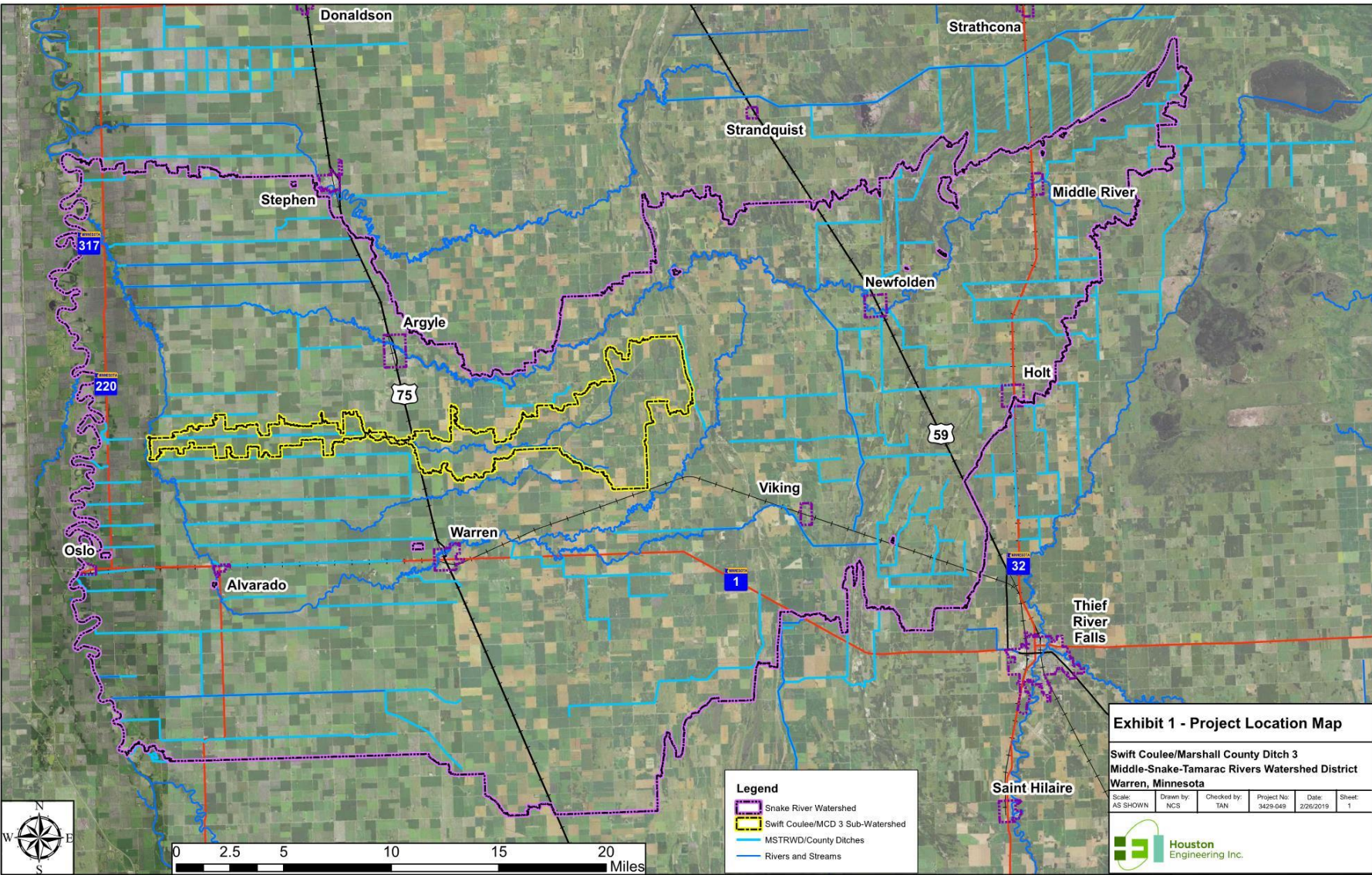
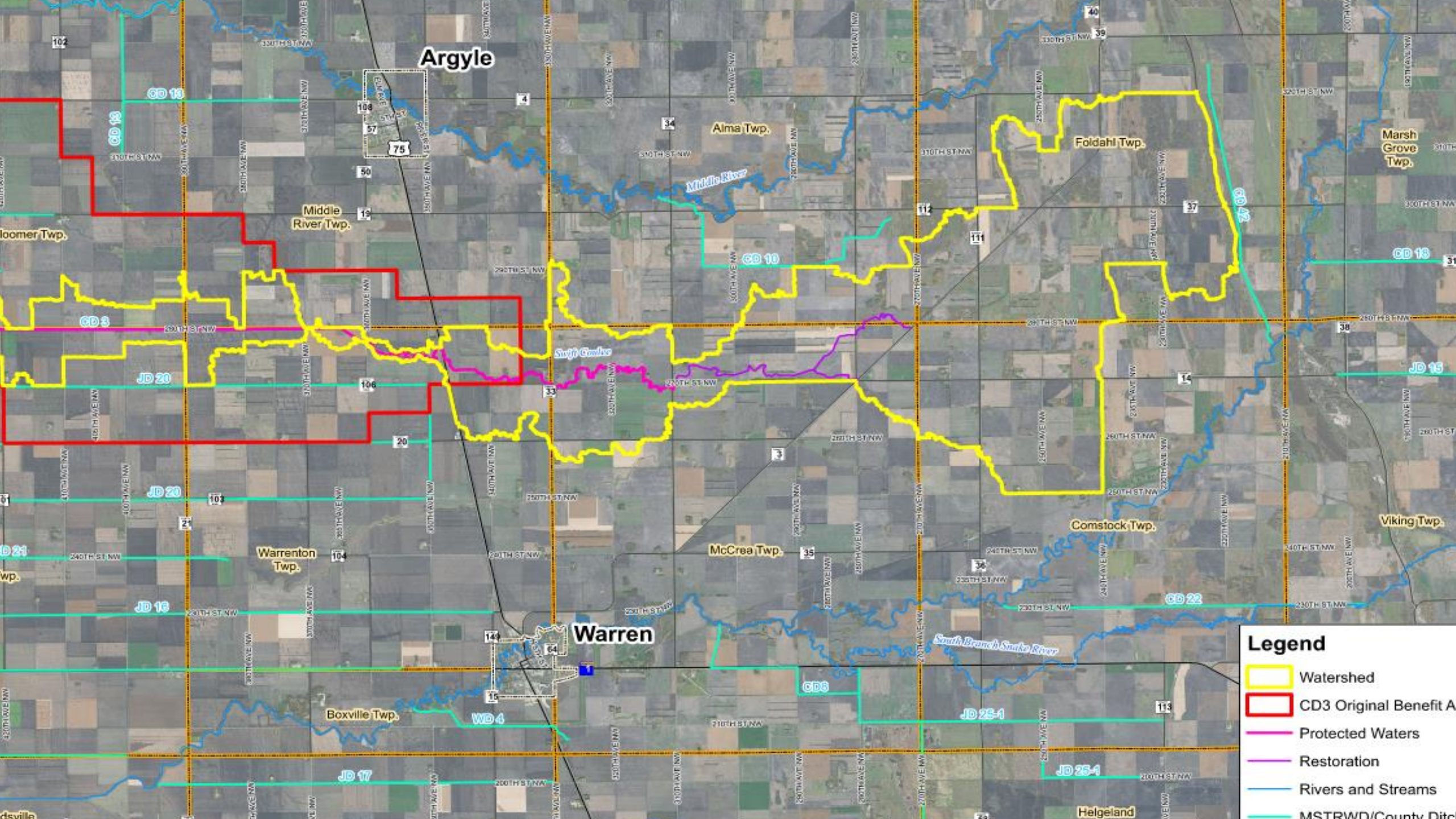


SWIFT COULEE CHANNEL RESTORATION PROJECT

MIDDLE-SNAKE-TAMARAC RIVERS WATERSHED DISTRICT

DECEMBER 19, 2022

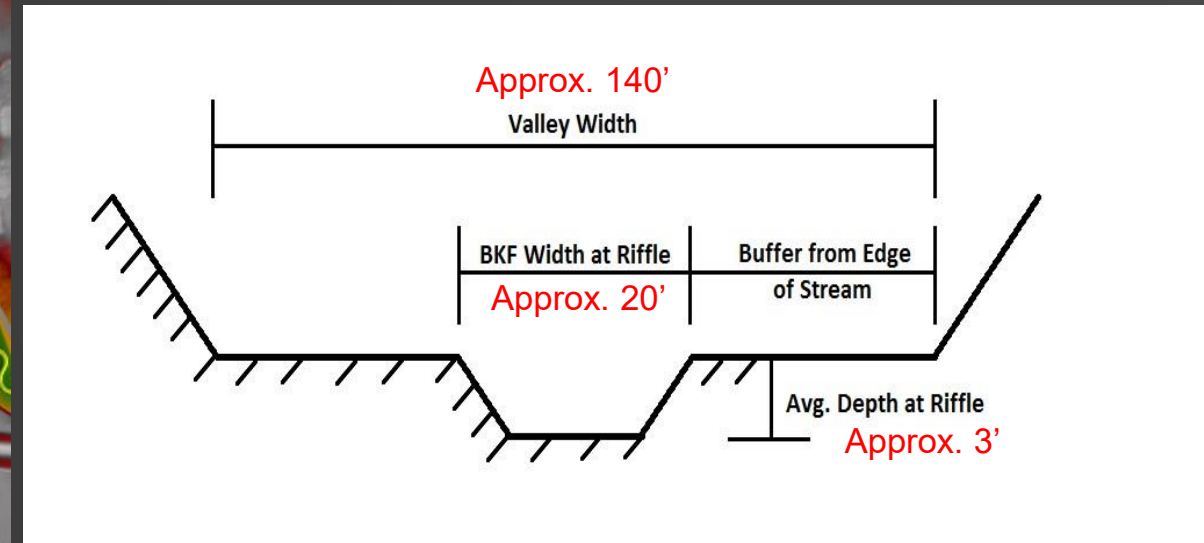
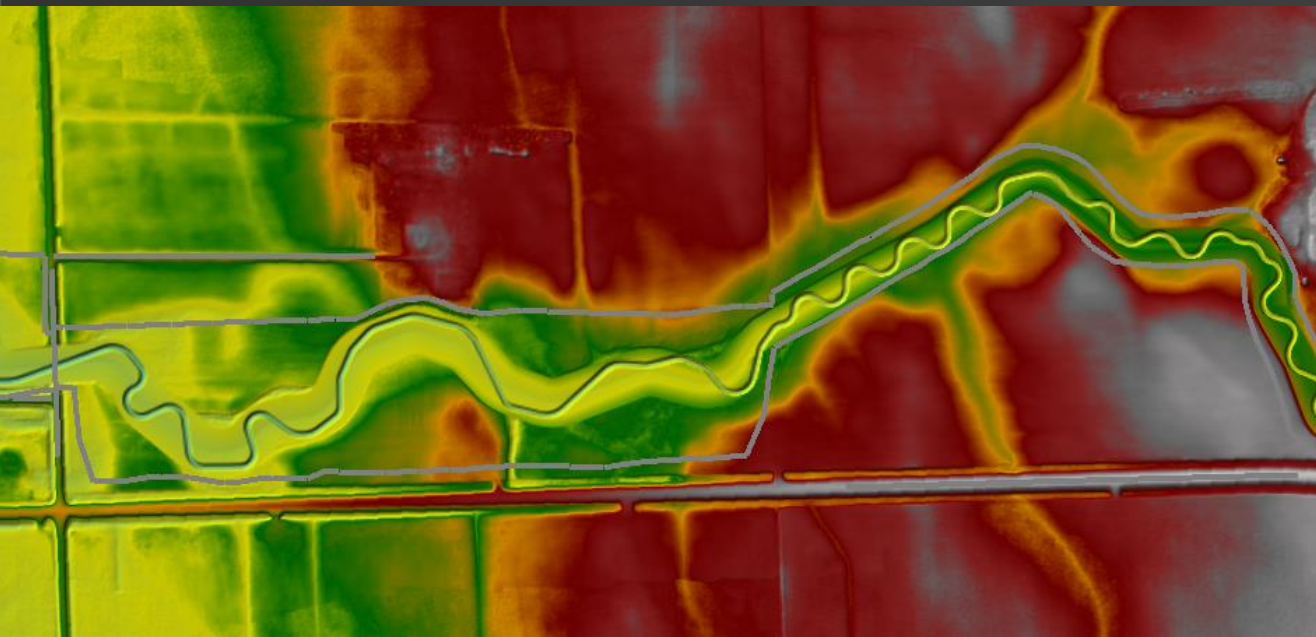




Review Hydraulic & Hydrologic Modeling Results

E- Channel Restoration

- Culvert to Culvert Profile – Multiple Centerline Culverts Modified to Simulate Existing 10-yr Peak Flows
- Historic Aerial Photography – Add Meander Back into Channel Alignment with Set Back Levees
- Image of 1.5-yr Meandering Channel with 10-yr Floodplain and Set Back Levees














■ Tasks completed

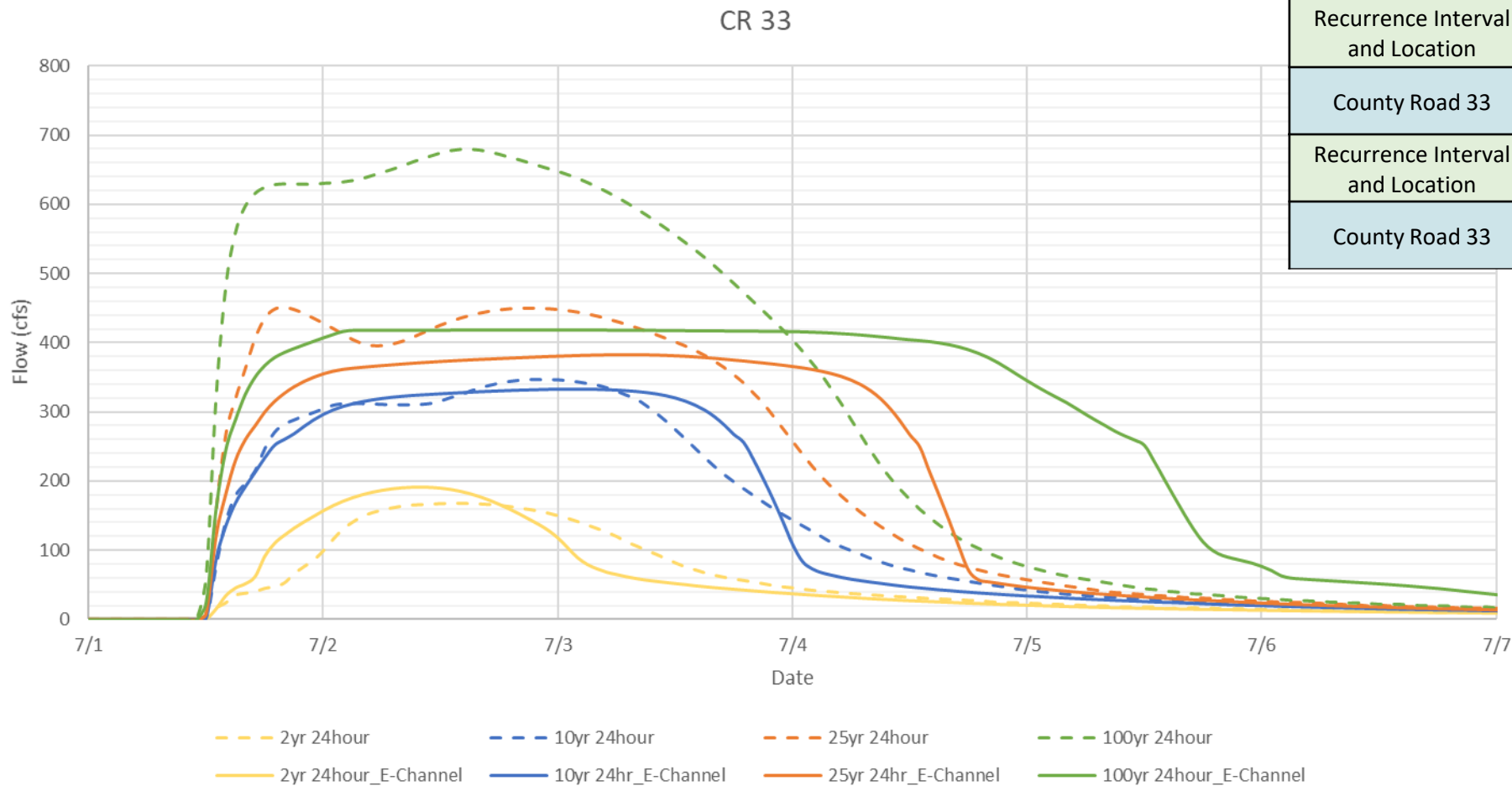
- Purpose and Need of Project – Concurrence Point #1
- Potential Alternatives and Alternatives to Carry Forward – Concurrence Point #2
- Individual Meetings with Majority Landowners where Alternatives were Identified
- Identification of the Selected Alternative – Concurrence Point #3
 - 13 Alternatives screened through the Concurrence Point process
 - Alt.11 – Restoration with Impoundment showed the most benefit meeting the purpose and need
 - Landowner Unwillingness – Alt. 11 – August 19, 2020 Project Team Meeting – Landowners Suggest Share Flooding Burden
 - Alt. 13 – Channel Restoration/Setback Levees/Culvert Sizing/SWI's – Share Flooding Burden
- Alt. 13 – Selected as Preferred Alternative on February 11, 2021 Project Team Meeting

CHANNEL RESTORATION CULVERT CHANGES



Location	Existing	Preliminary Proposed
 County Ditch 3	Box Culverts 2- 12'X6'	Box Culvert 10'X5'
 Sect 2/3 Warrenton	RCP 2-48"	RCP 2-48"
 US Highway 75	Box Culverts 3 - 10'X5' & RCP 2-36"	Box Culverts 3 - 10'X5' & RCP 2-36"
 340 th Ave NW	Box Culverts 2- 10'X6'	Box Culvert 8'X5'
 County Road 33	Box Culvert 12'X8'	Box Culvert - 6'X5'
 320 th Ave NW	CMP 6' 5' & 5'	CMP 5' & 4'
 County Road 34	CMPA 2 - 6.08'X4.5'	CMPA 2 - 5.58'X3.4'
 270 th St NW	CMP 2 - 5.5'	CMP 5' & 5'
 300 th Ave NW	CMP 5' 4' & 3'	CMP 5' 3' & 2'
290 th Ave NW	CMP 5' & 3'	CMP 5' 3' & 2'
County Road 1	CMPA 6'X3.7'	CMPA 6'X3.7'
Driveway	CMP 6'	CMP 6'

CHANNEL RESTORATION RESULTS –CR 33



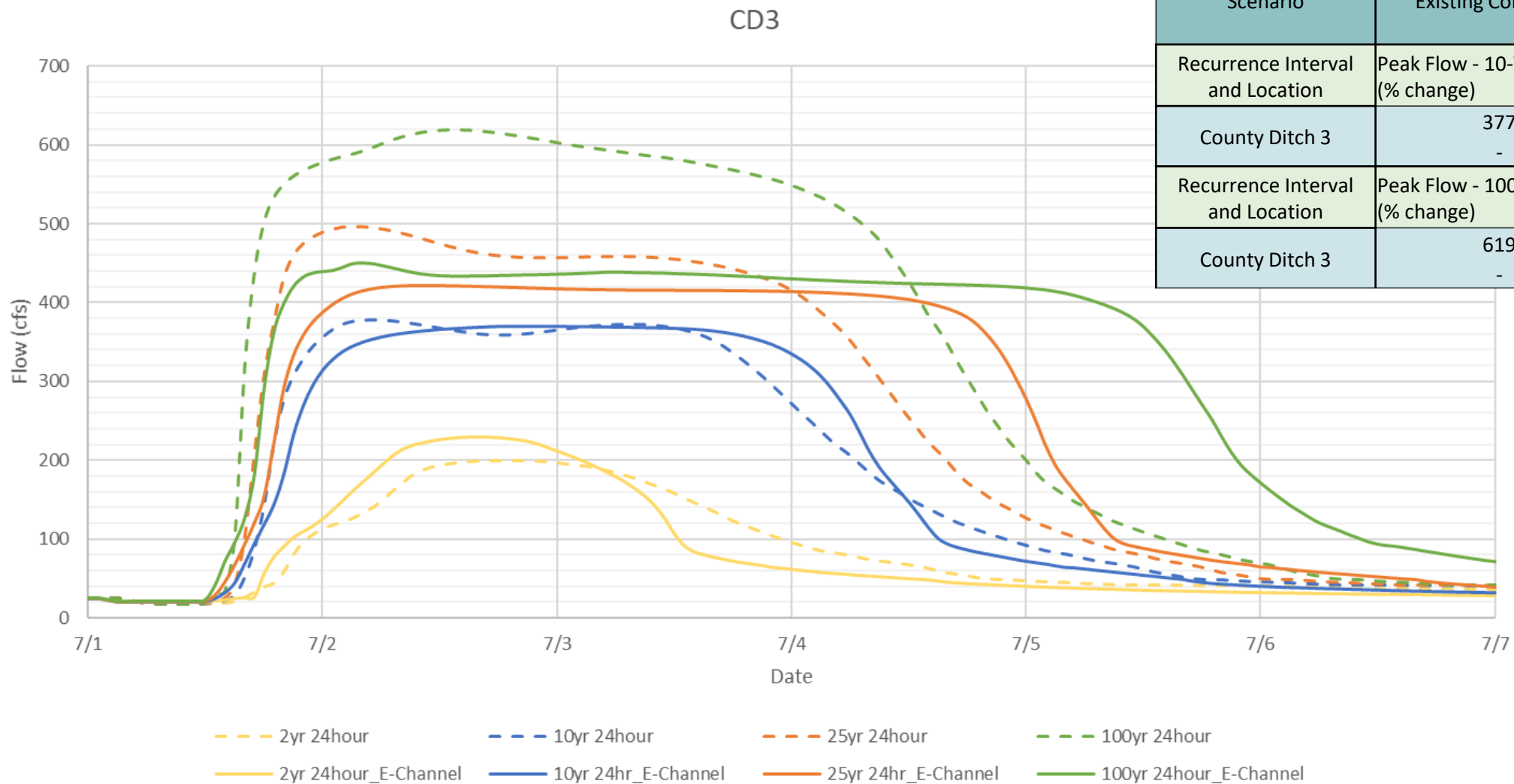
Scenario	Existing Conditions	Alternative 13: E-Channel Restoration with Floodplain/Centerline Culvert Sizing
Recurrence Interval and Location	Peak Flow - 10-Year, 24-Hour cfs (% change)	
County Road 33	347	333
	-	-4.0%
Recurrence Interval and Location	Peak Flow - 100-Year, 24-Hour cfs (% change)	
County Road 33	680	419
	-	-38.4%

CHANNEL RESTORATION RESULTS –HWY 75



Scenario	Existing Conditions	Alternative 13: E-Channel Restoration with Floodplain/Centerline Culvert Sizing
Recurrence Interval and Location	Peak Flow - 10-Year, 24-Hour cfs (% change)	
US HWY 75	384	371 -3.4%
Recurrence Interval and Location	Peak Flow - 100-Year, 24-Hour cfs (% change)	
US HWY 75	859	690 -19.7%

CHANNEL RESTORATION RESULTS –BEGINNING OF CD 3

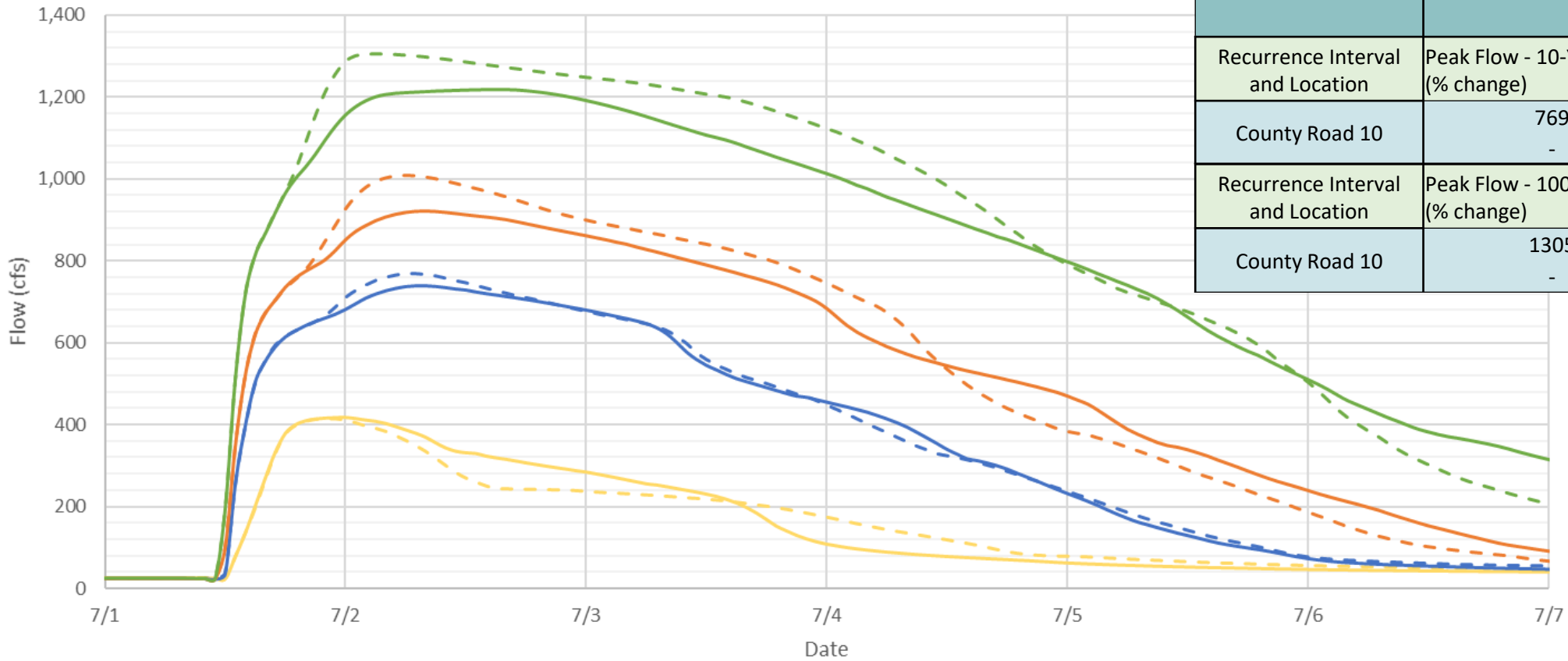


Scenario	Existing Conditions	Alternative 13: E-Channel Restoration with Floodplain/Centerline Culvert Sizing
Recurrence Interval and Location	Peak Flow - 10-Year, 24-Hour cfs (% change)	
County Ditch 3	377 -	369 -2.1%
Recurrence Interval and Location	Peak Flow - 100-Year, 24-Hour cfs (% change)	
County Ditch 3	619 -	450 -27.3%

CHANNEL RESTORATION RESULTS –CR 10



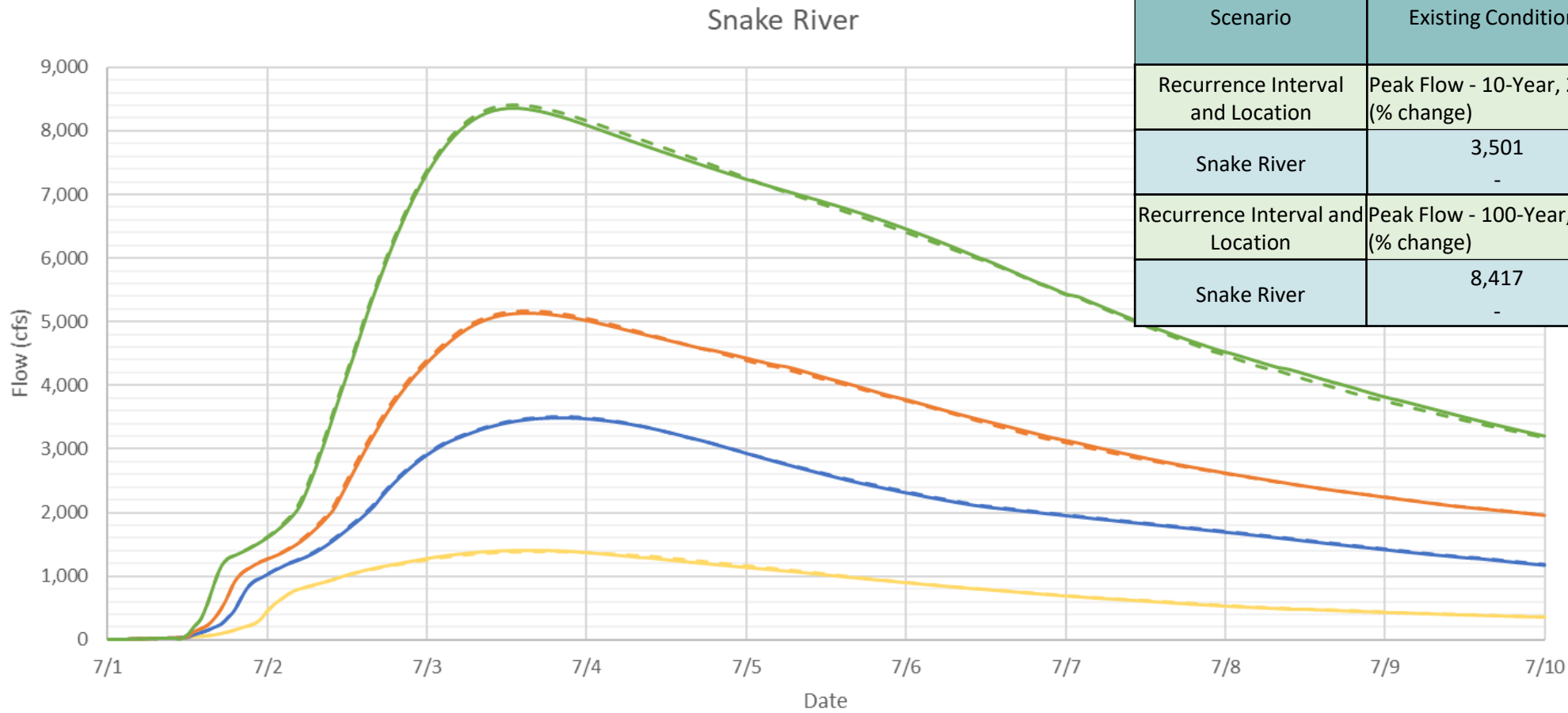
CR 10 (Full Transect)



--- 2yr 24hour --- 10yr 24hour --- 25yr 24hour --- 100yr 24hour
— 2yr 24hour_E-Channel — 10yr 24hr_E-Channel — 25yr 24hr_E-Channel — 100yr 24hour_E-Channel

Scenario	Existing Conditions	Alternative 13: E-Channel Restoration with Floodplain/Centerline Culvert Sizing
Recurrence Interval and Location	Peak Flow - 10-Year, 24-Hour cfs (% change)	
County Road 10	769 -	739 -3.9%
Recurrence Interval and Location	Peak Flow - 100-Year, 24-Hour cfs (% change)	
County Road 10	1305 -	1219 -6.6%

CHANNEL RESTORATION RESULTS – CONFLUENCE SNAKE RIVER

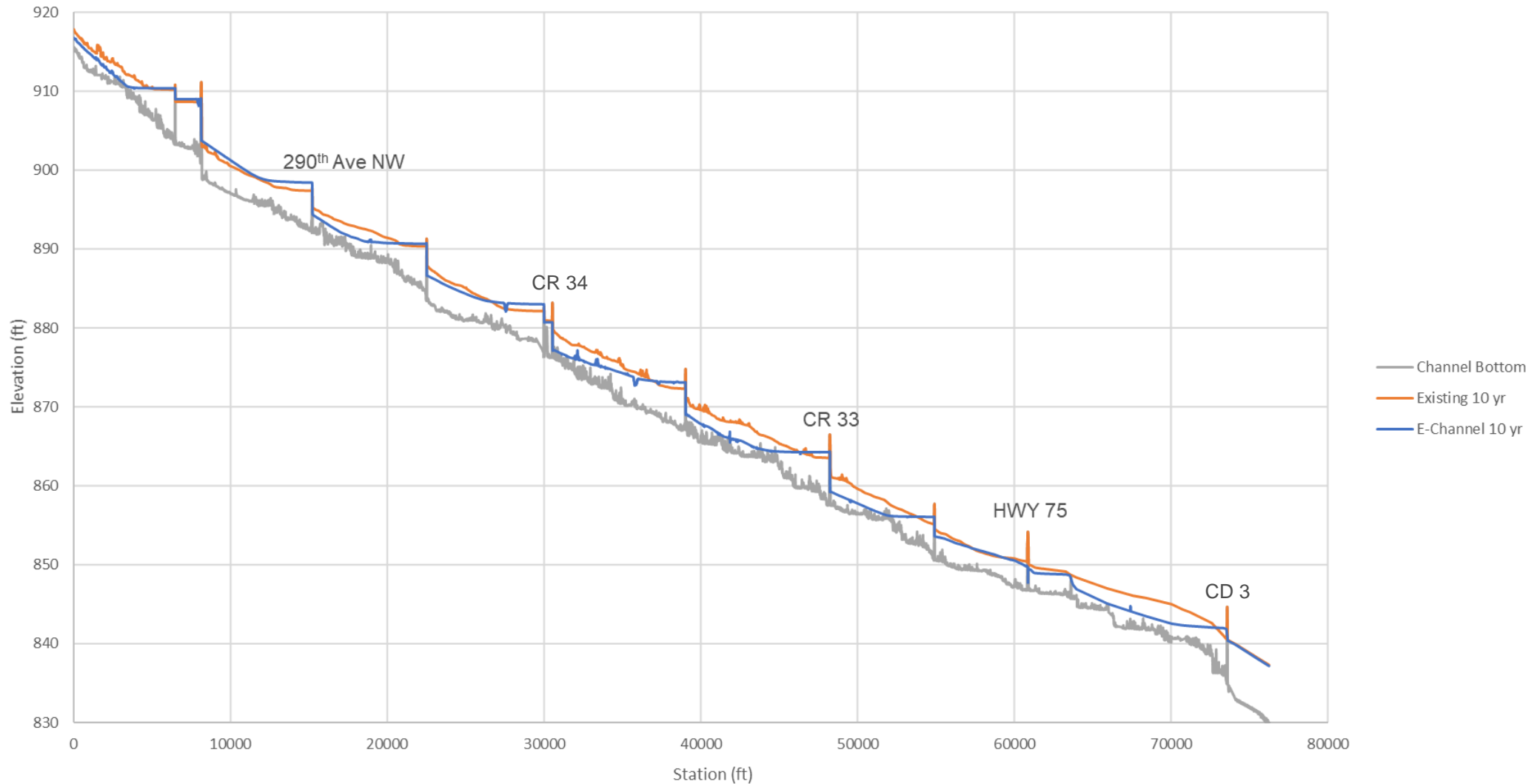


Scenario	Existing Conditions	Alternative 13: E-Channel Restoration with Floodplain/Centerline Culvert Sizing
Recurrence Interval and Location	Peak Flow - 10-Year, 24-Hour cfs (% change)	
Snake River	3,501	3,497
	-	-0.1%
Recurrence Interval and Location	Peak Flow - 100-Year, 24-Hour cfs (% change)	
Snake River	8,417	8,358
	-	-0.7%

CHANNEL RESTORATION 10-YEAR PROFILE COMPARISON RESULTS



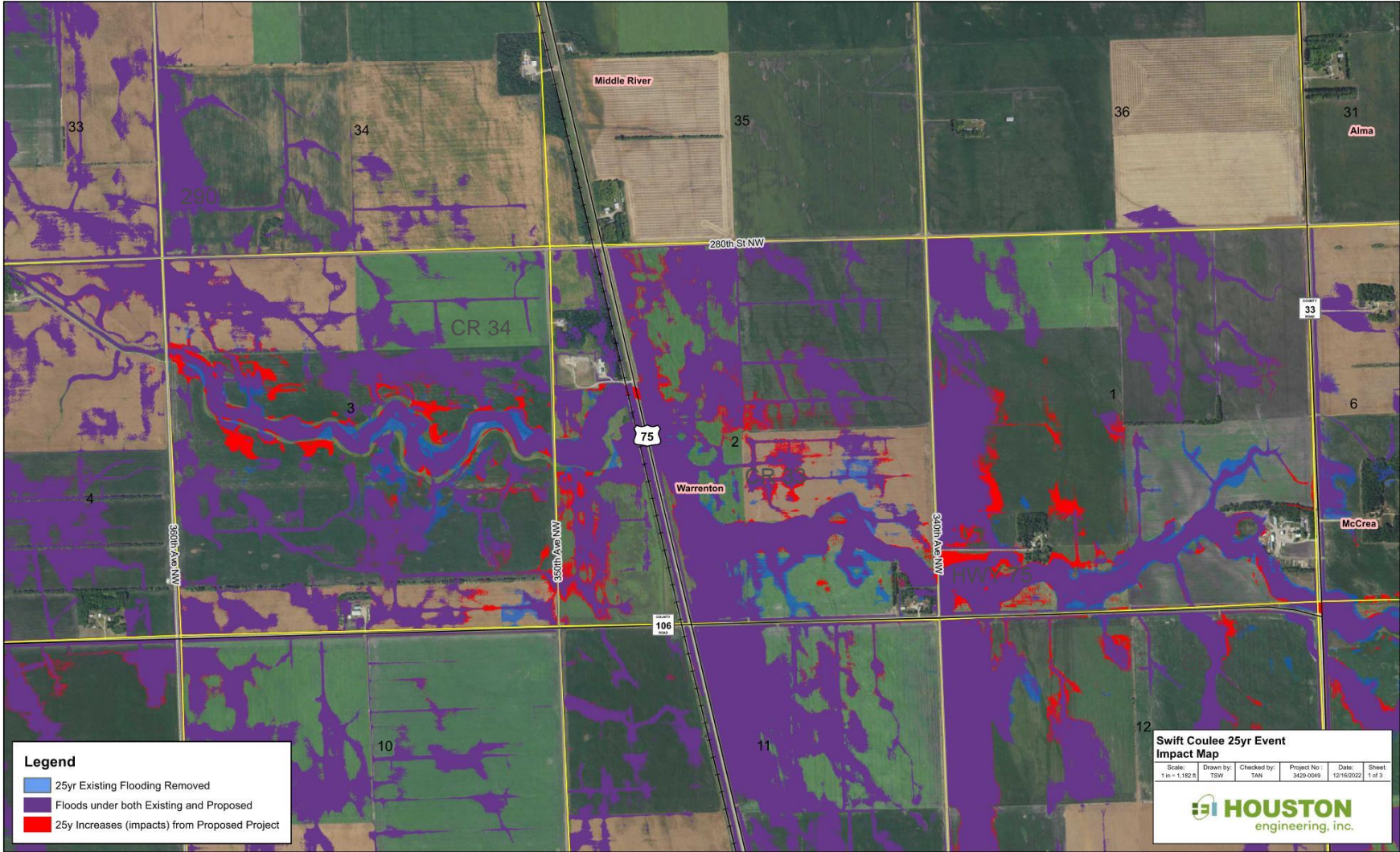
Profile Comparison Existing vs Proposed



CHANNEL RESTORATION 10-YEAR MAX WSE



CHANNEL RESTORATION 25-YEAR MAX WSE



CHANNEL RESTORATION 10-YEAR DURATION RESULTS



Duration (Hours)	Existing Conditions		Alternative 13	
	Inundated Acres Upstream of County Ditch 3 10-Year, 24-Hour (% Change)			
	Cropland	Total	Cropland	Total
0-24	2350 -	2719 -	2449 4.2%	2818 3.6%
24-48	813 -	998 -	690 -15.0%	885 -11.4%
48-72	448 -	570 -	337 -24.9%	484 -15.1%
72-96	157 -	226 -	140 -10.8%	198 -12.4%
96-120	70 -	107 -	62 -11.7%	94 -12.5%
>120	295 -	479 -	299 1.6%	478 -0.1%
TOTAL	4133 -	5099 -	3978 -3.8%	4957 -2.8%
Duration (Hours)	Cropland	Total	Cropland	
24-120 (sum of durations 24-120)	1488 -		1229 -17.4%	
>24 hours (sum of durations > 24 hrs)		2380 -		2139 -10.1%

Duration (Hours)	Existing Conditions		Alternative 13	
	Inundated Acres County Ditch 3 to County Road 10 10-Year, 24-Hour (% Change)			
	Cropland	Total	Cropland	Total
0-24	1869 -	1923 -	1895 1.4%	1951 1.4%
24-48	699 -	723 -	678 -3.0%	700 -3.2%
48-72	473 -	503 -	422 -10.7%	457 -9.0%
72-96	376 -	402 -	404 7.5%	431 7.2%
96-120	85 -	96 -	89 4.5%	99 3.5%
>120	146 -	191 -	143 -2.3%	185 -3.0%
TOTAL	3648 -	3838 -	3631 -0.5%	3823 -0.4%
Duration (Hours)	Cropland	Total	Cropland	
24-120 (sum of durations 24-120)	1633 -		1593 -2.4%	
>24 hours (sum of durations > 24 hrs)		1915 -		1873 -2.2%

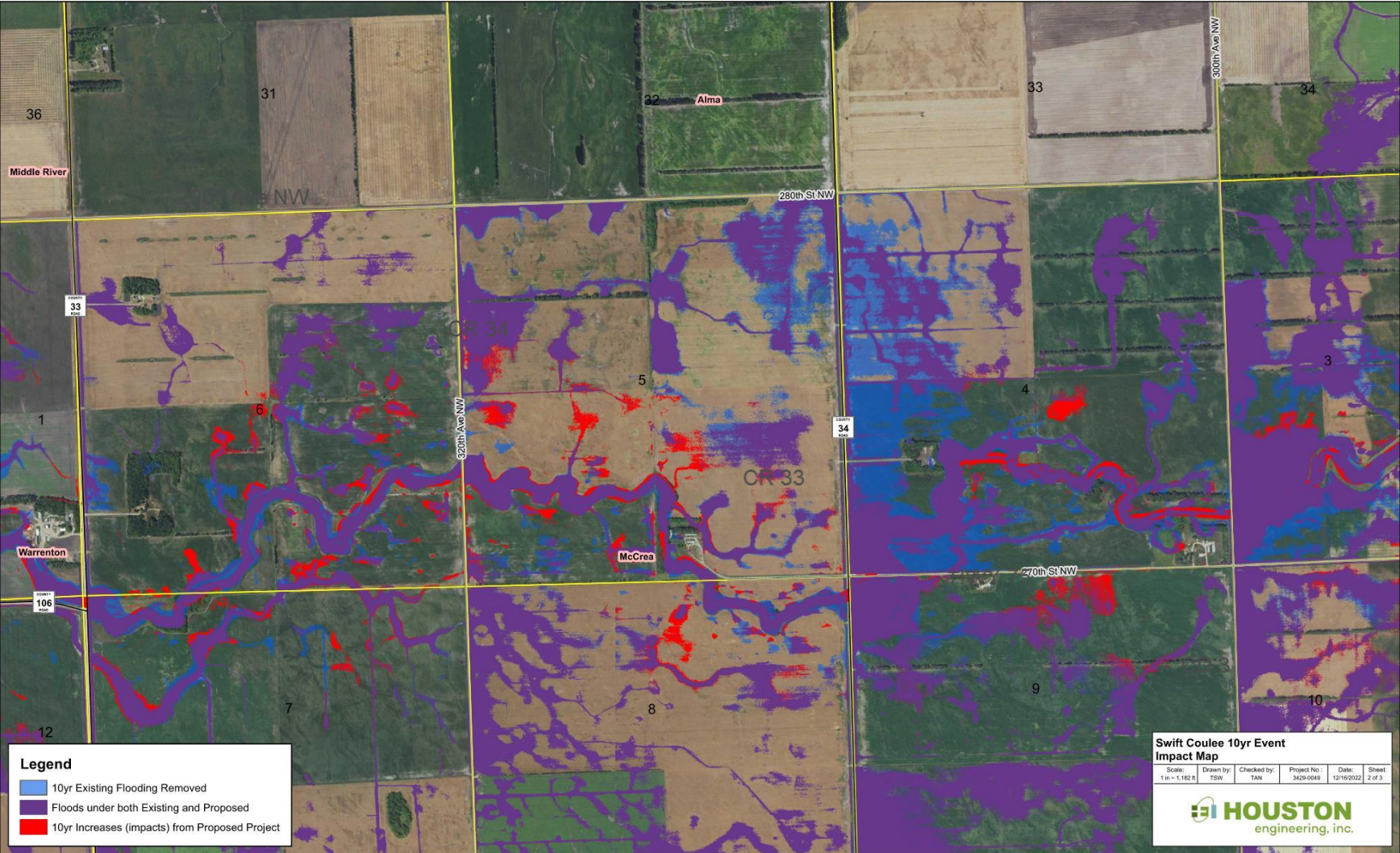
CHANNEL RESTORATION 25-YEAR DURATION RESULTS



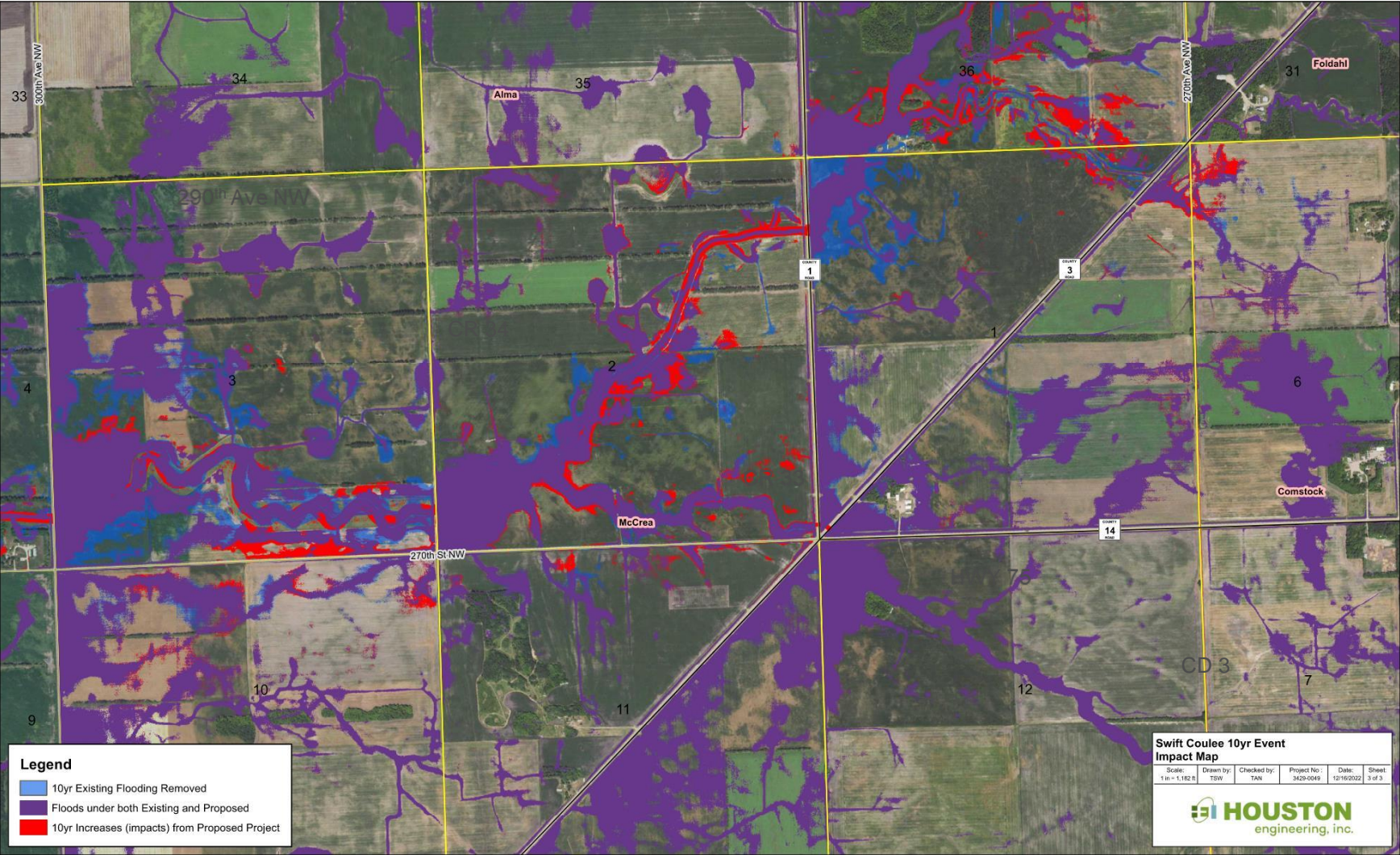
Duration (Hours)	Existing Conditions		Alternative 13	
	Cropland	Total	Cropland	Total
Inundated Acres Upstream of County Ditch 3 25-Year, 24-Hour (% Change)				
0-24	3085	3575	3264	3759
	-	-	5.8%	5.2%
24-48	1003	1236	870	1089
	-	-	-13.3%	-11.9%
48-72	679	824	499	654
	-	-	-26.4%	-20.7%
72-96	243	327	231	339
	-	-	-5.0%	3.7%
96-120	83	126	109	146
	-	-	30.7%	16.4%
>120	309	502	334	523
	-	-	8.1%	4.3%
TOTAL	5403	6589	5309	6511
	-	-	-1.8%	-1.2%
Duration (Hours)	Cropland	Total	Cropland	Total
24-120 (sum of durations 24-120)	2009		1710	
	-		-14.9%	
>24 hours (sum of durations > 24 hrs)		3014		2751
		-		-8.7%

Duration (Hours)	Existing Conditions		Alternative 13	
	Cropland	Total	Cropland	Total
Inundated Acres County Ditch 3 to County Road 10 25-Year, 24-Hour (% Change)				
0-24	2285	2349	2322	2387
	-	-	1.6%	1.6%
24-48	797	819	801	824
	-	-	0.6%	0.5%
48-72	667	699	562	584
	-	-	-15.8%	-16.4%
72-96	668	704	525	564
	-	-	-21.4%	-19.8%
96-120	380	400	477	501
	-	-	25.6%	25.3%
>120	221	273	304	358
	-	-	37.1%	31.2%
TOTAL	5019	5245	4992	5218
	-	-	-0.5%	-0.5%
Duration (Hours)	Cropland	Total	Cropland	Total
24-120 (sum of durations 24-120)	2512		2366	
	-		-5.8%	
>24 hours (sum of durations > 24 hrs)		2895		2831
		-		-2.2%

CHANNEL RESTORATION 10-YEAR MAX WSE



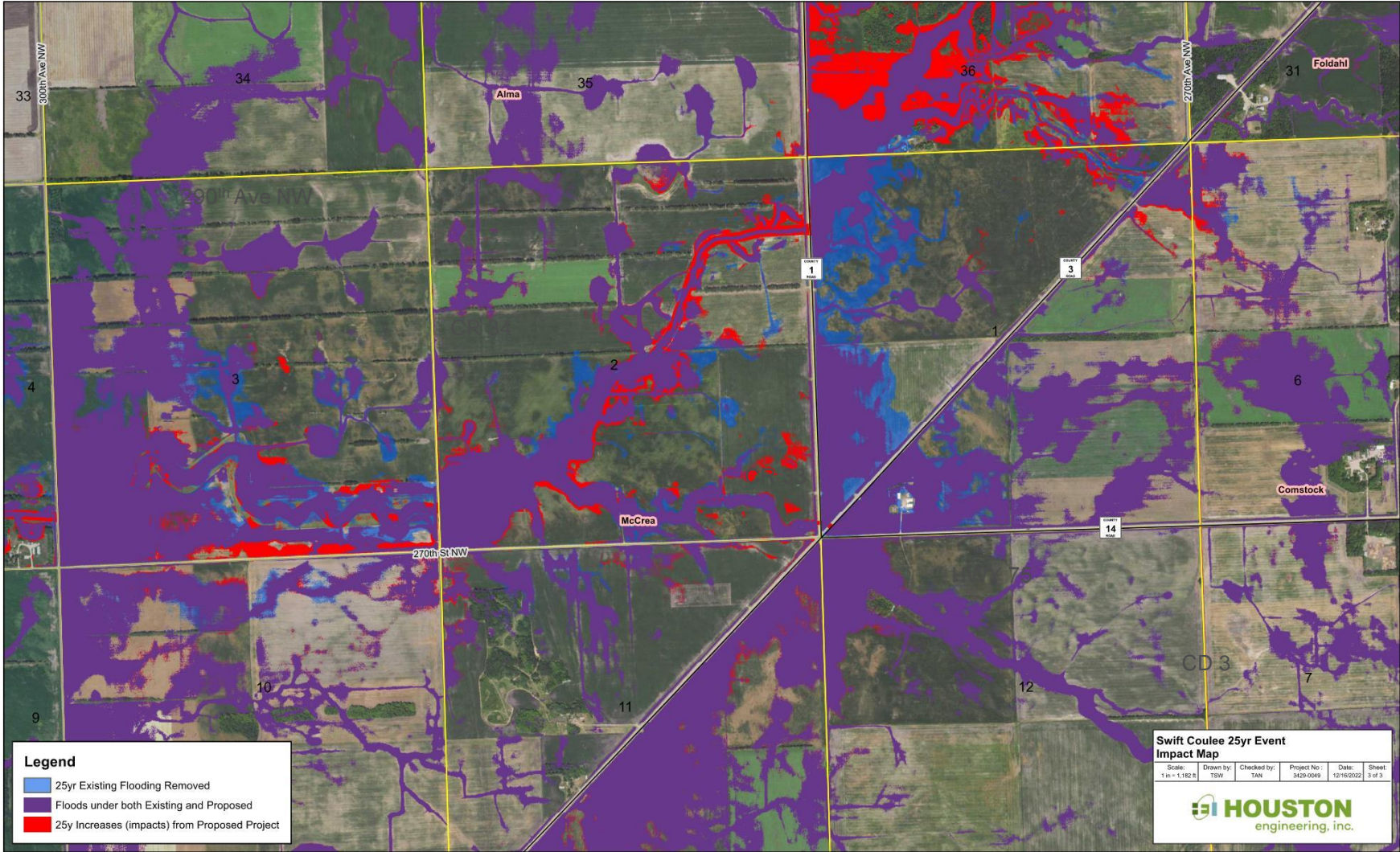
CHANNEL RESTORATION 10-YEAR MAX WSE



CHANNEL RESTORATION 25-YEAR MAX WSE



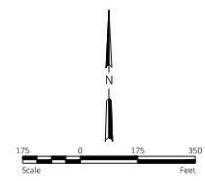
CHANNEL RESTORATION 25-YEAR MAX WSE



PRELIMINARY EASEMENT BOUNDARY MAPS



PRELIMINARY EASEMENT BOUNDARY MAPS



- BLUE AREA**
PROPERTY NO. 5
MARSHALL COUNTY PARCEL NO. 450008001
DONALD AND MARK YUTRZENKA
PERMANENT EASEMENT = 1.6 ACRES
- YELLOW AREA**
PROPERTY NO. 6
MARSHALL COUNTY PARCEL NO. 450005001
DONALD AND MARK YUTRZENKA
PERMANENT EASEMENT = 3.3 ACRES
- GREEN AREA**
PROPERTY NO. 7
MARSHALL COUNTY PARCEL NO. 450009000
RUTH ANN SHELIF ETAL, C/O SHARON NICHOLLS
PERMANENT EASEMENT = 10.1 ACRES
- ORANGE AREA**
PROPERTY NO. 8
MARSHALL COUNTY PARCEL NO. 450010000
KENNETH JOHNSON
PERMANENT EASEMENT = 25.8 ACRES
- PINK AREA**
PROPERTY NO. 9
MARSHALL COUNTY PARCEL NO. 450010001
ERIC LARSON
PERMANENT EASEMENT = 1.0 ACRES

No.	Revision	Date	R/W

SWIFT COULLEE RESTORATION EASEMENTS
MIDDLE-SNAKE-TAMARAC RIVERS WATERSHED DISTRICT
WARRENTON, MN
SITE MAP



Drawn By
ELB

Checked By
TAN

Date
4-12-2021

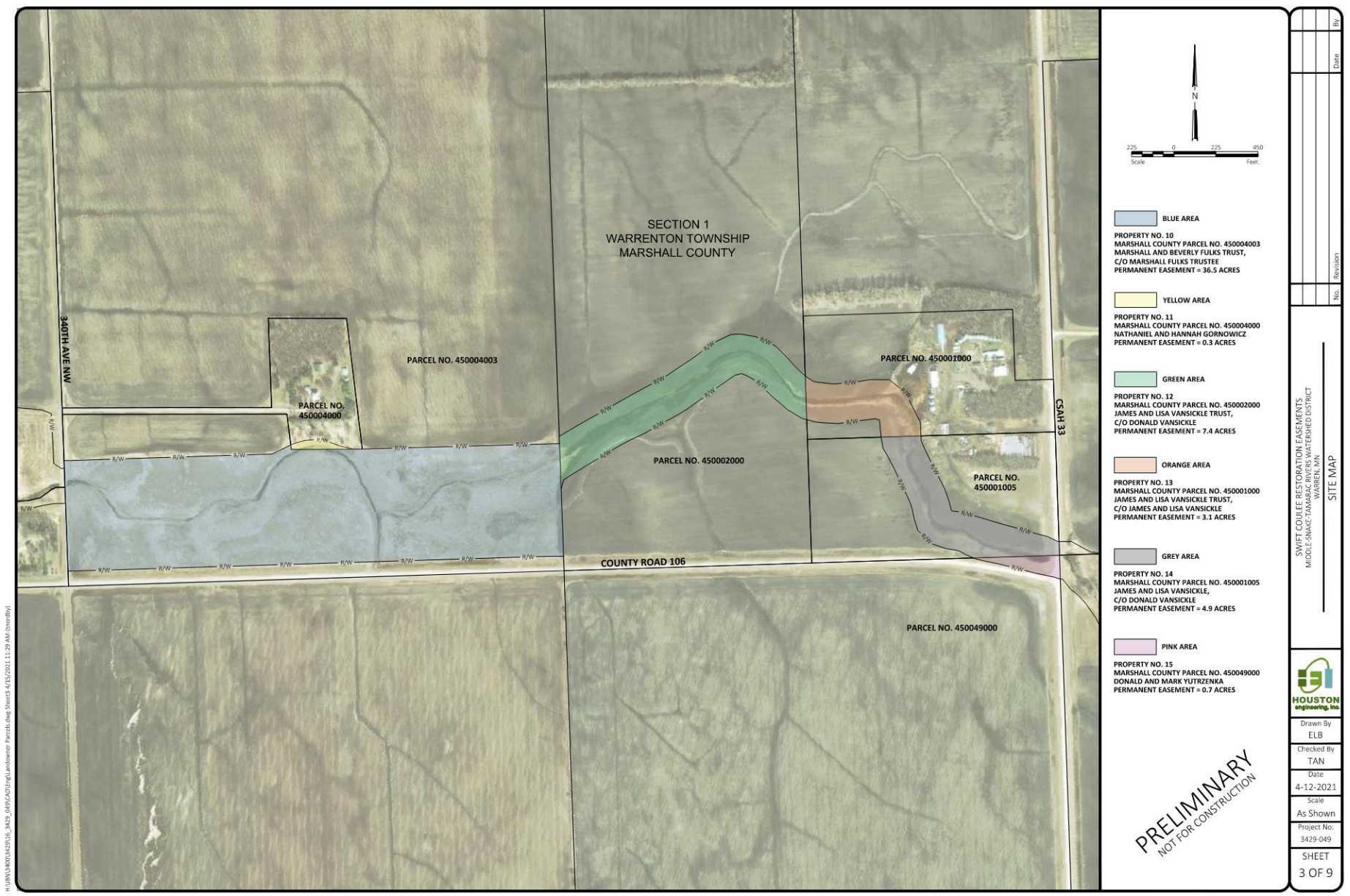
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Project No.
3429-049

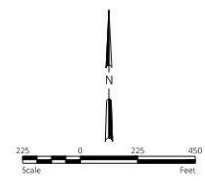
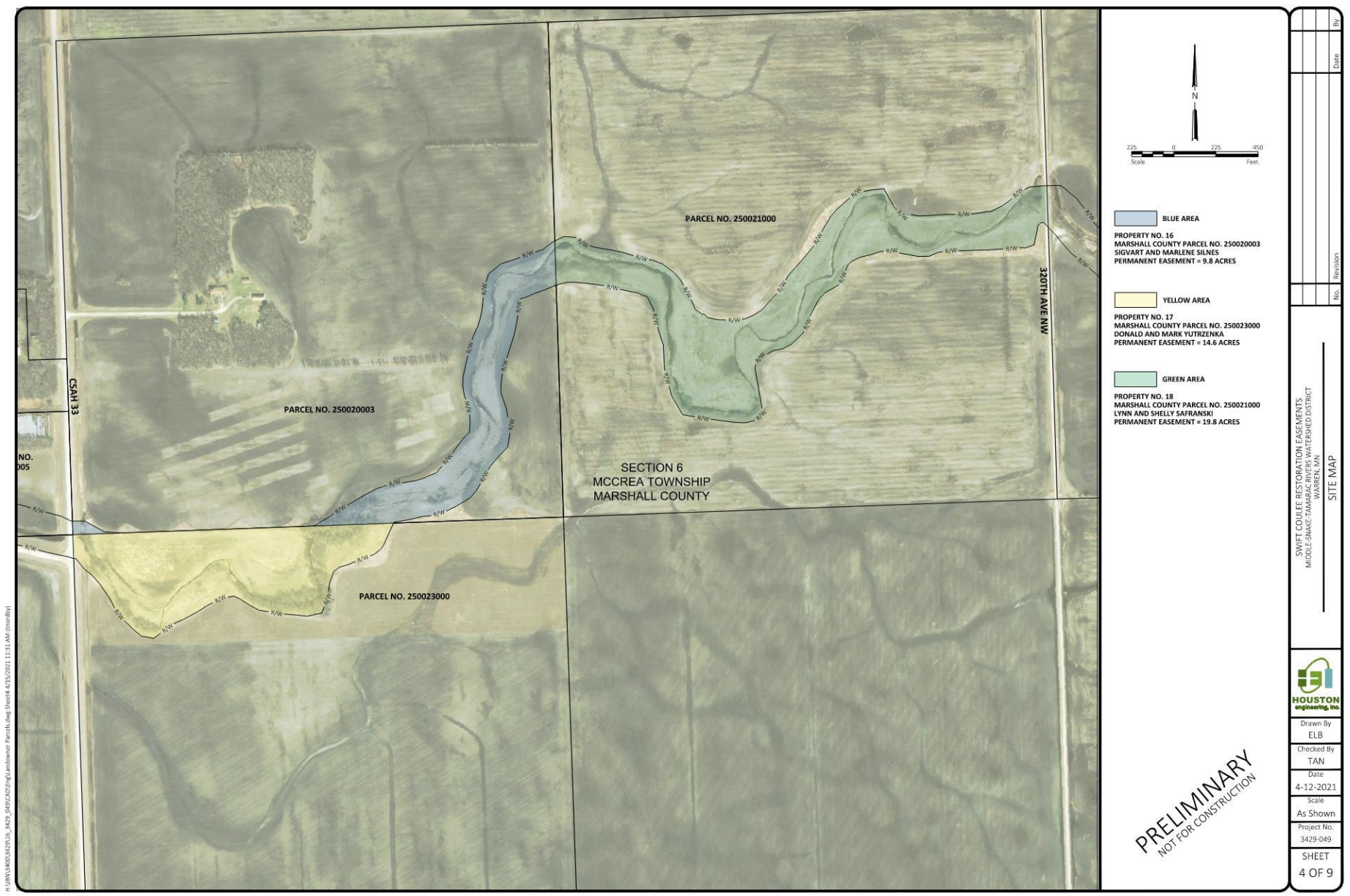
PRELIMINARY
NOT FOR CONSTRUCTION

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PRELIMINARY EASEMENT BOUNDARY MAPS



PRELIMINARY EASEMENT BOUNDARY MAPS



- BLUE AREA**
PROPERTY NO. 16
MARSHALL COUNTY PARCEL NO. 25002003
SIGVART AND MARLENE SILNES
PERMANENT EASEMENT = 9.8 ACRES

- YELLOW AREA**
PROPERTY NO. 17
MARSHALL COUNTY PARCEL NO. 250023000
DONALD AND MARK YUTRZENKA
PERMANENT EASEMENT = 14.6 ACRES

- GREEN AREA**
PROPERTY NO. 18
MARSHALL COUNTY PARCEL NO. 250021000
LYNN AND SHELLY SAFRANSKI
PERMANENT EASEMENT = 19.8 ACRES

No.	Revision	Date	R/W

SWIFT COULLEE RESTORATION EASEMENTS
MIDDLE-SNAKE-TAMARAC RIVERS WATERSHED DISTRICT
WARREN, MN
SITE MAP



Drawn By
ELB

Checked By
TAN

Date
4-12-2021

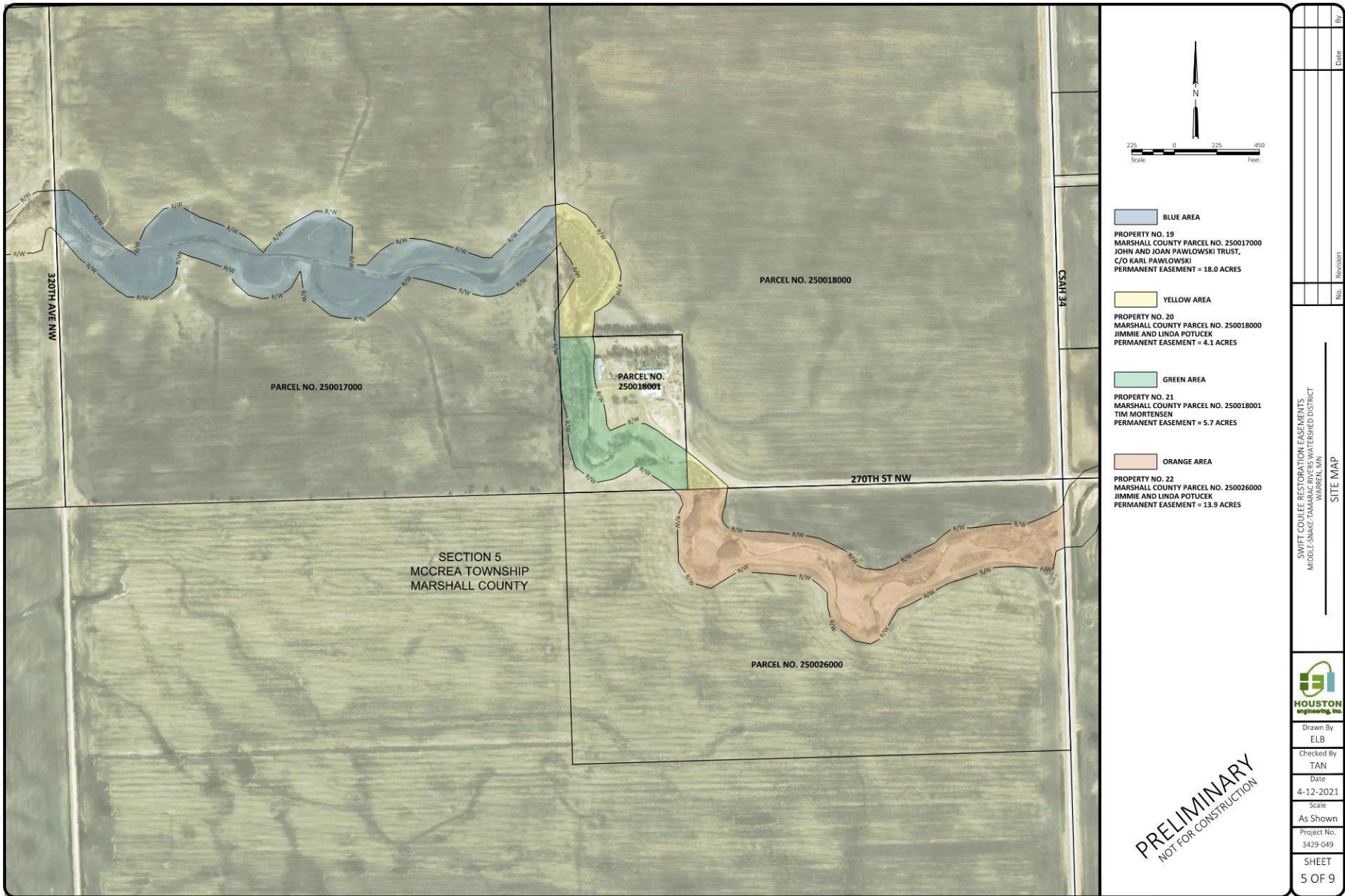
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Project No.
3429-049

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PRELIMINARY EASEMENT BOUNDARY MAPS



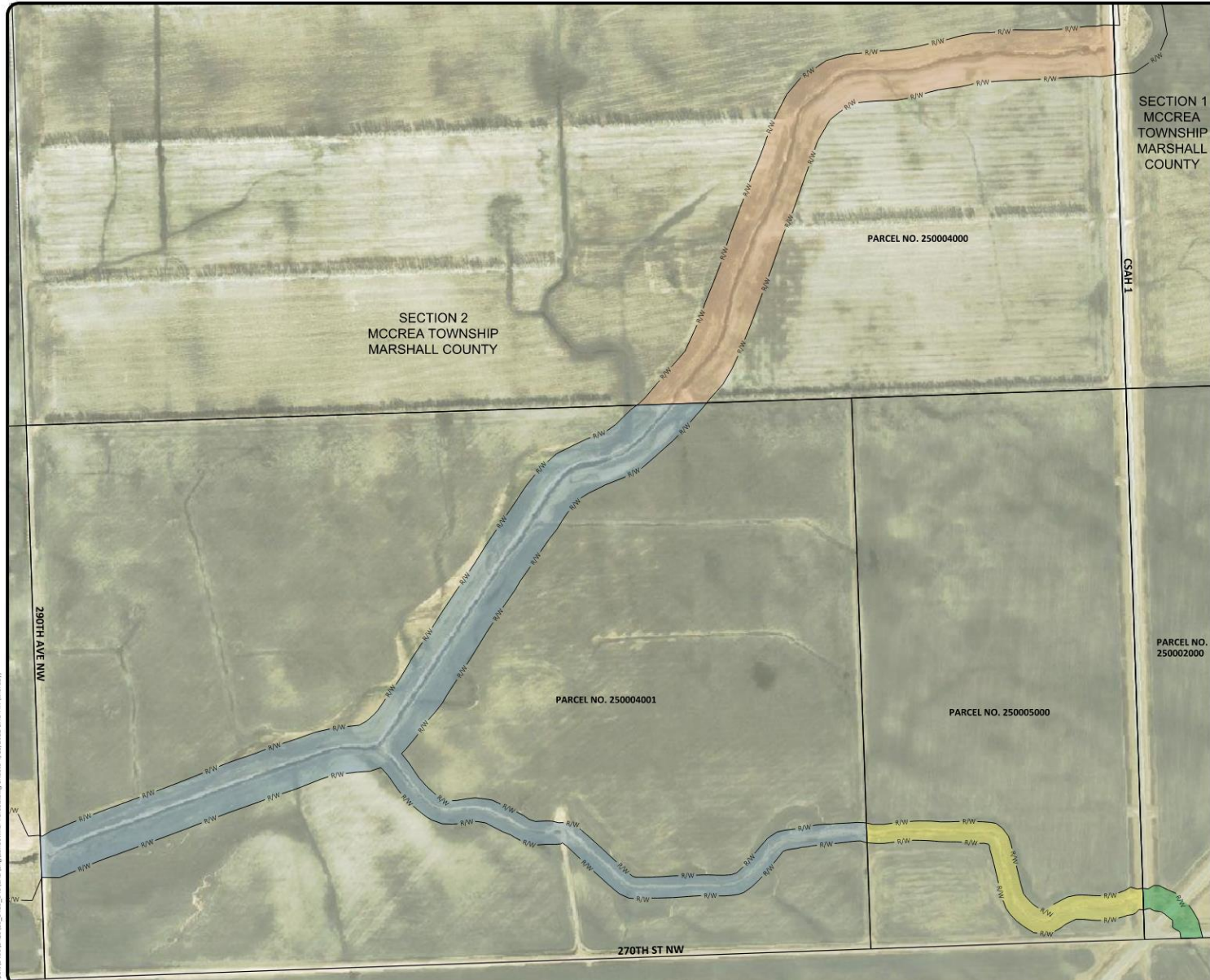
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PRELIMINARY EASEMENT BOUNDARY MAPS

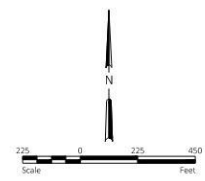


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PRELIMINARY EASEMENT BOUNDARY MAPS



SECTION 1
MCCREA TOWNSHIP
MARSHALL COUNTY



- BLUE AREA**
PROPERTY NO. 34
MARSHALL COUNTY PARCEL NO. 250004001
FAGERSTROM REVOCABLE TRUST,
C/O LLOYD AND DAWN FAGERSTROM
PERMANENT EASEMENT = 26.8 ACRES
- YELLOW AREA**
PROPERTY NO. 35
MARSHALL COUNTY PARCEL NO. 250005000
ROSEMARIE FULTON
PERMANENT EASEMENT = 3.9 ACRES
- GREEN AREA**
PROPERTY NO. 36
MARSHALL COUNTY PARCEL NO. 250002000
ROSEMARIE FULTON
PERMANENT EASEMENT = 0.8 ACRES
- ORANGE AREA**
PROPERTY NO. 37
MARSHALL COUNTY PARCEL NO. 250004000
VIRGINIA KRUGER
PERMANENT EASEMENT = 17.0 ACRES

No.	Revision	Date	R/W

SWIFT COULLEE RESTORATION EASEMENTS
MIDDLE-SNAKE-TAMARAC RIVERS WATERSHED DISTRICT
WARREN, MN
SITE MAP



Drawn By
ELB
Checked By
TAN
Date
4-12-2021
Scale
As Shown
Project No.
3429-049

SHEET
8 OF 9

PRELIMINARY
NOT FOR CONSTRUCTION

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- Can easement be adjusted to more practicable shape?
- How are field drains to the coulee going to be addressed with levee in place?
- Preliminary design route of project corridor not set in stone
- Work with landowners as much as possible to avoid impacts.



Questions/Discussion

CHANNEL RESTORATION 5-YEAR DURATION RESULTS



Duration (Hours)	Existing Conditions		Alternative 13	
	Cropland	Total	Cropland	Total
Inundated Acres Upstream of County Ditch 3 5-Year, 24-Hour (% Change)				
0-24	1834	2119	1864	2150
	-	-	1.6%	1.5%
24-48	625	780	573	759
	-	-	-8.4%	-2.7%
48-72	301	399	226	326
	-	-	-25.0%	-18.3%
72-96	114	168	90	134
	-	-	-21.2%	-19.9%
96-120	60	94	50	78
	-	-	-17.6%	-16.9%
>120	280	454	285	455
	-	-	2.0%	0.3%
TOTAL	3214	4014	3088	3903
	-	-	-3.9%	-2.8%
Duration (Hours)	Cropland		Cropland	Total
24-120 (sum of durations 24-120)	1101		938	
	-		-14.8%	
>24 hours (sum of durations > 24 hrs)		1895		1753
		-		-7.5%

Duration (Hours)	Existing Conditions		Alternative 13	
	Cropland	Total	Cropland	Total
Inundated Acres County Ditch 3 to County Road 10 5-Year, 24-Hour (% Change)				
0-24	1586	1636	1584	1635
	-	-	-0.1%	-0.1%
24-48	411	434	408	434
	-	-	-0.6%	0.0%
48-72	307	333	346	379
	-	-	12.6%	14.1%
72-96	134	150	113	126
	-	-	-15.6%	-16.5%
96-120	33	37	31	34
	-	-	-6.9%	-7.0%
>120	126	170	122	163
	-	-	-3.4%	-4.0%
TOTAL	2597	2760	2604	2771
	-	-	0.3%	0.4%
Duration (Hours)	Cropland		Cropland	Total
24-120 (sum of durations 24-120)	885		898	
	-		1.4%	
>24 hours (sum of durations > 24 hrs)		1124		1137
		-		1.1%

SITE D



Option A	
Drainage Area	37 (Mi ²)
Gated Elevation	863.4 (Ft.)
Gated Storage	3,965 (Ac.-Ft.)
Max Gated Pool Depth	13 (Ft.)
Average Gated Pool Depth	9 (Ft.)
Emergency Spillway Elevation	864.3 (Ft.)
Ungated Storage	500 (Ac.-Ft.)
Ungated Pool Footprint	637 (Ac.)
Embankment Length	20,485 (Ft.)
Wetland Impact (NWI) fill	0 (Ac.)
Wetland Impact (NWI) excavation	.10 (Ac.)
Wetland Impact (NWI) inundate	0 (Ac.)

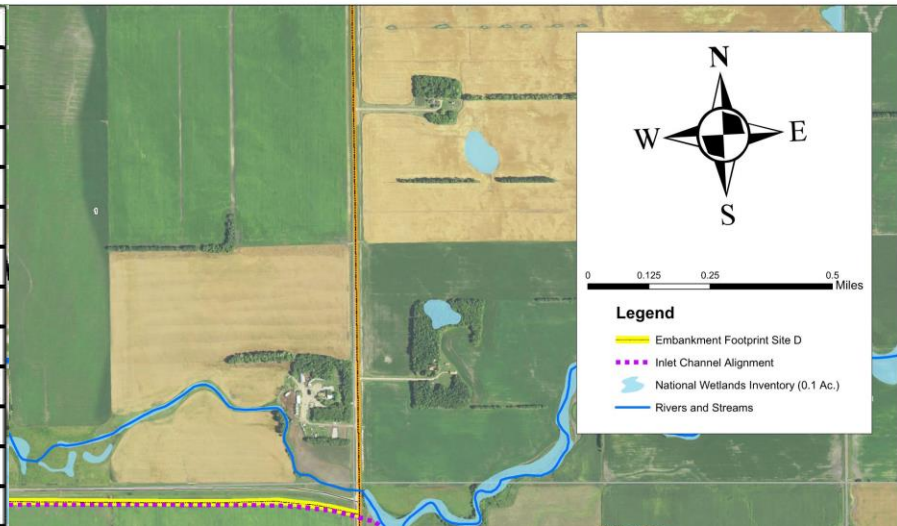


Exhibit 8B:
Alt 4A: Off Channel Impoundment-Site D

Scale:	Drawn by:	Checked by:	Project No.:	Date:	Sheet:
AS SHOWN	JHL		1915-219	9/12/2019	4

HoustonEngineering Inc.

SELECTED ALTERNATIVE

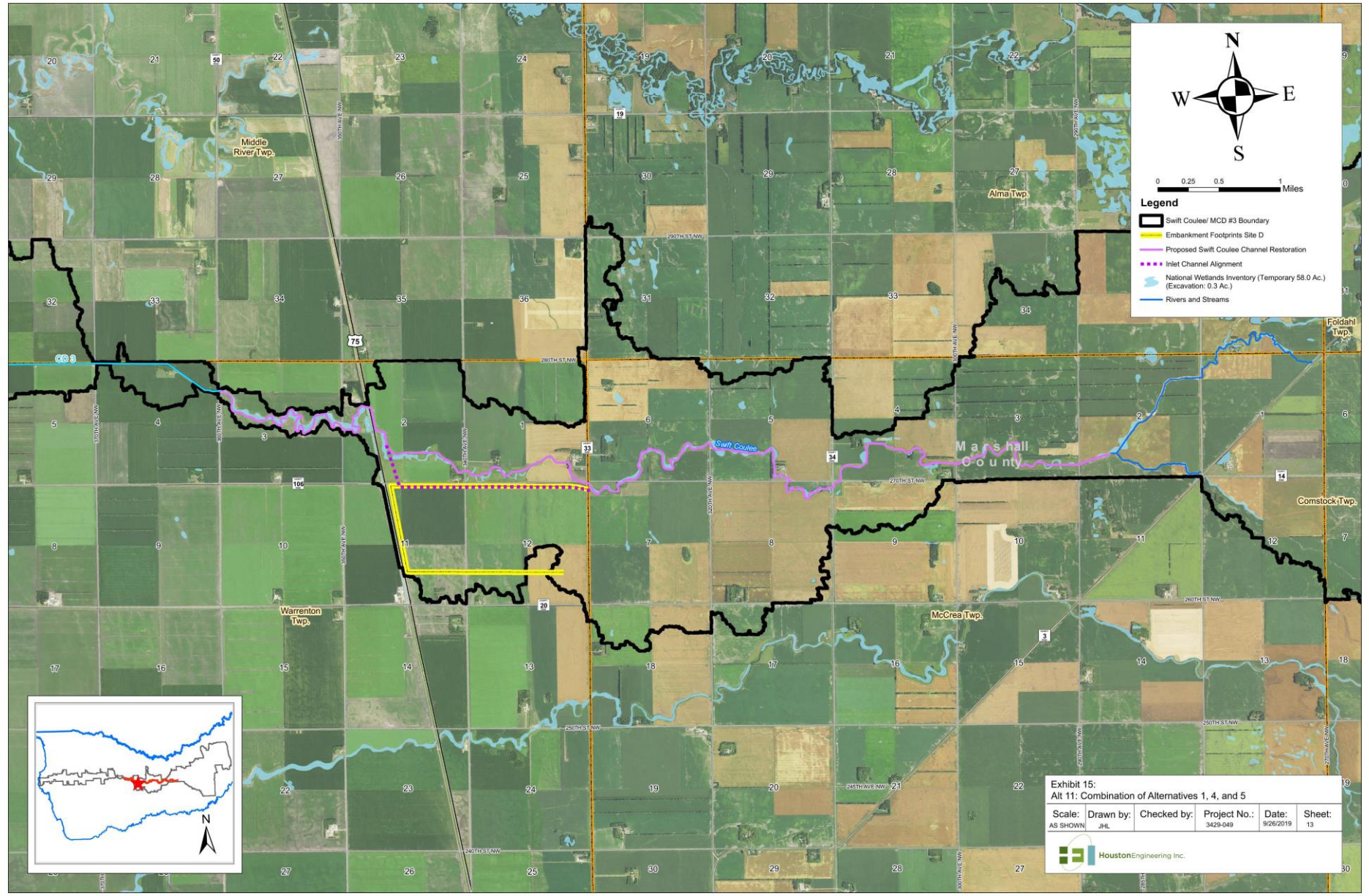


Exhibit 15:
 Alt 11: Combination of Alternatives 1, 4, and 5
 Scale: AS SHOWN | Drawn by: JHL | Checked by: | Project No.: 3429-049 | Date: 9/26/2019 | Sheet: 13
 Houston Engineering Inc.



- Alternative 11
 - Meets the Purpose and Need throughout Sub-Watershed
 - Low Potential Impacts to Aquatic Ecosystem
 - Preferred off-channel impoundment site (Site D)
 - Largest Gated Storage Capacity
 - Minimal Environmental Impact
 - No Drain Tile, Least Amount of Landowners
 - Channel Restoration – Environmental Enhancement (Outside Funding)