Preliminary Drainage Study

For

MTS Clean Transit Advancement Campus

4586 Federal Boulevard
San Diego CA 92102

Prepared for

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Prepared by

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N.E. Job No. 120-103.1
May 20, 2022

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Cory Schrack **R.C.E. 65976** **Date**

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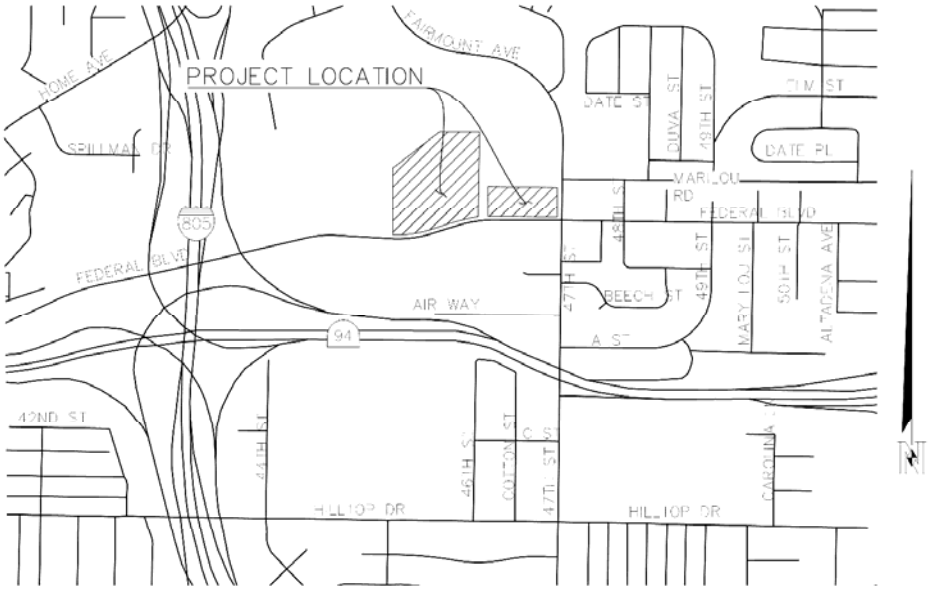
PURPOSE:

The purpose of this Preliminary Drainage study is to analyze the drainage conditions of the proposed "MTS Clean Transit Advancement" project. This report will calculate, analyze, and compare storm water runoff for both the existing and proposed site conditions in order to ensure that the existing hydrologic regime is not negatively impacted by the project. This study is intended to support the environmental document and is based on conceptual site planning and project description. During detailed design, a final drainage study should be prepared based on the final proposed project.

DESCRIPTION:

The project is located in the Mid-City Community area, approximately on 4586 Federal Boulevard, in San Diego California. The proposed project consists of demolition of existing buildings, the construction of a new bus maintenance facility, the construction of retaining walls to create level bus circulation, and electric vehicle charging lot. The new buildings consist of a new administration office/ operation building, and storage areas. The maintenance facility will consist of 20 bus maintenance service bays, bus wash lanes, and 200 Zero Emission Bus Chargers. The site will also be resurfaced with asphalt or concrete to accommodate for approximately 200 buses, 350 employee vehicles, and 60 non-revenue vehicles. The project will be confined to an area encompassing approximately 12.09 acres. The general direction of the storm water flow for this site is shown on the attached drainage exhibits (Existing Conditions and Proposed Conditions Exhibits). This project is not subject to requirements set forth in CWA 401/404 because it does not discharge to navigable waters.

VICINITY MAP



EXISTING DRAINAGE:

The existing site is approximately 12.09 acres and is encompassed by 5 parcels. The existing site consists of multiple industrial buildings and an open parking lot.
The existing conditions consist of 4 drainage basins as shown on the existing conditions exhibit. Basin 1 encompasses approximately 2.41 acres, and storm water sheet flows from the most northeast corner to the southwest corner of the lot and discharges to a curb inlet west on Federal Boulevard. Basin 2A is approximately 0.64 acres and sheet flows from northeast corner of lot to the south at the driveway of the property and discharges to the gutter. Basin 2B is approximately 0.77 acres and sheet flows from northwest corner to the southwest corner at the driveway and flows into the gutter. Basin 2C is approximately 1.47 acres and sheet flows from the top of driveway by Federal Boulevard to a grate inlet in the center of the buildings. Discharge then flows through a storm drain pipe at the limits of project on northwest side, and discharges to Chollas Creek. Basin 3 is approximately 1.35 acres and discharge sheet flows from northeast corner to the grate inlet by the driveway which discharges to the curb inlet on Federal Boulevard. Lastly Basin 4 is approximately 5.45 acres, discharge sheet flows from northeast side and southwest side of the lot to the grate inlet on the northwest limits of the lot. Discharge from this basin travels through a storm drain pipe and discharges into Chollas Creek. All discharge from existing conditions discharges into Chollas Creek downstream on Federal Blvd.

See **Appendix A – Existing Hydrologic Conditions Exhibit,** for further information.

PROPOSED DRAINAGE:

The proposed conditions encompass approximately 12.09 acres on 5 existing parcels surrounding 4586 Federal Boulevard. The proposed improvements include the construction of new administration building, new storage areas, and asphalt concrete resurfacing. The proposed site is divided into three basins. Basin 1 is approximately 2.41 acres and discharge from the roofs of the proposed administration building and parking structure will discharge to the existing gutter on Federal Boulevard after being treated on site. Flow will eventually reach the curb inlet on the west and eventually discharge into the Chollas Creek. Basin 2 is approximately 4.23 acres, discharge from the charging stations will sheet flow to the curb inlet on Federal Boulevard after being treated on site. Basin 3 is approximately 5.45 acres and includes the 20 maintenance bays, operations building, and bus washing stations. Discharge from roofs and asphalt from the site will sheet flow in general to northwest side to the existing grate inlet. Discharge will travel through a storm drain pipe and discharge into Chollas Creek after being treated on site. In general, the proposed conditions will discharge west downstream to Chollas Creek after being treated on site.

See **Appendix B – Proposed Hydrologic Conditions Exhibit,** for further information.

METHODOLOGY:

Storm water runoff for both the existing and proposed site conditions is calculated, analyzed, and compared in order to ensure that the proposed conditions do not negatively affect the existing hydrologic regime. Runoff is calculated by utilizing methods outlined in the City of San Diego Drainage Design Manual, January 2017 Edition. Topographical information has been obtained from SANGIS topography maps and modeled using AutoCAD Civil 3D. Hydrologic basin boundaries, landscape areas, and flow path characteristics such as change in elevation and length of flow are obtained from the Existing and Proposed Conditions Maps which are drafted in AutoCAD Civil 3D 2020 software. This information is utilized to determine the basin area, runoff coefficient and travel time.

CALCULATIONS:

Calculations have been performed using the Rational Method Formula set forth in Appendix A of the City of San Diego Drainage Design Manual, January 2017 Edition.

The Rational Method Formula is expressed in Equation A-1.

Equation A-1. RM Formula Expression

$$Q = C\ I\ A$$

where:

Q	=	peak discharge, in cubic feet per second (cfs)
C	=	runoff coefficient expressed as that percentage of rainfall which becomes surface runoff (no units);
I	=	average rainfall intensity for a storm duration equal to the time of concetrnatation (T_c) of the contributing draiange area, in inches per hour;
A	=	drainage area contributing to the design location, in acres

- Runoff Coefficients (C) have been selected based on Table A-1 of the Drainage Design Manual.

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

- Based on the percent imperviousness and not on the Land Use type as shown on Table A-1 of the Drainage Design Manual, the existing condition is more than 90% impervious. Then the selected runoff coefficient C is 0.95 for the existing conditions. For the proposed condition, the runoff coefficient C is 0.95.

- Stormwater runoff is considered to be in an Overland Flow condition in both lots of the project. Time of concentration for Urban Area Overland Flow is determined per the equation published on figure A-4 “Rational Formula - Overland Time of Flow Nomograph" located in Appendix A of the City of San Diego Drainage Design Manual.

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

Where:

D= Water course distance
s= Slope
C= Runoff coefficient
T= Overland Flow Time

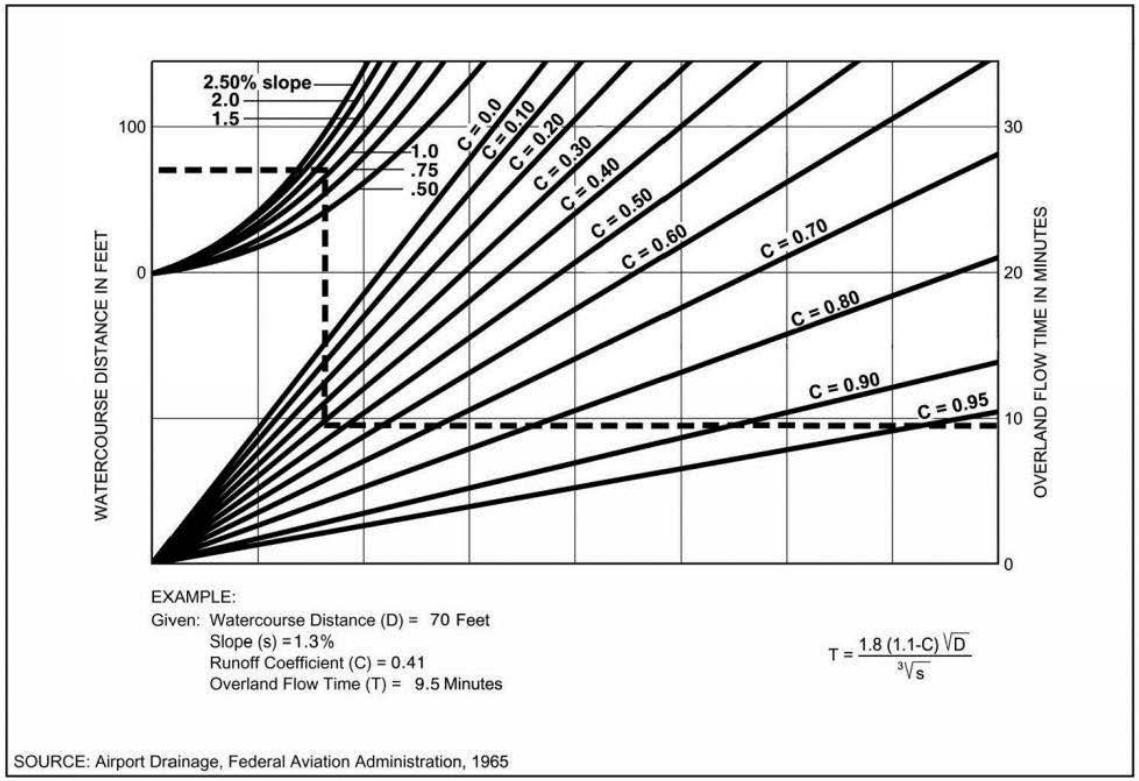


Figure A-4. Rational Formula – Overland Time of Flow Nomograph

Note: Use formula for watercourse distances in excess of 100 feet.

- Rainfall Intensity (I) has been determined from the Intensity-Duration-Frequency Design Chart (Figure A-1) from the Drainage manual.

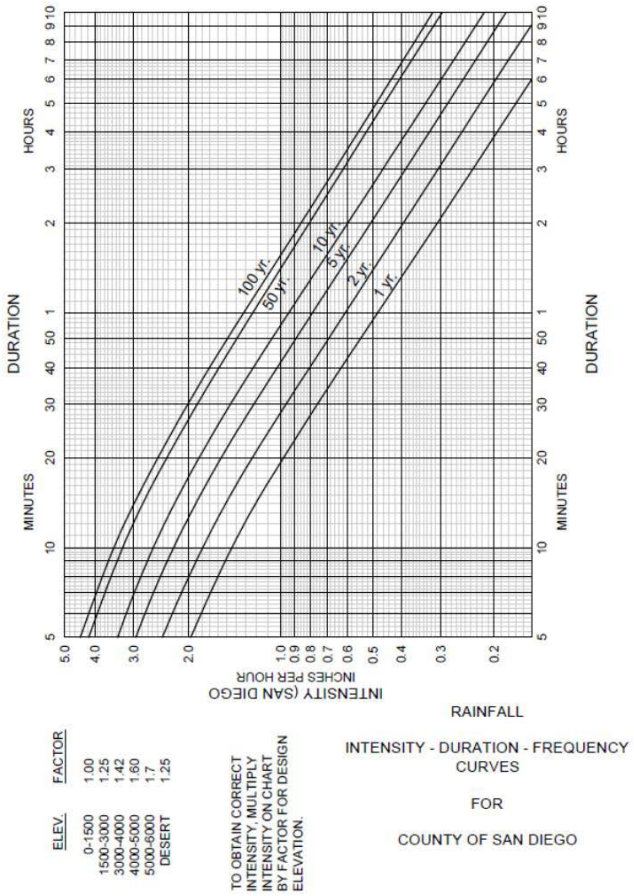


Figure A-1. Intensity-Duration-Frequency Design Chart

The following Table 1 represent the data calculated for the time of concentration for the existing and proposed conditions on the site. Time of concentration is the time required for water in the farthest region of a watershed to reach the point of discharge. Rainfall intensity can be found using the time of concentration and using the Intensity Duration Design Chart above. Table 2 shows the Peak Discharge calculations using the Rational Method Q=CIA. Peak discharges for 2,10-, 50-, and 100-year storm event were calculated for both existing and proposed conditions. The outfall summary table shows a summary of results for the peak discharges for the existing and proposed conditions at the points of connections/outfalls that will discharge into Chollas Creek. The proposed improvements will increase in general the sites surface runoff by about 1 cubic foot per second. Increase in runoff assumes the majority of the site will be impervious area.

Table 1 - Time of Concentration (Tc)

Existing Site Conditions																
Basin	Runoff Coefficient	[1] Urban Area Overland Flow Tc						[2] Pipe Flow								T_c
		High Point	Low Point	ΔE	Length	Avg Slope	$T_{overland}$	High	Low	ΔE	Length	Ave Slope	Flowrate	Velocity	T_{gutter}	
	(C)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(min)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(cfs)	(fps)	(min)	(min)
1	0.95	231.50	224.00	7.50	560	0.013	5.8									5.8
2A	0.95	220.00	218.00	2.00	303	0.007	5.4									5.4
2B	0.95	220.00	208.00	12.00	194	0.062	2.1									5.0
3	0.95	196.00	188.50	7.50	300	0.025	3.5									5.0
2C	0.95	220.00	198.50	21.50	456	0.047	3.5	198.50	146.00	52.50	351.0	0.150	6.13	16.53	0.4	5.0
4	0.95	180.00	168.00	12.00	670	0.018	5.8	168.00	146.00	22.00	29.0	0.759	21.75	42.07	0.0	5.8

Proposed Site Conditions																
Basin	Runoff Coefficient	[1] Urban Area Overland Flow Tc						Pipe Flow								T_c
		High Point	Low Point	ΔE	Length	Avg Slope	$T_{overland}$	High	Low	ΔE	Length	Ave Slope	Flowrate	Velocity	T_{gutter}	
	(C)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(min)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(cfs)	(fps)	(min)	(min)
1	0.95	231.50	224.00	7.50	560	0.013	5.8									5.8
2	0.95	220.00	188.87	31.13	700	0.044	4.4	188.87	188.50	0.37	25.0	0.015	17.68	9.07	0.0	5.0
3	0.95	223.00	168.00	55.00	168	0.327	1.1	168.00	146.00	22.00	29.0	0.759	50.08	43.03	0.0	5.0

1. Stormwater runoff is considered to be in an Overland Flow condition until it reaches a drainage structure such as a drainage ditch, gutter, or storm drain. Time of concentration for Ubran Area Overland Flow is determined per the equation published on the "Urban Areas Overland Time of Flow Curves" located in Appendix I-E of the City of San Diego Drainage Design Manual. The time of concentration is determined using the "Nomograph for Determination of Time of Concentration for Natural Watersheds" located in Appendix I-E in the City of San Diego Drainage Design Manual.

2. Time of concentration for stormwater runoff flowing in a drainage ditch, gutter or storm drain is determined per the "Gutter & Roadway Discharge-Velocty Chart" located in Appendix I-F of the City of San Diego Drainage Design Manual.

Table 2 - Peak Discharge (Q)

Existing Site Conditions																
Basin	Basin Area	Basin Acreage (A)	Pervious Area	Impervious Area	% Pervious	% Impervious	[1]Runoff Coefficient	[2]Tc	[3]Intensity 2-year	Q_2	[3]Intensity 10-year	Q_{10}	[3]Intensity 50-year	Q_{50}	[3]Intensity 100-year	Q_{100}
	(sf)	(ac)	(sf)	(sf)	%	%	(C)	(min)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)
1	104,980	2.41	0	104,980	0%	100%	0.95	5.8	2.30	5.27	3.20	7.33	3.90	8.93	4.20	9.62
2A	27,886	0.64	2,160	25,726	8%	92%	0.95	5.4	2.60	1.58	3.10	1.89	4.00	2.43	4.50	2.74
2B	33,660	0.77	5,888	27,772	17%	83%	0.95	5.0	2.50	1.84	3.30	2.42	4.10	3.01	4.40	3.23
3	58,806	1.35	7,700	51,106	13%	87%	0.95	5.0	2.50	3.21	3.30	4.23	4.10	5.26	4.40	5.64
2C	63,906	1.47	8,334	55,572	13%	87%	0.95	5.0	2.50	3.48	3.30	4.60	4.10	5.71	4.40	6.13
4	237,402	5.45	38,598	198,804	16%	84%	0.95	5.8	2.30	11.91	3.20	16.57	3.90	20.19	4.20	21.75
Total	526,640	12.09	62,680	463,960	12%	88%				27.28		37.03		45.54		49.10

Proposed Site Conditions																
Basin	Basin Area	Basin Acreage (A)	Pervious Area	Impervious Area	% Pervious	% Impervious	[1]Runoff Coefficient	[2]Tc	[3]Intensity 2-year	Q_2	[3]Intensity 10-year	Q_{10}	[3]Intensity 50-year	Q_{50}	[3]Intensity 100-year	Q_{100}
	(sf)	(ac)	(sf)	(sf)	%	%	(C)	(min)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)
1	104,980	2.41	0	104,980	0%	100%	0.95	5.8	2.30	5.27	3.20	7.33	3.90	8.93	4.20	9.62
2	184,258	4.23	5,800	178,458	3%	97%	0.95	5.0	2.50	10.05	3.30	13.26	4.10	16.48	4.40	17.68
3	237,402	5.45	38,652	198,750	16%	84%	0.95	5.0	2.50	12.94	3.30	17.09	4.10	21.23	4.40	22.78
Total	526,640	12.09	44,452	482,188	8%	92%				28.26		37.67		46.63		50.08
									Change in Site Surface Runoff (CFS)	**0.97**		**0.64**		**1.10**		**0.97**

1. Runoff coefficients have been been determined by Table A-1 in the San Diego Drainage Manual 2017 Edition

2. See Table 1 for time of concentration calculations.

3. Intensity values have been calculated per the "Intensity-Duration Design Chart" figure A-1 of the San Diego Drainage Manual 2017 Edition.

MTS Clean Transit Advacement Campus- Existing & Proposed Outfall Summary							
Basin Outfall ID	**Existing Contributory Basin Area (Acres)**	**Existing Q_{50} (CFS)**	**Existing Q_{100} (CFS)**	**Basin Outfall ID**	**Proposed Contributory Basin Area (Acres)**	**Proposed Q_{50} (CFS)**	**Proposed Q_{100} (CFS)**
POC 1	2.41	8.93	9.62	**POC1**	2.41	8.93	9.62
POC 2	0.64	2.43	2.74	**POC 2**	4.23	16.48	17.68
POC 3	0.77	3.01	3.23	**POC 3**	5.45	21.23	22.78
POC 4	1.35	5.26	5.64				
POC 5	6.92	25.91	27.88				
Total	12.09	45.54	49.10		12.09	46.63	50.08

SUMMARY OF CEQA QUESTIONS:

This section is a response to each issue for Hydrology and Water Quality presented in the 2014 California Environmental Quality Act (CEQA) Statute and Guidelines.

a) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

No impact. The post development follows the guidelines from the County of San Diego Model BMP Design Manual (September 2020) to comply with the NPDES MS4 permit and waste discharge requirements for all discharges from the MS4s draining the watersheds within the San Diego Region; Order No. R9-2013-0001 and all subsequent amendments issued by the California Regional Water Quality Control Board San Diego Region.

b) Would the project Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

No Impact. This project does not propose a well or any other improvement that may draw from ground water supplies.

c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

i) Result in substantial erosion or siltation on- or off-site;

No impact. Runoff from the site will not adversely affect streams or rivers with erosion or siltation.

ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;

No Impact. The post development drainage pattern will maintain the same drainage pattern as predevelopment. It is our professional opinion that this site will not increase the rate of surface runoff in a manner that would result in flooding both on and off site.

iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

The project will not significantly increase stormwater runoff. Stormwater runoff will be treated as required by the MS4 permit and as indicated in the preliminary SWQMP report.

or

iv) impede or redirect flood flows?

No Impact. The project will not place structures within a 100-year flood hazard zone.

d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

No impact. Due to the site's geographic location, the risks associated with inundation hazard due to tsunamis and seiches very low. Historically, tsunami wave heights have ranged up to 3.7 feet in the San Diego area. According to the County of San Diego Hazard Mitigation Plan (2010), the largest tsunami effect

recorded in San Diego since 1950 was May 22, 1960, which had maximum run-up amplitudes of 2.1 feet (0.7 meters).

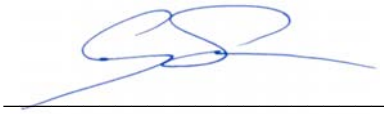
e) **Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?**
No Impact. The project will not obstruct the implementation of water quality control plan or sustainable groundwater management plan.

CONCLUSION:

The proposed "MTS Clean Transit Advancement Campus" project could potentially minimally increase the peak runoff discharge in a potential 50-year or 100-year storm event. Existing 100-year peak flow discharge is 49.10 cubic feet per second and the proposed 100-year peak flow discharge is calculated to be 50.08 cubic feet per second. The increase in discharge is mainly to do a decrease in concentration time and the assumption that the majority of the sites surface will be impervious, but should not be of great impact to the existing hydrologic conditions of the area. During final design, a final hydrology study shall be prepared utilizing the construction documents. The site plan provided for this preliminary study is conceptual in nature and the calculations in this study are subject to change.

ENGINEER OF WORK:

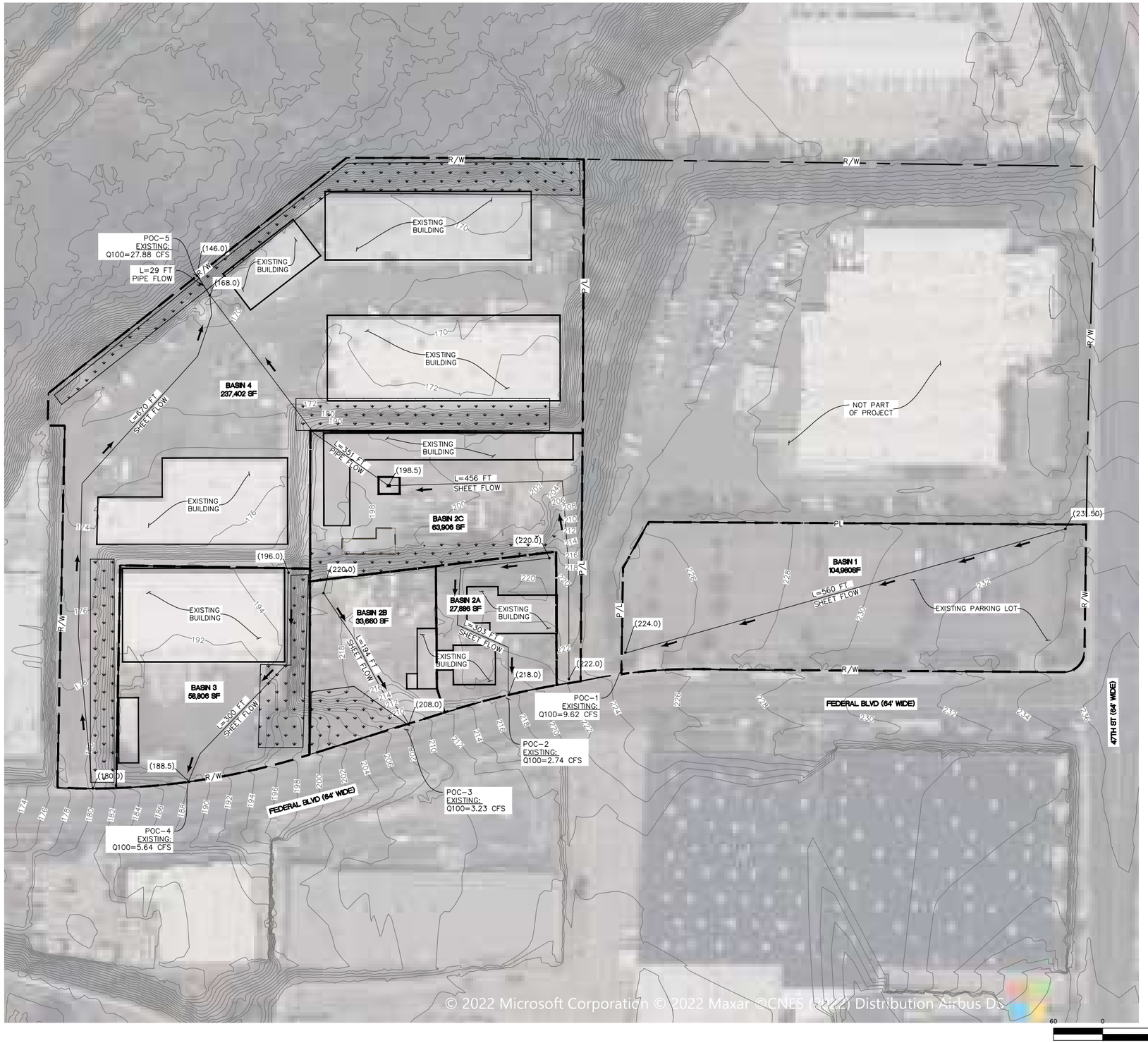
This report was prepared under the supervision of Cory Schrack, PE, Senior Project Manager for Nasland Engineering.



Cory Schrack ● RCE 65976 ● Expires 06-30-22

APPENDIX A

Existing Hydrology



LEGEND

- BASIN BOUNDARY
- FLOW DIRECTION
- PROPERTY LINE
- (230.0) EXISTING ELEVATION
- EXISTING PERVIOUS AREA

60 0 60 120 180 240

SCALE 1" = 60'

EXISTING HYDROLOGY

MTS CLEAN TRANSIT
ADVANCEMENT CAMPUS

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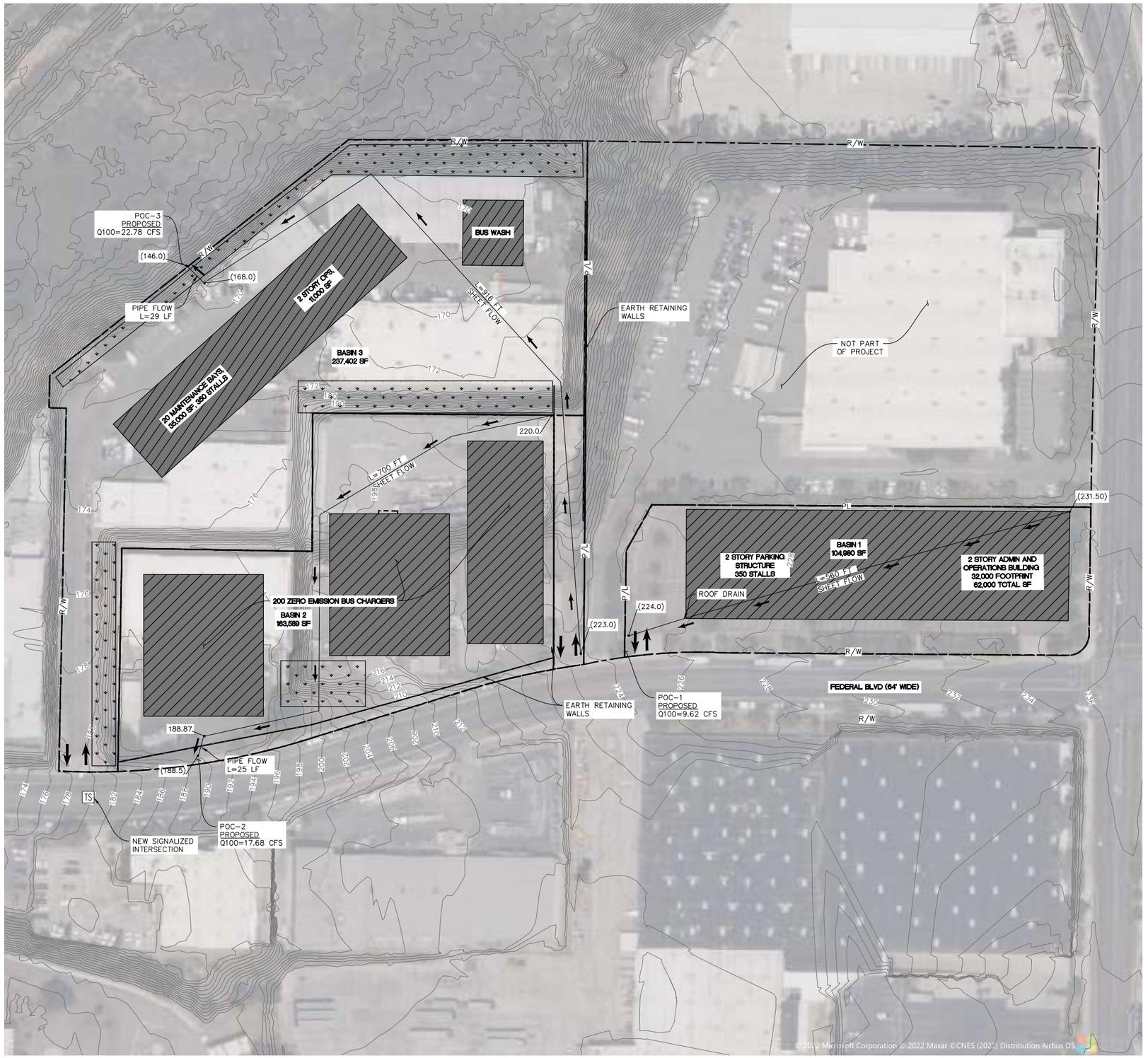
APPENDIX B

Proposed Hydrology



LEGEND

- BASIN BOUNDARY
- FLOW DIRECTION
- PROPERTY LINE
- PROPOSED IMPERVIOUS AREA
- PROPOSED PERVIOUS AREA

N

60 0 60 120 180 240

SCALE 1" = 60'

PROPOSED HYDROLOGY

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