Servicing and Stormwater Management Report - Blackstone Block 366

Project # 160401433

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Prepared for:

Mattamy (Monarch) Limited

Prepared by:

Stantec Consulting Ltd.

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Prepared by  (signature)

Thakshika Rathnasooriya

Reviewed by  (signature)

Sheridan Gillis

Approved by  (signature)

Dustin Thiffault, P.Eng.

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1.0 BACKGROUND

Stantec Consulting Ltd. has been commissioned by Mattamy (Monarch) Limited to prepare the following Servicing and Stormwater Management Report for Block 366 of the Blackstone Community under ownership of Mattamy Homes Ltd. The subject property is located northeast of the intersection of Fernbank Road and Rouncey Road within the Fernbank Community. The property is currently zoned R4Z, and is bordered by Fernbank Road to the south, Atlas Terrace to the north, Rouncey Road to the west, and a future school block to the east. The property is located with the Blackstone Subdivision Phase 4-8 (currently approved and under construction) as shown in **Figure 1**. The development is to consist of 3.14ha of land in total containing 216 stacked townhome units.

Figure 1: Approximate Location of Blackstone Block 366 Area

2.0 REFERENCES

Documents referenced in preparation of the design for the proposed development include:

- Fernbank Community Design Plan Master Servicing Study (MSS), Novatech Engineering Consultants Ltd., June 2009.
- Fernbank Community Ultimate Pond 8 Stormwater Management Facility Design Report, Stantec Consulting Ltd., August 10, 2018.
- Geotechnical Investigation – Proposed Residential Development Blackstone Community- Phase 5 - Condominium Block Fernbank Road – Ottawa, Paterson Group Inc., February 19, 2019.
- Servicing and Stormwater Management Report – Blackstone Community Phase 4-8, Stantec Consulting Ltd., April 11, 2019.
- City of Ottawa Sewer Design Guidelines, 2nd Ed., City of Ottawa, October 2012.
- City of Ottawa Design Guidelines – Water Distribution, Infrastructure Services Department, City of Ottawa, First Edition, July 2010.

3.0 POTABLE WATER SERVICING

3.1 BACKGROUND

The proposed development is located within Zone 3W of the City of Ottawa's water distribution system. This zone is fed by the Glen Cairn Pump Station.

The proposed development lies within Phase 4-8 of the Blackstone Community and consists of 216 stacked townhome units. The site will be serviced through connections to the 200mm diameter watermains within Rouncey Road and Atlas Terrace immediately west and north of the proposed development.

The proposed ground elevations of the development range from approximately 99.9m to 101.6m. Grading and elevations have been determined for the site and included on **Drawing GP-1**. Under normal operating conditions, hydraulic gradelines vary from approximately 156.1 m to 161.6m as confirmed through boundary conditions provided by the City of Ottawa for Blackstone Phase 4-8 (see **Appendix A.3**). The boundary conditions for Blackstone Phase 4-8 were applied as Block 366 was included as a part of the overall detailed design of the subdivision.

3.2 WATER DEMANDS

Water demands for the development were estimated using the Ministry of Environment's Design Guidelines for Drinking Water Systems (2008) and the Ottawa Design Guidelines – Water Distribution (2010). A daily rate of 350 L/cap/day has been applied for the population of the proposed site. Population densities have been assumed as 2.3 persons / stacked townhome unit. See **Appendix A.1** for detailed domestic water demand estimates.

The average day demand (AVDY) was determined to be 2.0 L/s. The maximum daily demand (MXDY) was estimated based on 2.5 times the AVDY (residential property), which totals 5.0 L/s. The peak hour demand (PKHR) is 2.2 times the MXDY, totaling 11.1 L/s.

Wood frame construction and limited combustibility of building contents was considered in the assessment for fire flow requirements according to the FUS Guidelines. Based on calculations per the FUS Guidelines (**Appendix A.2**), the minimum required fire flow for the townhome units is 15,000 L/min (250 L/sec).

3.3 HYDRAULIC MODEL RESULTS

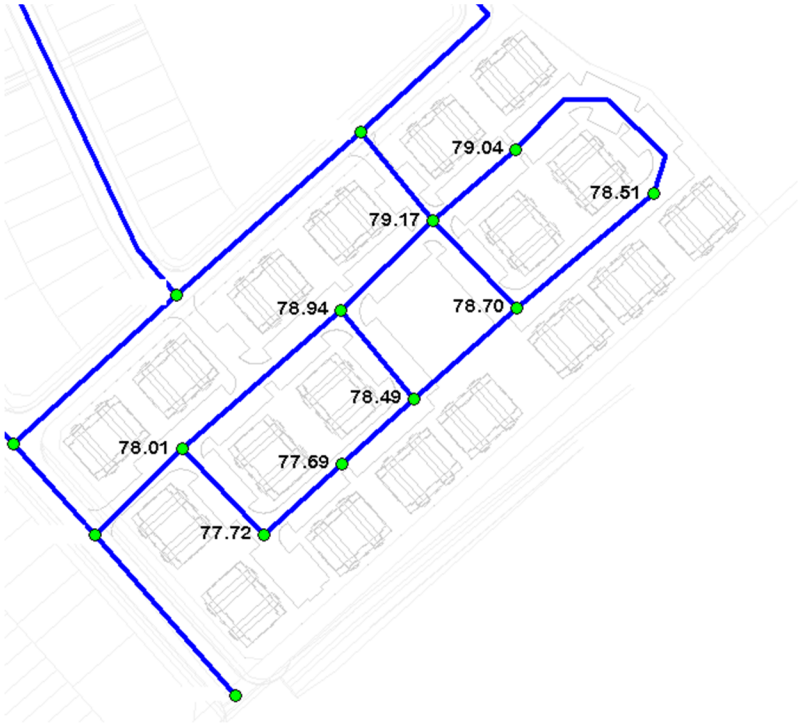
A hydraulic model was used to simulate the proposed development conditions based on boundary conditions provided by the City of Ottawa. The hydraulic analysis was completed with H2OMAP Water Software and assessed the internal network and connections to the surrounding infrastructure. The model was tested under peak hour, average day, and maximum day plus fire flow conditions.

Potable Water Servicing

The proposed watermain layout allows serviceable pressures to be maintained under average day, peak hour, and maximum day plus fire flow demands. The minimum pressure during the peak hour scenario was approximately 77.7 psi and the maximum pressure modeled was approximately 86.9 psi. These pressures exceed the serviceable limit of 50 to 80 psi (345 to 552 kPa) as per City of Ottawa guidelines. Therefore, pressure relief measures (PRVs) are required to keep pressures below 80 psi at all units. Results for system pressure at the junction points for average day and peak hour scenarios are displayed in **Figure 2** and **Figure 3** below.

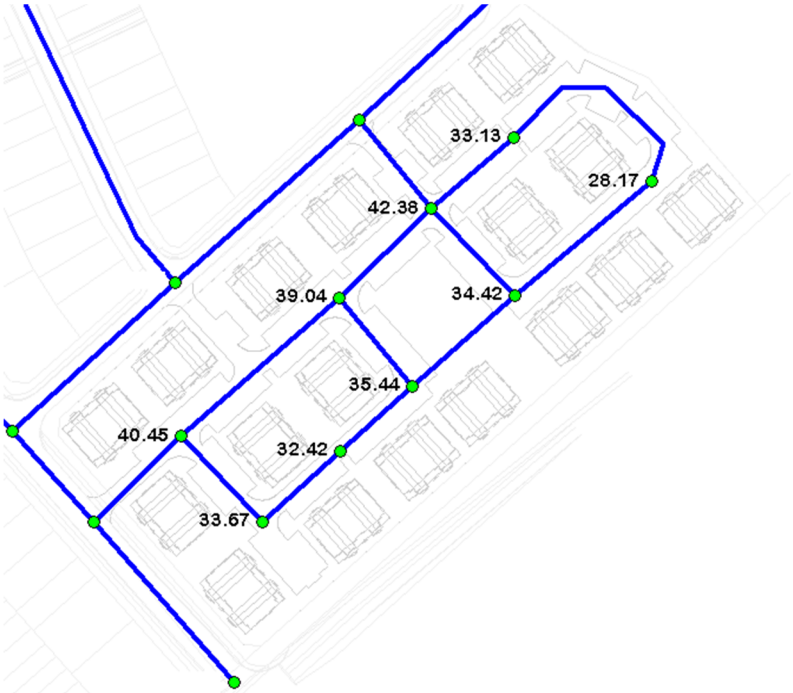
Figure 2: AVDY Pressure Results (psi)

Figure 3: PKHR Pressure Results (psi)



A fire flow analysis was carried out using the hydraulic model to determine the anticipated amount of flow that could be provided for the proposed development under maximum day demands and worst-case fire flow requirements per the FUS methodology (250 L/s at hydrant location). The fire flow simulation was run using the Blackstone Subdivision Phases 4-8 model considering boundary conditions at a conservative fire flow requirement of 267L/s. Results of the modeling analysis indicate that flows in excess of the required fire flow rate can be delivered while still maintaining a residual pressure of 140 kPa (20 psi). Results of the hydraulic modeling are included for reference in **Appendix A**. The results for residual pressure in the system under the maximum day plus fire flow scenario are displayed below in **Figure 4**. Hydrants have been spaced on-site within 90m to conform to the City of Ottawa's Design Guidelines for Water Distribution. Each building lies within 90m of a minimum of three hydrants located either on-site or within surrounding public rights-of-way.

Figure 4: MXDY + Fire Flow (15,000L/min) Residual Pressure Results (psi)



3.3.1 SUMMARY OF FINDINGS

Based on the findings of the hydraulic analysis, the proposed network is capable of servicing the development area and meets all servicing requirements as per City of Ottawa standards under typical demand conditions (peak hour and average day conditions) as well as under emergency fire demand conditions (maximum day + fire flow). Pressure reducing valves are required at all units to meet average day pressure objectives per MECP / City of Ottawa requirements.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

The site will be serviced via the existing 200mm diameter sanitary sewer within Atlas Terrace per the *Servicing and Stormwater Management Report for Blackstone Community Phase 4-8.* The sewer directs flows to the existing trunk sewer on Cope Drive / Akerson Road, and ultimately to the Hazeldean Pump Station (HPS). A sanitary stub has been made available to service the development, with a flow allotment from an equivalent residential population of 497 persons (see **Drawing SA-1** in **Appendix B**).

For detailed information regarding the wastewater servicing and pump station improvements for the area, please refer to the *Servicing and Stormwater Management Report for Blackstone Community Phase 4-8* (Stantec, April 11, 2019).

4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP's Design Guidelines for Sewage Works, the following criteria were used to calculate estimated wastewater flow rates and to size the sanitary sewers:

- Minimum Velocity – 0.6 m/s (0.8 m/s for upstream sections)
- Maximum Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Minimum size – 200mm dia. for residential areas, 250mm for commercial areas
- Average Wastewater Generation (Residential) – 280L/person/day
- Population Density (Stacked Townhome) – 2.3persons/unit
- Peak Factor – per Harmon's equation with correction factor of 0.8
- Extraneous Flow Allowance – 0.33 l/s/ha (conservative value)
- Manhole Spacing – per Ottawa Sewer Design Guidelines
- Minimum Cover – 2.5m

4.3 PROPOSED SERVICING

The proposed site will be serviced by gravity sewers which will direct the wastewater flows (approx. 6.5 L/s with allowance for infiltration) to the existing 200mm diameter sanitary sewer. The Blackstone Phase 4-8 Servicing Report estimated a lower population density, and thus lower wastewater flows from the proposed site (approx. 5.9 L/s), however the capacity of the sewers downstream demonstrate that the system has excess capacity to service the proposed development (see report excerpts in **Appendix B.1**). The proposed drainage pattern is detailed on **Drawing SA-1**. A sanitary sewer design sheet for the proposed sewer network is included in **Appendix B.2**. Full port backwater valves are to be installed on all sanitary services within the site to prevent any potential surcharge from the downstream sanitary sewer from impacting the proposed property.

5.0 STORMWATER MANAGEMENT

The following sections describe the stormwater management (SWM) design for Block 366 in accordance with the background documents and governing criteria.

5.1 PROPOSED CONDITIONS

The proposed 3.14 ha development is located within the Blackstone Community Phase 4-8 and comprises 216 stacked townhome units, an amenity area, and associated parking. The storm sewer collection system for the site will discharge to the 675 mm diameter storm sewer on Atlas Terrace that ultimately directs runoff to the existing Fernbank Pond 8. Quality control of stormwater runoff from the proposed Block 366 will be provided by the existing downstream Fernbank Pond 8. Detailed grading has been designed to direct emergency overland flows above the 100-year event to Atlas Terrance. Minor grassed areas at the boundary of the proposed site cannot be graded to drain internally and as such will sheet drain uncontrolled offsite to the existing Rouncey Road and Atlas Terrace ROWs.

5.2 SWM CRITERIA AND CONSTRAINTS

The overall approach for storm servicing and stormwater management for the proposed development was outlined in Stantec Consulting's Blackstone Community Phase 4-8 Servicing and Stormwater Management Report (April 2019). Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa).
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa).
- Quality control requirements as identified in the Blackstone Community Phase 4-8 Servicing and Stormwater Management Report are provided by the downstream Fernbank SWM Pond 8 for the site.

Storm Sewer & Inlet Controls

- All stormwater runoff from the ultimate site up to and including the 100 year event to be stored on site and released into the minor system at a maximum rate of 565.2L/s (City of Ottawa, Stantec).
- Proposed site to discharge to the existing 675mm diameter storm sewer within the Atlas Terrance ROW at the northern boundary of the subject site (City of Ottawa).
- 100-year Storm HGL to be a minimum of 0.30 m below building footing elevations (City of Ottawa).

Surface Storage & Overland Flow

- 150mm of vertical clearance to be maintained between spill elevation in public rights-of-way and the ground elevation at the building envelope (City of Ottawa).
- 300mm of vertical clearance to be maintained between spill elevations within paved parking areas on-site and the ground elevation at the building envelope (City of Ottawa).
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35m for design storm events (i.e. up to 100-year storm) (City of Ottawa).
- Provide adequate emergency overflow conveyance off-site (City of Ottawa).

5.3 STORMWATER MANAGEMENT QUANTITY CONTROL

Stormwater runoff from the proposed development will be directed to an existing 675mm diameter storm sewer located at the northern boundary of the site along Atlas Terrance and then east along Cope Drive towards the existing Fernbank SWM Pond 8. The proposed site servicing plan and existing storm sewer infrastructure on Atlas Terrance are shown on **Drawing SSP-1**. A rational method design sheet for the proposed storm sewer can be found in **Appendix C.1,** and the design sheet for the existing subdivision can be found is **Appendix C.3**..

5.3.1 Allowable Release Rate

The Modified Rational Method was employed to assess the rate and volume of runoff during post-development conditions.

The site was subdivided into subcatchments (subareas) tributary to stormwater controls as defined by the location of inlet control devices. A summary of subareas and runoff coefficients is provided in **Appendix C.2** ,and **Drawing SD-1** indicates the stormwater management subcatchments.

Based on the Blackstone Community Phase 4-8 Servicing and Stormwater Management Report (Stantec, revised April 2019), the subject site is to control the 100-year flow on site and the minor system for the total site will be restricted to the 100 year storm event release rate of 565.2L/s, and the 2-year minor system outflow is to be controlled to 504.6L/s. Runoff coefficients (C) for the proposed catchment areas have been calculated based on actual pervious and impervious areas shown on the proposed site plan. C coefficient values have been increased by 25% for the post-development 100-year storm event based on MTO Drainage Manual recommendations. Peak flow rates have been calculated using the modified rational method as follows:

Q = 2.78 CiA
Where: Q = peak flow rate, L/s
A = drainage area, ha
I = rainfall intensity, mm/hr (per Ottawa IDF curves)
C = site runoff coefficient

Detailed calculations relating to allowable release rate and proposed site conditions can be found in **Appendix C.2**.

The target release rate for the site is summarized in **Table 1** below:

Table 1: Target Release Rate

Design Storm	Target Flow Rate (L/s)
2yr Event	504.6
100yr Event	565.2

5.3.2 Storage Requirements

The site requires quantity control measures to meet the restrictive stormwater release criteria. It is proposed that inlet-control devices in combination with surface storage be used to reduce site peak outflow to target rates.

5.3.2.1 Surface Storage

It is proposed to detain stormwater within parking and amenity areas tributary to catchbasins equipped with vertical orifice controls to reduce peak outflow from the proposed site. The catchbasins will release by gravity to the proposed storm sewer outlet for the site. Should catchbasin discharge orifices become blocked; flows will spill from catchbasin grates overland to the northeast corner of the property, and ultimately to the Atlas Terrance ROW. Maximum surface storage elevations lie well below proposed building opening elevations to ensure adequate drainage of the property.

Surface storage volumes have been estimated based on surface models created via AutoCAD for the proposed grading plan. **Table 2: Surface Storage Volumes** summarizes surface storage depths and volumes within the proposed site:

Table 2: Surface Storage Volumes

Drainage Area ID	Structure	Ponding Depth (m)	Ponding Area (m^2)	Ponding Volume (m^3)
L2000A	CB500	0.20	184.8	12.3
L2001A	CB504	0.30	372.0	37.2
L2001B	CB505	0.31	510.6	52.8
L2002A	CB506	0.33	226.4	24.9
L2002B	CB507	0.35	220.0	25.7
L2003A	CB501	0.35	374.2	43.7
L2003B	CB502	0.30	362.6	36.3
L2004A	CB503	0.30	452.9	45.3
L2005A	CB508	0.32	529.3	56.5
L2006A	CB512	0.35	250.8	29.3
L2006B	CB516	0.30	188.3	18.8
L2006C	CB513	0.28	211.2	19.7
L2006D	CB517	0.25	160.5	13.4
L2007A	CB514	0.33	263.4	29.0
L2007B	CB515	0.30	382.5	38.3
L2008A	CB509	0.30	303.5	30.4
L2009A	CB510	0.35	206.9	24.1
L2009B	CB511	0.33	205.1	22.6

The modified rational method was employed to determine the peak volume stored in catchbasins & surface storage areas. Inlet control devices were sized to fully utilize surface storage during the 100-year storm event. **Table 3** and **Table 4** summarizes the estimated storm release rates and storage volumes for controlled subcatchments during the 2 and 100-Year events (includes an additional $0.5m^3$ of storage supplied within each catchment areas catchbasin). Discharge curves are as provided by the manufacturer for the selected IPEX Tempest ICDs (see **Appendix C** for details)

Table 3 : Peak Surface Volume and Controlled Discharge (2-Year Storm Event)

Drainage Area ID	ICD Type	Head (m)	Qrelease (L/s)	Vstored (m^3)	Vavailable (m^3)
L2000A	IPEX TEMPEST HF (83mm ORIFICE)	0.77	12.0	0.0	12.8
L2001A	IPEX TEMPEST HF (95mm ORIFICE)	1.53	22.2	4.1	37.7
L2001B	IPEX TEMPEST LMF 65	1.48	4.4	8.4	53.3
L2002A	IPEX TEMPEST HF (102mm ORIFICE)	1.27	23.3	0.0	25.4
L2002B	IPEX TEMPEST HF (127mm ORIFICE)	0.79	28.5	0.0	26.2
L2003A	IPEX TEMPEST HF (95mm ORIFICE)	1.45	21.6	5.7	44.2
L2003B	IPEX TEMPEST HF (95mm ORIFICE)	1.44	21.6	3.6	36.8
L2004A	IPEX TEMPEST HF (83mm ORIFICE)	1.46	16.6	6.0	45.8
L2005A	IPEX TEMPEST HF (95mm ORIFICE)	1.48	21.8	8.2	57.0
L2006A	IPEX TEMPEST HF (127mm ORIFICE)	0.88	30.2	0.0	29.8
L2006B	IPEX TEMPEST LMF 65	1.40	4.3	1.1	19.3
L2006C	IPEX TEMPEST HF (127mm ORIFICE)	0.64	25.6	0.0	20.2
L2006D	IPEX TEMPEST HF (108mm ORIFICE)	0.63	18.5	0.0	13.9
L2007A	IPEX TEMPEST HF (108mm" ORIFICE)	1.33	26.7	0.0	29.5
L2007B	IPEX TEMPEST LMF 100	1.48	10.9	6.5	38.8
L2008A	IPEX TEMPEST HF (83mm ORIFICE)	1.48	16.7	3.9	30.9
L2009A	IPEX TEMPEST HF (108mm ORIFICE)	1.11	24.5	0.0	24.6
L2009B	IPEX TEMPEST HF (127mm ORIFICE)	0.74	27.7	0.0	23.1
TOTAL			**357.0**	**47.5**	**569.2**

Table 4 : Peak Surface Volume and Controlled Discharge (100-Year Storm Event)

Drainage Area ID	ICD Type	Head (m)	Qrelease (L/s)	Vstored (m^3)	Vavailable (m^3)
L2000A	IPEX TEMPEST HF (83mm ORIFICE)	1.58	17.2	10.6	12.8
L2001A	IPEX TEMPEST HF (95mm ORIFICE)	1.68	23.3	37.7	37.7
L2001B	IPEX TEMPEST LMF 65	1.69	4.7	38.3	53.3
L2002A	IPEX TEMPEST HF (102mm ORIFICE)	1.71	27.1	24.4	25.4
L2002B	IPEX TEMPEST HF (127mm ORIFICE)	1.73	42.2	24.4	26.2
L2003A	IPEX TEMPEST HF (95mm ORIFICE)	1.73	23.6	43.7	44.2
L2003B	IPEX TEMPEST HF (95mm ORIFICE)	1.68	23.3	36.8	36.8
L2004A	IPEX TEMPEST HF (83mm ORIFICE)	1.68	17.8	39.3	45.8
L2005A	IPEX TEMPEST HF (95mm ORIFICE)	1.70	23.4	55.3	57.0
L2006A	IPEX TEMPEST HF (127mm ORIFICE)	1.73	42.2	27.2	29.8
L2006B	IPEX TEMPEST LMF 65	1.68	4.7	8.8	19.3
L2006C	IPEX TEMPEST HF (127mm ORIFICE)	1.66	41.4	18.8	20.2
L2006D	IPEX TEMPEST HF (108mm ORIFICE)	1.63	29.6	13.6	13.9
L2007A	IPEX TEMPEST HF (108mm" ORIFICE)	1.71	30.4	28.4	29.5
L2007B	IPEX TEMPEST LMF 100	1.68	11.6	34.1	38.8
L2008A	IPEX TEMPEST HF (83mm ORIFICE)	1.73	18.0	30.0	30.9
L2009A	IPEX TEMPEST HF (108mm ORIFICE)	1.73	30.5	24.4	24.6
L2009B	IPEX TEMPEST HF (127mm ORIFICE)	1.71	42.0	23.1	23.1
TOTAL			**452.9**	**518.8**	**569.2**

5.3.2.2 Uncontrolled Area

Due to grading restrictions, one subcatchment has been designed without a storage component. The catchment area discharges off-site uncontrolled to the adjacent streets surrounding the proposed site. Peak discharges from uncontrolled areas have been considered in the overall SWM plan and have been balanced through overcontrolling proposed site discharge rates to meet target levels.

Table 5: Uncontrolled Non-Tributary Area (UNC-1)

Design Storm	Discharge (L/s)
2-Year	36.5
100-Year	106.2

5.3.2.3 Results

Table 6 demonstrates the proposed stormwater management plan and demonstrates adherence to target peak outflow rates for the site.

Table 6: Summary of Total 2 and 100 Year Event Release Rates

	2-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
Uncontrolled – Surface	36.5	106.2
Controlled – Surface	357.0	452.9
Total	**393.5**	**559.1**
Target	**504.6**	**565.2**

5.3.3 Climate Change Event

Based on a summation of peak flows from all controlled catchment areas on-site at a conservative time of concentration of 10 minutes, the site is estimated to generate a peak runoff rate of 1247L/s during the 100-year storm event. A 20% increase in peak runoff from the site to represent the climate change scenario can therefore be conservatively estimated at a peak rate of 249.4L/s. The site has been graded to permit overland flows in excess of the 100 year event to spill from high-point to high-point through parking access routes to the downstream Atlas Terrace ROW. Flow depth during the climate change event can be estimated in consideration of the access route acting as a weir 0.15m high (representing barrier curb) and 6.0m in width. The weir equation is as follows:

$Q = 2/3\ Cw\ L\ (2 \times 9.81)^{0.5}\ H^{3/2}$
Where: Q = peak flow rate, m^3/s
Cw = weir coefficient (set to 1.68)
L = length of weir, m
H = Head, m

Solving for head with the known flow rate of 249.4 L/s, the depth of flow across the weir is estimated at 42mm. Given that the minimum freeboard (300mm) is achieved from building openings to the static spill elevations equivalent to the 100-year storm event depth of ponding, no flooding concerns have been identified for the climate change scenario at an additional 42mm depth of flow.

6.0 GRADING AND DRAINAGE

The proposed development site measures approximately 3.14 ha in area. The topography across the site is relatively flat, and currently drains from west to east. A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy the stormwater management requirements, adhere to permissible grade raise restrictions (see **Section 10.0**) for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

The subject site maintains emergency overland flow routes for flows deriving from storm events in excess of the maximum design event to the northeast along Atlas Terrance.

7.0 UTILITIES

Existing Bell, Hydro and Rogers services are located within Rouncey Road and Atlas Terrance. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities, along with determination of any off-site works required for development, will be finalized after design circulation. Detailed design of the required utility services will be completed by the respective utility companies. Implementation of the plan will also require coordination with Hydro Ottawa on any impacts to existing hydro poles within the Fernbank Road ROW. Hydro Ottawa has been circulated preliminary plans of the grading and units for Block 366 to ensure adequate clearance to their existing pole line and will continue to be circulated on design plans as they are advanced.

8.0 APPROVALS

As the site is under singular ownership, not industrial in nature, and discharges to a pre-existing separated sewer system, Ontario Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approvals (ECAs, formerly Certificates of Approval (CofA)) under the Ontario Water Resources Act are not expected to be a requirement for the development to proceed. Conservation Authority approval will be required for the development to proceed.

Requirement for a MOE Permit to Take Water (PTTW) is unlikely for the site as the majority of proposed works are above the groundwater elevations shown in the geotechnical report. The geotechnical consultant shall confirm at the time of application that a PTTW is not required.

9.0 EROSION CONTROL DURING CONSTRUCTION

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit extent of exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Plan construction at proper time to avoid flooding.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

9. Verification that water is not flowing under silt barriers.
10. Clean and change silt traps at catch basins.

Refer to **Drawing EC/DS-1** for the proposed location of silt fences, straw bales and other erosion control structures.

10.0 GEOTECHNICAL INVESTIGATION

A geotechnical Investigation Report was prepared by Patersongroup on February 19, 2019 for the Blackstone Phase 5 Condominium Block (now Block 366). The report summarizes the existing soil conditions within the subject area and construction recommendations. For details which are not summarized below, please see the original Paterson report.

A subsurface investigation was conducted and concluded that the site conditions include cultivated topsoil/organic layer followed by silty sand fill, overlying a sensitive silty clay deposit. Depths of Bedrock was estimated at 10m to 50m depth based on available geological mapping. Long term groundwater elevations are expected between 2m to 3m depth. Grade raise fill restrictions of 2.0m above the original ground surface were recommended for Block 366.

The required pavement structure for proposed hard surfaced areas are outlined in **Table 7** and **Table 8** below:

Table 7: Recommended Pavement Structure – Car Parking Areas

Thickness (mm)	Material Description
50	Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
300	Subbase – OPSS Granular B Type II
-	Subgrade – Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Table 8: Recommended Pavement Structure – Local Residential Roadways

Thickness (mm)	Material Description
40	Wear Course – Superpave 12.5 Asphaltic Concrete
50	Binder Course –Superpave 19.0 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
400	Subbase – OPSS Granular B Type II
-	Subgrade – Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil

Table 9: Recommended Pavement Structure – Roadways with Bus Traffic

Thickness (mm)	Material Description
40	Wear Course – Superpave 12.5 Asphaltic Concrete
50	Upper Binder Course – Superpave 19.0 Asphaltic Concrete
50	Lower Binder Course – Superpave 19.0 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
600	Subbase – OPSS Granular B Type II
-	Subgrade – Either in situ soil, or OPSS Granular B Type II material placed over in situ soil

11.0 CONCLUSION

11.1 WATER SERVICING

Based on the supplied boundary conditions for existing watermains and estimated domestic and fire flow demands for the subject site, it is anticipated that the proposed servicing in this development will provide sufficient capacity to sustain the required domestic demands and emergency fire flow demands of the proposed site. Fire flows greater than those required per the FUS Guidelines are available for this development.

11.2 SANITARY SERVICING

The proposed sanitary sewer network is sufficiently sized to provide gravity drainage of the site. The proposed site will be serviced by a network of gravity sewers which will direct wastewater flows to the existing 200mm dia. sanitary sewer situated within Atlas Terrace at the northern boundary of the site. A sanitary design sheet has been included in **Appendix B.2** which indicates, the proposed drainage outlet has sufficient capacity to receive sanitary discharge from the site.

11.3 STORMWATER SERVICING

The proposed stormwater management plan is in compliance with the goals specified through consultation with the City of Ottawa. The on-site storm sewer system has been designed to limit peak storm sewer inflows to downstream storm sewers to 565.2L/s as determined by background reports. The downstream receiving sewer has sufficient capacity to receive runoff volumes from the site based on the Blackstone Phase 4-8 Servicing and Stormwater Management Report.

11.4 GRADING

Detailed grading has been designed to satisfy the stormwater management requirements, adhere to permissible grade raise restrictions, and provide for minimum cover requirements for storm and sanitary sewers. Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities. Detailed grading is provided within **Drawing GP-1**.

11.5 UTILITIES

Existing Bell, Hydro, Gas, and Rogers services are located within Rouncey Road and Atlas Terrace. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location, and routing of utilities, along with determination of any off-site works required for development, will be finalized after design circulation.

11.6 APPROVALS/PERMITS

An MECP Environmental Compliance Approval is not expected to be required for installation of the proposed storm and sanitary sewers within the site. A Permit to Take Water is not anticipated to be required for pumping requirements for sewer installation. The Rideau Valley Conservation Authority will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.