CDOT Workflow - Creating a Rainfall Data File

This document describes the procedures for creating an IDF rainfall data file that is used by InRoads Storm & Sanitary. Creating the data for the IDF file requires the use of two Excel spreadsheets; the UD_Rain_v1.01.xlsm and the InRoads Rainfall Data.xlsx. The _Rain_v1.01.xlsm spreadsheet computes the actual data and the InRoads Rainfall Data.xlsx formats the data into a form usable by Storm & Sanitary.

Creating Rainfall Data

The spread sheet UD_Rain_v1.01.xlsm to compute the rainfall data. This spreadsheet is provided by the Urban Drainage and Flood Control District. Precipitation frequency maps are also used to fill out the spreadsheet.

1. Open the *UD_Rain_v1.01.xlsm*, the *InRoads Rainfall Data.xlsx*, and the *######HYDR_Rainfall_Data.idf* files.

Note: Open the #####HYDR_Rainfall_Data.idf using Notepad. Using Word will add formatting to the file that InRoads Storm & Sanitary cannot read.

- 2. In the UD_Rain_v1.01.xlsm spreadsheet, <D> the Options button.
- 3. In the *Microsoft Office Security Options* dialog box, toggle on Enable this content and <D> OK. This allows data to be entered into the spreadsheet.

0		UD-Rain_v1.01.xlsm - Microsoft Excel
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_	J10 \bullet f_x N/A	content provides critical functionality and you trust its source.
	A B C D E F	More information
1	Depth-Duration-Frequency and	File Path: C:\Roads Storm and Sanitary Lab Data\Rainfall Data\UD-Rain_v1.01.xlsm
2	Tables for Colorado Hydro	Enable this content
3	Blue cells are inputs.	
4	conterns:	
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6		
0	Where is the Watershed Locatec	
9	CLocated within UDFCD Boundary	
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11	 Located outside of UDFCD Boundary 	
12		Open the Trust Center

4. <D> on the DDF & IDF Tables worksheet.

5. Set the Where is the Watershed Located toggle.



Note: The UDFCD Boundary covers the Denver metro area from Boulder to Castle Rock and from Golden to the Front Range Airport. If the project in question is in this region, set the Where is the Watershed Located toggle to Located within the UDFCD Boundary. Use the map displayed in the spreadsheet to determine if the project is within the boundary.



Projects Outside the UDFCD Boundary

6. If your project is outside the Denver Metro area, key in the Hydrologic Zone as indicated on the map at the right.

1	A	B	c)epth-D Ta	D Duration bles fo	E Frequ r Colora	F ency and ado Hydro	G Intensi ologic Z	н ty-Dura cones 1	tion-Fro throug	J equenc h 4	к у	L	М	N O P Q R S T U V W X Depth-Duration-Frequency and Intensity-Duration-Frequency Tables for Colorado Hydrologic Zones 1 through 4
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6 7 8 9 10 11		Where is O Locate Locate	the Watersh ed within UD ed outside o	ed Locatec FCD Bound # UDFCD Be	lary ounda	Ele	Hydrologic vation at Ce Watersh	Zone (1, 2 enter of Wa ied Area (1	, 3, or 4) = atershed = Optional) =	3	(see map) ft sq. mi.		4	
12 13 14 15 16	(0	Optional	Select a	location	within the	UDFCD bou	Inda			ar Works	heet	•	,	
17	1.	Rainfal	l Depth-D	uration-F	requency	Table							,	
18	If	within th	e UDFCD E	Boundary,	Enter the 1	-hour and 6-	hour rainfa	I depths fr	om the US	DCM Volur	ne 1.			
19	0	therwise Doturn	, Enter the	e 6-nour an	10 24-hour	raintail depth	s from the	NUAA Atla	is 2 Volum	e III.				5
20		Perind	5-min	10-min	15-min	30-min	1_hr	2_hr	3_hr	6-hr	24-hr			
22		2-vr	0.16	0.25	0.31	0.36	0.55	0.64	0.71	0.90	1.20			D =
23		5-yr	0.22	0.35	0.44	0.50	0.77	0.88	0.97	1.20	1.60		I	COLORADO MAR ATAT 3. Name 10 III N 19 19 III III Product 1-3. Name 10 Figure 19
24	1	10-yr	0.26	0.41	0.52	0.60	0.91	1.01	1.09	1.30	1.80			The second secon
25		25-yr	0.31	0.49	0.62	0.72	1.09	1.22	1.33	1.60	2.10		E	100 108 100 108 109 108

- Open the Internet Explorer and navigate to the <u>http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=co</u> website. This site has an interactive map that provides data from collection stations across Colorado.
- 8. Move the cursor on to the red "+". <D> and hold then drag the "+" to the approximate location of the project.



9. Use the scale slider to zoom into the area. This zoom centers on the location of the "+".



- 10. Adjust the location of the "+" as needed.
- 11. Once the "+" is positioned, enter the elevation information from the map into the *UD_Rain_v1.01.xlsm* spreadsheet.



12. From the website, transcribe the precipitation frequency data to the UD_Rain_v1.01.xlsm spreadsheet. Use the 6-hr and 24-hr rows for the 2, 5,10, 25, 50, and 100 columns.

A .	B C D E F O H I J K L Depth-Duration-Frequency		PF tabular	PF grap	hical	Supplementa	ry information				Print Pag	20
2	Tables for Colorado Hydrologic Zones 1 through 4		PI	OS-based p	recipitation	frequency e	stimates wi	th 90% con	fidence inte	rvals (in inc	hes) ¹	
3 Dive cel	is are inputs. Help filling out this	Durate				Aver	age recurrenc	e interval (ye	ars)			
5 Project	worksheet	Durabo	n 1	2	5	10	25	50	100	200	500	1000
8 7	r Vhere is the Vatesthed Locates	5-min	0.143 (0.110-0.185)	0.173 (0.133-0.226)	0.229 (0.176-0.300)	0.282 (0.215-0.370)	0.362	0.430 (0.314-0.609)	0.504 (0.356-0.735)	0.585	0.701 (0.458-1.09)	0.796 (0.504-1.25)
8 9	O Localed while UDFCD Boundary Hydrologic Zone (1, 2, 3, or 4) = 3 (see map) Elevation at Center of Watershed 5,082 ft	10-mir	0.209	0.254 (0.195-0.330)	0.336	0.412	0.530	0.630	0.738 (0.521-1.08)	0.857 (0.581-1.29)	1.03 (0.670-1.60)	1.17 (0.738-1.83)
11 12	Q Located outside of UDFCD Bounda	15-mir	0.255	0.309 (0.238-0.403)	0.410	0.503	0.646	0.768 (0.560-1.09)	0.900	1.05 (0.708-1.57)	1.25 (0.817-1.95)	1.42 (0.899-2.23)
13	(Optional) Select a location within the UDFCD bound	30-mir	0.323	0.390	0.514 (0.395-0.672)	0.630 (0.481-0.827)	0.808 (0.605-1.13)	0.960 (0.700-1.36)	1.12 (0.793-1.64)	1.31 (0.885-1.96)	1.56 (1.02-2.43)	1.78 (1.12-2.78)
16	1. Rainfall Depth-Duration-Frequency Table	60-mir	0.395	0.473 (0.364-0.616)	0.614	0.745 (0.568-0.978)	0.943 (0.705-1.31)	1.11 (0.809-1.57)	1.29 (0.910-1.88)	1.49 (1.01-2.23)	1.77 (1.15-2.74)	2.00 (1.25=3.13)
18 19	If within the UDFCD Boundary, Enter the 1-hour and 6-hour rainfail depths from the USDCN Volume 1. Otherwise, Enter the 6-hour and 24-hour rainfail depths from the NOAA Atlas 2 Volume II.	2-hr	0.466 (0.363-0.599)	0.555 (0.432-0.714)	0.715	0.860	1.08 (0.014-1.40)	1.26 (0.920-1.76)	1.46 (1.04-2.09)	1.67 (1.14-2.47)	1.97 (1.30-3.02)	2.22 (1.42-3.43)
20 21	Return Rainfal Depth in Inches at Time Duration Period S-min 10-min 15-min 30-min 1-hr 2-hr 3-hr 6-h 24-hr	3.hr	0.520	0.615	0.782	0.932	1.15	1.34 (0.991-1.04)	1.54	1.75	2.04	2.28 (1.47-3.50)
22 23	2-yr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5-yr 0.00 0.00 0.00 0.00 0.00 0.00	6-hr	0.540	0.748	0.935	1.10	1.34	1.54	1.75	1.97	2.28	2.53
24 25	10-yr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 25-yr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	12-hr	0.802	0.927	1.15	1.34	1.63	1.86	2.11	2.38	2.75	3.05
27	YOFT VXV VXV VXV 0.00 0.00 100-yr 0.00 0.00 0.00 0.00 0.00 0.00 500-yr 0.60 0.60 0.60 0.60 0.00 0.00	24-hr	0.988	1.13	1.38	1.61	1.94 (1.53-2.53)	2.22 (1.70-2.94)	2.52	2.84	3.30	3.66 (2.43-5.39)
29	Note: Relie to Figure 4-1 through 4-12 of USDCM Volume 1 for He and 5-he rainfall depts. Relie to NOAA Affaig 2 Volume 11 locatival mage to 6 through 4-12 and 2-be rainfall depts.	2-day	1.18 (0.974-1.43)	1.34	1.62	1.88	2.27	2.59	2.94	3.32	3.86	4.29
31	Rainfall depths for durations less than 14r are calculated using Equation 4.4 in USDCM Volume 1.	3-day	1.30 (1.08-1.58)	1.48 (1.23-1.78)	1.80 (1.49-2.18)	2.10 (1.72~2.54)	2.53 (2.03-3.23)	2.90 (2.26-3.75)	3.29 (2.45-4.38)	3.71 (2.68-5.11)	4.30 (3.00-6.12)	4.79 (3.23-6.89)

Another option for getting data from the website is from the data reporting station.

- 13. From the website, toggle on b) Click on station icon. This displays the stations as green squares on the map.
- 14. <D> on the square closest to the project location.
- 15. Fill out the *UD_Rain_v1.01.xlsm* spreadsheet as described in steps 11 and 12 above.

Projects Inside the UDFCD Boundary

If the project is within the UDFCD Boundary, the NOAA website is not needed. All the information is contained within the UD_Rain_v1.01.xlsm spreadsheet.

16. In the *UD_Rain_v1.01.xlsm* spreadsheet, use the (Optional) Select a location within the UDFCD boundary drop down menu to select the reporting station nearest the project. This fills out the tables below.

Creating the Rainfall Intensity – Duration – Frequency File (*.IDF File)

With data entered into the UD_Rain_v1.01.xlsm spreadsheet, the InRoads Rainfall Data.xlsx file is automatically filled in. This data is used to create the project IDF (Intensity-Duration-Frequency) file used by the storm drain part of InRoads Storm & Sanitary.

- 1. In the *InRoads Rainfall Data.xlsx* file, highlight the shaded area.
- 2. <R> within the highlighted area and select Copy from the menu.



3. In the *#####HYDR_Rainfall_Data.idf* file, highlight the data as shown in the illustration below.

] #####H	YDR_Ra	infall_Data.idf	- Notepad					×
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ł		INT	ENSITY-DU	RATION-F	REQUENCY	Table	- Imperial Units		*
	Note:	The (ret The Comm Blan	first data urn period rainfall i ments must mk lines an	a line c ds). Th intensit have a re permi	ontains e next d y is exp semi-col ssable.	the numl ata line ressed on (;)	per of frequencies e contains return periods. in inches per hour (in/hr). at the beginning of the line.		
;	Used Repla	for p ce th	project rai nis line wi	infall d ith the	ata comp project	uted fro code and	om the UD-Rain_v1.01.xlsm spr d description	eadsheet.	
;	DURATI (min)	ON				Years			
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D		3.22	4.55	5.26	7.63	8.72			
5		3.22	4.55	5.26	7.63	8.72			
	L	2.37	3.49	4.19	5.86	6.69			
P	2	2.38	3.36	3.89	5.65	6.45			
14	5 4	2.23	3.14	3.63	5.27	6.02			
1	5	2.16	3.04	3.52	5.11	5.83			
17	7	2.09	2.86	3.31	4.95	5.49			
18	8	1.97	2.78	3.22	4.67	5.34			
20	5	1.87	2.64	3.05	4.43	5.06			
21		1.82	2.57	2.97	4.31	4.93			
2	3	1.73	2.45	2.83	4.11	4.69			
24	4	1.69	2.39	2.76	4.01	4.58			
20	5	1.60	2.34	2.7	3.92	4.48			
27	7	1.58	2.24	2.59	3.75	4.29			
20	9	1.55	2.19	2.33	3.68	4.2			
30	D D	1.49	2.1	2.43	3.53	4.03			
3	L 2	1.40	2.06	2.39	3.40	3.95			
3	3	1.41	1.99	2.3	3.34	3.81			
34	1 5	1.38	1.95	2.26	3.28	3.74			
36	5	1.34	1.88	2.18	3.16	3.61			
37	7 R	1.31	1.85	2.14	3.11	3.55			
39	9	1.27	1.79	2.07	3.01	3.44			
40	0	1.25	1.76	2.04	2.96	3.38			
42	2	1.21	1.71	1.98	2.87	3.28			
4	3	$1.19 \\ 1 18$	1.69 1.66	1.95	2.83	3.23			
4	5	1.16	1.64	1.89	2.75	3.14			
40	5 7	$1.14 \\ 1 13$	1.61	1.87	2.71	3.1			
48	8	1.11	1.57	1.82	2.64	3.01			
49	9	1.1	1.55	1.79	2.6	2.97			
51	L	1.07	1.51	1.75	2.53	2.89			
52	2	1.06	1.49	1.72	2.5	2.86			
54	1	1.03	1.45		2.44	2.79			
5	5	1.02	1.44	1.66	2.41	2.75			
57	7	0.99	1.42	1.62	2.35	2.69			
58	3	0.98	1.39	1.6	2.33	2.66			
60	ő –	0.96	1.35	1.57	2.27	2.6			
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								+	

- 4. <**R**> and select **Paste** from the right click menu. This replaces the data with that copied from the *InRoads Rainfall Data.xlsx* file.
- 5. Select File > Save from the Notepad menu bar to save the changes made to the #####HYDR_Rainfall_Data.idf file.

Using The Project IDF File In InRoads

The completed #####HYDR_Rainfall_Data.idf file is added to the InRoads Project Defaults so that it can be accessed by Storm & Sanitary.

1. From the InRoads menu bar, select File > Project Defaults. This displays the *Project Defaults* dialog box.



In displays the *Project Defaults* dialog box, <D> in the Rainfall Data (*.idf) field.

3.	<d> the Browse button.</d>

🖌 Set Project Defaults			-
Configuration Name:	12345	•	Apply
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Surfaces (*.dtm):	ow://hqpwz01.dot.state.co	o.us:PwiseProduction\Documents\Trainin	g\InRoads\Students
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- 4. Navigate to the location of the *#####HYDR_Rainfall_Data.idf* file.
- 5. Highlight the *#####HYDR_Rainfall_Data.idf* file and <D> the Open button. This adds the file to the *Project Defaults* dialog box and dismisses the *Open* window.
- 6. In the *Project Defaults* dialog box, <D> the Apply button then <D> Close. This loads the data from the file and dismisses the *Project Defaults* dialog box.

	12345 🔹	Apply
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