



# DOWNSTREAM ASSESSMENT

MOLODOW AND COLLINWOOD SITES

Town of Fairview

May 2020

# Downstream Assessment

1. Purpose
2. Analysis Criteria
3. Analysis Approach
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6. Hydraulic Analysis
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## Purpose

- To verify the new development will cause no adverse drainage impacts to downstream properties.
- To provide mitigation alternatives if it is determined that adverse drainage impacts will be caused by the new development.

## Analysis Criteria

- No development within FEMA floodplain
- No on-site detention required for lots 1.5-acre or greater
- Limit increase in 100-year Water Surface Elevations to 0.1', unless channel or pipe has the capacity to fully convey developed flows
- Limit increase in channel velocities to 5% or stay below 6-fps

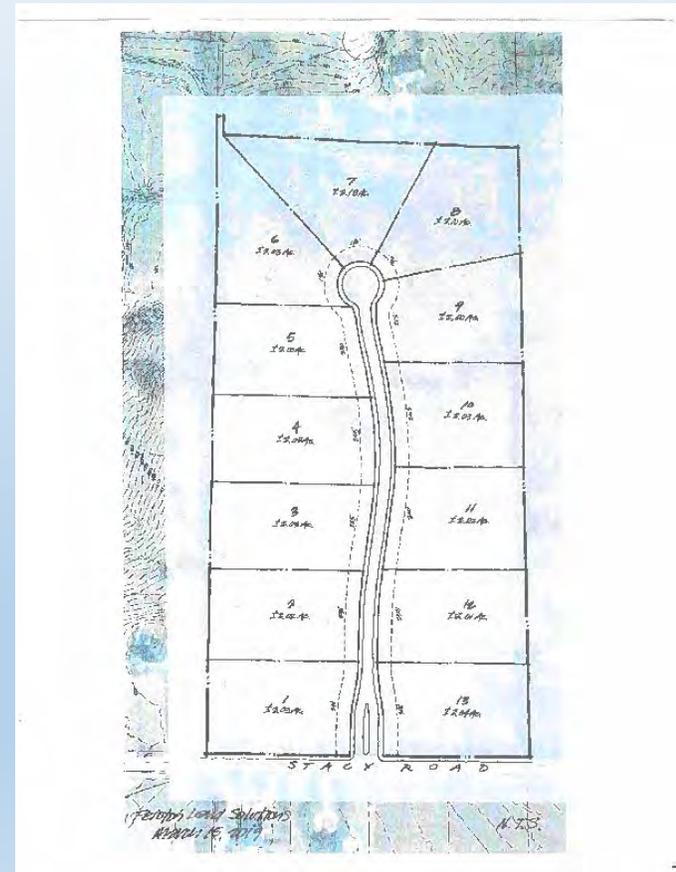
# Molodow Site

Existing Condition: 28 acres, pasture land, one dwelling  
Proposed Condition: 28 acres, 2-acre lots, 13 lots and street

Existing Condition



Proposed Condition



# Collinwood Site

Existing Condition: 12 acres, low density residential & pasture land, two dwellings

Proposed Condition: 5.6 acres, 1.5-acre lots, 3 lots and street

Existing Condition



Proposed Condition



# Analysis Approach

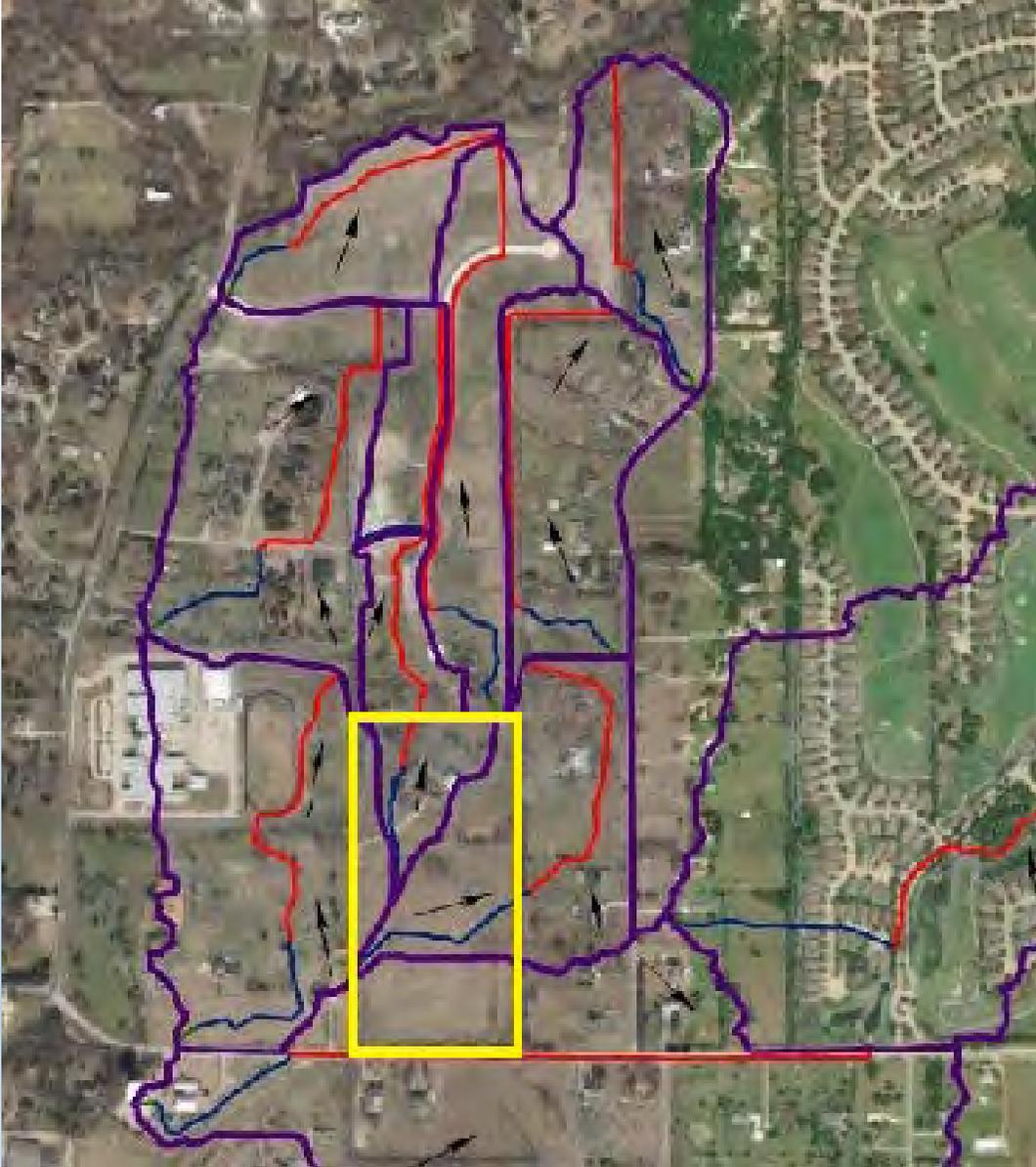
1. Create a Hydrologic Model to Establish Baseline Conditions
2. Determine Existing Peak Discharges at Various Downstream Locations through Zone of Influence (ZOI)
3. Determine Proposed Peak Discharges Based on Proposed Land Use through ZOI
4. Compare Existing And Proposed Discharges through ZOI
5. Create a Hydraulic Model and Analyze Increases in Water Surface Elevation and Velocity
6. Determine Impacts and Any Necessary Mitigation Alternatives

**Zone of Influence – The downstream point where the project site area comprises 10% or less of the overall watershed area (10% rule).**

# Methodology And Data Sources

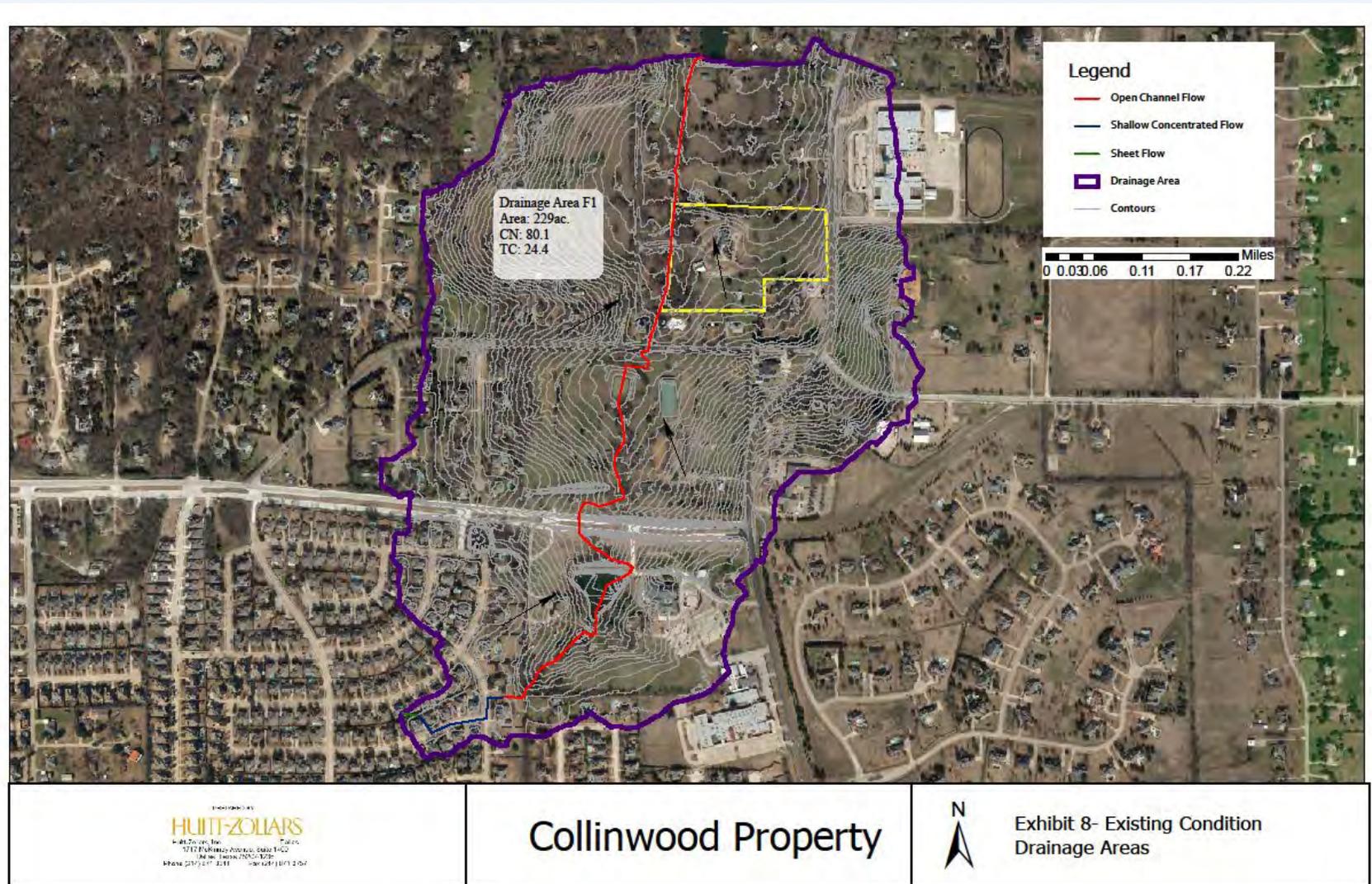
- Topography based on 1-ft contours from Town of Fairview Lidar
- Soils Data Source: NRCS Web Soil Survey
- Land Use Data from USGS National Land Cover Database And Fairview Land Use Map
- Drainage Boundaries Defined Based on Contours, Verified and Adjusted per Field Visit.
- HEC-HMS used for Hydrologic Model
- HEC-RAS used for Hydraulic Model
- Curve Numbers generated with ARC GIS pro
- Lag Time defined based on NRCS's TR-55

## Existing Conditions Hydrology – Molodow Site

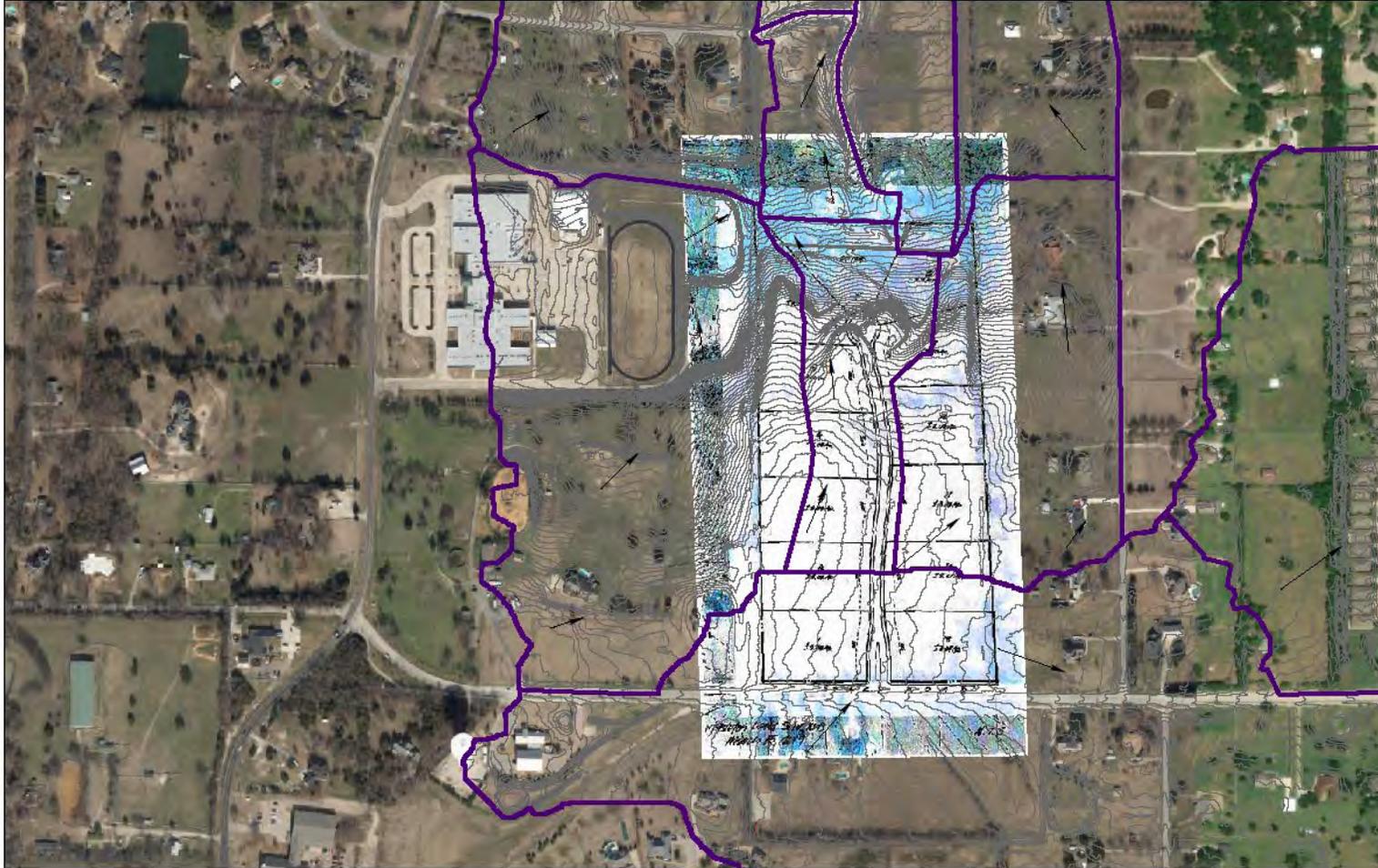


1. Site Flows Split Into 4 Directions - North, Northeast, Southeast, and West – Creating four d/s Watersheds
2. North Flows through Harper Landing
3. Northeast Flows through Kentucky Ln Lots & Harper Landing
4. Southeast flows through Kentucky Lane Lots and Stacy Road Storm Drain
5. West drains to School Pond

# Existing Conditions Hydrology – Collinwood Site

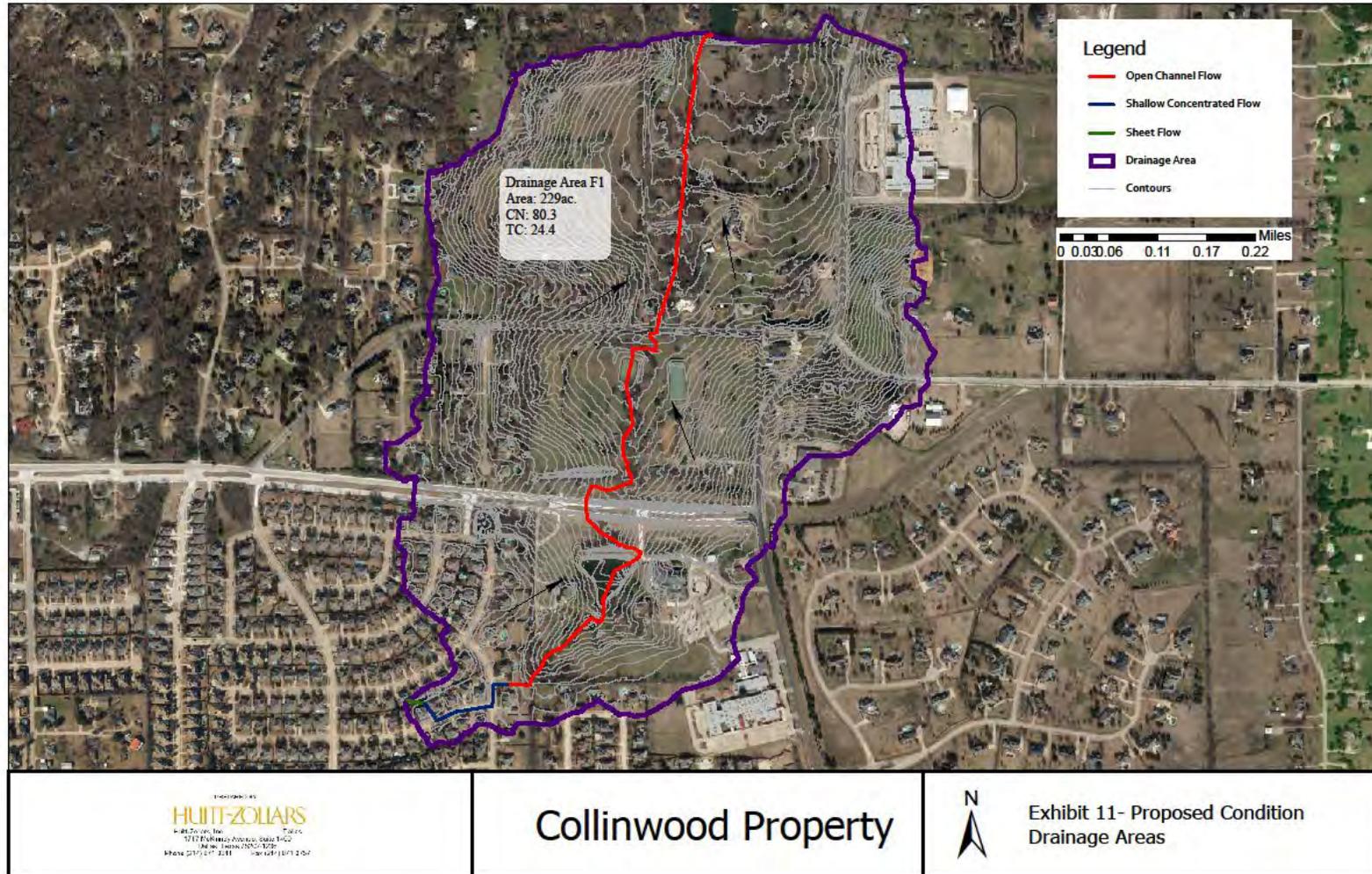


## Proposed Conditions Hydrology – Molodow Site



- Maintain Drainage Patterns
- Route North Area Flows to Existing Ditch or School Pond
- Stacy Road Storm Drain and Heritage Ranch Channel Sized to Accommodate Developed Site Flows
- Decrease in Discharge to Kentucky Lane Lots
- Assumes Curb & Gutter Street with Storm Drain
- Existing Ditch to Be Extended Within Easement

# Proposed Conditions Hydrology – Collinwood Site



- Curve Number Increase From 80.1 to 80.3
- Insignificant Increase in Discharge
- No Mitigation Necessary

# Hydrology Results

HMS Junction	Table 1 - Peak Discharges Comparison - Molodow Site						
	Existing (cfs)			Proposed (cfs)			Exis-Prop (cfs)
	1-yr	5-yr	100-yr	1-yr	5-yr	100-yr	100-yr
School Pond	5.8	16.9	65.3	8.3	17.9	69.4	-4.1
JA1B0	5.8	16.9	65.3	11.3	30.0	102.4	-37.1
JA1A2	44.9	91.1	220.7	47.6	99.2	248.2	-27.5
JA2A3	61.9	123.5	295.5	64.0	130.2	319.0	-23.5
JA3B3*	102.7	205.4	490.4	102.4	206.9	499.2	-8.8
Subbasin B1	13.4	26.5	61.2	6.6	13.4	31.6	29.6
JB1B2	17.7	35.1	81.7	14.0	28.6	68.6	13.1
JB2B3	41.0	82.2	194.9	39.2	78.3	183.4	11.5
JA3B3*	102.7	205.4	490.4	101.6	203.5	484.4	6.0
Subbasin C1	28.8	57.7	134.7	25.0	49.8	115.8	18.9
JC1C2	49.8	101.7	246.3	47.8	97.7	235.3	11.0
JC2C3*	67.4	137.6	332.7	66.4	135.0	323.3	9.4
Subbasin D1*	132.8	252.6	563.2	133.4	253.4	564.0	-0.8
JD1D2	274.7	513.9	1125.9	275.3	514.6	1126.7	-0.8

## Molodow Site

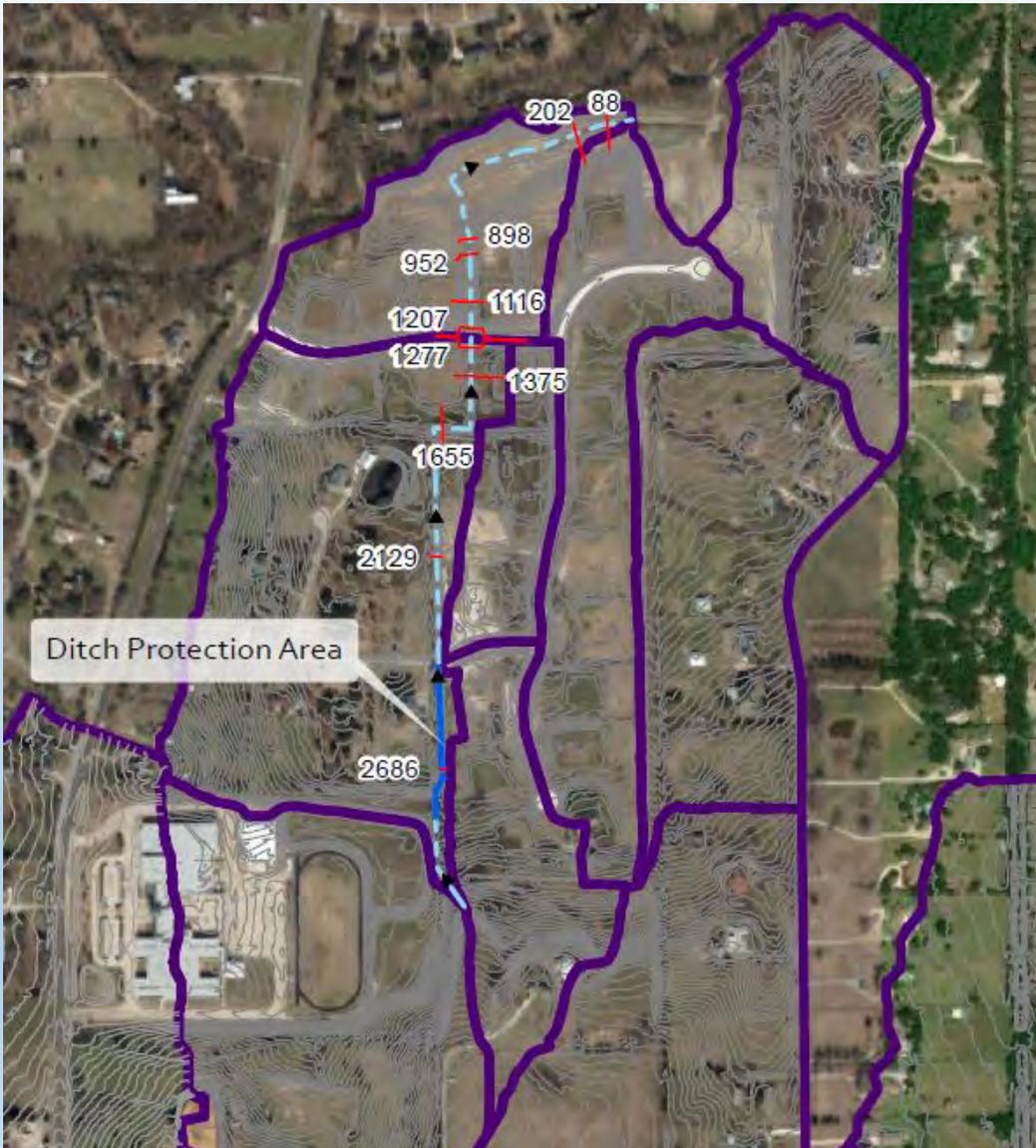
- Increase in Discharge in Existing Ditch North of Pond Outfall
- Decrease or Same Discharge Values For The Other Three Watersheds
- Discharge into Ditch Can Be Reduced By Routing Discharge to School Pond, Increasing School Pond Capacity By 1 Acre-Ft And Modifying Outfall Structure

HMS Junction	Table 2 - Peak Discharges-Collinwood					
	Existing (cfs)			Proposed (cfs)		
	1-yr	5-yr	100-yr	1-yr	5-yr	100-yr
F1	271.5	523.8	1182.5	274.2	527	1185.9

## Collinwood Site

- Insignificant Increase in Discharge

# Hydraulic Analysis



- Increase in Discharge to Existing Ditch Warranted a Hydraulic Analysis to Determine Impacts Downstream
- Results Indicate an Increase in Channel Velocity From 5.4 fps to 6.7 fps. Erosion Expected on Grassed Channel.
- Ditch has adequate Capacity to Convey Developed Flows, But Will Need to Be Protected To Prevent Erosion.
- Ditch Protection Limits Should Be From Site's Northwest Corner to Homestead Drive. Ditch Should Be Extended to Site's Northwest Corner.
- Channel Velocities d/s of Homestead Drive Also Increase, But Are Non-Erosive.

# Existing Vs. Proposed Conditions Comparison Tables

Table 3 - Existing Conditions Channel Velocities And Water Surface Elevations									
River Sta.	1-Year			5-Year			100-Year		
	Q (cfs)	W.S. El. (ft)	Vel. (fps)	Q (cfs)	W.S. El. (ft)	Vel. (fps)	Q (cfs)	W.S. El. (ft)	Vel. (fps)
2869	5.8	557.62	2.22	16.9	558.04	3.17	65.3	558.81	5.39
2129	5.8	547.32	2.66	16.9	547.56	3.38	65.3	548.06	4.65
1655	45.0	541.57	2.38	91.0	541.97	3.19	221.0	542.43	4.34
1375	45.0	539.86	3.27	91.0	540.01	3.95	221.0	540.35	4.55
1277	45.0	539.12	0.43	91.0	539.58	0.57	221.0	540.46	0.81
1207	45.0	539.1	0.72	91.0	539.56	0.88	221.0	540.44	1.2
1116	62.0	538.86	3.3	124.0	539.22	4.35	296.0	539.89	6.07
952	62.0	536.75	4.69	124.0	537.12	5.76	296.0	537.82	7.41
898	62.0	535.14	4.62	124.0	535.55	5.22	296.0	536.24	6.23
202	62.0	525.17	1.52	124.0	525.58	1.91	296.0	526.22	2.58
88	62.0	524.86	2.02	124.0	525.21	2.53	296.0	525.81	3.34

Table 4 - Proposed Conditions Channel Velocities And Water Surface Elevations									
River Sta.	1-Year			5-Year			100-Year		
	Q (cfs)	W.S. El. (ft)	Vel. (fps)	Q (cfs)	W.S. El. (ft)	Vel. (fps)	Q (cfs)	W.S. El. (ft)	Vel. (fps)
2869	11.00	557.86	2.71	30.00	558.35	3.86	102.00	559.12	6.69
2129	11.00	547.45	3.08	30.00	547.73	3.83	102.00	548.30	5.24
1655	48.00	541.60	2.45	99.00	542.04	3.36	248.00	542.44	4.76
1375	48.00	539.88	3.32	99.00	540.03	4.05	248.00	540.47	4.22
1277	48.00	539.14	0.45	99.00	539.62	0.60	248.00	540.56	0.87
1207	48.00	539.12	0.75	99.00	539.60	0.93	248.00	540.54	1.29
1116	64.00	538.88	3.33	130.00	539.25	4.43	319.00	539.96	6.23
952	64.00	536.76	4.76	130.00	537.15	5.84	319.00	537.89	7.56
898	64.00	535.15	4.65	130.00	535.59	5.27	319.00	536.31	6.34
202	64.00	525.19	1.54	130.00	525.61	1.95	319.00	526.28	2.66
88	64.00	524.87	2.04	130.00	525.24	2.58	319.00	525.87	3.42

# Results And Conclusion

## Molodow Site

- Stacy Road Storm Drain and Heritage Ranch Channel Can Accommodate Developed Flows From The Site
- Runoff Leaving The Site's Northeast Section is Expected to Decrease When Compared to Existing Runoff
- Runoff Currently Leaving The Site's Northern Section Will Be Routed to The Site's Northwest Corner. This Will Eliminate Flows Directly into Harper Landing Lots.
- Flows in The Existing Ditch Will Increase, Causing Higher Channel Velocities. A portion of The Ditch From The Site's Northwest Corner to Homestead Drive Should be Protected to Prevent Erosion.
- Alternatively, In Lieu of Discharging Into Existing Ditch, Site Runoff Could Be Directed to School Pond to Be Detained And Released at A Lower Rate Into Ditch. This Would Require The Existing Pond to Be Expanded to Provide An Additional 1 Acre-Ft of Storage And Potential Modification to The Outfall Structure, But Would Not Require Protection To The Existing Ditch.

# Results And Conclusion

## Collinwood Site

- Small Increase in Discharge Expected through ZOI, But Insignificant to Cause Any Adverse Impacts Downstream

## Interviews With Residents

- A Series of Individual Interviews With Residents Was Conducted Between February 28 And April 23, 2020 With The Goal of Understanding Resident's Drainage Concerns, Explain The Process of Development Within The Town of Fairview And Floodplain Areas, And Make Suggestions to The Town to Address These Concerns.

<b>Name</b>	<b>Address</b>	<b>Date</b>
Ken Hardison	1280 Camino Real	02-28-2020
Holly Parsons	480 Home Place	03-03-2020
Cory Zuerker	540 Hackberry Drive	03-11-2020
James Coates	922 Shoal Creek Drive	03-11-2020
Cheryl Sinacola	1061 Country Trail	03-20-2020
Justin Jinright	571 Kentucky Lane	03-20-2020
Benjamin White	531 Michelle Way	03-25-2020
Rachelle Farkas	1041 Pecan Drive	04-21 & 04-23 2020

# 1280 Camino Real – Ken Hardison

## Resident's Concerns

- Recent increase in frequency of flooding in yard.
- Less rainfall required to flood backyard
- Harper Landing development floodplain fill caused increased flooding

## Huitt-Zollars Comments

- Perceived increase in flooding frequency likely due to increased rainfall amounts in the past 5 years.
- Harper Landing on-site detention would cause adverse impacts to Sloan Creek due to its location within watershed.
- Videos during significant storm in March 2020 show overflow channel and functioning adequately (slow velocities and not overtopping). March 2020 was the third wettest March on record.

## Monthly and Annual Precipitation Records

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2020	5.00	3.88	6.75										
2019	1.58	1.29	2.01	6.75	8.15	4.13	0.78	2.44	T	4.42	1.80	1.17	34.52
2018	0.85	11.31	2.90	0.77	1.87	1.27	0.25	2.99	12.69	15.66	0.86	4.55	55.97
2017	4.39	2.33	1.06	3.38	0.70	8.44	4.12	4.24	0.47	2.12	0.81	4.56	36.62
2016	1.04	2.20	2.67	4.60	6.25	3.60	3.89	4.42	0.98	2.01	3.22	0.60	35.48
2015	3.62	2.96	2.53	5.56	16.96	3.95	0.92	0.46	2.14	9.82	9.86	3.83	62.61
2014	0.33	0.41	1.45	1.74	3.40	3.26	0.98	4.34	0.06	2.09	2.13	1.13	21.32
2013	4.06	1.68	2.27	1.98	3.17	2.14	2.05	1.32	2.72	3.13	2.12	2.76	29.40
2012	6.18	1.88	5.74	4.24	1.66	2.82	0.78	3.19	1.75	1.02	0.05	1.95	31.26
2011	1.60	0.92	0.07	2.46	7.95	2.84	0.09	0.96	0.66	3.12	0.86	4.35	25.88
2010	2.76	2.83	3.57	2.03	1.09	2.08	3.13	0.41	9.09	1.16	1.50	2.05	31.70
2009	0.82	0.72	5.56	3.54	4.36	3.98	2.09	1.64	6.52	8.05	1.76	1.85	40.89
2008	0.27	2.30	6.07	3.85	2.21	0.84	0.81	2.82	0.84	2.29	4.53	0.27	27.10
2007	5.58	0.43	3.81	2.82	8.34	11.10	5.54	0.35	4.99	3.53	1.22	2.34	50.05
2006	2.25	3.85	4.40	1.86	1.90	0.34	1.78	0.52	2.60	4.34	2.58	3.33	29.75
2005	4.33	1.62	2.17	0.56	3.35	1.14	0.74	2.46	1.36	0.89	0.02	0.33	18.97
2004	3.04	3.84	1.71	2.96	4.73	10.49	4.16	4.24	1.02	5.72	5.01	0.65	47.57
2003	0.22	3.07	0.85	1.90	2.53	5.17	0.08	1.85	3.99	0.78	3.15	0.96	24.55
2002	4.90	0.94	7.39	5.68	5.40	3.10	3.07	1.47	1.38	6.44	0.52	4.13	44.42
2001	2.44	6.17	5.27	0.89	5.58	1.28	3.85	2.72	3.72	1.87	1.11	3.24	38.14
2000	1.59	3.30	2.91	4.28	3.17	5.93	T	0.00	0.17	4.38	6.95	3.57	36.26
1999	1.44	0.48	2.84	2.74	6.91	0.99	0.77	T	2.30	2.26	0.31	2.55	23.59
1998	5.07	3.22	4.45	1.25	2.38	1.75	0.11	0.35	0.68	5.64	4.91	4.43	34.24
1997	0.33	7.40	2.21	6.73	3.92	3.99	1.68	3.13	2.01	5.66	1.01	6.93	45.00
1996	0.97	0.35	2.36	2.14	0.95	3.42	3.85	5.02	1.51	6.56	5.54	0.47	33.14
1995	2.11	0.44	6.69	6.83	7.50	2.41	3.45	0.86	1.54	0.75	0.74	2.07	35.39
1994	1.43	2.01	1.69	3.62	5.80	2.05	4.58	4.89	1.39	8.19	6.03	2.42	44.10
1993	1.74	5.78	3.03	3.49	1.75	3.75	0.00	0.75	3.28	5.10	1.62	2.54	32.83
1992	3.25	2.40	3.24	2.46	6.93	5.23	2.48	2.08	3.25	3.05	3.56	4.26	42.19
1991	2.72	2.60	1.35	3.63	6.97	4.26	3.99	4.30	4.61	9.32	1.04	8.75	53.54
1990	4.54	4.72	5.89	6.90	7.16	1.89	2.60	2.37	1.12	2.81	3.81	1.46	45.27
1989	2.56	3.70	3.72	1.86	9.62	8.75	2.61	1.89	2.40	2.02	0.49	0.33	39.95
1988	0.88	1.23	2.03	2.21	2.11	3.23	2.47	0.44	4.04	1.64	2.28	2.48	25.04
1987	1.22	3.67	1.70	0.11	5.95	3.45	1.77	0.81	1.38	0.12	4.17	2.90	27.25
1986	T	2.40	1.08	5.20	5.53	2.03	0.41	1.63	4.60	1.81	2.25	2.44	22.45

# 480 Home Place – Holly Parsons



## Resident's Concerns

- Backyard floods and takes several days to dry
- No way for City to control what residents do within their lots that could adversely impact neighbors
- Would like to receive answers from the City within a reasonable timeframe

## Huitt-Zollars Comments

- Backyard floods due to large upstream watershed draining through yard. Town may consider regulating streams draining large areas. This would require easements dedicated to the Town.
- Grading a swale though this and downstream properties will alleviate flooding.
- More structured process for receiving and answering resident's concerns within a timeframe.
- Identify need for additional resources.

## 540 Hackberry Drive – Cory Zuerker



### Resident's Concerns

- Resident understands his property is within floodplain and is expected to flood frequently
- No increase in flooding frequency, except for 2015
- Erosion taking place along Sloan Creek streambanks

# 922 Shoal Creek Drive – James Coates

## Resident's Concerns

- Heritage Ranch golf course floods often, but this is expected since it is within the floodplain
- Some residents at Heritage Ranch expressed concerns about additional drainage coming from the Molodow site
- Happy with City Engineer's work assisting with maintenance needs at Heritage Ranch.

# 1061 Country Trail – Cheryl Sinacola

## Resident's Concerns

- Diverted drainage from home to the north that underwent expansion and development off Hart Road causing more water to drain into her backyard.
- Concerned there are no regulations on what residents are allowed to do that can adversely impact neighbors.
- Would like to see a ditch intercepting drainage from property adjacent/north and routing it east to stream

## Huitt-Zollars Comments

- Consider requiring in the permitting process proof of no drainage diversion due to new construction or expansion.
- Intercepting swale will re-route drainage to its original direction toward stream and alleviate runoff into backyard.

# 571 Kentucky Lane - Justin Jinright

## Resident's Concerns

- Noticed increase in frequency of flooding and erosion within his property
- Concerned about other residents' ability to adversely impact his and neighbors' properties
- Removal of ponds during development of Harper landing increase volume going to Sloan Creek

## Huitt-Zollars Comments

- Increase in flooding likely due to increase in rainfall amounts experienced in the past 5 years
- Video during significant rainfall in March of 2020 shows Sloan Creek, overflow channel and ditch functioning adequately (near bankfull but not overtopping)
- Sloan Creek, overflow channel and ditch will overtop during severe storm events due to location within floodplain.

# 571 Michelle Way – Benjamin White

## Resident's Concerns

- Drainage overtopping overflow channel goes to neighbor's property. Concerned about impact to his neighbor.
- Willing to work with City to improve overflow channel and provide detention within his property to alleviate neighbor's drainage issues.
- Lack of ability of the City to regulate changes within private property that can adversely impact neighbors.

## Huitt-Zollars Comments

- Ditch and overflow channel appear to function adequately during moderate storms according to videos recorded during significant rainfall in March of 2020.
- On-site detention would likely have an adverse impact to Sloan Creek due to location near the downstream end of watershed.
- Town may consider in the future regulating streams draining large areas to limit impacts to adjacent properties

# Rachelle Farkas (and Foxglen neighbors) – 1041 Pecan Drive



## Resident's Concerns

- Street floods and takes up to 2 weeks to dry out, allowing for bad smell, mosquito and algae growth.
- Severe streambank erosion caused loss of yard up to 15-ft and large trees in backyard to fall and be carried down Sloan Creek

## Huitt-Zollars Comments

- Swale between lots providing positive drainage will drain water from street to Sloan Creek
- Streambank protection highly recommended to stop bank erosion.

# 1060 Pecan Drive



## Resident's Concerns

- Homeowner believes more frequent flooding in his front yard is due to his neighbor's driveway being raised, constricting the natural drainage path.

## Huitt-Zollars Comments

- Increasing the culvert opening under the recently raised driveway is expected to decrease front yard flooding and restore drainage back to or similar to its original condition.
- Increase in frequency of flooding also due to greater rainfall amounts seen in the past 5 years.

# 475 Cottonwood Place & 490 Hackberry Street

## Resident's Concerns

- Pond and swales adjacent to pond have overflowed a few times in the past 5 years
- Noticed higher water levels than normal recently

## Huitt-Zollars Comments

- Increase in rainfall amounts since 2015 are likely the cause for pond and swale overflowing and for higher than normal water levels

# 520 Cottonwood Place

## Resident's Concerns

- Water backs up on ditches along the street and it takes several days to dry out.

## Huitt-Zollars Comments

- Ponding is due to flat grades and lack of positive drainage, due to sediment accumulation over the years
- Ditches need maintenance to re-establish original grades and provide positive drainage to Sloan Creek.

# 491 Hackberry Drive

## Resident's Comments

- Neighbor's house at Lakewood Drive used to flood so he created a berm around his house which diverted drainage into resident's backyard, causing his backyard and shed to flood.
- Adjacent neighbors have also been adversely impacted by change in drainage pattern.

## Huitt-Zollars Comments

- Improvements on neighbor's property appear to be the cause of additional runoff.
- Town may consider previous suggestion of incorporating into the permitting process proof by the owner that improvements will not cause change in drainage patterns that could adversely impact adjacent properties.

# 561 Cottonwood Place

## Resident's Concerns

- Lot backs to Sloan Creek. Severe erosion along streambank causing loss of yard and large trees to fall into the creek.

## Huitt-Zollars Comments

- Streambank is severely eroded. Armoring of streambank is highly recommended to stop erosion.

# 580 Maple Lane



## Resident's Concerns

- Severe streambank erosion has caused the loss of as much as 20-ft of yard at three different locations.
- Large trees have fallen into the creek due to bank erosion
- Concerned about continuing trend of erosion causing additional loss of yard and large trees.

## Huitt-Zollars Comments

- Streambank erosion is the most severe out of all the properties observed.
- Immediate streambank protection is highly recommended to prevent further bank erosion, loss of land and trees.