

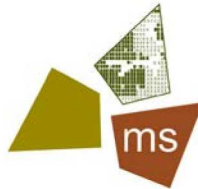
PRELIMINARY STORMWATER MANAGEMENT REPORT

WHATABURGER
NE Quadrant of M 150 Hwy and SW Hollywood Drive
Lee's Summit, MO 64082

PREPARED FOR

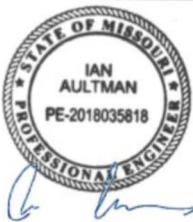


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General Information

Whataburger is proposing to construct a new restaurant in Lee's Summit, Missouri.

The subject parcel is located in the City of Lee's Summit, Jackson County, Missouri, in the northeast quadrant of the M 150 Hwy & SW Hollywood Drive intersection. The subject parcel is 1.45 acres and is an undeveloped lot. The site drains to the south and to the east. Adjacent land use in the project area is commercial. Proposed work includes the construction of the new Whataburger Restaurant, the associated parking lot, utility service lines and mainline connections, and a stormwater conveyance system, and storm water detention basin. A Project Location Map is provided in **Appendix A**.

The project is located in the FEMA Flood Zone X (Area with Minimal Flood Hazard). The FIRMette condensed map of the FEMA floodplain map (FIRM 47157C0470F, Eff. September 28, 2007) is included in **Appendix A**.

The Soil Survey for Jackson County, Missouri, developed by the United States Department of Agriculture Soil Conservation Service, was referenced to determine the predominant soil types at the project site. One soil type was identified within the project limits and has been listed in the table below. The Custom Soil Resource Report for Jackson County, Missouri, which includes a soils map, can be found in **Appendix D**.

Soil Types for the Project Site				
Symbol	Description	Slope	Hydrologic Soil Group	Hydric Rating
10082	Arisburg-Urban land complex	1 to 5%	C	No

Methodology

Hydrologic calculations were performed using SCS methodology (TR-55), in accordance with the City of Lee's Summit requirements and APWA Sections 5602 and 5608, and implemented through Hydroflow Hydrograph's computation software. A theoretical Point of Interest, or Point of Analysis, was used as the basis for determining the release rate off-site from all proposed work within the project limits. Per the requirements, the site was analyzed for the 2 year, 10 year and 100 year storm events.

Analysis of the storm conveyance system, which ultimately discharges into the City of Lee's Summit municipal storm sewer system, was also performed. Hydraulic calculations were performed utilizing the Rational methodology for the 10-year storm event, and implemented through the Hydraflow Storm Sewer computation software.

Existing Conditions Analysis

The existing site is currently a combination of brush, trees and grass. It drains to both the south (towards Highway 150) and to the east (toward Arby's). The existing conditions analysis can be found in **Appendix C**. The existing conditions map with the time of concentration can be found in **Appendix B**. The pre-development time of concentration was determined to be 23.23 minutes based on the current site conditions. There is one point of interest (POI) for the project which is located in the northeast corner of the site – the existing manhole since the proposed site drainage will be connect to it.



The land cover curve numbers used for the existing conditions TR-55 runoff analysis are as follows:

Cover Type	Hydrologic Soil Type	Curve Number	Area
Open Space (Good)	C	74	1.44 ac
Impervious	C	98	0.01 ac

Storm Event	Existing Runoff (cfs)	Allowable Release Rate
2 Year	1.86	0.5 x site area = 0.5 x 1.45ac = 0.73 cfs
10 Year	4.02	2.0 x site area = 2.0 x 1.45ac = 2.90 cfs
100 Year	8.41	3.0 x site area = 3.0 x 1.45ac = 4.35 cfs

Proposed Conditions Analysis

The proposed site is currently a combination of impervious and grass. The post-developed undetained area drains to both the south (towards Highway 150) and to the east (toward Arby's). The post-developed detained area drains to the northeast to the existing manhole on SW Summitcrest Drive. The proposed conditions analysis can be found in **Appendix C**. The proposed conditions map with the time of concentrations can be found in **Appendix B**. The post-development time of concentration was determined to be 14.4 minutes for the undetained area and 8.10 minutes for the detained area based on the proposed site conditions. There is one point of interest (POI) for the project which is located in the northeast corner of the site – the existing manhole since the proposed site drainage will be connect to it.

The land cover curve numbers used for the proposed undetained conditions TR-55 runoff analysis are as follows:

Cover Type	Hydrologic Soil Type	Curve Number	Area
Open Space (Good)	C	74	0.31 ac
Impervious	C	98	0.01 ac

The land cover curve numbers used for the proposed detained conditions TR-55 runoff analysis are as follows:

Cover Type	Hydrologic Soil Type	Curve Number	Area
Open Space (Good)	C	74	0.24 ac
Impervious	C	98	0.89 ac

The detained area will drain to an underground detention basin to be located on the east side of the site under the parking lot. The underground detention basin will then discharge connect into the manhole along SW Summitcrest Drive.

Storm Event	Allowable Runoff (cfs)	Total Postdeveloped Runoff (cfs)
2 Year	0.73	0.71
10 Year	2.09	1.37
100 Year	4.35	3.80

The site was analyzed for water quality. The 1.37"/24-hour storm was calculated for the site and the underground basin will release this storm within 40-hour extended detention requirement. Additionally, the underground detention system will have an isolation row which will be sized to hand the "first flush" of storm runoff. The calculation is in the Hydroflow Hydrograph routing as the 1-year storm event in **Appendix C**.

Conclusions and Recommendations

Whataburger is proposing to construct a new restaurant in Lee's Summit, Missouri. The existing site is currently a combination of brush, trees and grass. The proposed site will be a combination of grass and paving. Stormwater management will consist of an underground detention system designed to reduce the runoff to the required rates. As indicated above and shown by the attached calculations, the project is in compliance with the City of Lee's Summit / Kansas City Metropolitan Chapter of APWA Design Criteria stormwater requirements.