

DRAINAGE REPORT

For

PROPOSED



RESTAURANT

**494 Lincoln Street
Worcester, Massachusetts
Worcester County**

Prepared by:

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the re-development of an existing vacant restaurant and parking lot to a proposed Raising Cane's Restaurant at 494 Lincoln Street in the City of Worcester, Massachusetts. This site, which consists of approximately 1.04± acres of land, contains existing paved parking area, on-site utilities, and landscaping.

The proposed project includes the construction of a new 3,447± SF Raising Cane's Restaurant with Drive-Thru along with new paved parking areas, landscaping, storm water management, and associated utilities. This report addresses a comparative analysis of the pre- and post-development site runoff conditions. Additionally, this report provides calculations documenting the design of the proposed stormwater conveyance system as illustrated within the accompanying Site Development Plans prepared by Bohler. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at three (3) "design points" where stormwater runoff currently drains to under existing conditions. These design points are described in further detail in **Section II** below. A summary of the existing and proposed conditions peak runoff rates for the 2-, 10-, 25-, and 100-year storms can be found in **Table 1.1** below. In addition, the project has been designed to meet or exceed the Stormwater Management Standards as detailed herein.

Table 1.1: Design Point Peak Runoff Rate Summary

	Peak Flow Discharge in cubic feet per second (cfs)											
	2-year			10-year			25-year			100-year		
	Exist	Prop.	Delta	Exist	Prop.	Delta	Exist	Prop.	Delta	Exist	Prop.	Delta
DP1A	3.90	3.70	-0.20	6.40	6.20	-0.20	8.30	8.10	-0.20	11.60	11.20	-0.40
DP1B	0.10	0.20	0.10	0.20	0.40	0.20	0.30	0.50	0.20	0.50	0.80	0.30
DP1	4.00	3.90	-0.10	6.60	6.50	-0.10	8.70	8.60	-0.10	12.10	12.00	-0.10

**Flows are represented in cubic feet per second (cfs)*

II. EXISTING SITE CONDITIONS

Existing Site Description

The overall parcel is located at 494 Lincoln Street in the City of Worcester, Massachusetts and described as Map 39, Block 29, Lot 1C. The parcel contains approximately 1.04± acres of land

and currently features an existing masonry building, paved parking areas, on-site utilities, landscaping, and other associated site features.

On-Site Soil Information

Soils within the analyzed area consist of the following as classified by the Natural Resource Conservation Service (NRCS):

Table 2.1: Existing Soil Information

Soil Unit Symbol	Soil Name / Description	Hydrologic Soil Group (HSG)
102C	Chatfield-Hollis-Rock outcrop complex	B
602	Urban Land	D

Onsite soil investigations were performed by Bohler on June 25th, 2024. Refer to **Appendix C** for additional information.

Existing Collection and Conveyance

The majority of the site drains to a series of catch basins located onsite which outlet to a drainage manhole in Country Club Boulevard and ultimately the City of Worcester drainage system. The remaining portion of the site sheet flows into Lincoln Street and Country Club Boulevard and is collected via the City drainage system. There are no existing stormwater management or treatment systems located on site. Slopes on the site range from 0%-67% with on-site elevations ranging from 562.6 at the northern corner of the property to 555.1 at the southeastern corner of the property.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at three (3) “design points” as described below where stormwater runoff currently drains to under existing conditions. The existing site was subdivided into two (2) separate sub catchments, as described below, to analyze existing and proposed flow rates at the design points. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr). The area of analysis for this project consists of approximately 1.21 acres of land, of which approximately 0.17 acres are offsite areas.

Design Point #1 (DP1) is the City drainage system in Lincoln Street. Under existing conditions, this design point ultimately receives stormwater flows from design points DP1A and DP1B, as further described below.

DP1A is the drainage manhole in Country Club Boulevard. Under existing conditions, this design point receives stormwater flows from approximately 1.16 acres of land, designated as watershed “ED1A”.

DP1B is Lincoln Street. Under existing conditions, this design point receives stormwater flows from approximately 0.05 acres of land, designated as watershed “ED1B”.

Refer to **Table 2.2** below for additional detail.

Table 2.2: Existing Sub-Catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)
ED1A	1.16±	Paved parking, rooftops, grass	93	6.0
ED1B	0.05±	Pavement, grass	83	6.0

Refer to **Table 1.1** for the existing conditions peak rates of runoff at all design points Refer to **Appendix D** and the Drainage Area Maps in the appendices of this report for a graphical representation of the existing drainage areas.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed project consists of the construction of a new 3,447± SF Raising Cane’s Restaurant with Drive-Thru along with new paved parking areas, landscaping, storm water management, and associated utilities. The site, including the proposed parking areas, has been designed to drain to deep-sump, hooded catch basins. The catch basins will capture and convey stormwater runoff, via an underground pipe system, to a proprietary water quality unit for treatment prior to discharge to the City drainage system.

Proposed Development Collection and Conveyance

Deep sump hooded catch basins are proposed to collect and route runoff from the paved parking areas to a proprietary water quality unit for treatment prior to discharge to the City drainage system. Roof runoff is also proposed to be collected by the onsite drainage system. Pipes have been designed for the 25-year storm using the Rational Method. Pipe sizing calculations are included in **Appendix F**.

The best management practices (BMPs) incorporated into the proposed stormwater management system have been designed to meet, or exceed, the standards set forth in the Massachusetts Department of Environmental Protection Stormwater Handbook standards. Refer to **Section V** for additional information.

Proposed Watersheds and Design Point Information

The project has been designed to maintain existing drainage watersheds to the greatest extent possible, with the same design points described in **Section II** above. The site was subdivided into two (2) separate sub catchments for the proposed conditions as described below. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Under proposed conditions DP1A receives stormwater flows from approximately 1.13 acres of land, designated as watershed “PD1A”.

Under proposed conditions DP1B receives stormwater flows from approximately 0.08 acres of land, designated as watershed “PD1B”.

Refer to **Table 3.1** below for additional detail.

Table 3.1: Proposed Sub-catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)	Hydrologic Routing
PD1A	1.13±	Rooftops, paved parking, grass	92	6.0	DP1A/DP1
PD1B	0.08±	Paved parking, grass	84	6.0	DP1B/DP1

The site was analyzed at DP1; the ultimate design point and City drainage system in Lincoln Street. Two design points, DP1A and DP1B, were further analyzed to examine flows at the drainage connection in Country Club Boulevard as well as overland flows. It is notable that there is a decrease in runoff rates to DP1A, and a slight increase in flows to DP1B due to the addition

of a pedestrian connection from the project site to the City sidewalk. As a result, there is an overall reduction in runoff rates to DP1 and ultimately the City drainage system. Refer to **Table 1.1** for the calculated proposed conditions peak rates of runoff.

For additional hydrologic information, refer to **Appendix E** and the Drainage Area Maps in the appendices of this report for a graphical representation of the proposed drainage areas.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD computer program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The rainfall data utilized and listed below in **Table 4.1** below for stormwater calculations is based on NOAA Atlas 14 using the upper bounds per the City of Worcester. Refer to **Appendix F** for more information.

Table 4.1: NOAA Rainfall Intensities

Frequency	2 year	10 year	25 year	100 year
Rainfall* (inches)	3.87	6.02	7.74	10.6

*Values derived from NOAA ATLAS on 10/2/2024 (upper bounds)

The proposed stormwater management as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events to the ultimate design point (DP1). Additionally, the proposed project meets, or exceeds, the MADEP Stormwater Management standards. Compliance with these standards is described further below.

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges

The project has been designed so that proposed impervious areas shall be collected and passed through the proposed drainage system for treatment prior to discharge.

Standard #2: Peak Rate Attenuation

As outlined in **Table 1.1**, the development of the site and the proposed stormwater management system, have been designed so that post-development peak rates of runoff are below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at the ultimate design point (DP1).

Standard #3: Recharge

The project as proposed will involve the reduction of impervious area compared to the existing condition; therefore, recharge is not required.

Standard #4: Water Quality

Water quality treatment is provided via deep sump catch basins and a proprietary water quality unit. TSS removal calculations are included in **Appendix F** of this report.

The water quality unit has been sized to treat the 1-inch water quality flow rate. Refer to **Appendix F** of this report for calculations.

Standard #5: Land Use with Higher Potential Pollutant Loads

Not Applicable for this project.

Standard #6: Critical Areas

Not Applicable for this project.

Standard #7: Redevelopment

The project is a redevelopment and has been designed to meet the Stormwater Standards as if it were a new development.

Standard #8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets. Additionally, the project is required to file a Notice of Intent with the US EPA and implement a Stormwater Pollution Prevention Plan (SWPPP) during the construction period. The SWPPP will be prepared prior to

the start of construction and will be implemented by the site contractor under the guidance and responsibility of the project's proponent.

Standard #9: Operation and Maintenance Plan (O&M Plan)

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix G** of this report. The O&M Plan includes a list of responsible parties and outlines procedures and time tables for the long term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations.

Standard #10: Prohibition of Illicit Discharges

The proposed stormwater system will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensates, etc.) and will not contain any illicit discharges from prohibited sources. An Illicit Discharge Statement is included in **Appendix G** of this report.

VI. **SUMMARY**

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler results in a reduction in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies at the ultimate design point (DP1). In addition, the proposed best management practices will result in an effective removal of total suspended solids from the post-development runoff.

APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST