
RUNOFF AND DETENTION ANALYSIS

Received By:
Grove City Development
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ABSTRACT

The proposed 49.87-acre Site is located south of London-Groveport Road at the intersection of London-Groveport Road and Rings Avenue in the City of Grove City, Franklin County, Ohio. The property is bounded to the east by a parcel owned by Jack Strader and to the west and south by FedEx. This report shall analyze the 100-year storm event and establish adequate storage and outlet structures to accommodate the necessary detention. This report follows the Rational Method and guidelines set forth by the City of Grove City, Ohio.

EXISTING AND PROPOSED CONDITIONS

The total site area is 49.87 acres. There are 48.27 acres of developable site and 1.60 acres of existing and proposed right of way for London-Groveport Road. The runoff from the public ROW will discharge undetained into the northern stream and is excluded from our detention calculations.

The existing site consists mainly of row crops. There is a small wooded area by the Old Homestead and the streams have some trees and shrubs along the banks. Runoff flows in sheet flow and shallow concentrated flow through the site to the two existing streams. In the existing condition 16.17 acres drains to the southern stream and 32.10 acres to the northern stream (excluding 1.60 acres of existing and proposed ROW).

After development, 38.07 acres of the site will be routed to the south retention pond. The outlots and Convenience Store on the north side of the site are unable to be routed to the southern retention basin due to crossing conflicts with the northern stream. Site constraints will not allow a regional retention basin for these outlots. These outlots (6.30 acres) will be responsible for providing their own detention as the outlots develop. Detention should be provided via at grade detention (parking lot detention) or underground storage. The critical year storm for the southern drainage area is the 50-year storm and the northern area is the 1-year storm.

Since we are proposing to develop the Convenience Store as part of the initial construction, we have included detention calculations for this area. The Convenience Store site is 3.12 acres and includes runoff from the west entrance drive. Detention for the Convenience Store (including the future car wash) will be provided via underground and at grade detention.

The east entrance drive is 0.30 acres. Runoff from the east entrance drive will be released undetained into the northern stream. This uncontrolled runoff has been taken into account in determining the allowable release rates for the remaining outlots.


This report provides documentation to prove that the southern retention pond will over-detain enough runoff so the pond may discharge without exceeding the 1-year pre-developed discharge for the site during the 50-year critical year storm. The following tables list the drainage areas and provide a brief description of the runoff schemes. See detailed Drainage Area Map in the Appendix.

Summary of Comments on Pages 1-4 from 234-StormReport-012406.pdf

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The outlots and Convenience Store on the north side of the site are unable to be routed to the southern retention basin due to crossing conflicts with the northern stream. Site constraints will not allow a regional retention basin for these outlots. These outlots (6.30 acres) will be responsible for providing their own detention as the outlots develop. Detention should be provided via at grade detention (parking lot detention) or underground storage.

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This report provides documentation to prove that the southern retention pond will over-detain enough runoff so the pond may discharge without exceeding the 1-year pre-developed discharge for the site during the 50-year critical year storm. The following tables list the drainage areas and provide a brief description of the runoff schemes.

DRAINAGE AREA TABLE

DESCRIPTION	AREA
Runoff to rear pond (19.11 acres Meijer, 18.96 acres seller retained parcel)	38.07 ACRES
Convenience Store Runoff (including west entrance drive)	3.12 ACRES
Outlot Runoff	4.37 ACRES
Seller Retained Outlot	1.93 ACRES
East Entrance Drive	0.30 ACRES
Existing and proposed Right of Way	1.60 ACRES

The land use classification and corresponding runoff curve numbers are listed below for existing and proposed conditions of the watershed area. The following CN values have been weighted to reflect the distribution of soil types. Runoff Curve Number worksheets can be found in the appendix.


Pre-Developed Northern Area	CN = 78	32.10 Acres (excluding right-of-way)
Pre-Developed Southern Area	CN = 78	16.17 Acres
Post-Developed Areas	CN = 94	48.27 Acres (excluding right-of-way)

ROUTING


A stage/storage/discharge analysis was performed for the proposed site. The proposed site is divided into northern and southern portions of the site.

For the area draining to the south pond, the outlet structure used in the analysis for this pond was an ODOT 2-3 catch basin with a 12" orifice at elevation 815.0-feet and a grate at elevation 817.50-feet. The south pond discharges into the stream on the southern boundary of the site. The post-developed south pond will be limited to the 1-year pre-developed discharge for the post-developed 50-year storm. The critical year storm was calculated using a volume of 0.891 ac-ft for the 1-year pre-developed event and 5.327 ac-ft for the 1-year post-developed event. The percent increase is 498% which corresponds with a 50-year critical storm. The south pond will also be required to detain the Water Quality Volume for the site for at least 24 hours per OEPA requirements. Calculations have been provided in the Appendix and a summary chart is provided below.

¹For the areas located north of the northern stream, the Convenience Store and outlots, the discharge amounts have been divided based on acreage per lot. The east entrance drive will drain uncontrolled into the north stream. ²The Convenience Store will have (2) two 86-foot lengths of 48" pipe and 24" pipe oversized for underground detention and at grade detention (parking lot detention) located behind the Convenience Store. The discharge from the Convenience Store will be restricted by a 1" orifice at elevation 818.00-feet and a 2-foot weir at elevation 823.00-feet located inside MH 2.1. The critical year

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For the areas located north of the northern stream, the Convenience Store and outlots, the discharge amounts have been divided based on acreage per lot. The east entrance drive will drain uncontrolled into the north stream.

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The Convenience Store will have (2) two 86-foot lengths of 48" pipe and 24" pipeoversized for underground detention and at grade detention (parking lot detention) located behind the Convenience Store. The discharge from the Convenience Store will be restricted by a 1" orifice at elevation 818.00-feet and a 2-foot weir at elevation 823.00-feet located inside MH 2.1.


storm was calculated using 1.769 ac-ft for the 1-year pre-developed event and 1.360 ac-ft for the 1-year post-developed event. The percent increase is -23% which corresponds with a 1-year critical storm. (The area draining to the north ditch was reduced by 21.97 acres.)¹ The three outlots and the seller retained parcel located north of the north stream will be required to provide detention and water quality volumes for each individual lot. Calculations have been provided in the Appendix and a summary chart showing the allowable discharge amounts for each lot is provided below.

For post-developed conditions, the critical year storm and more frequent storms must maintain a peak outflow from the site less than the 1-year pre-developed storm. This was accomplished by analyzing the pre-developed release rate from the site and the post developed runoff amounts from the total area.


TABLE OF RESULTS – South Pond				
Event (Yr.)	Pre Developed Site (CFS)	Allowable Discharge (CFS)	Post Developed Site (CFS)	Elevation (feet)
1	6.29	6.29	0.21	815.26
2	8.42	6.29	0.74	815.49
5	13.89	6.29	2.04	815.87
10	18.08	6.29	3.19	816.17
25	22.44	6.29	4.01	816.56
50	26.03	6.29	4.60	816.88
100	28.75	28.75	4.99	817.13

TABLE OF RESULTS – North Outlots					
Event (Yr.)	Pre Developed Site (CFS)	Allowable Discharge (CFS)	East Entrance Drive (CFS)	Convenience Store (CFS)	Remaining Allowable Discharge (CFS)
1	12.05	12.05	0.83	0.05	11.17
2	16.11	16.11	0.94	0.05	15.12
5	26.58	26.58	1.20	0.05	25.33
10	34.68	34.68	1.38	0.05	33.25
25	43.12	43.12	1.57	0.05	41.50
50	50.05	50.05	1.71	0.05	48.29
100	55.33	55.33	1.83	0.05	53.45

² The remaining discharge should be divided evenly among the outlots. Each of the three outlots (A, B and C) will be allowed to discharge 23% of the remaining APD for each storm event and the seller retained parcel will be allowed 31% of the remaining APD. Refer to the table on next page.

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The three outlots and the seller retained parcel located north of the north stream will be required to provide detention and water quality volumes for each individual lot. Calculations have been provided in the Appendix and a summary chart showing the allowable discharge amounts for each lot is provided below.

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The remaining discharge should be divided evenly among the outlots. Each of the three outlots (A, B and C) will be allowed to discharge 23% of the remaining APD for each storm event and the seller retained parcel will be allowed 31% of the remaining APD.

1 TABLE OF RESULTS – Remaining North Outlots


Event (Yr.)	Remaining Allowable Discharge (CFS)	Outlot A (CFS)	Outlot B (CFS)	2 Outlot C (CFS)	Seller Retained Parcel (CFS)
1	11.17	2.57	2.57	2.57	3.46
2	15.12	3.48	3.48	3.48	4.69
5	25.33	5.83	5.83	5.83	7.85
10	33.25	7.65	7.65	7.65	10.31
25	41.50	9.55	9.55	9.55	12.87
50	48.29	11.11	11.11	11.11	14.97
100	53.45	12.29	12.29	12.29	16.57


CONCLUSION

The results of this analysis show adequate detention and storage are provided for the development.

The storm sewer system has been sized for a 10-year 24-hour storm design. The hydraulic grade line for the 10-year event will remain below the rim of the storm structures. An overland flow path has been provided for storms that exceed the capacity of the storm pipes. The grades within the main parking lot are such that the water could pond 0.80-feet before flowing overland to the proposed retention basins.

All worksheets, hydrograph summaries, and storm routing worksheets are included in the Appendix.

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Outlot C
(CFS)