Figure 2: Dows Lake

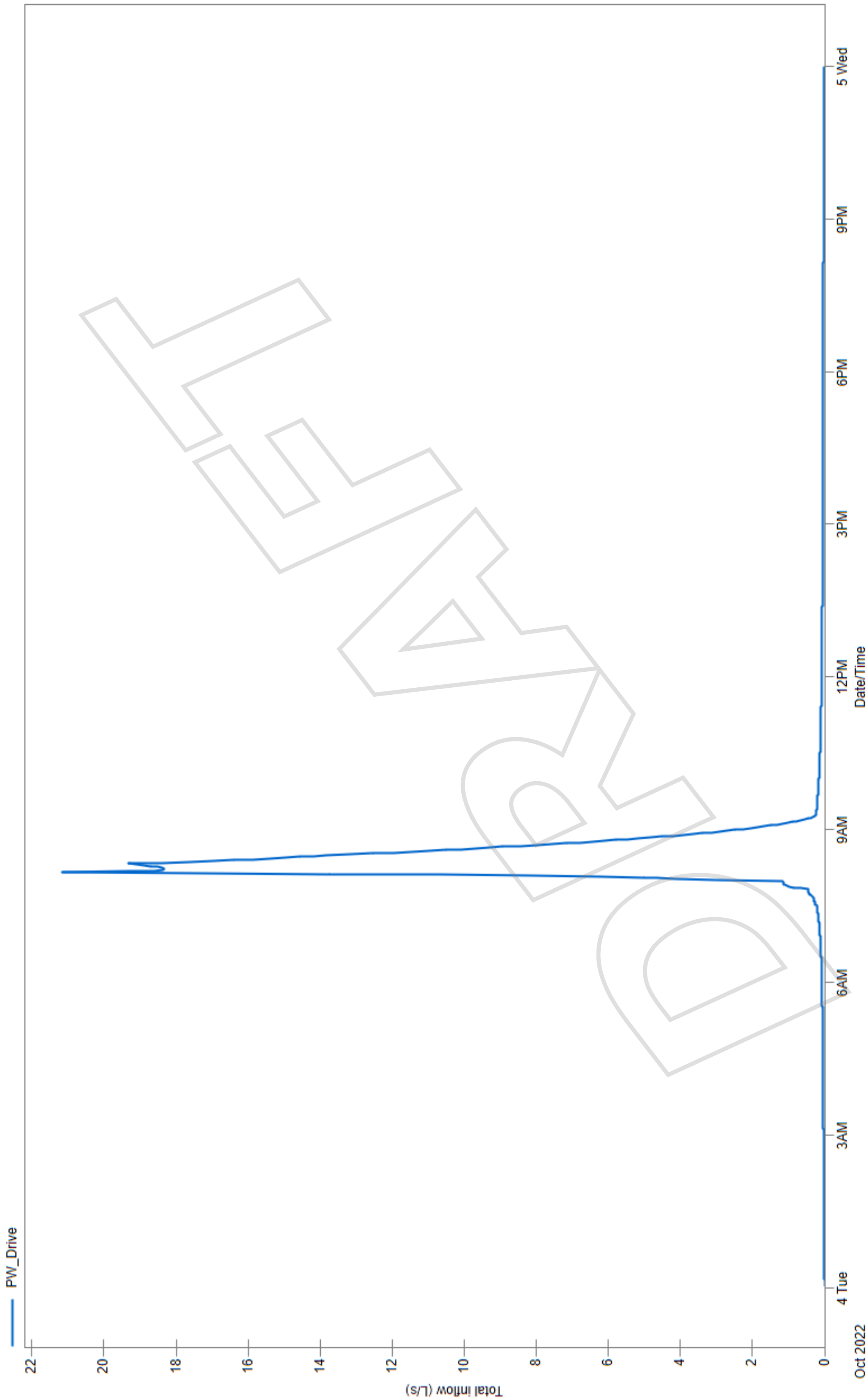

Figure 3: Prince of Wales

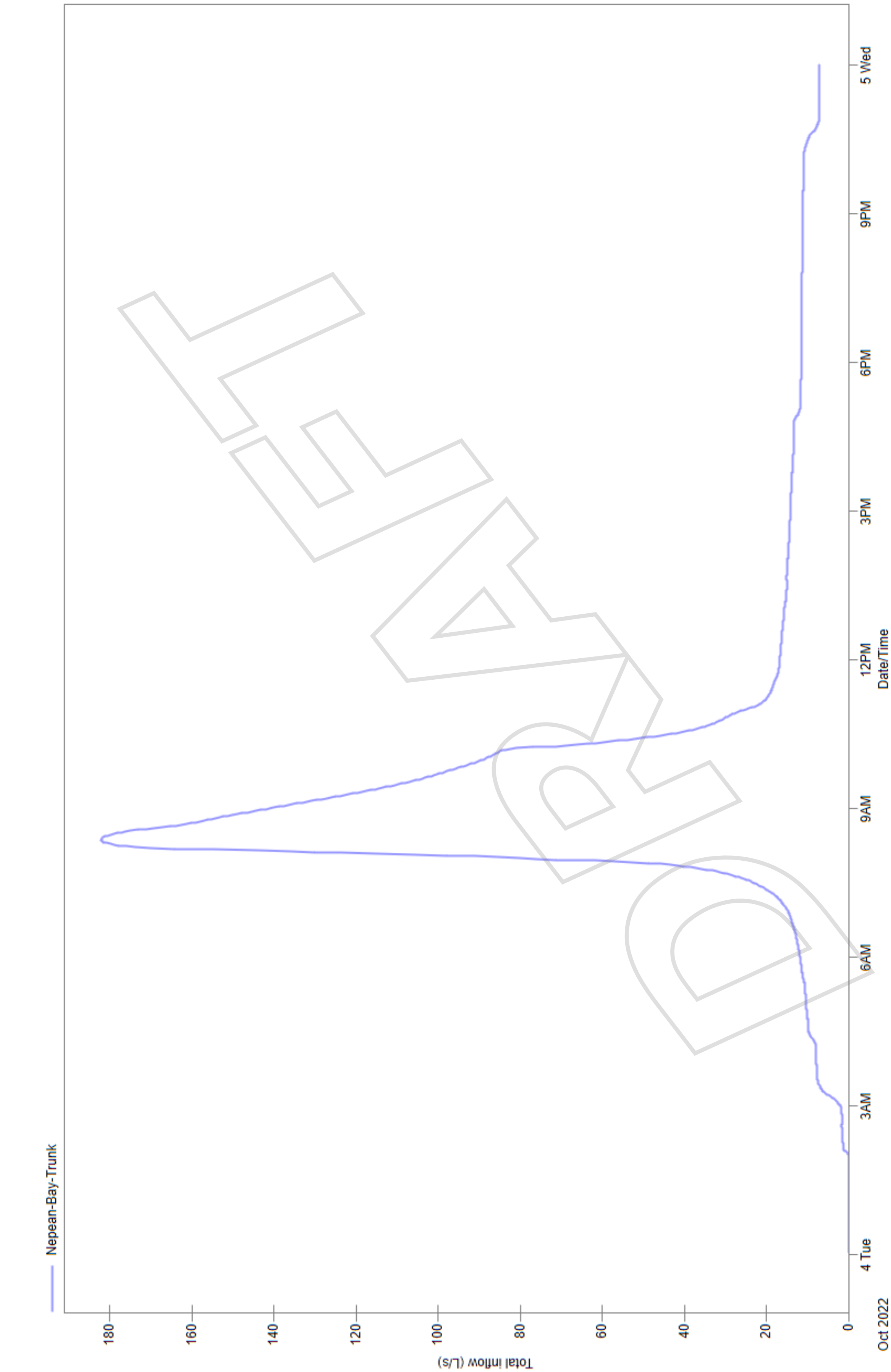

Figure 4: Nepean Bay Trunk

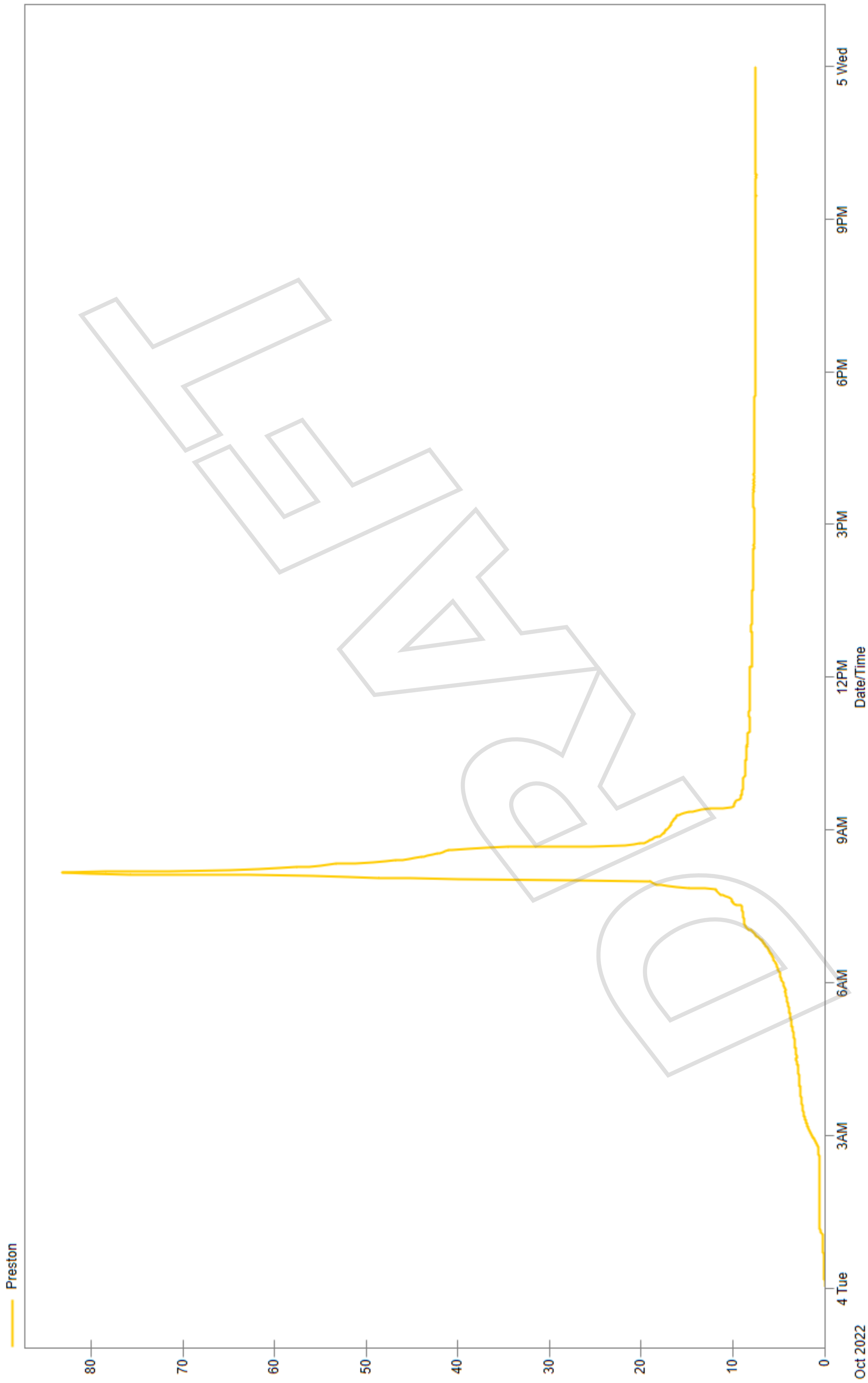

Figure 5: Preston Street

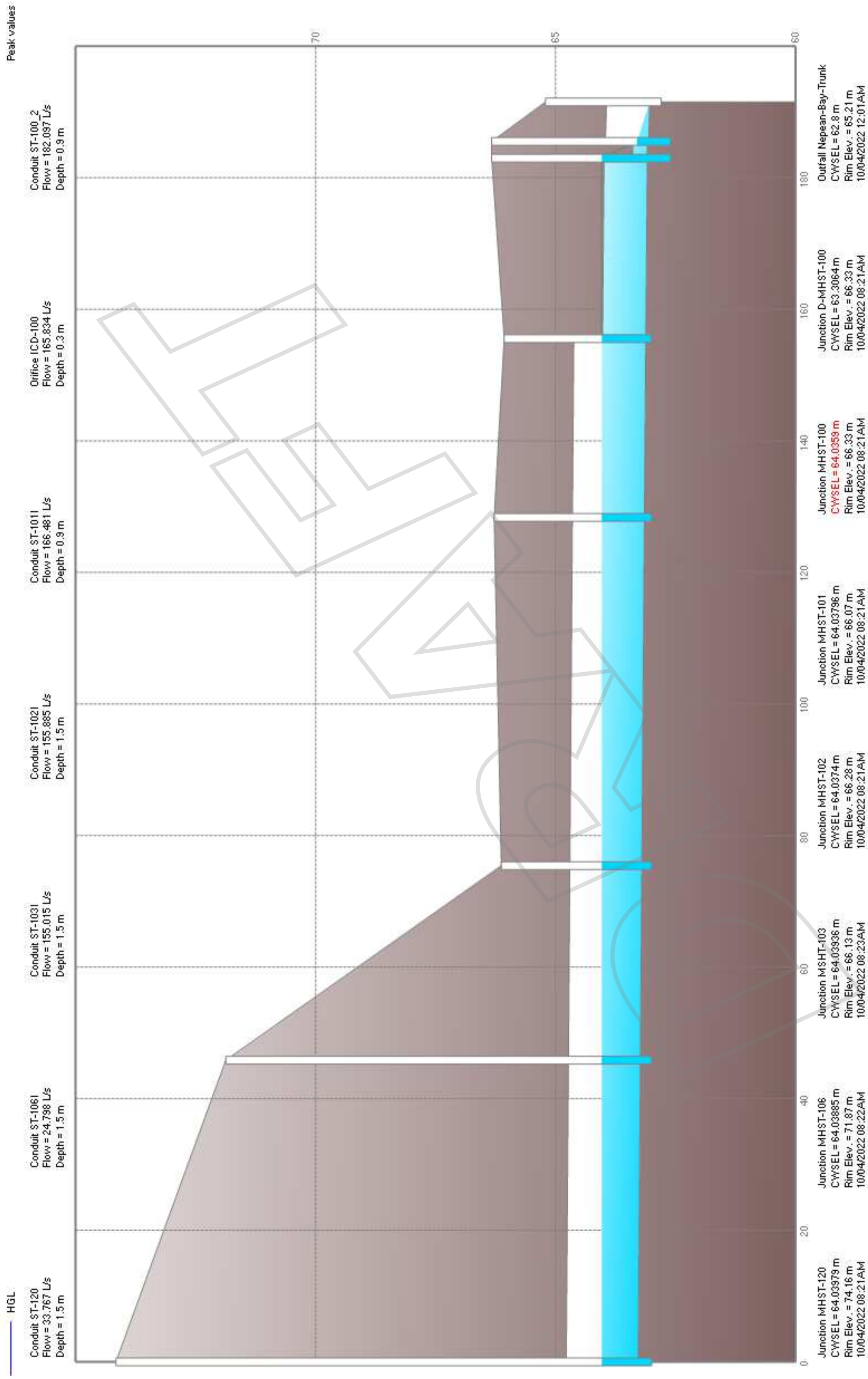

Figure 6: Road A

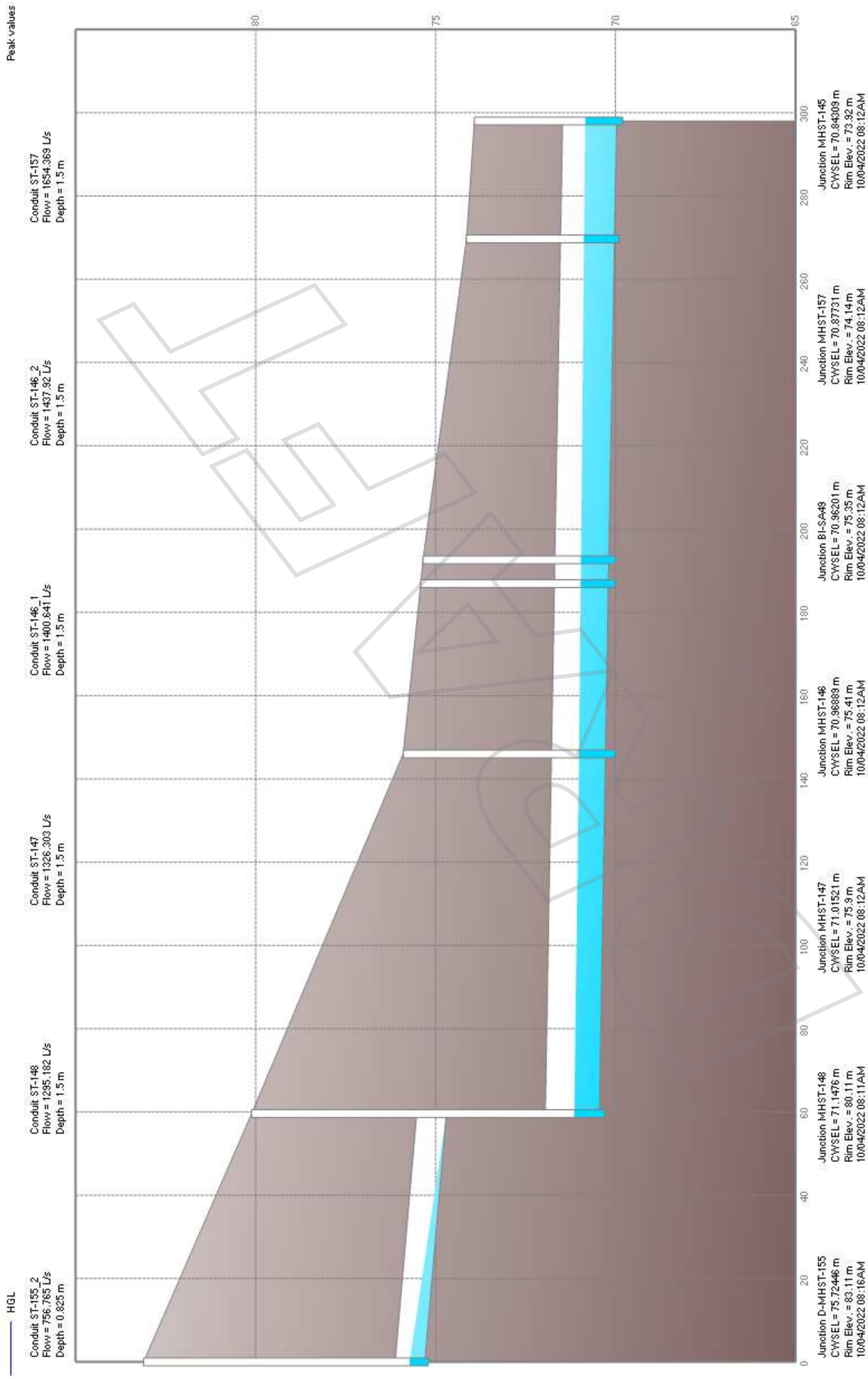

Figure 7: Road D

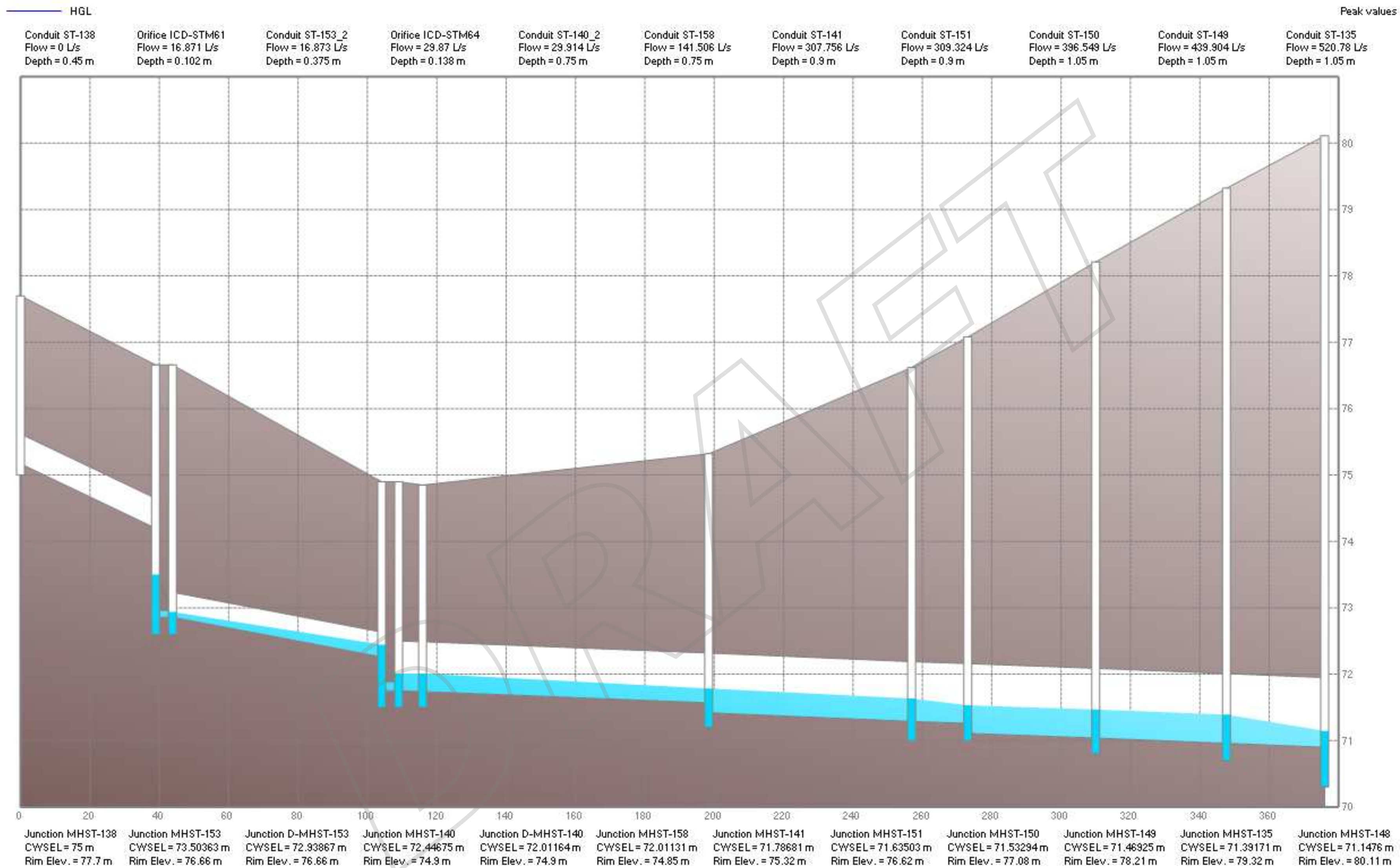

Figure 8: Road E

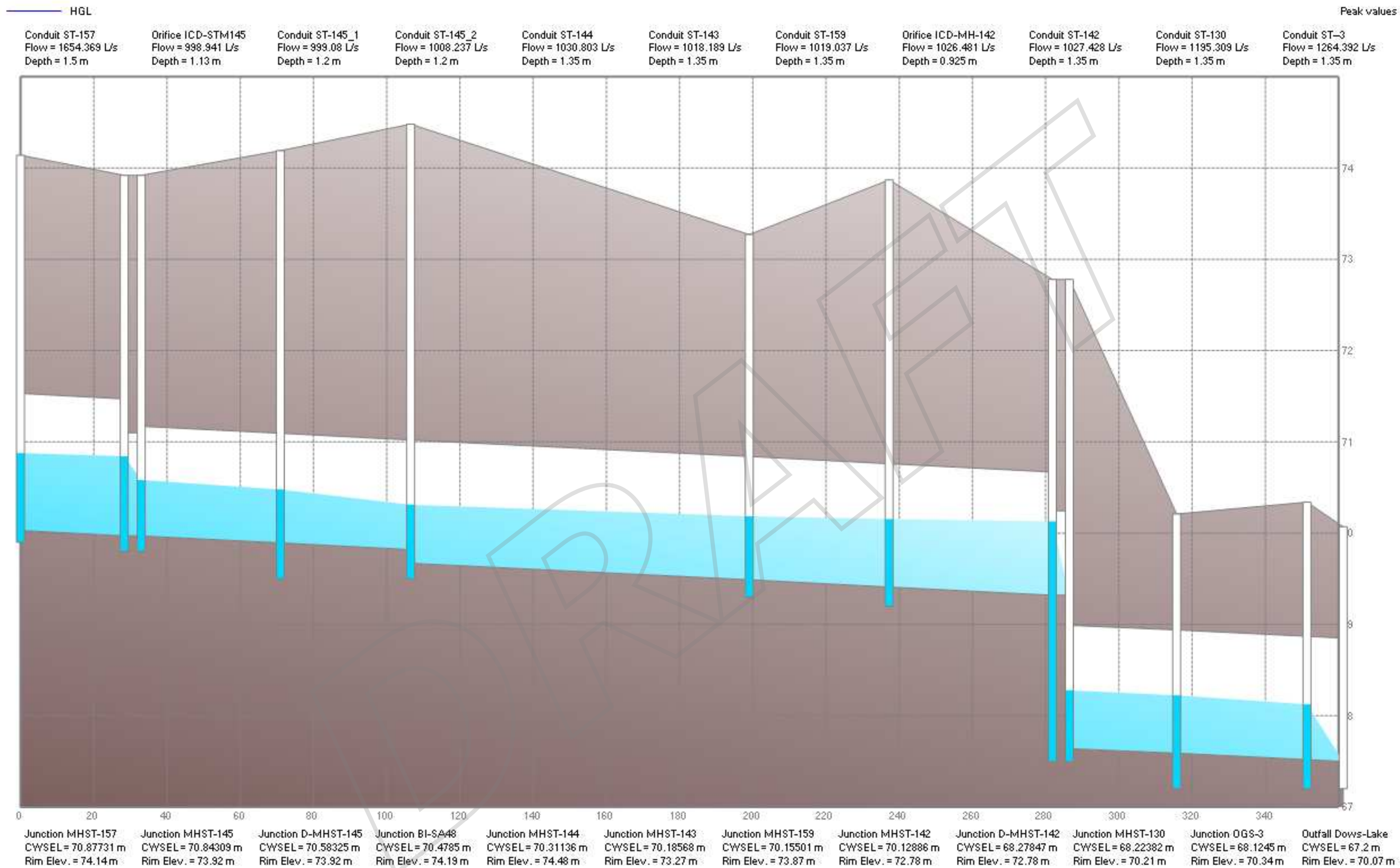

Figure 9: Road D to Dows Lake Outfall

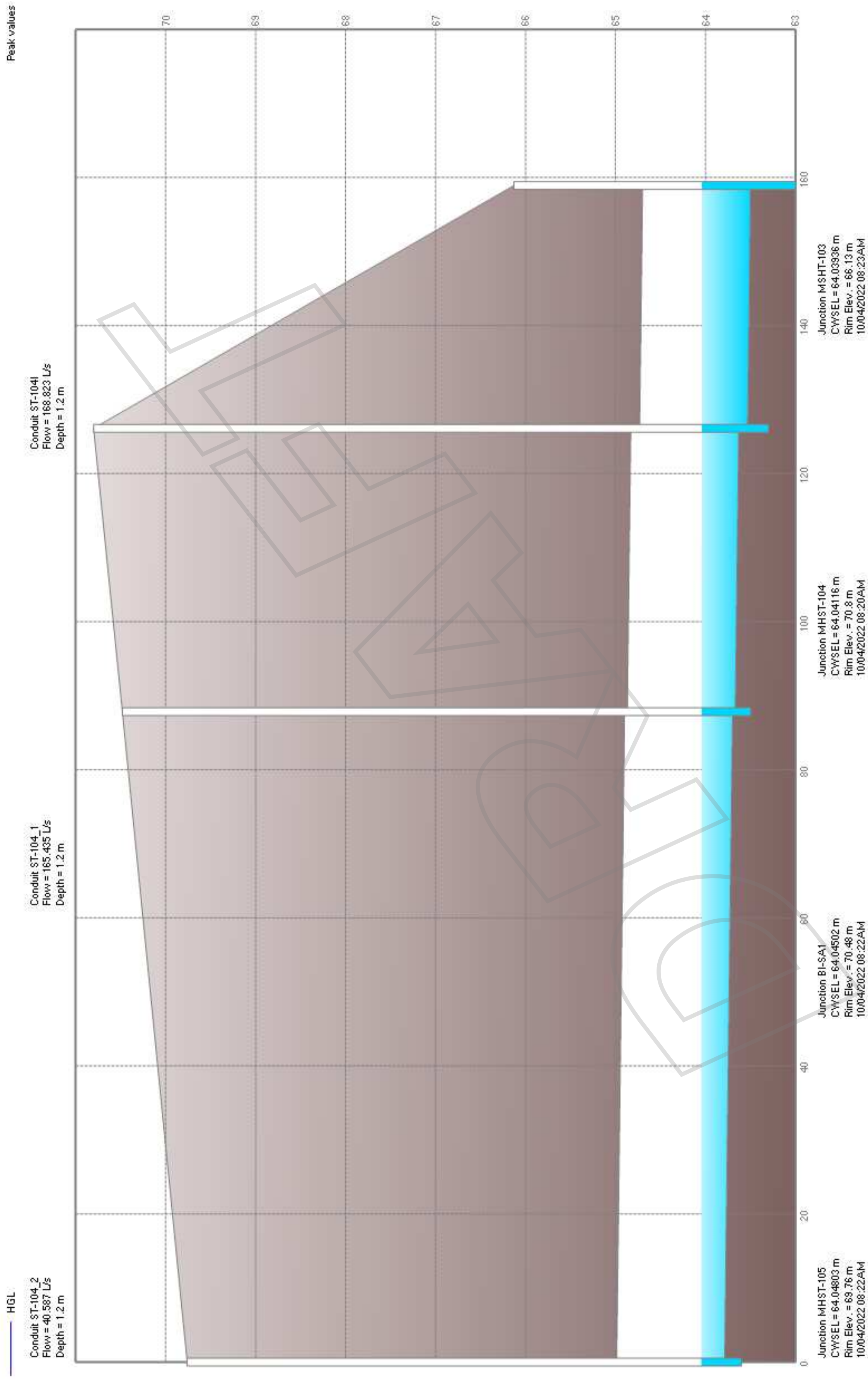

Figure 10: Road B

Table 1: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
1	24Hour-5Year-City	SA-1	1.2364	3	100	0.016	0.15	1.57	4.67	25	64.03	0	355.25
10	24Hour-5Year-City	13B_2	0.0828	3	9.73	0.016	0.15	1.57	4.67	25	64.03	49.06	13.87
11	24Hour-5Year-City	Wales-OLF-N03	0.03	3	100	0.016	0.15	1.57	4.67	25	64.03	0	8.68
12	24Hour-5Year-City	BI-SA1-S	0.1182	5	53.01	0.016	0.15	1.57	4.67	25	64.03	25.2	30.46
13B_1	24Hour-5Year-City	MHST-104-S	0.13	5	98.08	0.016	0.15	1.57	4.67	25	64.03	1.03	37.38
13B_2	24Hour-5Year-City	BI-SA1-S	0.22	5	98.08	0.016	0.15	1.57	4.67	25	64.03	1.05	71.73
14	24Hour-5Year-City	Carling_OLF	0.014	3	15.98	0.016	0.15	1.57	4.67	25	64.03	45.55	2.6
14B	24Hour-5Year-City	S-14B	0.0986	3	0	0.016	0.15	1.57	4.67	25	64.03	53.91	19.35
14C	24Hour-5Year-City	Carling_OLF	0.0104	3	59.6	0.016	0.15	1.57	4.67	25	64.03	21.69	2.7
14D	24Hour-5Year-City	Carling_OLF	0.0185	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.35
15	24Hour-5Year-City	S-15	0.36	3	3.65	0.016	0.15	1.57	4.67	25	64.03	53.67	30.86
16	24Hour-5Year-City	LRT-Corridor	0.023	3	0	0.016	0.15	1.57	4.67	25	64.03	53.66	5.05
17	24Hour-5Year-City	LRT-Corridor	0.031	3	0	0.016	0.15	1.57	4.67	25	64.03	53.81	6.4
18	24Hour-5Year-City	Carling_OLF	0.0913	3	5.91	0.016	0.15	1.57	4.67	25	64.03	51.31	13.57
19	24Hour-5Year-City	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	64.03	50.24	24.94
2	24Hour-5Year-City	SA-2	0.7231	3	100	0.016	0.15	1.57	4.67	25	64.03	0	229
20	24Hour-5Year-City	Carling_OLF_N01_1	0.1714	8	0	0.016	0.15	1.57	4.67	25	64.03	53.97	32.72
21B	24Hour-5Year-City	S-21B	0.434	10	0	0.016	0.15	1.57	4.67	25	64.03	72.29	127.78
22B_1	24Hour-5Year-City	MHST-120-S	0.262	5	95.43	0.016	0.15	1.57	4.67	25	64.03	2.45	74.27
22B_2	24Hour-5Year-City	MHST-106-S	0.061	5	95.43	0.016	0.15	1.57	4.67	25	64.03	2.44	17.49
22B_3	24Hour-5Year-City	MSHT-103-S	0.132	5	95.43	0.016	0.15	1.57	4.67	25	64.03	2.45	37.8
22B_4	24Hour-5Year-City	MHST-102-S	0.071	5	95.43	0.016	0.15	1.57	4.67	25	64.03	2.44	20.35
22B_5	24Hour-5Year-City	MHST-101-S	0.091	5	95.43	0.016	0.15	1.57	4.67	25	64.03	2.44	26.08
24	24Hour-5Year-City	MHST-107	0.034	3	56.98	0.016	0.15	1.57	4.67	25	64.03	23.34	8
25	24Hour-5Year-City	OGS1	0.0438	3	79.37	0.016	0.15	1.57	4.67	25	64.03	11.18	11.57
26B	24Hour-5Year-City	S-26B	0.776	9.406	8.78	0.016	0.15	1.57	4.67	25	64.03	51.21	65.33
27	24Hour-5Year-City	MHST-101-S	0.071	3	65.62	0.016	0.15	1.57	4.67	25	64.03	18.44	18.89

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
28	24Hour-5Year-City	MHST-102-S	0.075	5	62.44	0.016	0.15	1.57	4.67	25	64.03	20.14	19.8
29	24Hour-5Year-City	7	0.008	3	0	0.016	0.15	1.57	4.67	25	64.03	54.48	1.15
2B	24Hour-5Year-City	SA-2	0.103	3	100	0.016	0.15	1.57	4.67	25	64.03	0	29.81
3	24Hour-5Year-City	S-3	0.198	3	34.51	0.016	0.15	1.57	4.67	25	64.03	40.05	62.48
3B	24Hour-5Year-City	3	0.0431	3	100	0.016	0.15	1.57	4.67	25	64.03	0	12.47
4	24Hour-5Year-City	2	0.0269	3	100	0.016	0.15	1.57	4.67	25	64.03	0	7.79
40	24Hour-5Year-City	MHST-156	1.186	6.77	47.28	0.016	0.15	1.57	4.67	25	64.03	29.6	202.23
41	24Hour-5Year-City	MHST-132	1.523	3	14.99	0.016	0.15	1.57	4.67	25	64.03	49.74	98.54
42_1	24Hour-5Year-City	MHST-135-S	0.4	5	75.88	0.016	0.15	1.57	4.67	25	64.03	13	107.05
42_2	24Hour-5Year-City	MHST-149-S	0.31	5	75.88	0.016	0.15	1.57	4.67	25	64.03	13.02	82.18
42_3	24Hour-5Year-City	MHST-150-S1	0.61	2	75.88	0.016	0.15	1.57	4.67	25	64.03	13.21	151.19
42_4	24Hour-5Year-City	MHST-141-S	0.47	2	75.88	0.016	0.15	1.57	4.67	25	64.03	13.11	120.35
43	24Hour-5Year-City	SA-CUP	0.56	2	100	0.016	0.15	1.57	4.67	25	64.03	0	161.46
44	24Hour-5Year-City	MHST-62534	9.994	3	33.41	0.016	0.15	1.57	4.67	25	64.03	37.81	1294.39
45	24Hour-5Year-City	63	0.532	4	37.33	0.016	0.15	1.57	4.67	25	64.03	34.58	90.93
46	24Hour-5Year-City	21B	1.188	10	21.02	0.016	0.15	1.57	4.67	25	64.03	44.26	135.28
47_1	24Hour-5Year-City	D-MHST-155-S	0.11	3	65.85	0.016	0.15	1.57	4.67	25	64.03	18.45	27.88
47_2	24Hour-5Year-City	MHST-148-S	0.46	3	65.85	0.016	0.15	1.57	4.67	25	64.03	18.97	99.95
47_3	24Hour-5Year-City	MHST-147-S	0.19	3	65.85	0.016	0.15	1.57	4.67	25	64.03	18.59	45.69
47_4	24Hour-5Year-City	MHST-146-S	0.4	3	65.85	0.016	0.15	1.57	4.67	25	64.03	18.9	88.39
47_5	24Hour-5Year-City	MHST-157-S	0.25	3	65.85	0.016	0.15	1.57	4.67	25	64.03	18.69	58.33
48	24Hour-5Year-City	SA-48	0.138	2	100	0.016	0.15	1.57	4.67	25	64.03	0	39.77
49	24Hour-5Year-City	SA-49	0.164	2	100	0.016	0.15	1.57	4.67	25	64.03	0	47.12
5	24Hour-5Year-City	preston	0.00928	3	100	0.016	0.15	1.57	4.67	25	64.03	0	2.69
50	24Hour-5Year-City	SA-50	0.345	2	100	0.016	0.15	1.57	4.67	25	64.03	0	95.02
51	24Hour-5Year-City	SA-51	1.33	2	0	0.016	0.15	1.57	4.67	25	64.03	5.32	24.92
52	24Hour-5Year-City	SA-52	0.346	2	100	0.016	0.15	1.57	4.67	25	64.03	0	95.27

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
53	24Hour-5Year-City	SA-53	0.15	2	100	0.016	0.15	1.57	4.67	25	64.03	0	43.17
54	24Hour-5Year-City	SA-54	0.155	2	100	0.016	0.15	1.57	4.67	25	64.03	0	44.59
55	24Hour-5Year-City	MHST-159	0.455	2	0	0.016	0.15	1.57	4.67	25	64.03	5.62	8.55
56	24Hour-5Year-City	SA-56	0.784	2	79.52	0.016	0.15	1.57	4.67	25	64.03	11.2	199.05
57	24Hour-5Year-City	Carling_OLF_N01	0.152	15	4.5	0.016	0.15	1.57	4.67	25	64.03	51.38	32.06
58	24Hour-5Year-City	S-58	0.212	16	0	0.016	0.15	1.57	4.67	25	64.03	54.73	26.59
59	24Hour-5Year-City	MHST-133	0.715	2	93.37	0.016	0.15	1.57	4.67	25	64.03	3.58	194.57
6	24Hour-5Year-City	3	0.1007	3	0	0.016	0.15	1.57	4.67	25	64.03	54.42	14.94
60	24Hour-5Year-City	S-60	1.197	25	0	0.016	0.15	1.57	4.67	25	64.03	56.13	77.35
61	24Hour-5Year-City	UGS_Z4P	1.292	3	48.3	0.016	0.15	1.57	4.67	25	64.03	29.33	212.85
62	24Hour-5Year-City	PW_Drive	0.609	6	0	0.016	0.15	1.57	4.67	25	64.03	58.37	17.79
62B	24Hour-5Year-City	PW_Drive	0.0174	6	100	0.016	0.15	1.57	4.67	25	64.03	0	5.04
63	24Hour-5Year-City	S-63	0.423	2	48.45	0.016	0.15	1.57	4.67	25	64.03	34.82	186.75
64	24Hour-5Year-City	UGS_Z6BP	0.351	6	50.72	0.016	0.15	1.57	4.67	25	64.03	26.95	73.65
7	24Hour-5Year-City	2	0.0291	3	51.85	0.016	0.15	1.57	4.67	25	64.03	26.14	7.68
8	24Hour-5Year-City	2	0.0255	3	100	0.016	0.15	1.57	4.67	25	64.03	0	7.38
9	24Hour-5Year-City	1	0.0241	3	100	0.016	0.15	1.57	4.67	25	64.03	0	6.98

Table 2: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.09	0.62	165.88	3.555	2.443
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	1027.63	22.432	9.606
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.13	69.97	0.62	998.98	20.9	8.689
ICD-STM155	MHST-155	D-MHST-155	SIDE	CIRCULAR	0.75	75.47	0.62	745.97	10.949	3.743
ICD-STM61	MHST-153	D-MHST-153	SIDE	CIRCULAR	0.102	72.86	0.62	16.88	1.292	0.624
ICD-STM64	MHST-140	D-MHST-140	SIDE	CIRCULAR	0.138	71.75	0.62	29.87	1.643	0.802

Table 3: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	0.01	0.08
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	0	0
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	83.32	1.71
CA-OLF_2	Carling_OLF_N01	Carling_OLF_N01_1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	27.71	0.46
CA-OLF_3	Carling_OLF_N03	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	36.01	0.41
CA-OLF_4	Carling_OLF_N01_1	Carling_OLF_N03	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	50.07	0.65
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	16.43	0.25
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	182.29	1.3
ST-100-S	MHST-100-S	Carling_OLF_N03	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101	CBMHST-101	MHST-153	23.2	0.013	73.09	72.86	CIRCULAR	0.525	0.00991	48.74	0.47
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	166.58	0.44
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-102	CBMHST-101	13.4	0.013	73.12	73.09	CIRCULAR	0.525	0.00224	25.35	0.69
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	156.78	0.35
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	11.06	0.15

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-103	CBMHST-103	CBMHST-102	20.2	0.013	75.32	74.92	CIRCULAR	0.3	0.01981	0	0
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	160.04	0.42
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	6.7	0.14
ST-104	CBMHST-104	CBMHST-101	20.5	0.013	75.19	74.78	CIRCULAR	0.375	0.02	0	0
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	165.53	1.02
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	40.65	0.3
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	170.14	0.99
ST-105	CBMHST-105	CBMHST-104	11.3	0.013	75.48	75.25	CIRCULAR	0.375	0.02036	0	0
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	51.59	0.55
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	19.76	0.3
ST-106	CBMHST-106	CBMHST-105	21.4	0.013	76	75.56	CIRCULAR	0.3	0.02057	0	0
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	34.8	0.08
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	40.91	0.93
ST-107	CBMHST-107	MHST-140	21.7	0.013	72.1	71.88	CIRCULAR	0.45	0.01014	27.42	0.66
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	50.27	0.75
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	50.82	0.8
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	50.71	0.91
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	51.84	0.78
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	34.83	0.14
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	28.49	0.87
ST-130	MHST-130	OGS-3	35.6	0.013	67.59	67.52	CIRCULAR	1.35	0.00197	1196.08	1.87
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	218.85	1.19
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	97.22	1.89
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	219.59	0.97
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	520.84	1.63
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	0	0
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	23.23	0.4

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-140_2	D-MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	29.93	0.47
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	309.36	1.32
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	161.92	0.91
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.64	67.59	CIRCULAR	1.35	0.00171	1029.11	1.57
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	1018.78	1.38
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	1032.22	1.49
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	1000.09	1.77
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	1009.7	1.93
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	1402.36	1.53
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	57.91	0.6
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	1440.6	1.49
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	36.73	0.39
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	1332.15	1.5
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	56.54	0.53
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	1307.42	1.57
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	37.18	0.51
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	440.57	1.32
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	73.16	0.67
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	400.75	1.21
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	113.08	0.6
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	309.32	1.45
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	163.63	1.07
ST-152	MHST-152	MHST-155	14	0.013	75.6	75.47	CIRCULAR	0.825	0.00929	632.66	1.83
ST-153_2	D-MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	16.88	1
ST-154	MHST-154	MHST-155	19	0.013	75.54	75.47	CIRCULAR	1.2	0.00368	1337.81	1.99
ST-155_2	D-MHST-155	MHST-148	59.6	0.013	75.3	74.7	CIRCULAR	0.825	0.01007	757.1	2.73
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	6.5	0.26

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	287.08	0.36
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	1663.35	1.59
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	57.58	0.37
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	141.51	1.11
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	110.48	0.53
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	1019.04	1.21
ST--3	OGS-3	Dows-Lake	9.877	0.013	67.52	67.5	CIRCULAR	1.35	0.00202	1266.18	2.07
ST-62534	MHST-62534	MHST-62537	38	0.013	76.42	76.29	CIRCULAR	1.2	0.00342	1353.24	2.16
ST-62537	MHST-62537	MHST-154	50.921	0.013	76.29	76.11	CIRCULAR	1.2	0.00353	1339.59	2.21
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	21.62	1.14
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	56.39	1.62
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	12.65	0.83
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	12.65	0.75
ST-S41	UGS_Exp_Farm	MHST-152	4	0.013	75.62	75.6	CIRCULAR	0.825	0.005	629.9	4.25
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.25	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	10.06	0.93
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	10	0.91
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	27.29	14.61
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	10	0.84
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	20.05	1.11
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	10.05	0.86
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	25.02	1.14
ST-UGS4	UGS_Z4P	CBMHST-102	3.2	0.013	73.13	73.12	CIRCULAR	0.525	0.00313	28.48	0.65
ST-UGS6B	UGS_Z6BP	CBMHST-107	2.8	0.013	72.13	72.1	CIRCULAR	0.3	0.01071	46.49	1.13
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.4	69.97	CIRCULAR	0.9	0.04437	722.97	1.71
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.02	1.2
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	8.68	0.52

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	9.01	0.6

Table 4: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-14B	61.65	63.3	1.65	1.33	62.98	19.35	0	0	0	1	0	4	17.02
S-15	62.1	63.9	1.8	1.48	63.58	30.86	0	0	0	1	0.017	15	7.15
S-19	64	66	2	1.54	65.54	24.94	0	0	0	0	0.014	5	3.65
S-21B	63.54	65.7	2.16	1.69	65.23	127.78	0	0	0	5	0.18	14	3.83
S-26B	67.33	69.62	2.29	1.97	69.3	65.33	0	0	0	2	0.053	16	8.23
S-3	62.2	64.26	2.06	1.66	63.86	62.48	0	0	0	1	0.016	19	23.89
S-58	64.93	66.95	2.02	1.54	66.47	26.59	0	0	0	0	0.005	2	12.65
S-60	67.69	69.34	1.65	1.19	68.88	77.35	0	0	0	0	0.003	1	73.33
S-63	80.3	82.16	1.86	1.78	82.08	186.75	0	0	0	2	0.06	40	64
SA-1	69.5	72.5	3	1.08	70.58	355.25	0	0	0	4	0.238	36	60
SA-2	62.6	65.6	3	1.02	63.62	258.81	0	0	0	19	0.307	34	7
SA-48	72.01	75.01	3	0.9	72.91	39.77	0	0	0	2	0.019	30	10
SA-49	73.6	76.6	3	0.99	74.59	47.12	0	0	0	3	0.025	33	10
SA-50	72.82	75.82	3	1.09	73.91	95.02	0	0	0	6	0.076	36	10
SA-51	73.5	76.5	3	0.06	73.56	292.87	0	0	0	1	0.006	2	280
SA-52	69.5	72.5	3	1.1	70.6	95.27	0	0	0	6	0.077	37	10
SA-53	69.08	72.08	3	0.71	69.79	43.17	0	0	0	1	0.011	24	20
SA-54	70.76	73.76	3	0.91	71.67	44.59	0	0	0	2	0.023	30	10
SA-56	72.04	75.04	3	0.9	72.94	199.05	0	0	0	4	0.135	30	25
SA-CUP	72.5	75.5	3	0.13	72.63	161.46	0	0	0	0	0.065	4	50

Table 4: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	75.62	78.02	2.4	0.61	76.23	629.9	0	0	0	2	0.353	25	142.13
UGS_Z1P	70.07	72.07	2	0.53	70.6	722.97	0	0	0	12	0.791	26	338.06
UGS_Z4P	73.13	74.48	1.35	0.37	73.5	212.85	0	0	0	9	0.231	30	28.48
UGS_Z6BP	72.13	73.35	1.22	0.32	72.45	86.89	0	0	0	4	0.045	28	46.49

Table 5: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Overflow-58	S-58	Carling_OLF_N01	TRANSVERSE	0.3	0	66.91	1.65	0	0.212	0
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.25	1.65	0	3.942	1.762
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.65	0	0.955	0.404
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.6	1.84	0	3.555	2.443
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.85	1.84	0	22.432	9.606
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.6	1.84	0	20.9	8.689
Weir6	MHST-155	D-MHST-155	TRANSVERSE	0.8	0	77.3	1.65	0	10.949	3.743
Weir7	MHST-153	D-MHST-153	TRANSVERSE	0.3	0	74.5	1.84	0	1.292	0.624
Weir8	MHST-140	D-MHST-140	TRANSVERSE	0.3	0	73.3	1.84	0	1.643	0.802

Table 6: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.06	64.66	10/04/2022 08:14 AM	46.81	46.81	0.067	1.433	0.721
Dows-Lake	NO	67.2	70.07	NORMAL	0	67.2	10/04/2022 00:00 AM	1266.18	1266.18	9.134	24.84	10.769
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	11.46	11.46	0.006	0.054	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	182.29	182.29	1.994	5.389	2.692
Preston_Street	NO	60.9	63.76	NORMAL	0.19	61.09	10/04/2022 08:10 AM	83.32	83.32	0.677	2.384	1.526
PW_Drive	NO	65.5	65.8	FREE	0	65.5	10/04/2022 00:00 AM	21.18	21.18	0.045	0.626	0.017

PCSWMM Report

24 Hour - 100year - Partial Green Roof

Model Permanent Dewatering.inp

March 6, 2023

Table of Contents

Summary 1: Inflows

Name	Permanent Dewatering
Time series inflows	1
Dry weather	0
Groundwater	0
RDII inflows	0

Summary 2: Runoff quantity continuity

Name	Permanent Dewatering
Initial LID storage (mm)	0.160
Initial snow cover (mm)	n/a
Total precipitation (mm)	106.607
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	38.388
Surface runoff (mm)	62.506
LID drainage (mm)	3.235
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.690
Continuity error (%)	-0.049

Summary 3: Flow routing continuity

Name	Permanent Dewatering
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	21.826
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.100
External outflow (ML)	22.047
Flooding loss (ML)	0.000
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	1.412
Continuity error (%)	-2.327

Summary 4: Results statistics

Name	Permanent Dewatering
Max. subcatchment total runoff (ML)	5.65
Max. subcatchment peak runoff (L/s)	3216.42
Max. subcatchment runoff coefficient	0.989
Max. subcatchment total precip (mm)	106.61
Min. subcatchment total precip (mm)	106.61
Max. node depth (m)	3.24
Num. nodes surcharged	8
Max. node surcharge duration (hours)	24
Max. node height above crown (m)	2.046
Min. node depth below rim (m)	0
Num. nodes flooded	0
Max. node flooding duration (hours)	0
Max. node flood volume (ML)	0
Max. node ponded volume or depth (ha-mm/1000 m³/m)	0
Max. storage volume (1000 m³)	2.049
Max. storage percent full (%)	93
Max. outfall flow frequency (%)	98.82
Max. outfall peak flow (L/s)	2018.46
Max. outfall total volume (ML)	17.318
Total outfall volume (ML)	22.047
Max. link peak flow (L/s)	3342.46
Max. link peak velocity (m/s)	15.22
Min. link peak velocity (m/s)	0
Num. conduits surcharged	20
Max. conduit surcharge duration (hours)	21.86
Max. conduit capacity limited duration (hours)	0.06

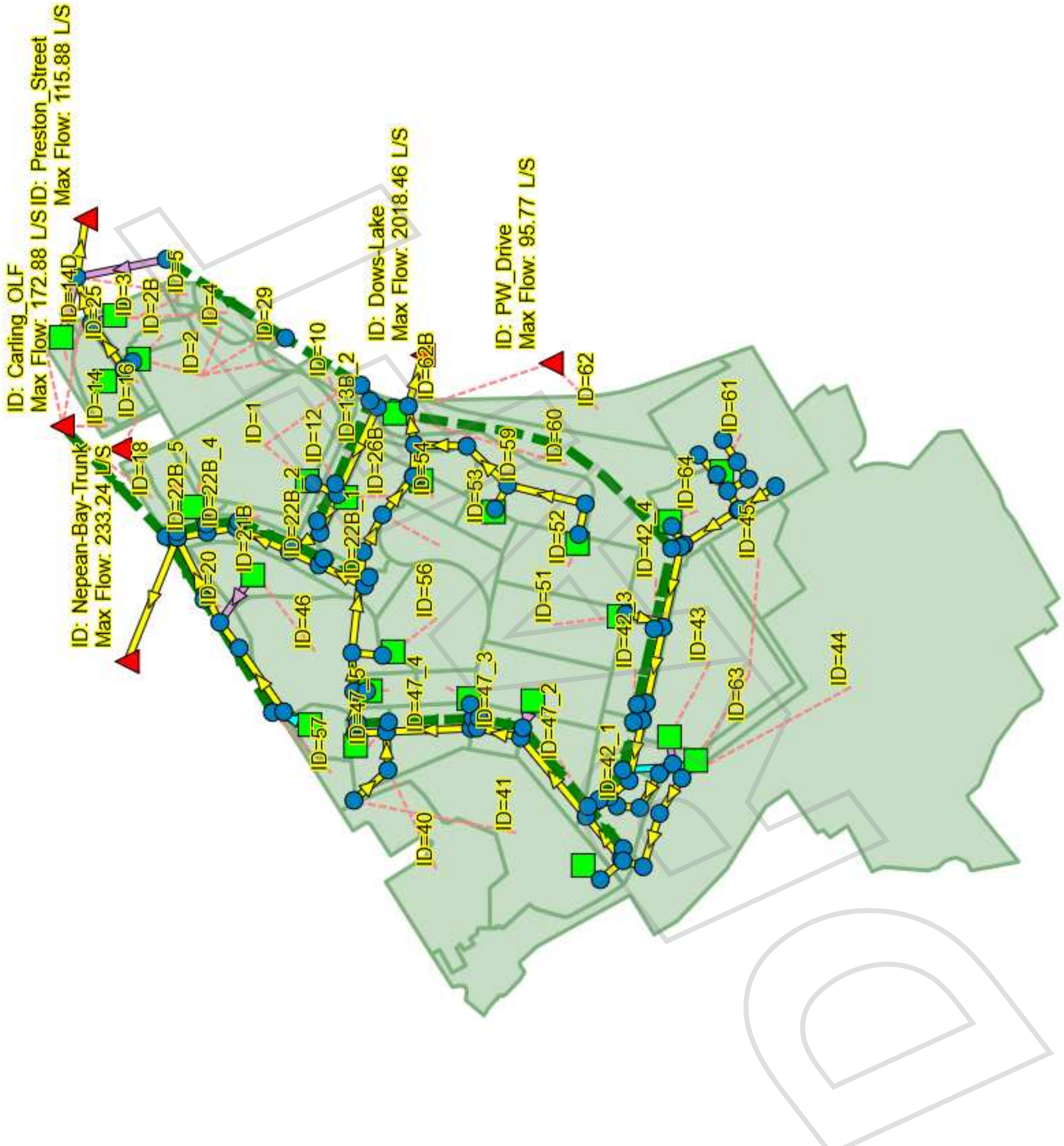

Figure 1: Extent 1

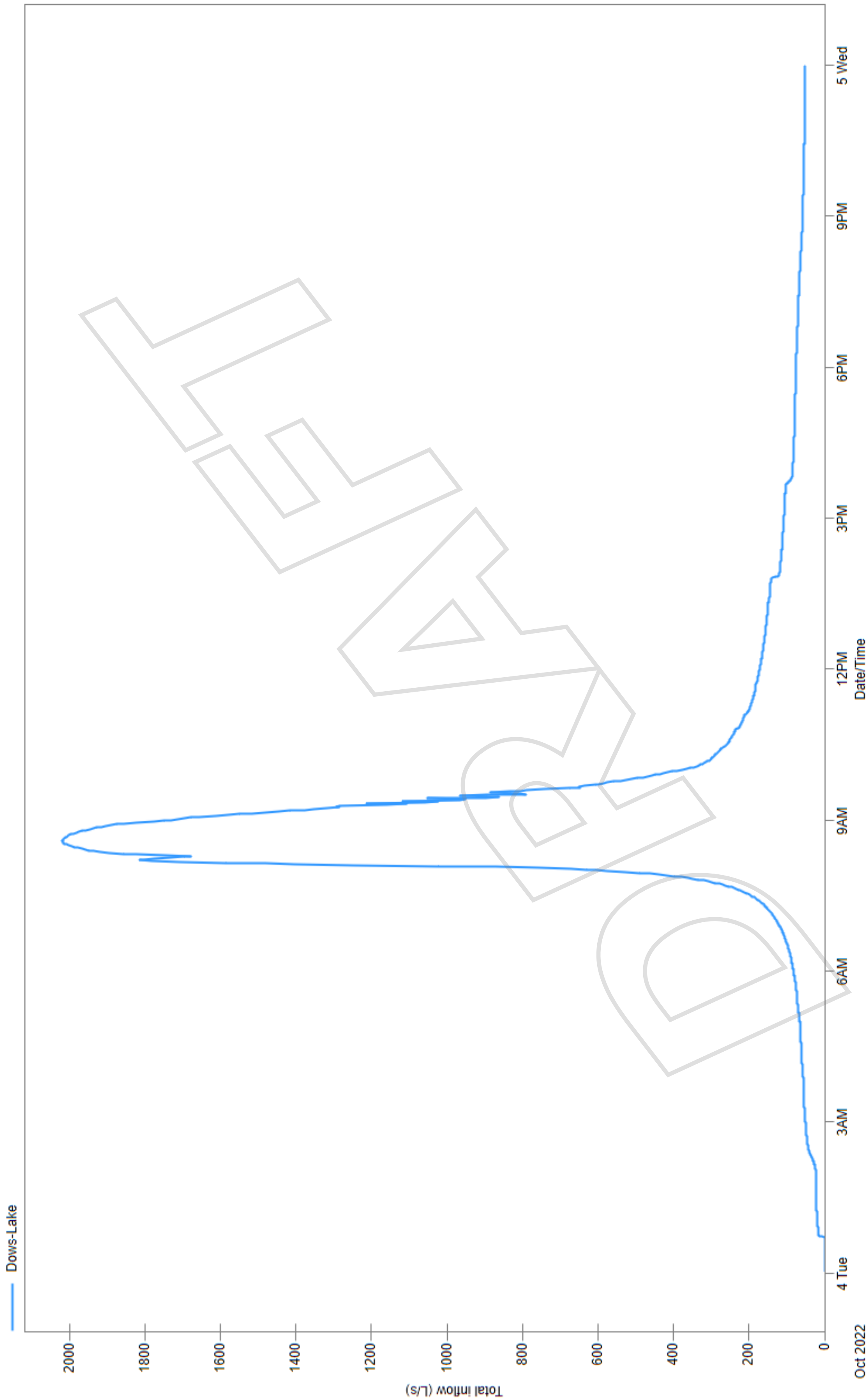

Figure 2: Dows Lake

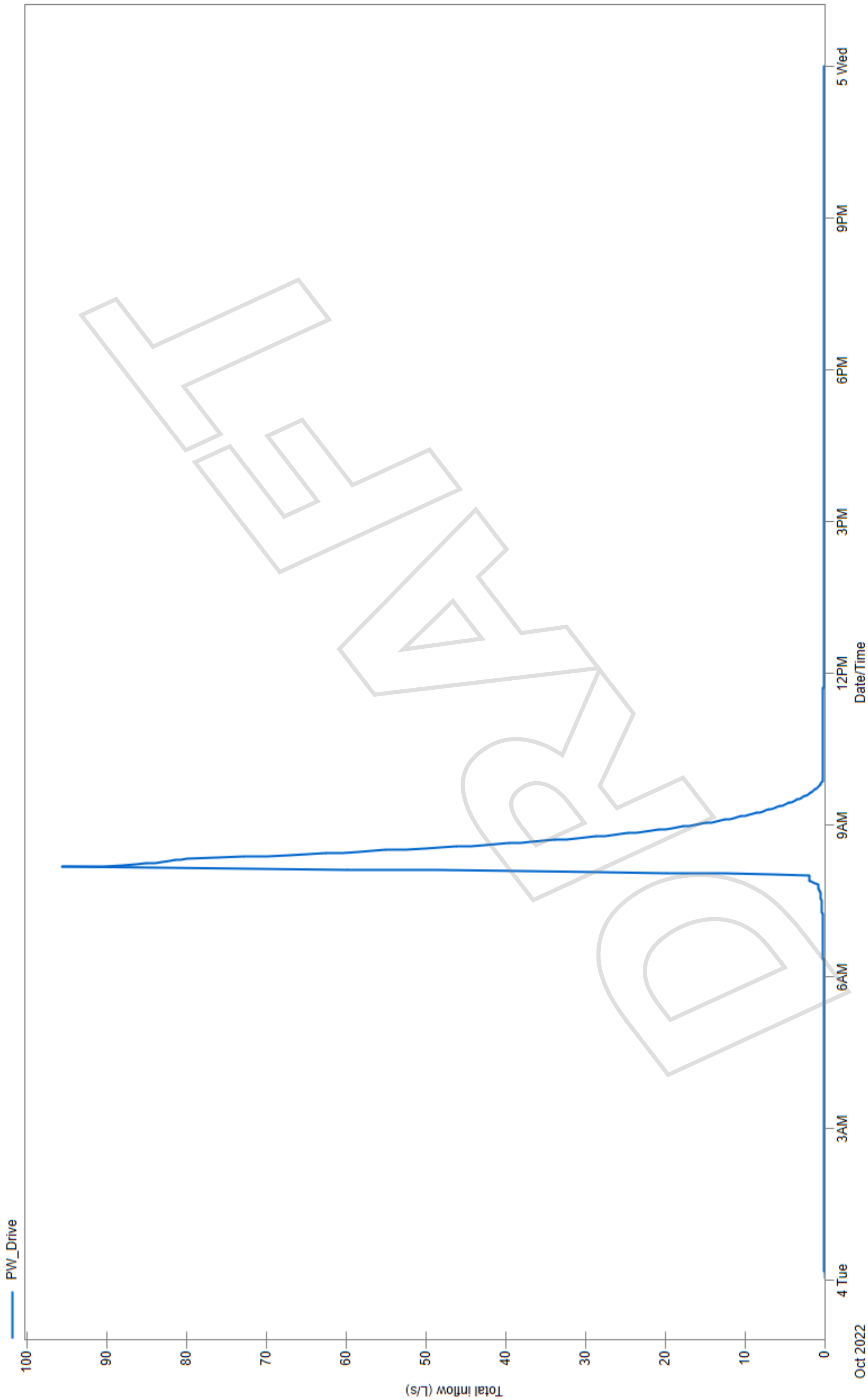

Figure 3: Prince of Wales

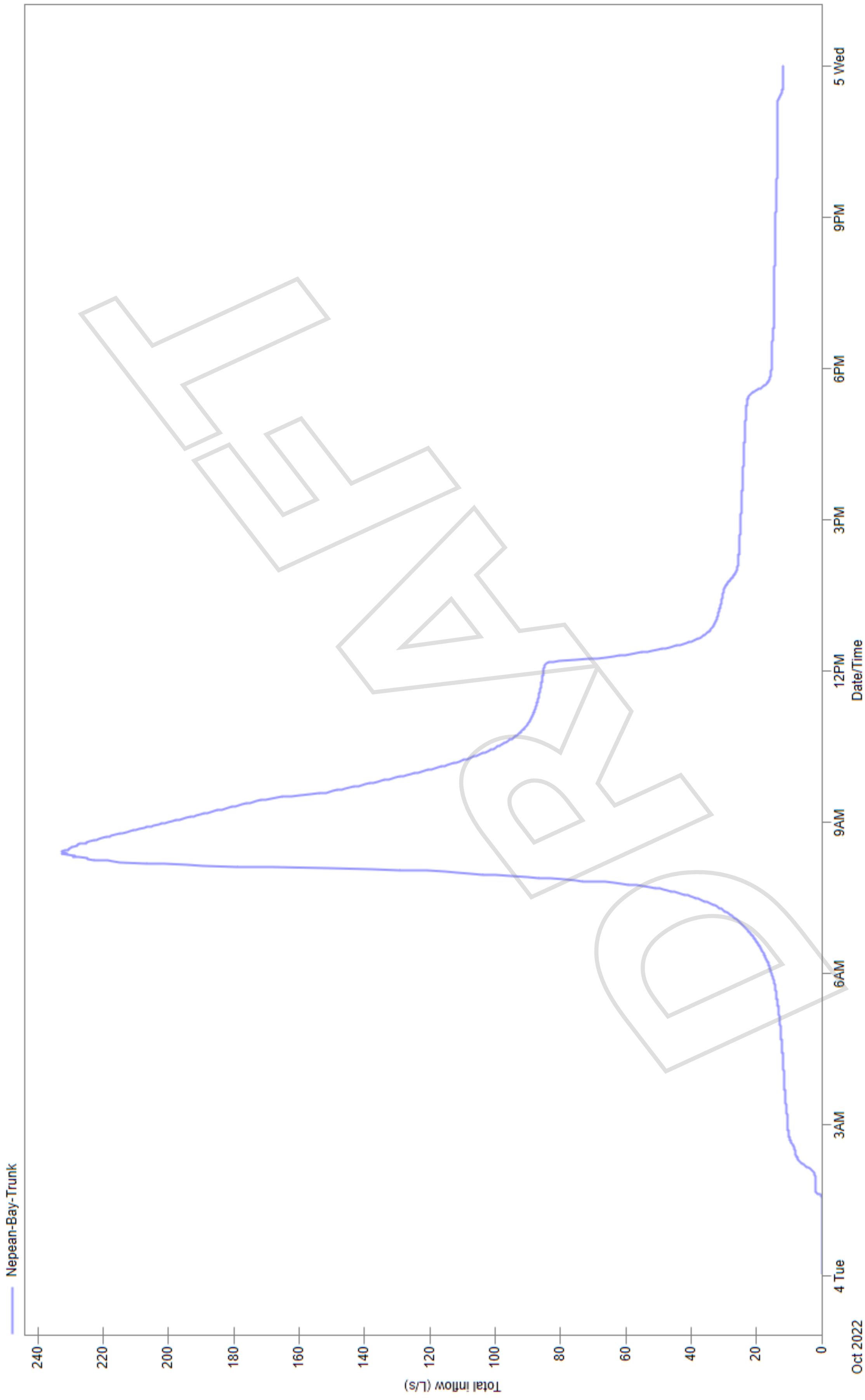

Figure 4: Nepean Bay Trunk

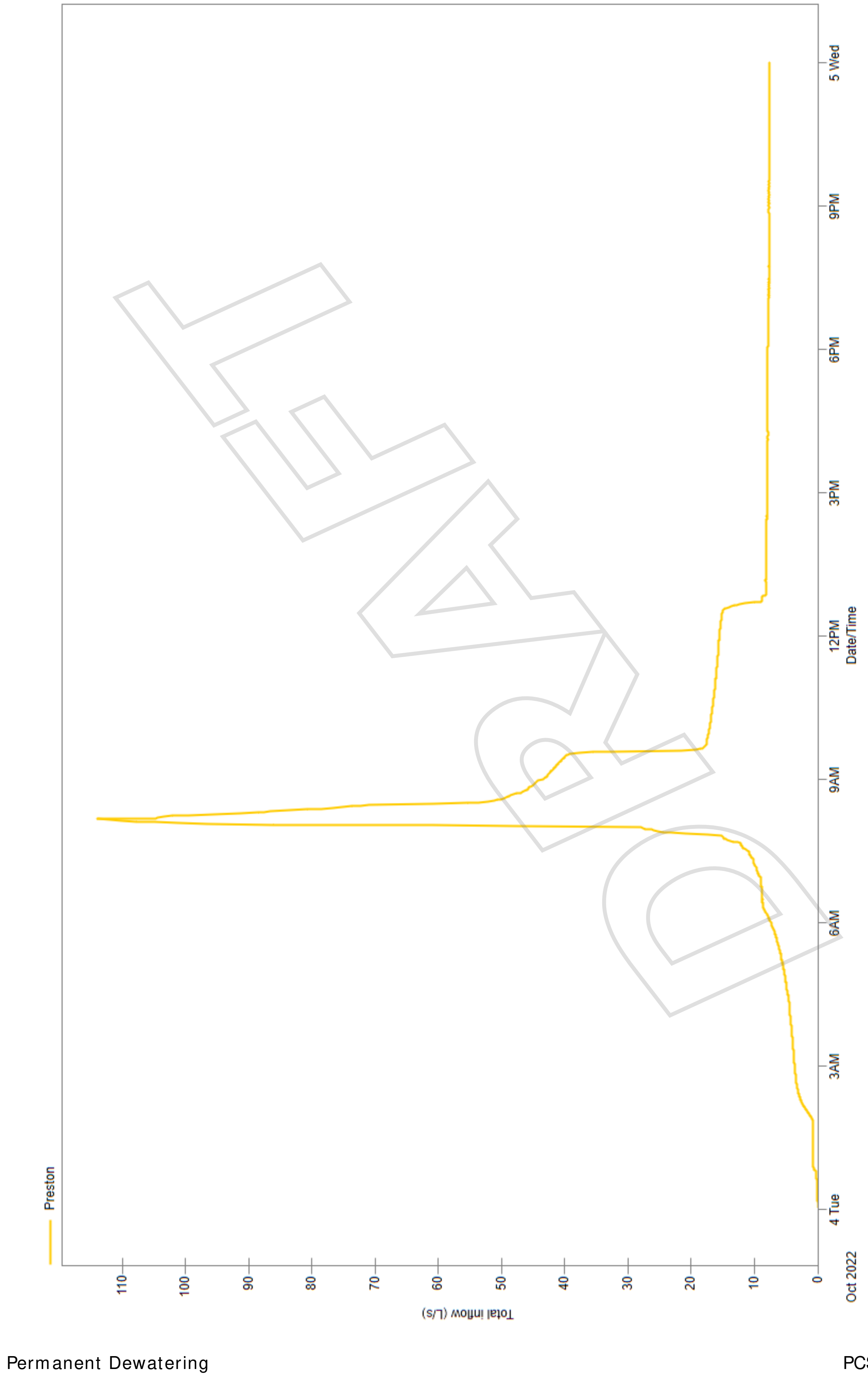

Figure 5: Preston Street

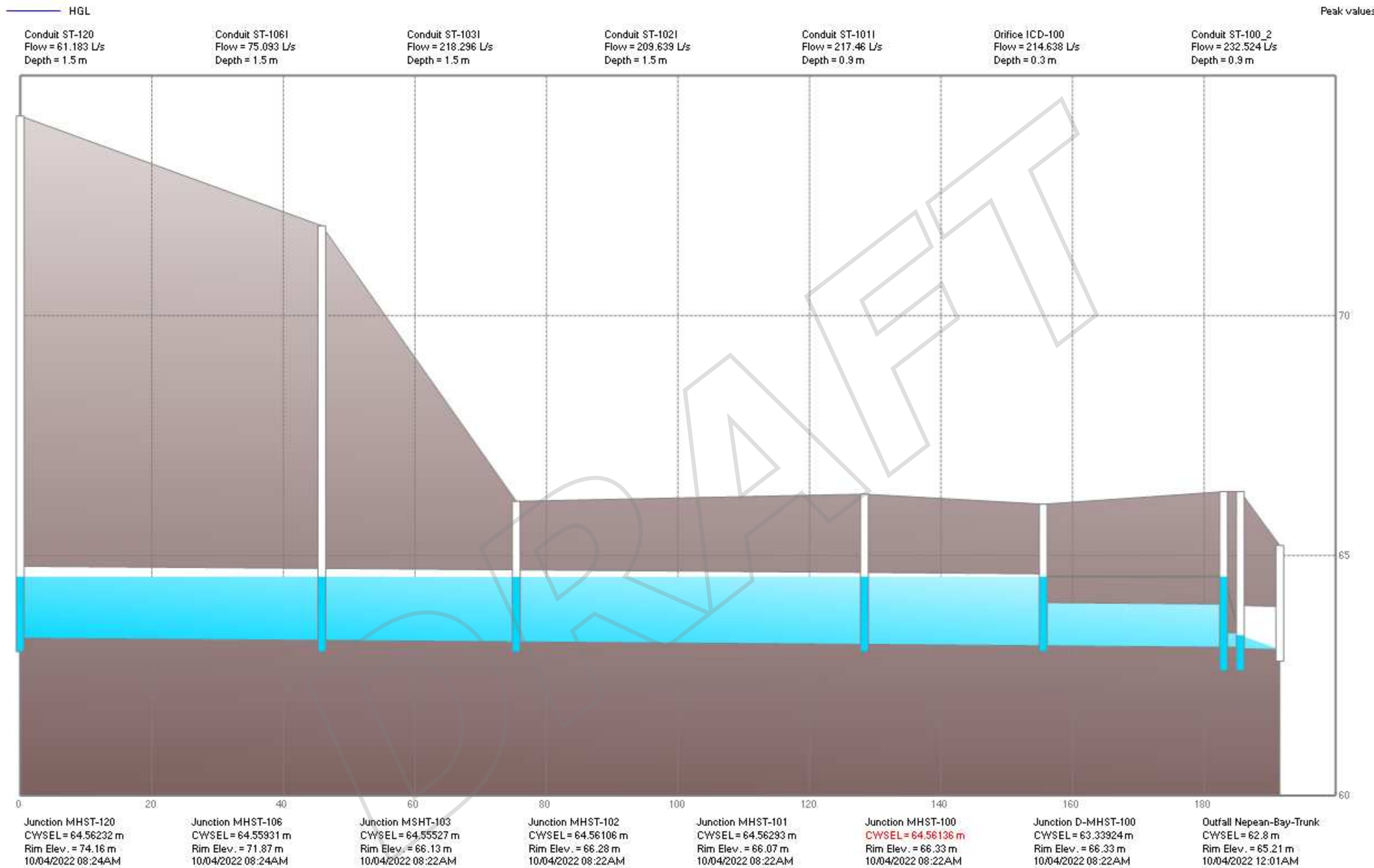

Figure 6: Road A

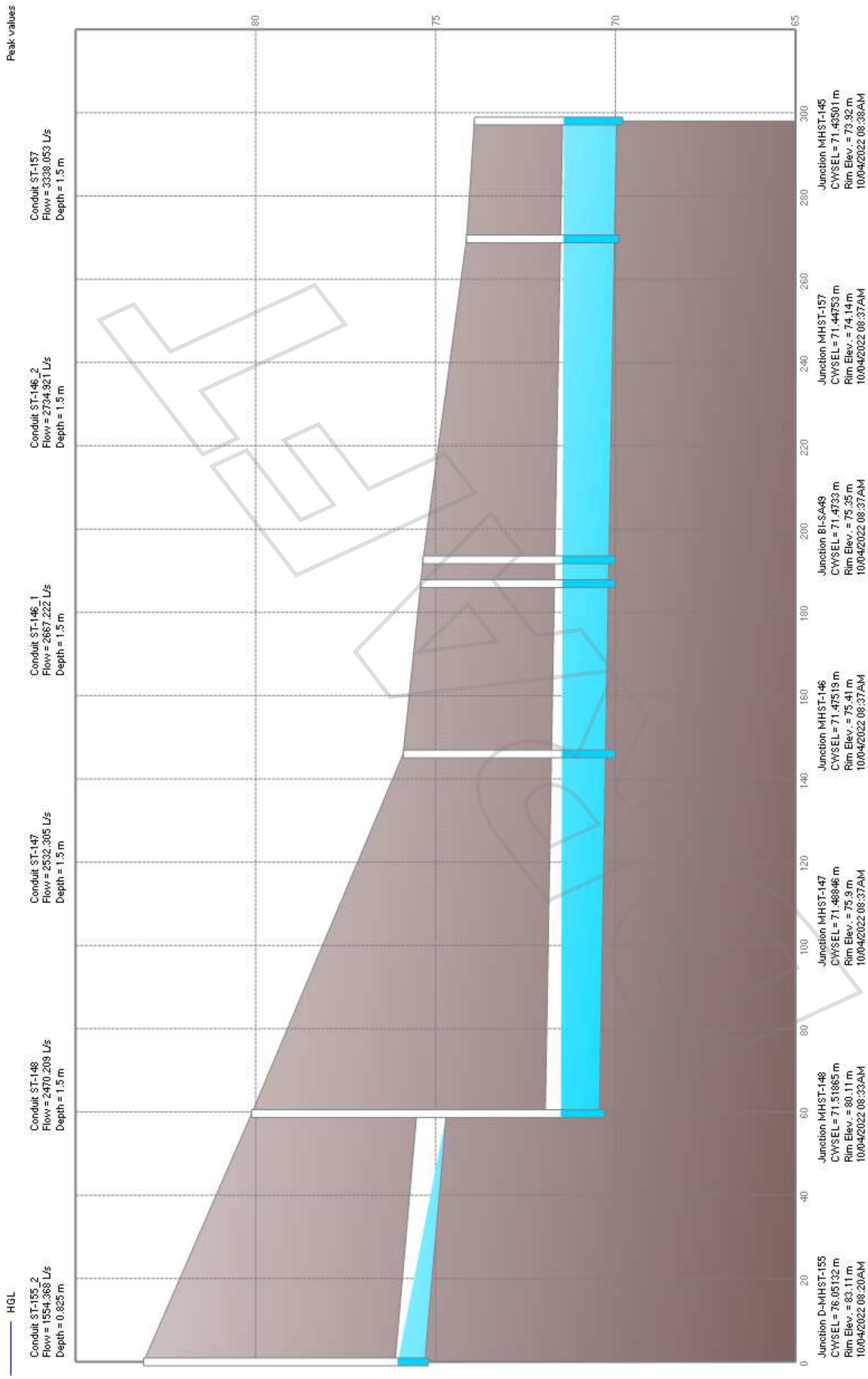

Figure 7: Road D

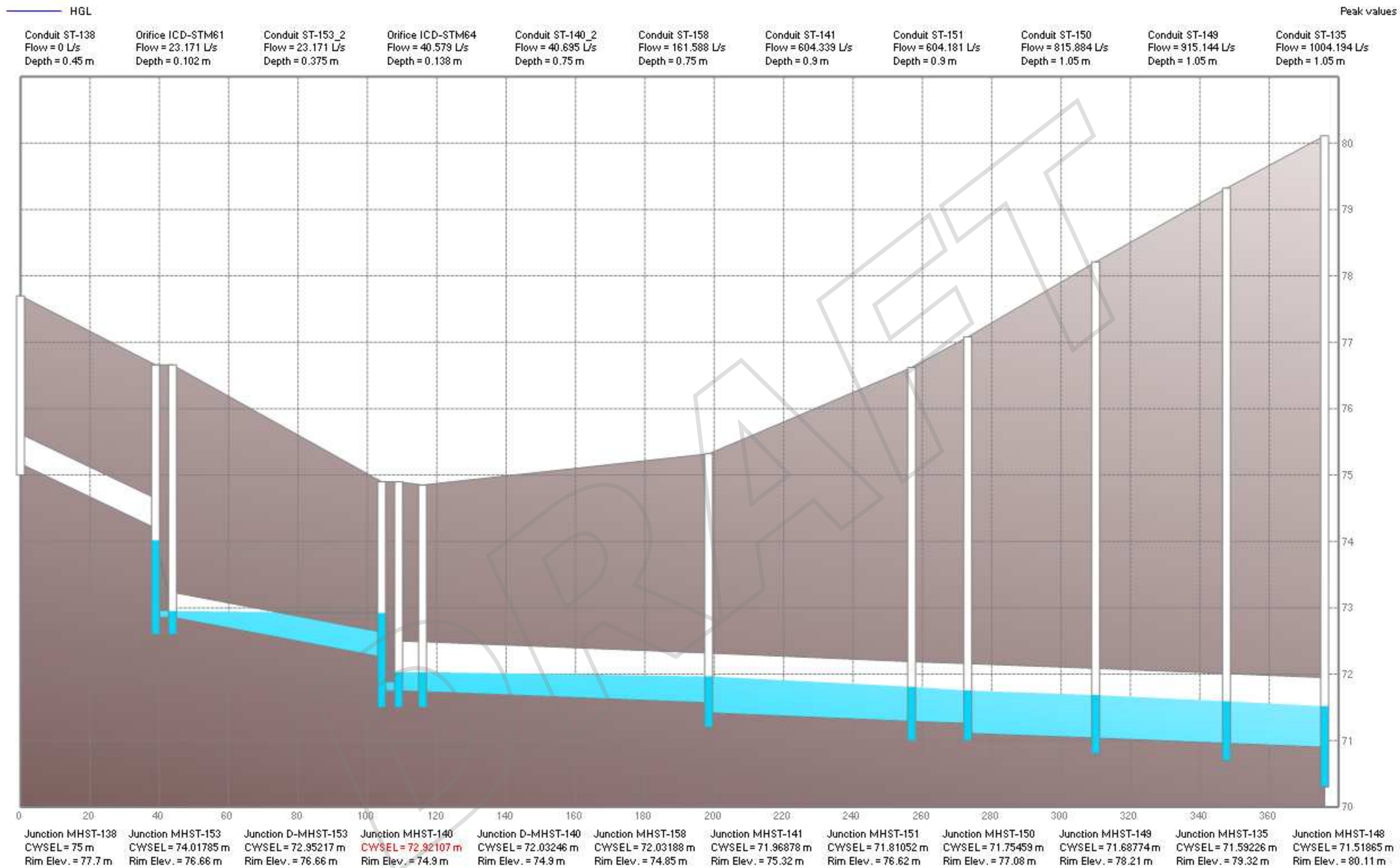

Figure 8: Road E

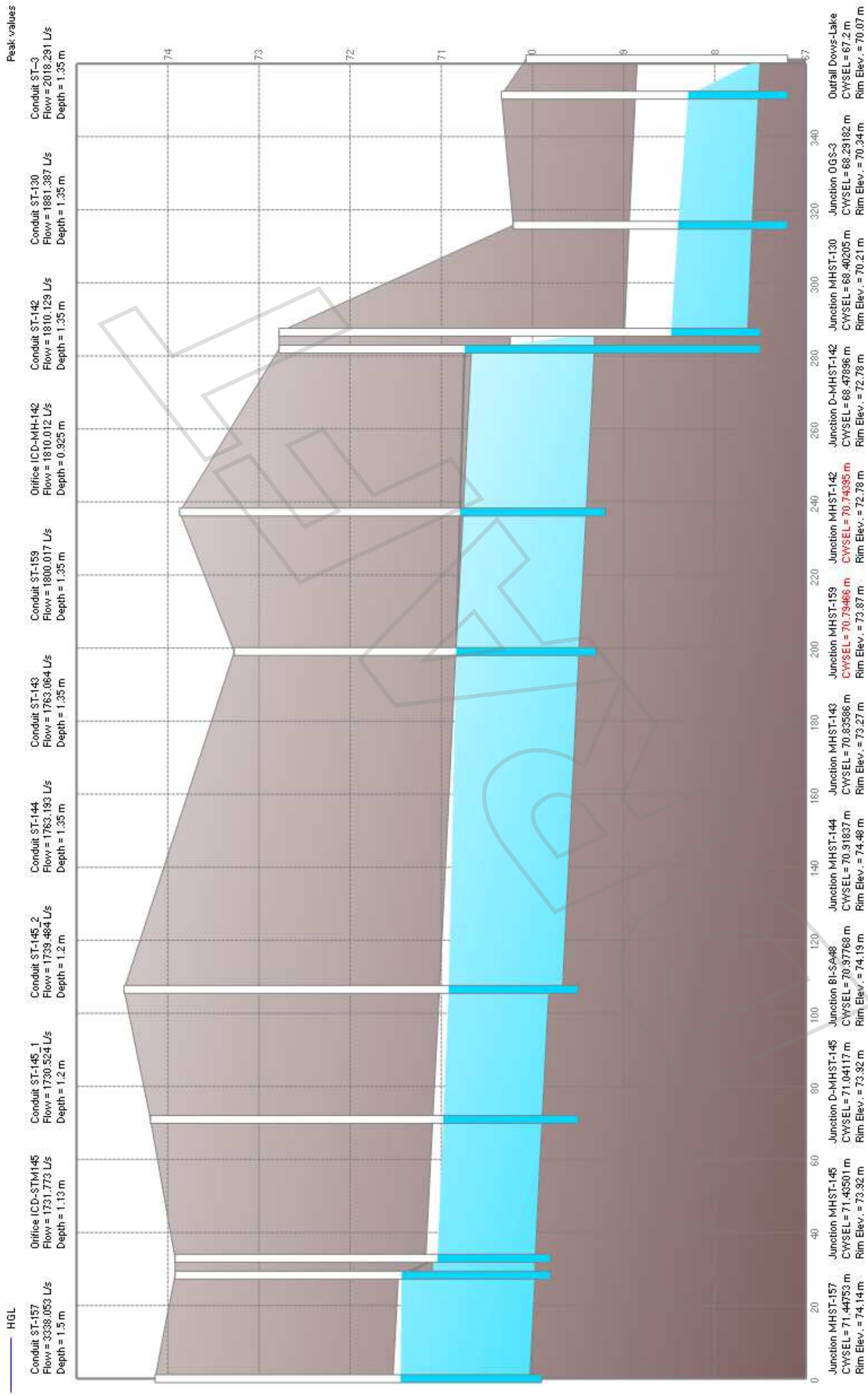

Figure 9: Road D to Dows Lake Outfall

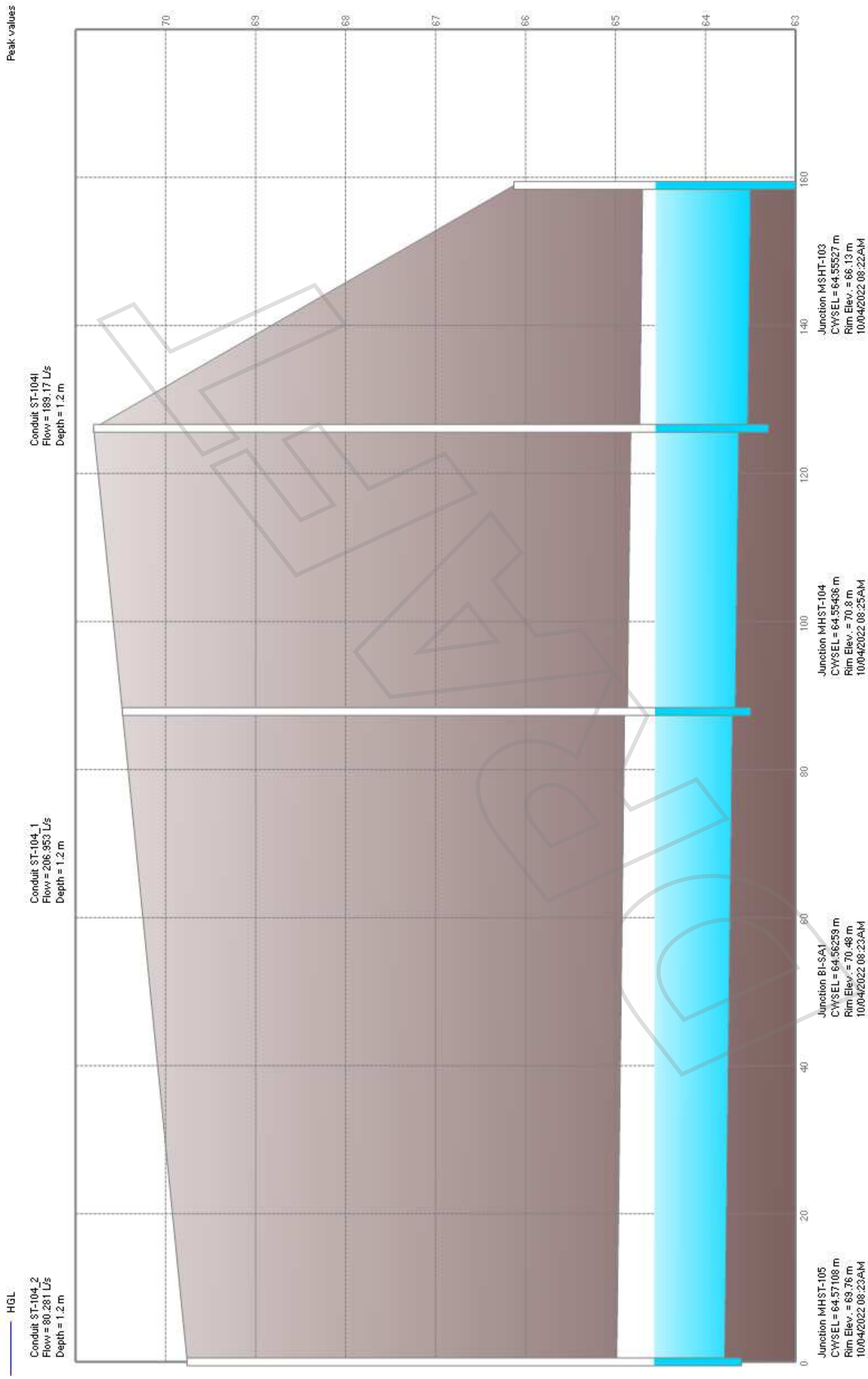

Figure 10: Road B

Table 1: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
1	24Hour-100Year-CityIDF	SA-1	1.2364	3	100	0.016	0.15	1.57	4.67	25	106.61	0	618.8
10	24Hour-100Year-CityIDF	13B_2	0.0828	3	9.73	0.016	0.15	1.57	4.67	25	106.61	65.1	36
11	24Hour-100Year-CityIDF	Wales-OLF-N03	0.03	3	100	0.016	0.15	1.57	4.67	25	106.61	0	14.88
12	24Hour-100Year-CityIDF	BI-SA1-S	0.1182	5	53.01	0.016	0.15	1.57	4.67	25	106.61	33.64	56.17
13B_1	24Hour-100Year-CityIDF	MHST-104-S	0.13	5	98.08	0.016	0.15	1.57	4.67	25	106.61	1.37	64.33
13B_2	24Hour-100Year-CityIDF	BI-SA1-S	0.22	5	98.08	0.016	0.15	1.57	4.67	25	106.61	1.41	141.21
14	24Hour-100Year-CityIDF	Carling_OLF	0.014	3	15.98	0.016	0.15	1.57	4.67	25	106.61	60.51	6.24
14B	24Hour-100Year-CityIDF	S-14B	0.0986	3	0	0.016	0.15	1.57	4.67	25	106.61	71.79	44.18
14C	24Hour-100Year-CityIDF	Carling_OLF	0.0104	3	59.6	0.016	0.15	1.57	4.67	25	106.61	28.94	4.97
14D	24Hour-100Year-CityIDF	Carling_OLF	0.0185	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.18
15	24Hour-100Year-CityIDF	S-15	0.36	3	3.65	0.016	0.15	1.57	4.67	25	106.61	70.66	116.6
16	24Hour-100Year-CityIDF	LRT-Corridor	0.023	3	0	0.016	0.15	1.57	4.67	25	106.61	71.61	10.39
17	24Hour-100Year-CityIDF	LRT-Corridor	0.031	3	0	0.016	0.15	1.57	4.67	25	106.61	71.72	13.96
18	24Hour-100Year-CityIDF	Carling_OLF	0.0913	3	5.91	0.016	0.15	1.57	4.67	25	106.61	67.99	38.41
19	24Hour-100Year-CityIDF	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	106.61	66.34	78.44
2	24Hour-100Year-CityIDF	SA-2	0.7231	3	100	0.016	0.15	1.57	4.67	25	106.61	0	399.52
20	24Hour-100Year-CityIDF	Carling_OLF_N01_1	0.1714	8	0	0.016	0.15	1.57	4.67	25	106.61	71.83	76.54
21B	24Hour-100Year-CityIDF	S-21B	0.434	10	0	0.016	0.15	1.57	4.67	25	106.61	97.6	429.62
22B_1	24Hour-100Year-CityIDF	MHST-120-S	0.262	5	95.43	0.016	0.15	1.57	4.67	25	106.61	3.27	129.03
22B_2	24Hour-100Year-CityIDF	MHST-106-S	0.061	5	95.43	0.016	0.15	1.57	4.67	25	106.61	3.26	30.13
22B_3	24Hour-100Year-CityIDF	MSHT-103-S	0.132	5	95.43	0.016	0.15	1.57	4.67	25	106.61	3.27	65.2
22B_4	24Hour-100Year-CityIDF	MHST-102-S	0.071	5	95.43	0.016	0.15	1.57	4.67	25	106.61	3.27	35.07
22B_5	24Hour-100Year-CityIDF	MHST-101-S	0.091	5	95.43	0.016	0.15	1.57	4.67	25	106.61	3.27	44.95
24	24Hour-100Year-CityIDF	MHST-107	0.034	3	56.98	0.016	0.15	1.57	4.67	25	106.61	30.99	15.96
25	24Hour-100Year-CityIDF	OGS1	0.0438	3	79.37	0.016	0.15	1.57	4.67	25	106.61	14.85	21.19
26B	24Hour-100Year-CityIDF	S-26B	0.776	9.406	8.78	0.016	0.15	1.57	4.67	25	106.61	67.33	233.28
27	24Hour-100Year-CityIDF	MHST-101-S	0.071	3	65.62	0.016	0.15	1.57	4.67	25	106.61	24.61	34.14

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
28	24Hour-100Year-CityIDF	MHST-102-S	0.075	5	62.44	0.016	0.15	1.57	4.67	25	106.61	26.89	35.95
29	24Hour-100Year-CityIDF	7	0.008	3	0	0.016	0.15	1.57	4.67	25	106.61	72.22	3.36
2B	24Hour-100Year-CityIDF	SA-2	0.103	3	100	0.016	0.15	1.57	4.67	25	106.61	0	51.09
3	24Hour-100Year-CityIDF	S-3	0.198	3	34.51	0.016	0.15	1.57	4.67	25	106.61	53.52	149.31
3B	24Hour-100Year-CityIDF	3	0.0431	3	100	0.016	0.15	1.57	4.67	25	106.61	0	21.38
4	24Hour-100Year-CityIDF	2	0.0269	3	100	0.016	0.15	1.57	4.67	25	106.61	0	13.34
40	24Hour-100Year-CityIDF	MHST-156	1.186	6.77	47.28	0.016	0.15	1.57	4.67	25	106.61	38.92	454.2
41	24Hour-100Year-CityIDF	MHST-132	1.523	3	14.99	0.016	0.15	1.57	4.67	25	106.61	65.74	290.01
42_1	24Hour-100Year-CityIDF	MHST-135-S	0.4	5	75.88	0.016	0.15	1.57	4.67	25	106.61	17.31	193.84
42_2	24Hour-100Year-CityIDF	MHST-149-S	0.31	5	75.88	0.016	0.15	1.57	4.67	25	106.61	17.33	150.01
42_3	24Hour-100Year-CityIDF	MHST-150-S1	0.61	2	75.88	0.016	0.15	1.57	4.67	25	106.61	17.47	287.68
42_4	24Hour-100Year-CityIDF	MHST-141-S	0.47	2	75.88	0.016	0.15	1.57	4.67	25	106.61	17.4	225.23
43	24Hour-100Year-CityIDF	SA-CUP	0.56	2	100	0.016	0.15	1.57	4.67	25	106.61	0	277.5
44	24Hour-100Year-CityIDF	MHST-62534	9.994	3	33.41	0.016	0.15	1.57	4.67	25	106.61	49.67	3216.42
45	24Hour-100Year-CityIDF	63	0.532	4	37.33	0.016	0.15	1.57	4.67	25	106.61	45.63	219.69
46	24Hour-100Year-CityIDF	21B	1.188	10	21.02	0.016	0.15	1.57	4.67	25	106.61	58.21	395.45
47_1	24Hour-100Year-CityIDF	D-MHST-155-S	0.11	3	65.85	0.016	0.15	1.57	4.67	25	106.61	24.55	52.62
47_2	24Hour-100Year-CityIDF	MHST-148-S	0.46	3	65.85	0.016	0.15	1.57	4.67	25	106.61	24.99	201.6
47_3	24Hour-100Year-CityIDF	MHST-147-S	0.19	3	65.85	0.016	0.15	1.57	4.67	25	106.61	24.65	89.42
47_4	24Hour-100Year-CityIDF	MHST-146-S	0.4	3	65.85	0.016	0.15	1.57	4.67	25	106.61	24.92	178.03
47_5	24Hour-100Year-CityIDF	MHST-157-S	0.25	3	65.85	0.016	0.15	1.57	4.67	25	106.61	24.73	115.86
48	24Hour-100Year-CityIDF	SA-48	0.138	2	100	0.016	0.15	1.57	4.67	25	106.61	0	68.38
49	24Hour-100Year-CityIDF	SA-49	0.164	2	100	0.016	0.15	1.57	4.67	25	106.61	0	81.17
5	24Hour-100Year-CityIDF	preston	0.00928	3	100	0.016	0.15	1.57	4.67	25	106.61	0	4.6
50	24Hour-100Year-CityIDF	SA-50	0.345	2	100	0.016	0.15	1.57	4.67	25	106.61	0	167.39
51	24Hour-100Year-CityIDF	SA-51	1.33	2	0	0.016	0.15	1.57	4.67	25	106.61	7.05	154.81
52	24Hour-100Year-CityIDF	SA-52	0.346	2	100	0.016	0.15	1.57	4.67	25	106.61	0	167.85

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
53	24Hour-100Year-CityIDF	SA-53	0.15	2	100	0.016	0.15	1.57	4.67	25	106.61	0	74.29
54	24Hour-100Year-CityIDF	SA-54	0.155	2	100	0.016	0.15	1.57	4.67	25	106.61	0	76.75
55	24Hour-100Year-CityIDF	MHST-159	0.455	2	0	0.016	0.15	1.57	4.67	25	106.61	7.45	55.89
56	24Hour-100Year-CityIDF	SA-56	0.784	2	79.52	0.016	0.15	1.57	4.67	25	106.61	14.83	372.97
57	24Hour-100Year-CityIDF	Carling_OLF_N01	0.152	15	4.5	0.016	0.15	1.57	4.67	25	106.61	68.49	68.75
58	24Hour-100Year-CityIDF	S-58	0.212	16	0	0.016	0.15	1.57	4.67	25	106.61	72.42	84.9
59	24Hour-100Year-CityIDF	MHST-133	0.715	2	93.37	0.016	0.15	1.57	4.67	25	106.61	4.77	346.8
6	24Hour-100Year-CityIDF	3	0.1007	3	0	0.016	0.15	1.57	4.67	25	106.61	72.17	42.65
60	24Hour-100Year-CityIDF	S-60	1.197	25	0	0.016	0.15	1.57	4.67	25	106.61	73.81	337.98
61	24Hour-100Year-CityIDF	UGS_Z4P	1.292	3	48.3	0.016	0.15	1.57	4.67	25	106.61	38.54	467.25
62	24Hour-100Year-CityIDF	PW_Drive	0.609	6	0	0.016	0.15	1.57	4.67	25	106.61	77.06	87.14
62B	24Hour-100Year-CityIDF	PW_Drive	0.0174	6	100	0.016	0.15	1.57	4.67	25	106.61	0	8.63
63	24Hour-100Year-CityIDF	S-63	0.423	2	48.45	0.016	0.15	1.57	4.67	25	106.61	47.27	405.77
64	24Hour-100Year-CityIDF	UGS_Z6BP	0.351	6	50.72	0.016	0.15	1.57	4.67	25	106.61	35.67	158.09
7	24Hour-100Year-CityIDF	2	0.0291	3	51.85	0.016	0.15	1.57	4.67	25	106.61	34.7	16.78
8	24Hour-100Year-CityIDF	2	0.0255	3	100	0.016	0.15	1.57	4.67	25	106.61	0	12.65
9	24Hour-100Year-CityIDF	1	0.0241	3	100	0.016	0.15	1.57	4.67	25	106.61	0	11.95

Table 2: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.09	0.62	214.86	3.555	2.443
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	1810.01	22.432	9.606
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.13	69.97	0.62	1731.87	20.9	8.689
ICD-STM155	MHST-155	D-MHST-155	SIDE	CIRCULAR	0.75	75.47	0.62	1426.23	10.949	3.743
ICD-STM61	MHST-153	D-MHST-153	SIDE	CIRCULAR	0.102	72.86	0.62	23.17	1.292	0.624
ICD-STM64	MHST-140	D-MHST-140	SIDE	CIRCULAR	0.138	71.75	0.62	40.59	1.643	0.802

Table 3: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	24.12	0.22
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	24.87	0.56
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	115.88	1.78
CA-OLF_2	Carling_OLF_N01	Carling_OLF_N01_1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	67.9	0.55
CA-OLF_3	Carling_OLF_N03	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	125.7	0.57
CA-OLF_4	Carling_OLF_N01_1	Carling_OLF_N03	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	139.59	0.8
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	18.71	0.27
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	233.24	1.39
ST-100-S	MHST-100-S	Carling_OLF_N03	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101	CBMHST-101	MHST-153	23.2	0.013	73.09	72.86	CIRCULAR	0.525	0.00991	48.54	0.47
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	219.04	0.44
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-102	CBMHST-101	13.4	0.013	73.12	73.09	CIRCULAR	0.525	0.00224	31.12	0.63
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	213.41	0.34
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	25.4	0.18

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-103	CBMHST-103	CBMHST-102	20.2	0.013	75.32	74.92	CIRCULAR	0.3	0.01981	0	0
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	225.75	0.4
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	15.38	0.15
ST-104	CBMHST-104	CBMHST-101	20.5	0.013	75.19	74.78	CIRCULAR	0.375	0.02	0	0
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	222.27	1.04
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	91.51	0.29
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	211.35	0.98
ST-105	CBMHST-105	CBMHST-104	11.3	0.013	75.48	75.25	CIRCULAR	0.375	0.02036	0	0
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	93.43	0.57
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	41.17	0.38
ST-106	CBMHST-106	CBMHST-105	21.4	0.013	76	75.56	CIRCULAR	0.3	0.02057	0	0
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	84.96	0.14
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	89.52	0.92
ST-107	CBMHST-107	MHST-140	21.7	0.013	72.1	71.88	CIRCULAR	0.45	0.01014	27.21	0.59
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	50.15	0.74
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	50.31	0.79
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	51.89	0.91
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	50.37	0.74
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	71.53	0.12
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	66.08	1.09
ST-130	MHST-130	OGS-3	35.6	0.013	67.59	67.52	CIRCULAR	1.35	0.00197	1881.4	2.17
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	370.89	1.42
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	287.08	2.47
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	372.79	1.17
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	1004.9	1.94
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	0	0
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	39.96	0.4

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-140_2	D-MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	40.7	0.54
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	606.47	1.58
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	330.12	1.1
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.64	67.59	CIRCULAR	1.35	0.00171	1810.13	1.98
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	1763.07	1.46
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	1763.28	1.59
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	1730.9	2.04
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	1739.52	2.17
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	2670.56	1.96
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	170.94	0.79
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	2740.56	2
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	120.12	0.58
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	2532.85	1.88
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	155.81	0.68
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	2472.56	1.87
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	116.04	0.71
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	916.07	1.67
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	149.91	0.81
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	816.14	1.47
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	297.37	0.86
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	612.82	1.76
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	335.48	1.28
ST-152	MHST-152	MHST-155	14	0.013	75.6	75.47	CIRCULAR	0.825	0.00929	1890.94	3.54
ST-153_2	D-MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	23.17	1.07
ST-154	MHST-154	MHST-155	19	0.013	75.54	75.47	CIRCULAR	1.2	0.00368	3282.94	2.9
ST-155_2	D-MHST-155	MHST-148	59.6	0.013	75.3	74.7	CIRCULAR	0.825	0.01007	1555.97	3.08
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	20.15	0.38

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	722.39	0.55
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	3342.46	2.46
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	151.77	0.45
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	161.7	1.15
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	217.35	0.55
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	1800.03	1.27
ST--3	OGS-3	Dows-Lake	9.877	0.013	67.52	67.5	CIRCULAR	1.35	0.00202	2018.46	2.42
ST-62534	MHST-62534	MHST-62537	38	0.013	76.42	76.29	CIRCULAR	1.2	0.00342	3283.6	2.9
ST-62537	MHST-62537	MHST-154	50.921	0.013	76.29	76.11	CIRCULAR	1.2	0.00353	3282.24	2.92
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	30.25	1.15
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	76.85	1.67
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	14.55	0.86
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	14.55	0.76
ST-S41	UGS_Exp_Farm	MHST-152	4	0.013	75.62	75.6	CIRCULAR	0.825	0.005	1891.23	4.9
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.2	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	10.03	0.93
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	10	0.91
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	141.66	15.22
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	10.01	0.85
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	20.04	1.11
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	10.07	0.87
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	25	1.15
ST-UGS4	UGS_Z4P	CBMHST-102	3.2	0.013	73.13	73.12	CIRCULAR	0.525	0.00313	36.77	0.62
ST-UGS6B	UGS_Z6BP	CBMHST-107	2.8	0.013	72.13	72.1	CIRCULAR	0.3	0.01071	39.14	0.98
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.4	69.97	CIRCULAR	0.9	0.04437	2116.32	4.05
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.02	1.2
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	32.96	0.75

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	28.17	0.61

Table 4: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-14B	61.65	63.3	1.65	1.64	63.29	44.18	0	0	0	3	0.01	75	20.05
S-15	62.1	63.9	1.8	1.77	63.87	116.6	0	0	0	13	0.096	86	7.79
S-19	64	66	2	1.65	65.65	78.44	0	0	0	4	0.06	23	3.78
S-21B	63.54	65.7	2.16	1.88	65.42	429.62	0	0	0	28	0.587	46	4.05
S-26B	67.33	69.62	2.29	2.21	69.54	233.28	0	0	0	20	0.234	69	8.71
S-3	62.2	64.26	2.06	2.05	64.25	149.31	0	0	0	6	0.078	93	26.74
S-58	64.93	66.95	2.02	1.98	66.91	84.9	0	0	0	1	0.042	16	15.07
S-60	67.69	69.34	1.65	1.54	69.23	350.91	0	0	0	1	0.092	31	139.1
S-63	80.3	82.16	1.86	2.01	82.31	405.77	0	0	0	5	0.135	90	228.98
SA-1	69.5	72.5	3	2.29	71.79	618.8	0	0	0	13	0.504	76	60
SA-2	62.6	65.6	3	1.98	64.58	450.61	0	0	0	45	0.593	66	7
SA-48	72.01	75.01	3	2.12	74.13	68.38	0	0	0	7	0.044	71	10
SA-49	73.6	76.6	3	2.29	75.89	81.17	0	0	0	9	0.057	76	10
SA-50	72.82	75.82	3	2.26	75.08	167.39	0	0	0	21	0.158	75	10
SA-51	73.5	76.5	3	0.15	73.65	363.28	0	0	0	1	0.015	5	280
SA-52	69.5	72.5	3	2.27	71.77	167.85	0	0	0	21	0.159	76	10
SA-53	69.08	72.08	3	2.08	71.16	74.29	0	0	0	4	0.033	69	20
SA-54	70.76	73.76	3	2.11	72.87	76.75	0	0	0	8	0.053	70	10
SA-56	72.04	75.04	3	2.07	74.11	372.97	0	0	0	14	0.311	69	25
SA-CUP	72.5	75.5	3	0.32	72.82	277.5	0	0	0	1	0.161	11	50

Table 4: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	75.62	78.02	2.4	1.81	77.43	1891.23	0	0	0	4	1.058	76	484.39
UGS_Z1P	70.07	72.07	2	1.37	71.44	2116.32	0	0	0	16	2.049	68	920.94
UGS_Z4P	73.13	74.48	1.35	0.89	74.02	467.25	0	0	0	26	0.528	69	36.77
UGS_Z6BP	72.13	73.35	1.22	0.79	72.92	158.09	0	0	0	12	0.108	68	39.14

Table 5: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Overflow-58	S-58	Carling_OLF_N01	TRANSVERSE	0.3	0	66.91	1.65	0.52	0.212	0
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.25	1.65	0	3.942	1.762
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.65	160.79	0.955	0.404
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.6	1.84	0	3.555	2.443
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.85	1.84	0	22.432	9.606
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.6	1.84	0	20.9	8.689
Weir6	MHST-155	D-MHST-155	TRANSVERSE	0.8	0	77.3	1.65	118.03	10.949	3.743
Weir7	MHST-153	D-MHST-153	TRANSVERSE	0.3	0	74.5	1.84	0	1.292	0.624
Weir8	MHST-140	D-MHST-140	TRANSVERSE	0.3	0	73.3	1.84	0	1.643	0.802

Table 6: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.1	64.7	10/04/2022 08:11 AM	172.88	172.88	0.187	1.433	0.721
Dows-Lake	NO	67.2	70.07	NORMAL	0	67.2	10/04/2022 00:00 AM	2018.46	2018.46	17.318	24.84	10.769
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	24.34	24.34	0.019	0.054	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	233.24	233.24	3.347	5.389	2.692
Preston_Street	NO	60.9	63.76	NORMAL	0.3	61.2	10/04/2022 08:08 AM	115.88	115.88	0.978	2.384	1.526
PW_Drive	NO	65.5	65.8	FREE	0	65.5	10/04/2022 00:00 AM	95.77	95.77	0.198	0.626	0.017

PCSWMM Report

24 Hour - StressEvent - Partial Green Roof

Model Permanent Dewatering.inp

March 6, 2023

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Name	Permanent Dewatering
Time series inflows	1
Dry weather	0
Groundwater	0
RDII inflows	0

Summary 2: Runoff quantity continuity

Name	Permanent Dewatering
Initial LID storage (mm)	0.160
Initial snow cover (mm)	n/a
Total precipitation (mm)	127.928
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	42.907
Surface runoff (mm)	78.836
LID drainage (mm)	3.692
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.717
Continuity error (%)	-0.049

Summary 3: Flow routing continuity

Name	Permanent Dewatering
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	27.399
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.100
External outflow (ML)	28.752
Flooding loss (ML)	0.004
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	2.002
Continuity error (%)	-7.925

Summary 4: Results statistics

Name	Permanent Dewatering
Max. subcatchment total runoff (ML)	7.2
Max. subcatchment peak runoff (L/s)	4221.31
Max. subcatchment runoff coefficient	0.991
Max. subcatchment total precip (mm)	127.93
Min. subcatchment total precip (mm)	127.93
Max. node depth (m)	3.56
Num. nodes surcharged	29
Max. node surcharge duration (hours)	24
Max. node height above crown (m)	2.06
Min. node depth below rim (m)	0
Num. nodes flooded	1
Max. node flooding duration (hours)	0.07
Max. node flood volume (ML)	0.004
Max. node ponded volume or depth (ha-mm/1000 m^3/m)	0
Max. storage volume (1000 m^3)	2.821
Max. storage percent full (%)	100
Max. outfall flow frequency (%)	98.89
Max. outfall peak flow (L/s)	2626.81
Max. outfall total volume (ML)	21.47
Total outfall volume (ML)	28.752
Max. link peak flow (L/s)	4448.49
Max. link peak velocity (m/s)	21.54
Min. link peak velocity (m/s)	0
Num. conduits surcharged	51
Max. conduit surcharge duration (hours)	22.32
Max. conduit capacity limited duration (hours)	0.67

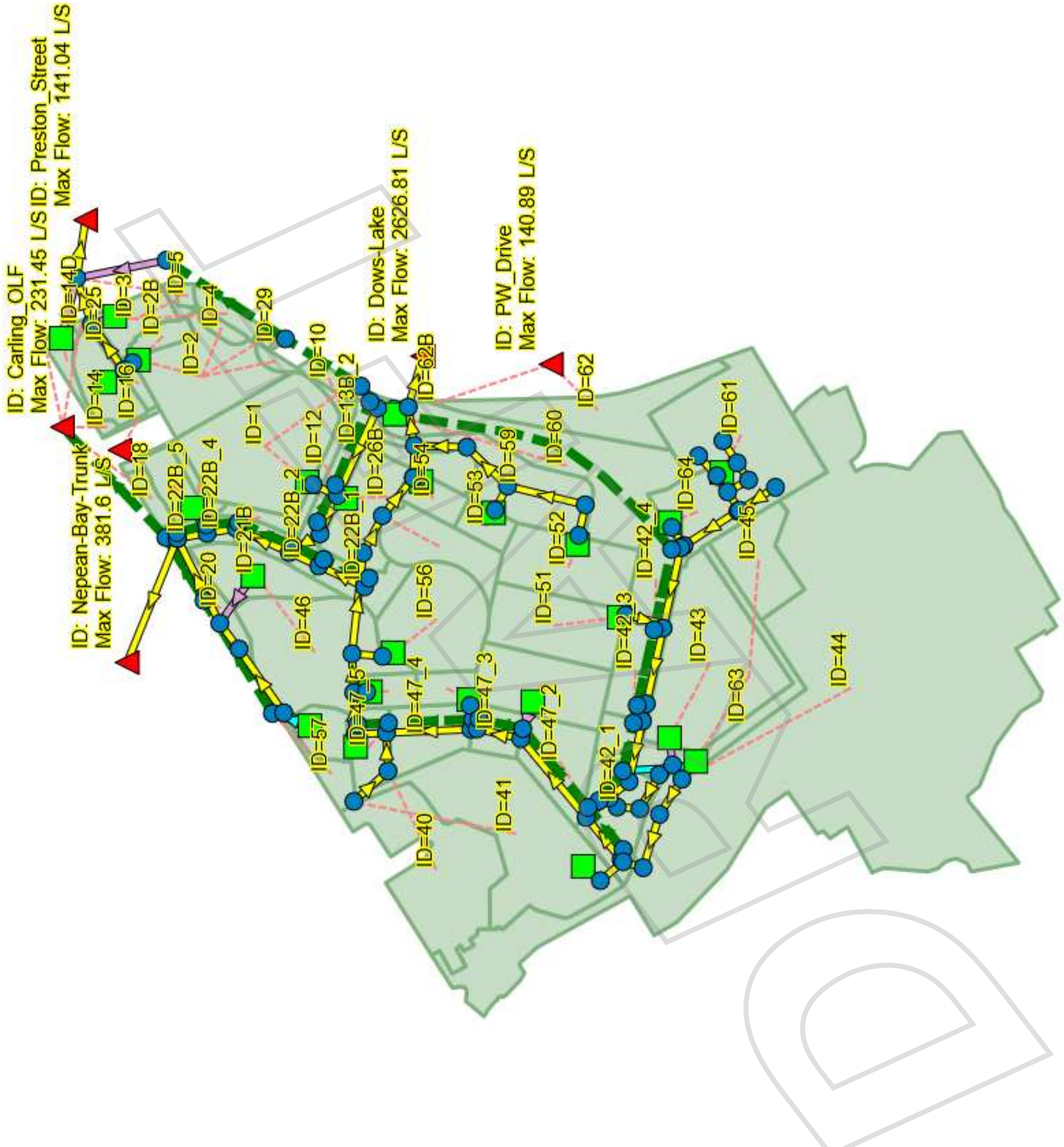

Figure 1: Extent 1

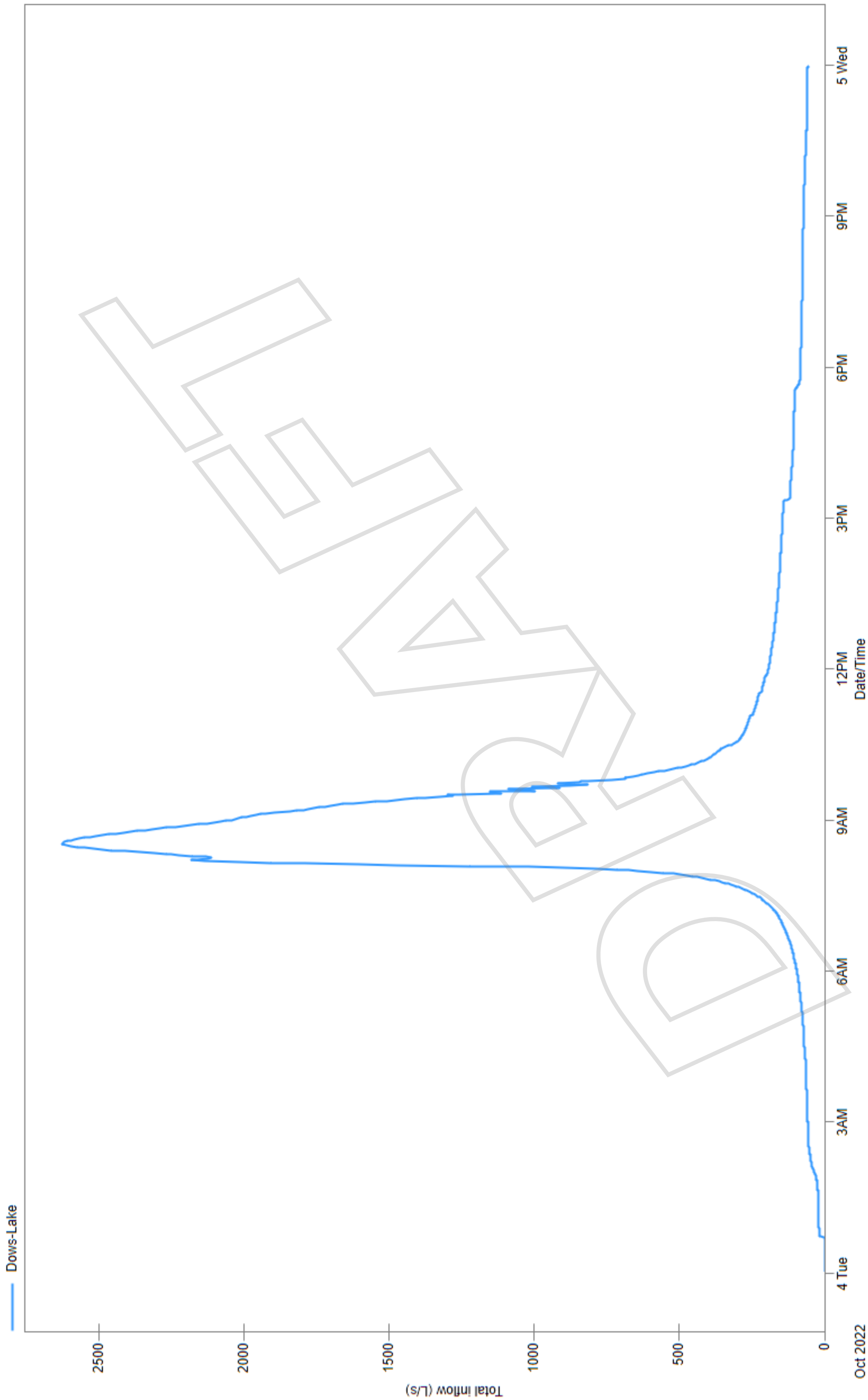

Figure 2: Dows Lake

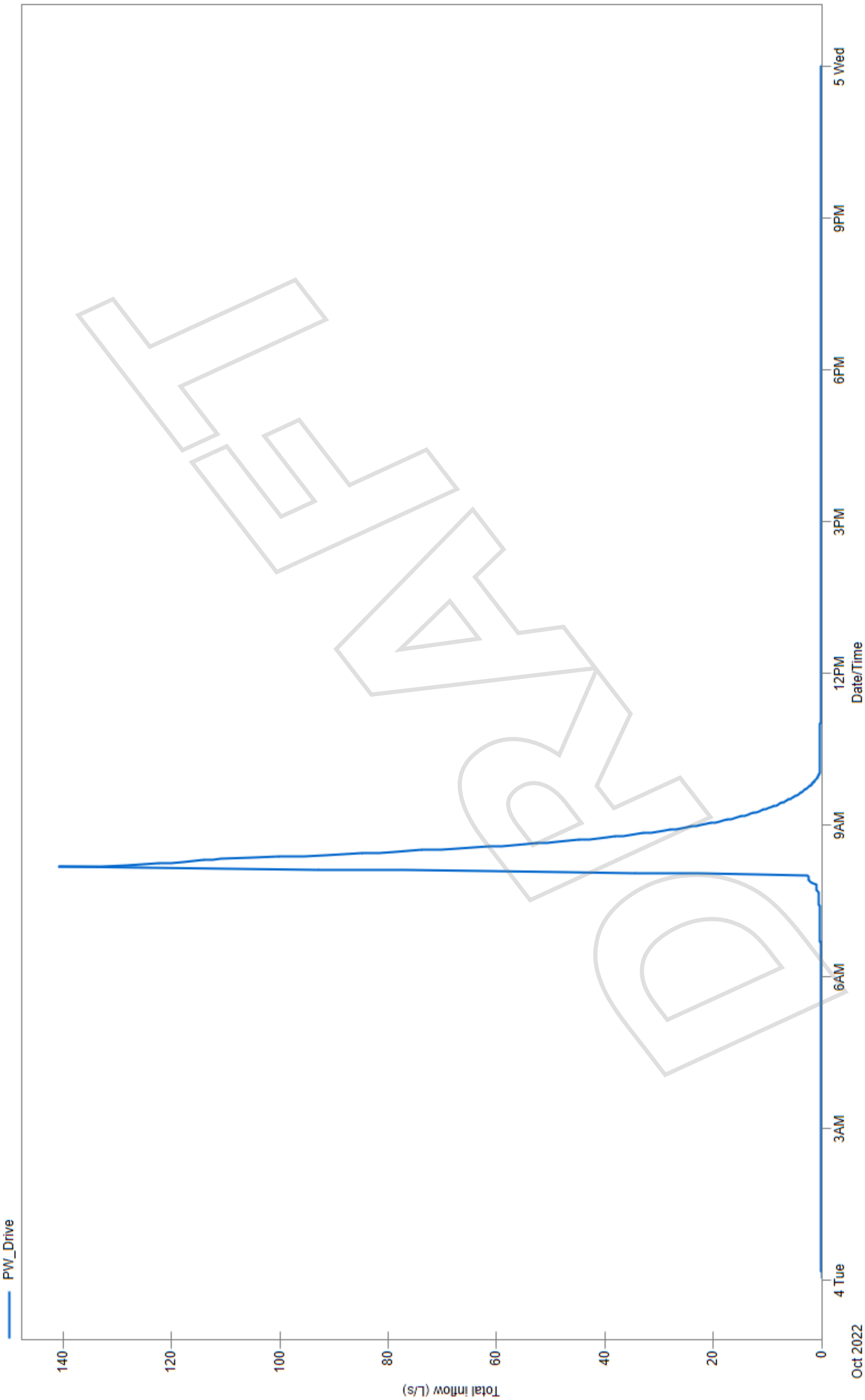

Figure 3: Prince of Wales

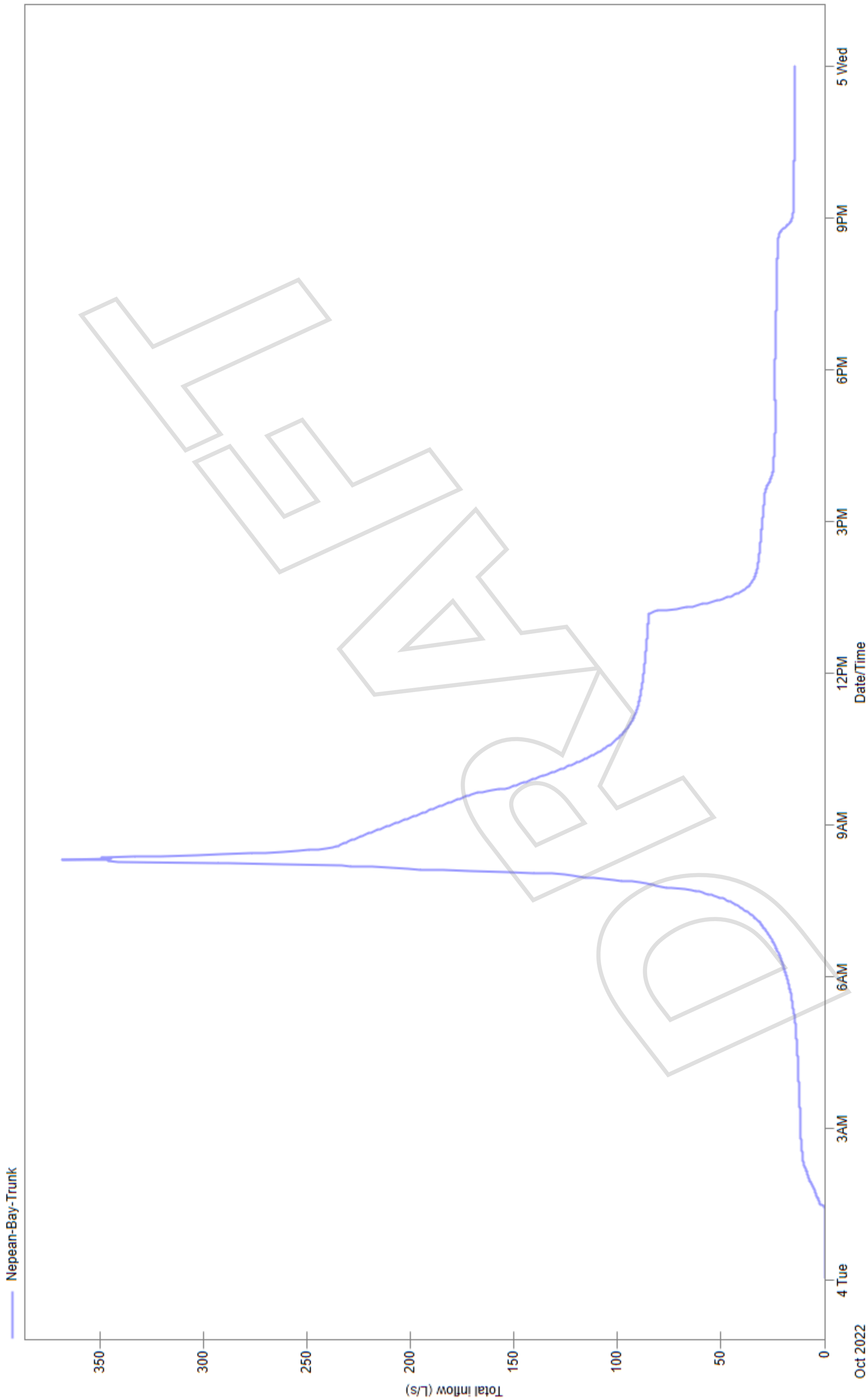

Figure 4: Nepean Bay Trunk

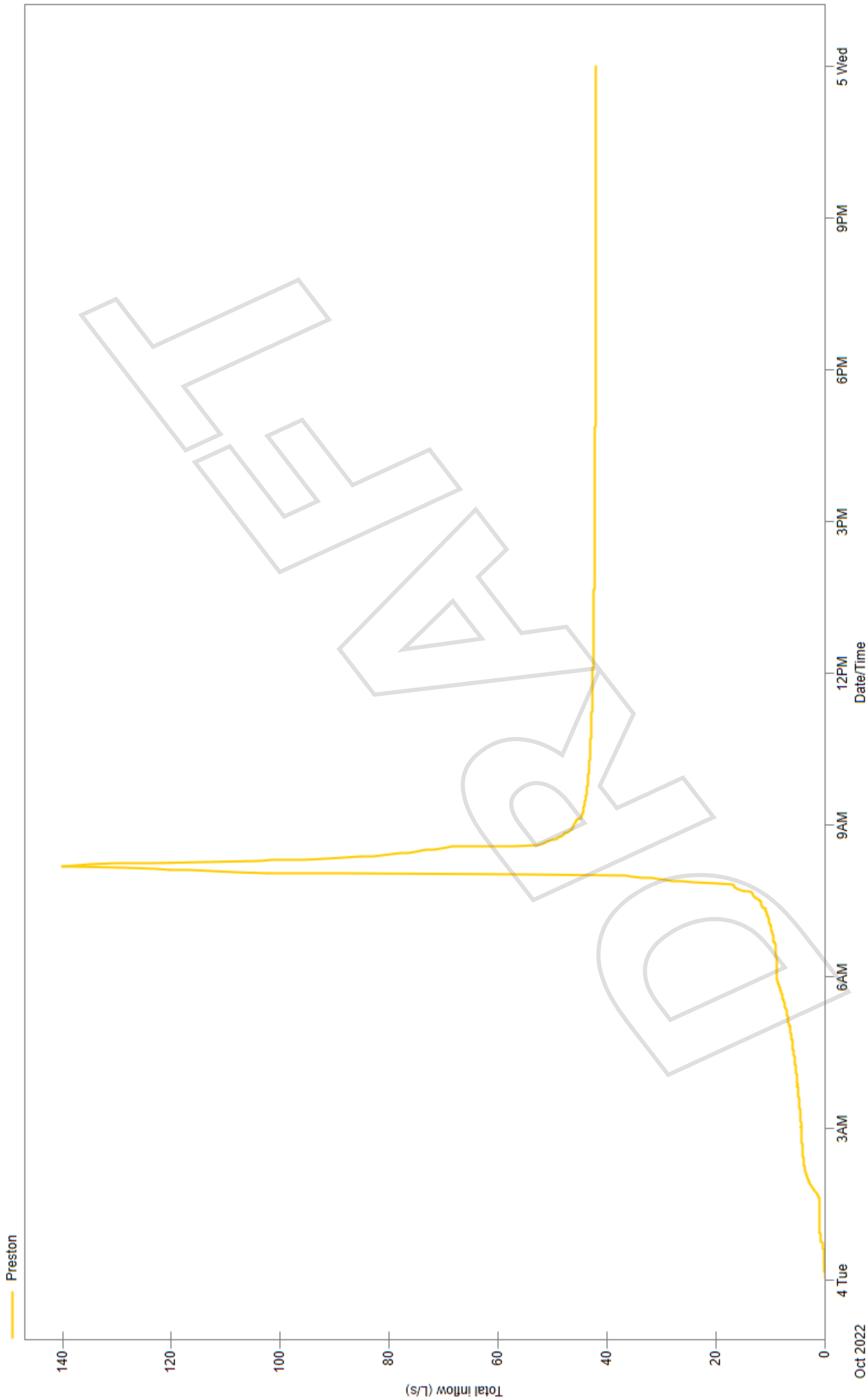

Figure 5: Preston Street

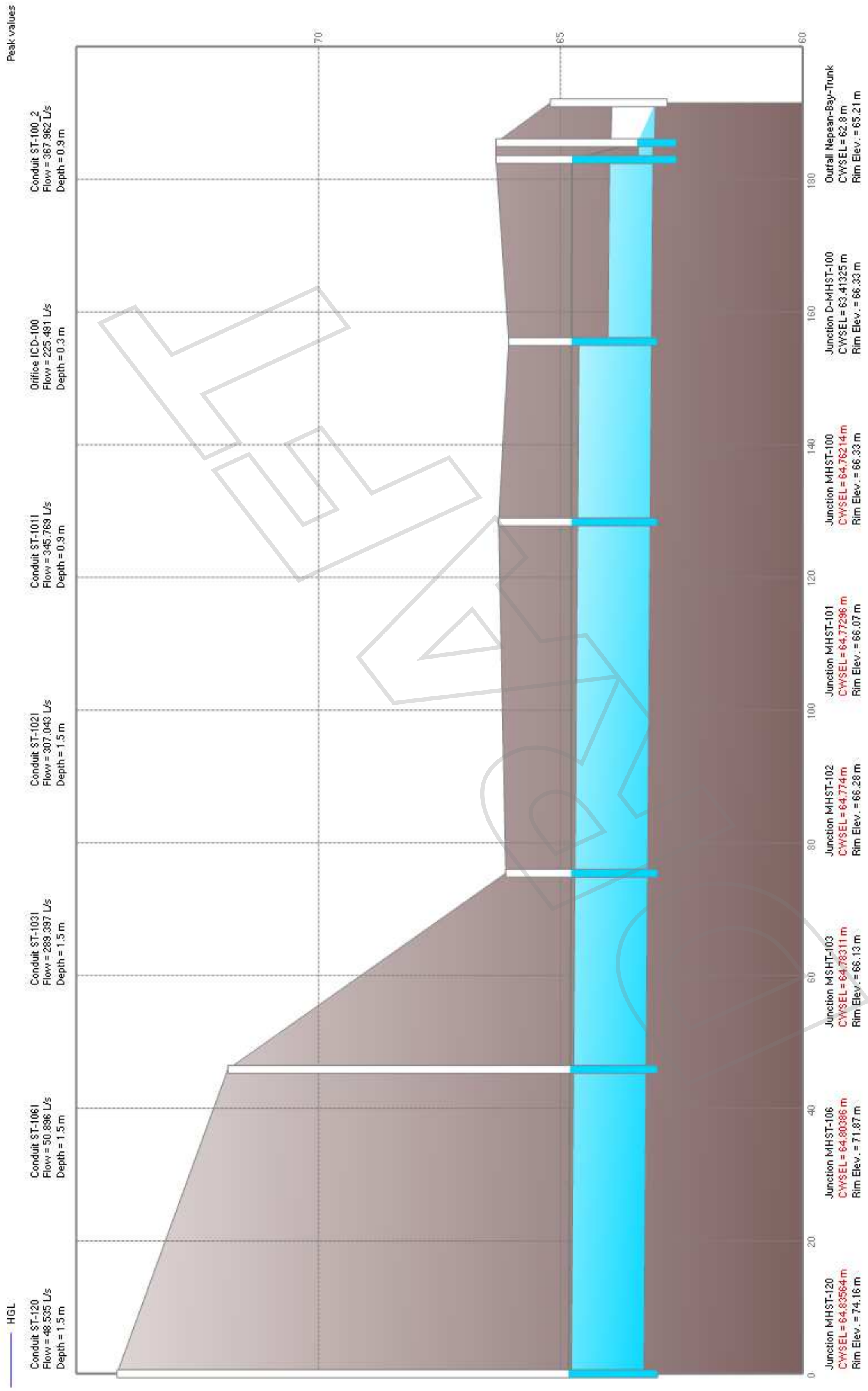

Figure 6: Road A

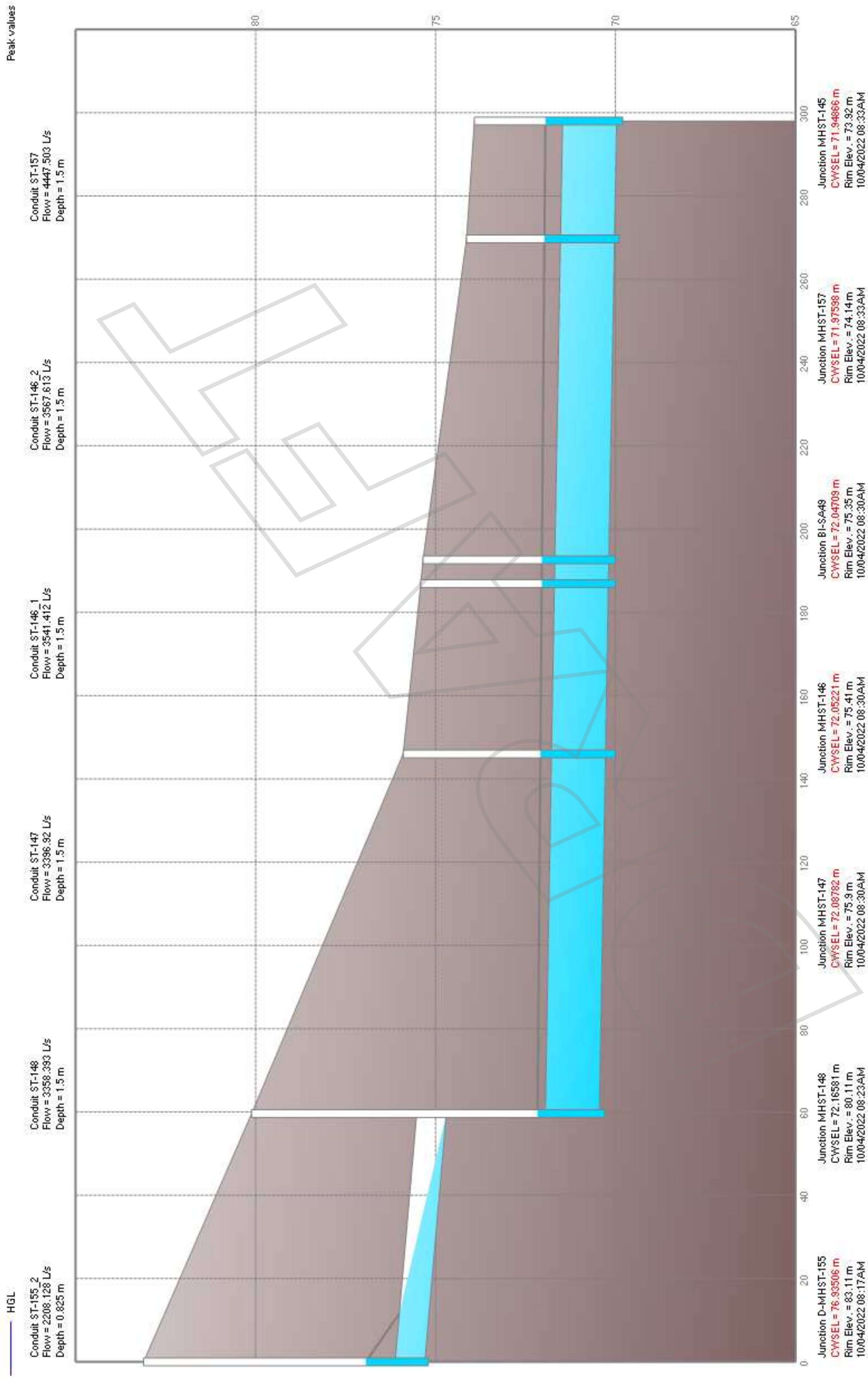

Figure 7: Road D

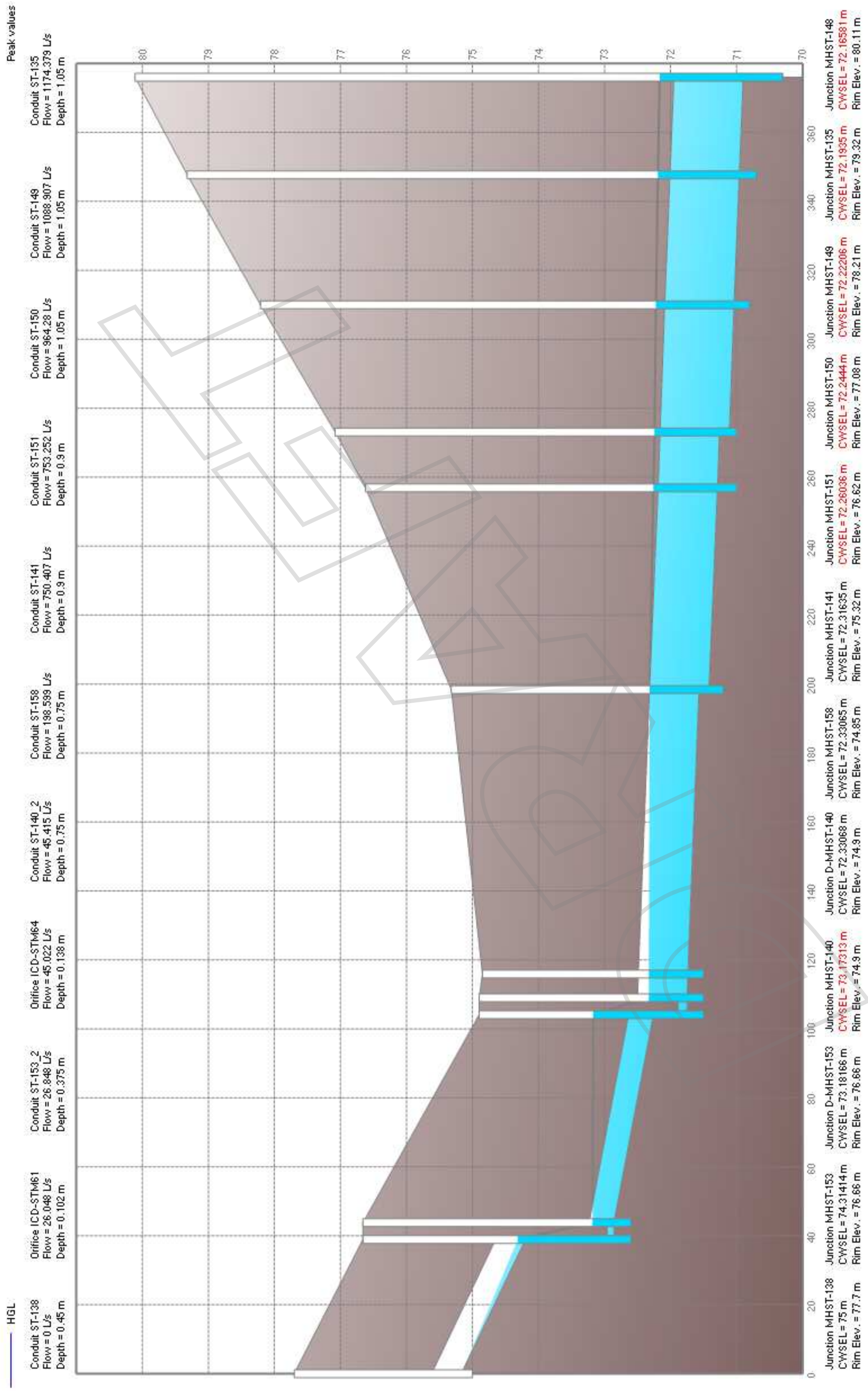

Figure 8: Road E

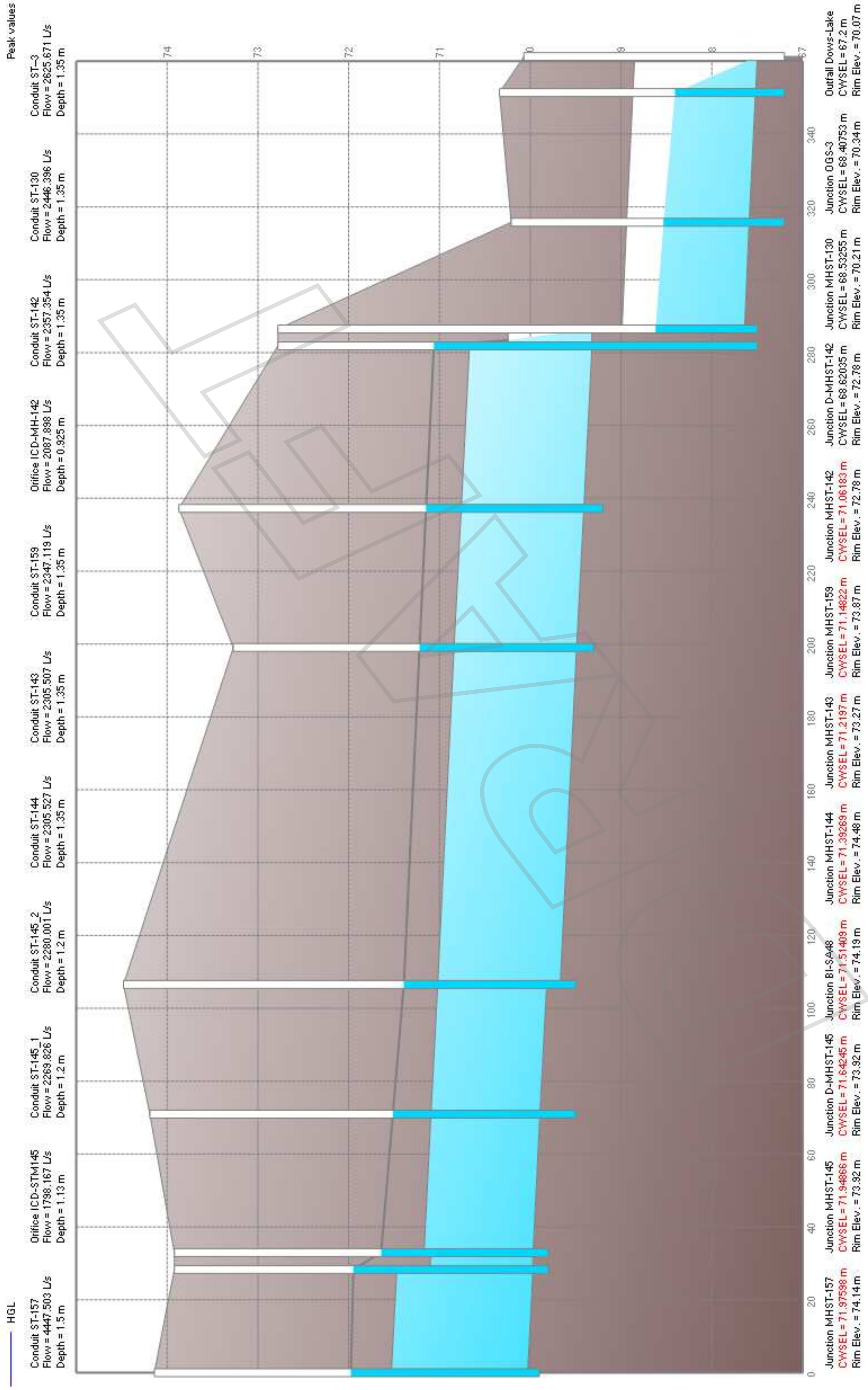

Figure 9: Road D to Dows Lake Outfall

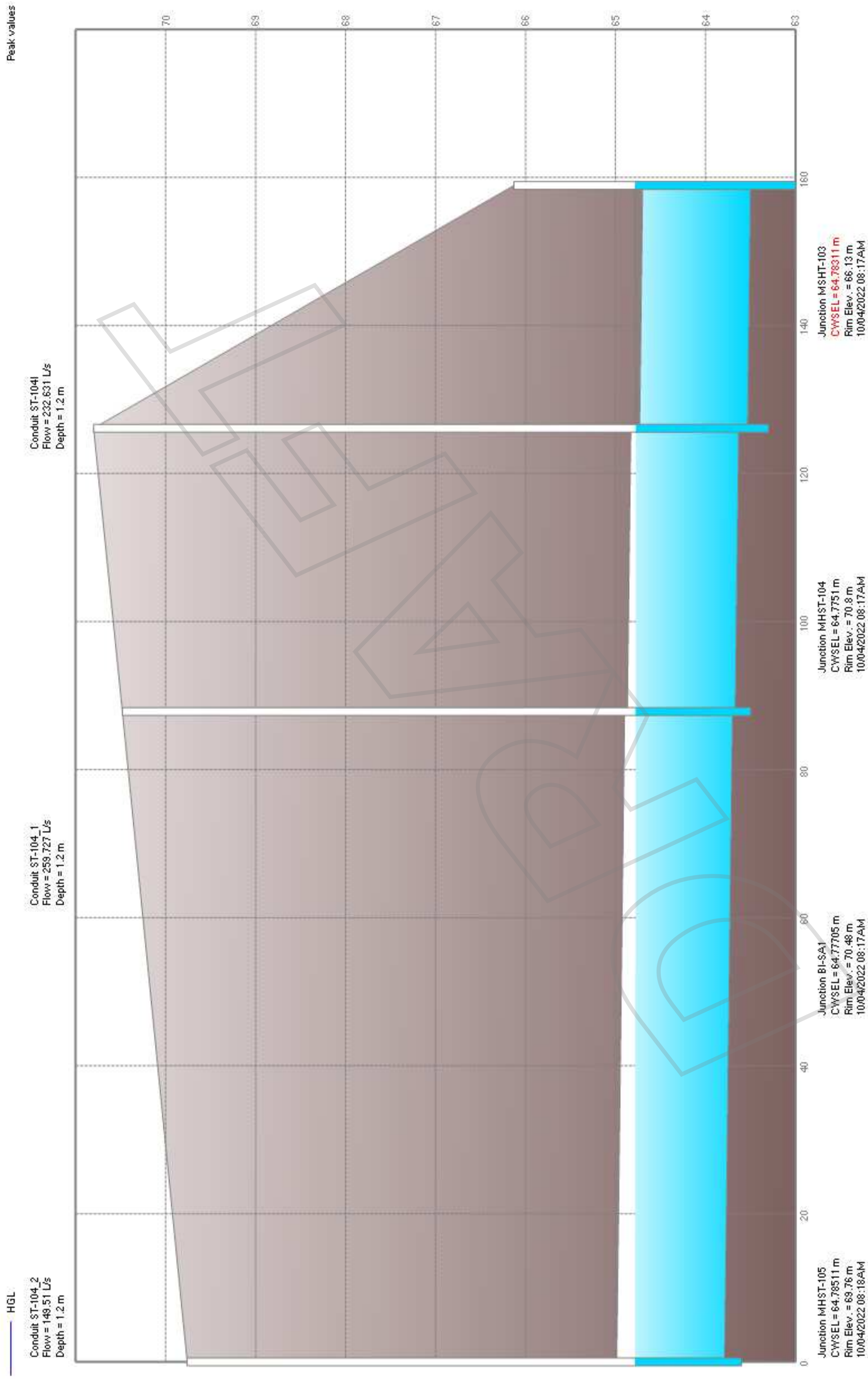

Figure 10: Road B

Table 1: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
1	24-Hour-StressEvent	SA-1	1.2364	3	100	0.016	0.15	1.57	4.67	25	127.93	0	744.94
10	24-Hour-StressEvent	13B_2	0.0828	3	9.73	0.016	0.15	1.57	4.67	25	127.93	73.09	45.15
11	24-Hour-StressEvent	Wales-OLF-N03	0.03	3	100	0.016	0.15	1.57	4.67	25	127.93	0	17.86
12	24-Hour-StressEvent	BI-SA1-S	0.1182	5	53.01	0.016	0.15	1.57	4.67	25	127.93	37.82	68.12
13B_1	24-Hour-StressEvent	MHST-104-S	0.13	5	98.08	0.016	0.15	1.57	4.67	25	127.93	1.54	77.25
13B_2	24-Hour-StressEvent	BI-SA1-S	0.22	5	98.08	0.016	0.15	1.57	4.67	25	127.93	1.58	173.2
14	24-Hour-StressEvent	Carling_OLF	0.014	3	15.98	0.016	0.15	1.57	4.67	25	127.93	67.95	7.75
14B	24-Hour-StressEvent	S-14B	0.0986	3	0	0.016	0.15	1.57	4.67	25	127.93	80.68	54.56
14C	24-Hour-StressEvent	Carling_OLF	0.0104	3	59.6	0.016	0.15	1.57	4.67	25	127.93	32.54	6.02
14D	24-Hour-StressEvent	Carling_OLF	0.0185	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.01
15	24-Hour-StressEvent	S-15	0.36	3	3.65	0.016	0.15	1.57	4.67	25	127.93	79.08	158.24
16	24-Hour-StressEvent	LRT-Corridor	0.023	3	0	0.016	0.15	1.57	4.67	25	127.93	80.51	12.77
17	24-Hour-StressEvent	LRT-Corridor	0.031	3	0	0.016	0.15	1.57	4.67	25	127.93	80.61	17.19
18	24-Hour-StressEvent	Carling_OLF	0.0913	3	5.91	0.016	0.15	1.57	4.67	25	127.93	76.3	48.77
19	24-Hour-StressEvent	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	127.93	74.36	102.32
2	24-Hour-StressEvent	SA-2	0.7231	3	100	0.016	0.15	1.57	4.67	25	127.93	0	480.88
20	24-Hour-StressEvent	Carling_OLF_N01_1	0.1714	8	0	0.016	0.15	1.57	4.67	25	127.93	80.71	94.69
21B	24-Hour-StressEvent	S-21B	0.434	10	0	0.016	0.15	1.57	4.67	25	127.93	109.89	592.18
22B_1	24-Hour-StressEvent	MHST-120-S	0.262	5	95.43	0.016	0.15	1.57	4.67	25	127.93	3.68	155.16
22B_2	24-Hour-StressEvent	MHST-106-S	0.061	5	95.43	0.016	0.15	1.57	4.67	25	127.93	3.67	36.2
22B_3	24-Hour-StressEvent	MSHT-103-S	0.132	5	95.43	0.016	0.15	1.57	4.67	25	127.93	3.67	78.32
22B_4	24-Hour-StressEvent	MHST-102-S	0.071	5	95.43	0.016	0.15	1.57	4.67	25	127.93	3.67	42.13
22B_5	24-Hour-StressEvent	MHST-101-S	0.091	5	95.43	0.016	0.15	1.57	4.67	25	127.93	3.67	54
24	24-Hour-StressEvent	MHST-107	0.034	3	56.98	0.016	0.15	1.57	4.67	25	127.93	34.8	19.5
25	24-Hour-StressEvent	OGS1	0.0438	3	79.37	0.016	0.15	1.57	4.67	25	127.93	16.68	25.63
26B	24-Hour-StressEvent	S-26B	0.776	9.406	8.78	0.016	0.15	1.57	4.67	25	127.93	75.27	318.87
27	24-Hour-StressEvent	MHST-101-S	0.071	3	65.62	0.016	0.15	1.57	4.67	25	127.93	27.67	41.28

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
28	24-Hour-StressEvent	MHST-102-S	0.075	5	62.44	0.016	0.15	1.57	4.67	25	127.93	30.23	43.51
29	24-Hour-StressEvent	7	0.008	3	0	0.016	0.15	1.57	4.67	25	127.93	81.06	4.27
2B	24-Hour-StressEvent	SA-2	0.103	3	100	0.016	0.15	1.57	4.67	25	127.93	0	61.31
3	24-Hour-StressEvent	S-3	0.198	3	34.51	0.016	0.15	1.57	4.67	25	127.93	60.13	186.94
3B	24-Hour-StressEvent	3	0.0431	3	100	0.016	0.15	1.57	4.67	25	127.93	0	25.65
4	24-Hour-StressEvent	2	0.0269	3	100	0.016	0.15	1.57	4.67	25	127.93	0	16.01
40	24-Hour-StressEvent	MHST-156	1.186	6.77	47.28	0.016	0.15	1.57	4.67	25	127.93	43.5	579.5
41	24-Hour-StressEvent	MHST-132	1.523	3	14.99	0.016	0.15	1.57	4.67	25	127.93	73.08	401.48
42_1	24-Hour-StressEvent	MHST-135-S	0.4	5	75.88	0.016	0.15	1.57	4.67	25	127.93	19.45	234.07
42_2	24-Hour-StressEvent	MHST-149-S	0.31	5	75.88	0.016	0.15	1.57	4.67	25	127.93	19.47	181.29
42_3	24-Hour-StressEvent	MHST-150-S1	0.61	2	75.88	0.016	0.15	1.57	4.67	25	127.93	19.6	350.91
42_4	24-Hour-StressEvent	MHST-141-S	0.47	2	75.88	0.016	0.15	1.57	4.67	25	127.93	19.53	273.33
43	24-Hour-StressEvent	SA-CUP	0.56	2	100	0.016	0.15	1.57	4.67	25	127.93	0	333.13
44	24-Hour-StressEvent	MHST-62534	9.994	3	33.41	0.016	0.15	1.57	4.67	25	127.93	55.44	4221.31
45	24-Hour-StressEvent	63	0.532	4	37.33	0.016	0.15	1.57	4.67	25	127.93	51.13	278.95
46	24-Hour-StressEvent	21B	1.188	10	21.02	0.016	0.15	1.57	4.67	25	127.93	65.09	525.9
47_1	24-Hour-StressEvent	D-MHST-155-S	0.11	3	65.85	0.016	0.15	1.57	4.67	25	127.93	27.58	63.82
47_2	24-Hour-StressEvent	MHST-148-S	0.46	3	65.85	0.016	0.15	1.57	4.67	25	127.93	27.98	250.19
47_3	24-Hour-StressEvent	MHST-147-S	0.19	3	65.85	0.016	0.15	1.57	4.67	25	127.93	27.67	109.18
47_4	24-Hour-StressEvent	MHST-146-S	0.4	3	65.85	0.016	0.15	1.57	4.67	25	127.93	27.92	220.4
47_5	24-Hour-StressEvent	MHST-157-S	0.25	3	65.85	0.016	0.15	1.57	4.67	25	127.93	27.74	142.14
48	24-Hour-StressEvent	SA-48	0.138	2	100	0.016	0.15	1.57	4.67	25	127.93	0	82.09
49	24-Hour-StressEvent	SA-49	0.164	2	100	0.016	0.15	1.57	4.67	25	127.93	0	97.48
5	24-Hour-StressEvent	preston	0.00928	3	100	0.016	0.15	1.57	4.67	25	127.93	0	5.52
50	24-Hour-StressEvent	SA-50	0.345	2	100	0.016	0.15	1.57	4.67	25	127.93	0	202.08
51	24-Hour-StressEvent	SA-51	1.33	2	0	0.016	0.15	1.57	4.67	25	127.93	7.92	384.45
52	24-Hour-StressEvent	SA-52	0.346	2	100	0.016	0.15	1.57	4.67	25	127.93	0	202.64

Table 1: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)
53	24-Hour-StressEvent	SA-53	0.15	2	100	0.016	0.15	1.57	4.67	25	127.93	0	89.2
54	24-Hour-StressEvent	SA-54	0.155	2	100	0.016	0.15	1.57	4.67	25	127.93	0	92.16
55	24-Hour-StressEvent	MHST-159	0.455	2	0	0.016	0.15	1.57	4.67	25	127.93	8.37	135.82
56	24-Hour-StressEvent	SA-56	0.784	2	79.52	0.016	0.15	1.57	4.67	25	127.93	16.63	453.72
57	24-Hour-StressEvent	Carling_OLF_N01	0.152	15	4.5	0.016	0.15	1.57	4.67	25	127.93	76.98	84.55
58	24-Hour-StressEvent	S-58	0.212	16	0	0.016	0.15	1.57	4.67	25	127.93	81.24	109.61
59	24-Hour-StressEvent	MHST-133	0.715	2	93.37	0.016	0.15	1.57	4.67	25	127.93	5.35	418.85
6	24-Hour-StressEvent	3	0.1007	3	0	0.016	0.15	1.57	4.67	25	127.93	81.02	54.01
60	24-Hour-StressEvent	S-60	1.197	25	0	0.016	0.15	1.57	4.67	25	127.93	82.51	471.41
61	24-Hour-StressEvent	UGS_Z4P	1.292	3	48.3	0.016	0.15	1.57	4.67	25	127.93	43.02	597.36
62	24-Hour-StressEvent	PW_Drive	0.609	6	0	0.016	0.15	1.57	4.67	25	127.93	85.7	130.53
62B	24-Hour-StressEvent	PW_Drive	0.0174	6	100	0.016	0.15	1.57	4.67	25	127.93	0	10.36
63	24-Hour-StressEvent	S-63	0.423	2	48.45	0.016	0.15	1.57	4.67	25	127.93	53.41	508.71
64	24-Hour-StressEvent	UGS_Z6BP	0.351	6	50.72	0.016	0.15	1.57	4.67	25	127.93	40.02	195.85
7	24-Hour-StressEvent	2	0.0291	3	51.85	0.016	0.15	1.57	4.67	25	127.93	38.96	20.75
8	24-Hour-StressEvent	2	0.0255	3	100	0.016	0.15	1.57	4.67	25	127.93	0	15.18
9	24-Hour-StressEvent	1	0.0241	3	100	0.016	0.15	1.57	4.67	25	127.93	0	14.34

Table 2: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.09	0.62	226.37	3.555	2.443
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	2088.12	22.432	9.606
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.13	69.97	0.62	1804.99	20.9	8.689
ICD-STM155	MHST-155	D-MHST-155	SIDE	CIRCULAR	0.75	75.47	0.62	1432.82	10.949	3.743
ICD-STM61	MHST-153	D-MHST-153	SIDE	CIRCULAR	0.102	72.86	0.62	26.05	1.292	0.624
ICD-STM64	MHST-140	D-MHST-140	SIDE	CIRCULAR	0.138	71.75	0.62	45.02	1.643	0.802

Table 3: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	91.72	0.42
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	49.52	0.68
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	141.04	2
CA-OLF_2	Carling_OLF_N01	Carling_OLF_N01_1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	84.13	0.58
CA-OLF_3	Carling_OLF_N03	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	164.82	0.61
CA-OLF_4	Carling_OLF_N01_1	Carling_OLF_N03	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	175.76	0.84
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	20.87	0.3
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	381.6	1.61
ST-100-S	MHST-100-S	Carling_OLF_N03	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101	CBMHST-101	MHST-153	23.2	0.013	73.09	72.86	CIRCULAR	0.525	0.00991	52.58	0.47
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	371.12	0.58
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-102	CBMHST-101	13.4	0.013	73.12	73.09	CIRCULAR	0.525	0.00224	37.28	0.62
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	327.95	0.34
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	32.65	0.2

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-103	CBMHST-103	CBMHST-102	20.2	0.013	75.32	74.92	CIRCULAR	0.3	0.01981	0	0
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	307.92	0.4
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	19.77	0.15
ST-104	CBMHST-104	CBMHST-101	20.5	0.013	75.19	74.78	CIRCULAR	0.375	0.02	0	0
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	293.2	1.04
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	152.89	0.25
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	269.49	0.94
ST-105	CBMHST-105	CBMHST-104	11.3	0.013	75.48	75.25	CIRCULAR	0.375	0.02036	0	0
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	112.45	0.55
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	51.97	0.4
ST-106	CBMHST-106	CBMHST-105	21.4	0.013	76	75.56	CIRCULAR	0.3	0.02057	0	0
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	133.62	0.14
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	114.6	0.92
ST-107	CBMHST-107	MHST-140	21.7	0.013	72.1	71.88	CIRCULAR	0.45	0.01014	34.61	0.58
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	68.57	0.74
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	83.31	0.79
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	89.93	0.91
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	61.24	0.74
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	96.63	0.12
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	85.73	1.17
ST-130	MHST-130	OGS-3	35.6	0.013	67.59	67.52	CIRCULAR	1.35	0.00197	2446.76	2.37
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	444.42	1.51
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	401.46	2.55
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	445.89	1.24
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	1179.76	1.97
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	0	0
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	48.25	0.4

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-140_2	D-MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	45.43	0.56
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	753.4	1.5
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	447.45	1.11
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.64	67.59	CIRCULAR	1.35	0.00171	2358.05	2.17
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	2305.61	1.61
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	2305.54	1.61
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	2270.65	2.05
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	2280.9	2.22
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	3557.97	2.16
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	229.41	0.85
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	3577.72	2.19
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	163.04	0.63
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	3408.57	2.06
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	202.04	0.73
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	3362.55	2.02
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	159.09	0.79
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	1089.53	1.68
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	186.44	0.87
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	964.89	1.48
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	422.99	0.99
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	755.14	1.54
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	454.85	1.38
ST-152	MHST-152	MHST-155	14	0.013	75.6	75.47	CIRCULAR	0.825	0.00929	2302.48	4.31
ST-153_2	D-MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	26.85	1.09
ST-154	MHST-154	MHST-155	19	0.013	75.54	75.47	CIRCULAR	1.2	0.00368	4289.9	3.79
ST-155_2	D-MHST-155	MHST-148	59.6	0.013	75.3	74.7	CIRCULAR	0.825	0.01007	2208.14	4.13
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	27.4	0.44

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	934.53	0.62
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	4448.49	2.74
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	198.86	0.48
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	205.29	0.94
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	344.78	0.65
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	2347.75	1.64
ST--3	OGS-3	Dows-Lake	9.877	0.013	67.52	67.5	CIRCULAR	1.35	0.00202	2626.81	2.67
ST-62534	MHST-62534	MHST-62537	38	0.013	76.42	76.29	CIRCULAR	1.2	0.00342	4290.21	3.79
ST-62537	MHST-62537	MHST-154	50.921	0.013	76.29	76.11	CIRCULAR	1.2	0.00353	4289.96	3.79
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	33.95	1.06
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	84.16	1.65
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	14.73	0.86
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	14.95	0.76
ST-S41	UGS_Exp_Farm	MHST-152	4	0.013	75.62	75.6	CIRCULAR	0.825	0.005	2302.66	4.94
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.19	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	10.04	0.93
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	10	0.9
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	281.03	21.54
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	10.01	0.85
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	20	1.11
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	12.26	0.88
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	25.01	1.14
ST-UGS4	UGS_Z4P	CBMHST-102	3.2	0.013	73.13	73.12	CIRCULAR	0.525	0.00313	44.87	0.62
ST-UGS6B	UGS_Z6BP	CBMHST-107	2.8	0.013	72.13	72.1	CIRCULAR	0.3	0.01071	58.84	0.98
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.4	69.97	CIRCULAR	0.9	0.04437	2913.78	5.18
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.02	1.2
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	63.23	0.88

Table 3: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	54.79	0.62

Table 4: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
S-14B	61.65	63.3	1.65	1.65	63.3	54.56	0.07	34.41	0.004	4	0.013	100	20.15
S-15	62.1	63.9	1.8	1.8	63.9	158.24	0	0	0	74	0.112	100	7.86
S-19	64	66	2	1.7	65.7	102.32	0	0	0	7	0.084	32	3.83
S-21B	63.54	65.7	2.16	1.96	65.5	592.18	0	0	0	40	0.794	62	4.16
S-26B	67.33	69.62	2.29	2.28	69.61	318.87	0	0	0	34	0.327	96	8.86
S-3	62.2	64.26	2.06	2.06	64.26	186.94	0	0	0	74	0.084	100	26.84
S-58	64.93	66.95	2.02	2.03	66.96	109.61	0	0	0	1	0.053	21	31.2
S-60	67.69	69.34	1.65	1.64	69.33	523.15	0	0	0	2	0.16	54	220.7
S-63	80.3	82.16	1.86	2.1	82.4	508.71	0	0	0	5	0.148	100	334.23
SA-1	69.5	72.5	3	2.93	72.43	744.94	0	0	0	18	0.644	98	60
SA-2	62.6	65.6	3	2.48	65.08	542.19	0	0	0	58	0.744	83	7
SA-48	72.01	75.01	3	2.78	74.79	82.09	0	0	0	11	0.058	93	10
SA-49	73.6	76.6	3	2.97	76.57	97.48	0	0	0	14	0.074	99	10
SA-50	72.82	75.82	3	2.87	75.69	202.08	0	0	0	30	0.201	96	10
SA-51	73.5	76.5	3	0.35	73.85	384.45	0	0	0	1	0.035	12	280
SA-52	69.5	72.5	3	2.88	72.38	202.64	0	0	0	30	0.201	96	10
SA-53	69.08	72.08	3	2.82	71.9	89.2	0	0	0	6	0.045	94	20
SA-54	70.76	73.76	3	2.75	73.51	92.16	0	0	0	12	0.069	92	10
SA-56	72.04	75.04	3	2.68	74.72	453.72	0	0	0	22	0.403	89	25
SA-CUP	72.5	75.5	3	0.43	72.93	333.13	0	0	0	1	0.214	14	50

Table 4: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	75.62	78.02	2.4	2.24	77.86	2302.66	0	0	0	5	1.307	93	504.35
UGS_Z1P	70.07	72.07	2	1.88	71.95	2913.78	0	0	0	18	2.821	94	901.07
UGS_Z4P	73.13	74.48	1.35	1.19	74.32	597.36	0	0	0	35	0.684	89	44.87
UGS_Z6BP	72.13	73.35	1.22	1.05	73.18	195.85	0	0	0	17	0.14	87	58.84

Table 5: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Overflow-58	S-58	Carling_OLF_N01	TRANSVERSE	0.3	0	66.91	1.65	16.47	0.212	0
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.25	1.65	78.42	3.942	1.762
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.65	264.7	0.955	0.404
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.6	1.84	137.23	3.555	2.443
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.85	1.84	269.61	22.432	9.606
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.6	1.84	746.35	20.9	8.689
Weir6	MHST-155	D-MHST-155	TRANSVERSE	0.8	0	77.3	1.65	1027.46	10.949	3.743
Weir7	MHST-153	D-MHST-153	TRANSVERSE	0.3	0	74.5	1.84	0	1.292	0.624
Weir8	MHST-140	D-MHST-140	TRANSVERSE	0.3	0	73.3	1.84	0	1.643	0.802

Table 6: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.11	64.71	10/04/2022 08:11 AM	231.45	231.45	0.265	1.433	0.721
Dows-Lake	NO	67.2	70.07	NORMAL	0	67.2	10/04/2022 00:00 AM	2626.81	2626.81	21.47	24.84	10.769
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	29.95	29.95	0.026	0.054	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	381.6	381.6	3.978	5.389	2.692
Preston_Street	NO	60.9	63.76	NORMAL	0.3	61.2	10/04/2022 08:04 AM	141.04	141.04	2.734	2.384	1.526
PW_Drive	NO	65.5	65.8	FREE	0	65.5	10/04/2022 00:00 AM	140.89	140.89	0.279	0.626	0.017