PRELIMINARY DRAINAGE REPORT

AMERICA'S CAR-MART
1150 SE BLUE PARKWAY
LEE'S SUMMIT, MO
PROJECT NO. 2140180

06/11/2021
Revised 07/12/2021

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07/12/2021

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INTRODUCTION

The America's Car-Mart project consists of the construction of a car sales facility with 4460 sf sales building and 2352 sf detailing building, with vehicles display areas, associated drives, parking lots, and utilities. A new detention pond will also be installed to control the runoff from the site. The development is located on a 4.1 acre commercial lot in the Vista Del Verde 11th Plat at 1150 SE Blue Parkway in Lee's Summit, Missouri, and will disturb approximately 4 acres.

An aerial photo is shown in Appendix A.

GENERAL INFORMATION

The existing Lot 314 of Vista Del Verde 11th Plat is 4.1 acres of undeveloped grass lot with a gravel parking lot on the west side. The site slopes generally from west to east with a minor area sloping to SE Vista Dr. The south 100 ft of the property drains to the existing open channel at the SE corner of the site. The remainder of the property drains to the low point inlet in 8th Street near the NE corner of the property. This property is located in Zone X, area of minimal flood hazard according to FEMA Flood Map 29095C0438G, dated 1/20/2017. According to the National Wetlands Inventory there are no wetland within this property.

The Jackson County Soil Survey on the USDA website shows the existing soils to primarily belong to hydrologic soil group "C", as shown in Appendix B. The following Soil Classification Table summarizes the soil class.

SOIL TYPE	HYDROLOGIC RATING	PERCENT OF SITE
Arisburg – Urban land complex, 1 – 5 % slope	C	41.4%
Udarents – Urban land Sampsel complex, 2 – 5% slope	C	58.6%

DRAINAGE CRITERIA AND METHODOLOGY

The City of Lee's Summit Section 5600 Design Criteria Supplement, Default Strategy requires that the discharges expected from post-construction of the site shall conform to prescribed release rate per acre for the 1%, 10%, and 50% (100, 10 and 2 year) storm events. The required release rates are listed in Required Release Rate Table on page 4. The detention basin will also provide extended 40 hour control for the 90% (1 year) storm event. The detention pond will convey the runoff from all storms up to the 100 year storm and provide a minimum of 1 foot of freeboard. An emergency overflow route is required to be capable of conveying the 100 year storm in the event that the primary outlet is totally clogged. APWA Section 5600 Design Criteria will be used for all other storm drainage design elements not modified by the Lee's Summit Design Criteria Supplement.

Bentley's PondPack software package was used to determine preliminary flows from the site. PondPack used the NRSC – TR55 and SCS hydrograph methodology to analyze the site.

RAINFALL DATA

The 24-hour total rainfall depths were used for all storm events. These depths were used in accordance with APWA Section 5600 Design Criteria Manual and the Lee's Summit Section 5600 Design Criteria supplement. The SCS Type II rainfall distribution was used to model the storms, with the total rainfall depths from NOAA Atlas 14 for the Lee's Summit area as provided in the following table.

RAINFALL DATA	
STORM FREQUENCY	**TOTAL RAINFALL DEPTH (IN)**
1 Year (90%)	1.37
2 Year (50%)	3.71
10 Year (10%)	5.67
100 Year (1.0%)	9.24

EXISTING CONDITIONS

The America's Car-Mart proposed development is located on Lot 314 of Vista Del Verde 11th Plat within the Langsford Watershed. The lot contains 4.11 acres of grass covered undeveloped property. A drainage easement and 30' utility easement are located along the east property line containing a 3'x6' box culvert and 12" sanitary sewer main. The property is bounded on the north by SE 8th Street, on the west by SE Vista Drive and to the south by Blue Parkway. An existing drainage ditch flows in the Blue Parkway R/W to the open channel between the culvert under Blue Parkway and the 3'x6' RCB. The site slopes generally from west to east with a minor area sloping to SE Vista Dr. The south 100 ft of the property drains to the existing open channel at the SE corner of the site. The remainder of the property drains to the low point inlet in 8th Street near the NE corner of the property. There is no offsite runoff flowing through this property. Existing site runoff flow is listed in the table below. The Point of Interest for this Preliminary Analysis is the curb inlet on the south side of SE 8th Street.

This property is located in Zone X, area of minimal flood hazard according to FEMA Flood Map 29095C0438G, dated 1/20/2017. A flood plain for the East Fork of Little Blue River is located approximately 1300 ft downstream of this site. The FEMA map is shown in Appendix A.

The Jackson County Soil Survey on the USDA website shows the existing soils to primarily belong to hydrologic soil group "C", as shown in Appendix B. The SCS method was used for runoff using type "C" soils with a "curve number" (CN) value of 74 for meadow. There is an existing gravel lot on site, with a CN of 89. The Time of Concentration, Tc, was calculated using TR-55 methods in line with APWA 5600. The CN for the property is 75.6 and the Tc for the existing condition is 0.35 hours. The CN Value and Time of Concentration calculations for existing conditions are shown in Appendix C.

Bentley's PondPack software package was used to determine preliminary flows from the site. PondPack used the NRSC – TR55 and SCS hydrograph methodology to analyze the site.

The PondPack results for the preliminary existing conditions can be seen in Appendix C.

Existing flows:

STORM EVENT	TOTAL EXISTING FLOW TO POI (CFS)
90% (1 Year)	0.28
50% (2 Year)	6.21
10% (10 Year)	12.99
1.0% (100 Year)	26.27

DEVELOPED CONDITIONS

The proposed America's Car-Mart auto dealership development will provide a 4,460 sf sales building, a 2,352 sf detail building, 59,400 sf of outside sales display area along with employee parking. The development will add 2.85 acres of impervious area. Due to the site's proximity to the East Fork of Little Blue River floodplain, stormwater detention will be provided to provide runoff rates at rates prescribed in the Default Strategy, Comprehensive Protection for the 50%, 10% and 1% storm events. The detention basin will also provide 40 hour extended detention for the 90% storm event. Preliminary drainage areas are shown on the attached Preliminary Drainage Plan in Appendix F.

The proposed site improvements will maintain the current drainage pattern. An on site storm drainage system will collect runoff and direct it to a detention basin at the northeast corner of the site. Runoff draining directly to Vista Dr and SE 8th St will be minimal, reducing the direct runoff to the low point in SE 8th St. The proposed site CN is 91 and developed Tc is 0.22 hours. Refer to the calculations in Appendix D for additional information. The developed condition peak runoff rates contributing to the POI are listed in the Proposed Flows table on the following page.

The Jackson County Soil Survey on the USDA website shows the existing soils to primarily belong to hydrologic soil group "C", as shown in Appendix B. The SCS method was used for runoff using type "C" soils with a "curve number" (CN) value of 74 for landscaped areas. The pavement and building have a CN of 98. The Time of Concentration, Tc, was calculated using TR-55 methods in line with APWA 5600. The CN Value and Time of Concentration used for proposed conditions are shown in Appendix D.

The PondPack results for the developed conditions can be seen in Appendix D.

Proposed flows:

STORM EVENT	TOTAL PROPOSED FLOW AT POI (CFS)
90% (1 Year)	3.24
50% (2 Year)	13.57
10 % (10 Year)	22.39
1% (100 Year)	38.21

DETENTION DESIGN

The Car-Mart property is graded to direct the maximum possible area to the internal storm drainage system. Only a small area of the landscape buffer along 8th St and an area draining directly to the drainage easement at the SE corner, totaling 9,600 sf, are not routed to the detention basin. No offsite storm runoff flows through this property. The proposed detention basin is planned to be a graded basin at the northeast corner of the site and west of the utility easement. Refer to the Preliminary Drainage Plan, C2. An on-site storm drainage system will collect and convey the runoff to the detention basin. The concrete outlet structure will consist of a 3 stage outlet with 2 orifice openings and a weir to control the release rate for all storm events. The outlet structure will be designed to control the release of the 90% storm to provide detention and release the runoff over the required 40 hour timeframe. An overflow weir will be set in the outlet structure at the 1% volume elevation for additional protection in case of clogging. A 6" orifice invert will be at the invert elevation of the pond with a 15" orifice 3 ft higher. A stormwater BMP will be incorporated into the bottom of the basin to control the 90% release for the 40 hour detention draw down. The maximum elevation around the pond will be 981.02. An emergency overflow weir will be built into the southeast area of the berm to direct any overflow into the existing channel to reduce the chance of ponding at the low point in 8th Street. The maximum storage volume for the 1% storm will be 48,262 cu-ft at elevation. Additional basin information is provided in the Preliminary Detention Basin table on page 5. The following table lists the maximum release rates prescribed by City Standards.

REQUIRED RELEASE RATES

STORM EVENT	REQUIRED DETETNION RELEASE RATE (CFS)	PROPOSED DETENTION MAX RELEASE RATE (CFS)
90% (1 Year)	40 hour release	TBD
50% (2 Year)	0.50 cfs/AC	2.05
10 % (10 Year)	2.0 cfs/AC	8.22
1% (100 Year)	3.0 cfs/AC	12.33

For PondPack input/output regarding the proposed pond and outlet structure, see Appendix E.

Preliminary Detention Basin Flows:

STORM EVENT	TOTAL DEVELOPED FLOW INTO POND (CFS)	EXISTING RUNOFF (CFS)	REQUIRED MAX RELEASE RATE (CFS)	DETENTION BASIN RELEASE RATE (CFS)	VOLUME DETAINED (CU-FT)	PEAK STAGE ELEVATION (FT)
90% (1 Year)	3.24	0.28	NA	TBD	4,843	976.36
50% (2 Year)	13.57	6.21	(0.5cfs/ac) 2.05	1.79	18,227	978.17
10% (10 year)	22.39	12.99	(2.0 cfs/ac) 8.22	6.05	28,450	979.27
1% (100 Year)	38.21	26.27	(3.0 cfs/ac) 12.33	11.77	48,262	981.02

- Top of pond elevation at 982.25

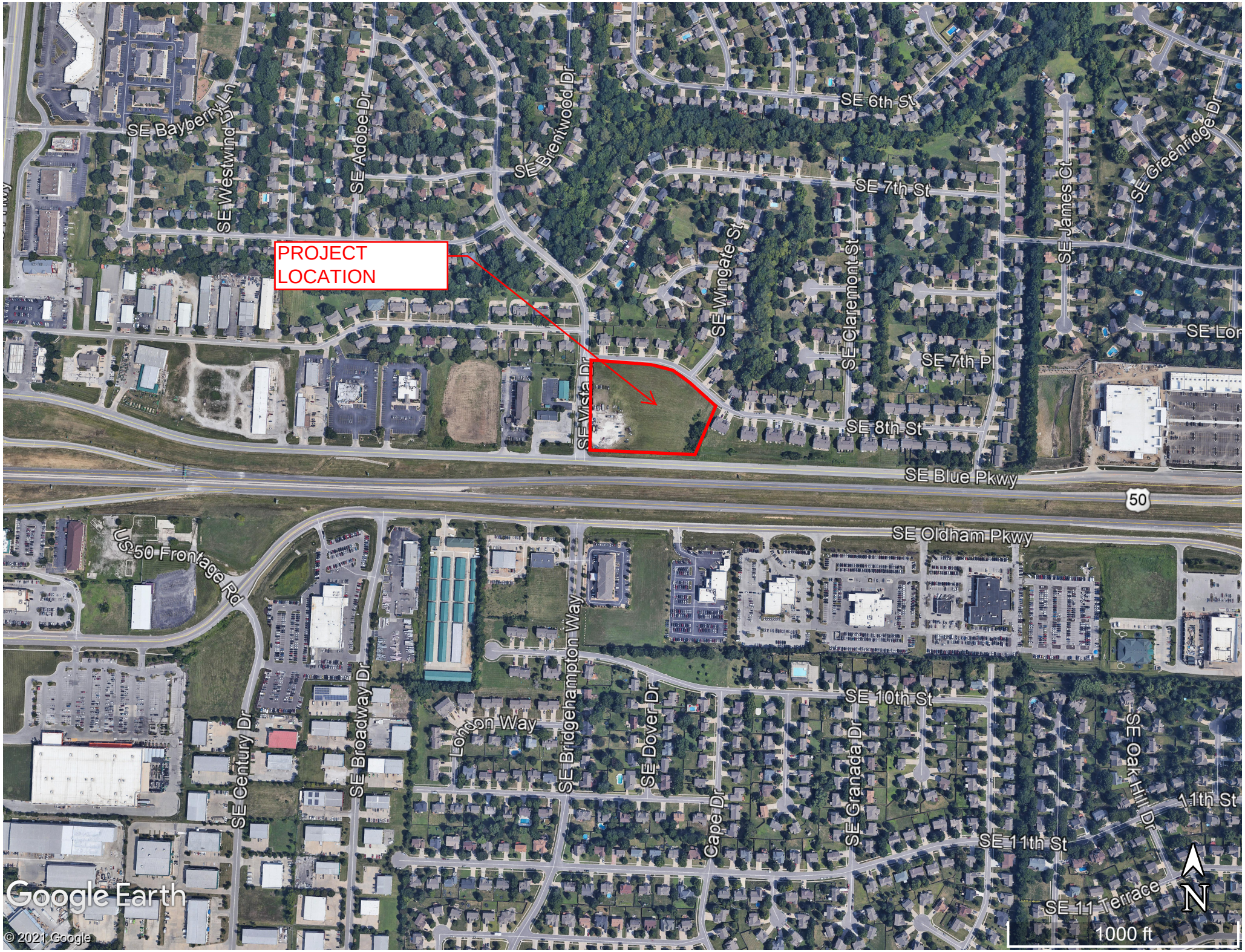
RECOMMENDATIONS AND CONCLUSIONS

Due to the increase in impervious area created by the Car-Mart development and the projects proximity to the flood plain for the East Fork of Little Blue River, stormwater detention with 40 hour extended detention for the 90% storm will be provided for this development. The storm drainage and detention designs will meet the drainage criteria of the City of Lee's Summit. The design of the America's Car-Mart development will incorporate a storm drainage system, stormwater BMPs and detention basin which meet the requirements stipulated in the Lee's Summit Section 5600 Default Strategy, Comprehensive Protection, APWA Section 5600 and the recommendations of the Pre-Application Meeting. The basin will control the 90%, 50%, 10% and 1% storm events with release rates meeting the requirements of the Default Strategy and the 90% storm event will be detained and released over a span of 40 hours.

The America's Car-Mart development will not have an adverse impact on the downstream storm drainage system or the East Fork of the Little Blue River floodplain. The detention pond will maintain a minimum of 1 foot of freeboard for all storms and includes an emergency overflow weir per City requirements. Additional information and data can be found in the attached Appendices.

Appendix A

(Areal Photo, FEMA map)


PROJECT LOCATION
SE 6th St
SE 7th St
SE 7th Pl
SE 8th St
SE Blue Pkwy
50
SE Oldham Pkwy
SE 10th St
SE 11th St
SE 11 Terrace
11th St
SE Bayberry Ln
SE Westwind Dr
SE Adobe Dr
SE Brentwood Dr
SE Wingate St
SE Claremont St
SE James Ct
SE Greenridge Dr
SE Vista Dr
US 50 Frontage Rd
SE Century Dr
SE Broadway Dr
London Way
SE Bridgehampton Way
SE Dover Dr
Cape Dr
SE Granada Dr
SE Oak Hill Dr
N
1000 ft
Google Earth
© 2021 Google

National Flood Hazard Layer FIRMette

FEMA

94°21'28"W 38°54'28"N

94°20'51"W 38°54'N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/8/2021 at 7:00 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.