City of Oshkosh Stormwater Management



Common Council Workshop Sawyer Creek Watershed September 1, 2009

Overview

- Sawyer Creek Storm Water Management Plan
 - Watershed Characteristics
 - Plan Goals
 - Existing Conditions
 - Alternatives Analysis
- Campbell Creek Storm Water Management Plan
 - Review of Alternatives
- Water Quality Analysis





Sawyer Creek Watershed Characteristics

Municipality	Area (Acres)	
City of Oshkosh	3,182	31.7
Town of Algoma	1,409	14.1
Town of Omro	954	9.5
Town of Nekimi	3,015	30.1
Town of Utica	<u>1,466</u>	<u>14.6</u>
Total	10,026	100%



Sawyer Creek Plan Goals

- Reduce or eliminate street flooding to the maximum extent practicable.
- Reduce 100-year floodplain elevations to remove habitable buildings from the 100-year floodplain, where possible.
- Culverts/Bridges at street crossings should convey stormwater runoff from a 100-year storm event without roadway overtopping, where possible. If this is not possible, provide passage of the greatest storm event possible (25-year to 50-year being desirable).
- Stormwater management practices to be employed should improve stormwater quality by reducing the amount of suspended solids and attached nutrients in the runoff to the maximum extent practicable.

Sawyer Creek Existing Conditions

STH 21

Flooding Review Points: 1.W. 20th Ave. / Clairville Rd. 2.Oakwood Rd. 3.9th Ave. Bridge Locale. 4.Westhaven Bridge Locale. 5.Washburn St. near Kienast property. 6.North Westfield St. and Taft Ave. 7.Arthur Ave., Van Buren Ave., Coolidge Ave. Locale. 8.Dove Street Locale. 9.Westhaven Dr., Maricopa Dr., Dickinson Ave., Washburn St. Locale (Portion within Campbell Creek watershed)







Sawyer Creek Existing Conditions

Bridge Overtopping Frequency

Roadway Crossing	Approximate Overtopping Frequency (Design Storm Event)
Clairville / CTH K	25-50
Pedestrian Bridge 2	<2
Pedestrian Bridge 1	<2
Oakwood Road	25-50
West 9 th Avenue	25-50
Westhaven Drive	25-50
Pommerening Residence	5-10
Naslund Residence	5-10
USH 41 and Frontage Roads	100
Westfield Drive	50-100
Sawyer Street	100

Sawyer Creek Alternatives Analysis



				Channel					
				Improvement	MODIFIED				
				s At,	Channel				
				Upstream	Improvement				
			Oakwood	and	s At,			Campbell	
	James	Westhaven	Road/	Downstream	Upstream		Campbell	Creek	Campbell
	Road/	West Golf	Badger	of Westfield	and		Creek	Tipler and	Creek
	HWY 91	Course	Avenue	Street from	Downstream	HWY 41/	Alternativ	Armory	Alternativ
	Detention	Detention	Detention	Mead & Hunt	of Westfield	Frontage Road	e 13B in	Detention	e 12 in
Alt.	Basin	Basin	Basin	2000 Study	Street	Reconstruction	place	Basins	place
1	Х					X			
2		X				X			
3			Х			X			
4					X	X			
5	Х	X	X		X	X			
6	Х	X	Х		X	X	Х		
7	Х		X		X	X			Х
8	X		X		X	X		X	
9	X		X	X		X			X

Alternative 1 – Detention Basin Located near James Road and STH 91

	Pros		Cons
•	Rural land less expensive than urban	•	Potential wetland issues
	land.		
-	Excellent location for reducing peak flows from upstream in the watershed.	•	Potential need for soil undercutting for embankment construction
		-	Potential need for
-	Provides 229 acre- feet of storage volume		dewatering during construction.
		•	No Quality Benefit.
L		1	



Alternative 1 – Detention Basin Located near James Road and STH 91





Storm Event	Peak Flow into Detention Basin from Creek (cfs)	Local flows to Detention Basin (cfs)	Peak Flow Remaining in Creek (cfs)	Peak Discharge from Detention Basin (cfs)	Percent Reduction	Max. Water Surface Elevation	Max. Storage (ac-ft)
2-Year	21	11	131	5	84	805.46	7.4
10-Year	169	25	177	65	66	808.44	61.6
25-Year	410	38	255	108	76	810.62	111.8
50-Year	676	51	359	141	81	812.88	167.5
100- Year	897	67	443	156	84	814.76	229.1



Alternative 2 – Westhaven West Golf Course Detention Basins

	Peak Flow into		Da als Elassi	Deale			
	Detention Bosin from		Peak Flow	Peak		Max Motor	Mox
0.1.0.0.0	Dasin nom	Local Flows To		Discharge	Devee		IVIAX.
Storm	Сгеек	Detention Basin	Сгеек	from Detention	Percent	Surface	Storage
Event	(cfs)	(cfs)	(cfs)	Basin (cfs)	Reduction	Elevation	(ac-ft)
2-Year	0	23	391	4	83	767.61	6.7
10-Year	1	50	968	14	73	768.19	14.8
25-Year	190	56	1343	84	66	770.80	60.1
50-Year	505	62	1677	141	75	774.38	128.7
100-Year	994	70	2223	193	82	777.82	199.9

	Pros		Cons
•	Helps alleviate flooding downstream.	•	Potential wetland issues
•	Makes use of "open" land in urbanized area of the City.	•	Potential need for soil undercutting for embankment
•	Location is ideal for reducing peak discharges downstream		construction
	in the watershed.	•	Potential need for dewatering during construction.
-	Provides 200 acre-feet of storage volume.	•	Korobago and Wauseon soils may be underlain by sandy
•	Provides stormwater quality treatment for 130.5 acres.		layers that may necessitate a clay liner in the wet basin
			areas.

Alternative 2 - Westhaven West Golf Course Detention Basin

Golf Course Operations are Retained





Alternative 3 – Oakwood Road / Badger Avenue Detention (Southwest Industrial Park)



Oakwood Road/Badger Avenue Detention Basin Site Looking Southwest

Pros	Cons
 TSS reduction Makes use of "open" land in urbanized area of the City. Provides 9.4 acre-feet of storage volume during 100-year storm resulting in reductions in peak discharge rate and flood elevations downstream of the detention basin. 	 Potential need for soil undercutting for embankment construction Potential need for dewatering during construction. Wauseon soils may be underlain by sandy layers that may necessitate a clay liner in the wet basin areas. Small effect on peak discharge rates and 100-year flood elevations along Sawyer Creek.

Alternative 3 – Oakwood Road / Badger Avenue Detention Basin (Southwest Industrial Park)

	Deels Jefleys	Peak	Deveent	Maximum	Max
Storm Event	cfs)	(cfs)	Reduction	Elevation	(ac-ft)
2-Year	12	2	83	817.07	3.6
10-Year	26	6	77	818.04	7.4
25-Year	36	20	44	818.23	8.2
50-Year	47	31	34	818.34	8.7
100-Year	67	53	21	818.51	9.4

Alternative 4 – Channel Improvements

- Westfield Street Locale



Alternative 4 – Channel Improvements

- Westfield Street Locale



Westfield Street Locale

Pros	Cons
 No land acquisition. 	 Potential wetland issues.
 Improvement in water surface profile in vicinity and just upstream of improvements 	 Potential dredging issues.
just upstream of improvements.	Chapter 30 permit issues.
	 No reduction in peak discharge rates.

				Channel					
				Improvement	MODIFIED				
				s At,	Channel				
				Upstream	Improvement				
			Oakwood	and	s At,			Campbell	
	James	Westhaven	Road/	Downstream	Upstream		Campbell	Creek	Campbell
	Road/	West Golf	Badger	of Westfield	and		Creek	Tipler and	Creek
	HWY 91	Course	Avenue	Street from	Downstream	HWY 41/	Alternativ	Armory	Alternativ
	Detention	Detention	Detention	Mead & Hunt	of Westfield	Frontage Road	e 13B in	Detention	e 12 in
Alt.	Basin	Basin	Basin	2000 Study	Street	Reconstruction	place	Basins	place
1	X					X			
2		X				X			
3			Х			X			
4					X	X			
5	Х	Х	Х		Х	Х			
6	Х	Х	Х		Х	Х	Х		
7	Х		Х		Х	Х			Х
8	Х		Х		Х	Х		Х	
9	X		Х	X		X			X

Alternatives 5 through 9 are different combinations of the components contained in Alternatives 1 through 4.

Assessment Parameter 1 – 100-year Storage Volume Provided (ac-ft)

	Storage in Sawyer	Rank Based On Total
Alt.	Creek	Storage Provided
1	229.1	6
2	199.9	7
3	21.9	8
4	0	9
5	430.8	1
6	430.8	1
7	251	3
8	251	3
9	251	3

Assessment Parameter 2 – Percent Reduction in 100-Year Peak Flow Rate at the Fox River / Sawyer Creek Confluence

	Existing 100-Year Flow Rate at Sawyer Creek	100-Year Flow Rate at Sawyer Creek with Alternative in Place		
Alt.	(cfs)	(cfs)	% Reduction	Rank ¹
1	3401	2807	17.5%	7
2	3401	2658	21.8%	3
3	3401	3375	0.8%	8
4	3401	3391	0.3%	9
5	3401	2275	33.1%	2
6	3401	2210	35.0%	1
7	3401	2746	19.3%	4
8	3401	2765	18.7%	6
9	3401	2746	19.3%	5

¹ The tiebreaker between Alternatives 7 and 9 goes to Alternative 7 because the modified Westfield channel improvements would be less costly to implement than the original Mead and Hunt Westfield channel improvements.

Assessment Parameter 3 – Greatest Freeboard at the 5 Flooding Analysis Points

Alt.	Average Freeboard at 5 Locations (feet)	Rank
1	-0.366	7
2	-0.228	5
3	-1.028	8
4	-1.038	9
5	0.304	2
6	0.336	1
7	-0.244	4
8	-0.254	6
9	-0.228	3

Freeboard is the distance between the flood water surface and the first floor elevation of structures.

(-) = Average 100-Year Water Surface Elevation Above the 1st Floor Elevation

(+) = Average 100-Year Water Surface Elevation Below the 1st Floor Elevation

Assessment Parameter 4 – Average Storm Passed at Bridges Assessed

Roadway Crossing	Exist.	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9
Clairville Road / W. 20th Avenue	25-50	100	25-50	25-50	25-50	100	100	100	100	100
Pedestrian Bridge 2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Pedestrian Bridge 1	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Oakwood Road	25-50	25-50	25-50	25-50	25-50	50-100	50-100	25-50	25-50	25-50
9th Avenue	25-50	50-100	50-100	25-50	25-50	100	100	50-100	50-100	50-100
Westhaven Drive	25-50	50-100	50-100	25-50	25-50	100	100	50-100	50-100	50-100
Witzel Ave.(CTH E)	100	100	100	100	100	100	100	100	100	100
Pommerening Residence	5-10	5-10	5-10	5-10	5-10	10-25	5-10	5-10	5-10	5-10
Naslund REsidence	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10
USH 41 and Frontage Roads	100	100	100	100	100	100	100	100	100	100
Westfield Drive	25-50	25-50	100	25-50	50-100	100	100	100	100	100
Sawyer Street	100	100	100	100	100	100	100	100	100	100
Rank		6	7	9	8	1	2	4	3	5

¹ Tie breaker between Alternatives 5 and alt 6 goes to Alternative 5 because it is less costly to implement in the Campbell Creek watershed.

² Tie breaker between Alternatives 8 and 9 goes to Alternative 8 because Alternative 9 requires land acquisition at occupied land, Alternative 8 is vacant land.

³ Tie breaker between Alternatives 3 and 4 goes to Alternative 3 because Alternative 3 provides water quality side benefit for the same water quantity benefit.

Rank Based on Average of Four Assessment Parameters

A 14	Rank for 100-year Storage Volume	Rank for Percent Reduction in 100-year Peak Flow Rate at the Fox River/ Sawyer	Rank for Greatest Freeboard at the 5 Flooding Analysis	Rank for Average Storm Passed at	Average Rank Based on 4 Assessment
AIL.	provided		7	6	
	0		/	0	1
2	7	3	5	7	6
3	8	8	8	9	8
4	9	9	9	8	9
5	1	2	2	1	2
6	1	1	1	2	1
7	3	4	4	4	3
8	3	6	6	3	5
9	3	5	3	5	4

Campbell Creek



Campbell Creek Review of Alternatives

- Alternatives 12 and 13B had best flooding reduction performance.
- Alternative 12:
 - Tipler Dry Detention Basin Council Approved
 - Armory Wet Detention Basin Council Approved
 - 9th and Washburn Wet Detention Basin
- Alternative 13B
 - Tipler Dry Detention Basin Council Approved
 - Armory Wet Detention Basin Council Approved
 - Westhaven Golf Course Detention Basins

Campbell Creek Review of Alternatives

Alternative 12

Tipler, Armory and 9th & Washburn

Benefits

•140.3 acre-feet of Storage

•2.3 feet Freeboard at Landmark Plaza for 100-year storm

 Increased # of Streets with 10-Year Storm Capacity vs.
 Existing Conditions



Campbell Creek Review of Alternatives

Alternative 13B

Tipler, Armory and Golf Course

Benefits

•215.1 acre-feet of Storage

•3.6 feet Freeboard at Landmark Plaza for 100-year storm

•Increased # of Streets with 10-Year Storm Capacity versus Existing Conditions and Alternative 12





Water Quality Analysis

- Wisconsin DNR Storm Water Discharge Permit Coverage issued on January 2, 2007
- Permit requires reduction of pollution to waters of the state
- Pollutant of Interest: Total Suspended Solids (TSS)
- Must reduce Base Load by 40% by 2013



Water Quality Analysis

- City of Oshkosh TSS Pollution Information
 - Base Load: 1693 tons/year
 - Required Reduction: 677 tons/year (40% of 1693)
 - Current Practices Reduction: 309 tons/year
 - Additional Reduction Required: 368 tons/year (677-309)



Combined Mitigation Strategies for Sawyer Creek and Campbell Creek Watersheds

- Sawyer Creek
 - Alternatives 6 and 7 have best performance based upon flood reduction.
 - Alternative 6 impacts Westhaven Golf Course
 - Alternative 7 does not impact Westhaven Golf Course
- Campbell Creek
 - Alternatives 12 and 13B have best performance based upon flood reduction
 - Alternative 13B impacts Westhaven Golf Course
 - Alternative 12 does not impact Westhaven Golf Course

Projects Independent of Golf Course Decision

- James Road / STH 91 Detention Basin
- Oakwood Road / Badger Avenue Detention Basin
- Channel Improvements along Sawyer Creek in Westfield Street Area
- Armory Detention Basin¹ Council Approved
- Tipler Detention Basin Council Approved

1. If 9th and Washburn Location selected, Armory Detention Basin requires acquisition of approximately 5 acres of Commercially zoned land.

Projects Independent of Golf Course Decision

Project Cost Analysis

Component	Storage Provided (ac-ft)	TSS Pollution Removed (tons / year)	Estimated Cost	Cost per ac-ft Storage
James Road / USH 91 Detention Basin	229.1	None	\$ 7,271,000	\$ 31,700
Oakwood Road / Badger Avenue Detention Basin	21.9	12.8	\$ 1,076,000	\$ 49,130
Channel Improvements in Westfield Street Area	0	None	\$ 727,600	NA
Expanded Armory Detention Basin ²	44.1	None ¹	\$ 6,946,200	\$ 157,510
Tipler Detention Basin	41.5	None	\$ 1,750,000	\$ 42,170
Total:	336.6		\$ 17,770,800	\$ 52,800

1. Armory Detention Basin not estimated to reduce pollution due to being adjacent to a navigable waterway. DNR regulations typically require smaller storm events to remain within the waterway. These smaller storm events carry the majority of pollutants. During Design Phase staff will work with DNR to explore every possibility to include water quality benefit.

2. If 9th and Washburn Location selected, Armory Detention Basin requires acquisition of approximately 5 acres of Commercially zoned land.

Projects Dependent on Golf Course Decision

Project Cost Analysis

Component	Storage Provided (ac-ft)	TSS Removed (tons/year)	Estimated Cost	Cost per ac-ft Storage
Westhaven Golf Course ¹	354.2	68.1	\$ 24,531,800	\$ 69,260
9 th and Washburn	28.9	13.8	\$ 8,634,000	\$ 298,750

1. This option allows the Armory Detention Basin to be reduced to by eliminating the purchase of 5 acres of Commercially zoned land.

Options Analysis

Summary

	Existing Conditions	No Impact to Westhaven	Impacting Westhaven	
Storage Provided (ac-ft)	NA	365.5	677.6	
Total TSS Removed (tons/year)	NA 26.6		80.9	
100-year Flood Plain Area (ac)	591	385	359	
Estimated City Parcel Value in 100-year Flood Plain	\$ 265,778,500	\$ 192,006,500	\$ 176,244,500	
Number of Residential City Parcels within 100-year Flood Plain	683	496	410	
Number of Dwelling Units within City within 100-year Flood Plain ¹	2,182	1,535	1,295	
Miles of Streets within 100- year Flood Plain	12.37	8.19	6.40	
Project Cost	NA	\$ 26,404,800	\$ 37,851,800	

To make up the pollution reduction difference between the two options, approximately 460 acres of Commercial, Industrial and Institutional Land would require treatment with Bio-filters. The estimated construction cost would be \$4.2 million, with estimated annual maintenance costs of \$620,000 vs. \$28,000 for the detention basins.

Future Direction from Common Council

- To utilize Westhaven Golf Course, or not.
- To begin implementation of Sawyer Creek Storm Water Management Plan.

