

7 Implementation Plan

7.1 First Phase Subwatersheds

As discussed in Chapter 5, attacking the first phase of priority areas (including their critical zones) will create the most significant improvement in water quality in the shortest amount of time. Columbia Creek, Skinner-Extension Drain and Silver Creek subwatersheds were identified as the first phase priority areas and ideally implementation would begin in one to three years.

- First Phase: **Green**
 - Defining Parameters
 - *E.coli* TMDL
 - High *E.coli* concentrations (exceeding WQS)
 - Source tracking presence (all or a combination of): Equine, Bovine and Human
 - Nine critical zones have been identified

Tables 34-36 outline the prioritized objectives, best management practices and area of focus. To achieve water quality improvement, watershed goals and objectives were established in Chapter 6. When creating the implementation plan for the first phase subwatersheds, the goals and objectives leading to PBC and TBC were selected as the priority for implementation. In Tables 34-36, estimated quantity refers to the baseline information collected through the agricultural practices survey, land use data, LLWFA tool, septic areas of HLI and partner input. Estimated quantities are intended to be used as a jumping off point, by which to measure progress over time. The entities listed as partners are those organizations that have been identified as either interested in pursuing an implementation project or pivotal in terms of stakeholder trust.

Table 34. Columbia Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Columbia Creek (Critical Zone: 1)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, disposal and/or application of manure. Identify livestock access to surface water.	Livestock farms bovine and/or equine	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 28 Observed farms-acreage TBD</p>	MSUE, NRCS, ICD, ECD	\$5,000 each	\$140,000	11 Farms	17 Farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	8,267 acres of cropland	<p>Critical Zone-- Cropland between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 826 acres = 10%. Need to determine current on the ground practices</p>	MSUE, NRCS, ICD, ECD	\$20,000 each	\$500,000	826 acres	1,654 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ICD, ECD, Farm Bureau, Local government, Landscape and gardening industry, Local gardening and food groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ICD, ECD, Farm Bureau, Local Government and Business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

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Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Columbia Creek (Critical Zone: 1)									
Implement vegetative management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> loading	Columbia Rd (btwn Onondaga and Eifert Rd.), Nichols Rd. (btwn Onondaga and Eifert Rd.)	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 28 Observed farms and land use data identified 120 acres as permanent pasture</p>	MSUE, NRCS, ICD, ECD	\$10,000 each	\$280,000	11 Farms	17 Farms
				<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 826 acres = 10%, Need to determine current on the ground practices</p>					
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	8,267 acres of cropland	<p>Critical Zone- Property between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 2 sites and potential for 11.26 miles of stream buffers</p>	MSUE, NRCS, ICD, ECD	\$9,000/mile	\$99,000	2 miles	5 miles
Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	8,267 acres of cropland	Columbia and Gale Rd., South Eifert Rd (btwn Curtice and Bunker Rd.)	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 5-10% over current numbers found in agricultural practice survey</p>	MSUE, NRCS, ICD, ECD	\$300/acre	\$2,500,000	413 acres	826 acres

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Subwatershed: Columbia Creek (Critical Zone: 1)									
Implement livestock best management practices	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	South Eifert and Curtice Rd.	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 1 site, additional site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$1.50/ft	\$8,000	1 site (critical zone)	8 sites
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- Site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$9,000/mile	\$100,000	1 site	5 sites
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- Site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$3,000/site	\$50,000	1 site	5 sites
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E.coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 28 Observed farms-facility capacity TBD</p>	MSUE, NRCS, ICD, ECD	\$50,000 each	\$1,400,000	11 Farms	17 Farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	South Eifert and Curtice Rd.	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 1 site, additional site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$4,000 each	\$115,000	1 site (critical zone)	10 sites

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Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Columbia Creek (Critical Zone: 1)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	South Eifert Rd. (btwn Curtice and Bunker Rd.) and 56 Septic Areas of HLI	Critical Zone- Homes upstream of ECD Site 7	ICHD and Local Government	\$70,000	\$150,000	Track and identify human sources around ECD Site 7	Track and identify additional human sources in the subwatershed
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database maintained by ICHD	ICHD and Local Government	\$100,000	\$500,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	South Eifert Rd. (btwn Curtice and Bunker Rd.) and 56 Septic Areas of HLI	Critical Zone- Homes upstream of ECD Site 7 Subwatershed- 1 site and 56 Septic Areas of HLI identified and require on the ground investigation	ICHD and Local Government	\$15,000 each	\$800,000	100% of homes upstream of ECD Site 7	25% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	South Eifert Rd. (btwn Curtice and Bunker Rd.) and 56 Septic Areas of HLI	Critical Zone- Homes upstream of ECD Site 7 Subwatershed- 1 site and 56 Septic Areas of HLI identified and require on the ground investigation	ICHD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative

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Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Columbia Creek (Critical Zone: 1)									
Implement septic system management practices	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by ICHD and local entities such as townships, conservation districts, etc.	ICHD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.
		Work with homeowners to provide financial and technical assistance for those who qualify.						25% of septic areas of HLI	
		Wetland restoration projects completed on private and/or public lands						100% of homes upstream of ECD Site 7	
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Aurelius and Toles Rd (North of Glenna Droscha Park), Eifert Rd (btwn Barnes and Plains Rd.), Eifert and Aurelius Rd (Curlice and Bunker Rd. intersect), Aurelius and Toles Rd (West of Glenna Droscha Park)	Using the LLWFA tool 4 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, ICD, ECD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$6,000,000	5% of high impact areas	15% of high impact areas

Table 35. Skinner-Extension Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Skinner Extension Drain (Critical Zone: 6)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, disposal and/or application of manure. Identify livestock access to surface water.	Columbia and Gunnell Rds	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 1 site, additional site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$5,000 each	\$220,000	18 Farms	26 Farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies. Includes spreaders, calibration, direct injection, spraying and/or survey to investigate current usage and methods.	17,558 acres of cropland	<p>Critical Zone- Cropland upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 1,755 acres = 10%, Need to determine current on the ground practices</p>	MSUE, NRCS, ICD, ECD	\$20,000 each	\$880,000	1,755 acres	3,512 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ICD, ECD, Farm Bureau, Local government, Landscape and gardening industry, Local gardening and food groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ICD, ECD, Farm Bureau, Local government and business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

Table 35. Skinner-Extension Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Skinner Extension Drain (Critical Zone: 6)									
Implement vegetative management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> loading	Livestock farms with bovine and/or equine	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 44 Observed farms and land use data identified 639 acres as permanent pasture</p>	MSUE, NRCS, ICD, ECD	\$10,000 each	\$440,000	18 Farms	26 Farms
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	17,558 acres of cropland	<p>Critical Zone- Cropland upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 1,755 acres = 10%, Need to determine current on the ground practices</p>	MSUE, NRCS, ICD, ECD	\$300/acre	\$5,300,000	1,755 acres	3,512 acres
	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	<p>Critical Zone- Area upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- Potential for 15.84 miles of stream buffers</p>	MSUE, NRCS, ICD, ECD	\$9,000/mile	\$143,000	2 miles	5 miles
	Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	17,558 acres of cropland	<p>Critical Zone- Farms between ECD Sites 7 & 16, upstream of ECD Site 7 and upstream of ECD Site 18.</p> <p>Subwatershed- 5-10% over current numbers found in agricultural practice survey</p>	MSUE, NRCS, ICD, ECD	\$300/acre	\$5,300,000	877 acres	1,755 acres

Table 35. Skinner-Extension Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Skinner-Extension Drain (Critical Zone: 6)									
Implement livestock best management practices	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Island Hwy (btwn South Gunnell and Canal Rds.)	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 1 site, additional site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$1.50/ft	\$8,000	1 site	8 sites
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 44 Observed farms-Site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$9,000/mile	\$100,000	1 site	5 sites
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 44 Observed farms-Site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$3,000/site	\$50,000	1 site	5 sites
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E.coli</i> from reaching water bodies	Columbia and Gunnell Rds	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 1 site, additional site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$50,000 each	\$1,400,000	18 Farms	26 Farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Island Hwy (btwn South Gunnell and Canal Rds.)	<p>Critical Zone- Farms upstream of ECD sites 5, 9 and 10 and upstream of ECD sites 12, 8, 4 and B</p> <p>Subwatershed- 1 site, additional site identification necessary</p>	MSUE, NRCS, ICD, ECD	\$4,000 each	\$115,000	1 site	10 sites

Table 35. Skinner-Extension Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Skinner Extension Drain (Critical Zone: 6)									
Implement septic system management practices	Implement monitoring strategy	Isolate human sources	Entire Subwatershed	Subwatershed- 116 Septic Areas of HLI identified and require on the ground investigation	ICHD, BEDHD and Local Government	\$140,000	\$300,000	Track and identify human sources	Track and identify additional human sources
	Software-database upgrade to track and manage	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database for each health department (to be maintained by ICHD and BEDHD)	ICHD, BEDHD and Local Government	\$200,000	\$400,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit connections.	Repair illicit or leaky septic connections	Entire Subwatershed	Subwatershed- 116 Septic Areas of HLI identified and require on the ground investigation	ICHD, BEDHD and Local Government	\$15,000 each	\$900,000	10% of Septic Areas of HLI	25% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	Entire Subwatershed	Subwatershed- 116 Septic Areas of HLI identified and require on the ground investigation	ICHD, BEDHD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/main tenance initiative
	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by ICHD, BEDHD and local entities such as townships, conservation districts, etc.	ICHD, BEDHD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.

Table 35. Skinner-Extension Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Skinner Extension Drain (Critical Zone: 6)									
Implement septic system management practices	Implement cost share/loan program for failing systems and/or modern system (if no system present)	Work with homeowners to provide financial and technical assistance for those who qualify.	Entire Subwatershed	Subwatershed- 116 Septic Areas of HLI identified and require on the ground investigation	ICHD, BEDHD and Local Government	\$15,000 each	\$1,000,000	10% of Septic Areas of HLI	25% of Septic Areas of HLI
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Groverberg and Holt Rd, Petrieville Rd (area of Spicer Creek and Owen Drain), Rossman and Ransom R. (area of Skinner Extension Drain), Barnes and Arch Rd. (area of Harris Drain), Toles and Waverly Rd (area of Bunker Canoe Landing), Waverly and Gilbert Rd	Using the LLWFA tool 6 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, ICD, ECD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$9,000,000	5% of high impact areas	15% of high impact areas

Table 36. Silver Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Silver Creek (Critical Zone: 2)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, livestock access, disposal and/or application of manure.	Livestock farms with bovine and/or equine	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$5,000 each	\$20,000	4 Farms	Additional farms found in the subwatershed
				Subwatershed- 4 Observed farms-acreage TBD					
	Manure application and equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	4,612 acres of cropland	Critical Zone- Cropland upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$20,000 each	\$250,000	461 acres	923 acres
				Subwatershed- 461 acres = 10%, Need to determine current on the ground practices					
Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ICD, ECD, Farm Bureau, Local government, Landscape and gardening industry, Local food groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network	
									Address the need for a long term solution to utilize manure as an energy resource
Investigate development of on-farm or community digestors	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ICD, ECD, Farm Bureau, Local government and business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digestors	

Table 36. Silver Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Silver Creek (Critical Zone: 2)									
Implement vegetative best management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> loading	Vermontville Hwy (btwn Canal and Smith Rds.)	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$10,000 each	\$40,000	4 Farms	Additional farms identified in the subwatershed
				Subwatershed- 1 site, 4 Observed farms and land use data identified 152 acres as permanent pasture					
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	4,612 acres of cropland	Critical Zone- Cropland upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$300/acre	\$1,400,000	461 acres	922 acres
				Subwatershed- 461 acres = 10%. Need to determine current on the ground practices					
Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	Critical Zone- Property upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$9,000/mile	\$27,000	1 mile	2 miles	
			Subwatershed- Potential for 3 miles of stream buffers						
Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	4,612 acres of cropland	Critical Zone- Cropland upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$300/acre	\$1,400,000	230 acres	461 acres	
			Subwatershed- 5-10% over current numbers found in agricultural practice survey						

Table 36. Silver Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Silver Creek (Critical Zone: 2)									
Implement livestock best management practices	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Livestock farms with bovine and/or equine	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$1.50/ft	\$4,000	1 site	3 sites
				Subwatershed- 4 observed farms-Site identification necessary					
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$9,000/mile	\$25,000	1 site	3 sites
				Subwatershed- 4 observed farms-Site identification necessary					
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$3,000/site	\$12,000	1 site	3 sites
				Subwatershed- 4 observed farms-Site identification necessary					
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E. coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$50,000 each	\$200,000	4 Farms	Additional farms identified in the subwatershed
				Subwatershed- 4 Observed farms-facility capacity TBD					
Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Livestock farms with bovine and/or equine	Critical Zone- Farms upstream of ECD sites 2, 3, 20 and 21	MSUE, NRCS, ICD, ECD	\$4,000 each	\$16,000	1 site	3 sites	
			Subwatershed- 4 observed farms-Site identification necessary						

Table 36. Silver Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Silver Creek (Critical Zone: 2)									
Implement septic system management practices	Implement monitoring strategy	Isolate human sources	Martin Drain and 64 Septic Areas of HLI	<p>Critical Zone- Homes upstream of ECD Site 3</p> <p>Subwatershed-1 site and 64 Septic Areas of HLI identified and require on the ground investigation</p>	BEHD, ICHD and Local Government	\$140,000	\$300,000	Track and identify human sources around ECD Site 3	Track and identify additional human sources in the subwatershed
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database for each health department (to be maintained by ICHD and BEDHD)	BEHD, ICHD and Local Government	\$200,000	\$400,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharges.	Repair illicit or leaky septic discharge	Martin Drain and 64 Septic Areas of HLI	<p>Critical Zone- Homes upstream of ECD Site 3</p> <p>Subwatershed-1 site and 64 Septic Areas of HLI identified and require on the ground investigation</p>	BEHD, ICHD and Local Government	\$15,000 each	\$900,000	100% of homes upstream of ECD site 3	25% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	Martin Drain and 64 Septic Areas of HLI	<p>Critical Zone- Homes upstream of ECD Site 3</p> <p>Subwatershed-1 site and 64 Septic Areas of HLI identified and require on the ground investigation</p>	BEHD, ICHD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative

Table 36. Silver Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Silver Creek (Critical Zone: 2)									
Implement septic system management practices	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by ICHD, BEDHD and local entities such as townships, conservation districts, etc.	BEHD, ICHD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.
		Work with homeowners to provide financial and technical assistance for those who qualify.						100% of homes upstream of ECD site 3	25% of septic areas of HLI
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Wetland restoration projects completed on private and/or public lands	Martin Drain and 64 Septic Areas of HLI Canal Rd. and Windsor Hwy, Creyts Rd., Vermontville Hwy and Canal, Windsor Hwy and Gunnell Rd.	Using the LLWFA tool 4 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, ICD, ECD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$6,000,000	5% of high impact areas	15% of high impact areas

7.2 Second Phase Subwatersheds

Winchell and Union Drain, Cryderman Lake Drain and Sandstone Creek subwatersheds were identified as the second phase priority areas and ideally implementation would begin in four to six years.

- Second Phase: **Purple**
 - Defining Parameters
 - High livestock density (≥ 12 / sq. mi.)
 - Septic Areas of Highest Likely Impact (HLI) (≥ 20)
 - HIT Model Sedimentation Results

Tables 37-39 outline the prioritized objectives, best management practices and area of focus. To achieve water quality improvement, watershed goals and objectives were established in Chapter 6. When creating the implementation plan for the second phase subwatersheds, the goals and objectives leading to the creation of critical areas and those that support the defining parameters were selected as the priority for implementation. In Tables 37-39, estimated quantity refers to the baseline information collected through the agricultural practices survey, land use data, LLWFA tool, septic areas of HLI and partner input. Estimated quantities are intended to be used as a jumping off point, by which to measure progress over time. The entities listed as partners are those organizations that have been identified as either interested in pursuing an implementation project or pivotal in terms of stakeholder trust. As previously mentioned, short term is defined as 1 to 5 years and long term is defined as over 5 years.

Table 37. Winchell and Union Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Winchell and Union Drain (Critical Zones TBD)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, disposal and/or application of manure. Identify livestock access to surface water.	Livestock farms with bovine and/or equine	20 Observed farms-acreage TBD	MSUE, NRCS, ECD	\$5,000 each	\$100,000	5 Farms	15 Farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	9,130 acres of cropland	913 acres = 10% current acreage TBD	MSUE, NRCS, ECD	\$20,000 each	\$500,000	913 acres	1,826 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ECD, Farm Bureau, Local Government, Landscape Industry, Local Gardening and Food Groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ECD, Farm Bureau, Local Government and Business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

Table 37. Winchell and Union Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Winchell and Union Drain (Critical Zones TBD)									
Implement vegetative best management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> /loading	Livestock farms with bovine and/or equine	20 Observed farms and land use data identified 50.5 acres as permanent pasture	MSUE, NRCS, ECD	\$10,000 each	\$200,000	5 Farms	15 Farms
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	9,130 acres of cropland	913 acres = 10%, current acreage TBD	MSUE, NRCS, ECD	\$300/acre	2,700,000	913 acres	1826 acres
	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	Potential for 12.4 miles of stream buffers	MSUE, NRCS, ECD	\$9,000/mile	112,000	3 miles	7 miles
	Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	9,130 acres of cropland	5-10% over current numbers found in agricultural practice survey	MSUE, NRCS, ECD	\$300/acre	2,700,000	456 acres	913 acres

Table 37. Winchell and Union Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Winchell and Union Drain (Critical Zones TBD)									
Implement livestock best management practices	Implement monitoring strategy	Follow QAPP procedures to collect water quality data and determine critical areas. This should include <i>E.coli</i> concentrations and BST	Entire Subwatershed	Minimum of one field season	MDEQ, BEHD, ECD, Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Livestock farms with bovine and/or equine	20 Observed farms- Site identification necessary	MSUE, NRCS, ECD	\$1.50/ft	\$5,000	2 sites	5 sites
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	20 Observed farms- Site identification necessary	MSUE, NRCS, ECD	\$9,000/mile	\$45,000	2 sites	5 sites
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	20 Observed farms- Site identification necessary	MSUE, NRCS, ECD	\$3,000/site	\$15,000	2 sites	5 sites
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E.coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	20 Observed farms- Site identification necessary	MSUE, NRCS, ECD	\$50,000 each	\$1,000,000	5 farms	10 farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Livestock farms with bovine and/or equine	20 Observed farms- Site identification necessary	MSUE, NRCS, ECD	\$4,000 each	\$20,000	2 sites	5 sites

Table 37. Winchell and Union Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Winchell and Union Drain (Critical Zones TBD)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	22 Septic Areas of HLI	22 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database maintained by BEHD	BEHD and Local Government	\$100,000	\$500,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	22 Septic Areas of HLI	22 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$15,000 each	\$800,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	22 Septic Areas of HLI	22 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative

Table 37. Winchell and Union Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Winchell and Union Drain (Critical Zones TBD)									
Implement septic system management practices	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by BEHD and local entities such as townships, conservation districts, etc.	BEHD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.
	Implement cost share/loan program for failing systems and/or modern system (if no system present)	Work with homeowners to provide financial and technical assistance for those who qualify.	22 Septic Areas of HLI	22 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$15,000 each	\$1,000,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Sunfield and Shaytown Rd. (Bismark Rd cross-sects), Dow and Gates Rd (Mount Hope Hwy cross-sects), Round Lake and Brown Rd (Bismark and Kelly Rd cross-sects), Mount Hope Hwy and St. Joe Hwy (Dow Rd cross-sects), St. Joe Hwy and Saginaw Hwy (Dow Rd cross-sects)	Using the LLWFA tool 5 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, ECD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$7,000,000	5% of high impact areas	15% of high impact areas

Table 37. Winchell and Union Drain Implementation Plan

Subwatershed: Winchell and Union Drain (Critical Zones TBD)									
Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Implement rural residential best management practices	Low development techniques	Pervious pavement, rain gardens, native plant landscaping and other low impact development techniques	Rural residential property	Site identification necessary	TCRPC, ECD, and Local Government	\$10,000/site	\$500,000	5 sites	10 sites
Implement recommended drain maintenance practices	Land use planning and assessment	Land use planning and assessment using the Rural Water Quality Protection guidebook, channel stabilization, and erosion control techniques	Entire Subwatershed	1 county	TCRPC and Local Government: Planning Commissions, Drain Office, Economic Development Committees	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better land use and drain management	Implement developed strategies to contribute to better land use and drain management

Table 38. Cryderman Lake Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Cryderman Lake Drain (Critical Zones TBD)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, disposal and/or application of manure. Identify livestock access to surface water.	Livestock farms with bovine and/or equine	28 Observed farms-acreage TBD	MSUE, NRCS, ECD	\$5,000 each	\$140,000	6 Farms	16 Farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	14,860 acres of cropland	1,486 acres = 10% current acreage TBD	MSUE, NRCS, ECD	\$20,000 each	\$500,000	1,486 acres	2,300 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ECD, Farm Bureau, Local Government, Landscape Industry, Local Gardening and Food Groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ECD, Farm Bureau, Local Government and Business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

Table 38. Cryderman Lake Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Cryderman Lake Drain (Critical Zones TBD)									
Implement vegetative best management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> /loading	Okemos Rd (South of Morris Rd)	1 site identified, 28 observed farms and land use data identified 133 acres as permanent pasture	MSUE, NRCS, ECD	\$10,000 each	\$250,000	6 Farms	16 Farms
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	14,860 acres of cropland	1,486 acres = 10% current acreage TBD	MSUE, NRCS, ECD	\$300/acre	4,500,000	1,486 acres	3,000 acres
	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	Potential for 18.3 miles of stream buffers	MSUE, NRCS, ECD	\$9,000/mile	165,000	2 miles	5 miles
	Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	14,860 acres of cropland	5-10% over current numbers found in agricultural practice survey	MSUE, NRCS, ECD	\$300/acre	4,500,000	743 acres	1,486 acres

Table 38. Cryderman Lake Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Cryderman Lake Drain (Critical Zones TBD)									
Implement livestock best management practices	Implement monitoring strategy	Follow QAPP procedures to collect water quality data and determine critical areas. This should include <i>E.coli</i> concentrations and BST	Entire Subwatershed	Minimum of one field season	MDEQ, BEHD, ECD, Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Okemos Rd (South of Morris Rd)	1 site identified, additional site identification necessary	MSUE, NRCS, ECD	\$1.50/ft	\$5,000	2 sites	5 sites
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	28 observed farms, site identification necessary	MSUE, NRCS, ECD	\$9,000/mile	\$45,000	2 sites	5 sites
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	28 observed farms, site identification necessary	MSUE, NRCS, ECD	\$3,000/site	\$15,000	2 sites	5 sites
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E.coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	28 observed farms, site identification necessary	MSUE, NRCS, ECD	\$50,000 each	\$1,000,000	5 farms	10 farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Okemos Rd (South of Morris Rd)	1 site identified, additional site identification necessary	MSUE, NRCS, ECD	\$4,000 each	\$30,000	3 sites	5 sites

Table 38. Cryderman Lake Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Cryderman Lake Drain (Critical Zones TBD)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	66 Septic Areas of HLI	66 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database maintained by BEHD	BEHD and Local Government	\$100,000	\$500,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	66 Septic Areas of HLI	66 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$15,000 each	\$800,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	66 Septic Areas of HLI	66 Septic Areas of HLI identified and require on the ground investigation	BEHD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative

Table 38. Cryderman Lake Drain Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Cryderman Lake Drain (Critical Zones TBD)									
Implement septic system management practices	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program improvements to see where improvements could be made.	Entire Subwatershed	Developed by BEHD and local entities such as townships, conservation districts, etc.	BEHD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.
		Work with homeowners to provide financial and technical assistance for those who qualify.						66 Septic Areas of HLI	66 Septic Areas of HLI identified and require on the ground investigation
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Mulliken and Boyer Rd (near Mulliken Ballfield), Musgrove Rd and Keefer Hwy, Tupper Lake Rd and Turner and Charlotte Rd.	Using the LLWFA tool 4 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, ECD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$6,000,000	5% of high impact areas	15% of high impact areas

Table 38. Cryderman Lake Drain Implementation Plan

Subwatershed: Cryderman Lake Drain (Critical Zones TBD)									
Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Implement rural residential best management practices	Low development techniques	Pervious pavement, rain gardens, native plant landscaping and other low impact development techniques	Rural residential property	Site identification necessary	TCRPC, ECD, and Local Government	\$10,000/site	\$500,000	5 sites	10 sites
Implement recommended drain maintenance practices	Land use planning and assessment	Land use planning and assessment using the Rural Water Quality Protection guidebook, channel stabilization, and erosion control techniques	Entire Subwatershed	2 counties	TCRPC and Local Government: Planning Commissions, Drain Office, Economic Development Committees	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better land use and drain management	Implement developed strategies to contribute to better land use and drain management

Table 39. Sandstone Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sandstone Creek (Critical Zones TBD)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, disposal and/or application of manure. Identify livestock access to surface water.	Livestock farms with bovine and/or equine	17 observed farms- acreage TBD	MSUE, NRCS, ECD, CCD	\$5,000 each	\$140,000	4 farms	8 farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	9,068 acres of cropland	906.80 acres = 10%, current acreage TBD	MSUE, NRCS, ECD, CCD	\$20,000 each	\$300,000	906 acres	1812 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network- number of sites and development TBD	MSUE, ECD, CCD, Farm Bureau, Local Government, Landscape Industry, Local Gardening and Food Groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ECD, CCD, Farm Bureau, Local Government and Business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

Table 39. Sandstone Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sandstone Creek (Critical Zones TBD)									
Implement vegetative best management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> loading	Livestock farms with bovine and equine	17 observed farms and land use data identified 215 acres as permanent pasture	MSUE, NRCS, ECD, CCD	\$10,000 each	\$170,000	4 farms	9 farms
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	9,068 acres of cropland	906.80 acres = 10%, current acreage TBD	MSUE, NRCS, ECD, CCD	\$300/acre	\$2,700,000	906 acres	1812 acres
	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	Potential for 12.2 miles of stream buffers	MSUE, NRCS, ECD, CCD	\$9,000/mile	\$109,800	2 miles	5 miles
	Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	9,068 acres of cropland	5-10% over current numbers found in agricultural practice survey	MSUE, NRCS, ECD, CCD	\$300/acre	\$2,700,000	453 acres	906 acres

Table 39. Sandstone Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sandstone Creek (Critical Zones TBD)									
Implement livestock best management practices	Implement monitoring strategy	Follow QAPP procedures to collect water quality data and determine critical areas. This should include <i>E.coli</i> concentrations and BST	Entire Subwatershed	Minimum of one field season	MDEQ, BEHD, ECD, CCD, Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Oneida Rd. and Mount Hope Hwy	1 site, additional site identification necessary	MSUE, NRCS, ECD, CCD	\$1.50/ft	\$5,000	2 sites	5 sites
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	17 Observed farms- site identification necessary	MSUE, NRCS, ECD, CCD	\$9,000/mile	\$45,000	2 sites	5 sites
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	17 Observed farms- site identification necessary	MSUE, NRCS, ECD, CCD	\$3,000/site	\$15,000	2 sites	5 sites
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E.coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	17 Observed farms- facility capacity TBD	MSUE, NRCS, ECD, CCD	\$50,000 each	\$850,000	3 farms	6 farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Oneida Rd. and Mount Hope Hwy	1 site, additional site identification necessary	MSUE, NRCS, ECD, CCD	\$4,000 each	\$30,000	2 sites	5 sites

Table 39. Sandstone Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sandstone Creek (Critical Zones TBD)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	81 Septic Areas of HLI	81 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database maintained by BEHD	BEHD, Clinton HD and Local Government	\$100,000	\$500,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	81 Septic Areas of HLI	81 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and Local Government	\$15,000 each	\$100,000,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	81 Septic Areas of HLI	81 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative

Table 39. Sandstone Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sandstone Creek (Critical Zones TBD)									
Implement septic system management practices	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by BEHD and local entities such as townships, conservation districts, etc.	BEHD, Clinton HD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.
	Implement cost share/loan program for failing systems and/or modern system (if no system present)	Work with homeowners to provide financial and technical assistance for those who qualify.	81 Septic Areas of HLI	81 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and Local Government	\$15,000 each	\$3,000,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Broadbent Hwy (near Miller Creek and Lootens Park), Forest Hill Rd and Eaton Hwy, Oneida Rd (near Ledge Meadows Golf Course and Unknown Drain), Oneida Rd and St. Joe Hwy (near Sandstone Creek), Saginaw Hwy (near Sandstone Creek and Willow Colonial Park) and Willow and Nixon Rd	Using the LLWFA tool 6 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, ECD, CCD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$8,000,000	5% of high impact areas	15% of high impact areas

Table 39. Sandstone Creek Implementation Plan

Subwatershed: Sandstone Creek (Critical Zones TBD)									
Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Implement rural residential best management practices	Low development techniques	Pervious pavement, rain gardens, native plant landscaping and other low impact development techniques	Rural residential property	Site identification necessary	TCRPC, ECD, CCD and Local Government	\$10,000/site	\$500,000	5 sites	10 sites
Implement recommended drain maintenance practices	Land use planning and assessment	Land use planning and assessment using the Rural Water Quality Protection guidebook, channel stabilization, and erosion control techniques	Entire Subwatershed	2 counties	TCRPC and Local Government: Planning Commissions, Drain Office, Economic Development Committees	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better land use and drain management	Implement developed strategies to contribute to better land use and drain management

7.3 Third Phase Subwatersheds

Frayser and Sebewa Creek subwatersheds were identified as the third phase priority areas and ideally implementation would begin in seven plus years.

- Third Phase: **Orange**
 - Defining Parameters
 - Other Analysis
 - Absence of TMDL
 - Identifying gaps in data

Tables 40-41 outline the prioritized objectives, best management practices and area of focus. To achieve water quality improvement, watershed goals and objectives were established in Chapter 6. When creating the implementation plan for the first phase subwatersheds, the goals and objectives leading to PBC and TBC were selected as the priority for implementation. In Tables 40-41, estimated quantity refers to the baseline information collected through the agricultural practices survey, land use data, LLWFA tool, septic areas of HLI and partner input. Estimated quantities are intended to be used as a jumping off point, by which to measure progress over time. The entities listed as partners are those organizations that have been identified as either interested in pursuing an implementation project or pivotal in terms of stakeholder trust. As previously mentioned, short term is defined as 1 to 5 years and long term is defined as over 5 years.

Table 40. Frayer Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Frayer Creek (Critical Zones TBD)									
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, livestock access, disposal and/or application of manure.	Livestock farms with bovine and/or equine	15 Observed farms- acreage TBD	MSUE, NRCS, ECD, Ionia CD, CCD	\$5,000 each	\$75,000	3 farms	7 farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	12,414 acres of cropland	1,241.40 acres = 10% current acreage TBD	MSUE, NRCS, ECD, Ionia CD, CCD	\$20,000 each	\$400,000	1,241 acres	2,482 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ECD, Ionia CD, Clinton CD, Farm Bureau, Local Government, Landscape Industry, Local Gardening and Food Groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ECD, Ionia CD, Clinton CD, Farm Bureau, Local Government and Business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

Table 40. Frayer Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Frayer Creek (Critical Zones TBD)									
Implement vegetative best management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> loading	Livestock farms with bovine and/or equine	15 Observed farms and land use data identified 173 acres as permanent pasture	MSUE, NRCS, ECD, Ionia CD, CCD	\$10,000 each	\$150,000	3 farms	7 farms
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	12,414 acres of cropland	1,241.10 = 10% current acreage TBD	MSUE, NRCS, ECD, Ionia CD, CCD	\$300/acre	\$3,800,000	1,241 acres	2,482 acres
	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	Potential for 13.4 miles of stream buffers	MSUE, NRCS, ECD, Ionia CD, CCD	\$9,000/mile	\$120,600	3 miles	6 miles
	Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	12,414 acres of cropland	5-10% over current numbers found in agricultural practice survey	MSUE, NRCS, ECD, Ionia CD, CCD	\$300/acre	\$3,800,000	620 acres	1,241 acres

Table 40. Frayer Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Frayer Creek (Critical Zones TBD)									
Implement livestock best management practices	Implement monitoring strategy	Follow QAPP procedures to collect water quality data and determine critical areas. This should include <i>E. coli</i> concentrations and BST	Entire Subwatershed	Minimum of one field season	MDEQ, BEHD, Ionia CD, ECD, CCD, Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Livestock farms with bovine and/or equine	15 Observed farms-site identification necessary	MSUE, NRCS, ECD, Ionia CD, CCD	\$1.50/ft	\$5,000	2 sites	5 sites
	Setback near existing crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Livestock farms with bovine and/or equine	15 Observed farms-site identification necessary	MSUE, NRCS, ECD, Ionia CD, CCD	\$9,000/mile	\$45,000	2 sites	5 sites
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	15 Observed farms-site identification necessary	MSUE, NRCS, ECD, Ionia CD, CCD	\$3,000/site	\$15,000	2 sites	5 sites
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E. coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	15 Observed farms-facility capacity TBD	MSUE, NRCS, ECD, Ionia CD, CCD	\$50,000 each	\$750,000	3 farms	6 farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Livestock farms with bovine and/or equine	15 Observed farms-site identification necessary	MSUE, NRCS, ECD, Ionia CD, CCD	\$4,000 each	\$30,000	2 sites	5 sites

Table 40. Frayer Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Frayer Creek (Critical Zones TBD)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	7 Septic Areas of HLI	7 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD, Clinton HD and Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database for each health department (to be maintained by Clinton HD, Ionia HD and BEDHD)	BEHD, Ionia HD, Clinton HD and Local Government	\$200,000	\$400,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	7 Septic Areas of HLI	7 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD, Clinton HD and Local Government	\$15,000 each	\$200,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	7 Septic Areas of HLI	7 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD, Clinton HD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative

Table 40. Frayer Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Frayer Creek (Critical Zones TBD)									
Implement septic system management practices	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by BEHD and Ionia HD and local entities such as townships, conservation districts, etc.	BEHD, Ionia HD, Clinton HD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.
		Work with homeowners to provide financial and technical assistance for those who qualify.						7 Septic Areas of HLI identified and require on the ground investigation	7 Septic Areas of HLI
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Benton and Eaton Hwy (near Grange and Unknown Drain) and Wheaton and St. Joe Hwy (near Frayer Creek and Unknown Drain)	Using the LLWFA tool 2 high impact areas for wetland restoration were identified. On the ground investigation of identified areas necessary.	NRCS, Ionia CD, ECD, CCD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$1,000,000	5% of high impact areas	15% of high impact areas

Table 40. Frayer Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Frayer Creek (Critical Zones TBD)									
Implement rural residential best management practices	Low development techniques	Pervious pavement, rain gardens, native plant landscaping and other low impact development techniques	Rural residential property	Site identification necessary	Ionia CD, ECD, CCD and Local Government	\$10,000/site	\$500,000	5 sites	10 sites
Implement recommended drain maintenance practices	Land use planning and assessment	Land use planning and assessment using the Rural Water Quality Protection guidebook, channel stabilization, and erosion control techniques	Entire Subwatershed	3 counties	TCRPC and Local Government: Planning Commissions, Drain Office, Economic Development Committees	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better land use and drain management	Implement developed strategies to contribute to better land use and drain management

Table 41. Sebewa Creek Implementation Plan

Subwatershed: Sebewa Creek (Critical Zones TBD)									
Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Implement manure management planning and implementation	Completed manure management plans	Address the need for appropriate site planning in regards to storage, handling, disposal and/or application of manure. Identify livestock access to surface water.	Livestock farms with bovine and/or equine	17 Observed farms-acreage TBD	MSUE, NRCS, ECD, Ionia CD	\$5,000 each	\$85,000	4 farms	8 farms
	Manure application equipment and timing	Address the need for appropriate manure application equipment and timing of spreading to reduce <i>E.coli</i> from reaching water bodies	11,192 acres of cropland	1,119.20 = 10% current acreage TBD	MSUE, NRCS, ECD, Ionia CD	\$20,000 each	\$340,000	1,119 acres	2,238 acres
	Investigate development of a manure and/or compost network	Address the need for a long term solution to utilize manure as a resource. Includes connecting farms producing manure and those who can utilize it such as cropping systems, home gardeners, urban agriculture, etc.	Entire Subwatershed	1 network-number of sites and development TBD	MSUE, ECD, Ionia CD, Farm Bureau, Local Government, Landscape Industry, Local Gardening and Food Groups	\$1,500,000	\$2,500,000	Planning process to develop manure and/or compost network	Utilization of manure and/or compost network
	Investigate development of on-farm or community digesters	Address the need for a long term solution to utilize manure as an energy resource	Entire Subwatershed	TBD	MSU, ECD, Ionia CD, Farm Bureau, Local Government and Business	\$1,500,000	\$2,500,000	Planning process to develop digester usage	Utilization of digesters

Table 41. Sebewa Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sebewa Creek (Critical Zones TBD)									
Implement best vegetative management practices	Pasture management techniques	Manage pasture based on paddock size, rotational grazing, soil testing, grazing plan and forage selection to reduce <i>E.coli</i> loading	Livestock farms with bovine and/or equine	17 Observed farms and land use data identified 25 acres as permanent pasture	MSUE, NRCS, ECD, Ionia CD	\$10,000 each	\$170,000	4 farms	8 farms
	Cover crops	Cereal rye, oil seed radish and oats applied to cropland to reduce <i>E.coli</i> reaching waterbodies	11,192 acres of cropland	1,119.20 = 10% current acreage TBD	MSUE, NRCS, ECD, Ionia CD	\$300/acre	\$3,400,000	1,119 acres	2,238 acres
	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Agricultural and rural residential property	Potential for 15.2 miles of stream buffers	MSUE, NRCS, ECD, Ionia CD	\$9,000/mile	\$136,800	4 miles	7 miles
	Tillage Practices	Maintain current conservation tillage practices and/or adopt where appropriate	11,192 acres of cropland	5-10% over current numbers found in agricultural practice survey	MSUE, NRCS, ECD, Ionia CD	\$300/acre	\$3,400,000	560 acres	1,119 acres

Table 41. Sebewa Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sebewa Creek (Critical Zones TBD)									
Implement livestock management best practices	Implement monitoring strategy	Follow QAPP procedures to collect water quality data and determine critical areas. This should include <i>E. coli</i> concentrations and BST	Entire Subwatershed	Minimum of one field season	MDEQ, BEHD, ECD, Ionia CD, Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Livestock exclusion or controlled access at crossing	Install fencing to exclude livestock from freely accessing the creeks or river or install controlled access for livestock to cross a creek in a small determined area	Dow Rd (South of Saginaw Hwy), Shaytown Rd (South of Saginaw Hwy), and Keefer Hwy (between Emery and Bippley Rds.)	3 sites, further identification necessary	MSUE, NRCS, ECD, Ionia CD	\$1.50/ft	\$15,000	3 sites	5 sites
	Setback near existing crossing	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	17 Observed farms- Site identification necessary	MSUE, NRCS, ECD, Ionia CD	\$9,000/mile	\$55,000	4 farms	8 farms
	Setback at holding facility	Install fencing to create 300' (dirt lot) or 10' (pasture) wide buffer area before stream bank.	Livestock farms with bovine and/or equine	17 Observed farms- Site identification necessary	MSUE, NRCS, ECD, Ionia CD	\$3,000/site	\$25,000	4 farms	8 farms
	Waste storage and/or compost facilities	Install manure and/or compost structures to reduce <i>E. coli</i> from reaching water bodies	Livestock farms with bovine and/or equine	17 Observed farms- Facility capacity TBD	MSUE, NRCS, ECD, Ionia CD	\$50,000 each	\$850,000	4 farms	8 farms
	Alternative water sources	Install water sources to prevent the need of livestock to access surface water by way of the creek or river	Dow Rd (South of Saginaw Hwy), Shaytown Rd (South of Saginaw Hwy), and Keefer Hwy (between Emery and Bippley Rds.)	3 sites, further identification necessary	MSUE, NRCS, ECD, Ionia CD	\$4,000 each	\$40,000	3 sites	5 sites

Table 41. Sebewa Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Sebewa Creek (Critical Zones TBD)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	19 Septic Areas of HLI	19 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD and Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database for each health department (to be maintained by Ionia HD and BEDHD)	BEHD, Ionia HD and Local Government	\$200,000	\$400,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	19 Septic Areas of HLI	19 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD and Local Government	\$15,000 each	\$400,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	19 Septic Areas of HLI	19 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative
	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by BEHD and Ionia HD and local entities such as townships, conservation districts, etc.	BEHD, Ionia HD and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.

Table 41. Sebewa Creek Implementation Plan

Subwatershed: Sebewa Creek (Critical Zones TBD)										
Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)	
Implement septic system management practices	Implement cost share/loan program for failing systems and/or modern system (if no system present)	Work with homeowners to provide financial and technical assistance for those who qualify.	19 Septic Areas of HLI	19 Septic Areas of HLI identified and require on the ground investigation	BEHD, Ionia HD and Local Government	\$15,000 each	\$400,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI	
Implement wetland restoration	Wetland restoration projects completed on private and/or public lands	Use the information from the LLWFA tool to restore high impact areas.	Mt. Hope and St. Joe Hwy (near Shaytown and Dow Rd.)	Using the LLWFA tool 1 high impact area for wetland restoration was identified. On the ground investigation of identified areas necessary.	NRCS, Ionia CD, ECD, DU, Habitat and Wildlife Groups	\$6,000/acre	\$500,000	5% of high impact areas	15% of high impact areas	
Implement rural residential best management practices	Low development techniques	Pervious pavement, rain gardens, native plant landscaping and other low impact development techniques	Rural residential property	Site identification necessary	Ionia CD, ECD, and Local Government	\$10,000/site	\$500,000	5 sites	10 sites	
Implement recommended drain maintenance practices	Land use planning and assessment	Land use planning and assessment using the Rural Water Quality Protection guidebook, channel stabilization, and erosion control techniques	Entire Subwatershed	2 counties	TCRPC and Local Government: Planning Commissions, Drain Office, Economic Development Committees	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better land use and drain management	Implement developed strategies to contribute to better land use and drain management	

7.4 Carrier Creek Implementation

Carrier Creek currently has a TMDL for Biota. The purpose of the TMDL was to identify an appropriate reduction in sediment loading from existing sources. After the publication of the TMDL (2002) a large scale restoration project was completed to address the issue of sediment loading. Currently there is debate as to the effectiveness of the restoration project. Also, MDEQ has drafted a TMDL for Dissolved Oxygen that would impact portions of Carrier Creek once finalized with EPA. It was determined to highlight Carrier Creek as a special case within the Watershed, therefore, not including it in the ranking process, rather as a stand-alone area. As previously mentioned, short term is defined as 1 to 5 years and long term is defined as over 5 years.

Table 42. Carrier Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Carrier Creek (Critical Zones TBD)									
Implement septic system management practices	Implement monitoring strategy.	Isolate human sources	75 Septic Areas of HLI	75 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and ICHD, and Local Government	\$1,000/site	\$30,000	Determine critical areas	Identify sources and causes
	Software-database upgrade to track and manage records.	This could include an online database that is accessible to the public.	Entire Subwatershed	1 database for each health department (to be maintained by BEDHD, Clinton HD and Ingham HD)	BEHD, Clinton HD and ICHD, and Local Government	\$200,000	\$400,000	Planning process to develop software-database	Utilization of software-database
	Identify and correct illicit discharge.	Repair illicit or leaky septic discharge	75 Septic Areas of HLI	75 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and ICHD, and Local Government	\$15,000 each	\$800,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
	Regular inspection and maintenance of septic systems through septic ordinance.	Work with homeowners to track and implement inspection and maintenance protocol for septic systems.	75 Septic Areas of HLI	75 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and ICHD, and Local Government	\$200,000	\$500,000	Planning process to develop inspection and maintenance initiative	Utilization of inspection/maintenance initiative
	Additional strategies to be developed by local entities.	Adopt policies and procedures to contribute to better septic system health. This could include evaluating current Time of Sale or Transfer Program to see where improvements could be made.	Entire Subwatershed	Developed by BEHD, Clinton HD and ICHD and local entities such as townships, conservation districts, etc.	BEHD, Clinton HD and ICHD, and Local Government	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better septic system health.	Implement developed strategies to contribute to better septic system health.

Table 42. Carrier Creek Implementation Plan

Prioritized Objective	Best Management Practice (in priority order)	Action	Areas of Focus	Estimated Quantity (in priority order)	Partners	Estimated Cost	Total Installed Cost	Measurable Milestone (0-3 yrs)	Measurable Milestone (4-10 yrs)
Subwatershed: Carrier Creek (Critical Zones TBD)									
Implement septic system management practices	Implement cost share/loan program for failing systems and/or modern system (if no system present)	Work with homeowners to provide financial and technical assistance for those who qualify.	75 Septic Areas of HLI	75 Septic Areas of HLI identified and require on the ground investigation	BEHD, Clinton HD and ICHD, and Local Government	\$15,000 each	\$800,000	10% of Septic Areas of HLI	15% of Septic Areas of HLI
Implement vegetative best management practices	Buffer strips and/or riparian plantings (including trees)	Grassed waterways, contour grass strips, shelterbreaks/field windbreaks, living snow fences, filter strips, riparian buffers	Residential Property	Potential for 10.5 miles of stream buffers	MSUE, ECD, TCRPC, and Local Government	\$9,000/mile	\$94,500	3 miles	6 miles
Implement rural residential best management practices	Low development techniques	Pervious pavement, rain gardens, native plant landscaping and other low impact development techniques	Residential property	Site identification necessary	ECD, CCD, ICD, and Local Government	\$10,000/site	\$500,000	5 sites	10 sites
Implement recommended drain maintenance practices	Land use planning and assessment	Land use planning and assessment using the Rural Water Quality Protection guidebook, channel stabilization, and erosion control techniques	Entire Subwatershed	3 counties	TCRPC and Local Government: Planning Commissions, Drain Office, Economic Development Committees	\$250,000	\$350,000	Planning process to evaluate and determine appropriate strategy to contribute to better land use and drain management	Implement developed strategies to contribute to better land use and drain management

7.5 Implementation Plan Evaluation

Evaluation of the implementation plan is important so that partners can apply adaptive management techniques to efforts within the Watershed when necessary. The following parameters should be part of the evaluation:

- How many prioritized objectives have been completed?
- What best management practices have been put in place?
- Is there a reduction in the primary pollutant and/or secondary pollutants as a result of implemented best management practices?
- Have the number of priority subwatersheds and/or critical zones been reduced?

Ideally an evaluation process would take place five to seven years after several components have been implemented. Part of the evaluation process should involve a cost-benefit analysis to determine the fiscal impact of the implementation plan.

Partner interest, commitment and capacity will play a large role in completing on the ground projects to improve water quality within the Watershed. It is important to track partner interest for the purpose of knowing where on the ground work can be accomplished once capacity is identified to complete a project. See Appendix 12 for example partner projects.

Ultimately, the success of the implementation plan will be defined by the attainment of designated uses and the restoration of TMDL reaches.

7.6 Implementation Plan Summary

First, second and third phase subwatershed implementation plans have been developed. Carrier Creek subwatershed remains a special standalone case and has its own implementation plan. Prioritized objectives along with their best management practices were selected based on the information at hand for the primary and secondary pollutants. The subwatershed implementation plans include the identified critical zones where appropriate. It is important to remember that the implementation plan should adapt to the needs of the Watershed as conditions change and evolve over time.