

**PRELIMINARY STORM WATER
MANAGEMENT STUDY**

MCPL - COLBERN ROAD BRANCH REMODEL

1000 NORTHEAST COLBERN ROAD
LIBERTY, MISSOURI

**PREPARED FOR
MID-CONTINENT PUBLIC LIBRARY**

**PREPARED BY
OLSSON, INC.
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**NOVEMBER, 2019
(REVISED DECEMBER, 2019)**

OLSSON PROJECT No. B18-0330.182

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GENERAL INFORMATION

This Stormwater Management Study is being submitted on behalf of the Mid-Continent Public Library (MCPL) for the proposed remodel and expansion of the existing Colbern Road Branch Library facility located at 1000 Northeast Colbern Road in Lee's Summit, Missouri.

Project Location and Description

The site is located on Lot 1 of the Rice Acres Plat in the Northeast ¼ of Section 29, Township 48 North, Range 31 West, in Jackson County, Lee's Summit, Missouri. Currently the site is 2.9 acres, however, the MCPL has acquired an additional 100' of the unplatted property to the east for a total of 4.0 acres (See Exhibit 1 – Appendix A).

Retail businesses surround the project to the south, while undeveloped properties are located to the west, north, and east. The proposed remodeled plans anticipate on demolishing the existing 18,000 sf. library facility and constructing a new library facility that will be approximately 34,000 sf. The improvements will consists of the expanding the existing parking lot, developing landscaping, updating grading, utilities.

The entirety of the existing and acquired sites are located outside of the 100-Year FEMA Floodplain (See Appendix B).

Study Purpose

The purpose of this study is to provide a Stormwater Management Plan for the proposed development in accordance with the American Public Works Association (APWA) *Standard Specifications and Design Criteria* Section 5600 "Storm Drainage Systems and Facilities", APWA Manual of Best Management Practices (BMP) for Stormwater Quality, and applicable City of Lee's Summit, Missouri guidelines.

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Soils Descriptions

Soil classifications were obtained from the Natural Resource Conservation Service's website by utilizing the Web Soil Survey feature. The site soil composition and classification are listed below:

10128 – Sharpsburg-Urban Land Complex, 2 to 5 percent slopes – HSG Type D.

*HSG – Hydrologic Soils Group

See Soils Map in Appendix B.

METHODOLOGY

General Criteria and References

Analytical and design criteria conform to those of Division V - *Section 5600 – “Storm Drainage Systems and Facilities”* of the Kansas City Metropolitan Chapter of the American Public Works Association's *“Standard Specifications and Design Criteria”*. Based on these criteria's, Post-development discharge rates for the 1, 10, and 100-year storm events will be limited to provisions in section 5608.4-C1 *Performance Criteria – “Comprehensive Control”*. Post-development discharge rates are limited to 0.5 cfs per acre for 2-Year, 2.0 cfs per acre for 10-year, and 3.0 cfs per acre for 100-year storm events. Pre and post-development flows from the site are shown below and were calculated using HEC-HMS for the 1, 10 and 100-year storm events. Existing and proposed hydrographs were calculated using the 24-hour SCS Type II rainfall distribution. Existing times of concentration were determined using Inlet Time and Travel Time equations found in Section 5602.7 of APWA Section 5600. A minimum inlet time of five minutes was utilized when calculating the times that were under five minutes. This method was also applied during the calculation of the proposed times of concentration.

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HYDROLOGIC/HYDRAULIC ANALYSES

Existing Conditions Analysis

The existing site is currently functioning as a branch for MCPL. The acquired property to the east is undeveloped, along with the properties to the west and north. The property is also bounded by retail businesses to the south.

Current runoff for the existing library is collected by roof drains and flumes in the parking lot that directs the water to an existing detention basin on the east side of the site. The roof drains are piped to the basin as well. The current drainage patterns consist of the paved parking area that drains to southeastern flumes, that then drain to a swale, that directs the flow to the basin. The basin is connected to an existing public storm line (existing Outfall “A”) on the north side of Colbern Road that drains to the east to unnamed tributary (See Exhibit 2 – Appendix A).

The existing basin is not clearly defined, and the outflow structure is in disrepair. It seems to still function, but no clear indication of existing storage volume or outflow.

There is an existing swale on the western edge of the property as well. This swale diverts runoff from the undeveloped property west of the site to north along the existing curb. After this, the swale turns to the northeast. This is where the runoff flows to the neighboring undeveloped property.

With the comprehensive control method is being used for drainage design, an existing curve number analysis is not required for the site. For the purpose of these calculations, the analysis will treat the site as if the existing building and parking were not there.

Proposed Conditions Analysis

A new 34,000 SF library will be constructed on the site. The parking area will also be increased to accommodate the larger building. The Stormwater Management Plan noted as Exhibit 3 in Appendix A shows the proposed improvements. The location of the building

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and the parking area will essentially remain in the same configuration. Along with this, the site drainage patterns will remain the same as existing. The additional site runoff will be captured by an enclosed storm sewer system. The increase in impervious area will increase runoff from the site and to mitigate the increase in runoff, the following strategy will be implemented.

Outfall A – All impervious areas for site will drain to the enclosed storm system and be directed into a new detention basin and water treatment facility. Due to the site design, the drainage area for this outfall will increase. However, the detention facility is designed to mitigate the increased runoff to this outfall. The site areas being directed to the basin includes the roof drains, the parking area, and the detention basin itself (approximately 3.2 acres). A control structure located within the basin will limit the 2, 10, and 100-year storm events to the comprehensive control levels.

Table 1: Post-Development Curve Number Analysis

Sub-Area	Area (AC)	Soil Group	Curve Number
Pavement, Buildings, Impervious	2.5	D	98
Turf (Good)	1.0	D	80

A peak flow analysis of the post-development site was conducted using HEC-HMS, the composite curve number, and rainfall and distribution information acquired from APWA section 5600. Post-development peak flows to the outfall are summarized in the Table 2. Detailed reports from HEC-HMS are available in Appendix D

Table 2: Proposed Peak Flows

Sub-Area / Outfall	Tributary Area (acres)	Q (1-Year Storm) (cfs)	Q (10-Year Storm) (cfs)	Q (100-Year Storm) (cfs)
Outfall A	3.5	10.8	21.6	30.7

In order to maintain the existing flow patterns on the west side of the property, the existing swale will be extended north to the edge of the proposed service area. The extended

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swale will continue to divert the off-site runoff from the west to the undeveloped property to the north of the site. It is assumed that when the future public road is constructed on the west side of the site, runoff from the off-site area will be collected in a public storm system.

Stormwater Detention Requirements

As stated previously, a new detention pond will be constructed to mitigate the increase in flow due to the increase in impervious area. The detention basin will be located on the east side of the site and will collect runoff from 3.2 acres of the 4.0 acre property. This includes most of the impervious areas through a series of inlets, yard drains, roof drains, and underground pipes. A control structure will be located at the outlet of the basin. An orifice/weir plate in the control structure will limit outflow in the 2, 10, and 100 year storms.

The drainage from the southeast corner of the parking lot (0.3 ac) will be collected in a curb inlet. This runoff will not be detained. The inlet is connected downstream of the control structure by the outlet pipe from the basin. It will combine with the outflow from the basin. The control structure was designed to over-detain the runoff collected in the basin. Therefore, the combined flow will not exceed the allowable release rate. HEC-HMS was used to route the storms as they enter the underground system. Hydrographs for the combined flows of the detained and undetained areas are shown in Appendix D.

To meet water treatment requirements, the water quality volume (WQv) will be controlled by a series of 1" orifices at the bottom of the orifice plate. The conduit will release the water quality volume over a 40-hour period to allow pollutants to settle out of this precipitation event.

Two areas from the 4.0-acre property will not be detained. The entrance drive and median (0.39 acres post-construction) on Colbern Road flow to the public storm system in the road. This drainage pattern is essentially unchanged in the pre and post construction phases. There is also 0.12 acres on the north and eastern edge of the pervious vegetated areas that will not be detained, because they will have no impact on the neighboring property.

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An orifice will be located above the WQv surface elevation to control the 1 and 10-year storms. Both storms have been analyzed through the control structure and will release below the pre-existing storm events. The 100-year storm event will flow into a weir placed place at a higher elevation in the control structure. The dam will have an emergency spillway to control the 100-year overflow.

Table 3 provides the water surface elevations (WSE's) and peak flows for the proposed detention basin.

Table 3: Detention Basin, WSE's and Peak Flows

Description	Detention Basin
Bottom of Basin	958.5
Total Storage Volume	1.2 ac-ft
Top of Dam Elevation	965.5
WQv Orifice (IE Elevation, Pipe Size)	958.5, 2 – 1" (ft, # hole - diam)
Water Quality Volume WSE, Storage, Peak Outflow	960.8, 0.2, 0.08 (ft, ac-ft, cfs)
2-year & 10-Year Orifice (IE Elevation, Pipe Size)	960.8, 1-5" (ft, orifice size)
10–Year Storm WSE, Storage, Peak Outflow	962.2, 0.5, 4.8 (ft, ac-ft, cfs)
100–Year Storm Weir (Elevation, Length)	961.2, 3 (ft, lf)
100–Year Storm WSE, Storage, Peak Outflow	963.3, 0.7, 9.3 (ft, ac-ft, cfs)

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Table 4 shows the allowable peak flow for the site based on the Comprehensive Control Method.

Table 4: Allowable Peak Flows Based on Comprehensive Control

Sub-Area / Outfall	Tributary Area (acres)	Q (2-Year Storm) (cfs)	Q (10-Year Storm) (cfs)	Q (100-Year Storm) (cfs)
Outfall A	3.5	1.8	7.0	10.5

Table 5 shows the peak flow for the site post-construction. Note that the peak flows for post-construction construction condition are at or below the allowable peak flows shown in Table 4.

Table 5: Post Construction Peak Flows

Sub-Area / Outfall	Tributary Area (acres)	Q (2-Year Storm) (cfs)	Q (10-Year Storm) (cfs)	Q (100-Year Storm) (cfs)
Detained	3.2	1.3	4.8	9.3
Undetained	0.3	0.6	1.4	2.0
Outfall A	3.5	1.8	5.2	10.1

STORMWATER TREATMENT REQUIREMENTS

As stated previously, the proposed detention is designed to act an extended dry bottom detention facility will be used to treat stormwater per MARC water quality standards. The orifice plate for the basin will be sized to release the water quality volume (1.37") over a 40-hour period to allow pollutants to settle from runoff before entering the public stormwater system. The maximum storage for the water quality event in the basin will be 0.1 acre-ft reaching a peak water surface of elevation 960.8 feet.

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CLEAN WATER ACT SECTION 404 PERMITTING REQUIREMENTS

No jurisdictional Waters of the United States have been identified on the study site. Therefore, a Section 404 permit is not required.

FEMA/DWR PERMIT REQUIREMENTS

No FEMA permitting or submittals will be required on this site because there are no FEMA delineated floodplains on the site. A copy of the FIRM map for this area has been included in Appendix B.

CONCLUSIONS AND RECOMMENDATIONS

As outlined in the preceding report, increased runoff rates in the post-development conditions are mitigated by the detention basins. Drainage patterns on the site remain relatively unchanged. Lastly, an extended dry detention basin has been designed to maintain or improve the storm water quality. Based on these facts and other information provided herein, we request approval of this stormwater study.