united
engineering
group

MEMORANDUM

To: City of Lee's Summit
From: Steve LaCasse, United Engineering Group
Date: February 11. 2025

Re: Lee's Summit Hyundai Premier Auto Outlet
Stormwater Study

The purpose of this study is to analyze the hydrology and impact of the proposed Lee's Summit Hyundai Premier Auto Outlet site development.

The subject property is known as Lot 1A-1 and the west 30 feet of Lot 1A-2, Summit Innovation Center, Lee's Summit, Missouri.

Prior Reports:

1. Preliminary Development Plan, Summit Orchards North, Lots 1A & 1B
   Prepared by Own, Inc., December 8, 2023

2. Stormwater Report, Summit Technology Campus, Summit Orchards North
   Prepared by Own, Inc., November 21, 2023

Project Description: The subject property is located southeast of the I-470/SW Blue Parkway interchange. The property is 7.72 acres in size – it is a smaller portion of the larger 17.01 acre parcel identified as Lot 1A in the prior Stormwater Report. The proposed development is an automotive dealership and associated parking lot, consistent with the Preliminary Development Plan, with the exception that the current project does not include (at this time) construction of all the planned parking lot on the west side of the parcel. The project also includes an access drive along the common line of Lots 1A-1 and 1A-2.

Existing Conditions: Exhibit 1 is attached. It shows Sheet C3 from the prior Preliminary Development Plan underlaid, with the boundary of Lots 1A-1, 1A-2, and 1B shown. In addition, a major dividing line is shown – dividing the property into two major basins. The west side of the property flows to the "West Outfall" and the east part of the property flows towards the "East Outfall – Regional Detention Basin" – as identified in the prior Stormwater Report. The "West" and "East" outfalls and associated drainage areas are identified in the prior approved Stormwater Report. For the PostDeveloped condition, the prior report establishes areas, curve numbers, and peak discharges for benchmark rainfall events, for both major basins. The goal of the civil site design for the subject parcel is to match the peak flows for the benchmark storms in each major basin. Below the "Hydrograph Reports" for each benchmark storm, in the PostDeveloped condition, are shown – taken from the previously approved Stormwater Report.

WEST OUTFALL:

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Monday, 11 / 20 / 2023

Hyd. No. 3

West Outfall PostDeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 20.04 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 43,023 cuft
Drainage area	= 5.610 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.20 min
Total precip.	= 2.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Monday, 11 / 20 / 2023

Hyd. No. 3

West Outfall PostDeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 35.55 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 79,422 cuft
Drainage area	= 5.610 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.20 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Monday, 11 / 20 / 2023

Hyd. No. 3

West Outfall PostDeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 57.78 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 133,139 cuft
Drainage area	= 5.610 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.20 min
Total precip.	= 7.69 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

EAST OUTFALL:

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Monday, 11 / 20 / 2023

Hyd. No. 4

East Outfall PostDeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 75.70 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 268,855 cuft
Drainage area	= 32.290 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.40 min
Total precip.	= 2.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Monday, 11 / 20 / 2023

Hyd. No. 4

East Outfall PostDeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 135.49 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 496,318 cuft
Drainage area	= 32.290 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.40 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Monday, 11 / 20 / 2023

Hyd. No. 4

East Outfall PostDeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 221.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 832,006 cuft
Drainage area	= 32.290 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.40 min
Total precip.	= 7.69 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

As described previously, the proposed development and subject parcel are significantly smaller than the major "West" and "East" basins. Exhibit 2 is attached, showing a closer view of the subject parcel and major basin dividing line, the Sheet C3 from the prior Preliminary Development Plan underlaid. Within the limits of the subject parcel, 3.53 acres flows towards the "West Outfall" and 4.19 acres flows towards the "East Outfall".

Future Conditions: Exhibit 3 is attached. It shows Sheet C300 (Drainage Plan) from the current civil site plans for the subject parcel. It depicts the major east/west basin dividing line, which is in a slightly different location than what was shown on the prior approved Stormwater Report, with 3.46 acres flowing to the "West Outfall" and 4.26 acres flowing to the "East Outfall". The table below summarizes the difference:

	Prior Report	Current Proposal
West Outfall	3.53 acres	3.46 acres
East Outfall	4.19 acres	4.26 acres

The Curve Numbers for the future conditions were also examined. The table below shows a breakdown of the sub-basins within each major east/west basin into "Turf" and "Pavement/Roof" areas. And, it shows the accumulated CN for each major basin: CN = 77 for the "West Outfall" and CN = 93 for the "East Outfall".

Future Conditions

Area Designation	Area Assigned (sf)	Area Turf (CN=74) (sf)	Area Pavement/Roof (CN=98) (sf)	COMBINED CN
West Outfall				
10	18,812	315	18,497	98
11	131,706	131,054	652	74
Total:	150,518	131,369	19,149	77
East Outfall				
1	33,893	2,568	31,325	96
2	26,049	4,154	21,895	94
3	25,503	3,124	22,379	95
4	26,830	5,599	21,231	93
5	59,928	17,092	42,836	91
7	4,893	0	4,893	98
8	2,178	0	2,178	98
Unassigned Area East Side Site	6,179	6,179	0	74
Total:	185,453	38,716	146,737	93

It should be noted that Area 11 is planned to be almost entirely turf at this time. Exhibit 3 shows a parking lot on Area 11, and ultimately this is planned However, the owner does not plan to construct this parking area at this time. Therefore it is counted as turf in this report; and, it would be re-evaluated with any subsequent development proposal to construct this parking lot.

The tables below show a comparison of each major basin. For each major basin, West and East, the following information is shown:

Section A replicates information from the prior approved Stormwater Report.
Section B shows the area and CN for the subject parcel only.
Section C shows the area and CN for the remainder of the major basin, excluding the subject parcel.
Section D shows the total area and composite CN for the areas included in Sections B & C, along with Q100.

Prior Report vs Current Proposal - West Outfall

Section A				Section B		Section C		Section D		
Prior Report West Outfall - Entire Basin				Current Proposal Subject Parcel to West Outfall		Remaining Portion of Prior Report West Outfall not Included in Current Proposal		Total Combined West Outfall with Current Proposal		
Area (ac)	CN	100 YR Rain (in)	Q100 (cfs)	Area (ac)	CN	Area (ac)	CN	Area (ac)	CN	Q100 (cfs)
5.61	94	7.69	57.8	4.26	77	1.29 *	94	5.55 *	81	49.2

* Reflects reduction of west basin by 0.06 acres due to relocation of major dividing line.

Prior Report vs Current Proposal - East Outfall

Section A				Section B		Section C		Section D		
Prior Report East Outfall - Entire Basin				Current Proposal Subject Parcel to East Outfall		Remaining Portion of Prior Report East Outfall not Included in Current Proposal		Total Combined East Outfall with Current Proposal		
Area (ac)	CN	100 YR Rain (in)	Q100 (cfs)	Area (ac)	CN	Area (ac)	CN	Area (ac)	CN	Q100 (cfs)
32.29	94	7.69	221.2	4.26	93	28.09 *	94	32.35 *	94	221.6

* Reflects enlargement of east basin by 0.06 acres due to relocation of major dividing line.

It should be noted that the affect of the current proposal on the West basin is a reduction from 57.8 cfs to 49.2 cfs. As discussed previously, this is due to the decision to not construct the entire parking lot at this time. In the event this lot is constructed at a later date, the affects will have to be re-evaluated.

As discussed earlier, slight variances in the grading plan between the current proposal and the prior approved Stormwater Report and Preliminary Development Plan have caused a 0.06 acre shift in the dividing boundary between the two major basins – leading to the current proposal producing more runoff (221.6 cfs vs 221.2 cfs). This runoff increase is less than 1%, and every attempt has been made to adhere to the spirit of the prior approved report.

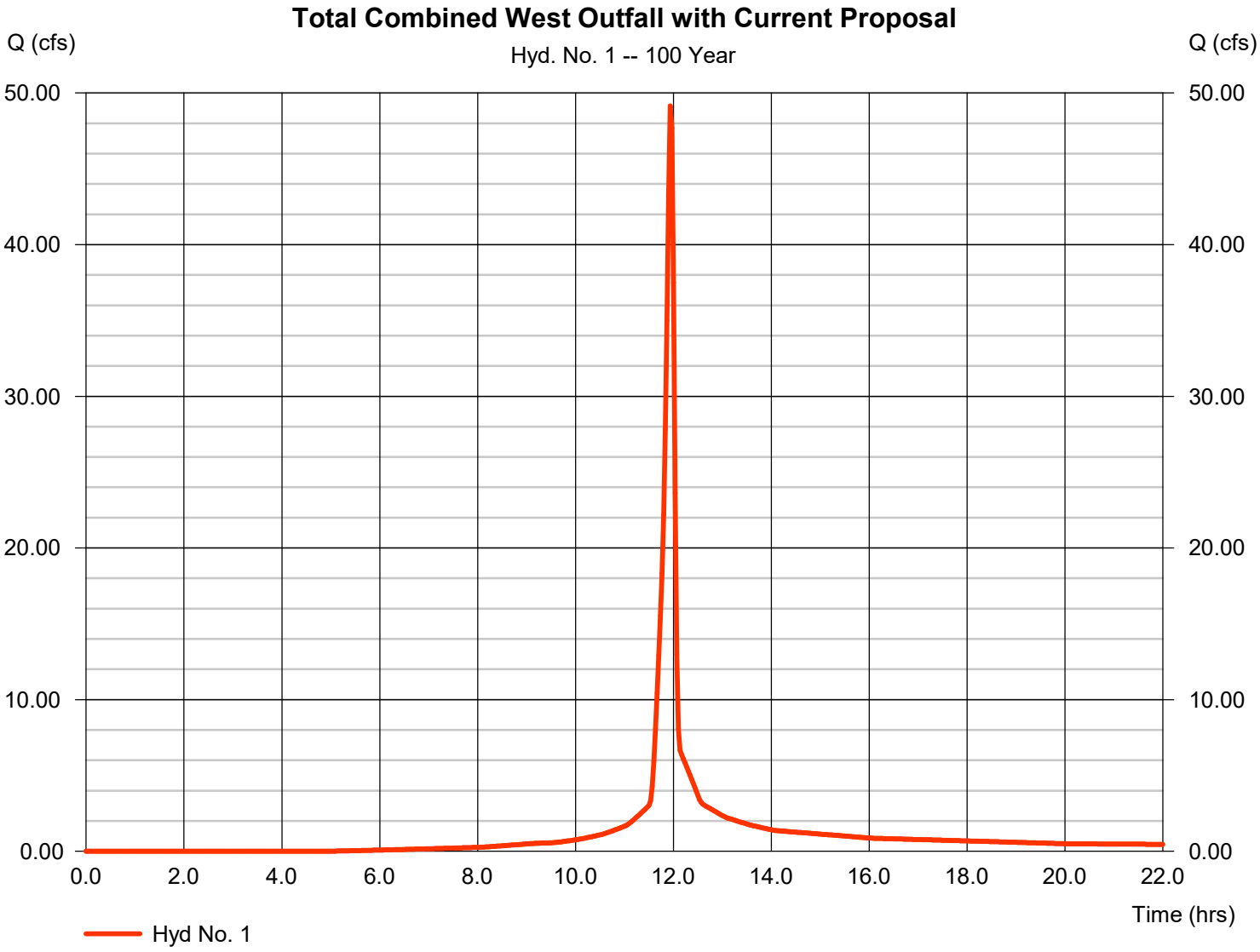
“Hydrograph Reports” for these future conditions are shown below.

Hydrograph Report

Hyd. No. 1

Total Combined West Outfall with Current Proposal

Hydrograph type	=	SCS Runoff	Peak discharge	=	49.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	102,942 cuft
Drainage area	=	5.550 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	3.20 min
Total precip.	=	7.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

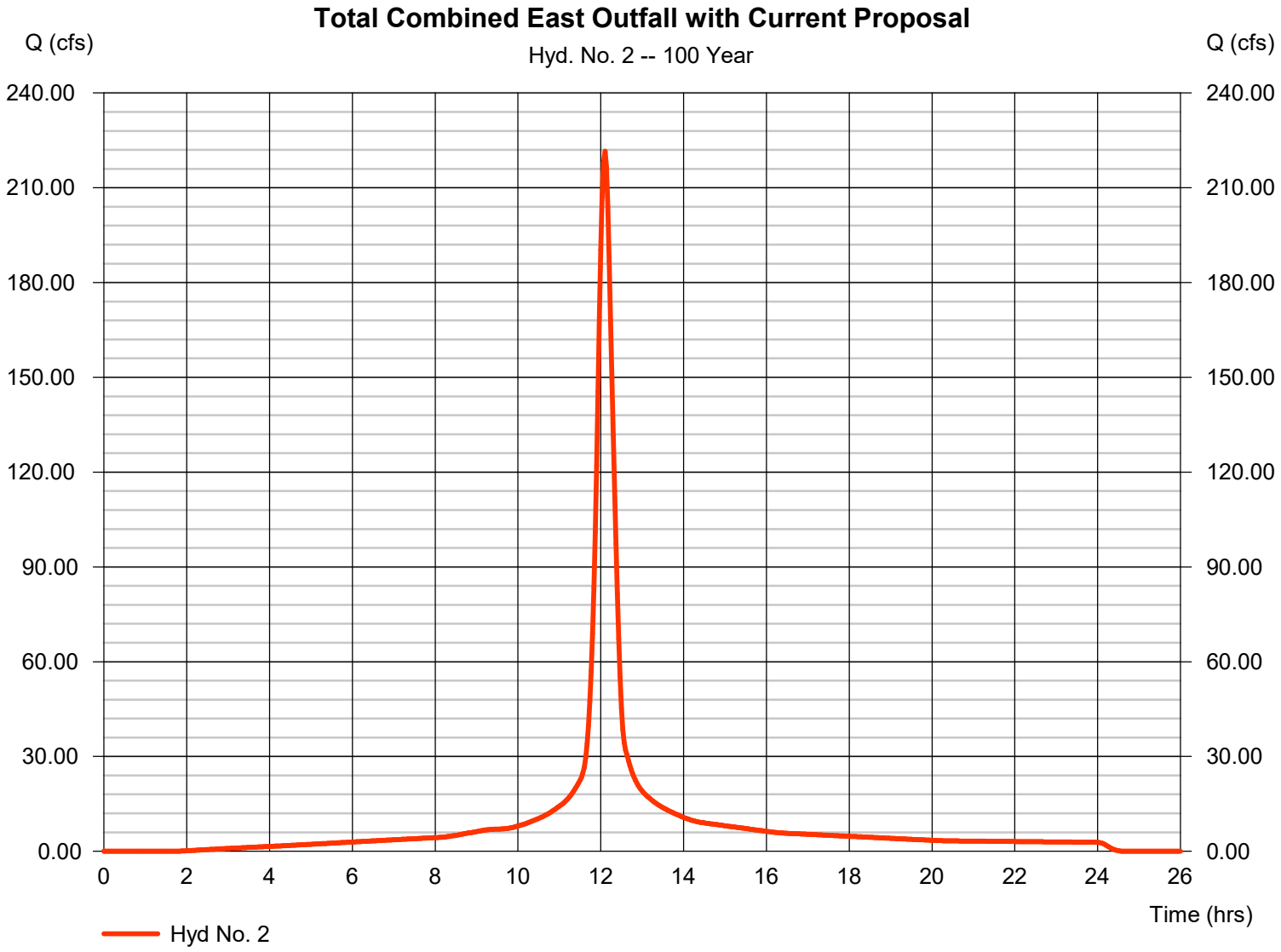


Hydrograph Report

Hyd. No. 2

Total Combined East Outfall with Current Proposal

Hydrograph type	=	SCS Runoff	Peak discharge	=	221.56 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	833,552 cuft
Drainage area	=	32.350 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	23.40 min
Total precip.	=	7.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Conclusions: The development of the subject parcel is a smaller portion of the larger development envisioned as the PostDevelopment Condition, in the prior approved Stormwater Report. The current proposal attempts to match the basin boundaries and curve numbers from that prior report. For the west basin, the current proposal does not increase runoff – although this will have to be re-evaluated in the event the entire parking lot is constructed in the future. For the east basin, there is a small (0.2%) increase in runoff, which should not have an adverse impact on the adjacent properties or downstream regional detention basin.

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