STORMWATER REPORT

Fire Station #4

5031 NE Lakewood Way
Lee's Summit, MO 64064

GLMV Architecture

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Revision 1: February 11, 2022

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0	INITIAL ISSUE	01/05/22	DERICK HOLMES	
1	REVISED PER CITY COMMENTS	02/11/22	DERICK HOLMES	STORMWATER NARRATIVE REVISED PER CITY COMMENTS PROVIDED 02/04/2022

CONTENTS

Appendices

References:

1. City of Lee's Summit, MO (January 13, 2022). *Section 5600 – Storm Drainage System & Facilities; City of Lee's Summit, Missouri Design Criteria*. Retrieved from https://cityofls.net/development-services/design/design-criteria/design-construction-manual-infrastructure
2. Kansas City Metropolitan Chapter of American Public Works Association (January 13, 2022). *Section 5600; Storm Drainage Systems & Facilities; February 16, 2011*. Retrieved from https://cityofls.net/development-services/design/design-criteria/design-construction-manual-infrastructure
3. City of Lee's Summit, MO (January 13, 2022). *City of Lee's Summit Watershed with Outfall Map.* Retrieved from https://cityofls.net/map-gallery/index.html?group=98ce512922a144cdbad6a03516df5897
4. NOAA. (January 5, 2022). *Point Precipitation Frequency (PF) Estimates*. Retrieved from https://hdsc.new.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nc
5. United States Department of Agriculture Natural Resources Conservation Service. (January 5, 2022). *Web Soil Survey.* Retrieved from https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
6. Autodesk Civil 3D 2021
7. Autodesk Storm and Sanitary Analysis 2021

1.0 INTRODUCTION

1.1 PURPOSE STATEMENT

The purpose of this Report is to document the steps taken to size the stormwater system for the proposed Fire Station #4 in Lee's Summit, MO.

1.2 PROJECT BACKGROUND

The purpose of this proposed Project is to construct a new Fire Station #4. The project will be located at 5031 NE Lakewood Way, Lee's Summit, MO 64064. As shown in Figure 1, the site is located at the intersection of Bowlin Road and NE Lakewood Way.

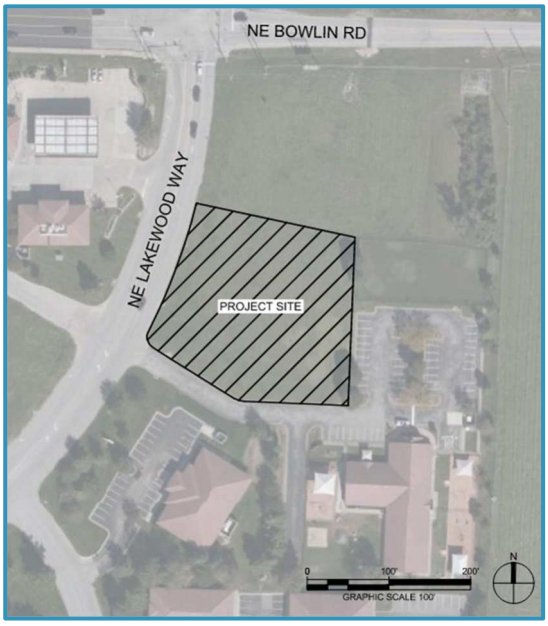

Figure 1 - Site Vicinity Map

1.3 EXISTING LAND USES

The Project currently consists of 1.17 acres of undeveloped grassland. Surrounding land uses consists of a mixture of both developed and undeveloped commercial properties. Adjacent properties that are developed include an animal health center, Montessori school, and a gas station.

This project will require a minor plat of Lot 6-A to acquire an additional 0.10 acres from Lot 7 to the north (see Appendix A).

1.4 EXISTING STORMWATER RUNOFF

The topography for the property generally slopes from southeast to northwest with elevations varying between 913 feet above mean sea level on the southeast side of the site to 907 feet at the site's lowest point at the northwest corner of the property.

Existing site runoff is primarily captured in the stormwater conveyance system on NE Lakewood Way. A curb inlet located at the NW corner of Lot 6-A then discharges stormwater east along Lot 6-A's northern property line. A stormwater manhole located east of the property then directs stormwater discharge to a regional detention basin located on Tract E (see Figure 2 and Appendix A).

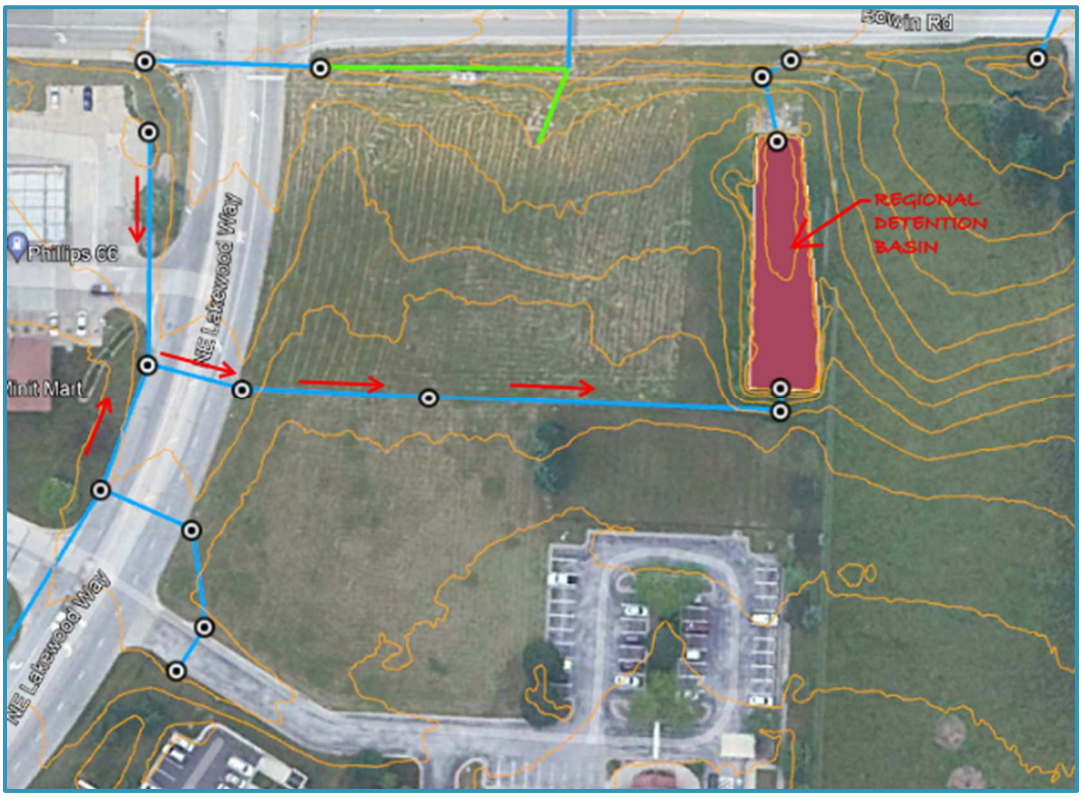

Figure 2 - Existing Stormwater Drainage

As shown in Appendix D, the Project is in the Blue Springs Watershed.

1.5 EXISTING SOIL CONDITIONS

A United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was performed and is documented in Appendix D. The report outlines the following soil classifications found:

Table 1 - USDA NRCS Web Soil Survey Soil Classifications

MAP UNIT SYMBOL	MAP UNIT NAME	HYDROLOGIC SOIL GROUP
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C
10113	Oska silty clay loam, 5 to 9 percent slopes, eroded	D

1.6 PROPOSED DRAINAGE CONCEPT

The proposed drainage concept is shown on Drawing C-104 (see Appendix A). A series of curb and area inlets will collect stormwater throughout the site. The Project's stormwater conveyance system will discharge stormwater to the existing detention basin on Tract E, east of the site. A new curb inlet will be installed on NE Lakewood Way to replace the existing curb inlet that will be converted to a junction box on the front apron of the fire station. The existing public stormwater pipes on the northern property line of Lot 6-A will be relocated to the new northern property line as part of the minor plat of Lots 6-A and 7. A new 15' utility easement will be established along the new property line (7.5' on each property). A new manhole will be

installed on the northeast corner of Lot 6-A. This manhole will serve to collect the Project's stormwater runoff and to direct it east to the detention basin. A new stormwater conveyance pipe will be installed from this manhole to the existing manhole to the east, just upstream of the detention basin's inlet; the proposed invert elevation at the existing manhole will remain unchanged.

2.0 DESIGN BASIS

Per the City of Lee's Summit, MO (References 1 and 2), the following applies to stormwater design of the Project:

Table 2 - Design Basis

#	REFERENCE, SECTION	DESIGN BASIS ITEM	NOTES
1	2 5601.3 B2	***5601.3 General Requirements and Applicability*** *The design shall be accomplished under the direction of a Registered Professional Engineer qualified in the field of stormwater design. The design shall be based on land use in the tributary area as zoned, actually developed, or indicated by an adopted future land use plan, whichever basis produces the greatest runoff.* *This design criterion shall apply to all development, including subdivision, which alters the surface of the land to create additional impervious surfaces, including, but not limited to, pavement, buildings, and structures with the following exceptions:* ***B. New Construction Meeting the Following Criteria*** *2. Construction of any buildings, structures, and/or appurtenant service roads, drives, and walks on a site having previously provided stormwater management, as defined in Section 5601.5 A4 as part of a larger unit of development, OR a site previously relieved of stormwater management requirements.*	Because the existing regional detention basin exists, this project is not required to utilize the Comprehensive Protection Method, as outlined in 5601.5 of Reference 1, for stormwater design. A field review of the existing detention basin was conducted and documented in Appendix C (LTR).
2	2 5601.8	***5601.8 Levels of Service*** *A storm drainage system shall be provided that is capable of conveying the peak discharge generated by the 1% storm. If the in-system capacity established in this section is less the 1% storm peak discharge, then an overflow system as specified in Section 5601.5 -A-3 may provide the additional system capacity.* ***B. Protection for Streets*** ***1. Gutter Spread:*** *Water spread in streets shall meet the requirements in Section 5604.2 for the 10% design storm. These values are intended to establish a standard of accessibility for the widths (classes) of roadways listed during the 10% storm. When the local jurisdiction requires a higher standard for curb inlets, the conveyance system connected to the roadway must*	

		also meet that higher standard. If the roadway conveyance system connects to an underground system with lesser capacity, the system must be constructed to allow the discharge of that excess capacity into the overflow system.	
3	2 5602.2	***5602.2 Computation Methods for Runoff*** *B. Baseline Unit Hydrograph Method: The following computer implementations of the unit hydrograph method are acceptable for all watersheds:* • *SCS Technical Release No. 55 "Urban Hydrology for Small Watersheds", 2nd Edition, June 1986.*	
4	1 5603.1	***Hydraulic Calculation for Pipes, Culverts, and Open Channels*** *"Enclosed systems will use the open channel, or gravity, flow design method for the appropriate design storm."*	
5	2 5604.2	***5604.2 Gutter Flow*** *Inlets shall be located to limit the width of flow in street gutters at the time of peak discharge for the design storm specified in 5601.8 B to the limits indicated in Table 5604-2.* **Table 5604-2: Gutter Spread Criteria** **Back to Back of Curb Street Width** (feet) / **Maximum Allowable Spread in Each Outside Curb Lane from Back of Curb*** (feet) 28 or Less — 12.0 Over 28 to 36 — 12.0 Over 36 — 12.0 Divided Roadways — As above for each direction roadway * spread may exceed these limits within 50 feet of a sump inlet.	

2.1 METHODOLOGY

To satisfy the requirements set forth in Table 2 above, the following design steps were taken:

1. Size the Project's stormwater conveyance system for the 1 (100%), 10 (10%) and 100-year (1%), 24-hr storm event utilizing the SCS TR-55 Unit Hydrograph Method.
    a. The site's post-development drainage characteristics were computed and documented in Appendix B.
        i. Each drainage area was assigned a composite curve number utilizing Table 5602-3 of Reference 2 (see Appendix D.2).
        ii. A minimum system time of concentration of 5 minutes was assumed per Reference 2 (Appendix D.2).
        iii. Point precipitation frequency estimates were found utilizing Reference 4 (Appendix D.4).

b. A stormwater model was created in AutoCAD Storm & Sanitary Analysis (SSA) (Reference 7). The peak discharges for the 1-, 10-, and 100-year, 24-hour storm events were documented in Appendix B. Gutter spreads for the system were checked for the 10-year, 24-hr storm event.

2. Conduct a field investigation to verify the existing regional detention basin is currently functioning. As per the City of Lee's Summit, the following items were documented (see Appendix C):
    a. The condition of the basin.
    b. Siltation within the basin and any measures needed to remove silt.
    c. Brush or vegetation within the basin that may need removal.
    d. Condition of the retaining wall within the basin to determine whether it is leaning or has other structural issues.
    e. The basin is working as intended.

3.0 SUMMARY

In summary, all stormwater conveyance pipes can safely pass the 100-year, 24-hour stormwater event. All inlet gutter spreads were checked against the 10-year, 24-hour storm event and were found to be satisfactory against the design criteria.