DRAINAGE LETTER REPORT

for

SMELKER-HCI BUILDING
LOT 2, PUMP IT BABY SUBDIVISION

Prepared for:

Hammers Construction Inc.
1411 Woolsey Heights
Colorado Springs, CO 80915

June 2, 2022
Revised August 17, 2022

Prepared by:

JPS ENGINEERING

19 E. Willamette Ave.
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

JPS Project No. 042203
PCD File No. PPR-22-037

SMELKER-HCI BUILDING
LOT 2, PUMP IT BABY SUBDIVISION
DRAINAGE REPORT STATEMENTS

1. Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan for the drainage basin. I accept responsibility for liability caused by negligent acts, errors or omissions on my part in preparing this report:

John P. Schwab Colorado P.E. No. 29891

2. Developer's Statement:

I, the developer, have read and will comply with all the requirements specified in this drainage report and plan.

By:

17 Oct 22

Printed Name: Elliot Smith
Date
Title: Project Manger
Hammers Construction, Inc., 1411 Woolsey Heights, Colorado Springs, CO 80915

3. El Paso County Statement:

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2, and Engineering Criteria Manual as amended.

County Engineer / ECM Administrator Date

Conditions:

I. INTRODUCTION

A. Property Location and Description

Smelker Schleder LLP is planning to construct a new 9,750 square-foot commercial building on the vacant 1-acre lot a 7920 Industry Road in El Paso County. The property is platted as Lot 2, Pump it Baby Subdivision (El Paso County Assessor's Parcel No. 53320-01-012), located at the southeast corner of Industry Road and Marksheffel Road.

The site is zoned Industrial (I-3), and the property adjoins developed commercial / industrial properties on all sides. Marksheffel Road is a fully improved arterial public road along the west boundary of the site, and Industry Road is an improved local public road along the south frontage of the property. A shared private access drive adjoins the east boundary of the site, providing access to the developed mini-warehouse facility adjoining the north boundary of the property (Lot 1, Pump it Baby Subdivision).

The lot on the east side of the shared access drive (Lot 2, Marksheffel Industrial Park) is developed with an existing distribution / warehouse building. The lot on the south side of Industry Road (Lot 18, Marksheffel Industrial Park) across from this site is also developed with existing distribution / warehouse facilities.

The proposed Site Development Plan consists of a new 9,750 square-foot single-story commercial Office / Warehouse Building with associated parking and site improvements. Access will be provided by a driveway connection to Industry Road along the southern boundary and a second driveway connection to the existing shared private drive along the eastern property boundary.

The total disturbed area associated with this project is approximately 0.9 acres. Recognizing that the land disturbance is under one acre, water quality facilities are not required as the project is not classified as an "applicable construction activity" in accordance with Section I.6.1 of the El Paso County Engineering Criteria Manual (ECM).

B. Scope

In support of the Site Development Plan submittal to El Paso County, this report is intended to meet the requirements of a Drainage Letter Report in accordance with El Paso County drainage criteria. This report will provide a summary of site drainage issues impacting the proposed development. The report is based on the guidelines and criteria presented in the City of Colorado Springs and El Paso County "Drainage Criteria Manual."

C. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual, Volumes 1 and 2," revised May, 2014.

Colorado Engineering & Geotechnical Group, Inc., "Drainage Letter, 5920 & 5950 Industry Road (addresses incorrectly labeled; report refers to 7920 & 7950 Industry Road), March 5, 2002.

El Paso County "Engineering Criteria Manual," December 13, 2016.

Oliver E. Watts, "Drainage Report, Lot 16, Marksheffel Industrial Park," March 12, 2001.

II. EXISTING AND PROPOSED DRAINAGE CONDITIONS

According to the Natural Resources Conservation Service (NRCS) Soil Survey for this site, on-site soils are comprised of "Blendon sandy loam" soils, and these well drained soils are classified as hydrologic soils group "B" (high infiltration rate; see Appendix A).

Subdivision Drainage Report

Drainage planning for this site was previously addressed in the "Drainage Letter, 5920 & 5950 Industry Road" by Colorado Engineering & Geotechnical Group, Inc. dated March 5, 2002, which was prepared for the "Pump it Baby Subdivision" replat of a portion of Marksheffel Industrial Park (while the addresses are incorrectly listed, this drainage letter refers to the subject property addressed as 7920 & 7950 Industry Road). The previously approved Drainage Letter by Mr. Paul R. Bryant, P.E., states:

> "I have reviewed the existing, approved Final Drainage Plan for the Marksheffel Industrial Park, of which this lot is a portion (Subbasin A). This plan, authored by Simons, Li & Associates, September 1985, calls for complete industrial development of all portions of the subdivision, with surface drainage of all flows (historic and developed) into the existing and improved drainage structures. The specified improvements appear to have been completed some years ago. The 100-year flood is now fully contained within the improved drainage channel…."

The Colorado Engineering Drainage Letter further states the proposed drainage plan "directs the runoff into a new curb-and-gutter system along a private driveway into the existing curb and gutter system along Industry Road. This is in accordance with the approved Final Drainage Plan."

Existing Site Drainage Conditions

As shown on the enclosed "Existing Conditions Drainage Plan" (Figure EX1), the majority of the existing Lot 2 site has been delineated as Basin A (0.94 acres), and surface drainage from Basin A flows southeasterly by sheet flow to Design Point #1 at the southeast corner of the property. The Lot 2 site is impacted by off-site drainage from the parking area on the adjoining Lot 1. The existing gravel parking area on the south side of the adjoining Lot 1 (delineated as Basin OA1 on Sh. EX1) sheet flows southeasterly towards the north boundary of the subject Lot 2. Drainage from Basins OA1 and A combines at Design Point #1, with existing peak flows calculated as $Q_5 = 3.8$ cfs and $Q_{100} = 9.1$ cfs.

Drainage from Design Point #1 flows easterly along the existing curb and gutter on the north side of Industry Road to the existing concrete-lined East Fork Sand Creek Subtributary Channel east of the property (east side of Lot 3, Marksheffel Industrial Park).

The west edge of the site has been delineated as Basin B (0.06 acres), and surface drainage from Basin B flows southwesterly to the existing 24" RCP culvert at Design Point #2 at the southwest corner of the property. Existing peak flows at Design Point #2 are calculated as $Q_5 = 0.02$ cfs and $Q_{100} = 0.14$ cfs.

Proposed Site Drainage Conditions

As shown on the enclosed Drainage Plan (Figure D1), the developed area of this project is limited to approximately 0.9 acres. The majority of the developed site has been delineated as Basin A (0.83 acres), and surface drainage from Basin A will flow southeasterly by sheet flow, drainage swales, and curb and gutter to Design Point #1 at the southeast corner of the property. Developed flows from Basins OA1 and A will combine at Design Point #1, with developed peak flows calculated as $Q_5 = 6.0$ cfs and $Q_{100} = 11.6$ cfs.

Developed drainage from Design Point #1 will continue to flow easterly along the existing curb and gutter on the north side of Industry Road to the existing concrete-lined East Fork Sand Creek Subtributary Channel east of the property. The Drainage Plan for Marksheffel Industrial Park identified peak flows of $Q_5 = 14.5$ cfs and $Q_{100} = 24.5$ cfs for Design Point A (original Lots 1-3 of Marksheffel Industrial Park, which include the subject property). Industry Road provides an allowable street capacity of $Q_5 = 14.5$ cfs and $Q_{100} = 127.5$ cfs, providing a suitable outfall for drainage from this site with adequate capacity to convey the combined developed flows to the drainage channel.

The landscaped area along the west boundary of the site has been delineated as Basin B (0.17 acres), and surface drainage from Basin B will flow southwesterly to the existing 24" RCP culvert at Design Point #2 at the southwest corner of the property. Developed peak flows at Design Point #2 are calculated as $Q_5 = 0.05$ cfs and $Q_{100} = 0.39$ cfs, representing a negligible flow contribution to the existing 24-inch RCP public Storm Sewer in the southwest corner of the site. As noted on Sh. D1, a riprap apron will be installed to dissipate flows from the proposed drainage swale at the northwest corner of the new building, and the project will re-seed the existing ditch area for stabilization along the west edge of the property.

The calculated impervious area of the proposed site development is 0.72 acres (72.0 percent of the overall site), which is below the presumed impervious percentage of 80 percent for light industrial areas in DCM Table 6-6. As such, the proposed development is fully consistent with the "complete industrial development" planned for the Marksheffel Industrial Park, with a slightly lower drainage impact based on the reduced impervious area.

Hydrologic calculations for the site are detailed in the attached spreadsheets (Appendix A), and peak flows are identified on Figures EX1 and D1 (Appendix A).

III. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls. The Four Step Process has been implemented as follows in the planning of this project:

Step 1: Employ Runoff Reduction Practices

- Minimize Impacts: The proposed site development consists of a new commercial building on a previously platted commercial lot which has been planned for full industrial development. This infill project will have minimal drainage impacts in comparison to new development of an unplatted site.

Step 2: Stabilize Drainageways

- There are no drainage channels directly adjacent to this project site. The existing drainage ditch along the west side of the property will be re-seeded for stabilization.
- The existing East Fork Sand Creek Subtributary Channel downstream of this property is a stable, concrete-lined channel.

Step 3: Provide Water Quality Capture Volume (WQCV)

- This site is excluded from permanent Water Quality control measure requirements based on the disturbed area remaining under one acre.

Step 4: Consider Need for Industrial and Commercial BMPs

- The Owner is responsible for maintaining proper housekeeping practices and spill containment procedures.

IV. FLOODPLAIN IMPACTS

Floodplain limits in vicinity of this site are delineated in the applicable Flood Insurance Rate Map, FIRM Panel No. 08041C0543G dated December 7, 2018 (FIRM exhibit enclosed in Appendix A), which has been revised by Letter of Map Revision (LOMR) 20-08-0548P dated June 1, 2021. This site is not impacted by the delineated 100-year FEMA floodplain.

V. STORMWATER DETENTION AND WATER QUALITY

No stormwater detention is required based on the previous drainage planning for this industrial park having accounted for higher impervious areas than currently proposed. As previously discussed, this site is excluded from water quality control measure requirements based on the disturbed area being smaller than one acre. A future change in I-3 Industrial zoning special or allowed use type may result in future water quality facilities or permanent control measures being required.

VI. DRAINAGE BASIN FEES

The site lies within the Sand Creek Drainage Basin. No public drainage improvements are required for development of this site. Required drainage fees have been paid during the previous subdivision platting process, so there are no applicable drainage fees required with the Site Development Plan.

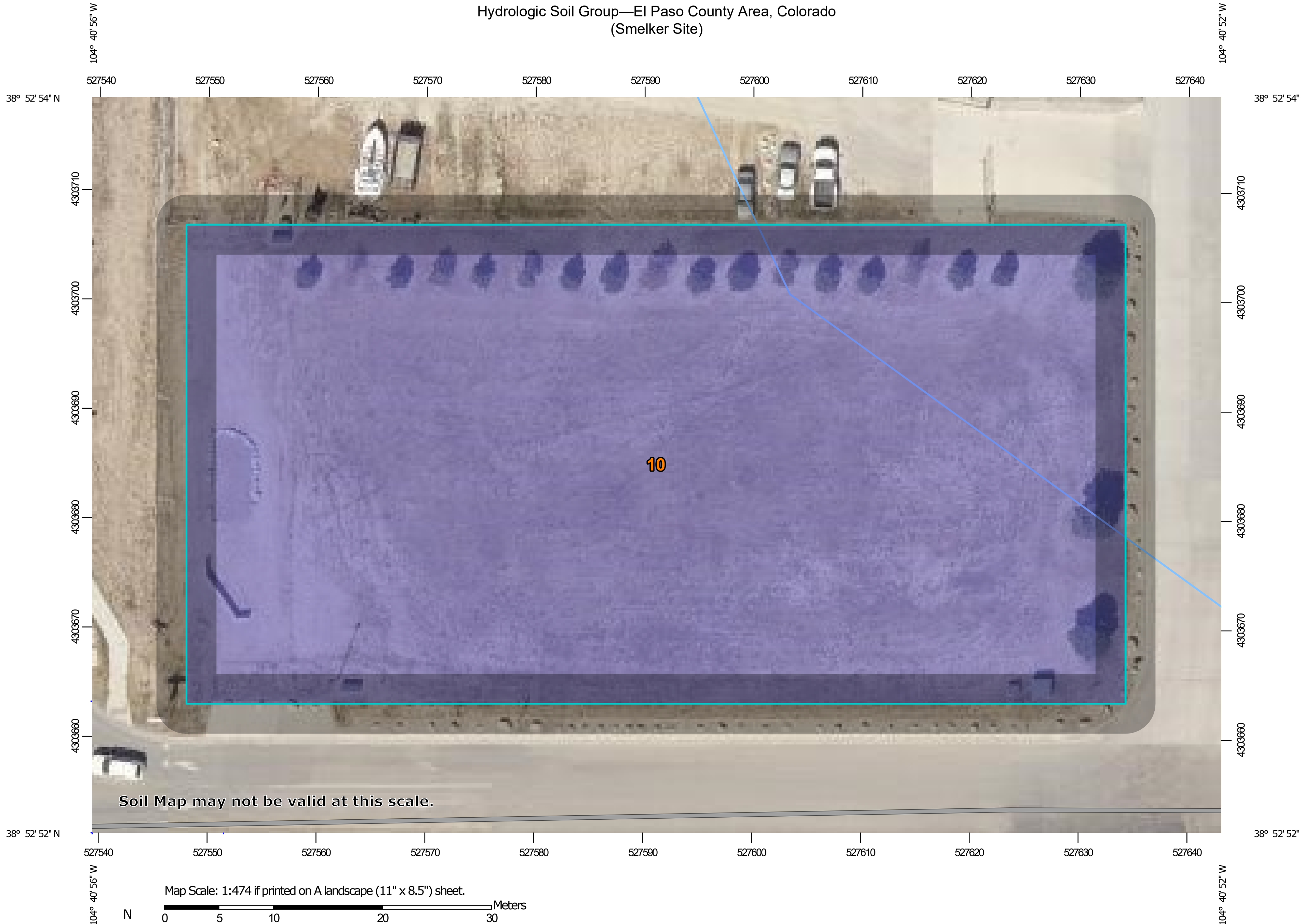
VII. SUMMARY

The developed drainage patterns associated with the proposed Smelker-HCI Building at 7920 Industry Road (Lot 2, Pump it Baby Subdivision) will remain consistent with the established drainage conditions for this subdivision. The existing stormwater outfalls are functioning properly, including the drainage ditch and 24” RCP public storm sewer along the west boundary of the site and the existing street and drainage system along Industry Road flowing east to the East Fork Sand Creek Subtributary Channel. Proper establishment and maintenance of positive drainage within the site, in conjunction with proper erosion control practices, will ensure that this developed site has no significant adverse impact on downstream or surrounding areas.

APPENDIX A

DRAINAGE CALCULATIONS & FIGURES

Hydrologic Soil Group—El Paso County Area, Colorado
(Smelker Site)



Map Scale: 1:474 if printed on A landscape (11" x 8.5") sheet.

N

0 5 10 20 30 Meters

0 20 40 80 120 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	B	0.9	100.0%
Totals for Area of Interest			**0.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \qquad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \qquad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

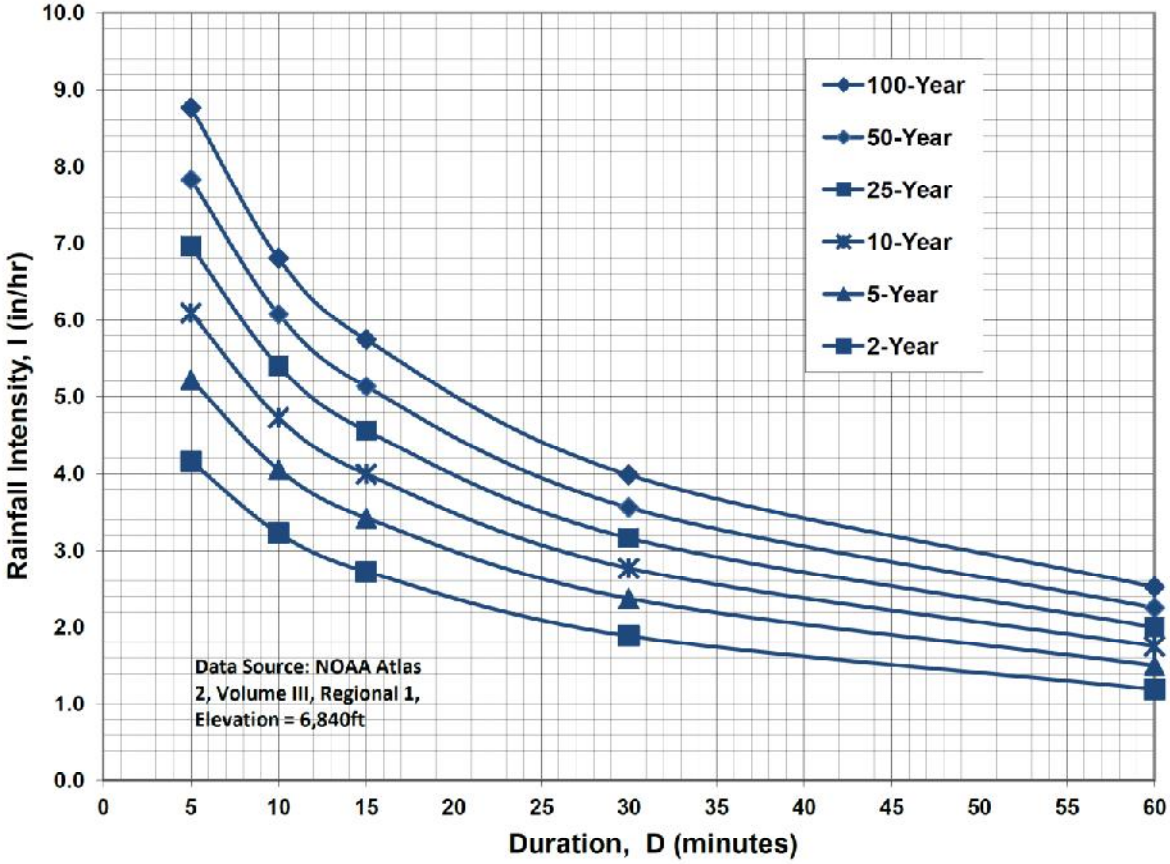
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_{5} = -1.50 \ln(D) + 7.583$$

$$I_{2} = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

SMELKER-HCI BUILDING - LOT 2, PUMP IT BABY SUBDIVISION
COMPOSITE RUNOFF COEFFICIENTS

EXISTING CONDITIONS

5-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OA1	1.59	1.59	GRAVEL PAVEMENT	0.59							0.590
A	0.94	0.94	MEADOW	0.08							0.080
OA1,A	2.53										0.401
B	0.06	0.06	MEADOW	0.08							0.080

100-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OA1	1.59	1.59	GRAVEL PAVEMENT	0.70							0.700
A	0.94	0.94	MEADOW	0.35							0.350
OA1,A	2.53										0.570
B	0.06	0.06	MEADOW	0.35							0.350

EXISTING CONDITIONS IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
OA1	1.59	1.59	GRAVEL PAVEMENT	80							80.000
A	0.94	0.94	MEADOW	0							0.000
OA1,A	2.53										50.277
B	0.06	0.06	MEADOW	0							0.000
OA1,A,B	2.59										**49.112**

SMELKER-HCI BUILDING - LOT 2, PUMP IT BABY SUBDIVISION
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OA1	1.59	1.59	GRAVEL PAVEMENT	0.59							0.590
A	0.83	0.72	BUILDING / PAVEMENT	0.90	0.11	LANDSCAPE	0.08				0.791
OA1,A	2.42										0.659
B	0.17	0.17	LANDSCAPE	0.08							0.080

100-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OA1	1.59	1.59	GRAVEL PAVEMENT	0.70							0.700
A	0.83	0.72	BUILDING / PAVEMENT	0.96	0.11	LANDSCAPE	0.35				0.879
OA1,A	2.42										0.761
B	0.17	0.17	LANDSCAPE	0.35							0.350

DEVELOPED CONDITIONS IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
OA1	1.59	1.59	GRAVEL PAVEMENT	80							80.000
A	0.83	0.72	BUILDING / PAVEMENT	100	0.11	LANDSCAPE	0				86.747
OA1,A	2.42										82.314
B	0.17	0.17	LANDSCAPE	0							0.000
OA1,A,B	2.59										**76.911**

SMELKER - HCI BUILDING - LOT 2, PUMP IT BABY SUBDIVISION
RATIONAL METHOD

EXISTING CONDITION FLOWS

					Overland Flow			Channel flow										
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
OA1	OA1	1.59	0.590	0.700	100	0.010	9.3	200	20	0.01	2.00	1.7	11.0	11.0	3.99	6.69	3.74	7.45
A	A	0.94	0.080	0.350	40	0.020	9.4	255	20	0.013	2.28	1.9	11.2	11.2	3.95	6.64	0.30	2.18
OA1,A	1	2.53	0.401	0.570									12.9	12.9	3.75	6.30	3.81	9.08
B	2	0.06	0.080	0.350	40	0.020	9.4	210	15	0.015	1.84	1.9	11.3	11.3	3.95	6.63	0.02	0.14

DEVELOPED FLOWS

					Overland Flow			Channel flow										
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
OA1	OA1	1.59	0.590	0.700	100	0.010	9.3	200	20	0.01	2.00	1.7	11.0	11.0	3.99	6.69	3.74	7.45
A	A	0.83	0.791	0.879	40	0.020	2.8	255	20	0.013	2.28	1.9	4.7	5.0	5.17	8.68	3.39	6.33
OA1,A	1	2.42	0.659	0.761									12.9	12.9	3.75	6.30	5.98	11.60
B	2	0.17	0.080	0.350	40	0.020	9.4	210	15	0.015	1.84	1.9	11.3	11.3	3.95	6.63	0.05	0.39

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
I_5 = -1.5 * ln(Tc) + 7.583
I_{100} = -2.52 * ln(Tc) + 12.735
6) Q = CiA

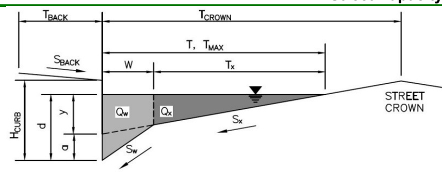
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Industry Road - Urban Local Street Capacity

Inlet ID: Street Capacity



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	22.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.5**	**127.5**	**cfs**

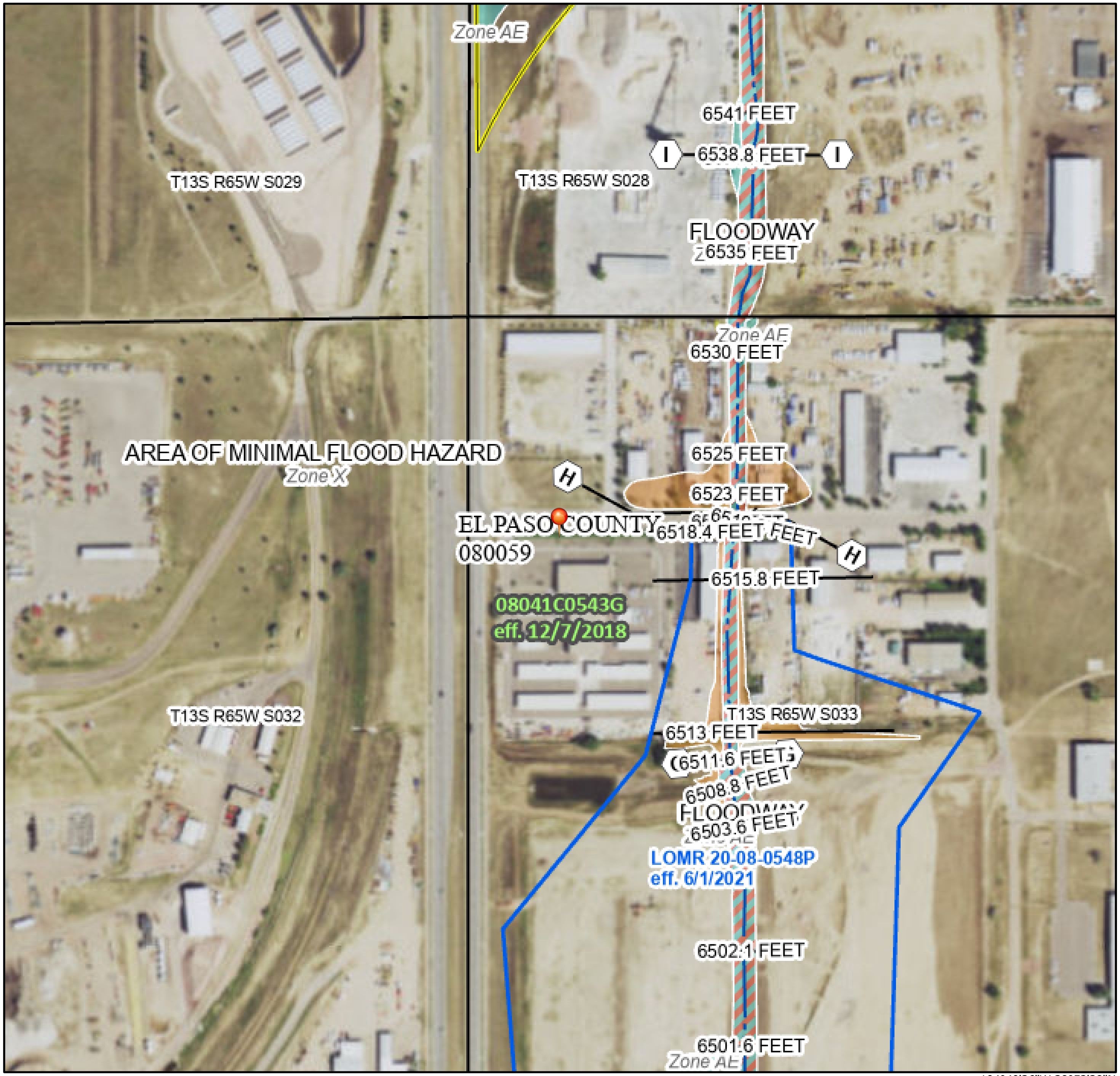
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

National Flood Hazard Layer FIRMette

FEMA

104°41'13"W 38°53'6"N



Feet

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

1:6,000

104°40'36"W 38°52'38"N

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
- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 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

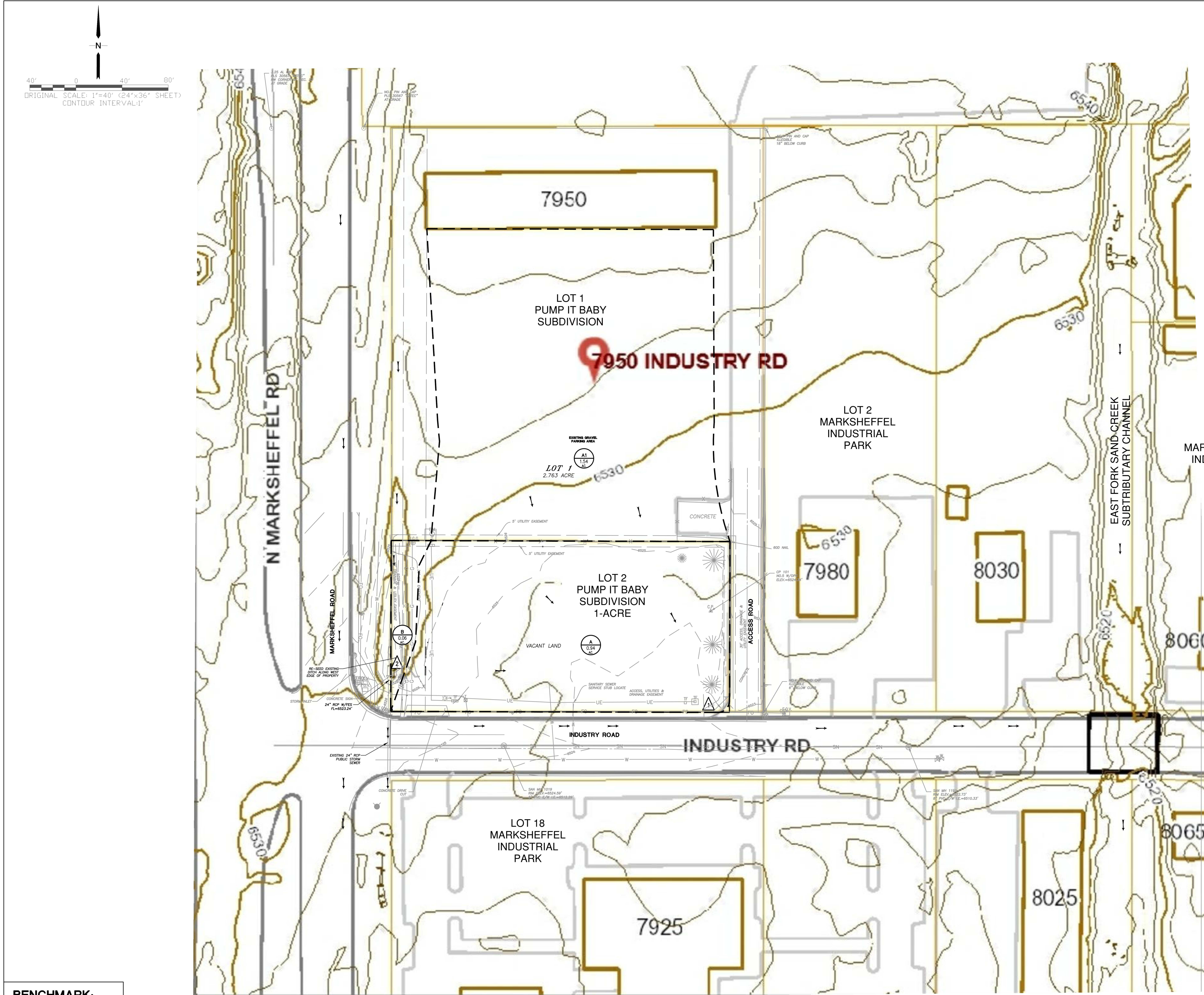
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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 6/2/2022 at 1:24 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.

ORIGINAL SCALE: 1"=40' (24"x36" SHEET)
CONTOUR INTERVAL: 1'



LEGEND

- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY LINE
- DRAINAGE BASIN BOUNDARY
- 6525 PROPOSED CONTOUR
- 6520 EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- DESIGN POINT
- BASIN DESIGNATION
- BASIN AREA (ACRES)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
1	3.8	9.1
2	0.02	0.14

BENCHMARK:
SAN MH 1019
RIM ELEV.=6524.59'

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

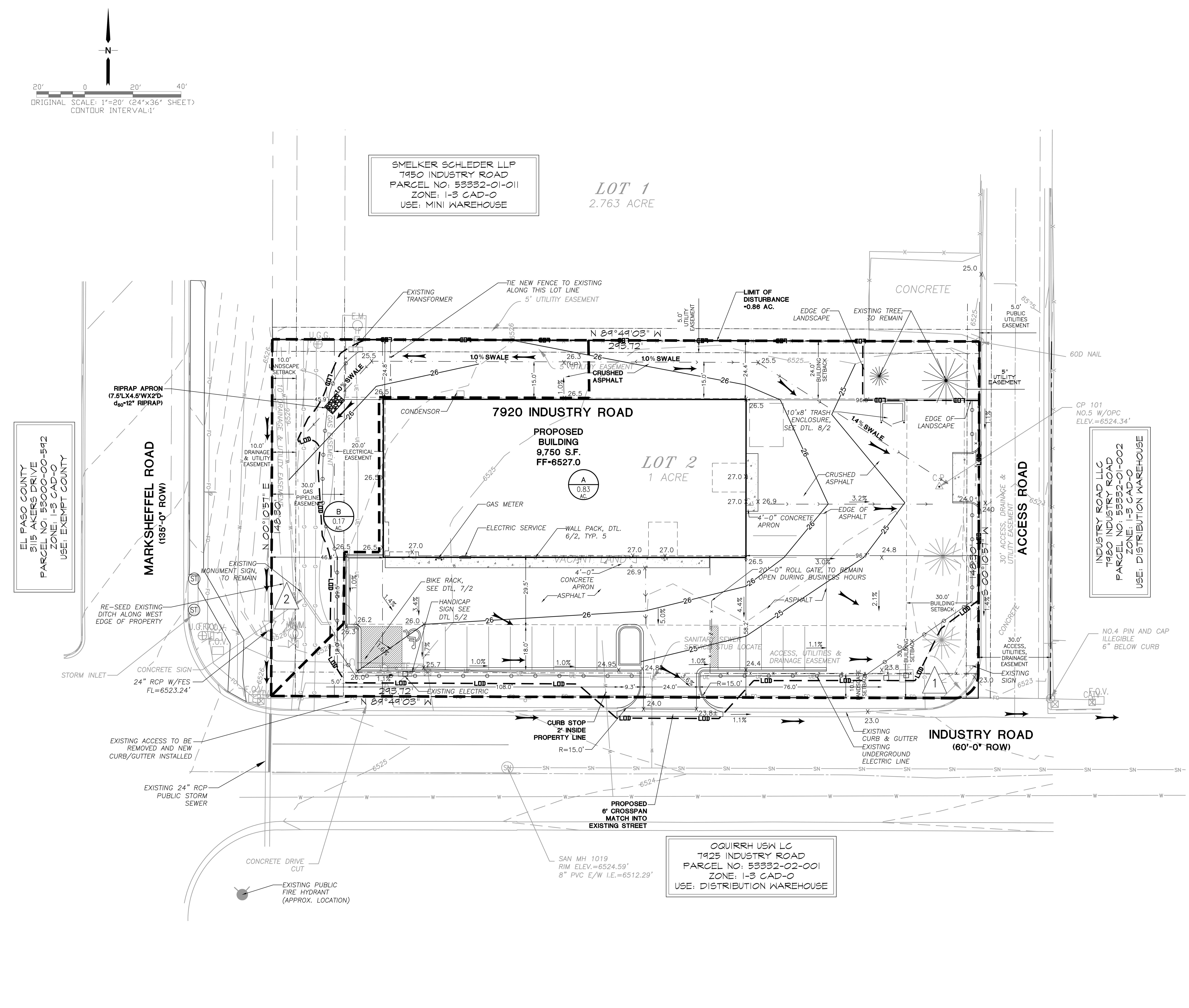
SMELKER - HCI BUILDING
LOT 2, PUMP IT BABY SUBDIVISION

No. | REVISION | BY | DATE

EXISTING CONDITIONS DRAINAGE PLAN

HORZ. SCALE: 1"=40'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: RIDGELINE	CHECKED: JPS
CREATED: 05/27/20	LAST MODIFIED: 08/17/22
PROJECT NO: 042203	MODIFIED BY: PV

SHEET: EX1



BENCHMARK:

SAN MH 1019
RIM ELEV.=6524.59'

LEGEND

- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY LINE
- DRAINAGE BASIN BOUNDARY
- PROPOSED CONTOUR (6525)
- EXISTING CONTOUR (6520)
- FLOWLINE
- FLOW DIRECTION ARROW
- DESIGN POINT
- BASIN DESIGNATION
- BASIN AREA (ACRES)

IMPERVIOUS AREA CALCULATIONS:

BASIN A SITE AREA = 0.83 AC.

SURFACE TYPE	AREA
SIDEWALK	0000 SF
BUILDING	9,850 SF
ASPHALT PARKING	12,047 SF
CRUSHED ASPHALT	9,360 SF
TOTAL IMPERVIOUS AREA	31,257 SF = 0.72 AC
	= 87%

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
1	6.0	11.6
2	0.05	0.39

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

NO.	REVISION	BY	DATE

SMELKER - HCI BUILDING
LOT 2, PUMP IT BABY SUBDIVISION

DEVELOPED DRAINAGE PLAN

HORZ. SCALE: 1"=20'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: RIDGELINE	CHECKED: JPS
CREATED: 05/27/20	LAST MODIFIED: 08/17/22
PROJECT NO: 042203	MODIFIED BY: PV
SHEET:	D1