



# **WELL No. 22**

## **FINAL DRAINAGE MEMO**

AT  
1755 COUNTY LINE ROAD  
NW ¼ SECTION 2, TOWNSHIP 11 SOUTH, RANGE 67 WEST OF THE 6<sup>TH</sup> P.M.  
COUNTY OF EL PASO, COLORADO

FOR  
**WOODMOOR WATER AND SANITATION DISTRICT No. 1**  
1845 WOODMOOR DRIVE  
MONUMENT, CO 80132



**JVA, Inc.**  
**Consulting Engineers**  
1319 Spruce Street  
Boulder, CO 80302  
(303) 444-1951

JVA Inc. Project No. 1051.9e

March 27, 2023



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March 27, 2023

[www.javja.com](http://www.javja.com)

Glenn Reese  
Stormwater Engineer  
El Paso County Department of Public Works  
Colorado Springs, CO 80910

RE: Final Drainage Memo  
WWSD Well No. 22  
JVA No. 1051.9e

Dear Glenn,

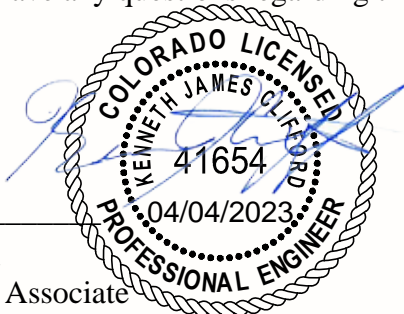
The following *Final Drainage Memo* has been prepared for the above referenced project. The stormwater memo and grading & erosion control plans have been produced in accordance with “The City of Colorado Springs/El Paso County Drainage Criteria Manual” recommendations.

It is our understanding that the information provided herein meets all requirements of the County of El Paso.

Please contact us if you have any questions regarding this submission.

Sincerely,  
JVA, Inc.

\_\_\_\_\_  
Kenneth J. Clifford, P.E.  
Senior Project Manager, Associate

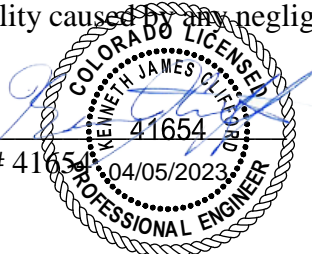




**Design Engineer's Statement:**

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 applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

\_\_\_\_\_  
Kenneth J. Clifford, P.E. # 41654



\_\_\_\_\_  
Date

**Owner/Developer's Statement:**

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

\_\_\_\_\_  
Jessie Shaffer, District Manager  
Woodmoor Water Sanitation District No. 1  
1845 Woodmoor Dr, Monument, CO 80132

\_\_\_\_\_  
Date

**El Paso County:**

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

\_\_\_\_\_  
County Engineer / ECM Administrator

\_\_\_\_\_  
Date

Conditions:

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# FINAL DRAINAGE REPORT WELL NO. 22

## GENERAL LOCATION AND DESCRIPTION

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### LOCATION

Woodmoor Water and Sanitation District No. 1 (WWSD) proposes to build a new groundwater well on their property at 1755 County Line Road in Monument, Colorado. The groundwater well will be constructed adjacent to WWSD's Crystal Creek Lift Station with access from County Line Road.

The facility is located in the Northwest ¼ Section 2 of Township 11 North, Range 67 West of the 6<sup>th</sup> Principal Meridian in Unincorporated El Paso County, State of Colorado. The project site is located southwest of the intersection of County Line Road and Doewood Drive just east of Interstate 25. A vicinity map is included in Appendix A.

The site currently drains in a westerly direction to Crystal Creek. The property is bound by County Line Road to the north, Crystal Creek to the west, and open space to the south and east.

### DESCRIPTION OF PROPERTY

The WWSD property is currently 0.8 acres that houses the Crystal Creek Lift Station, the property includes a gravel access road to the structure with the remnant of the property being undisturbed open space with various trees, shrubs and native grasses. In general, the majority of the site has slopes in the 4% to 8% range with some steeper areas approaching 4:1 slopes near the Creek or Roadside ditch along the south side of County Line Road.

The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) mapping of the area indicates that the soils are predominately Peyton-Pring complex, 8 to 15 percent slopes. These soils within the site area are classified as hydrological soil group B. Soils in this group have a moderate infiltration rate when thoroughly wet and therefore have moderate runoff potential.

There are no irrigation facilities on site. There are multiple utilities serving the lift station site.

### DESCRIPTION OF PROJECT

The design of the Well 22 site is split into three phases. The first phase, completed in the Summer of 2022, focused on drilling the well and completing any necessary site improvements to accommodate the drill rig. During this phase, JVA identified the placement of a future, additional well on the project site to aid WWSD in their planning efforts to meet future demand. The second phase will focus on the process design within the well house as well as the design of the well house building itself. The third and final phase will be the design of a transmission main to convey water from Well 22 to WWSD's Central Water Treatment Plant (CWTP). The requested erosion and stormwater quality control permit is only for the well house and the associated site development necessary to accommodate the building. The future well and transmission main, as well as any associated site developments, will be permitted separately at a later date.

## DRAINAGE BASINS

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### MAJOR DRAINAGE BASIN DESCRIPTION

The property will drain to Crystal Creek which is then conveyed to Monument Creek. This is part of the Fountain Creek Watershed which drains to the Arkansas River.

The Property is located within Zone X as defined by the Federal Emergency Management Agency (FEMA). Zone X is defined as: *Area of Minimal Flood Hazard*. The site is located within FEMA Flood Insurance Rate Map (FIRM) number 08041C0065G, revised December 7, 2018.

## DRAINAGE DESIGN CRITERIA

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### DEVELOPMENT CRITERIA REFERENCE

The proposed storm drainage facilities for the project are designed to comply with the “The City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.

### HYDROLOGIC METHOD

Design storm recurrence intervals for this project are consistent with The City of Colorado Springs/El Paso County Drainage Criteria Manual.

The Rational Method ( $Q=CIA$ ) was used to determine the storm runoff ( $Q$ ) from the site, with composite runoff coefficients ( $C$ ) and contributing areas ( $A$ ) given for design points in sub-basins. Intensities ( $I$ ) were determined using NOAA Time-Intensity-Frequency Tables for the site located in Unincorporated El Paso County, Colorado and a calculated Time of Concentration ( $t_c$ ). Runoff coefficients were calculated based on Table 6-3 of the UDFCD Runoff chapter. Post-development Time of Concentration calculations for each sub-basin, corresponding rainfall intensities, and composite runoff coefficients for each sub-basin are provided in Appendix B.

The runoff calculations were based on NOAA Point Precipitation Frequency Estimates Tables set in the location of the site in unincorporated El Paso County and are listed in Table 1 below.

Return Period	One Hour Depth (in).
5-year	1.20
100-year	2.52

The proposed development will not significantly alter historic drainage patterns and will not be disturbing more than an acre (.79 acres) for the new addition. Because of these considerations, there will not be any detention or water quality facilities proposed.

## DRAINAGE FACILITY DESIGN

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### GENERAL SUMMARY

An erosion and stormwater quality control permit for the Phase 1 drilling work (El Paso County Project Number CDR223) was issued in May 2022. The Phase 1 drilling for this project consisted of minor grading to create a generally level pad site for the drill rig to set up. The grading for the pad site resulted in the creation of two temporary diversion swales to route storm runoff around the drill rig pad site. Rock Check dams were located near the downstream ends of the two temporary drainage swales to act as “level spreaders” to provide energy dissipation of the swales and return the storm runoff to follow the historic overland flow. The swales were sized to route the stormwater runoff around the site temporarily during the Phase 1 operations. The Phase 1 drilling did not add any additional impervious areas to the site.

The Phase 2 improvements consist of the construction of the well house, an electrical transformer enclosure, wet and dry utilities, an asphalt access drive off of County Line Road, a gravel parking area, a retaining wall, and site grading.

The boundary and drainage pattern for the proposed basin will remain unchanged from the historic major basin. Offsite flows that are not within the WWSD property will continue to flow in historic patterns, entering and exiting the property until ending at Crystal Creek. There will be one developed swale to convey runoff along the east side of the retaining wall before it flows northwest to Crystal Creek. The proposed development will not adversely affect the adjacent or downstream parcels.

Any improvements associated with the future well and transmission main will be completed under a separate future permit.

### SPECIFIC DETAILS

The current development will result in a slight increase in impervious area and, consequently, runoff to Crystal Creek. 6,940 square feet (0.16 acre) of asphalt will be added to the site for the access drive to the well house. 1,440 square feet (0.03 acre) of gravel will be added for parking at the well house.

The increase in runoff from the proposed developments is negligible as it pertains to the capacity of the existing 18” RCP storm pipe under the access drive. Thus, the pipe will not require upsizing.

All disturbed areas will be returned to native seeding to match the historic conditions. Because the project is directly adjacent to Crystal Creek, the current development will not result in any increase in runoff to the neighboring or downstream parcels. Temporary erosion control BMP’s will be installed during construction to minimize erosion potential.

According to the National Wetlands inventory, a freshwater emergent wetland habitat (classification PEM1C) exists to the west of the lift station property. While no wetlands exist within either of the WWSD-owned properties in the project area, all work and earth disturbance shall be

done in a manner that minimizes pollution of the adjacent wetlands. Storm drainage design will consider the presence of the adjacent wetlands and limit impacts that can result from flow volumes, flow rates, and water quality entering the wetland habitat. Temporary BMPs will be installed to protect the wetlands during construction.

## CONCLUSION

The proposed WWSD Well 22 project has been designed in accordance with The City of Colorado Springs/El Paso County Drainage Criteria Manual. The area of disturbance will be less than one acre with 0.79 acres being disturbed. There will be no significant increase in impervious area on the parcel. Historic drainage patterns will be maintained and will have no significant increase in runoff from historic to proposed. It is determined that the drainage impact from the development of the WWSD property will not adversely affect downstream properties.



## REFERENCES

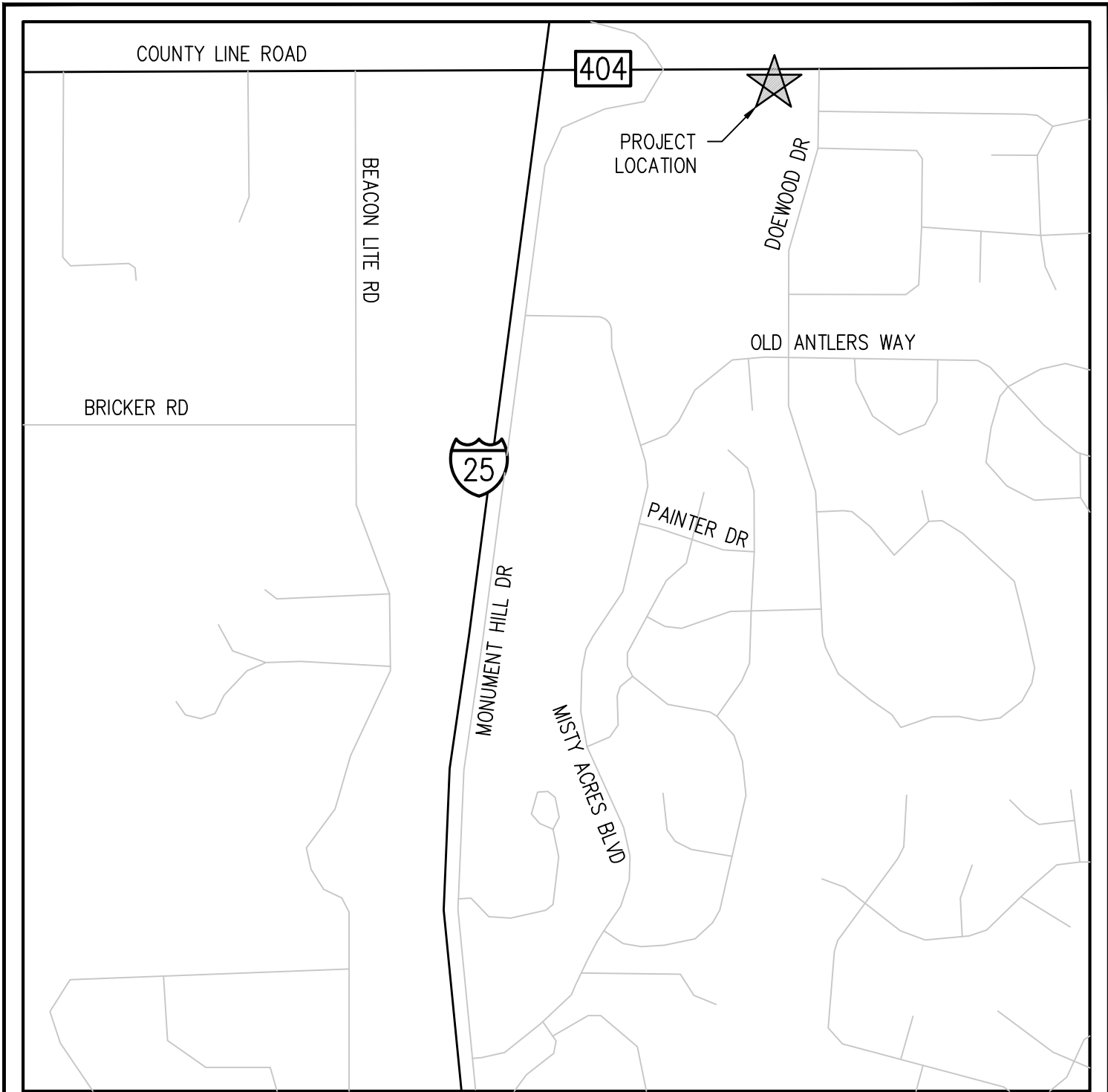
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1. City of Colorado Springs/County of El Paso Drainage Criteria Manual, October 1991.
2. “Urban Storm Drainage Criteria Manual,” Urban Drainage and Flood Control District, updated March 2017.
3. Web Soil Survey, Natural Resources Conservation Service, United State Department of Agriculture, Online at <http://websoilsurvey.nrcs.usda.gov>, accessed April 20, 2022.

# APPENDIX A – VICINITY MAP

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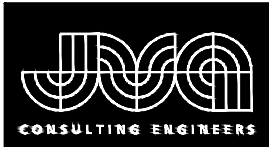
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NOT TO SCALE



**FIGURE 1 - VICINITY MAP**  
 WWSD WELL NO. 22  
 FEBRUARY 2022



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 Boulder • Fort Collins • Winter Park  
 Glenwood Springs • Denver

# APPENDIX B – CALCULATIONS

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 Boulder, CO 80302  
 Ph: (303) 444 1951

Job Name: Woodmoor Well 22  
 Job Number: 1051.9e  
 Date: 4/4/23  
 By: MHT

## Woodmoor Well 22

### Historic Runoff Coefficient & Time of Concentration Calculations

Location: 0  
 Minor Design Storm: 5  
 Major Design Storm: 100  
 Soil Type: B

Basin Design Data													I (%)		Runoff Coeff's				Initial Overland Time (t <sub>i</sub> )			Travel Time (t <sub>t</sub> ) t <sub>t</sub> =Length/(Velocity x 60)						t <sub>c</sub> Comp	t <sub>c</sub> Urbanized Check ON		t <sub>c</sub> Final
Basin Name	Design Point	A <sub>paved streets</sub> (sf)	A <sub>drives/co</sub> (sf)	A <sub>roof</sub> (sf)	A <sub>gravel</sub> (sf)	A <sub>plynd</sub> (sf)	A <sub>art. turf</sub> (sf)	A <sub>iscape (B soil)</sub> (sf)	A <sub>iscape (C/D soil)</sub> (sf)	A <sub>Total</sub> (sf)	A <sub>Total</sub> (ac)	Imp (%)	C2	C5	C10	C100	Upper most Length (ft)	Slope (%)	t <sub>i</sub> (min)	Length (ft)	Slope (%)	Type of Land Surface	K	Velocity (fps)	t <sub>t</sub> (min)	Time of Conc t <sub>i</sub> + t <sub>t</sub> = t <sub>c</sub>	Total Length (ft)	t <sub>c</sub> =(L/180)+10 (min.)	Min t <sub>c</sub>		
H1	1							21,227		21,227	0.49	2.0%	0.01	0.01	0.07	0.44	310	3.6%	23.0			Tillage/field	5	0.0	0.0	23.0	310	11.7	11.7		
H2	2	680			562			12,198		13,440	0.31	8.5%	0.05	0.06	0.13	0.47	147	7.0%	12.1			Paved areas & shallow paved swales	20	0.0	0.0	12.1	147	10.8	10.8		
TOTAL SITE		680	0	0	562	0	0	33,425	0	34,667	0.80	4.5%	0.02	0.03	0.09	0.45															

$$I = (28.5 P^1) / ((10 + TC) 0.786)$$

Basin Name	Design Point	Time of Conc (tc)	Runoff Coeff's				Rainfall Intensities (in/hr)				Area		Flow Rates (cfs)			
			C2	C5	C10	C100	2	5	10	100	A <sub>Total</sub> (sf)	A <sub>Total</sub> (ac)	Q2	Q5	Q10	Q100
H1	1	11.7	0.01	0.01	0.07	0.44	2.28	3.04	3.70	6.39	21,227	0.49	0.01	0.02	0.13	1.36
H2	2	10.8	0.05	0.06	0.13	0.47	2.36	3.15	3.83	6.61	13,440	0.31	0.03	0.06	0.15	0.95
0	0										0	0.00				
0	0										0	0.00				
0	0										0	0.00				
TOTAL SITE											34,667	0.80	0.04	0.08	0.28	2.31



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 Date: 4/4/23  
 By: MHT

## Woodmoor Well 22

### Composite Runoff Coefficient Calculations

Location: 0  
 Minor Design Storm: 5  
 Major Design Storm: 100  
 Soil Type: B

CA 100yr = 0.78i + 0.11  
 CB 100yr = 0.47i + 0.426  
 CC/D 100yr = 0.41i + 0.484

Basin Design Data																	
	I (%) =	100%	90%	90%	40%	25%	25%	2%	2%				I (%)	Runoff Coeff's			
Basin Name	Design Point	A <sub>paved streets</sub> (sf)	A <sub>drives/c onc</sub> (sf)	A <sub>roof</sub> (sf)	A <sub>gravel</sub> (sf)	A <sub>plygnd</sub> (sf)	A <sub>art. turf</sub> (sf)	A <sub>lscape (B soil)</sub> (sf)	A <sub>lscape (C/D soil)</sub> (sf)	A <sub>Total</sub> (sf)	A <sub>Total</sub> (ac)	Imp (%)	C2	C5	C10	C100	
A1	1	560	13	175				11,449		12,197	0.28	7.9%	0.04	0.05	0.12	0.46	
A2	2	2,235	34	198	1,440			6,267		10,174	0.23	30.9%	0.21	0.24	0.31	0.57	
A3	3	2,448						3,115		5,563	0.13	45.1%	0.33	0.36	0.42	0.64	
A4	4	1,725						4,798		6,523	0.15	27.9%	0.19	0.21	0.28	0.56	
TOTAL SITE		6,968	46	373	1,440	0	0	25,629	0	34,456	0.79	24.5%	0.16	0.19	0.26	0.54	



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 Date: 4/4/23  
 By: MHT

## Woodmoor Well 22

### Time of Concentration Calculations

Location: 0  
 Minor Design Storm: 5  
 Major Design Storm: 100  
 Soil Type: B

Sub-Basin Data				Initial Overland Time ( $t_i$ )			Travel Time ( $t_t$ ) $t_t = \text{Length} / (\text{Velocity} \times 60)$						$t_c$ Comp	tc Urbanized Check ON		$t_c$ Final
Basin Name	Design Point	$A_{\text{Total}}$ (ac)	C5	Upper most Length (ft)	Slope (%)	$t_i$ (min)	Length (ft)	Slope (%)	Type of Land Surface	$C_v$	Velocity (fps)	$t_t$ (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	$t_c = (L/180) + 10$ (min)	Min $t_c$
A1	1	0.28	0.05	28	2.0%	8.1	260	0.5%	Paved areas & shallow paved swales	20	1.4	3.1	11.1	288	11.6	11.1
A2	2	0.23	0.24	41	2.0%	8.0	132	0.5%	Paved areas & shallow paved swales	20	1.4	1.6	9.6	173	11.0	9.6
A3	3	0.13	0.36	70	8.0%	5.7	20	3.0%	Paved areas & shallow paved swales	20	3.5	0.1	5.8	90	10.5	5.8
A4	4	0.15	0.21	52	10.0%	5.4	50	1.0%	Paved areas & shallow paved swales	20	2.0	0.4	5.9	102	10.6	5.9



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Job Name: Woodmoor Well 22  
 Job Number: 1051.9e  
 Date: 4/4/23  
 By: MHT

**Woodmoor Well 22**

**Developed Storm Runoff Calculations**

Design Storm :

**100 Year**

Point Hour Rainfall (P<sub>1</sub>) : **2.52**

$I = (28.5 P_1) / ((10 + TC)^{0.786})$

Basin Name	Design Point	Area (ac)	Direct Runoff				Total Runoff				Inlets				Pipe				Pipe/Swale Travel Time				Notes		
			Runoff Coeff	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Inlet Type	Q intercepted	Q carryover	Q bypass	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)		tt (min)	Total Time (min)
A1	1	0.28	0.46	11.10	0.13	6.53	0.85	11.10	0.13	6.54	0.85														
A2	2	0.23	0.57	9.60	0.13	6.92	0.92	9.60	0.13	6.93	0.92														
A3	3	0.13	0.64	5.80	0.08	8.20	0.67	5.80	0.08	8.21	0.67														
A4	4	0.15	0.56	5.90	0.08	8.16	0.68	5.90	0.08	8.16	0.68														





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Job Name: Woodmoor Well 22  
 Job Number: 1051.9e  
 Date: 4/4/23  
 By: MHT

**Woodmoor Well 22**

**Developed Storm Runoff Calculations**

Design Storm : **5 Year**

Point Hour Rainfall (P<sub>1</sub>) : **1.20**

$I = (28.5 P_1) / ((10 + TC)^{0.786})$

Basin Name	Design Point	Area (ac)	Direct Runoff				Total Runoff				Inlets				Pipe				Pipe/Swale Travel Time				Notes		
			Runoff Coeff	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Inlet Type	Q intercepted	Q carryover	Q bypass	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)		tt (min)	Total Time (min)
A1	1	0.28	0.05	11.10	0.02	3.11	0.05	11.10	0.02	3.11	0.05														
A2	2	0.23	0.24	9.60	0.06	3.29	0.18	9.60	0.06	3.30	0.18														
A3	3	0.13	0.36	5.80	0.05	3.90	0.18	5.80	0.05	3.91	0.18														
A4	4	0.15	0.21	5.90	0.03	3.88	0.12	5.90	0.03	3.89	0.12														