130 ENVIRONMENTAL PARK

APPENDIX IIIA2
SURFACE WATER DRAINAGE CALCULATIONS

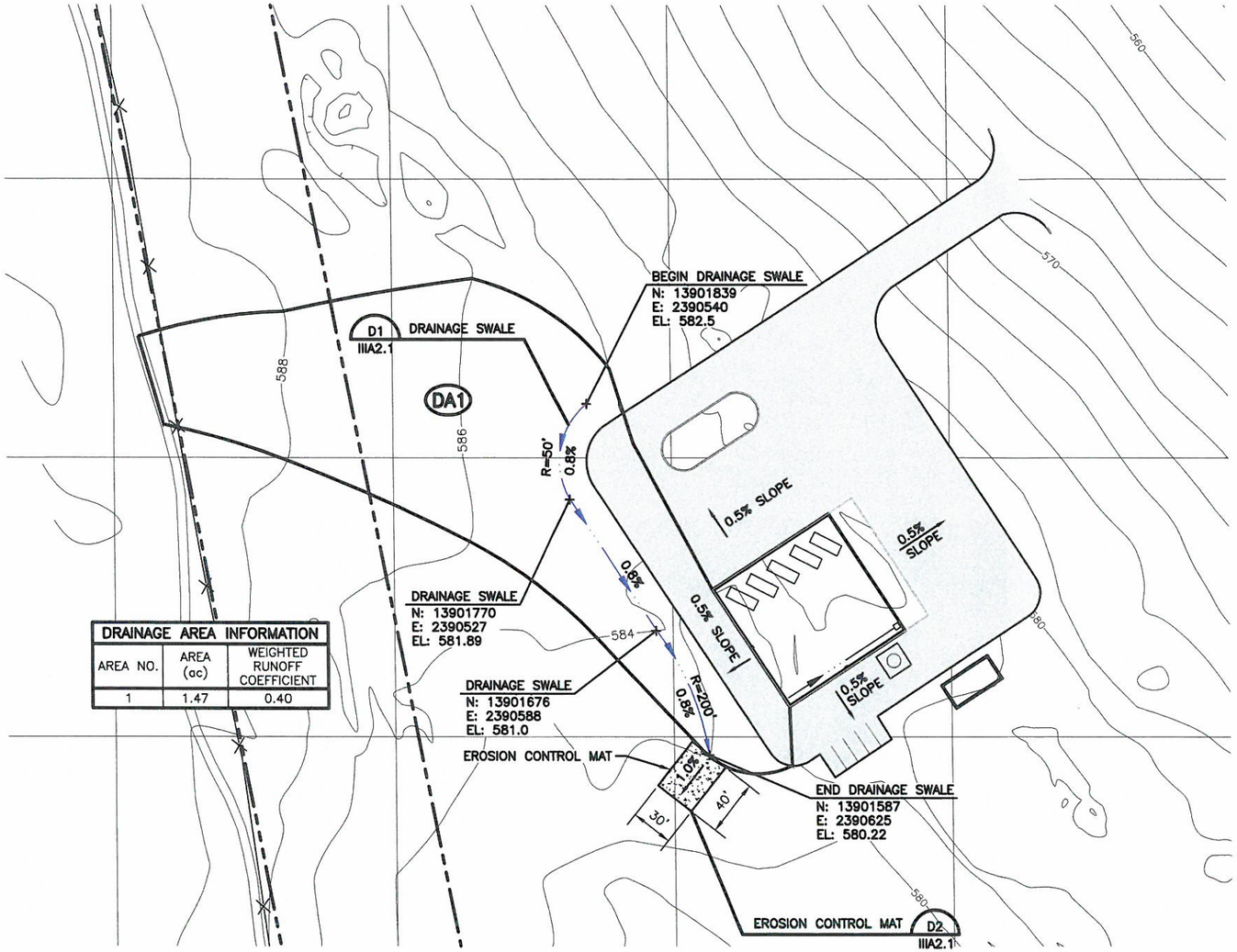
Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

7/11/14

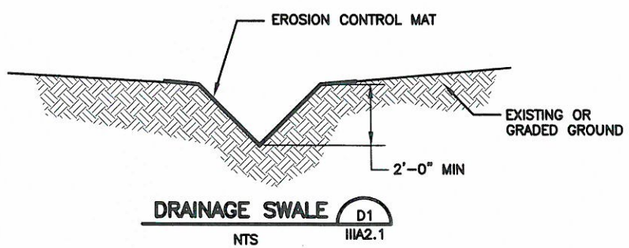
Includes pages IIIA2-1 th rough IIIA2-4

SURFACE WATER DRAINAGE CALCULATIONS

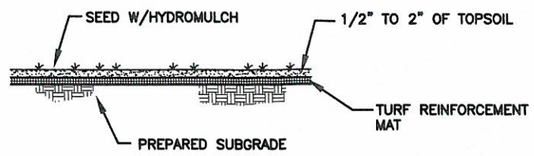
The drainage swale design calculations are depicted for the surface water management system to manage run-on from the contributing drainage area by directing surface water around the transfer station facility and to manage uncontaminated surface water runoff from the transfer station. The procedures in the Texas Department of Transportation (TXDOT), Hydraulic Design Manual, October 2011 were used to determine the 25-year peak flow rate, normal flow depth and capacity, and velocity for the design of the swale.



DRAINAGE AREA INFORMATION		
AREA NO.	AREA (ac)	WEIGHTED RUNOFF COEFFICIENT
1	1.47	0.40



DRAINAGE SWALE D1 IIIA2.1
NTS



EROSION CONTROL MAT D2 IIIA2.1
NTS

0 50 100
SCALE IN FEET

LEGEND
- PROPERTY BOUNDARY
- FACILITY BOUNDARY
- 560 EXISTING CONTOUR
- DRAINAGE AREA

NOTE:

1. CONTOURS AND ELEVATIONS PROVIDED BY DALLAS AERIAL SERVICE FROM AERIAL PHOTOGRAPHY FLOWN MAY 13, 2013. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83). ELEVATIONS ARE RELATIVE TO NAVD88 – GEOID 12A.

STATE OF TEXAS
J. HEATH PARKER
94764
LICENSED
PROFESSIONAL ENGINEER
7/11/14

ISSUED FOR REGISTRATION PURPOSES ONLY

REVISIONS						
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

DRAINAGE DESIGN PLAN

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK
TYPE V REGISTRATION APPLICATION

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256		TBPG FIRM NO. 50222	
DSN. CRH	DATE : 07/14		DRAWING
DWN. SRC	SCALE : GRAPHIC		IIIA2.1
CHK. JHP	DWG : IIIA2-1_DrngPlan.dwg		

J:\129\06 130 Park\103\IIIA2-1_DrngPlan.dwg Layout: IIIA-2.1 User: gwhite

130 Environmental Park
Transfer Station Registration
Drainage Swale Calculations

Required: Calculate the design flow rate, normal depth, and velocity in the drainage swale.

Methods:
1. Calculate the 25-year peak flow rate (Q) for the drainage area using the Rational Method.
2. Calculate the normal depth and velocity for the draingage swale discharge by applying Manning's Equation.

References:
1. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.
2. Texas Department of Transportation, *Hydraulic Design Manual,* Revised October 2011.
3. Strum, Terry W., *Open Channel Hydraulics, 2nd. Edition*, 2010

Solution:

1. Calculate the 25-year peak flow rate (Q) for the drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.52	in	(ref 1, extrapolated for 10 minutes)
Time of Concentration (tc) =	10	min	(conservative minimum value)
Rainfall Intensity (I) =	9.1	in/hr	(ref 2, I = Pd/tc)
Runoff Coefficient (C) =	0.40		(ref 2, Table 4-10)
Area (A) =	1.47	acre	
25-Year Peak Flow Rate (Q) =	CIA	cfs	
	Q = (0.4)(9.1)(1.47)		
	Q = 5.4	cfs	

2. Use Manning's equation to calculate the normal depth in the diversion swale for the drainage area.

List of Symbols:
- Q_o = design flow rate for channel, cfs
- R = hydraulic radius, ft
- n = Manning's roughness coefficient
- S = channel slope, ft/ft
- m = ratio of run to rise for channel sideslope
- A_o = flow area, sf
- g = gravitational acceleration = 32.2 ft/s^2
- B = top width of flow, ft
- y = normal flow depth of diversion channel, ft

Design Inputs:

Q_o =	5.4	cfs
S =	0.008	ft/ft
m =	5	(H) : 1 (V)
n =	0.022	(ref 3, Table 4.1, Typical value for excavated channel)

130 Environmental Park
Transfer Station Registration
Drainage Swale Calculations

Step 1 - Based on the geometry of the swale cross-section, solve for R and A_0 :

$$R = \frac{A_0}{2y(1+m^2)^{0.5}}$$ (ref 3, Table 2.1)

$A_o = my^2$ (ref 3, Table 2.1)

Solve Manning's equation for flow depth (y) based on previously calculated Q_0.

$$Q_o = \frac{1.49}{n} A_o R^{2/3} S^{1/2}$$

y = 0.63 ft

R = 0.308 ft

A_o = 1.97 sf

Step 2 - Solve for velocity in the diversion swale.

Q = VA => V = Q/A

V = 2.72 ft/s

130 Environmental Park
Transfer Station Registration
Drainage Calculations at Discharge

Required: Calculate the design flow rate, normal depth, and velocity at the discharge for the drainage swale.

Methods:
1. Calculate the 25-year peak flow rate (Q) for the drainage area using the Rational Method.
2. Calculate the normal depth and velocity for the draingage swale by applying Manning's Equation.

References:
1. United States Geologic Survey, *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas*, 2004.
2. Texas Department of Transportation, *Hydraulic Design Manual,* Revised October 2011.
3. Strum, Terry W., *Open Channel Hydraulics, 2nd. Edition*, 2010

Solution:

1. Calculate the 25-year peak flow rate (Q) for the drainage area using the Rational Method.

25-Year Rainfall Depth (Pd) =	1.52	in	(ref 1, extrapolated for 10 minutes)
Time of Concentration (tc) =	10	min	(conservative minimum value)
Rainfall Intensity (I) =	9.1	in/hr	(ref 2, I = Pd/tc)
Runoff Coefficient (C) =	0.40		(ref 2, Table 4-10)
Area (A) =	1.47	acre	
25-Year Peak Flow Rate (Q) =	CIA	cfs	
Q =	(0.4)(9.1)(1.47)		
Q =	5.4	cfs	

2. Use Manning's equation to calculate the normal depth and velocity at the erosion mat discharge.

List of Symbols:
- Q_o = design flow rate at discharge, cfs
- S = erosion control mat slope, ft/ft
- n = Manning's roughness coefficient
- B = top width of flow, ft
- A_o = flow area, sf
- y = normal flow depth of diversion channel, ft

Design Inputs:

Q_o =	5.4	cfs
S =	0.01	ft/ft
B =	30	ft.
n =	0.03	(ref 3, Table 4.1, Typical value for vegetal channel)

Calculations:

$$y = \left[\frac{(Q_o \times n)}{1.486 \times B \times S^{1/2}}\right]^{0.6}$$

y = 0.136 ft.

$$A_o = y \times B$$

A_o = 4.088 sf

$$v = Q_o / A_o$$

v = 1.312 fps

Summary: The runoff velocity leaving the erosion control mat at the discharge is less than 5 fps.

130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ REGISTRATION NO. MSW 40269

TYPE V REGISTRATION APPLICATION

PART III
FACILITY INVESTIGATION AND DESIGN

APPENDIX IIIC
CLOSURE PLAN

Prepared for

130 ENVIRONMENTAL PARK, LLC

August 2013
Revised February 2014

Revised July 2014

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

Prepared by

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FIRM REGISTRATION NO. F-834

CONTENTS

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

J. Heath Parker
7/11/14

2 CLOSURE REQUIREMENTS

30 TAC §330.459

At the time of closure, 130 Environmental Park Transfer Station will remove all waste, waste residues, and any recovered materials. The transfer station units shall either be dismantled and removed off-site or decontaminated. All material on-site, whether in process or processed will be evacuated to an authorized facility and the tipping floors, processing areas, and post-processing areas will be disinfected. A layout of the transfer station facility is provided in Appendix IIIB as Drawing IIIB.1.

No later than 90 days prior to the initiation of final closure, 130 Environmental Park Transfer Station shall, through a public notice in the newspaper(s) of largest circulation in the vicinity of the facility, provide public notice for final facility closure. This notice will include the name, address, and physical location of the facility, the registration number, and the last day of intended receipt of materials for processing at the facility. 130 Environmental Park Transfer Station will also make available an adequate number of copies of the approved Closure Plan for public review. The owner/operator will also provide written notification to the TCEQ of the intent to close the facility and place this Notice of Intent in the site operating record.

Initiation of closure activities for the facility will begin after the date on which the facility receives the known final receipt of waste to be processed.

The following steps will be taken:

- Notify the TCEQ.
- No later than 90 days prior to the initiation of final closure, post a minimum of one sign at the main entrance and all other frequently used points of access for the facility notifying all persons who may utilize the facility of the date of closing for the facility and the prohibition against further receipt of waste materials after the stated date.
- No later than 90 days prior to the initiation of final closure, install suitable barriers to all gates or access points or alternatively, fence around the entire waste processing area, to adequately prevent the unauthorized dumping of solid waste at the closed facility.
- Remove wastes, waste residues, and any recovered materials for disposal at an appropriate off-site location.
- Dismantle and remove or decontaminate facility units.
- Wash transfer station tipping floor and any surfaces that have been in contact with waste.
- Disinfect the tipping floor, processing area, and post-processing areas.
- Perform facility inspection and prepare certification of closure.
- If there is evidence of a release from the transfer station, the executive director may require an investigation into the nature and extent of the release and an assessment of measures necessary to correct an impact to groundwater.

3 CERTIFICATION OF FINAL FACILITY CLOSURE

30 TAC §330.461

Following completion of all final closure activities for the transfer station, 130 Environmental Park Transfer Station will submit within 10 days to the executive director for review and approval a documented certification signed by an independent registered professional engineer, verifying that final closure has been completed in accordance with the approved Closure Plan and the applicable rule provisions of 30 TAC Chapter 330 Subchapter K. The submittal to the executive director shall include all applicable documentation necessary for certification of final closure.

Within 10 days after completion of final closure activities for the facility, 130 Environmental Park Transfer Station will submit to the executive director a request for voluntary revocation of the facility's registration.

Following receipt of the required final closure documents, as applicable, the commission's regional office will conduct an inspection and provide a report verifying proper closure of the facility according to the approved Closure Plan before termination of operation and closure of the facility will be acknowledged and the facility deemed properly closed.

The provisions of §330.461(c)(1) and (d) do not apply to the transfer station as no wastes will remain at the closed facility.

130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ REGISTRATION NO. MSW 40269

TYPE V REGISTRATION APPLICATION

PART III
FACILITY INVESTIGATION AND DESIGN

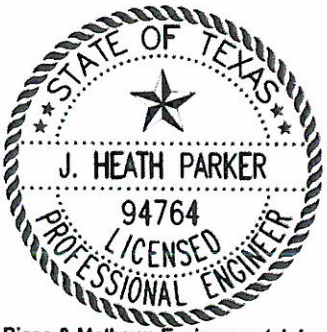
APPENDIX IIID
COST ESTIMATE FOR CLOSURE

Prepared for

130 ENVIRONMENTAL PARK, LLC

August 2013
Revised February 2014

Revised July 2014



Biggs & Mathews Environmental, Inc.
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7/11/14

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CONTENTS

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

J. Heath Parker
7/11/14

APPENDIX IIID2

EVIDENCE OF FINANCIAL ASSURANCE

30 TAC §37.8031

Mr. Richard A. Hyde, P.E.
Interim Executive Director
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Re: 130 Environmental Park
Caldwell County, Texas
TCEQ Registration Application No. MSW 40269

Dear Mr. Hyde:

This letter is to provide Evidence of Financial Responsibility pursuant to 30 TAC §330.505(b) of the Municipal Solid Waste Management Regulations with respect to the above-referenced project.

130 Environmental Park, LLC agrees to provide financial assurance for this registration in accordance with the financial assurance schedule developed in Part III, Appendix IIID – Cost Estimate for Closure, or other amount specified by the Texas Commission on Environmental Quality (TCEQ).

In accordance with §37.8031 the assurance will be provided by, but is not limited to, one or more of the following:

1. Trust Fund
2. Surety Bond Guaranteeing Payment or Performance
3. Letter of Credit
4. Insurance
5. Corporate Guarantee

After this registration application is approved by TCEQ, 130 Environmental Park, LLC will file the required financial assurance. A copy of the documentation required to demonstrate financial assurance, as specified in 30 TAC Chapter 37, Subchapter R, will be submitted to the executive director of the TCEQ 60 days prior to the initial receipt of waste. The financial assurance will indicate the TCEQ as beneficiary and shall remain in full force and effect throughout the life of the registration.

ATTEST:

130 Environmental Park, LLC

Ernest Kaufmann
President and Manager
130 Environmental Park, LLC

130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ REGISTRATION NO. MSW 40269

TYPE V REGISTRATION APPLICATION

PART III
FACILITY INVESTIGATION AND DESIGN

APPENDIX IIIE
COPY OF ATTACHMENT C2 – FLOOD CONTROL ANALYSIS FROM THE TYPE I (MSW 2383) PERMIT APPLICATION

Prepared for

130 ENVIRONMENTAL PARK, LLC

August 2013
Revised February 2014

Revised July 2014

Prepared by

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130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 2383

TYPE I PERMIT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN

ATTACHMENT C2
FLOOD CONTROL ANALYSIS

Prepared for

130 ENVIRONMENTAL PARK, LLC

February 2014

Revised June 2014

6-25-14

STATE OF TEXAS
T. Trew
105780
LICENSED PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
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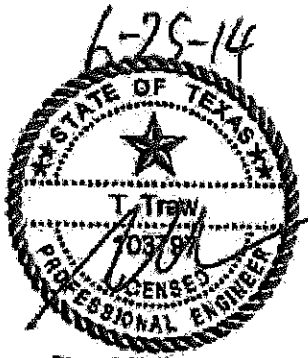
CONTENTS



Biggs & Mathews, Inc.
Firm Registration No. F-834

1 INTRODUCTION

1.1 Purpose

The flood control and analysis report is prepared as part of a permit application for 130 Environmental Park and includes the demonstrations consistent with the requirements of §§330.63(c)(2), 330.307, and 330.547. The flood control and analysis report demonstrates that solid waste disposal operations will not be located within the 100-year floodway as defined by the Federal Emergency Management Administration (FEMA), restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment.

130 Environmental Park is located in the San Marcos River drainage basin. Dry Creek traverses the property in a northeast to southwest direction and an unnamed tributary to Dry Creek traverses the property in a northwest to southeast direction. Both Dry Creek and the unnamed tributary enter the Soil Conservation Service (SCS) Site 21 Reservoir, located on Dry Creek, within the 130 Environmental Park property. Dry Creek exits the SCS Site 21 Reservoir and enters Plum Creek approximately five miles south of the property. Plum Creek flows generally in a northwest to southeast direction, and enters the San Marcos River about 23 miles downstream from the property.

The flood control and analysis report is organized to include a narrative description of the existing and postdeveloped conditions and a discussion of the various demonstrations. Drainage calculations are included in the appendices. Drainage design plans and details are included in Attachment C3. The following is a brief description of each of the appendices.

Appendix C2-A – Floodplain Maps

Appendix C2-A includes drawings demonstrating that no waste disposal operations shall be permitted in areas that are located in a 100-year floodway as defined by the Federal Emergency Management Agency (FEMA) and that the municipal solid waste storage and processing facilities shall be located outside of the 100-year floodplain. Appendix C2-A also includes drawings demonstrating that development of the 130 Environmental Park will not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not adversely impact Dry Creek, its unnamed tributary, or the SCS Site 21 Reservoir.

FEMA has defined the limits of the 100-year floodplain in the vicinity of the landfill as Zone A; no base flood elevations have been determined by FEMA. The limits of the floodplain are depicted on Drawing C2-A-1 - Flood Insurance Rate Map (FIRM), which is the drawing compiled from the FIRM Community Panel Number 48055C0125E, with an effective date of June 19, 2012. Drawing C2-A-1 includes the facility boundary, landfill footprint, and the limits of landfill grading depicted along with the limit of the FEMA

100-year floodplain. This drawing demonstrates that the proposed waste disposal units will not be located within the limits of the 100-year floodplain, based on the FEMA defined Zone A limits.

Drawing C2-A-2 – Existing Conditions Drainage Areas depicts the drainage areas contributing to Dry Creek, its unnamed tributary, and the SCS Site 21 Reservoir. A table is included with the area for each of the delineated areas. The facility and property boundary limits are also shown.

Drawing C2-A-3 – Existing Conditions Workmap depicts the delineation of the 100-year floodplain limits based upon the existing conditions. The facility and property boundary limits, and HEC-RAS cross section locations are shown. The limits of the FEMA Zone A are also depicted for information.

Drawing C2-A-4 – Postdeveloped Floodplain Workmap depicts the delineation of the 100-year floodplain limits based upon the existing conditions. The landfill footprint, limits of landfill grading, entrance road, and storage and processing facility locations are shown along with the facility and property boundary limits, and HEC-RAS cross section locations. The limits of the FEMA Zone A are also depicted for information.

Drawing C2-A-5 – Postdeveloped Floodplain Workmap Detail depicts the delineation of the 100-year floodplain limits based upon the existing conditions. This map depicts the landfill final completion plan and is produced at a scale to provide more detail comparing the limits of the 100-year floodplain with the landfill development. The landfill footprint, limits of landfill grading, entrance road, and storage and processing facility locations are shown along with the facility and property boundary limits, and HEC-RAS cross section locations. The limits of the FEMA Zone A are also depicted for information.

Appendix C2-B – Existing Condition HEC-HMS Evaluation

The existing condition HEC-HMS results for the floodplain evaluation are included in Appendix C2-B. The existing condition analysis includes delineation of drainage areas contributing to Dry Creek, its unnamed tributary, and the SCS Site 21 Reservoir. The results of the existing condition HEC-HMS evaluation are provided in the existing conditions summary, which provides results for the 25-year and 100-year events.

Appendix C2-C – Existing Condition HEC-RAS Evaluation

The existing condition HEC-RAS results are included in Appendix C2-C and represent the existing conditions. A summary table shows the results of the hydraulic analysis. The water surface elevation and energy grade line are graphically shown for each cross section.

Appendix C2-D – Postdeveloped Condition HEC-RAS Evaluation

The postdeveloped condition HEC-RAS results are included in Appendix C2-D and represent the postdeveloped conditions. A summary table shows the results of the hydraulic analysis. The water surface elevation and energy grade line are graphically shown for each cross section.

2 METHODOLOGY

2.1 Concepts and Methods

The hydrologic and hydraulic methods employed in this study are consistent with the TCEQ regulations. The United States Corps of Engineers (COE) HEC-HMS and HEC-RAS computer programs were used in the hydrologic and hydraulic analysis, respectively.

- Maps were prepared that provided information about the surface water runoff characteristics based on the existing conditions. These maps are included in Appendix C2-A.

- Surface water runoff hydrographs for the existing condition were developed in HEC-HMS. The HEC-HMS evaluation for the existing condition is in Appendix C2-B.

- Hydraulic models for the existing condition were developed to evaluate water surface elevations for Dry Creek, its unnamed tributary, and the SCS Site 21 Reservoir, under peak flow conditions using HEC-RAS is in Appendix C2-C.

- Hydraulic models for the postdeveloped condition were developed to evaluate water surface elevations for Dry Creek, its unnamed tributary, and the SCS Site 21 Reservoir under peak flow conditions using HEC-RAS is in Appendix C2-D.

3 HYDROLOGIC AND HYDRAULIC MODELING

3.1 HEC-HMS

The COE HEC-HMS program was developed to simulate the surface water runoff response of a watershed. The HEC-HMS model represents a watershed as a network of hydrologic and hydraulic components such as: sub-basins, reaches, reservoirs, junctions, and outlets. Specifically, HEC-HMS v3.5 was used to perform all of the hydrologic modeling. The following assumptions were made as part of the hydrologic modeling process:

- Precipitation: The meteorological model used was the frequency storm method which assumes precipitation rates that are temporally varied in 15 minute increments, but remain spatially unvaried across the entire watershed. This method uses the alternating block method of hyetograph distribution with the highest rainfall intensity occurring midway (50 percent) through the storm. A storm duration of 10 days was used in the model because it yielded the highest water surface elevation in the Site 21 reservoir and the largest peak discharges.

- Watershed Characteristics: The watershed characteristics considered in the analysis consist of rainfall loss, transform, and routing. *Urban Hydrology for Small Watersheds, TR-55*, describes the methods used for both rainfall loss and transform. Specifically, the (Soil Conservation Service) SCS runoff curve number method was used to analyze rainfall loss, while the SCS unit hydrograph method was used for transform. The routing method used in the analysis was the Kinematic Wave method.

3.2 Hydrologic Elements Naming Convention

The following naming convention was used in the existing hydrologic evaluations:

- UNT-1 – drainage area contributing to the Unnamed Tributary west of the proposed landfill

- DC-1 – drainage area contributing to Dry Creek on the east side of the proposed landfill

3.2.1 HEC-RAS

The COE HEC-RAS program was developed to evaluate gradually varied open channel flow in natural and man-made streams, as well as, the hydraulics related to structures such as bridges, culverts, dams, levees, etc. In this situation, separate models were created for both Dry Creek and the Unnamed Tributary network with both models using

the same downstream boundary condition resulting from the maximum water surface elevation in the Site 21 reservoir of 518.9 ft. Both streams were modeled in steady state and, as a result, the peak discharge applied does not change with time. The cross-sections for both models were taken from a combination of data listed in order of priority: on the ground survey delineating waters of the US, contours developed from aerial photography flown May 13, 2013, and contours available from CAPCOG. Manning's roughness coefficients for the channels and floodplain were determined through on-site investigation and aerial photos.

3.2.2 Hydraulic Elements Naming Convention

The following naming convention was used in the existing and post–developed hydraulic evaluations:

- A1.93 – cross-section on Dry Creek at river station 1.93
- B0.59 – cross-section on Unnamed Tributary at river station 0.59
- C0.41 – cross-section on Tributary A at river station 0.41
- D0.53 – cross-section on Tributary B at river station 0.53

4 EXISTING CONDITIONS

The existing conditions modeling reflects the peak discharges and maximum water surface elevations in the Site 21 reservoir as identified from the hydrologic model.

The hydraulic model for existing conditions uses the existing topographic data with one culvert located on Dry Creek at the Hommanville Trail crossing. Both the 25 and 100 year events significantly overtop, by as much as 7 feet, the limited capacity of the 2 - 5 foot diameter corrugated metal pipes under Hommanville Trail.

5 POSTDEVELOPMENT CONDITIONS

The postdeveloped conditions modeling reflect the same ~~lower~~ peak discharges ~~than~~ that were identified in the existing conditions hydrologic model. ~~The peak discharges in the condition are less than those in the existing condition as identified in Part III Attachment C1 of this application.~~

The changes to the postdeveloped conditions hydraulic model are limited to changes to the channel and floodplain geometry immediately upstream and downstream of where the proposed entrance road crosses the Unnamed Tributary and Tributary B. At the Unnamed Tributary crossing, 7 box culverts (7'H x 12'W) carry both the 100 and 25 year events without overtopping the entrance road. At the Tributary ~~A~~ B crossing, ~~a~~ two box culverts (4'H x 8'W) carryies both the 100 and 25 year events without overtopping the road, ~~while the 100 year event overtops.~~ In both locations, the culverts result in slight increases in the upstream water surface elevations. However, these increases terminate within the property boundary at cross-sections B8.74 and D2.4872. A comparison of existing/postdeveloped water surface elevations at each cross-section upstream of the culverts is shown in Tables 1 and 2.

130 Environmental Park

Table 1 - Unnamed Tributary Existing/Postdeveloped Cross-section Comparison

X-sec Label	River Station	25-Year Water Surface Elevation (ft.)			100-Year Water Surface Elevation (ft.)		
		Existing	Post-developed	Difference	Existing	Post-developed	Difference
B12	12	556.52	556.52	0.00	559.03	559.02	-0.01
B10.1	10.1	550.74	550.74	0.00	550.74	550.74	0.00
B9.73	9.73	548.18	548.18	0.00	548.64	548.63	-0.01
B9.12	9.12	545.68	545.68	0.00	546.15	546.15	0.00
B8.74	8.74	544.46	544.46	0.00	545.06	545.07	0.01
B8.19	8.19	543.20	543.22	0.02	543.85	543.91	0.06
B7.9	7.9	542.57	542.62	0.05	543.21	543.32	0.11
B7.56	7.56	541.24	541.48	0.24	541.97	542.37	0.40
B7.26	7.26	540.15	540.28	0.13	540.99	541.28	0.29

130 Environmental Park

Table 2 - Tributary B Existing/Postdeveloped Cross-section Comparison

X-sec Label	River Station	25-Year Water Surface Elevation (ft.)			100-Year Water Surface Elevation (ft.)		
		Existing	Post-developed	Difference	Existing	Post-developed	Difference
D3.88	3.88	581.30	581.30	0.00	581.50	581.50	0.00
D3.16	3.16	568.43	568.43	0.00	568.68	568.68	0.00
D2.99	2.99	565.14	565.14	0.00	565.43	565.43	0.00
D2.9	2.9	563.55	563.55	0.00	563.82	563.82	0.00
D2.72	2.72	557.32	557.32	0.00	557.72	557.72	0.00
D2.65	2.65	556.21	556.20	-0.01	556.58	556.58	0.00
D2.48	2.48	553.39	553.42	0.03	553.70	553.70	0.00
D2.36	2.36	551.52	551.48	-0.04	551.79	551.79	0.00
D2.29	2.29	549.62	550.43	0.81	549.93	551.32	1.39

6 CONCLUSIONS

In accordance with §330.547(a), 130 Environmental Park's waste disposal operations are not located in the 100-year floodway. In accordance with §330.547(b), 130 Environmental Park's new municipal solid waste disposal units are not located in the 100-year floodplain, will not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not result in the washout of solid waste. Further, in accordance with §330.547(c), 130 Environmental Park's processing and/or storage units are not located within the 100-year floodplain.

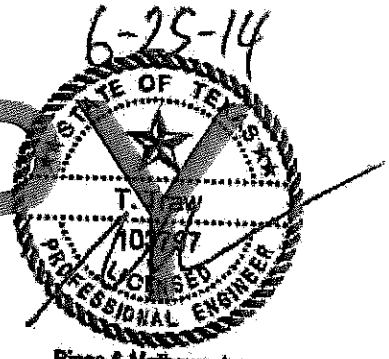
130 ENVIRONMENTAL PARK

ATTACHMENT C2

APPENDIX C2-A

FLOODPLAIN MAPS

6-25-14



Biggs & Mathews, Inc.
Firm Registration No. F-834

Includes pages C2-A-1 through C2-A-5

CONTENTS

6-25-14

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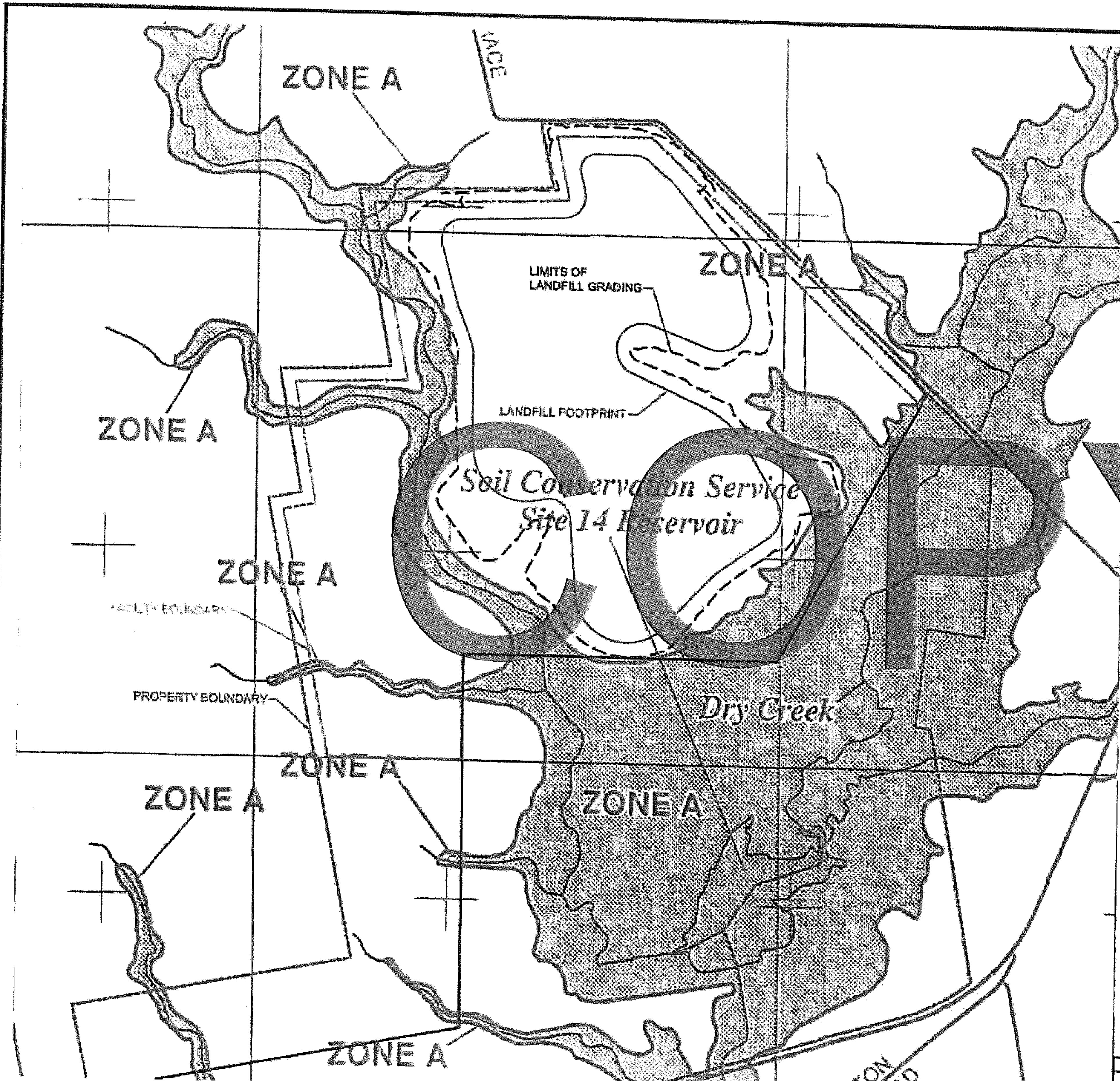

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

0 500 1000

SCALE IN FEET

1. THIS MAP HAS BEEN COMPILED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM) OF CALDWELL COUNTY, TEXAS AND UNINCORPORATED AREAS COMMUNITY PANEL: 48055C0125E EFFECTIVE DATE: 6-19-2012

2. LABELING OF THE RESERVOIR SITE AS "SOIL CONSERVATION SITE 14 RESERVOIR" IS AN APPARENT ERROR ON THE FIRM. THE RESERVOIR SITE SHOWN IS ACTUALLY SITE 21, ALSO KNOWN AS PLUM CREEK WATERSHED RETARDING STRUCTURE No. 21.

6-25-14

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2	6/14	RCD No 2	MNG	TLT	TLT	TLT
NO	DATE	DESCRIPTION	DRN BY	DES BY	CHK BY	APP BY

FLOOD INSURANCE RATE MAP (FIRM)

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 & F-834 | TBPG FIRM NO. 50222

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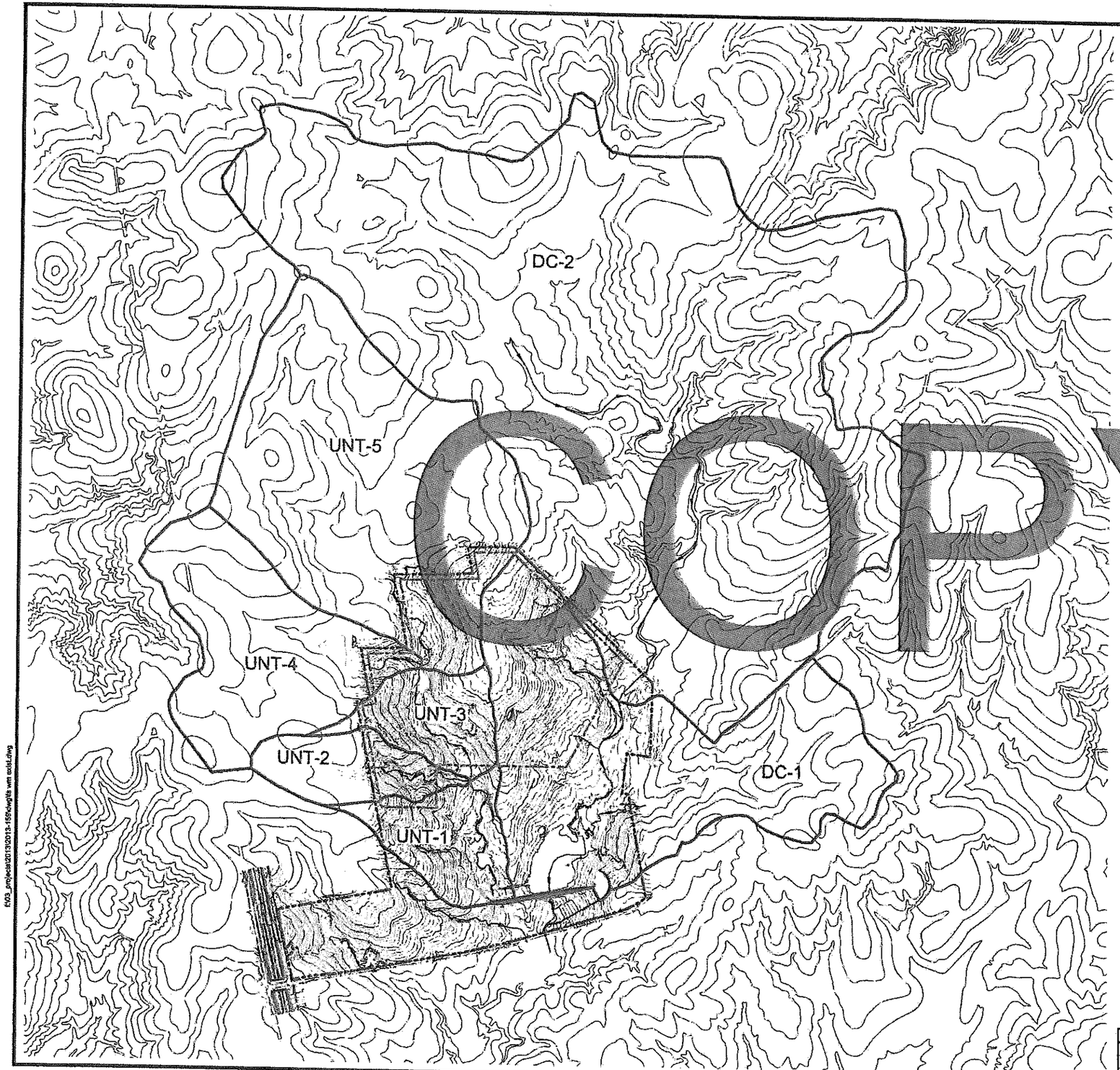

0 1200 2400
SCALE IN FEET

LEGEND

- PROPERTY BOUNDARY
- FACILITY BOUNDARY
- DRAINAGE AREA
- PRIMARY REACH

DRAINAGE AREA CHART

DA	AREA (ac.)
UNT-1	161.82
UNT-2	134.66
UNT-3	141.81
UNT-4	448.48
UNT-5	913.94
DC-1	884.64
DC-1	2905.38

NOTES:

1. CONTOURS AND ELEVATIONS WITHIN THE PROPERTY BOUNDARY PROVIDED BY DALLAS AERIAL SERVICE FROM AERIAL PHOTOGRAPHY FLOWN MAY 13, 2013. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83). ELEVATIONS ARE RELATIVE TO NAVD88 - GEOID 12A.
2. ROADWAYS IN THE IMMEDIATE VICINITY OF THE SITE TAKEN FROM TNRIS AERIAL PHOTOGRAPHY FLOWN JUNE 11, 2012. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
3. CONTOURS AND ELEVATIONS OUTSIDE THE PROPERTY BOUNDARY PROVIDED BY CAPCOG. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).

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REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

EXISTING CONDITIONS DRAINAGE AREAS

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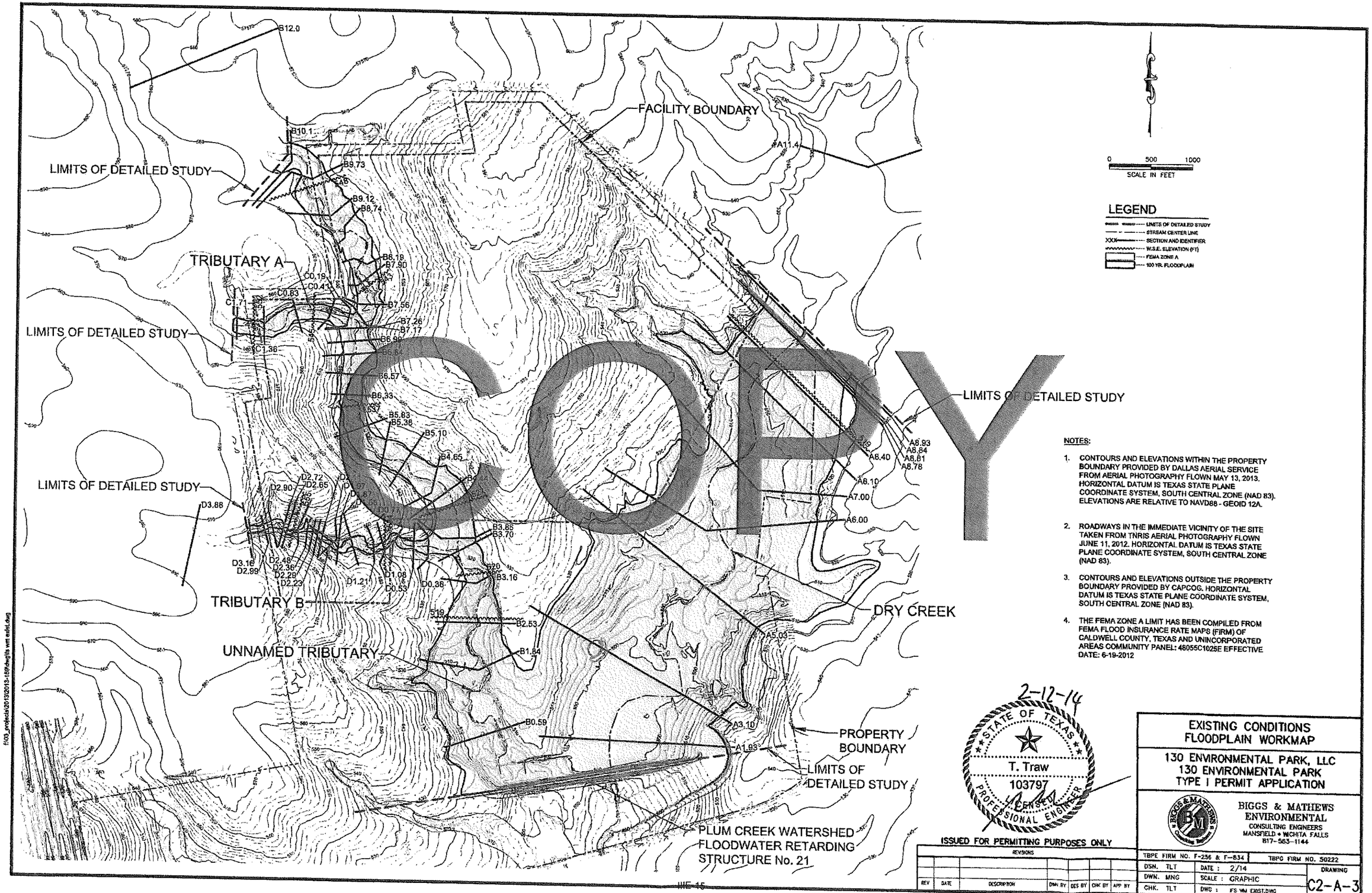

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EXISTING CONDITIONS FLOODPLAIN WORKMAP

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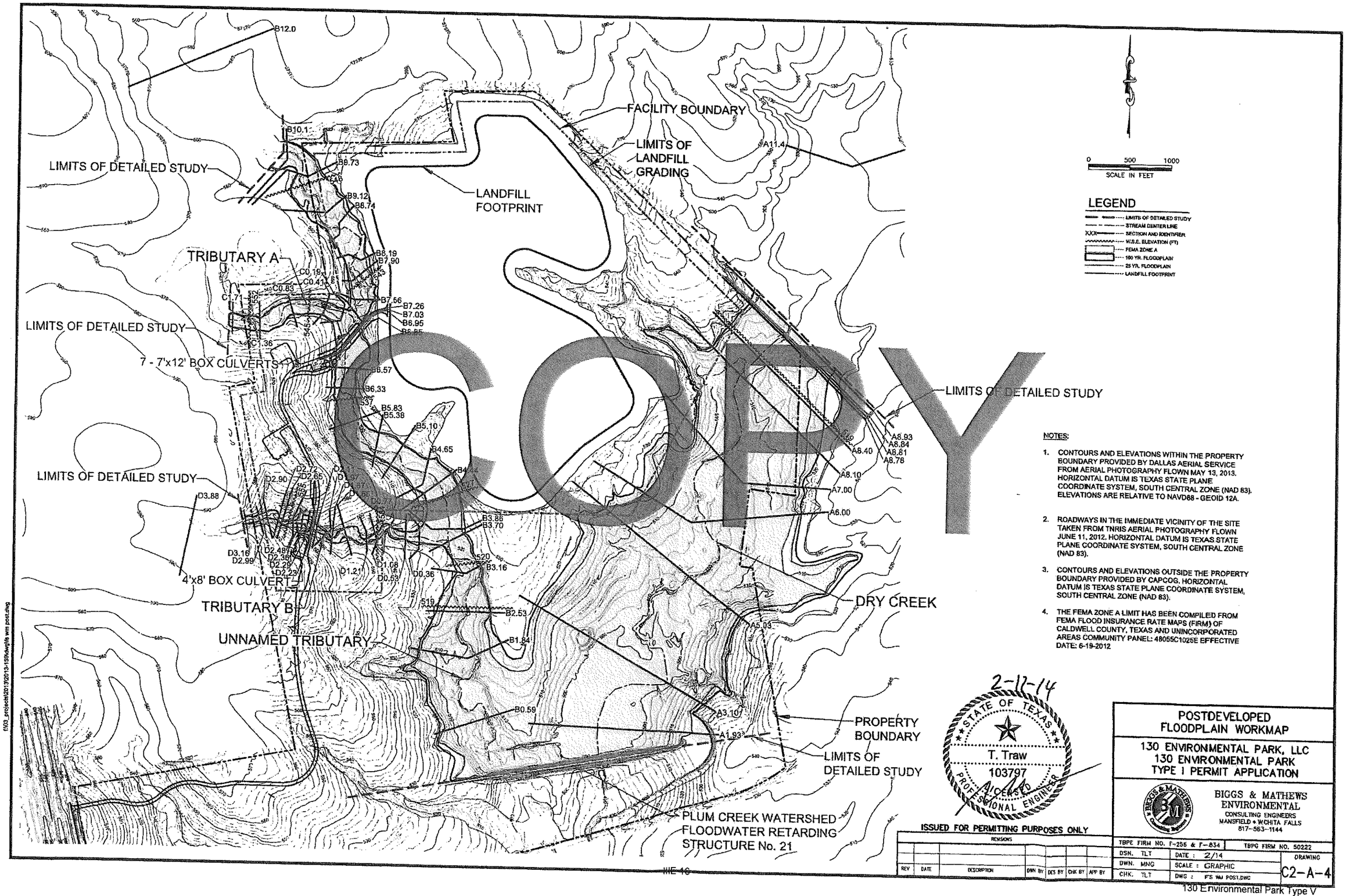

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POSTDEVELOPED FLOODPLAIN WORKMAP

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LIMITS OF DETAILED STUDY

LIMITS OF LANDFILL GRADING

FACILITY BOUNDARY

PROPERTY BOUNDARY

LANDFILL FOOTPRINT

TRIBUTARY A

7 - 7'x12' BOX CULVERTS

LIMITS OF DETAILED STUDY

UNNAMED TRIBUTARY

TRIBUTARY B

4'x8' BOX CULVERT

DRY CREEK

0 300 600
SCALE IN FEET

LEGEND

- LIMITS OF DETAILED STUDY
- STREAM CENTER LINE
- XXX SECTION AND IDENTIFIER
- W.S.E. ELEVATION (FT)
- FEMA ZONE A
- 100 YR. FLOODPLAIN
- 25 YR. FLOODPLAIN
- LANDFILL FOOTPRINT

NOTES:

1. CONTOURS AND ELEVATIONS WITHIN THE PROPERTY BOUNDARY PROVIDED BY DALLAS AERIAL SERVICE FROM AERIAL PHOTOGRAPHY FLOWN MAY 13, 2013. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83). ELEVATIONS ARE RELATIVE TO NAVD88 - GEOID 12A.
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POSTDEVELOPED FLOODPLAIN WORKMAP DETAIL

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DSN. TLT | DATE : 2/14 | DRAWING
DWN. MNG | SCALE : GRAPHIC | C2-A-5
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130 ENVIRONMENTAL PARK

ATTACHMENT C2

APPENDIX C2-B

EXISTING CONDITIONS HEC-HMS EVALUATION

Includes pages C2-B-1 through C2-B-17

2-12-14

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CONTENTS

2-12-14

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Firm Registration No. F-834

EXISTING CONDITION DISCHARGE SUMMARY

130 Environmental Park
Existing Conditions Discharge Summary

Flow Change Location/Cross-Section	100-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	Hydrologic Element
A11.4	5381.0	3939.6	Basin: DC-2
A7.00	7266.0	5326.5	Junction: Dry Creek
B12.0	1933.4	1410.5	Basin: UNT-5
B7.17	2909.0	2127.1	Junction: North
B3.7	3803.2	2761.0	Junction: South
C1.71	975.7	716.6	Basin: UNT-4
D3.88	337.2	245.4	Basin: UNT-2

WATERSHED CHARACTERISTICS

130 Environmental Park
Watershed Runoff Curve Numbers
Existing Watershed Characteristics

Watershed Name	Watershed Area (ac)	Watershed Area ($Mi.^2$)	CN (Weighted)	Partial Areas of Cover Type and Soil Group (ac)						
				Brush (fair), Soil Group D, CN = 77	Pasture (good), Soil Group D, CN = 80	Pasture (fair), Soil Group D, CN = 84	Paved (w/ROW), Soil Group D, CN = 93	Residential (1 ac), Soil Group D, CN = 84	Woods (fair), Soil Group D, CN = 79	Water, CN = 98
UNT-1	161.82	0.253	82	15.73	1.56	10.40			106.03	28.09
UNT-2	134.66	0.210	78	82.05		4.78	0.32		44.85	2.66
UNT-3	141.81	0.222	79	31.94		4.82			104.89	0.16
UNT-4	448.48	0.701	81	166.95	105.08	3.25	91.85		81.36	
UNT-5	913.94	1.428	79	332.63	545.12	3.57	11.02		17.50	4.11
DC-1	884.64	1.382	82	424.10	31.58	4.67	4.00		245.70	174.59
DC-2	2905.38	4.540	80	677.49	1611.60		57.91	70.87	455.85	31.66

130 Environmental Park
SCS Unit Hydrograph Lag Time
Existing Watershed Characteristics

Watershed Name	Sheet Flow					Shallow Conc. Flow				Channel Flow			Time of Conc. (hr)	Lag Time (min)
	Manning's Roughness	Water Course Length (ft)	Precipitation 2yr Total (in.)	Water Course Slope (ft/ft)	Time (hr)	Water Course Length (ft)	Roughness Coefficient	Water Course Slope (ft/ft)	Time (hr)	Avg. Bank Full Velocity (fps)	Water Course Length (ft)	Time (hr.)		
DC-2	0.24	240	3.60	0.03	0.38	8945	16.13	0.01	1.62	4.08	14140	0.96	2.97	107
DC-1	0.13	270	3.60	0.01	0.40	6467	16.13	0.01	1.17	0.00	0	0.00	1.57	57
UNT-1	0.13	260	3.60	0.01	0.51	3354	16.13	0.03	0.37	0.00	0	0.00	0.88	32
UNT-2	0.40	280	3.60	0.01	1.17	2882	16.13	0.01	0.45	3.27	2948	0.25	1.87	67
UNT-3	0.13	260	3.60	0.01	0.51	1947	16.13	0.03	0.21	3.50	995	0.08	0.80	29
UNT-4	0.24	275	3.60	0.01	0.88	6501	16.13	0.01	1.34	2.86	1437	0.14	2.35	85
UNT-5	0.24	250	3.60	0.03	0.40	8589	16.13	0.01	1.78	3.52	2943	0.23	2.42	87

130 Environmental Park
Kinematic Wave Routing Parameters
Existing Watershed Characteristics

Reach Name	Water Course Length (ft)	Water Course Slope (ft/ft)	Manning's Roughness	Shape	Bottom Width (ft)	Side Slope (xH:1V)
Dry Creek	1000	0.010	0.045	Trapezoid	30.00	5
Reach-2.0	656	0.010	0.065	Trapezoid	17.00	12
Reach-2.1	3455	0.005	0.065	Trapezoid	15.00	25

RAINFALL DATA

130 Environmental Park
Hypothetical Storm Data

Duration	15 min.	30 min.	1 hr.	2 hr.	3 hr.	6 hr.	12 hr.	24 hr.	2 day	3 day	5 day	7 day	10 day*
Precipitaion Depth (in.)	25 Year Return Period												
	1.90	2.50	3.35	4.33	4.71	5.31	6.09	7.70	9.00	9.60	10.00	10.80	13.40
Precipitaion Depth (in.)	100 Year Return Period												
	2.46	3.13	4.42	5.80	6.38	7.00	8.34	10.40	11.70	13.00	13.20	14.20	16.80

Precipitaion Depths from: Asquith, W.H., and Roussel, M.C., 2004, Atlas of depth-duration frequency of precipitation annual maxima for Texas: U.S. Geological Survey Scientific Investigations Report 2004-5041, 106 p. (TxDOT Implementation Report 5-1301-01-1)

*Precipitation Depths from: Technical Paper No. 49; Two to Ten-Day Precipitation for Return Periods of 2 to 100 Year in the Contiguous United States

130 Environmental Park
Hypothetical Storm Data

Duration	5 min.	15 min.	30 min.	1 hr.	2 hr.	3 hr.	6 hr.	12 hr.	24 hr.	2 day	4 day	7 day	10 day*
Precipitaion Depth (in.)	25 Year Return Period												
	1.69	2.24	2.68	3.20	3.82	4.24	5.07	6.06	7.24	8.65	10.34	11.94	13.09
Precipitaion Depth (in.)	100 Year Return Period												
	2.21	2.94	3.52	4.21	5.04	5.59	6.69	8.00	9.57	11.45	13.70	15.83	17.36

Precipitation depths used in the 10 day frequency storm meteorlogical model within the HEC-HMS hydrological model for flood analysis. Precipitation depths were "smoothed" using regression methods as suggested in the HEC-HMS Technical Reference Manual.

SITE 21 RESERVOIR DATA

130 Environmental Park
Pond Data for HEC-HMS
Site 21

Reservoir

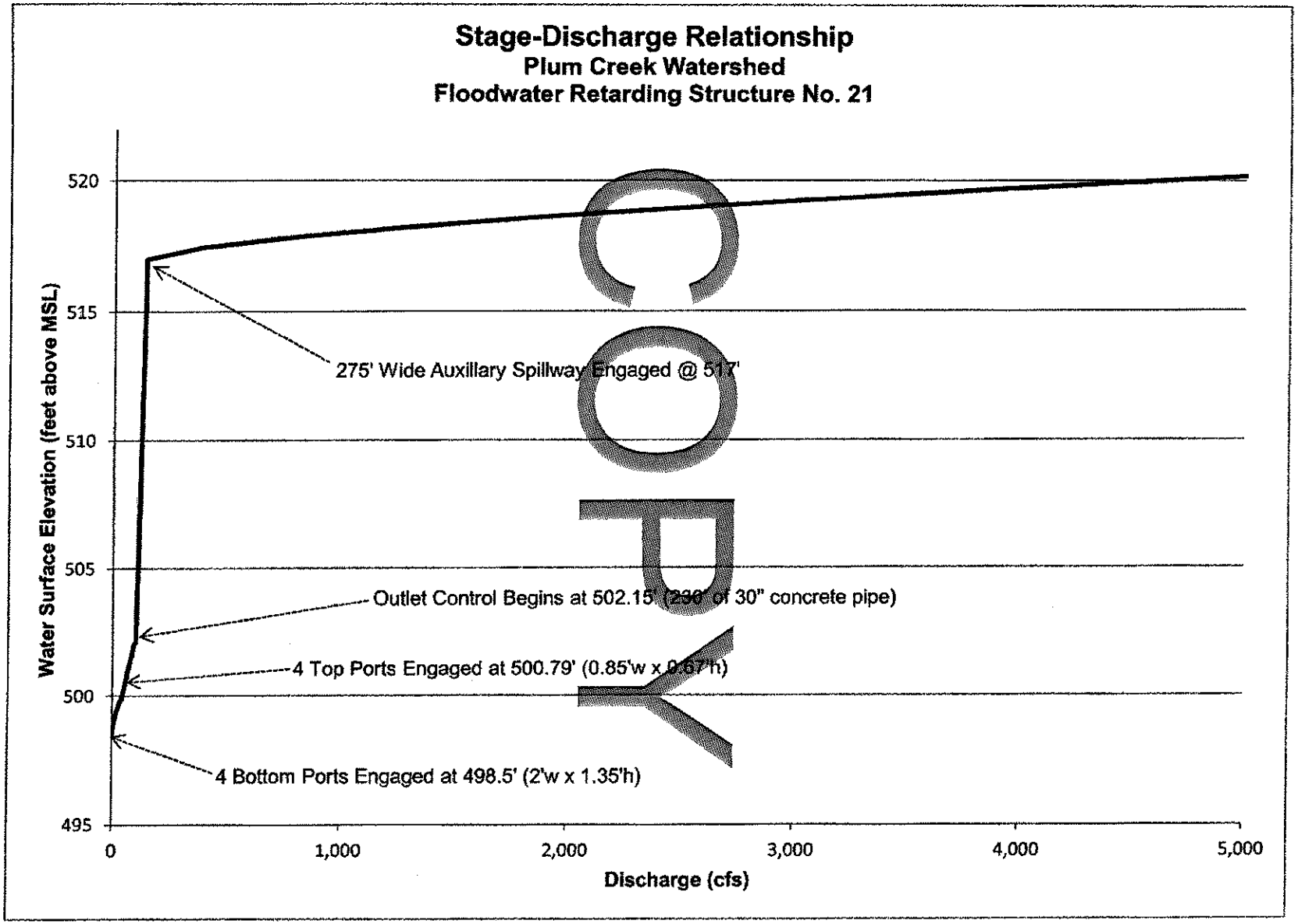
Description:	
Downstream:	CP8
Method:	Outflow Structures
Storage Method:	Elevation-Area-Discharge
Elev-Area Function:	Site 21 Elev Area
Elev-Dis Function	Site 21 Elev-Discharge
Primary:	Elevation-Discharge
Initial Condition:	Elevation
Initial Elevation:	498.5 ft

Paired Data
Elevation Storage Functions
Site 21 Elev Area

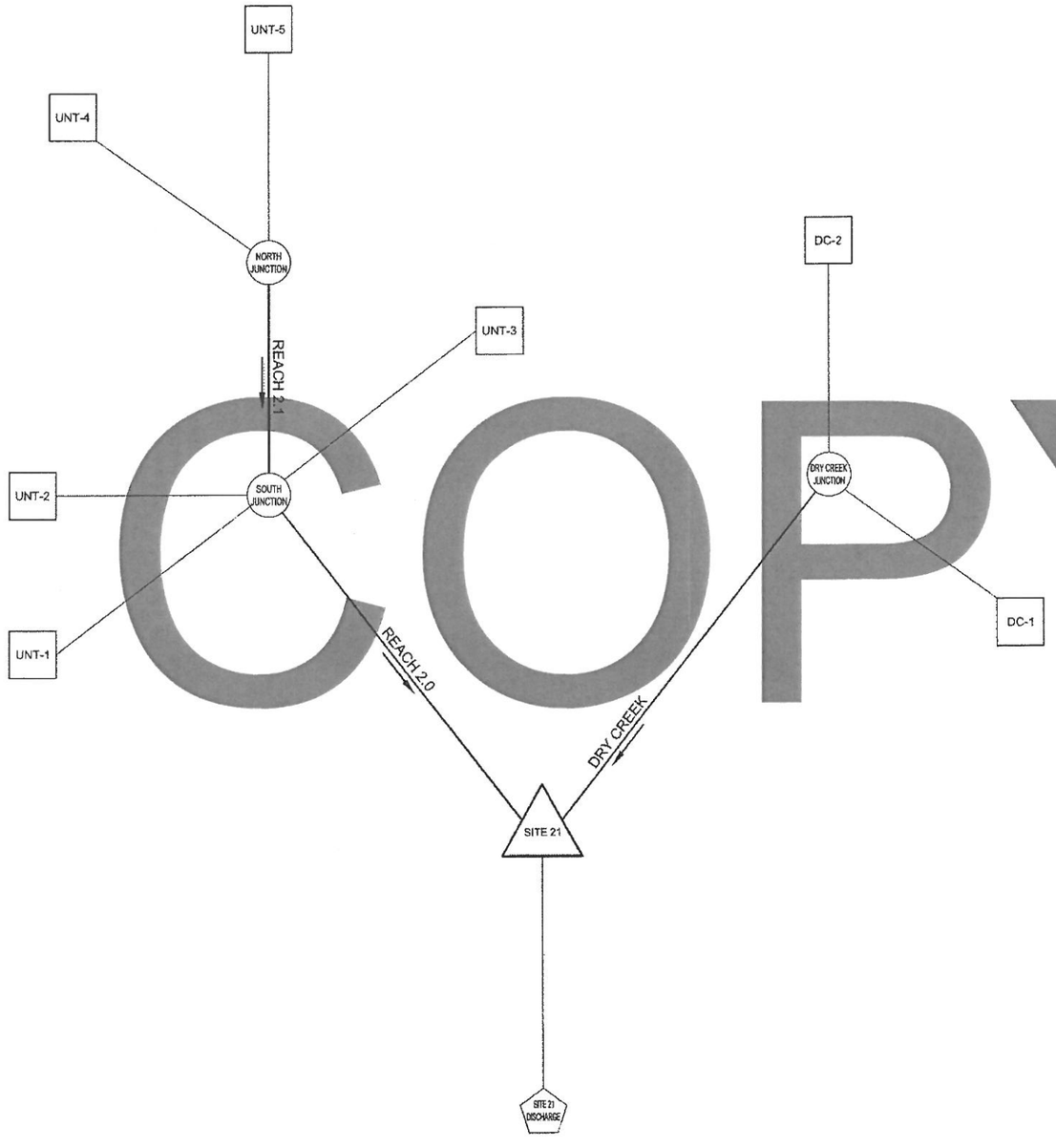
Elevation (ft)	Area (ac-ft)	Volume (ac-ft)
498.10	22.00	0.00
502	54.75	149.66
504	81.00	285.41
506	113.05	479.45
508	141.47	733.97
510	173.17	1048.60
512	204.87	1426.65
514	256.45	1887.97
516	296.24	2440.66
518	343.69	3080.59
520	411.10	3835.38
522	455.40	4701.88

Paired Data
Elevation Discharge Functions
Site 21 Elev-Discharge

Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
498.50	0.02	500.20	48.50	501.90	88.33	516.32	137.50
498.60	0.83	500.30	50.78	502.00	90.35	517.43	382.71
498.70	2.18	500.40	52.97	502.10	92.31	517.87	839.48
498.80	3.91	500.50	55.08	502.15	100.00	518.10	1134.54
498.90	5.94	500.60	57.10	502.96	102.50	518.32	1447.38
499.00	8.25	500.70	59.06	503.78	105.00	518.56	1819.62
499.10	10.79	500.80	60.96	504.62	107.50	518.78	2187.12
499.20	13.54	500.90	63.11	505.49	110.00	519.23	3010.38
499.30	16.50	501.00	65.43	506.37	112.50	519.70	3963.76
499.40	19.65	501.10	67.84	507.28	115.00	520.16	4981.12
499.50	22.98	501.20	70.33	508.20	117.50	520.63	6100.01
499.60	26.48	501.30	72.88	509.16	120.00	520.86	6675.17
499.70	30.13	501.40	75.49	510.12	122.50	521.10	7293.83
499.80	33.95	501.46	77.08	511.10	125.00	521.57	8558.14
499.84	39.16	501.50	79.45	512.10	127.50	522.04	9889.19
499.90	40.87	501.60	81.82	513.13	130.00		
500.00	43.56	501.70	84.07	514.17	132.50		
500.10	46.09	501.80	86.24	515.24	135.00		


Stage-Discharge Relationship
Plum Creek Watershed
Floodwater Retarding Structure No. 21
Water Surface Elevation (feet above MSL)
520
515
510
505
500
495
0
1,000
2,000
3,000
4,000
5,000
Discharge (cfs)
275' Wide Auxillary Spillway Engaged @ 517'
Outlet Control Begins at 502.15' (230' of 30" concrete pipe)
4 Top Ports Engaged at 500.79' (0.85'w x 0.67'h)
4 Bottom Ports Engaged at 498.5' (2'w x 1.35'h)

HEC-HMS SCHEMATIC



LEGEND

- SUB-BASIN
- RESERVOIR
- JUNCTION
- OUTLET
- REACH 2.1 — REACH
- CONNECTION

2-12-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

ISSUED FOR PERMITTING PURPOSES ONLY

REVISIONS						
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

HEC-HMS SCHEMATIC
EXISTING CONDITIONS

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK
TYPE I PERMIT APPLICATION

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 & F-834		TBPG FIRM NO. 50222
DSN. TLT	DATE : 2/14	DRAWING
DWN. MNG	SCALE : N.T.S.	C2-B-1
CHK. TLT	DWG : FC WM EXIST.DWG	

f:\03_projects\2013\2013-159\dwg\fs wm exist.dwg

HYDROLOGIC ANALYSIS

Project: 130 Environmental Park Simulation Run: 100yr 10day (smoothed)

Start of Run: 01Jan2013, 00:00 Basin Model: Existing
End of Run: 13Jan2013, 00:00 Meteorologic Model: 100 yr 10 day (smoothe
Compute Time: 21Jan2014, 17:36:47 Control Specifications: 12 days

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DC-1	1.38	2046.3	06Jan2013, 01:30	1095.6
DC-2	4.54	5381.0	06Jan2013, 02:00	3532.9
Dry Creek	5.92	7252.1	06Jan2013, 01:45	4628.9
Dry Creek Junction	5.92	7266.0	06Jan2013, 01:45	4628.4
North Junction	2.13	2909.0	06Jan2013, 01:30	1651.6
Reach-2.0	2.81	3775.4	06Jan2013, 01:30	2179.3
Reach-2.1	2.13	2900.9	06Jan2013, 01:45	1651.0
Site 21	8.73	2346.5	06Jan2013, 05:00	4828.2
Site 21 Discharge	8.73	2346.5	06Jan2013, 05:00	4828.2
South Junction	2.81	3803.2	06Jan2013, 01:30	2179.0
UNT-1	0.25	442.7	06Jan2013, 01:00	198.5
UNT-2	0.21	337.2	06Jan2013, 01:15	160.0
UNT-3	0.22	397.8	06Jan2013, 01:00	169.4
UNT-4	0.70	975.7	06Jan2013, 01:30	550.2
UNT-5	1.43	1933.4	06Jan2013, 01:30	1101.3

Project: 130 Environmental Park
Simulation Run: 100yr 10day (smoothed) Reservoir: Site 21

Start of Run:	01Jan2013, 00:00	Basin Model:	Existing
End of Run:	13Jan2013, 00:00	Meteorologic Model:	100 yr 10 day (smoothed)
Compute Time:	21Jan2014, 17:36:47	Control Specifications:	12 days

Volume Units: AC-FT

Computed Results

Peak Inflow :	11001.7 (CFS)	Date/Time of Peak Inflow :	06Jan2013, 01:45
Peak Outflow :	2346.5 (CFS)	Date/Time of Peak Outflow :	06Jan2013, 05:00
Total Inflow :	6808.3 (AC-FT)	Peak Storage :	3391.3 (AC-FT)
Total Outflow :	4828.2 (AC-FT)	Peak Elevation :	518.9 (FT)

Project: 130 Environmental Park Simulation Run: 25yr 10day (smoothed)

Start of Run: 01Jan2013, 00:00 Basin Model: Existing
End of Run: 13Jan2013, 00:00 Meteorologic Model: 25 yr 10 day
Compute Time: 24Jan2014, 12:45:08 Control Specifications: 12 days

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
DC-1	1.38	1508.5	06Jan2013, 01:30	788.3
DC-2	4.54	3939.6	06Jan2013, 02:00	2526.7
Dry Creek	5.92	5314.9	06Jan2013, 01:45	3315.5
Dry Creek Junction	5.92	5326.5	06Jan2013, 01:45	3315.1
North Junction	2.13	2127.1	06Jan2013, 01:30	1180.0
Reach-2.0	2.81	2740.0	06Jan2013, 01:45	1557.3
Reach-2.1	2.13	2118.9	06Jan2013, 01:45	1179.7
Site 21	8.73	382.9	06Jan2013, 16:00	3015.5
Site 21 Discharge	8.73	382.9	06Jan2013, 16:00	3015.5
South Junction	2.81	2761.0	06Jan2013, 01:30	1557.0
UNT-1	0.25	326.3	06Jan2013, 01:00	142.8
UNT-2	0.21	245.4	06Jan2013, 01:15	113.7
UNT-3	0.22	290.6	06Jan2013, 01:00	120.8
UNT-4	0.70	716.6	06Jan2013, 01:30	394.8
UNT-5	1.43	1410.5	06Jan2013, 01:30	785.2

Project: 130 Environmental Park
Simulation Run: 25yr 10day (smoothed) Reservoir: Site 21

Start of Run:	01Jan2013, 00:00	Basin Model:	Existing
End of Run:	13Jan2013, 00:00	Meteorologic Model:	25 yr 10 day
Compute Time:	24Jan2014, 12:45:08	Control Specifications:	12 days

Volume Units: AC-FT

Computed Results

Peak Inflow :	8054.8 (CFS)	Date/Time of Peak Inflow :	06Jan2013, 01:45
Peak Outflow :	382.9 (CFS)	Date/Time of Peak Outflow :	06Jan2013, 16:00
Total Inflow :	4872.8 (AC-FT)	Peak Storage :	2888.1 (AC-FT)
Total Outflow :	3015.5 (AC-FT)	Peak Elevation :	517.4 (FT)

130 ENVIRONMENTAL PARK

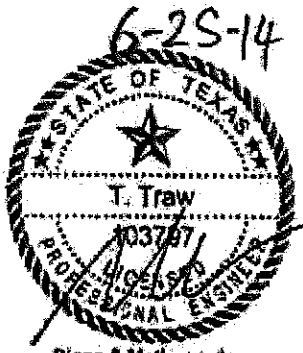
ATTACHMENT C2

APPENDIX C2-C

EXISTING CONDITIONS HEC-RAS EVALUATION

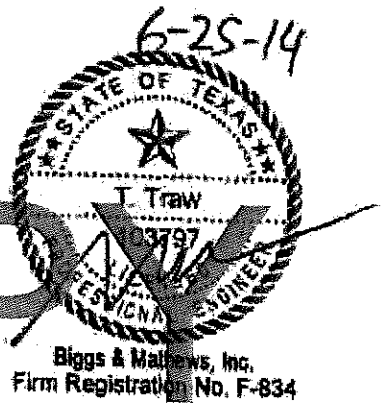
Includes pages C2-C-1 through C2-C-77

6-25-14

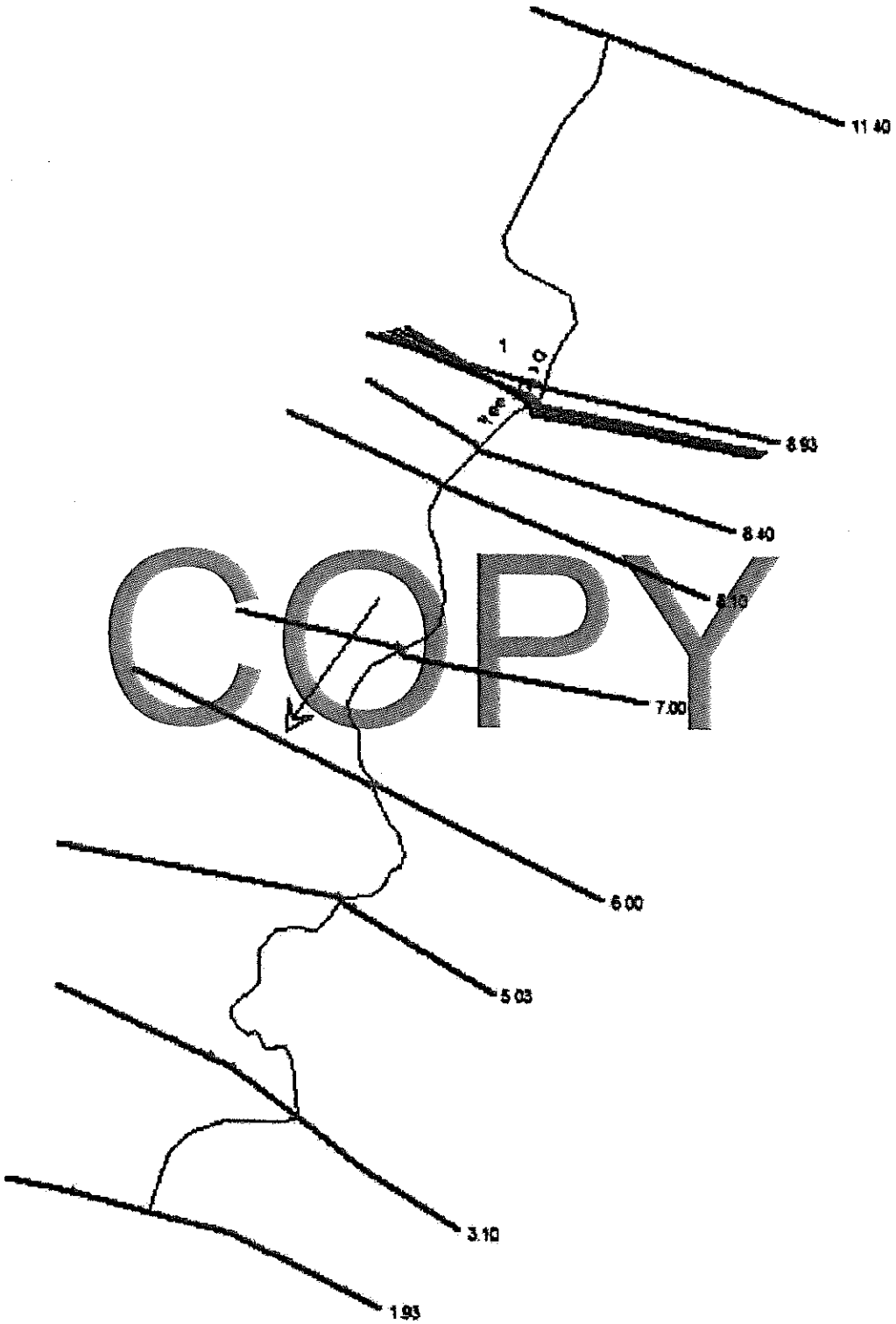


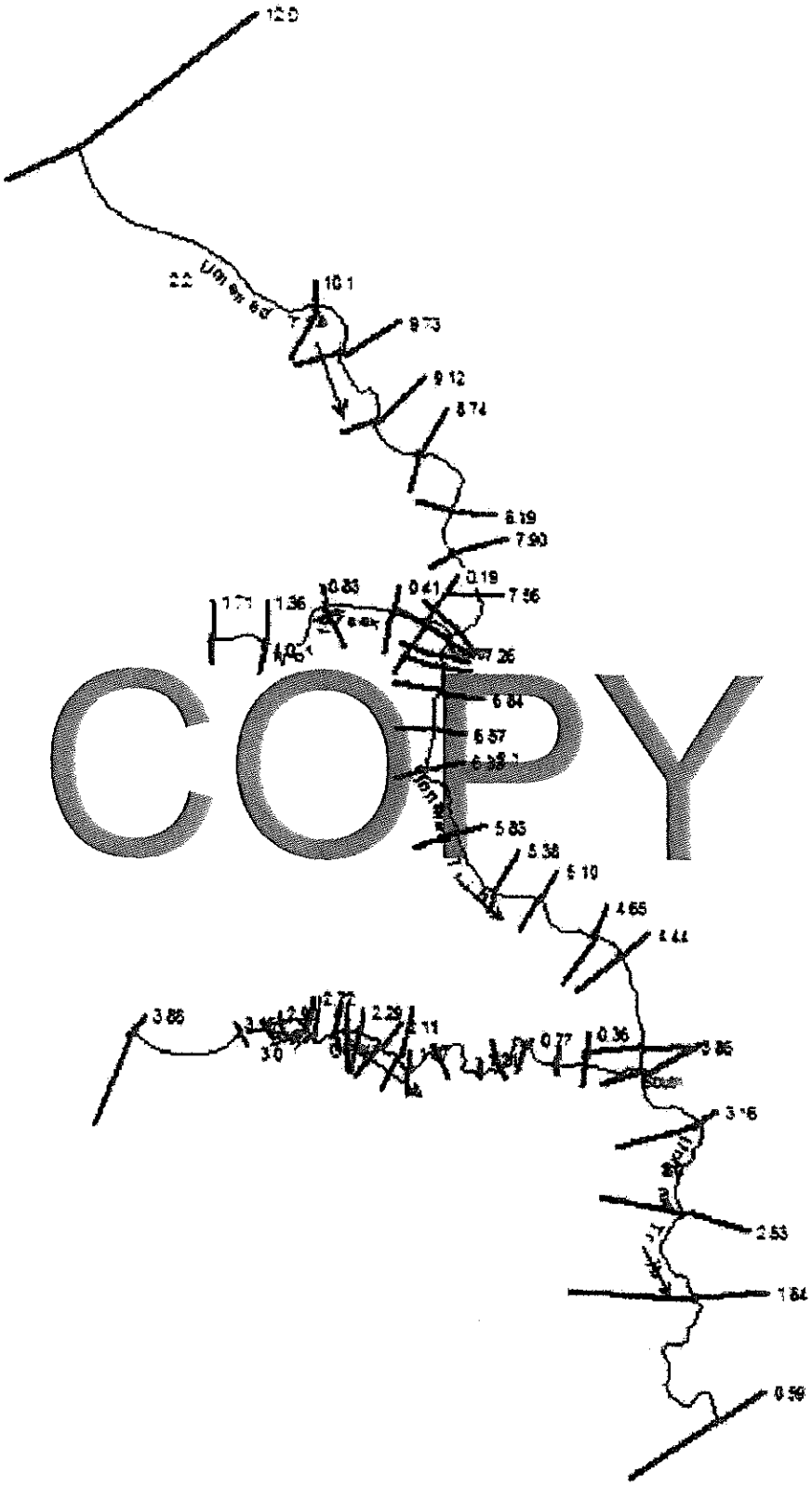
Biggs & Mathews, Inc.
Firm Registration No. F-834

CONTENTS



EXISTING CONDITION HEC-RAS SCHEMATIC

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9.73
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8.74
8.19
7.90
7.56
6.84
6.57
5.83
5.38
5.10
4.65
3.86
3.16
2.53
1.84
0.59

EXISTING CONDITION HEC-RAS ANALYSIS

HEC-RAS Plan: Dry Creek River: Dry Creek Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	11.40	100 yr	5381.00	514.60	521.38	521.38	522.04	0.035746	8.80	1152.96	746.25	0.74
1	11.40	25 yr	3939.60	514.60	521.12	521.12	521.67	0.030491	7.80	957.88	725.27	0.67
1	8.93	100 yr	5381.00	506.00	519.14	513.23	519.15	0.000099	1.16	6021.98	1361.27	0.06
1	8.93	25 yr	3939.60	506.00	517.64	512.74	517.66	0.000147	1.29	4130.43	1171.05	0.07
1	8.84	100 yr	5381.00	506.00	519.13	514.07	519.14	0.000127	1.19	5885.99	1323.34	0.07
1	8.84	25 yr	3939.60	506.00	517.63	513.53	517.64	0.000178	1.27	4094.37	1088.03	0.08
1	8.81		Culvert									
1	8.78	100 yr	5381.00	505.89	519.07		519.09	0.000217	1.66	5951.36	1321.31	0.09
1	8.78	25 yr	3939.60	505.89	517.61		517.63	0.000278	1.70	4190.24	1101.00	0.10
1	8.40	100 yr	5381.00	505.09	519.00		519.01	0.000194	1.65	6714.24	1606.63	0.08
1	8.40	25 yr	3939.60	505.09	517.50		517.52	0.000283	1.82	4497.96	1346.86	0.10
1	8.10	100 yr	5381.00	504.56	518.96		518.97	0.000090	1.17	9146.12	1799.46	0.06
1	8.10	25 yr	3939.60	504.56	517.46		517.47	0.000114	1.21	6638.62	1581.55	0.06
1	7.00	100 yr	7266.00	502.00	518.92		518.92	0.000028	0.73	14286.78	1609.42	0.03
1	7.00	25 yr	5326.50	502.00	517.42		517.42	0.000025	0.65	11952.51	1499.68	0.03
1	6.00	100 yr	7266.00	502.00	518.91		518.91	0.000012	0.72	20236.27	2123.98	0.03
1	6.00	25 yr	5326.50	502.00	517.41		517.41	0.000009	0.60	17241.55	1843.82	0.03
1	5.03	100 yr	7266.00	500.00	518.90		518.91	0.000007	0.49	23576.79	2115.32	0.02
1	5.03	25 yr	5326.50	500.00	517.40		517.40	0.000006	0.41	20489.25	1987.57	0.02
1	3.10	100 yr	7266.00	498.12	518.90		518.90	0.000001	0.28	32791.92	2343.33	0.01
1	3.10	25 yr	5326.50	498.12	517.40		517.40	0.000001	0.23	29346.24	2239.22	0.01
1	1.93	100 yr	7266.00	497.59	518.90	499.05	518.90	0.000001	0.27	32373.33	2207.92	0.01
1	1.93	25 yr	5326.50	497.59	517.40	498.83	517.40	0.000001	0.22	29172.10	1995.17	0.01

HEC-RAS Plan: Existing

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Unnamed Trib	2.2	12.0	100 yr	1933.40	555.00	559.03	558.97	560.08	0.017247	8.24	234.68	106.61	0.98
Unnamed Trib	2.2	12.0	25 yr	1410.50	555.00	558.52	558.47	559.43	0.017541	7.66	184.19	94.56	0.97
Unnamed Trib	2.2	10.1	100 yr	1933.40	546.00	550.74		550.93	0.002164	4.06	724.38	403.54	0.35
Unnamed Trib	2.2	10.1	25 yr	1410.50	546.00	550.30		550.47	0.002101	3.73	553.98	375.28	0.33
Unnamed Trib	2.2	9.73	100 yr	1933.40	544.26	548.64		549.05	0.013985	6.36	515.06	305.53	0.59
Unnamed Trib	2.2	9.73	25 yr	1410.50	544.26	548.18	547.76	548.59	0.015071	6.04	383.87	274.34	0.60
Unnamed Trib	2.2	9.12	100 yr	1933.40	539.18	546.15		546.26	0.002355	3.47	1014.55	539.36	0.26
Unnamed Trib	2.2	9.12	25 yr	1410.50	539.18	545.68		545.79	0.002290	3.23	773.58	494.42	0.25
Unnamed Trib	2.2	8.74	100 yr	1933.40	538.94	545.08		545.18	0.003943	4.02	864.84	439.63	0.32
Unnamed Trib	2.2	8.74	25 yr	1410.50	538.94	544.46		544.59	0.004989	4.13	617.91	381.95	0.36
Unnamed Trib	2.2	8.19	100 yr	1933.40	536.67	543.85		543.95	0.001608	3.19	941.12	365.22	0.22
Unnamed Trib	2.2	8.19	25 yr	1410.50	536.67	543.20		543.28	0.001534	2.90	722.52	303.07	0.21
Unnamed Trib	2.2	7.90	100 yr	1933.40	535.72	543.24		543.34	0.003135	4.25	771.96	314.25	0.29
Unnamed Trib	2.2	7.90	25 yr	1410.50	535.72	542.57		542.69	0.003137	3.96	587.77	257.91	0.29
Unnamed Trib	2.2	7.56	100 yr	1933.40	535.18	541.97	540.91	542.14	0.004436	5.21	684.42	294.55	0.36
Unnamed Trib	2.2	7.56	25 yr	1410.50	535.18	541.24		541.42	0.004936	5.07	492.29	228.93	0.37
Unnamed Trib	2.2	7.26	100 yr	1933.40	533.95	540.99		541.15	0.002947	4.20	744.29	252.23	0.30
Unnamed Trib	2.2	7.26	25 yr	1410.50	533.95	540.15		540.31	0.003254	4.01	549.23	211.36	0.30
Unnamed Trib	2.1	7.17	100 yr	2909.00	534.38	540.57		540.81	0.004334	4.87	898.42	300.89	0.36
Unnamed Trib	2.1	7.17	25 yr	2118.90	534.38	539.73		539.95	0.004509	4.48	673.28	242.25	0.35
Unnamed Trib	2.1	7.06	100 yr	2909.00	533.20	540.14		540.40	0.003616	4.61	809.58	228.77	0.33
Unnamed Trib	2.1	7.06	25 yr	2118.90	533.20	539.32		539.54	0.003492	4.12	638.29	194.58	0.31
Unnamed Trib	2.1	6.99	100 yr	2909.00	531.88	539.90		540.17	0.003521	4.92	812.67	244.53	0.33
Unnamed Trib	2.1	6.99	25 yr	2118.90	531.88	539.08		539.31	0.003367	4.42	631.71	200.48	0.31
Unnamed Trib	2.1	6.84	100 yr	2909.00	531.63	539.66		539.76	0.001525	3.52	1566.13	446.12	0.22
Unnamed Trib	2.1	6.84	25 yr	2118.90	531.63	538.80		538.90	0.001638	3.38	1193.94	424.77	0.23
Unnamed Trib	2.1	6.57	100 yr	2909.00	530.49	538.99		539.21	0.002606	4.31	975.43	269.30	0.28
Unnamed Trib	2.1	6.57	25 yr	2118.90	530.49	538.18		538.36	0.002393	3.81	769.57	237.89	0.27

HEC-RAS Plan: Existing (Continued)

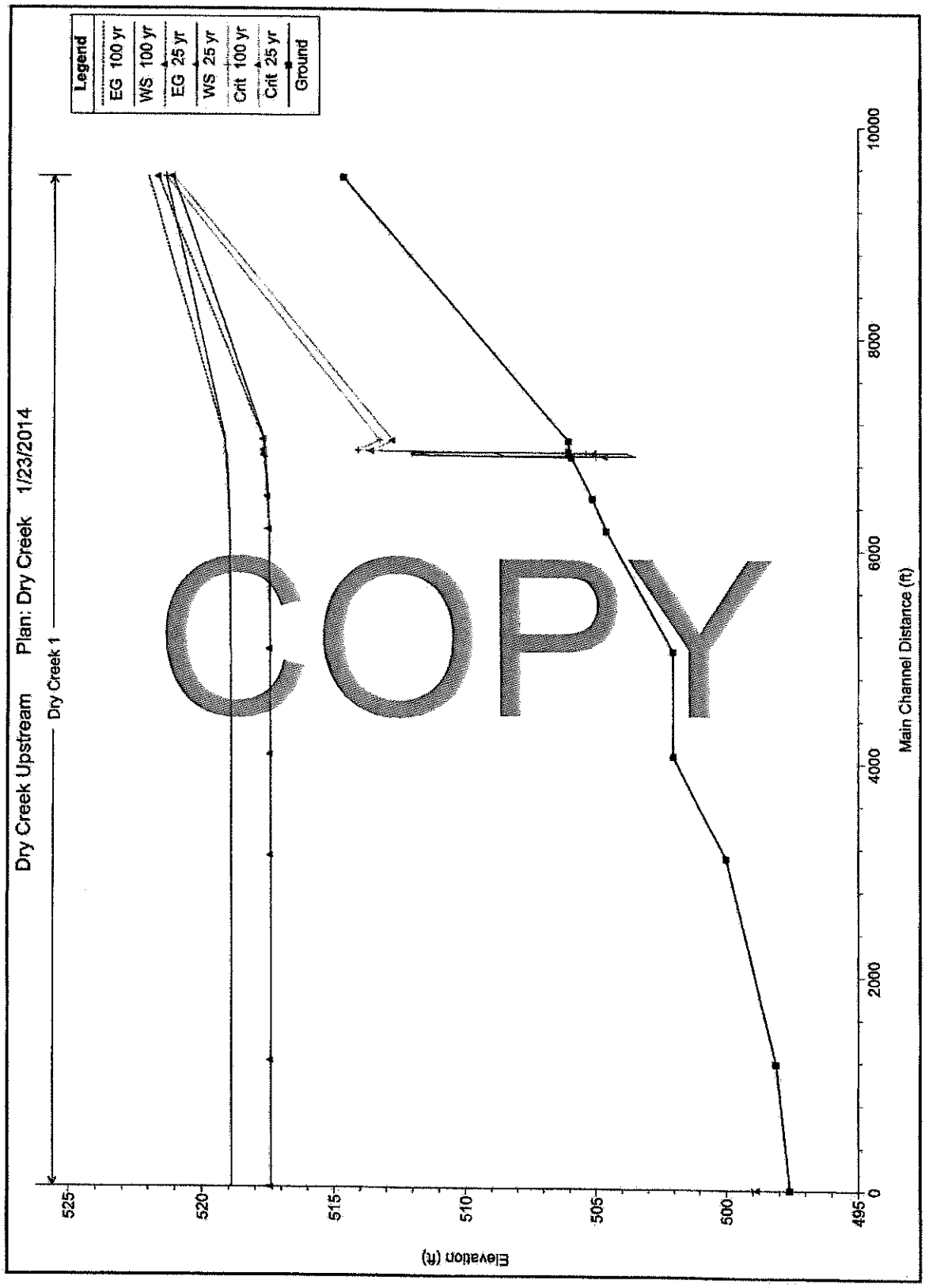
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Unnamed Trib	2.1	6.33	100 yr	2909.00	530.55	537.97		538.31	0.005338	5.87	810.94	256.11	0.40
Unnamed Trib	2.1	6.33	25 yr	2118.90	530.55	537.22		537.52	0.005142	5.32	630.40	223.29	0.38
Unnamed Trib	2.1	5.83	100 yr	2909.00	527.28	535.23		535.55	0.006706	6.51	778.38	255.77	0.44
Unnamed Trib	2.1	5.83	25 yr	2118.90	527.28	534.51		534.80	0.006652	6.03	606.39	225.92	0.43
Unnamed Trib	2.1	5.38	100 yr	2909.00	525.29	532.81		533.07	0.004352	5.28	928.24	296.77	0.36
Unnamed Trib	2.1	5.38	25 yr	2118.90	525.29	532.11		532.35	0.004286	4.87	727.49	281.24	0.35
Unnamed Trib	2.1	5.10	100 yr	2909.00	523.57	531.49		531.77	0.004970	5.40	898.23	300.25	0.38
Unnamed Trib	2.1	5.10	25 yr	2118.90	523.57	530.91		531.14	0.004435	4.78	728.12	277.14	0.35
Unnamed Trib	2.1	4.65	100 yr	2909.00	521.27	528.96		529.27	0.006901	6.62	945.43	431.63	0.45
Unnamed Trib	2.1	4.65	25 yr	2118.90	521.27	528.43		528.75	0.007022	6.32	722.03	408.82	0.45
Unnamed Trib	2.1	4.44	100 yr	2909.00	520.53	527.62		527.83	0.006230	5.87	1017.00	414.56	0.42
Unnamed Trib	2.1	4.44	25 yr	2118.90	520.53	527.10		527.30	0.006096	5.47	807.07	389.06	0.41
Unnamed Trib	2.1	3.86	100 yr	2909.00	518.57	525.13		525.27	0.003320	4.06	1284.89	519.55	0.31
Unnamed Trib	2.1	3.86	25 yr	2118.90	518.57	524.48		524.62	0.003657	3.91	942.35	463.22	0.32
Unnamed Trib	2.0	3.70	100 yr	3775.40	516.79	524.06		524.51	0.006314	6.16	948.69	319.19	0.43
Unnamed Trib	2.0	3.70	25 yr	2740.00	516.79	523.66		523.96	0.004487	4.97	825.96	290.58	0.36
Unnamed Trib	2.0	3.16	100 yr	3775.40	512.97	519.32		519.92	0.012554	7.26	775.41	311.24	0.58
Unnamed Trib	2.0	3.16	25 yr	2740.00	512.97	518.02	518.02	519.03	0.027811	8.76	421.32	234.95	0.82
Unnamed Trib	2.0	2.53	100 yr	3775.40	509.18	518.96		519.00	0.000445	1.99	2838.76	644.04	0.12
Unnamed Trib	2.0	2.53	25 yr	2740.00	509.18	517.45	512.98	517.50	0.000625	2.06	1919.93	557.07	0.14
Unnamed Trib	2.0	1.84	100 yr	3775.40	504.96	518.92		518.93	0.000043	0.80	6750.90	1032.00	0.04
Unnamed Trib	2.0	1.84	25 yr	2740.00	504.96	517.42		517.42	0.000043	0.73	5320.17	867.01	0.04
Unnamed Trib	2.0	0.59	100 yr	3775.40	498.13	518.90	506.54	518.90	0.000018	0.65	9669.92	938.57	0.03
Unnamed Trib	2.0	0.59	25 yr	2740.00	498.13	517.40	505.58	517.40	0.000015	0.56	8288.81	903.26	0.02
South Creek	3.0	3.88	100 yr	337.20	580.00	581.50	580.97	581.60	0.009409	2.91	147.05	151.83	0.42
South Creek	3.0	3.88	25 yr	245.40	580.00	581.30	580.82	581.38	0.009012	2.59	118.20	137.49	0.40
South Creek	3.0	3.16	100 yr	337.20	567.00	568.68		569.01	0.041998	6.61	81.58	76.00	0.90

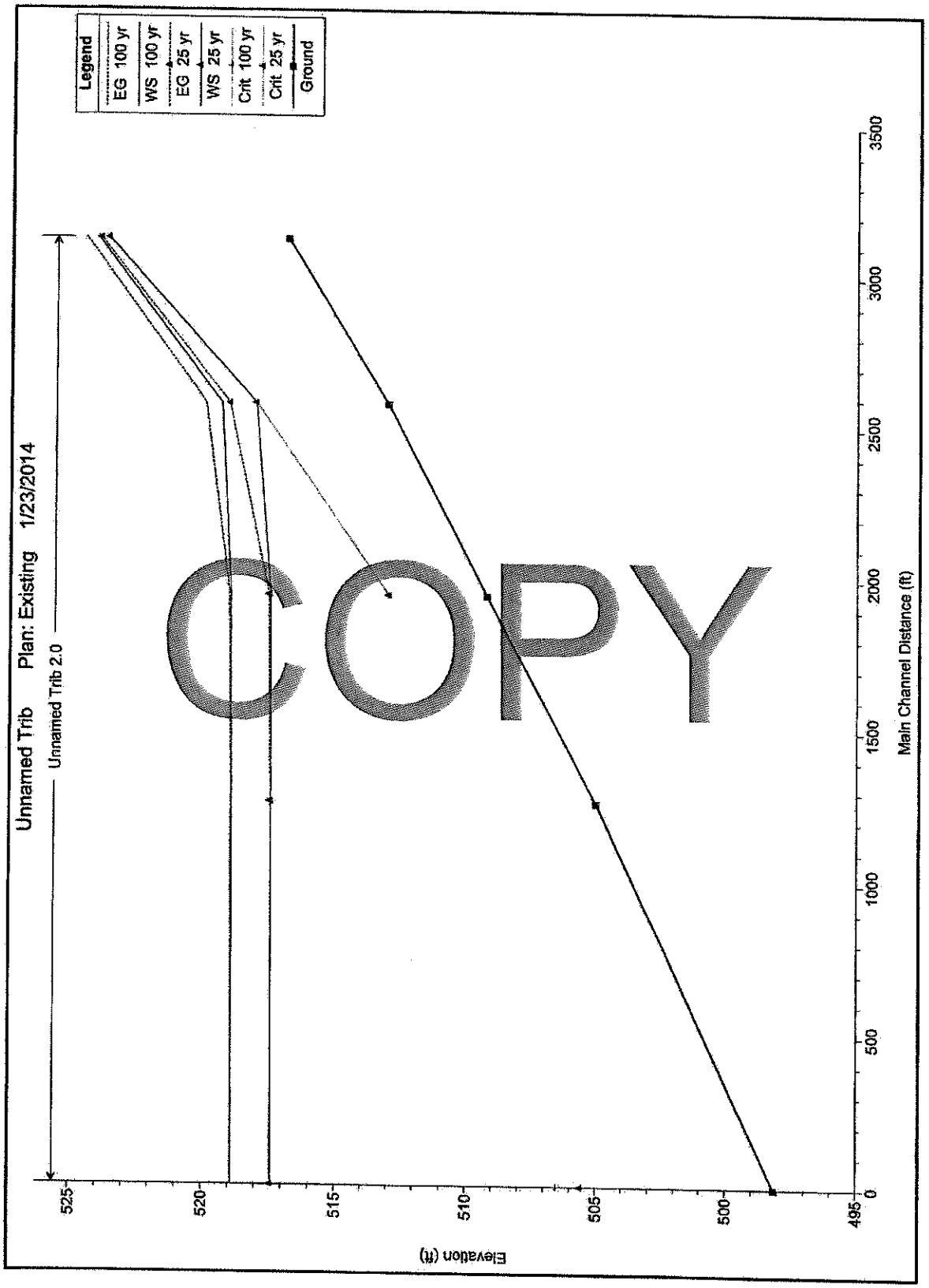
HEC-RAS Plan: Existing (Continued)

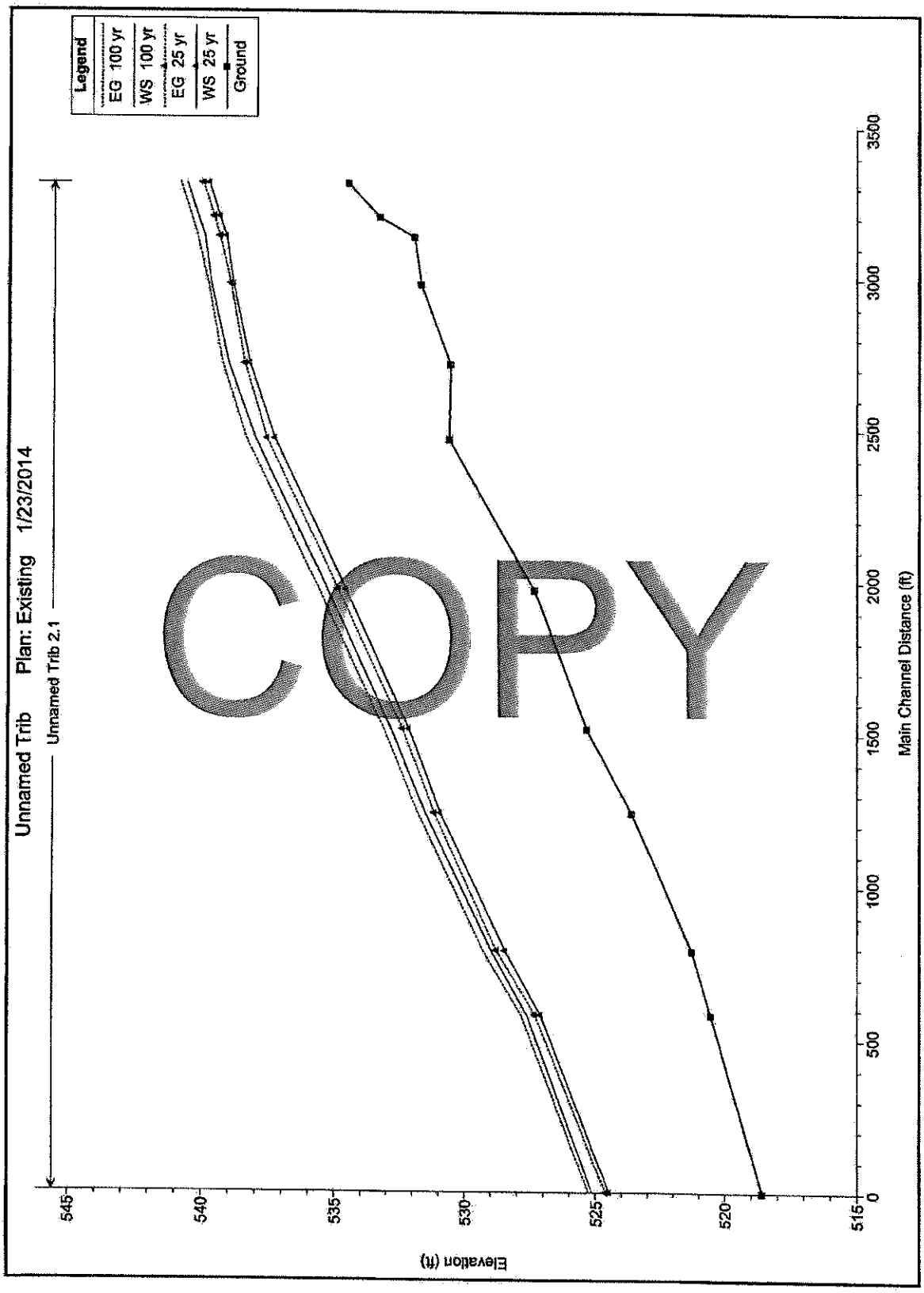
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Creek	3.0	3.16	25 yr	245.40	567.00	568.43	568.36	568.74	0.046657	6.27	63.24	72.50	0.92
South Creek	3.0	2.99	100 yr	337.20	563.05	565.43		565.64	0.011701	3.80	100.17	68.96	0.48
South Creek	3.0	2.99	25 yr	245.40	563.05	565.14		565.30	0.011388	3.35	80.63	63.56	0.47
South Creek	3.0	2.90	100 yr	337.20	561.91	563.82	563.49	564.12	0.021087	4.87	89.06	75.85	0.64
South Creek	3.0	2.90	25 yr	245.40	561.91	563.55	563.25	563.80	0.021287	4.38	69.66	67.84	0.63
South Creek	3.0	2.72	100 yr	337.20	554.76	557.72	557.72	558.56	0.053903	7.33	46.01	27.62	1.00
South Creek	3.0	2.72	25 yr	245.40	554.76	557.32	557.32	558.06	0.057514	6.91	35.50	24.45	1.01
South Creek	3.0	2.65	100 yr	337.20	554.11	556.58	555.84	556.79	0.010276	3.82	102.57	67.06	0.46
South Creek	3.0	2.65	25 yr	245.40	554.11	556.21	555.58	556.39	0.011275	3.51	78.46	60.31	0.47
South Creek	3.0	2.48	100 yr	337.20	550.38	553.70		554.17	0.022857	5.50	62.16	32.46	0.67
South Creek	3.0	2.48	25 yr	245.40	550.38	553.39		553.74	0.020894	4.70	52.37	30.68	0.62
South Creek	3.0	2.36	100 yr	337.20	549.54	551.79		552.13	0.024346	5.22	85.03	78.41	0.69
South Creek	3.0	2.36	25 yr	245.40	549.54	551.52		551.82	0.024728	4.72	65.63	68.89	0.68
South Creek	3.0	2.29	100 yr	337.20	547.28	549.93	549.64	550.38	0.022999	5.98	76.01	57.85	0.70
South Creek	3.0	2.29	25 yr	245.40	547.28	549.62	549.32	549.99	0.022131	5.32	59.40	49.97	0.67
South Creek	3.0	2.11	100 yr	337.20	544.58	546.93		547.21	0.015195	4.55	88.86	59.80	0.56
South Creek	3.0	2.11	25 yr	245.40	544.58	546.61		546.84	0.015274	4.08	70.49	55.72	0.54
South Creek	3.0	1.97	100 yr	337.20	542.05	544.91		545.20	0.013285	4.67	92.31	62.12	0.53
South Creek	3.0	1.97	25 yr	245.40	542.05	544.54		544.79	0.013833	4.26	70.69	54.42	0.53
South Creek	3.0	1.87	100 yr	337.20	541.35	543.84		544.04	0.008963	3.69	97.66	52.87	0.43
South Creek	3.0	1.87	25 yr	245.40	541.35	543.54		543.69	0.007834	3.13	82.33	50.23	0.40
South Creek	3.0	1.66	100 yr	337.20	539.78	541.98		542.13	0.009260	3.45	126.21	106.48	0.43
South Creek	3.0	1.66	25 yr	245.40	539.78	541.63		541.78	0.010786	3.27	91.86	90.12	0.45
South Creek	3.0	1.21	100 yr	337.20	532.89	535.40	535.00	535.88	0.026395	6.46	76.22	60.92	0.75
South Creek	3.0	1.21	25 yr	245.40	532.89	535.13		535.46	0.021140	5.32	61.78	45.29	0.66
South Creek	3.0	1.08	100 yr	337.20	531.07	534.07		534.21	0.006541	3.17	127.35	83.73	0.37
South Creek	3.0	1.08	25 yr	245.40	531.07	533.63		533.76	0.007915	3.01	92.82	71.80	0.39

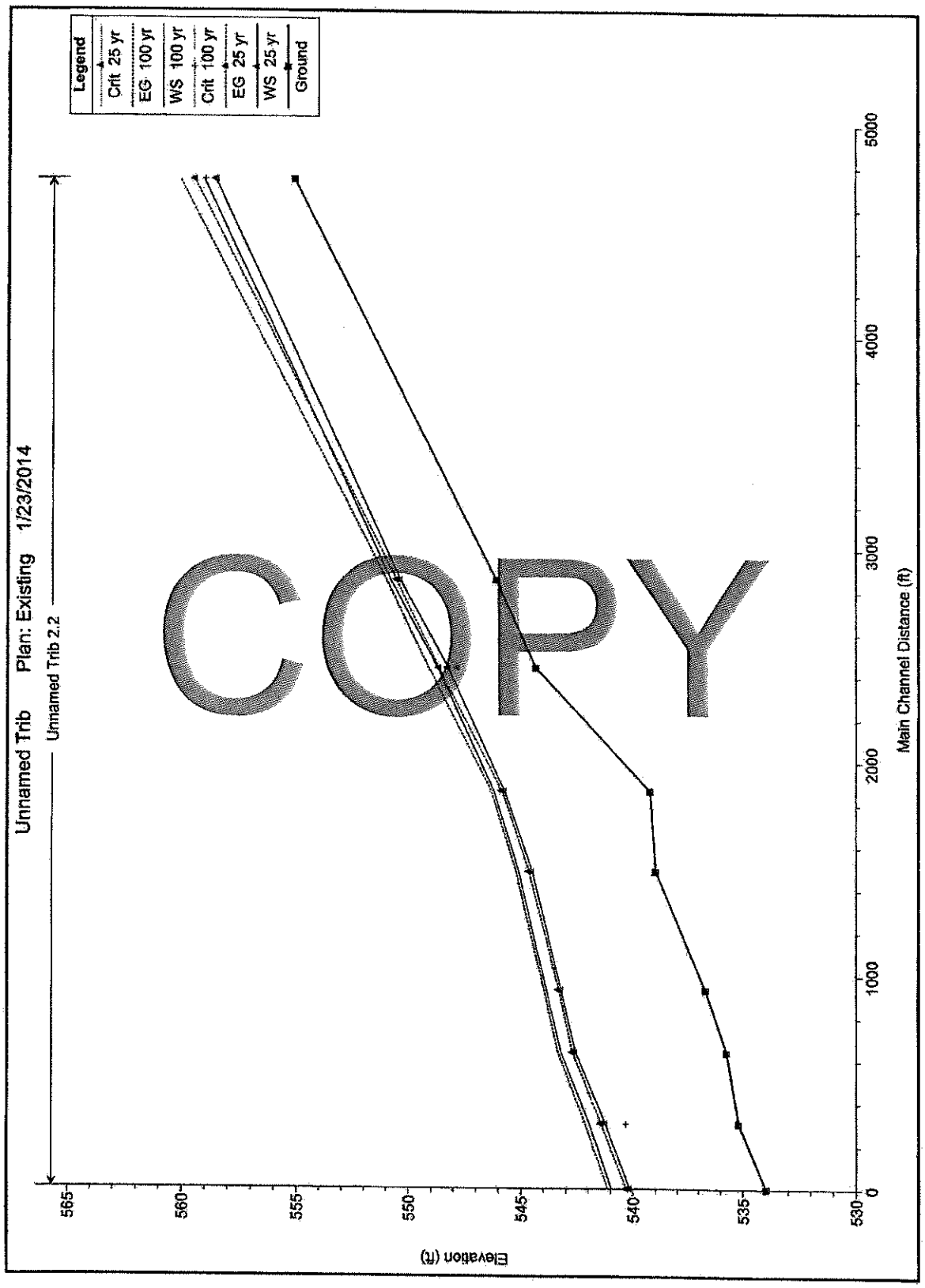
HEC-RAS Plan: Existing (Continued)

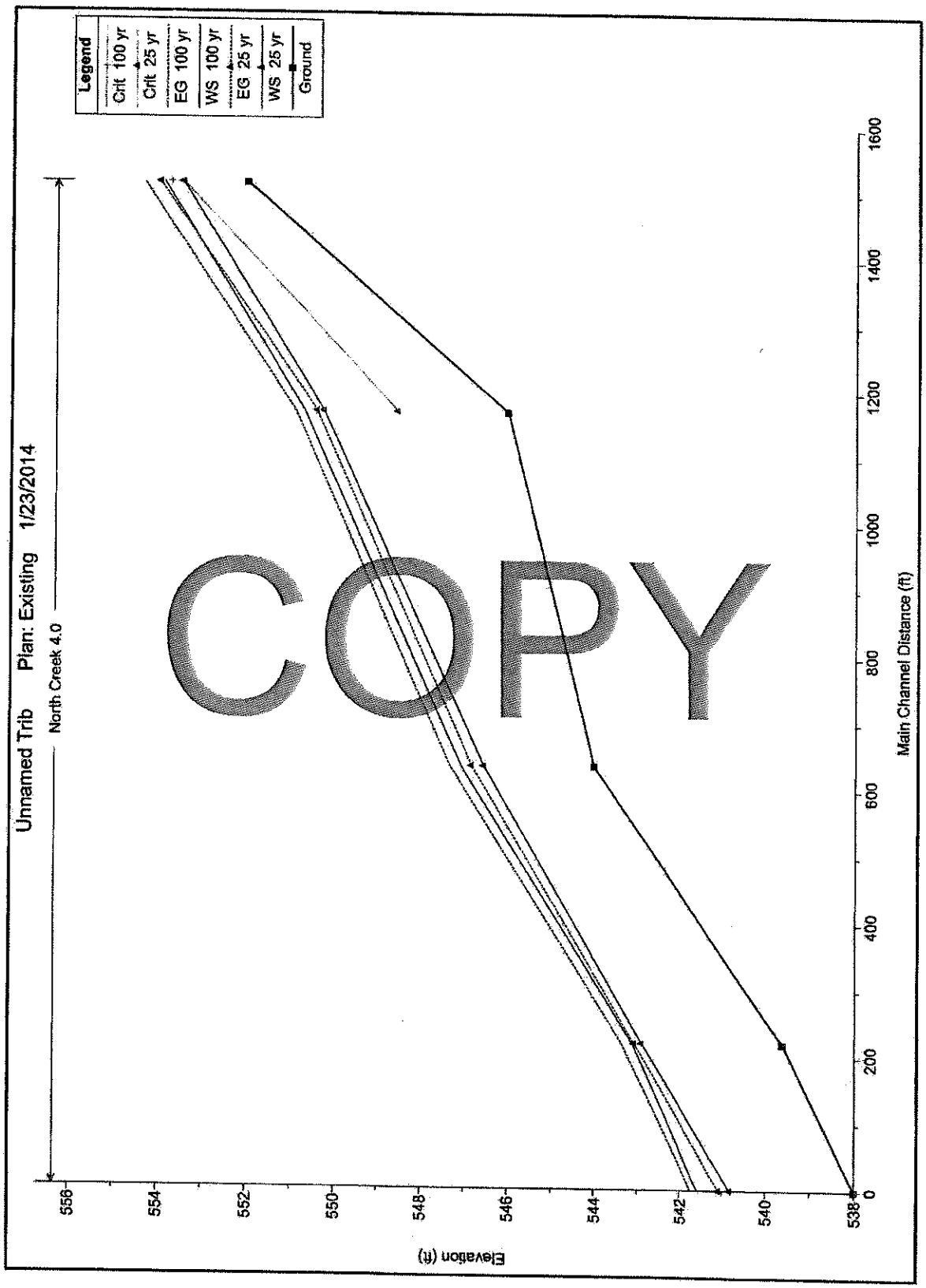
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Creek	3.0	0.77	100 yr	337.20	527.80	532.35	530.73	532.54	0.004760	3.76	128.92	85.76	0.34
South Creek	3.0	0.77	25 yr	245.40	527.80	531.92		532.06	0.004171	3.24	96.07	51.41	0.31
South Creek	3.0	0.53	100 yr	337.20	528.00	529.45	529.45	529.87	0.050737	5.85	75.03	91.66	0.94
South Creek	3.0	0.53	25 yr	245.40	528.00	529.27	529.27	529.63	0.051032	5.28	59.36	85.93	0.91
South Creek	3.0	0.36	100 yr	337.20	523.75	526.26	524.84	526.29	0.000755	1.62	304.77	206.14	0.18
South Creek	3.0	0.36	25 yr	245.40	523.75	525.46	524.67	525.52	0.002102	2.06	159.84	155.10	0.29
North Creek	4.0	1.71	100 yr	975.70	552.00	553.90	553.75	554.36	0.035119	6.57	223.42	186.46	0.84
North Creek	4.0	1.71	25 yr	716.60	552.00	553.48	553.48	554.00	0.051292	6.74	152.31	156.89	0.97
North Creek	4.0	1.36	100 yr	975.70	546.00	550.78		550.90	0.004631	4.23	360.83	152.39	0.35
North Creek	4.0	1.36	25 yr	716.60	546.00	550.25	548.55	550.40	0.003985	3.66	295.64	136.88	0.32
North Creek	4.0	0.83	100 yr	975.70	544.00	547.08		547.33	0.011148	4.85	309.59	185.15	0.51
North Creek	4.0	0.83	25 yr	716.60	544.00	546.55		546.82	0.014462	4.82	218.78	159.96	0.56
North Creek	4.0	0.41	100 yr	975.70	539.61	543.13		543.36	0.008447	4.48	306.54	173.87	0.45
North Creek	4.0	0.41	25 yr	716.60	539.61	542.90		543.07	0.006196	3.66	270.42	185.37	0.38
North Creek	4.0	0.19	100 yr	975.70	538.00	541.61		541.75	0.006128	3.99	400.20	255.47	0.39
North Creek	4.0	0.19	25 yr	716.60	538.00	540.82		541.09	0.014078	5.05	222.51	196.11	0.56

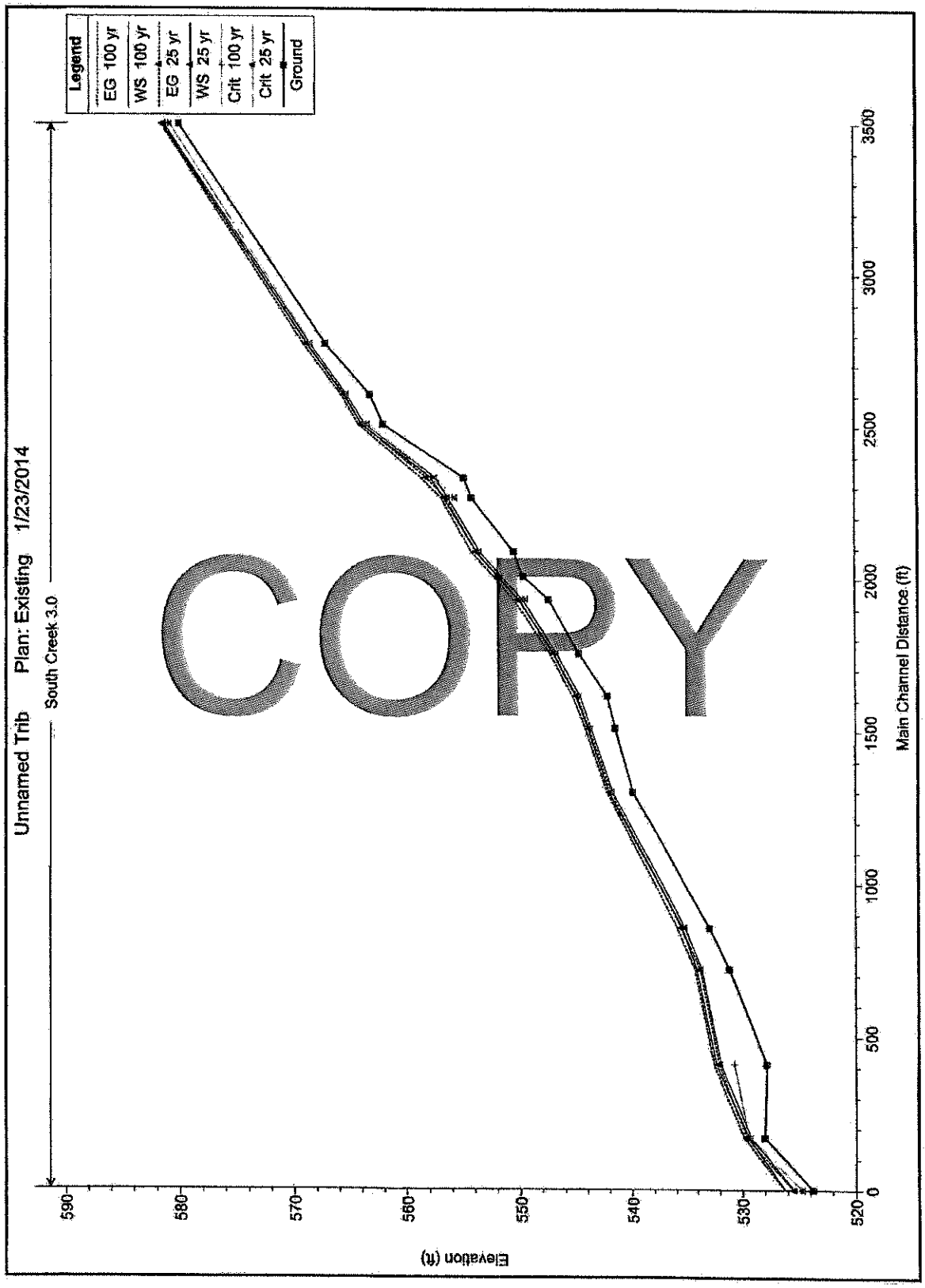

Dry Creek Upstream Plan: Dry Creek 1/23/2014
Dry Creek 1
Legend
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Crit 100 yr
Crit 25 yr
Ground
Elevation (ft)
525
520
515
510
505
500
495
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)

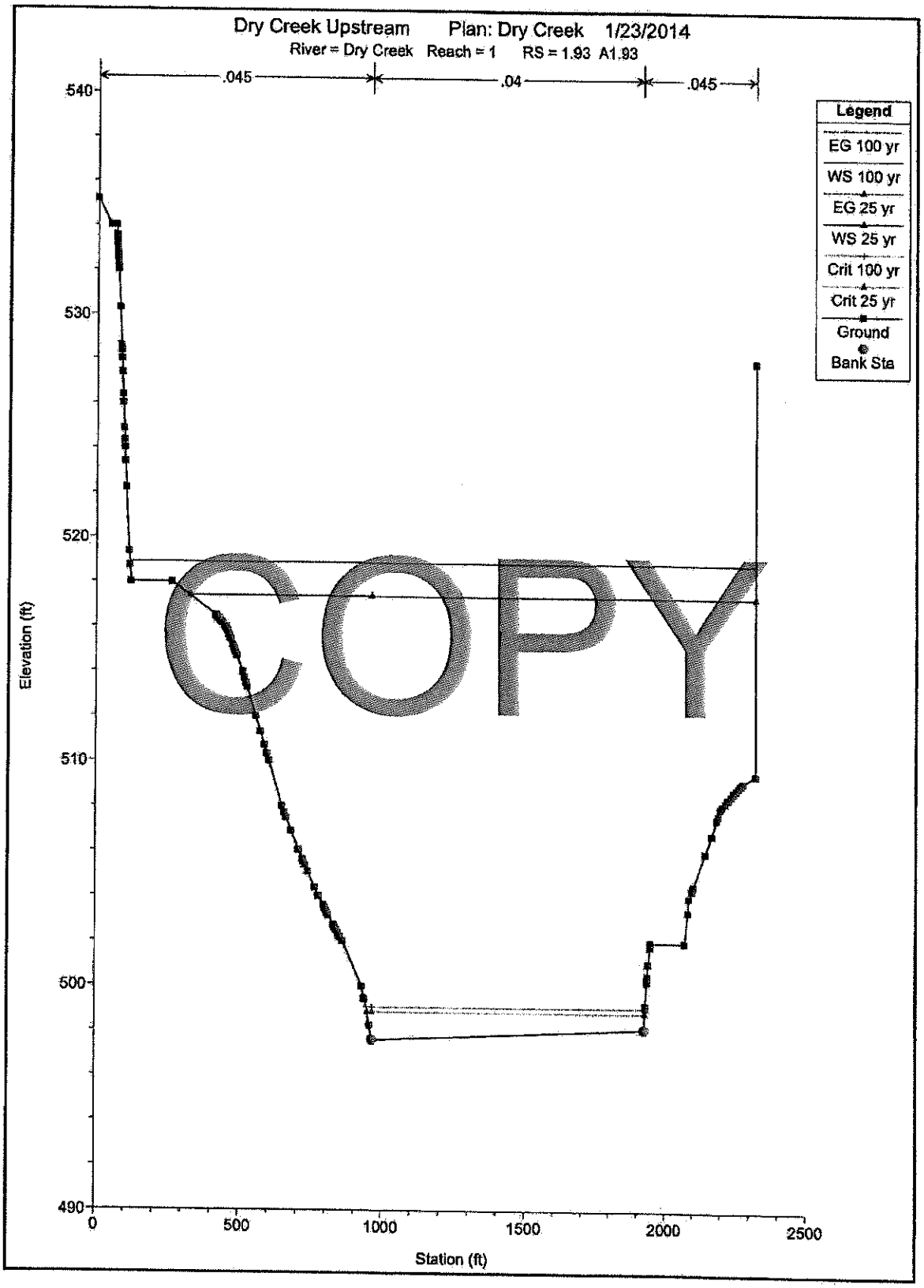

Unnamed Trib Plan: Existing 1/23/2014
Unnamed Trib 2.0
Legend
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Crit 100 yr
Crit 25 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
525
520
515
510
505
500
495
0
500
1000
1500
2000
2500
3000
3500

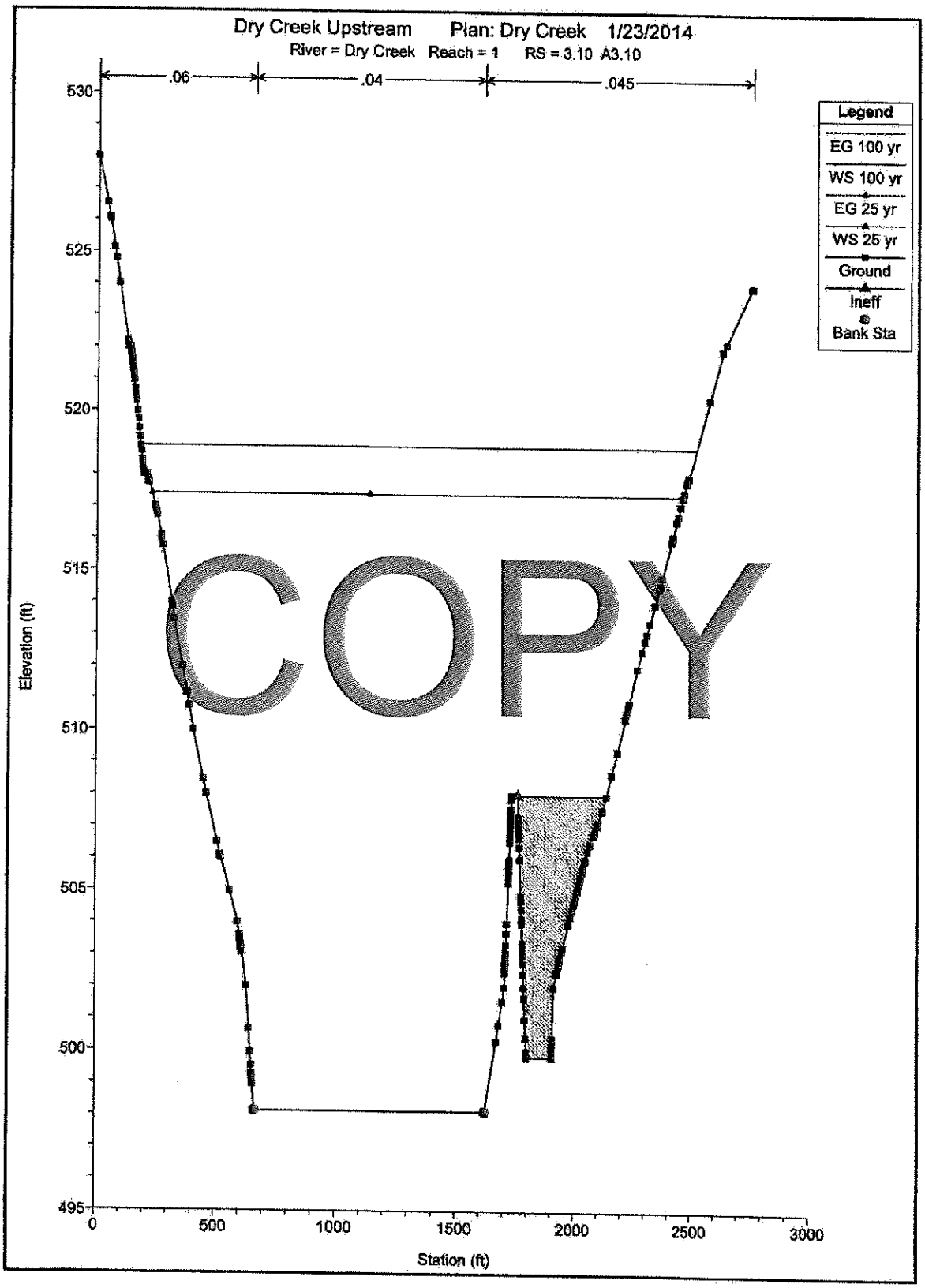

Unnamed Trib Plan: Existing 1/23/2014
Unnamed Trib 2.1
Legend
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
545
540
535
530
525
520
515
0
500
1000
1500
2000
2500
3000
3500


Unnamed Trib Plan: Existing 1/23/2014
Unnamed Trib 2.2
Legend
Crit 25 yr
EG 100 yr
WS 100 yr
Crit 100 yr
EG 25 yr
WS 25 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
565
560
555
550
545
540
535
530
0
1000
2000
3000
4000
5000


Unnamed Trib Plan: Existing 1/23/2014
North Creek 4.0
Legend
Crit 100 yr
Crit 25 yr
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
538
540
542
544
546
548
550
552
554
556
0
200
400
600
800
1000
1200
1400
1600


Unnamed Trib Plan: Existing 1/23/2014
South Creek 3.0
Legend
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Crit 100 yr
Crit 25 yr
Ground
Elevation (ft)
590
580
570
560
550
540
530
520
0
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)


Dry Creek Upstream Plan: Dry Creek 1/23/2014
River = Dry Creek Reach = 1 RS = 1.93 A1.93
.045
.04
.045
Legend
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Crit 100 yr
Crit 25 yr
Ground
Bank Sta
Elevation (ft)
540
530
520
510
500
490
0
500
1000
1500
2000
2500
Station (ft)


Dry Creek Upstream Plan: Dry Creek 1/23/2014
River = Dry Creek Reach = 1 RS = 3.10 A3.10
.06
.04
.045
Legend
EG 100 yr
WS 100 yr
EG 25 yr
WS 25 yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
530
525
520
515
510
505
500
495
0
500
1000
1500
2000
2500
3000