



TECHNICAL MEMORANDUM

TO: Mr. Bradford Massingill III
Resident at 110 Red Bird Lane
Williamson Creek Watershed

FROM: J. Eduardo Perez, E.I.T., C.F.M.
Watershed Protection Department

DATE: September 25, 2023

SUBJECT: Drainage Pattern and Public Infrastructure around Your Property

The purpose of this memorandum is to document the drainage pattern and the public infrastructure affecting the drainage pattern near your property. Your address 110 RED BIRD LN is near S Congress Ave and E Stassney Ln, and in the Williamson Creek watershed.

The drainage pattern of any creek ecology is affected by qualities in the landscape such as ground surface slope and type of ground cover. When rain falls water collects in territorial low spots and eventually, once enough water has ponded in these spots, water pours ‘downstream,’ in strict accordance to laws of physics. Streams wash over natural terrain via creeks, channels, and streambeds eroding landscapes into gravel and clay. The earthen material, once eaten away by washing water, is deposited elsewhere as silt and mud, molding landscapes and natural terrains.

The size of this effect can be witnessed in person or can be captured via satellite imagery. The awesome behavior of running water is consistent, dynamic, ecological, and economic. For these reasons, the City of Austin Watershed Protection Department keeps track of drainage assets that allow for these phenomena to occur in a harmonious and comprehensible manner for the residents of Austin.

The drainage assets that affect the drainage pattern near your home are summarized in the Map titled: *WPD Map of Drainage Assets near 110 Red Bird Lane*.

Drainage data and other calculations are provided in the Table: *Drainage Summary for 110 Red Bird Ln*.

Concept Designs for engineered drainage infrastructure are provided in *Appendix A: Three Types of Infrastructure to Convey Rainfall Runoff*

BACKGROUND

J. Eduardo Perez EIT, CFM and Kathy Rock visited the address 110 RED BIRD LN as a continuation of a flood investigation in this block of Red Bird Lane. The group witnessed what

Mr. Massingill had experienced with the lack of storm-drain infrastructure between the north and south lots of Red Bird Lane.

Preliminary drainage calculations showed a large drainage area, and a quick inventory of WPD drainage assets yielded no results.

E. Perez called Mr. Massingill after visiting the site address to confirm field investigation discoveries. After speaking with Mr. Massingill, I (J. E. Perez) took to initiative to author this technical memo to summarize my findings.

METHODOLOGY

The City of Austin Drainage Criteria Manual references the Rational Method as an acceptable method of calculating storm runoff resulting from precipitation events i.e. rain. Section 2 of the City of Austin Design Criteria Manual describes the equations and methodology used to calculate the proceeding hydraulic flow estimates. For brevity, no portion of that text will be shared here.

CALCULATION SAMPLE

$$Q_{10} = C * Intensity * Area = 0.85 * 9.6 \text{ in/hr} * 5.9 \text{ acres} * (1\text{cfs}/1.0083\text{in-ac/hr}) = 47 \text{ cfs}$$

FIGURES

Table 1 and 2 – Drainage Summary for 110 Red Bird Ln

Basin ID	Zone	Area (ac)	Tc (min)	Q2 (cfs)	Q5 (cfs)	Q10 (cfs)	Q25 (cfs)	Q100 (cfs)
110 Red Bird	1	5.90	5	27	37	47	61	79

Basin ID	Zone	Area (ac)	Tc (min)	C2	C5	C10	C25	C100	i2 (in/hr)	i5 (in/hr)	i10 (in/hr)	i25 (in/hr)	i100 (in/hr)	Q2 (cfs)	Q5 (cfs)	Q10 (cfs)	Q25 (cfs)	Q100 (cfs)
110 Red Bird	1	5.90	5	0.75	0.8	0.85	0.9	0.95	6.3	8.1	9.6	11.8	15.4	27	37	47	61	79

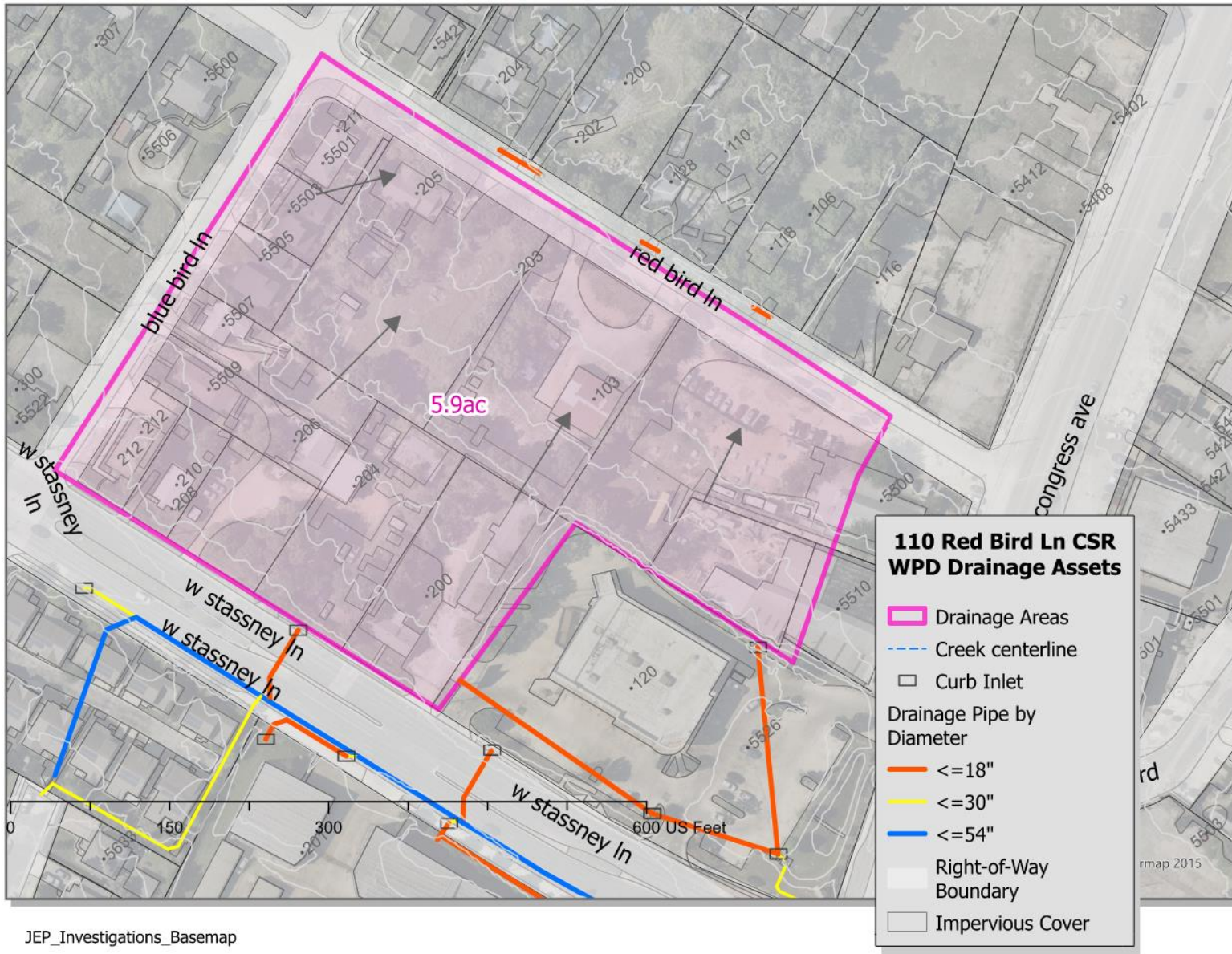


Figure 1 – WPD Map of Drainage Assets near 110 Red Bird Lane

Appendix A – Three Types of Infrastructure to Convey Rainfall Runoff

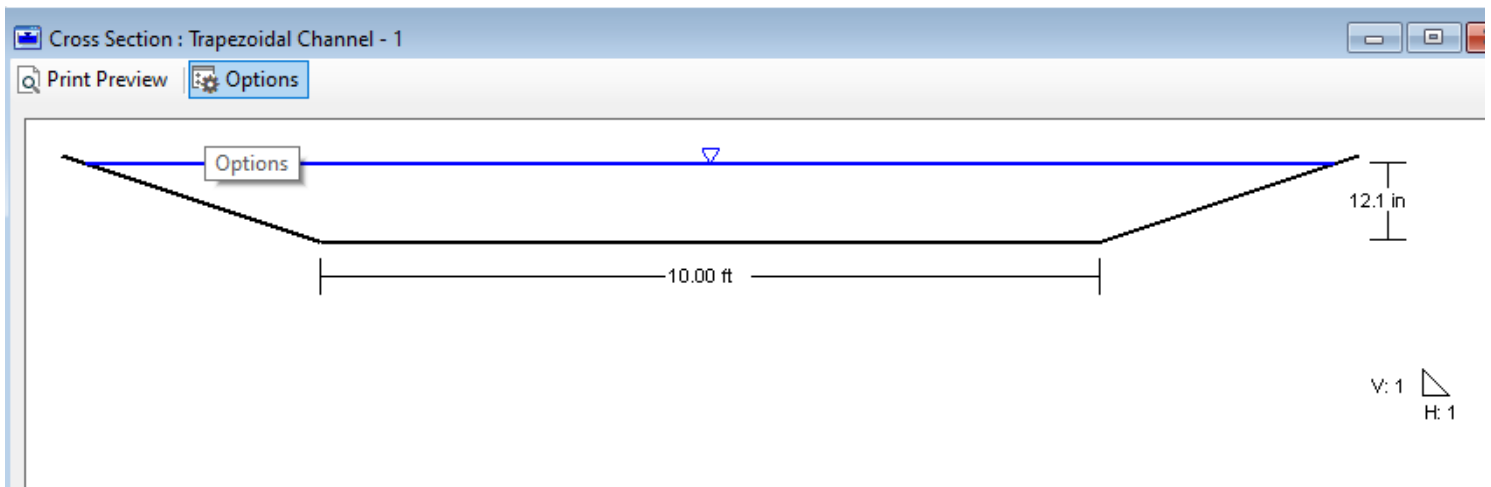
- **Concept 1: Trapezoidal Channel at 0.8% – 20ft Wide - Dimensions Shown**

Worksheet : Trapezoidal Channel - 1

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Normal Depth | Friction Method: Manning Formula

Roughness Coefficient:	0.060		Flow Area:	13.1	ft ²
Channel Slope:	0.008	ft/ft	Wetted Perimeter:	16.4	ft
Normal Depth:	12.1	in	Hydraulic Radius:	9.6	in
Left Side Slope:	3.000	H:V	Top Width:	16.03	ft
Right Side Slope:	3.000	H:V	Critical Depth:	6.6	in
Bottom Width:	10.00	ft	Critical Slope:	0.068	ft/ft
Discharge:	25.00	cfs	Velocity:	1.91	ft/s
			Velocity Head:	0.06	ft
			Specific Energy:	1.06	ft
			Froude Number:	0.373	
			Flow Type:	Subcritical	



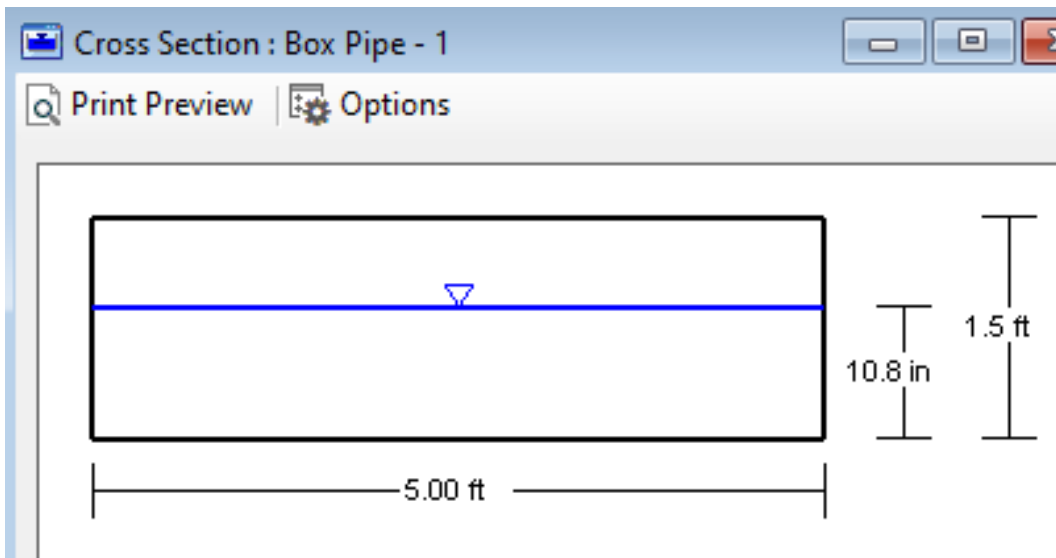
- **Concept 2: Rectangular Concrete Channel @ 1.5% and 1.0% – 10 Ft Wide – Dimensions Shown**

Worksheet : Box Pipe - 1

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Normal Depth | Friction Method: Manning Formula

Roughness Coefficient:	0.025		Flow Area:	4.5	ft ²
Channel Slope:	0.015	ft/ft	Wetted Perimeter:	6.8	ft
Normal Depth:	10.8	in	Hydraulic Radius:	8.0	in
Height:	1.5	ft	Top Width:	5.00	ft
Bottom Width:	5.00	ft	Critical Depth:	11.0	in
Discharge:	25.00	cfs	Percent Full:	60.2	%
			Critical Slope:	0.014	ft/ft
			Velocity:	5.54	ft/s
			Velocity Head:	0.48	ft
			Specific Energy:	1.38	ft
			Froude Number:	1.027	
			Discharge Full:	37.84	cfs
			Slope Full:	0.015	ft/ft
			Flow Type:	Supercritical	

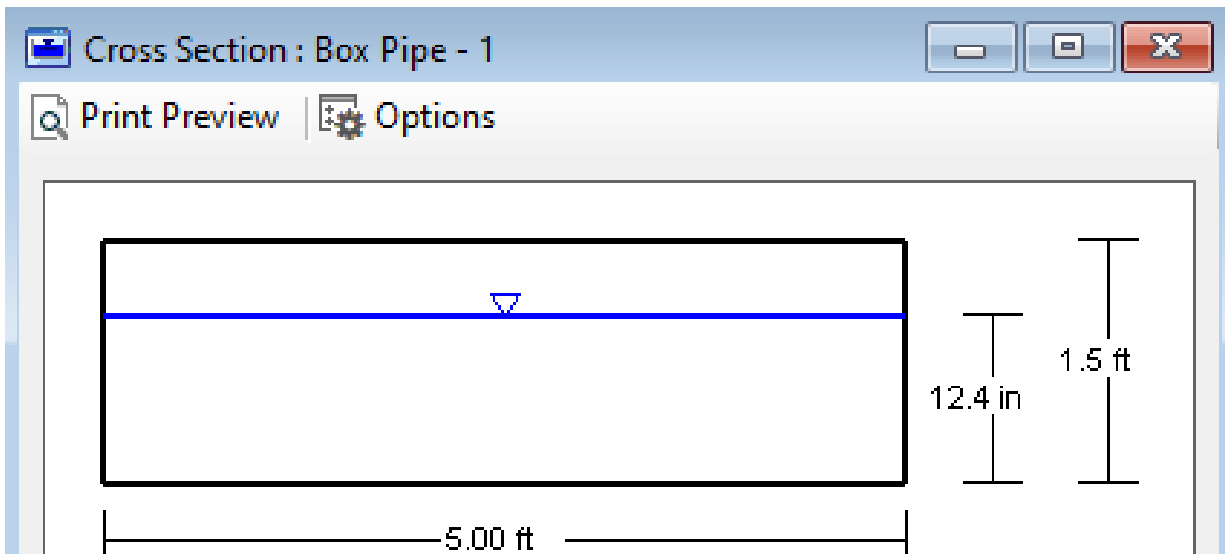


Worksheet : Box Pipe - 1

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Normal Depth | Friction Method: Manning Formula

Roughness Coefficient:	0.025		Flow Area:	5.2	ft ²
Channel Slope:	0.010	ft/ft	Wetted Perimeter:	7.1	ft
Normal Depth:	12.4	in	Hydraulic Radius:	8.8	in
Height:	1.5	ft	Top Width:	5.00	ft
Bottom Width:	5.00	ft	Critical Depth:	11.0	in
Discharge:	25.00	cfs	Percent Full:	69.0	%
			Critical Slope:	0.014	ft/ft
			Velocity:	4.83	ft/s
			Velocity Head:	0.36	ft
			Specific Energy:	1.40	ft
			Froude Number:	0.837	
			Discharge Full:	30.89	cfs
			Slope Full:	0.010	ft/ft
			Flow Type:	Subcritical	



- **Concept 3: 30in Reinforced Concrete Pipe (Circular) @ 1.5%– Dimensions Shown**
 - Note: 24" RCP shown for comparison

Worksheet: Circular Pipe - 14


Uniform Flow | Gradually Varied Flow | Messages

Solve For: Full Flow Capacity | Friction Method: Manning Formula

Roughness Coefficient:	0.015		Flow Area:	3.1	ft ²
Channel Slope:	0.015	ft/ft	Wetted Perimeter:	6.3	ft
Normal Depth:	24.0	in	Hydraulic Radius:	6.0	in
Diameter:	24.0	in	Top Width:	0.00	ft
Discharge:	24.01	cfs	Critical Depth:	20.8	in
			Percent Full:	100.0	%
			Critical Slope:	0.014	ft/ft
			Velocity:	7.64	ft/s
			Velocity Head:	0.91	ft
			Specific Energy:	2.91	ft
			Froude Number:	(N/A)	
			Maximum Discharge:	25.83	cfs
			Discharge Full:	24.01	cfs
			Slope Full:	0.015	ft/ft
			Flow Type:	Undefined	

Worksheet : Circular Pipe - 14

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Full Flow Capacity  Friction Method: Manning Formula

Roughness Coefficient	0.015		Flow Area:	4.9	ft ²
Channel Slope:	0.015	ft/ft	Wetted Perimeter:	7.9	ft
Normal Depth:	30.0	in	Hydraulic Radius:	7.5	in
Diameter:	30.0	in	Top Width:	0.00	ft
Discharge:	43.54	cfs	Critical Depth:	26.4	in
			Percent Full:	100.0	%
			Critical Slope:	0.013	ft/ft
			Velocity:	8.87	ft/s
			Velocity Head:	1.22	ft
			Specific Energy:	3.72	ft
			Froude Number:	(N/A)	
			Maximum Discharge:	46.83	cfs
			Discharge Full:	43.54	cfs
			Slope Full:	0.015	ft/ft
			Flow Type:	Undefined	

