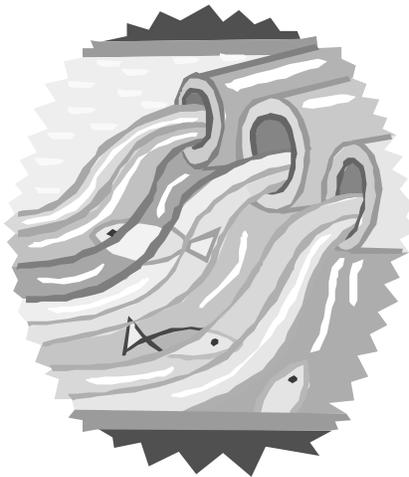


MDEQ Guidance for Storm Water Pollution Prevention Initiatives (SWPPI)

September/October 2005



Michigan Department of Environmental Quality
Water Bureau
NPDES Permit Program

Jennifer M. Granholm, Governor
Steven E. Chester, Director
www.michigan.gov/deq
(800) 662-9278

How to use this Guide

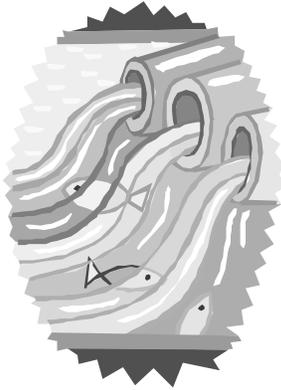
Minimum acceptable requirements are spelled out in this document by including language taken directly from the permit. Where the permit says "shall," it's a requirement. You will notice "shall", "need", and "must" are used in the guidance document to indicate specific requirements from the permit. For example, where the guidance says, "The following activities shall be included in the SWPPI..." it means the activities are required based on permit language. In addition, the items that are required based on permit language are in **bold** letters.

Most of the document includes recommended ways your community can meet the basic requirements. Where the guidance says, "Controls should include the following considerations, as applicable..." it means the controls mentioned are recommendations. Use of the word "should" indicates items that the DEQ considers important for review, or for the proper operation of storm water controls. Although "should" does not specify a clear mandate, it indicates the kind of detail that is helpful to the DEQ and an effective storm water program. If those items are not present, the DEQ may ask for additional detail in order to ensure the SWPPI is adequate.

CHAPTER 1

MDEQ GUIDANCE FOR WATERSHED MANAGEMENT PLANNING: FOR THE PURPOSE OF WRITING STORM WATER POLLUTION PREVENTION INITIATIVES

Chapter one



MDEQ Guidance for Watershed Management Planning: For The Purpose of Writing Storm Water Pollution Prevention Initiatives

In this guide, the basics of a Watershed Management Plan (WMP) are reviewed for the purpose of writing a Storm Water Pollution Prevention Initiative (SWPPI) under the Watershed Municipal Separate Storm Sewer System (MS4) Permit. **Pages 9 and 10 of the Permit (MIG619000) lay out specific WMP requirements** and also reference the guidance that gives details for developing a WMP.

Specific components of the WMP needed to produce an approvable SWPPI include:

1. Assessment of the watershed ecosystem
2. Long-term goals
3. Short-term measurable objectives
4. Actions to achieve long-term goals
5. Actions to achieve short-term measurable objectives
6. Commitments and dates - for each permittee - to implement the actions
7. Assessment of costs and benefits of actions (not a cost/benefit analysis).
8. Methods of evaluating progress



The SWPPI

The permittee-specific, enforceable, implementation document built, in part, from the WMP

The main purpose of the WMP is to identify implementation actions needed to protect and restore designated uses and resolve water quality and quantity concerns.

The WMP shall also address Total Maximum Daily Loads (TMDL) established for a parameter within the watershed that may be affected by storm water.

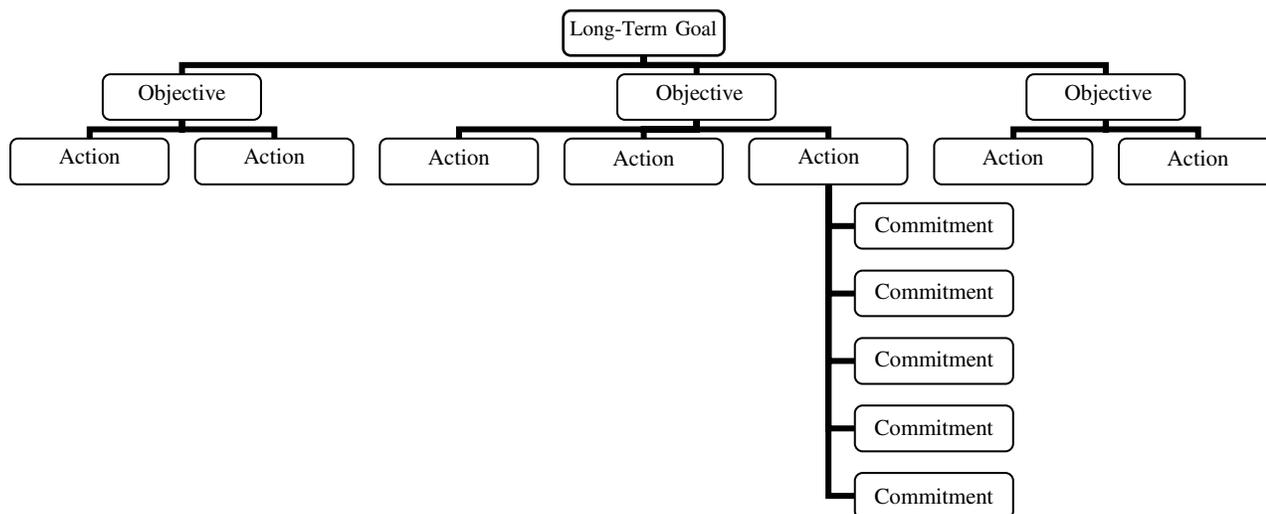
Setting goals and objectives is a main focus of the WMP. Both long-term goals and short-term measurable objectives are required. Actions must be identified to achieve the goals and objectives. Generally, a **long-term goal** is a broad target that could take multiple permit cycles to achieve. A **short-term measurable objective** defines a more specific target toward achieving the long-term goal. Short-term objectives should include a target that can be achieved within 5 years. **Note that objectives must always be measurable. All uses of the term objective in this document shall refer to measurable objectives.**

Long-term goals encompass both the protection and restoration of designated uses of the receiving waters, and attaining compliance with any storm water-affected TMDL. A TMDL is specific for each water body, if established. Designated uses are as follows:

Rule 323.1100 Designated Uses

1. Agriculture
2. Navigation
3. Industrial water supply
4. Public water supply at the point of water intake
5. Warmwater fishery
6. Other indigenous aquatic life and wildlife
7. Partial body contact recreation
8. Total body contact recreation from May 1 to October 31

The following chart shows the hierarchical relationship between long-term goals, measurable objectives (short-term and long-term), actions, and commitments. Having long-term objectives in the plan along with actions and commitments to meet those measurable objectives could prevent the watershed partners from having to substantially revise the WMP to add new objectives.



The WMP should address the entire watershed as identified in the Certificate of Coverage (COC). Although, the emphasis of the WMP is to mitigate the undesirable impacts caused by wet weather discharges from separate storm water drainage systems, the WMP should address all watershed concerns, which may include issues related to groundwater, sanitary wastes, industrial users, water-use and land-use, natural features protection, etc. The WMP will likely have goals for a watershed in addition to those that address storm water controls to protect and restore the designated uses and achieve TMDLs.

Long-term goals, objectives, and actions specified in the WMP may be watershed-wide or they may specify an individual water body such as a tributary or a lake within the watershed.

Actions may vary for each permittee, as long as they work toward achieving common objectives. However, if an objective is not applicable throughout the entire watershed, then only communities for which the objective applies will need to commit to actions to address that objective.

Goals and objectives can be general in nature

Actions to address these goals and objectives need to be more specific

If an objective is applicable throughout the entire watershed, every permittee having an impact on that objective will need to commit to a relevant action(s)

Significant components of the WMP which do not have complete agreement of the participants shall be detailed in an appendix to the WMP [including a description of the WMP component, identification of participants who disagreed with the component, reasons for disagreement (if provided), and suggested alternatives (if provided)].

Table 1 is an example of the type of WMP information that adequately addresses permit requirements. Goals, objectives (short-term and long-term), actions, and commitments are all requirements of the permit. Tables 2, 3 and 4 are examples from Michigan communities (the names have been changed). These demonstrate other methods for showing permittee commitments. The permittee may choose how the goals, objectives, actions, commitments, and evaluation methods are arranged and reported in the WMP.

Commitments in the WMP may be broad. A commitment to implement a specific action does not need to include details in the WMP other than a general timeframe for implementation. If more details are needed to implement the action, that can be included in the SWPPI. Permittees may choose to provide more detailed commitments in the WMP, as demonstrated for a few activities in Table 1.

“Wish list” activities may be included in the WMP without associated commitments. Wish list items are activities for which the communities recognize a need, but can’t or won’t commit to them for reasons such as:

- They go beyond the scope of the storm water controls
- They are not yet technologically feasible
- They can’t be implemented with the resources available



There is no limit to the number of activities that may be added to the WMP wish list, as long as the WMP also includes a reasonable number of activities with commitments to accomplish the goals and measurable objectives.

As shown in Table 1, a specific date is not required for a commitment, as long as implementation is clearly identified as either current (already being implemented), short-term or long-term and these timeframes are defined in the WMP. Short-term may be defined as either the remaining permit term or within 5 years.

If it’s determined during SWPPI development that the permittee can’t meet a commitment made in the WMP, changes can be made and identified in the submitted SWPPI. The permittee will need to provide adequate justification to the MDEQ for dropping a commitment or replacing an activity to accomplish the goal or measurable objective listed in the WMP.

The WMP must be reviewed and revised (if necessary) according to the date specified in the COC. Procedures for revising the WMP shall be identified in the WMP.

Example reasons to revise the WMP may include, but are not limited to:

- If only short-term objectives were identified
- If additional watershed concerns are discovered
- If different objectives are needed
- If evaluation of the WMP shows that modifications are needed to achieve goals and objectives

The specific examples provided do not represent an all inclusive list of what would typically be in a WMP to meet goals and objectives.

**Table 1
Perch River Watershed**

Goal 1	Objective	Action	Commitment (explanatory details are optional)	Timeframe	Evaluation Methods
Restore & protect aquatic life, wildlife, & habitat	Short-Term reduce embeddedness by 20% Long-Term reduce embeddedness by 80%	Stabilize eroding road/stream crossings	Perch CDC/CRC¹	Short-Term ²	Baseline & ongoing volunteer embeddedness studies Track completed road/stream crossings Track stabilized road/stream crossings & calculate pollutant load reductions
			All CVT	Short-Term	
			Perch CRC & All CVT Stabilize 100% road/stream crossings	Long-Term	
		Stabilize eroding stream banks	Perch CDC Selected tributaries	Short-Term	Volunteer erosion pin studies or Bank Erosion Hazard Index (BEHI) studies Records of all inventoried stream banks by Perch CDC & Perch City Track linear feet of stabilized banks & pollutant load reductions calculated
			Perch City Selected tributaries	Short-Term	
			Perch CDC All receiving streams	Wish List	
	Short-Term reduce nuisance blooms in Bass Lake Long-Term eliminate blooms in Bass Lake	Residential & municipal fertilizer educ. and reduction	All CVT Host a free soil testing day	Short-Term	Comparative analysis of plant & animal inventory around Bass Lake before & after implementation of actions listed to reduce nutrient loading Volunteer algae observations in the lake through participation in MDEQ's volunteer-based Cooperative Lakes Management Program
			All CVT Review & adopt ordinances for buffer zone requirements	Short-Term	
		Agricultural land - apply fertilizer at agronomic rates	Catfish Village Host seminar on fertilizer usage	Short-Term	
	Short-Term limit runoff to pre-development conditions from re-development & new development Long-Term reduce flashiness to pre-development conditions	Retrofit & modify existing infrastructure to reduce peak flows	All CVT	Long-Term	Comparative analysis between hydrologic data before & after implementation of actions listed Track installation of infiltration and retention BMP Volunteer erosion pin studies or BEHI studies Number of impervious surface ordinances adopted
		Establish impervious surface ordinances	Pisces Village & Carp City	Current	
			All CVT	Short-Term	
Install residential & commercial infiltration BMPs		Pike Place	Wish List		

¹CDC = County Drain Commissioner, CRC = County Road Commission, CVT = City, Village, and Township

²Short-Term means within remaining permit term; Long-Term means beyond remaining permit term, Wish List means there is no commitment yet

**Table 1 (cont.)
Perch River Watershed**

Goal 2	Objective	Action	Commitment (explanatory details are optional)	Timeframe	Evaluation Methods
Restore & enhance active and passive recreational uses	Reduce bacterial loadings that are harmful to public health and limit recreational use Short-Term Maintain or achieve water quality standards for partial body contact in recreational use areas Reduce beach closings by 50% Long-Term Maintain or achieve water quality standards for partial and total body contact in recreational use areas Reduce beach closings by 90%	Maintain existing sewer infrastructure	All CVT	Current (ongoing)	Track and report sewer inspections and repairs done in conjunction with road reconstruction
		Reduce overall illicit discharges	All CVT Train appropriate staff in detecting & eliminating illicit discharges	Current	Comparative analysis of the number of beach closings that occurred before & after implementation of WMP
			All CVT	Short-Term	Track # of failing septic systems discovered and fixed Track CVT and County IDEP implementation progress
		Eliminate illicit discharges from septic systems	Perch CDC Complete a review of point-of-sale septic system inspection/upgrade ordinances in other communities	Long-Term	Review County Health Department bacteria monitoring data
			All CVT Work jointly with Health Department to mail a septic system maintenance flier to septic owners	Current	Adoption of septic system inspection requirements, or alternative
			Perch CDC and RC Walk county and road drains to identify failing systems	Short-Term	
		All CVT and /or Perch County Inspect all systems every 5 years	Wish List		

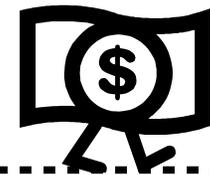
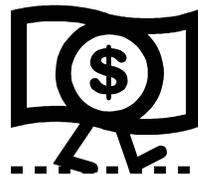
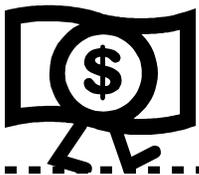
Assessments of Benefits and Costs



The permit calls for the general cost of the actions proposed in the WMP to be assessed so that permittees can determine what they can feasibly implement prior to making commitments. Committing to actions without understanding the cost of the action can cause problems when it comes time for implementation.

The benefits of each action also need to be determined in the WMP. Some actions are more beneficial than others. Actions with the most benefit should be considered before actions with a lesser benefit. By having the knowledge of both the benefit and estimated cost of an action, permittees should be better equipped to make commitments in the WMP and later in the SWPPI.

Although a “cost /benefit analysis” is not required, it is highly recommended to maximize the limited financial resources available to the permittees. It is important for permittees to prioritize the actions they intend to take to meet the measurable objectives defined in the WMP. Some actions will allow permittees to achieve more noticeable benefits in water quality at a quicker rate than others. One action may treat the symptoms of water quality problems while another may address the root of the problem. Some actions will bring noticeable benefits at lower costs than others. Since the financial resources available to address the water quality and quantity concerns in the watersheds are limited, it is important to address those concerns that have the maximum benefit for the cost expended.



NOTE FOR TABLES 1 & 2:

The permit requires methods for evaluating progress. These methods do not have to be in the same table as the goals and measurable objectives, as these examples demonstrate. They can be included in a separate document or chapter of the WMP.

Key: E = Ongoing during last 2 yrs. & continuing P = Planned w/in 5 yrs. NA = Not applicable ? = Data or decision not available CS = County standards applied NP = Not currently planned * = Will be evaluated L = Planned after 5 years	Table 2								
	Summary of Ongoing and Proposed Actions								
	Perch River Watershed Advisory Group Members								
Actions: (Specifics are listed in individual SWPPIs)	*Goals Addressed	Perch County	Perch CDC	Pike Place	Carp City	Pisces Village	Catfish Village	Perch CRC	Gill Township
Storm Water Management Ordinance	1-3, 8 & 10	E/P	P	E	P	P	NP	E	P
Other Water Protection Ordinances	5, 8, & 10	E/P	P	E	P	P	NP	E	P
Education for Land Use Decision Makers & Staff	1-5, 8, & 10	E/P	E/P	P	E/P	E/P	P	P	NP
Retrofitting Existing Detention System	1 -3, & 7	L	P	NA	NP	P	NA	P	NA
Storm Water Standards Redeveloped	1-3, 8, 10	CS	P	CS	CS	CS	CS	CS	CS
Stream Bank Stabilization Projects	2-4, & 6	*	P	?	E/P	*	L	*	P
Rain Barrel Demonstration Projects	1 & 7	P	L	P	E/P	L	P	L	E/P
Log Jam Inventory and Management	2-4, & 6	*	P	L	L	P	P	L	L
<p>Note: As part of the requirements of the Michigan General Storm Water Permit, the communities and agencies represented here are developing a Storm Water Pollution Prevention Initiative (SWPPI) outlining specific actions. The action items listed here have been developed using drafts of these SWPPIs and may change in the future.</p> <p>*A listing of goals addressed can be found on page 10 of the Watershed Management Plan (WMP).</p>									

Table 3						
Gill Township						
Perch River Watershed Management Plan						
BMP	*Goal & Objective	Current	Short Term	Long Term	Not Applicable	Comments
Construct/Maintain Storm Water Storage Facilities	1, 2, & 4	x				Required as part of ordinance. TWP currently owns and operates one detention facility.
Enhance Catch Basin Functionality	1-3, & 4	x				Clean catch basins and sewer system every 3-5 years. Regular program to monitor through TV.
Install/Maintain Storm Sewer Infiltration Treatment Devices	1-4		x			Stormceptors or similar devices required in the industrial section.
Maintain Sanitary Sewer Infrastructure	1 & 3	x				Ongoing.
Maintain Storm Water Controls	1-4	x				Ongoing. Detention/retention pond covenants for maintenance at new development and redevelopment. If facility does not maintain, the TWP will maintain and assess the facility.
Manage Public Facilities	1-4	x				Integrated pest management and salt control.
Perform Street Sweeping	1-3			x		Purchase street sweeper with dust control.
Reduce Directly Connected Impervious Surfaces	4		x			Low impact development ordinance.

*A listing of goals and objectives can be found on page 25 of the Watershed Management Plan (WMP).

Table 4**Bass River Action Plan Strategy Part 1**

The purpose of the Action Plan Strategy is to provide watershed goals and objectives and guidelines for developing and implementing Storm Water Pollution Prevention Initiatives (SWPPI) by each permitted community.

Watershed Goals	Watershed Objectives	Methods of Evaluation*
Reduce phosphorous loading from storm water runoff	1) Improve storm water quality 2) Educate public on phosphorous 3) Coordinate actions with TMDL plan	A,C,E,G,H
Enhance recreation within waterways	1) Conduct river clean-ups and other conservation projects 2) Objectives for improving and restoring aquatic habitat	C,D,G,H
Enhance the aesthetic appeal of areas near the waterways	1) Conduct river clean-ups and other conservation projects 2) Reduce erosion & sedimentation	C,D,G,H
Protect surface and ground waters from toxic and non-toxic contaminants	1) Improve storm water quality 2) Educate public 3) Coordinate with well-head protection program	A,B,C,E,F
Reduce bacteria and BOD from failing septic systems and illicit connections	1) Remove illicit connections 2) Educate the public on illicit connections and discharges 3) Abate failing septic systems	A,B
*List of Methods of Evaluation		
A	Track # of illicit connections identified and corrected	
B	Track # of complaints	
C	Conduct public surveys	
D	Track public participation	
E	Track catch basin maintenance and cleaning	
F	Track items and households from clean-up events	
G	Track miles of stream bank stabilization	
H	Track BMPs established throughout jurisdiction	

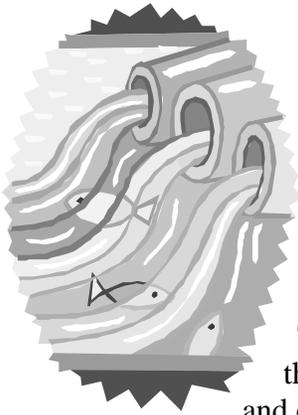
Table 4 (cont.)

Bass River Action Plan Strategy Part II

Watershed Goals	Plan Component Tasks	Responsible Parties	Timeline
Reduce bacteria and BOD from failing septic systems and illicit connections	Review/revise codes for illicit connections and discharges	All CVT, CDC, and CRC	w/in 1 year
	Train staff to identify illicit connections and discharges	All CVT, CDC, CRC and County	w/in 6 months
	Screen outfalls for dry weather discharges	CDC and CRC	20% per/yr.
	Develop septic system maintenance guides for homeowners	County	w/in 1 year
	Develop and implement code for septic inspections at time of sale	All CVT	w/in 3 years
	Implement public complaint hotline	County	w/in 6 months
	Reduce phosphorous loading from storm water runoff	Implement strategic street sweeping schedule	CRC
Develop brochure on proper lawn care for water quality and to all homeowners in their tax statement		County to develop and all CVT to send	w/in 6 months
Develop and implement catch basin cleaning and inspection program		All CVT, CDC, CRC and County	w/in 1 year
Develop maintenance requirements for private storm water systems		All CVT	w/in 1 year
Protect surface and ground waters from toxic and non-toxic contaminants	Evaluate emergency spill records for problem areas in road system	CRC	w/in 1 year
	Train emergency responders in storm water issues	All CVT	w/in 1 year
	Meet with well-head protection program staff quarterly	CVT	w/in 3 months

CHAPTER 2

MDEQ GUIDANCE FOR STORM WATER POLLUTION PREVENTION INITIATIVES (SWPPI)



Chapter Two

MDEQ Guidance for Storm Water Pollution Prevention Initiatives (SWPPI)

The purpose of the Storm Water Pollution Prevention Initiatives (SWPPI) is to detail the specific actions the permittee has determined will be implemented to meet the goals and objectives of the Watershed Management Plan (WMP) and the Watershed Permit requirements. At a minimum, the SWPPI must be designed to reduce the discharge of pollutants to the maximum extent practicable (MEP) and be consistent with the WMP.

In addition, the approved Illicit Discharge Elimination Plan (IDEP) and Public Education Plan (PEP) may be incorporated into the SWPPI in their entirety. This allows the permittee to bring together all of the actions being implemented under the Watershed Permit into a single document, but maintains the detail of the original IDEP and PEP. If modifications are made to the IDEP and PEP when they are combined with the SWPPI, the permittee must identify those modifications so they can be approved by the MDEQ District Office.

Permit holders will be in compliance with their permits as long as MDEQ and the permit holders agree that actions proposed in the approved SWPPIs will work towards restoration of designated uses and associated water quality standards, and the permit holder executes the actions according to approved schedules.

The main components of the SWPPI are:

- I. Actions to address WMP goals and objectives**
- II. Pollution prevention and good housekeeping activities**
- III. Post-construction controls**
- IV. Methods for assessing progress**
- V. Actions for urbanized areas with deferred WMPs**

It is a requirement that the SWPPI be reviewed and revised if needed 2 years after it is submitted.



The SWPPI

The permittee-specific, enforceable, implementation document built, in part, from the WMP

Specific components of the WMP needed to produce an approvable SWPPI include:

- 1. Assessment of the watershed ecosystem**
- 2. Long term goals**
- 3. Short term measurable objectives**
- 4. Actions to achieve long term goals**
- 5. Actions to achieve short term measurable objectives**
- 6. Commitments and dates - for each permittee - to implement the actions**
- 7. Assessment of Costs and Benefits of actions (not a Cost/Benefit Analysis).**
- 8. Methods of evaluating progress**

Note: See Chapter One, MDEQ Guidance for Watershed Management Planning: for the Purpose of Writing Storm Water Pollution Prevention Initiatives for further information.

I. The actions the permittee committed to in the WMP to achieve the goals and objectives of the WMP

WMP actions may not have precise **timelines and specific detail**. However, **this information needs to be included in the SWPPI**. If a commitment to an action was made by the permittee in the WMP, but not included in the SWPPI, an explanation of why the action was not included, along with an alternative action (if appropriate), should be in the SWPPI. Similarly, if the permittee determines that objectives in the WMP are not applicable in their jurisdiction, an explanation should be provided in the SWPPI if not previously provided in the WMP.

Actions listed in the SWPPI are somewhat flexible in that they can be altered at any point in the term of the permit to address water quality impairments associated with storm water discharges, as long as these changes are agreed upon by the MDEQ District Office.

A brief example of a SWPPI, **with all required information** for each action, is found in the table below.

Applicable actions that are already being implemented by the permittee are acceptable to include in the SWPPI toward meeting the requirements of the Permit and goals/objectives of the WMP.

Table 1. Example (partial) SWPPI

Storm Water Pollution Prevention Initiative
Catfish Village

June 2005

Long-term Goals	Measurable Objectives	Actions/Commitments	Timeline	Evaluation Methods
Restore & protect aquatic life, wildlife, & habitat	Short-Term Reduce Embeddedness by 20%	Stabilize eroding road/stream crossings	By 2007	Volunteer bioassessments conducted in conjunction with the Township, Perch River Watershed Council, Local School District, and College.
		Inventory stream bank conditions in conjunction with DC	By 2008	
		Stabilize eroding stream banks on Chum Creek	Spring 2006	
	Long-Term Reduce Embeddedness by 80%	Stabilize eroding steam banks on Perch River in conjunction with DC and Conservation District	Begin 2009 Finish 2011	
Restore & enhance active and passive recreational uses	Short-Term Maintain or achieve water quality standards for partial body contact in recreational use areas	Work jointly with Health Department to mail a septic system maintenance flier to septic owners	Begin 2005 Finish 2006	Utilize existing Health Department monitoring data at all public beaches and regarding failing OSDS
		Reduce beach closings by 50%	Develop/Enforce Illicit Discharge Ordinance	By 2007
	Long-Term Maintain or achieve water quality standards for partial and total body contact in recreational use areas	Develop OSDS Ordinance	By 2010	Track number of detected illicit discharges that have been eliminated
		Reduce beach closings by 90%	Begin enforcement of OSDS Ordinance	

DC = Drain Commissioner

OSDS = Onsite Sewage Disposal System

II. Pollution prevention and good housekeeping activities

Municipalities commonly have properties and infrastructure that can contribute pollutants to storm water during routine operation and maintenance. Municipal staff and contractors may also contribute to storm water pollutants, but with adequate training they can help prevent storm water pollution. **Training and inspection procedures for staff and contractors employed by the permittee are required.** The training required in the IDEP is not sufficient to address all areas of pollution prevention and good housekeeping.

The **following activities shall be included in the SWPPI**, or explain why they do not apply:

A Maintenance activities (both preventative and corrective), maintenance schedules, and inspection procedures for storm water structural controls (owned by the permittee)

Structural controls are designed to treat storm water runoff, divert storm water runoff from sensitive areas, and improve water quality, and may be associated with various areas such as DPW facilities, cemeteries, parks, fire stations, town & city halls, libraries, etc. The SWPPI **must include activities to ensure that structural controls are functioning properly and at optimum efficiency to reduce pollutants (including floatables) discharged from the permittee's separate storm water drainage system. All structural controls need inspection and maintenance schedules.**

Examples of storm water structural controls include, but not limited to:

- | | |
|-------------------------------------|------------------------------|
| 1. Storm water devices | 3. Infiltration facilities |
| a) Pipes, culverts, and ditches | a) Infiltration basins |
| b) Catch basins & grit traps | b) Infiltration trenches |
| c) Secondary containment | c) Rain gardens/bioretention |
| d) Oil/water separators | d) Porous pavements |
| 2. Detention facilities | 4. Biofilters |
| a) Wet ponds | a) Vegetated swales |
| b) Extended detention dry/wet ponds | b) Constructed wetlands |
| c) Vaults and tanks | c) Filter strips |

B Controls used for reducing or eliminating the discharges of water and pollutants from:

- 1. Streets, Roads, and Highways**
- 2. Parking lots**
- 3. Maintenance garages**
- 4. Storage yards**

Controls should include (but may not be limited to) the following, as applicable:

1. Street sweeping — a good street sweeping program would include:
 - a) Consideration of sweeper type and ability to remove fine sediments
 - b) Routine equipment maintenance to ensure proper operation
 - c) Removal of sediment from curb gutters
 - d) Sweeping frequency based on location, traffic loads, and amount of pollutants in area
 - e) Sweeping before spring snowmelt to reduce pollutant loads from traction aids applied over the winter

The new vacuum assisted or regenerative-air sweepers are very efficient at removal of fine particles as compared to the older brush-type mechanical sweepers. Fine particulates typically carry significant loads of toxic metals common to roadway runoff. The higher the percentage of impervious surface in an area, the more important a good sweeping program becomes.

2. Road salt application and storage practices
 - a) Application practices to consider:
 - i. Proximity to surface waters and other sensitive areas
 - ii. Frequency and amount of application should reflect site-specific characteristics
 - iii. Less environmentally harmful deicing alternatives near sensitive areas
 - iv. Devices to automatically control rate of material, and routinely calibrating them
 - v. Devices on trucks that accurately measure road surface temperature
 - b) Storage practices to consider:
 - i. Cover piles and store on impervious surfaces with runoff controls
 - ii. Comply with Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code) for spill/leak containment
 - iii. Clean up spills ASAP
3. Dust control
 - a) Adhere with road salt application guidance provided above
 - b) Comply with Part 22 Rules for Groundwater Quality including authorized substances to suppress dust according to R.323.2210(b)(i)
4. Snow Removal
 - a) Pile snow where there is not a significant potential for contamination of surface water (e.g. grassed areas or other porous ground) or groundwater (e.g. areas where there is an adequate depth of soil between the ground surface and water table to act as a filter)
 - b) Do not dispose directly into a surface water of the state
5. Maintenance garages and storage yards
 - a) Vehicle washing activities (wash water shall not be discharged to surface water or storm drains)
 - b) Spill control kits located in strategic areas
 - c) Chemical management and storage (Comply with Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code)
 - d) Fueling of vehicles should be monitored (never walk away or top off fuel tanks)
 - e) Store batteries, vehicular fluids, and oily substances under cover or inside
 - f) Vehicle inspection and maintenance schedule to ensure leaks are repaired ASAP.
 - g) Contain sanding and grinding wastes for proper disposal
 - h) Drain oil filters before disposal or recycling
 - i) Do not hose down areas to the storm drain inlets, use a broom and dispose of debris in garbage

6. Roadway and bridge maintenance
 - a) Capture and properly dispose of wastes from equipment cleaning and material transfer
 - b) Protect storm drain inlets and manholes from sediment and wastes created during paving operations and repairs.
 - c) Use drip pans and absorbent materials to limit leaks and spills from machinery
 - d) Consider alternative permeable road surface materials during resurfacing operations
 - e) Avoid using bridge scupper drains for new bridges and consider retrofits of existing scupper drains to provide storm water pollution and flow control.
 - f) Use proper pollution prevention practices during bridge maintenance to capture pollutants like paint, solvents, rust, concrete cutting or pulverizing slurry, and paint scrapings The Michigan Department of Transportation's (MDOT) specifications for construction and bridge maintenance are available online at <http://mdotwas1.mdot.state.mi.us/public/specbook/>
7. Gravel road maintenance
 - a) Divert runoff through vegetated filter areas and/or rock-lined turnouts
 - b) Avoid sending storm water runoff directly to surface waters
 - c) Keep runoff velocities low and avoid concentrating runoff
 - d) Minimize areas of disturbance and stabilize disturbed areas
8. Roadside Vegetation
 - a) Select roadside vegetation with higher salt tolerances
 - b) Minimize roadside spraying of vegetation.
 - c) Implement a 10 foot zero application buffer adjacent to surface waters
 - d) Mow rather than spray, where appropriate
 - e) Select native vegetation (deep-rooted native vegetation promotes infiltration)

Many of the above items can be included in educational training of staff, which may be easier to document than some of the action items (such as using drip pans or recycling).

C Procedures for the disposal of operation and maintenance waste from the separate storm water drainage system such as:

- 1. Accumulated sediments**
- 2. Floatables, and**
- 3. Other debris**

Disposal procedures should be spelled out in the SWPPI. The following components should be covered:

1. Methods for dewatering from catch basin cleanouts, including disposal methods of pump-out water
2. Solids must be disposed in an appropriate landfill
3. Have a procedure for handling and disposing of known hazardous or toxic materials
4. Cleaning of oil/water separators

III. The SWPPI must include the development, implementation, and enforcement of a **comprehensive storm water management program (SWMP) for post-construction controls for areas of new development and significant redevelopment** (i.e. development that disturbs greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into a drainage system).

The goal of the SWMP is to protect the designated uses in the receiving water from common impacts of urbanization. These impacts are detailed in a MDEQ publication entitled: *Hydrologic Impacts due to Development: The Need for Adequate Runoff Detention and Stream Protection*; which is available on the Web at: http://www.deq.state.mi.us/documents/deq-water-mgmt-Impact_4620_7.pdf.

- Some common impacts of urbanization include:
- “Flashiness” associated with higher peak stream flows from wet weather events and reduced base flows during droughts
 - Reduced stream-bank vegetation
 - Falling trees
 - Increased stream-bank erosion and slumping
 - Increased stream temperature and pollutant load
 - Degraded aquatic habitats and fish communities
 - Loss of pools & riffles due to sedimentation
 - Channel down-cutting & widening
 - Increased pollutants, temperatures, & nutrients

The following requirements must be included in a SWMP

A. **A SWMP shall include the evaluation and implementation of site-appropriate, cost-effective structural and nonstructural Best Management Practices (BMPs)** that prevent or minimize post-construction impacts on water quality. Nonstructural BMPs are managerial activities such as ordinances and public education. Structural BMPs are physical tools or systems that are used to protect or improve water quality, such as grassed swales, rain gardens, and retention ponds.

Permittees need to ensure that post construction controls are being designed in the planning stage of developments.

B. **A SWMP shall include a combination of BMPs sufficient to effectively prevent or minimize post-construction impacts on water quality.** A description of common controls for urbanization follows. It is suggested that a combination of these common controls be used. However, the list is not all-inclusive and other BMPs may be appropriate.

1. Growth ordinances and policies (e.g. Smart Growth, Low Impact Development, Open-Space Preservation, Conservation Design, etc.). These ordinances and policies should:
 - a) Protect wetlands, riparian zones, and other sensitive areas. Wetlands, floodplains, and riparian areas are important because they store water, filter pollutants, and slow runoff release rates, as well as provide important habitat.

Examples include: ordinances for buffers, wetlands, setbacks, and floodplain protection.

Low Impact Development (LID) is an attempt to merge development and storm water management with environmental protection. LID strives to preserve the predevelopment hydrologic regime and water quality by using small, cost-effective site design techniques that store, infiltrate, evaporate, and detain runoff.

LID = cost-effective storm water controls + environmental protection + aesthetics + higher property values = intelligent economics

- b) Maintain or increase open space areas, which help to reduce and slow runoff, facilitate flood control, and provide absorption and filtration of pollutants.

Examples include: Dedicated funding for open space acquisition, conservation easement programs, greenway corridor conservation programs, Purchase of Development Rights (PDR) programs, and Cluster Development ordinances.

- c) Encourage infill development in higher density urban areas and areas with existing infrastructure (i.e., reuse vacant or underutilized land in existing neighborhoods). Infill development may allow use of existing infrastructure (impervious surfaces, storm drains, utilities, etc.), which minimizes the need to build new infrastructure. It also can be a mechanism for reducing development of open spaces. Note: An ordinance change may be needed to allow for higher density development in existing communities.
- d) Identify acceptable areas for growth (i.e., Where should growth occur, and what areas should be preserved to protect water quality?). A Natural Features Inventory is a good way to determine where protection is most important. Many communities can take advantage of work that was already completed for an existing master plan.
- e) Limit runoff of storm water to pre-development rate and volume of discharge. Substantial scientific evidence shows negative impact on stream conditions begins when imperviousness in a watershed reaches 10%. Significant impacts occur with imperviousness between 10 and 20% unless steps are taken to maintain pre-development storm water runoff conditions.

Example regulatory controls include: ordinances that limit storm water runoff from the site; impervious surface restrictions; ordinances identifying allowable BMPs; and ordinances specifying conditions for off-site storm water treatment.

- 2. Establish maximum flow (rate and duration) targets for streams. Maximum flow targets should be designed to accomplish one or more of the following:
 - a) Reduce channel-forming events.
 - b) Minimize or reduce stream bank erosion.
 - c) Maintain healthy aquatic populations.
- 3. Coordinate releases from detention basins to remain within the established in-stream maximum flow targets. Reducing the amount of water going into the detention basin is the best way to reduce the volume discharged.

Maximum flow targets may be developed as part of a hydrologic study, or derived from a number of existing resources, including hydrologic studies conducted for watersheds in various areas of the state that may be suitable for other areas, as well as model ordinances.

IV. Methods of Assessing Progress in Storm Water Pollution Prevention

The permit requires assessment of progress made from storm water pollution prevention and implementation of the SWPPI. Assessment of storm water pollution controls is important:

It demonstrates progress is being made toward cleaner more usable waters of the state

An involved public will demand to see that progress is being made

○ The public will want to see that their money is being spent wisely

○ They'll want to see their resources protected or improved

○ Public wellbeing are influenced by the benefits from storm water pollution control

Assessment results can stimulate additional public involvement

Assessment can better direct program improvements and protect resources in the long term

Better water quality is an indicator of improved quality of life.

Revealing improvements can increase a community's desirability and even boost its prosperity

- A. Activity (also called output or effort) can be measured as a way of showing what the community is doing to carry out storm water controls under its SWPPI.

Measuring activities is often the easiest level of assessment. Nevertheless, measuring activities should not be substituted for measuring results. The MDEQ wants to be sure permittees understand the difference between reporting activities vs. results.

In most cases, the amount of effort expended to complete an activity is not an indication of the amount of pollution reduction or prevention achieved.

However, results aren't always immediately apparent, so the early implementation phase of an activity may have no results to report. Therefore, assessment methods may be focused more on the tracking of activities during early stages of implementation.

In addition, the annual report should include a summary of the activities implemented. This demonstrates the compliance status of the permittee.

Permittees working together to assess progress should detail their plans to MDEQ. Details should include who they are working with or relying on to meet assessment requirements.

Example activity measurements include (but are not limited to):

1. Number of public education activities conducted
 - a) Number of mailings
 - b) Number of newspaper ads or press releases
 - c) Number of workshops conducted
 - d) Number of school presentations
2. Number of storm water outfalls examined for illicit discharges
3. Completion of ordinances for:
 - a) Post-construction storm water controls for onsite retention of storm water
 - b) Open space preservation
 - c) Limiting impervious surfaces

- d) Septic tank inspections
- 4. Number of job-related public trained about:
 - a) How to identify illicit discharges
 - b) Proper application of fertilizers and pesticides
 - c) Construction site storm water BMPs
 - d) Proper catch basin cleaning and waste disposal techniques
 - e) Proper street cleaning techniques
 - f) Storm water detention basin inspections
 - g) Road salting techniques for water quality protection

B. Results (also called outcomes, benefits, improvements, consequences) are measured as a way of showing how the SWPPI activities have affected the watershed.

Example result measurements include (but are not limited to):

- 1. Direct assessment of resource
- 2. Tracking pollution removal or prevention
- 3. Social surveys

Where results monitoring is impossible or too difficult to be practical, permittees can present alternative assessments to MDEQ district staff prior to SWPPI submittal. Any alternatives should show progress toward a long-term goal to protect or improve Michigan's water bodies.

1. Direct Assessment of Resource

This measurement monitors water quality, living organisms, or some other aspect of the surface water environment that the permittee is trying to protect.

Two examples of directly assessing the resource include:

- a) Professional Monitoring
- b) Volunteer Monitoring

a) Professional Monitoring

Professional monitoring is carried out in Michigan to assess various characteristics of the surface water environment. Most characteristics monitored can reveal information about the impacts of urban storm water runoff. The MDEQ's monitoring programs include, but are not limited to, the following:

- Ambient water chemistry
- Sediment chemistry
- Biological integrity and physical habitat
- Bathing beach monitoring for human pathogens
- Inland lake quality and eutrophication

The MDEQ's program for monitoring each of the characteristics listed above is detailed in the Michigan Water Quality Monitoring Strategy (1997) and Michigan Water Quality Monitoring Strategy Update (April, 2005). The update identifies Local Program Support as one focus of its monitoring strategy. Local support is in the form of grants to local governments, universities and non-profit organizations each year for local water quality monitoring activities. Grants may be used to evaluate the effectiveness of local water quality protection and restoration programs.

Details of all of the DEQ's monitoring programs are available on line at www.michigan.gov/deqwater: click on <Water Quality Monitoring> <Assessment of Michigan Waters>. Specific links are listed for each category below.

i. Ambient Water Chemistry

Ambient water chemistry monitoring can be used to assess water quality changes in a lake, river, or stream as a result of the SWPPI related activities. It involves repeated collection and analysis of water samples taken from an open water body. This is an effective assessment method if carefully designed, but permittees must consider the costs involved and the number of samples that may be necessary to identify real changes in water quality. It's a common mistake to select a pollutant to study, and start sampling before the sampling and analysis methods have been properly designed. The process must start with a question that needs to be answered – for example, are the peak levels of suspended solids in the river declining, based on measurements taken 12 hours after a storm? A sampling regime is then designed to answer the question with defensible data. Appropriate expertise is important for survey design, sample collection, data analysis and interpretation.

Ambient Water Chemistry Monitoring

Is the most direct way to assess aquatic resources

Is MDEQ's primary assessment method

Data may be comparable to the following resources:

- Michigan's Water Quality Standards
- Data from other sources for the same, or similar, water body
- Targets established by the permittee, regulatory agencies, or others

If the intent of the assessment is to show a change in water quality over time or space, sampling and analysis methods must provide the statistical power to reduce uncertainty about whether a change really occurred. Natural data variations due to weather or other uncontrollable factors can easily be misinterpreted as water quality improvements, or mask improvements that have occurred. Because of the variability of pollutant levels in streams, multiple samples are needed to demonstrate that a data trend accurately shows changes in water quality. For example:

For conventional water quality parameters like dissolved oxygen, nutrients, or solids, the number of samples needed to characterize water quality conditions at a specific location over a field season in dry weather is usually around 15-20.

Comparable minimum sample numbers for bacteria in an urban area under dry weather are often higher – in the dozens – because of greater variability.

Comparable minimum sample numbers for all parameters under wet weather conditions are usually highest (50 to 100+).

In order to show a difference from one year to another, the number of samples shown above would need to be collected each year.

Careful sampling design is important to identify “controllable” data variability. One way to minimize data variability is to have separate data sets representing dry weather conditions and wet weather conditions. Pollutant concentrations are much more variable during and immediately after rain events. Another approach would be to monitor a river in an impoundment that provides retention time. Mixing within the impoundment reduces the daily data variations that may be common in the river.

The size of the river is also important to consider. A large river may not show significant improvement for many years, especially if the storm water pollution controls are implemented in only a small fraction of the total watershed. It may make more sense to select smaller problem drains or streams to track for improvements.

Proposed monitoring strategies should be as specific as possible, and should identify:

Parameter(s) to be measured
sampling locations and frequency
weather conditions during
sampling, if appropriate (e.g.
phosphorous under dry weather
and wet weather conditions)
who will finance and perform the
monitoring

**Chemical monitoring does
have many benefits, and
data can easily be used to
demonstrate water quality
issues to the public.**

Communities can defray costs by combining efforts with watershed partners.

In addition to cost sharing, the benefits of combining monitoring efforts include:

Monitoring of pollutants from several upstream contributors at one or a few points in a river channel

Consistency in sampling and analysis methods

Shows overall effects of watershed-wide planning and implementation

Ease of reporting and shared reporting

As stated earlier, the permittee should tell the MDEQ who they are working with or relying on to provide water quality monitoring.

The MDEQ recommends permittees check with their wastewater or water treatment plant laboratories to determine if they can provide water chemistry analysis at a reduced cost. Local colleges and universities may also provide laboratory analysis. It’s possible that they could even obtain grant money if the analysis can be linked to a research project.

Water chemistry monitoring can also be used to determine priority areas for BMP implementation under the SWPPI. MDEQ recommends the permittee use State Water Quality Standards to identify unmet designated uses and measure progress. MDEQ will also use attainment of designated uses, rather than just numeric water quality standards

alone, as a measure of the success of the SWPPIs. Designated uses are shown in a box in Chapter 1: Watershed Management Plans.

For informational purposes, standards for important water quality parameters are listed in the tables below (taken from the Part 4 rules promulgated pursuant to Part 31 of Public Act 451):

Parameter	Standard	Comment
Dissolved oxygen	Minimum for warm water = 4 or 5 mg/L; cold water = 6 or 7 mg/L	See Rule 323.1064-65 for details
Bacteria (<i>E. coli</i>)	Total body contact = 130 colonies/100 ml; Partial body contact = 1,000 colonies/100 ml	See Rule 323.1062 for details
Water temperature	R 323.1075 only lists temperature standards for point source discharges and mixing zones – not ambient water temperatures in surface water.	Recommended maximum temperatures are listed in the table below.
Phosphorous (under Plant Nutrients)	Prevent excessive aquatic plant growths that interfere with the designated uses	Analysis should be done using EPA Method 365.4
Settable solids or suspended solids	Not present in concentrations which interfere with the designated uses	If it is obvious, it's causing a problem

Maximum Monthly Temperatures (F) for discharges to Southern Michigan streams

Designation	J	F	M	A	M	J	J	A	S	O	N	D
Cold Water	38	38	43	54	65	68	68	68	63	56	48	40
Warm Water	41	40	50	63	76	84	85	85	79	68	55	43

Information on data sources for many Michigan waters is provided in Appendix 1.

Each year, MDEQ determines appropriate sites for ambient water monitoring and analysis in addition the fixed stations established in the statewide monitoring strategy. A letter is circulated annually by the MDEQ to solicit input on appropriate monitoring sites within a selected set of watersheds. A copy of that letter is in Appendix 2. Permittees interested in requesting a MDEQ monitoring site can get contact information on the MDEQ website at the <Monitoring Request Form> link under the Information banner.

ii. Sediment Chemistry

Contaminated sediments can directly impact bottom-dwelling organisms which are key components to the aquatic food chain. Human and wildlife health can also be impacted. Sediments samples can reveal:

- the history and location of wet weather pollutant inputs to a water body,
- deposits of toxic substances that may have ongoing impacts to humans, wildlife, and aquatic organisms, and
- long-term trends in pollutant inputs to the water body

Sediment sampling may be done at numerous locations in a water body to help pinpoint pollution sources, or it may be done in a single location to track trends. Choosing a single sampling location in a river or stream may first require sampling of multiple locations to determine where sediments tend to accumulate.

Like ambient water chemistry, care should be taken to reduce variability. In general, variability of sediment samples should be lower than that of ambient water chemistry samples, so fewer samples would be needed to characterize the parameters at the station. Preferably select locations with minimal influence of non-storm water inputs such as industrial and municipal wastewater.

Annual reports summarizing MDEQ sediment chemistry data collected at surface water locations statewide are available on the MDEQ website at <Sediment Chemistry> under the Monitoring Elements banner.

iii. Biological Integrity and Physical Habitat

This category includes all monitoring conducted for fish and benthic invertebrate community structure, nuisance aquatic plants, algae, slimes, and assessment of physical habitat. Biological communities respond to changes in water quality and stream flow. Sampling can demonstrate these changes. It can also reveal organisms that indicate high quality waters or reveal pollution concerns. The MDEQ identifies this monitoring element as an important tool for evaluating water quality.

MDEQ conducts much of this monitoring professionally, but many forms can easily be done by trained volunteers. Benefits of this element include:

- Relatively simple equipment

- MDEQ training available

- Written guidance: Michigan's Procedure 51, *Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers*

Additional information is available online from the <Biosurveys> link Under the Monitoring Elements banner.

iv. Bathing Beach Monitoring for Human Pathogens

This process is specific for identification of bacteria that indicate a potential for spread of human diseases. Beach monitoring is conducted by local/county health departments statewide, with some seed money available from MDEQ grants to help get beach monitoring programs started. Michigan's beach monitoring efforts, databases, and a document: [How to Develop a Beach Monitoring Program](#), are available on the MDEQ website at <Bathing Beaches> under the Monitoring Elements banner - then follow additional links.

v. Inland Lake Quality and Eutrophication

MDEQ administers a Cooperative Lakes Monitoring Program (CLMP) that integrates citizen volunteer monitoring activities with statewide water quality assessment efforts to protect Michigan's inland lakes. Volunteer lake monitoring programs are discussed below. More about the MDEQ's lake quality assessments, and the cooperative partnership between MDEQ and local volunteer groups is available on the MDEQ website at <Inland Lakes Monitoring> under the Monitoring Elements banner.

b) Volunteer Monitoring

A way to assess your program, and involve the public in storm water control at the same time, is to perform volunteer monitoring of water bodies using MDEQ approved methods. Guidance on volunteer monitoring is available as a link on the Assessment of Michigan Waters web page. Three types of volunteer monitoring are most common:

- Stream Biosurvey
- Stream Crossing Watershed Survey
- Lake and Stream Chemical and Physical Parameters

i. Stream Biosurvey

Biosurveys involve collection, identification, and quantification of invertebrates in wadeable streams using MDEQ's Procedure 51. Information on this process is available on the MDEQ website at <Biosurveys> under the Monitoring Elements banner.

ii. Stream Crossing Watershed Survey

This is a quick screening tool to increase the amount of general information available on water quality of streams and the sources of pollutants to the streams. It is not typically a substitute for the biosurveys or water chemistry monitoring, but is a tool that can be used to provide standardized data for limited uses. This procedure is available as a link from the MDEQ website at <Volunteer Monitoring> under the Monitoring Elements banner, or by using the following URL:

<http://www.deq.state.mi.us/documents/deq-swq-gleas-crossingsurvey.pdf>.

iii. Lake and Stream Chemical and Physical Parameters

The MDEQ funds programs through the Michigan Clean Water Corp (MiCorps). MiCorps programs provide funding and volunteer training for local volunteer monitoring programs. Information about this program is available online at www.micorps.net. Additional information about lake monitoring is available on the MDEQ website at <Inland Lakes Monitoring> under the Monitoring Elements banner.

MDEQ uses volunteer monitoring data as a screening tool to identify sites requiring a more detailed assessment. Volunteer monitoring data reported to the MDEQ is currently available only to MDEQ staff. As of the printing of this guidance, the MDEQ had scheduled to make volunteer monitoring data available on its web site as of December 31, 2006, and entered into STORET by December 31, 2007.

In addition to the forms of volunteer monitoring shown above, the DEQ has provided funding for the following additional sampling approaches:

- Geomorphology measurements
- Stream bank stability measurements
- Flow measurements
- Embeddedness measurements (rate of sediment deposition)

2. Tracking Pollution Removal or Prevention:

This method for assessing results involves the measurement or estimation of pollutant loads that did not reach a lake or stream, or which were removed from the environment because of efforts by the permittee.

Tracking the amount of pollution that was stopped is an effective evaluation tool. When measurements can be built into the pollution removal or prevention process, it can also be done with minimal additional time or effort.

Some examples include, but may not be limited to:

- a) Log number of truck loads or tons of waste disposed from street or catch-basin cleaning
- b) Report the reduction in pounds of phosphorus applied through changes in fertilizer use
- c) Stream cleanup volunteers estimate the amount of trash they remove
- d) Estimate pounds of sediment that did not reach the stream, due to erosion, because of riparian vegetation plantings or other stream bank stabilization.
- e) Directly measure pollution reduction, and BMP effectiveness, by monitoring before and after the BMP
- f) Communities could require developers to calculate how much flow volume is reduced as a result of Low Impact Development as compared with traditional development

3. Social Surveys as an Indirect Measurement of Potential Water Quality Improvement

Under this approach, the permittee assesses changes in behaviors or processes that historically contributed to storm water pollution. This approach will be less useful for assessing post construction controls and pollution prevention/good housekeeping. However, tracking changes from enforcement of ordinances could fit under this category.

Although these measurements may not directly indicate a level of water quality improvement, it may be the best approach for assessing public education results.

Social behaviors usually change gradually, through a number of outside influences continuing over a long period. Measurements of change in the polluting behaviors of community residents and businesses will likely capture the results of multiple public education activities, rather than individual activities.

Social surveys do not have to be lengthy or complicated but they should follow certain principles and have adequate quality assurance and quality control (QA/QC). Guidance for social surveys is provided on the MDEQ website www.michigan.gov/deq: Click on <Water> <Surface Water> <Nonpoint Source Pollution>. The Social Surveys link is located under the Information/Education banner.

Some measurements of change could be made even without formal surveys. For example:

- a) Greater public involvement in storm water related activities
- b) Decreased purchase of phosphorus containing fertilizers (tracked at the retailers)
- c) Sustained increases in purchase of products related to storm water control, such as rain barrels, wastewater recycling systems, and native plants
- d) Increased and sustained support for community storm water controls and spending
- e) Sustained increase in recreational use of water bodies. For example increased use of public beaches, increased usage of parks along waterways, increased fishing in the watershed

V. Deferred Watersheds

There are cases where a permittee has an urbanized area, which lies within multiple watersheds, and where there are few partners to develop an effective WMP for each watershed. For those areas, the WMP may be deferred until a time when there are adequate partners to develop a WMP. Permittees that wish to defer all WMPs will have to request coverage under the Jurisdictional Permit.

When the Certificate of Coverage (COC) indicates a WMP has been deferred, the permittee's SWPPI must include the deferred areas as required by the COC. The permittee may choose from the following two options to include deferred areas in the SWPPI, per Part I.B.2.a.2 of the general permit.

A. Option 1 requires the submittal of a SWPPI to address the following:

1. **Notify the MDEQ** that the current SWPPI will be extended to cover all of the permittee's urbanized areas where the WMP has been deferred.
2. **Perform a cursory assessment of each watershed that has been deferred in the permittee's urbanized area. The assessment shall identify any concerns or significant differences the permittee's SWPPI does not adequately address for the deferred watersheds.** Issues to consider during the assessment may include: stream type, land use, history of development, topography, soil type, significant and unique natural features, and sources of point and non-point source pollution.

Example: Large rivers have different characteristics than small streams. Thus pollution controls are often different between the two. For example, riparian buffers may have a greater benefit to a small stream than to a large river. Likewise, an impoundment on a large river may benefit from phosphorus controls that are not a priority for a small free-flowing stream.

3. **If the cursory assessment reveals significant differences between the watersheds, submit a SWPPI that includes additional, approvable actions to cover the deferred area(s).**

B. Option 2 requires the submission of additional information, as part of the Annual Report, describing actions to fulfill *three main areas*:

1. **Public Involvement and Participation**
 - a) **Notify the public that the SWPPI will be implemented in all urbanized areas of the deferred watershed(s). Include in the notice, where and when the SWPPI can be reviewed by the public.**
 - b) **Establish and implement a citizen advisory committee to encourage public involvement.**
 - c) **Pursue cooperation with local stream and watershed organizations by:**
 - i. **Providing copies of the preliminary SWPPI**
 - ii. **Informing them of activities in the SWPPI**
 - iii. **Seeking input on the SWPPI**
 - iv. **Providing copies of the final SWPPI**
 - v. **Seeking volunteer water quality monitoring assistance**
 - vi. **Pursuing ways to meet requirements by assisting the organizations in their ongoing relevant efforts.**

2. Post-Construction Storm Water Management Program for New Development and Redevelopment Projects

- a) **Develop and implement a comprehensive storm water management plan (SWMP) for post-construction controls in areas of new development and significant redevelopment.** This includes developments that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the drainage system). This requirement is the same as mentioned above for post-construction.

Post-construction controls may include:

- Ordinances (e.g. requirements for developments)
- Policies (e.g. enforcement policies for non-compliance)
- Standards (e.g. technical specifications for detention basins and ponds)
- Management (e.g. detention basin releases)

The SWMP must provide sufficient controls in order to protect the designated uses for receiving waters in the deferred watershed(s) and combat the effects commonly associated with urbanization, as mentioned above.

The SWMP should have a development phase, an implementation phase, and an enforcement policy or procedures to implement the above controls.

- b) **Develop and implement ordinances (or other regulatory mechanisms) to address post construction runoff.** Objectives should be to:

- Protect water quality from impacts of development
- Limit rate and volume of runoff during and after construction

Ordinances shall include the following:

- i. **Requirements for implementation of structural and non-structural BMPs.** Nonstructural BMPs are preventive or managerial activities such as buffer or open space easements and public education. Structural BMPs are physical tools or mechanisms that are used to protect or improve water quality, such as grassed swales, rain gardens, parking lot infiltration islands, and retention ponds.
- ii. **Requirements for adequate long-term operation and maintenance of BMPs. These requirements must be sufficient to retain the desired level of water quality protection over time.** Examples include:
 - Certification programs for builders/developers implementing BMPs
 - Designated inspection/enforcement staff for ordinance compliance
 - Storm water ordinances identifying entities responsible for long-term maintenance and routine inspections
 - Maintenance agreements
- iii. **Requirements to control sediment discharge, after the local permit and federal permit-by-rule (NPDES construction storm water discharge authorization from the MDEQ) is no longer in effect.**
- iv. **Requirements for regulating the rate of storm water flow into the drainage system.**

APPENDIX 1

WATER QUALITY MONITORING DATA

APPENDIX 1

Water Quality Monitoring Data

Annual reports summarizing DEQ water and sediment chemistry data collected at surface water locations statewide are available on-line at www.michigan.gov/deqwater: click on <Water Quality Monitoring> <Assessment of Michigan Waters>. Under the Monitoring Elements banner, select the Water Chemistry link. Reports are available under the Related Links banner of the Water Chemistry web page."

This location also provides a link to EPA's storage and retrieval (STORET) database, or you may access STORET directly from www.epa.gov/storet. STORET contains water monitoring data collected by federal, state and local agencies, Indian Tribes, volunteer groups, academics, and others. **The following pages provide a tutorial for retrieving data from STORET by county, latitude and longitude, or U.S. Geological Survey hydrologic unit (HUC) code.**

Water quality and stream flow data collected continuously by the U.S. Geological Survey is available on line at <http://waterdata.usgs.gov/nwis>

How To Get Everything You've Ever Wanted

Out of STORET

This step-by-step tutorial will walk you through a complete STORET session. In Example 1 of this tutorial, you'll be retrieving all water chemistry data available in "Modernized" STORET for the upstream Detroit River station, STORET ID 820414. STORET retrievals may also be further restricted to specific characteristics (e.g., mercury and hardness), and time ranges (e.g., 2003 data only). Example 1 begins on the following page.

In Example 2 of this tutorial, you'll be retrieving all water chemistry data available in "Modernized" STORET from a specific geographic location of Michigan (i.e., Wayne County). Example 2 begins immediately following the conclusion, at step 1.15, of Example 1.

Example 1:

In Example 1, you'll be retrieving all water chemistry data available in "Modernized" STORET for the upstream Detroit River station, STORET ID 820414. Just follow the steps outlined below.

1.1 Go to EPA's STORET website at www.epa.gov/storet. The web page is shown below. Once you're there, click on the link titled [Obtaining Water Quality Data](#). On the image below, an arrow points to the correct link.

EPA > Water > Wetlands, Oceans, & Watersheds > Monitoring and Assessing Water Quality > STORET - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www.epa.gov/storet/>

U.S. Environmental Protection Agency

STORET

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Welcome to STORET, EPA's largest computerized environmental data system.

STORET (short for STORage and RETrieval) is a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others. Take a minute to browse around our site or click on the water drop to retrieve monitoring data!

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Comments? If you have a question or comments on this website or on the STORET system, please call STORET User Assistance at 1-800-424-9067, or send us an email at STORET@epa.gov

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Last updated on Wednesday, February 23rd, 2005
URL: <http://www.epa.gov/storet/>

Start | Novell GroupWise - Sent I... | Probabilistic Monitoring - ... | Document1 - Microsoft W... | Microsoft Excel | EPA > Water > Wetlan... | 10:08 AM

1.2 You should now be at the web page shown below. Click on the button titled “Browse or Download Modernized STORET Data.” On the image below, an arrow points to the correct button.

STORET Database Access

STORET data available on the Internet is divided into two separate databases, according to when it was originally supplied to EPA, and to which of our two STORET databases it was originally archived. We call the older of these two databases the **STORET Legacy Data Center** (LDC for short), and the more current **Modernized STORET**.

STORET Legacy Data Center

Data supplied to EPA before 1999 were all placed in Legacy STORET. This system, designed in the 1960s, was a pioneer in the long term archival of field water monitoring results.

The Legacy Data Center contains data of undocumented quality. Further, these data are static. The Legacy Data Center does not permit updates, and data here will not change over time. All new data are being entered into Modernized STORET. Because the data do not change over time, it is never necessary to repeat a specific download.

Modernized STORET

All data supplied to EPA since January 1, 1999 have been placed in the Modernized STORET System. A full description of the design of this system can be examined on our [ABOUT STORET](#) page.

Modernized STORET is currently receiving new data on a regular basis, and will continue to do so for the foreseeable future. Downloads performed for the same sites may differ over time as a result of the addition of new data by their owners.

NOTE:
All data owned by STORET Agency "112WRD" (the United States Geological Survey) have been removed from the STORET Legacy Data Center (LDC). In the future, STORET will no longer maintain the "112WRD" USGS data on the STORET Legacy Data Center (LDC).

Water quality data owned by the USGS remains available for both browse and download from their web site. Please visit the USGS Water web site at <http://water.usgs.gov/nwis> [EXIT disclaimer](#) for further information about data available from USGS.

[EPA Home](#) | [Privacy and Security Notice](#) | [Contact Us](#)

1.3 You should now be at the web page shown below. Next, click on the link titled [Regular Results by Station](#). On the image below, an arrow points to the correct link.

The screenshot shows a Microsoft Internet Explorer browser window displaying the STORET Data Warehouse website. The address bar shows the URL: http://www.epa.gov/storet/dw_home.html. The page header includes the U.S. Environmental Protection Agency logo and the text 'STORET'. Below the header, there is a search bar and a navigation breadcrumb: 'EPA Home > Water > Wetlands, Oceans, & Watersheds > Monitoring and Assessing Water Quality > STORET > Database Access > Data Warehouse'. The main content area is titled 'STORET Data Warehouse' and includes a sub-header 'Data refreshed on February 9, 2005'. Below this, there are several sections of links:

- STORET Station Descriptions**
 - [Stations by Geographic Location](#)
 - [Stations by Organization and Station ID](#)
- STORET Regular Results** (Non-Biological Physical and Chemical Result Data)
 - [Regular Results by Geographic Location](#)
 - [Regular Results by Station](#) (indicated by an arrow)
 - [Regular Results by Project](#)
- STORET Biological Results**
 - [Biological Results by Geographic Location](#)
 - [Biological Results by Station](#)
 - [Biological Results by Project](#)
- STORET Habitat Results**
 - [Habitat Results by Geographic Location](#)
 - [Habitat Results by Station](#)
 - [Habitat Results by Project](#)

On the right side of the page, there are additional links and descriptions:

- Browse Using a Map**: Use either [EnviroMapper for Water](#) or [Window To My Environment](#) to search for monitoring data using a mapping tool.
- Training Exercise**: A step-by-step guide for first-time users of the STORET Data Warehouse. * Adobe Acrobat® Reader required.
- Data Quality Documentation**: Select from among available reports which document the standards, methods, practices, and other metadata supplied by data owners to document the quality of the monitoring results found in the National STORET Data Warehouse. * Adobe Acrobat® Reader required.
- Data Logger Results**: Download a delimited text file of results reported to STORET from Automated Data Loggers. These results, which cannot yet be downloaded via the query options at the left, will be in the form of a self-extracting compressed file (450K) which may be saved on disk and will expand when executed. In its uncompressed form, this file requires 14.8 MB of disk space.

At the bottom of the page, there is a section titled 'Stations registered in STORET' with the instruction '(Click anywhere on the map to see it enlarged)'. Below this text is a map of the United States showing the locations of registered stations. A 'Help' link is also visible in the bottom right corner of the main content area.

1.4 You should now be at the web page shown below. Next, you'll need to select the correct **Organization** from the dropdown box. On the image below, an arrow points to this dropdown box. Click on the dropdown box's arrow button...

The screenshot shows the EPA STORET website in Microsoft Internet Explorer. The browser's address bar displays the URL: http://oaspub.epa.gov/storpub/DW_resultcriteria_station. The page header includes the EPA logo and the text "U.S. Environmental Protection Agency". The main heading is "Regular Results by Station".

The "Station" section contains the following elements:

- Instruction: "Select an Organization and a Search Type, then enter a Search String and click 'Search Stations'".
- A table with two columns: "ORG ID" and "ORGANIZATION NAME". The "ORGANIZATION NAME" column contains a dropdown menu with the text "Select an Organization". An arrow points to the dropdown arrow button.
- "Search Type" section with three radio buttons: "Search by Station ID" (selected), "Search by Station Name", and "Search by Station Alias".
- "Select Station Alias Type" section with a text input field containing "STANDARD" and a "Look Up" button.
- "Search String" section with a text input field and a "Search Stations" button.
- A table with the following headers: "Org ID", "Station ID", "Alias Type", "Station Alias", and "Station Name". The table body is currently empty.
- "Clear Selected" and "Clear All" buttons at the bottom of the table.

The "Date" section contains the following elements:

- Instruction: "Specify Activity Start Date range(s)".
- "Date Range 1" section with dropdowns for month (JAN), day (1), and year (1900), followed by "To" and another set of dropdowns for month (MAR), day (22), and year (2005).
- "Date Range 2" and "Date Range 3" sections, each with three empty dropdown menus for month, day, and year, followed by "To" and another set of empty dropdown menus.

The browser's taskbar at the bottom shows several open applications: Start, Novell GroupWise - Sent I..., Probabilistic Monitoring - ..., STORET Retrieval Tutorial..., Microsoft Excel, and EPA > STORET > Regul... The system clock shows 10:30 AM.

1.5 ...and select "21MICH" from the list by clicking on it.

EPA > STORET > Regular Results by Station - Microsoft Internet Explorer

Address: http://oaspub.epa.gov/storpub/DW_resultcriteria_station

U.S. Environmental Protection Agency

STORET

[Recent Additions](#) | [Contact Us](#) | [Print Version](#) Search: **GO**

[EPA Home](#) > [Water](#) > [Wetlands, Oceans, & Watersheds](#) > [Monitoring and Assessing Water Quality](#) > [STORET](#) > [Data Warehouse](#)

Regular Results by Station

Station

Select an Organization and a Search Type, then enter a Search String and click "Search Stations".

ORG ID	ORGANIZATION NAME
Select an Organization	
21HI	Hawaii Dept. of Health
21IOWA	Iowa Dept. of Natural Resources
21KAN001	Kansas Dept. of Health & Environment
21KY	Kentucky Division of Water
21MICH	Michigan Department of Environmental Quality
21NC01WQ	NCDENR-DWQ
21NC02WQ	NCDENR-DWQ (2nd)
21NDHDWQ	North Dakota Dept. of Health
21NEB001	Nebraska Dept. of Environmental Quality
21NEV-1	Nevada Dept. of Conservation and Natural Resources
21NJDEP1	NJ Department of Environmental Protection

Search String:

Org ID	Station ID	Alias Type	Station Alias	Station Name
--------	------------	------------	---------------	--------------

Date

Specify Activity Start Date range(s)

Date Range 1: To

Date Range 2: To

Date Range 3: To

Done

Start | Novell GroupWise - Mailbox | Probabilistic Monitoring - ... | STORET Retrieval Tutorial... | Microsoft Excel | EPA > STORET > Regul... | Internet | 10:32 AM

1.6 Your screen should now look like the image below. Next, you'll need to enter a **Search String**. On the image below, an arrow points to the text box where you'll enter this information. Given that you'll be searching by Station ID, you'll want to enter the STORET ID(s) of the station(s) for which you'd like to retrieve data.

The screenshot shows the EPA STORET website interface. At the top, there is a navigation bar with the EPA logo and the text "U.S. Environmental Protection Agency". Below this, the page title is "STORET" and "Regular Results by Station".

The main content area is titled "Regular Results by Station" and contains a search form. The form includes the following elements:

- A header instruction: "Select an Organization and a Search Type, then enter a Search String and click 'Search Stations'."
- A table with two columns: "ORG ID" and "ORGANIZATION NAME". The first row shows "21MICH" and "Michigan Department of Environmental Quality".
- A "Search Type" section with three radio buttons: "Search by Station ID" (selected), "Search by Station Name", and "Search by Station Alias".
- A "Select Station Alias Type" dropdown menu set to "STANDARD" and a "Look Up" button.
- A "Search String" text input field, which is highlighted by a black arrow.
- A "Search Stations" button.
- A table with the following headers: "Org ID", "Station ID", "Alias Type", "Station Alias", and "Station Name". The table body is currently empty.
- "Clear Selected" and "Clear All" buttons at the bottom of the table.

Below the search form is a "Date" section with the instruction "Specify Activity Start Date range(s)". It contains three rows of date range selectors:

- Date Range 1: JAN 1 1900 To MAR 22 2005
- Date Range 2: --- --- --- To --- --- ---
- Date Range 3: --- --- --- To --- --- ---

The bottom of the screenshot shows the Windows taskbar with several open applications: Start, Novell GroupWise - Mailbox, Probabilistic Monitoring - ..., STORET Retrieval Tutorial..., Microsoft Excel, and EPA > STORET > Regul... The system clock shows 10:34 AM.

1.7 The image below is of the same web page as shown in Step 6, above, but a STORET ID has been typed into the **Search String** text box. Next, click on the button titled “Search Stations.” On the image below, an arrow points to the correct button.

The screenshot shows the EPA STORET website interface. At the top, the U.S. Environmental Protection Agency logo and the text "U.S. Environmental Protection Agency" are visible. Below this is the "STORET" header with navigation links: "Recent Additions", "Contact Us", "Print Version", and a search box with a "GO" button. A breadcrumb trail reads: "EPA Home > Water > Wetlands, Oceans, & Watersheds > Monitoring and Assessing Water Quality > STORET > Data Warehouse".

The main section is titled "Regular Results by Station". Underneath, the "Station" section contains a form with the following elements:

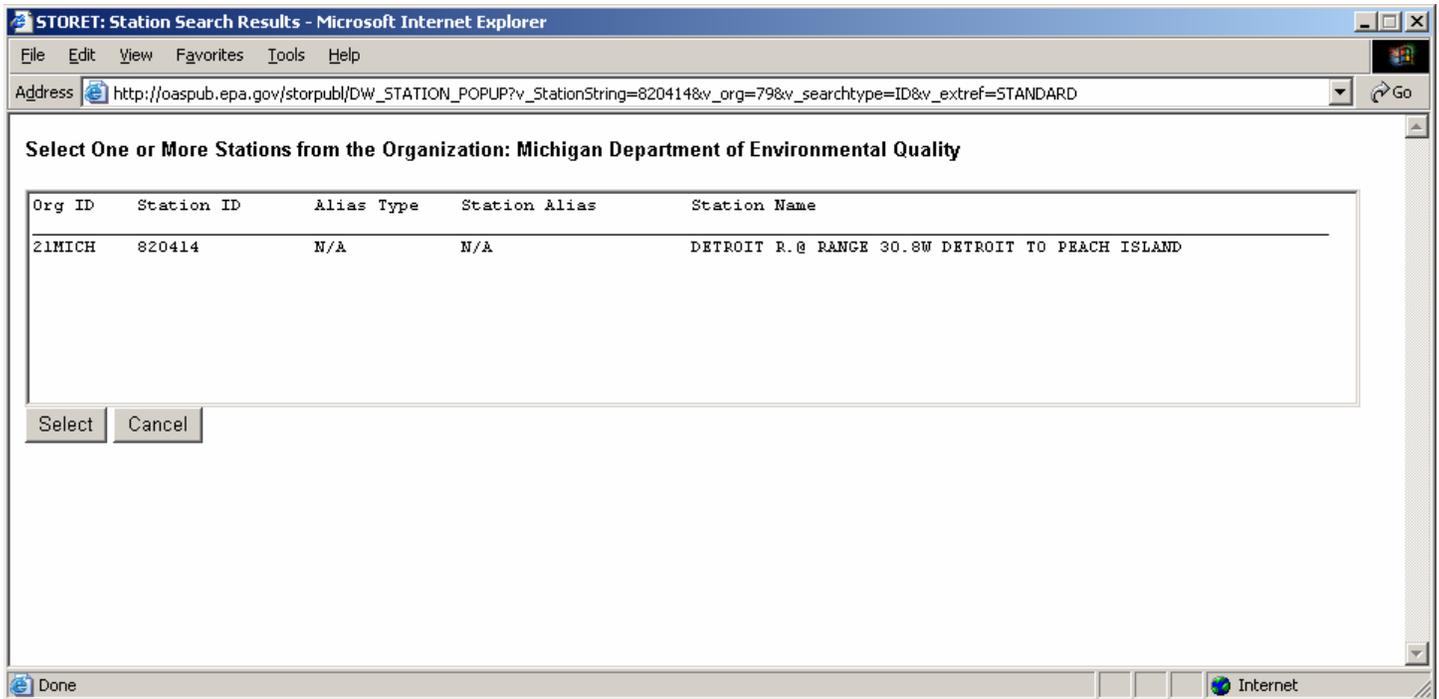
- Instruction: "Select an Organization and a Search Type, then enter a Search String and click 'Search Stations'".
- Organization selection: A table with columns "ORG ID" and "ORGANIZATION NAME". The selected row is "21MICH" for "Michigan Department of Environmental Quality".
- Search Type: Radio buttons for "Search by Station ID" (selected), "Search by Station Name", and "Search by Station Alias".
- Station Alias Type: A dropdown menu set to "STANDARD" and a "Look Up" button.
- Search String: A text box containing "820414".
- Action: A "Search Stations" button, which is pointed to by a black arrow.
- Table: A table with columns "Org ID", "Station ID", "Alias Type", "Station Alias", and "Station Name". The table is currently empty.
- Buttons: "Clear Selected" and "Clear All" buttons at the bottom of the table area.

The "Date" section below the station form is titled "Specify Activity Start Date range(s)" and contains three rows of date range selectors:

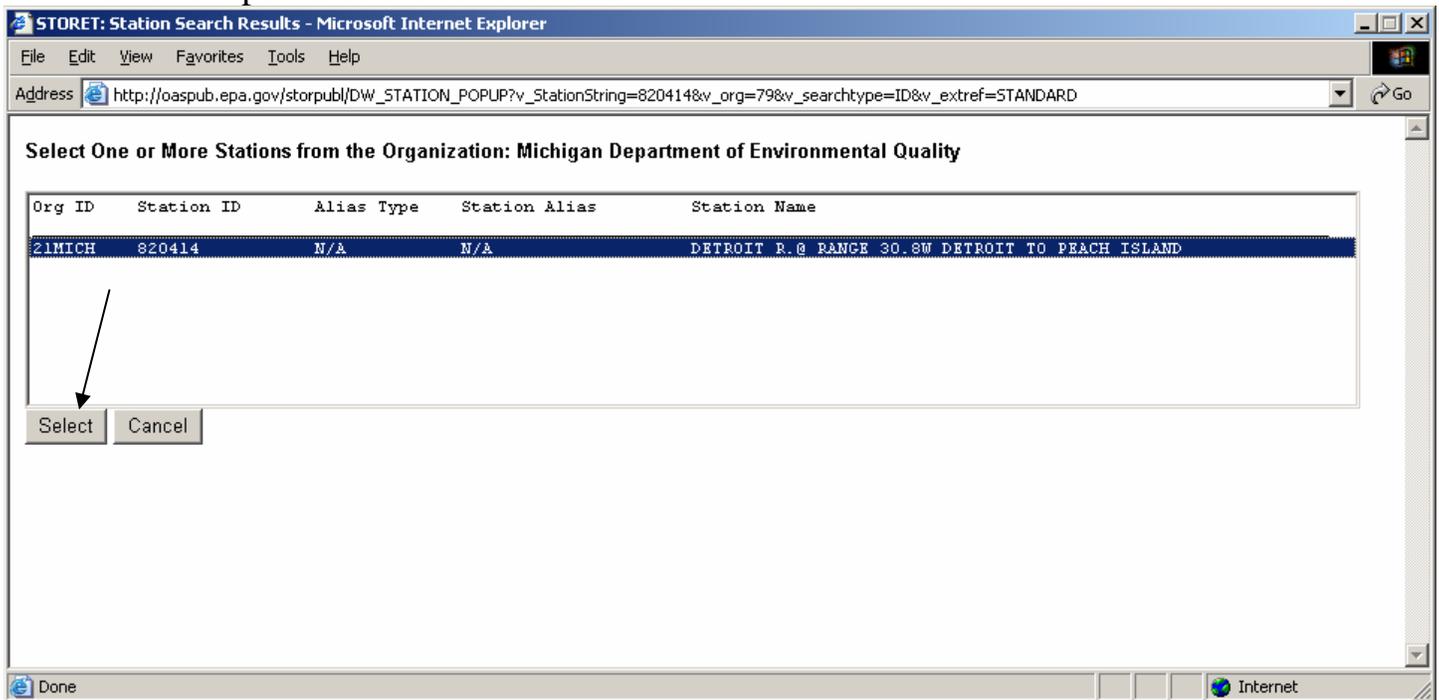
- Date Range 1: JAN 1 1900 To MAR 22 2005
- Date Range 2: --- --- --- To --- --- ---
- Date Range 3: --- --- --- To --- --- ---

The browser window title is "EPA > STORET > Regular Results by Station - Microsoft Internet Explorer". The taskbar at the bottom shows several open applications: Start, Novell GroupWise - Mailbox, Probabilistic Monitoring - ..., STORET Retrieval Tutorial..., Microsoft Excel, and EPA > STORET > Regul... The system clock shows 10:34 AM.

1.8 A new window will open, and it'll look like this:



1.9 You'll now need to do two things: First, click on the station so that it's highlighted in blue, as shown below. Second, click on the button titled "Select." On the image below, an arrow points to the correct button.



1.10 Your screen should now look like the image below. If you'd like to retrieve data for additional stations, repeat Steps 7-9. When you're done selecting stations, scroll to the bottom of the web page shown below.

The screenshot shows the EPA STORET website interface in Microsoft Internet Explorer. The browser's address bar displays the URL: http://oaspub.epa.gov/storpub/DW_resultcriteria_station. The page header includes the EPA logo and the text "U.S. Environmental Protection Agency". The main heading is "Regular Results by Station".

Station

Select an Organization and a Search Type, then enter a Search String and click "Search Stations".

ORG ID: 21MICH ORGANIZATION NAME: Michigan Department of Environmental Quality

Search Type

- Search by Station ID
- Search by Station Name
- Search by Station Alias

Select Station Alias Type: STANDARD Look Up

Search String: 820414

Search Stations

Org ID	Station ID	Alias Type	Station Alias	Station Name
21MICH	820414	N/A	N/A	DETROIT R. @ RANGE 30.6W DETROIT TO PEACH ISLAND

Clear Selected Clear All

Date

Specify Activity Start Date range(s)

Date Range 1: JAN 1 1900 To MAR 22 2005

Date Range 2: --- --- --- To --- --- ---

Date Range 3: --- --- --- To --- --- ---

The browser's taskbar at the bottom shows several open applications: Start, Novell GroupWise - Mailbox, Probabilistic Monitoring - ..., STORET Retrieval Tutorial..., Microsoft Excel, and EPA > STORET > Regul... The system clock indicates 10:35 AM.

1.11 Your screen should look like the image below. You'll now need to do two things: First, click on "Water" under **Activity Medium**, to select it. Second, click on the button titled "Continue." On the image below, an arrow points to the correct button.

The screenshot shows a Microsoft Internet Explorer browser window displaying the EPA STORET website. The address bar shows the URL: http://oaspub.epa.gov/storpub/DW_resultcriteria_station. The page content is organized into several sections:

- Date Range Filters:** Three rows of date range selectors labeled "Date Range 2:", "Date Range 3:", and "Date Range 4:". Each row has two "To" fields and a "Search" button.
- Activity Medium:** A section titled "Activity Medium" with a dropdown menu. The menu is open, showing options: "Select All", "Water", "Sediment", "Soil", "Air", and "Other". "Water" is currently selected.
- Characteristic Search:** A section titled "Characteristic" with the instruction "Use the Characteristic Search to create a list of up to 50 Characteristics". It contains a "Characteristic Search" text box, a "Search By" dropdown menu set to "CHARACTERISTIC NAME", a "Search" button, and a checked checkbox for "Hide Taxonomic Names". Below this is a large empty text box for "Characteristic Name". At the bottom of this section are "Clear Selected" and "Clear All" buttons.
- Buttons:** At the bottom of the page are "Continue" and "Clear Form" buttons. An arrow points to the "Continue" button.
- Footer:** Includes a "Help" link, a horizontal line, and links for "EPA Home | Privacy and Security Notice | Contact Us". It also states "Last updated on August 27, 2004" and provides the URL: http://oaspub.epa.gov/storpub/DW_resultcriteria_station.

The taskbar at the bottom shows several open applications: Start, Novell GroupWise - Mailbox, Probabilistic Monitoring - ..., STORET Retrieval Tutorial..., Microsoft Excel, and EPA > STORET > Regul... The system clock shows 10:37 AM.

1.12 Your screen should now look like the image below. Next, click on the button titled “Continue>>.” On the image below, an arrow points to the correct button.

The screenshot shows a Microsoft Internet Explorer browser window displaying the EPA STORET web application. The address bar shows the URL: http://oaspub.epa.gov/storpub/DW_RESULT_COUNT. The page header includes the EPA logo and the text "U.S. Environmental Protection Agency". The main content area is titled "Result Search Summary" and displays "Number of Results Returned: 1,902". Below this, a box labeled "Search Criteria" contains the following information:

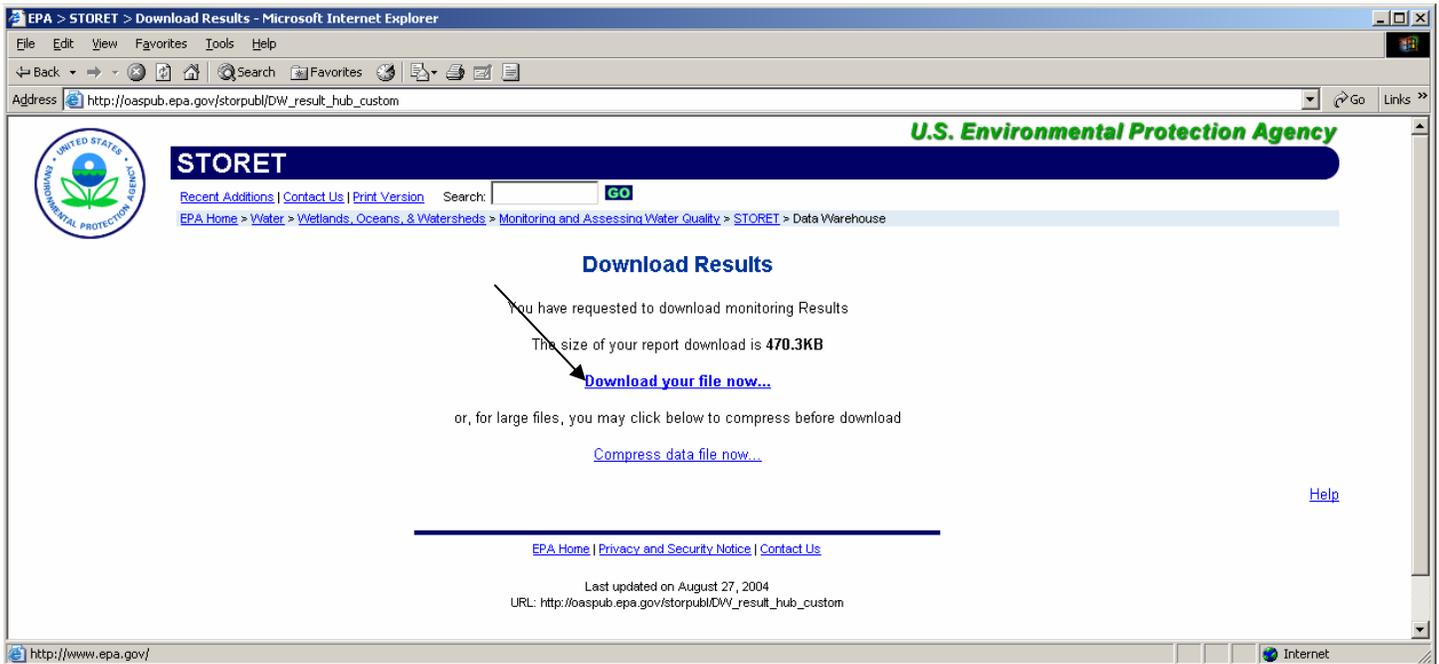
- Station(s): 820414
- Activity Start Dates: ALL
- Medium: Water
- Characteristic(s): ALL

Below the search criteria, there is a message: "Select 'Back' to modify search criteria and refine your query. Select 'Continue' to generate a report based on your current selections. You may customize the content of your report by selecting Data Elements below." Below this message are two buttons: "<<Back" and "Continue>>". An arrow points to the "Continue>>" button. Below the buttons is a section titled "Select Data Elements for Report" with a list of checkboxes and labels:

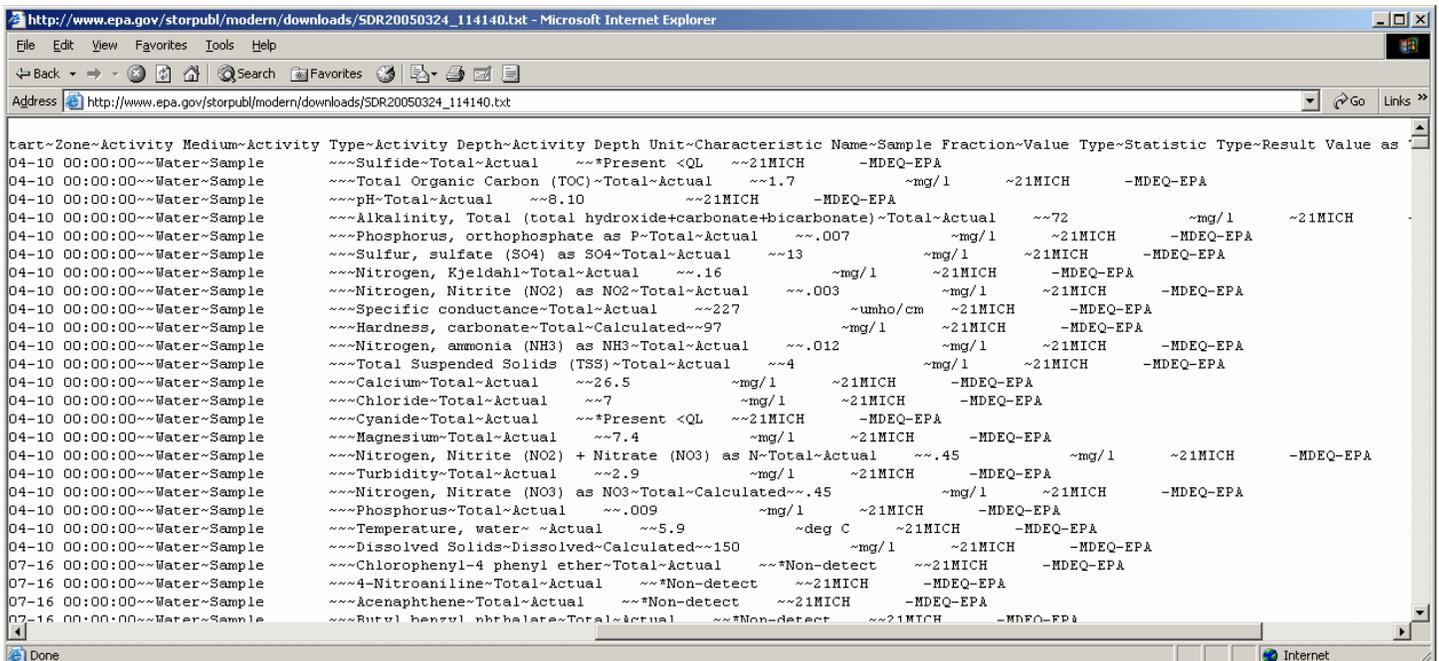
Select Data Elements for Report		
<input type="checkbox"/> Org ID	<input type="checkbox"/> Conv Actual Activity Lat/Long	<input type="checkbox"/> Converted Result Unit
<input checked="" type="checkbox"/> Org Name	<input type="checkbox"/> Well Number	<input type="checkbox"/> Result Comment
<input checked="" type="checkbox"/> Station ID	<input type="checkbox"/> Pipe Number	<input type="checkbox"/> Result Free Text
<input type="checkbox"/> Station Name	<input type="checkbox"/> Additional Act Location Info	<input type="checkbox"/> Weight Basis
<input checked="" type="checkbox"/> Station Location Info	<input checked="" type="checkbox"/> Activity Depth	<input type="checkbox"/> Temperature Basis
<input checked="" type="checkbox"/> Station Lat/Long	<input checked="" type="checkbox"/> Activity Depth Unit	<input type="checkbox"/> Duration Basis
<input type="checkbox"/> Conv Station Lat/Long	<input type="checkbox"/> Activity Upper Depth	<input type="checkbox"/> Particle Size Basis
<input type="checkbox"/> S/G/O Indicator	<input type="checkbox"/> Activity Rel Depth	<input type="checkbox"/> Distance Measured From
<input checked="" type="checkbox"/> Visit Num	<input type="checkbox"/> Activity Lower Depth	<input type="checkbox"/> Distance Measured To
<input type="checkbox"/> Visit Start	<input type="checkbox"/> Upr Lwr Depth Unit	<input checked="" type="checkbox"/> Analytical Proc ID
<input type="checkbox"/> Visit Stop	<input type="checkbox"/> Sample Collection ID	<input type="checkbox"/> Additional Anal Proc Info
<input type="checkbox"/> Trip ID	<input type="checkbox"/> Field Gear ID	<input type="checkbox"/> Lab Remark
<input type="checkbox"/> Trip Name	<input type="checkbox"/> Field Gear Config ID	<input type="checkbox"/> Dilution Ind
<input checked="" type="checkbox"/> Activity ID	<input type="checkbox"/> Sample Preservation	<input type="checkbox"/> Recovery Ind
<input checked="" type="checkbox"/> Activity Start	<input type="checkbox"/> Portable Data Logger	<input type="checkbox"/> Correction Ind
<input type="checkbox"/> Activity Stop	<input checked="" type="checkbox"/> Characteristic Name	<input type="checkbox"/> Other Lab Info

The taskbar at the bottom shows several open applications: Start, Novell GroupWise - Mailbox, Probabilistic Monitoring - ..., STORET Retrieval Tutorial..., Microsoft Excel, and EPA > STORET > Result... The system clock shows 2:00 PM.

1.13 A new window will open, and the image below shows what it will look like. Next, click on the link titled [Download your file now...](#) On the image below, an arrow points to the correct link.



1.14 And here is a portion of your data retrieval. All that work for this?? But we have ways of transforming it into something useful. First, notice that your file is a tilde(~) delimited text file.



1.15 Follow the steps outlined below and you're done!

- a) From the window shown in Step 14, above, go to **File, Save As**, and save the file, with a .txt extension, to your Desktop.
- b) Open Excel, go to **File, Open**, and look for **Files of type .txt** in your Desktop.
- c) Open your file. When you do, you'll note that Excel's Text Import Wizard automatically opens.
- d) In step 1 of the Wizard, select "Delimited" file type. Click **Next>**.
- e) In step 2 of the Wizard, de-select "Tab," select "Other," and enter a tilde (~) in the tiny text box to the right of "Other." Click **Next>**.
- f) In step 3 of the Wizard, simply click **Finish**. Your file should appear in column format and can now be manipulated (sorted) and saved as any other .xls file.

Example 2:

In Example 2, you'll be retrieving all water chemistry data available in "Modernized" STORET from a specific geographic location of Michigan (i.e., Wayne County). Example 2 assumes you have completed steps 1.1 and 1.2 of the previous example. After completing steps 1.1 and 1.2, just follow the steps outlined below.

2.3 You should now be at the web page shown below. Next, click on the link titled [Regular Results by Geographic Location](#). On the image below, an arrow points to the correct link.

The screenshot shows the EPA STORET Data Warehouse website. The page title is "STORET Data Warehouse" and it displays various query options. An arrow points to the link "Regular Results by Geographic Location" under the "STORET Regular Results" section. The page also includes a navigation menu on the left, a search bar at the top, and a map of the United States at the bottom showing registered stations.

STORET Data Warehouse
Data refreshed on February 9, 2005

Query Options

STORET Station Descriptions

- [Stations by Geographic Location](#)
- [Stations by Organization and Station ID](#)

STORET Regular Results
(Non-Biological Physical and Chemical Result Data)

- [Regular Results by Geographic Location](#) (indicated by an arrow)
- [Regular Results by Station](#)
- [Regular Results by Project](#)

STORET Biological Results

- [Biological Results by Geographic Location](#)
- [Biological Results by Station](#)
- [Biological Results by Project](#)

STORET Habitat Results

- [Habitat Results by Geographic Location](#)
- [Habitat Results by Station](#)
- [Habitat Results by Project](#)

STORET Station Descriptions

- [Browse Using a Map](#)
Use either [EnviroMapper for Water](#) or [Window To My Environment](#) to search for monitoring data using a mapping tool.
- [Training Exercise](#)
A step-by-step guide for first-time users of the STORET Data Warehouse.
* Adobe Acrobat® Reader required.
- [Data Quality Documentation](#)
Select from among available reports which document the standards, methods, practices, and other metadata supplied by data owners to document the quality of the monitoring results found in the National STORET Data Warehouse.
* Adobe Acrobat® Reader required.
- [Data Logger Results](#)
Download a delimited text file of results reported to STORET from Automated Data Loggers. These results, which cannot yet be downloaded via the query options at the left, will be in the form of a self-extracting compressed file (450K) which may be saved on disk and will expand when executed. In its uncompressed form, this file requires 14.8 MB of disk space.

[Help](#)

Stations registered in STORET
(Click anywhere on the map to see it enlarged)

The map shows the United States with numerous small blue dots representing registered stations. The dots are most densely clustered in the eastern and central United States.

2.4 You should now be at the web page shown below. Notice that “State/County” is the default selection under “Geographic Location.” This is correct. You’ll need to make three selections on this web page: one for “State Name,” one for “County Name,” and one for “Activity Medium.” On the image below, arrows point to each of the three places on the web page where your selections will be made. In this example, we’ll be changing the “State Name” to MICHIGAN, the “County Name” to WAYNE, and the “Activity Medium” to WATER. Make these three selections on the web page now.

U.S. Environmental Protection Agency

STORET

Recent Additions | Contact Us | Print Version Search: **GO**

EPA Home > Water > Wetlands, Oceans, & Watersheds > Monitoring and Assessing Water Quality > STORET > Data Warehouse

Regular Results by Geographic Location

Geographic Location

Select a single type of location search that you wish to perform (state/county, latitude/longitude, or HUC). Then enter the corresponding search criteria.

State/County

State Name: County Name:

Latitude/Longitude (in decimal degrees)

North Limit: N W

West Limit: W East Limit: W

South Limit: N

Drainage Basin/HUC

Cataloging Unit:

Date

Specify Activity Start Date range(s)

Date Range 1: To

Date Range 2: To

Date Range 3: To

Date Range 4: To

Activity Medium

Select one or more Activity Medium

ACTIVITY MEDIUM

- Select All
- Water
- Sediment
- Soil
- Air
- Other

2.5 After making these three selections, your screen should look like the image below. If it does, scroll down to the bottom of the web page...

The screenshot shows the EPA STORET web application interface. The browser title is "EPA > STORET > Regular Results by Geographic Location - Microsoft Internet Explorer". The address bar shows "http://oaspub.epa.gov/storpub/DW_resultcriteria_geo". The page header includes the EPA logo and the text "U.S. Environmental Protection Agency". The main heading is "STORET" with navigation links for "Recent Additions", "Contact Us", and "Print Version". A search bar is present with a "GO" button. The breadcrumb trail is "EPA Home > Water > Wetlands, Oceans, & Watersheds > Monitoring and Assessing Water Quality > STORET > Data Warehouse".

The main content area is titled "Regular Results by Geographic Location". Under the "Geographic Location" section, there is a prompt: "Select a single type of location search that you wish to perform (state/county, latitude/longitude, or HUC). Then enter the corresponding search criteria." Three options are available:

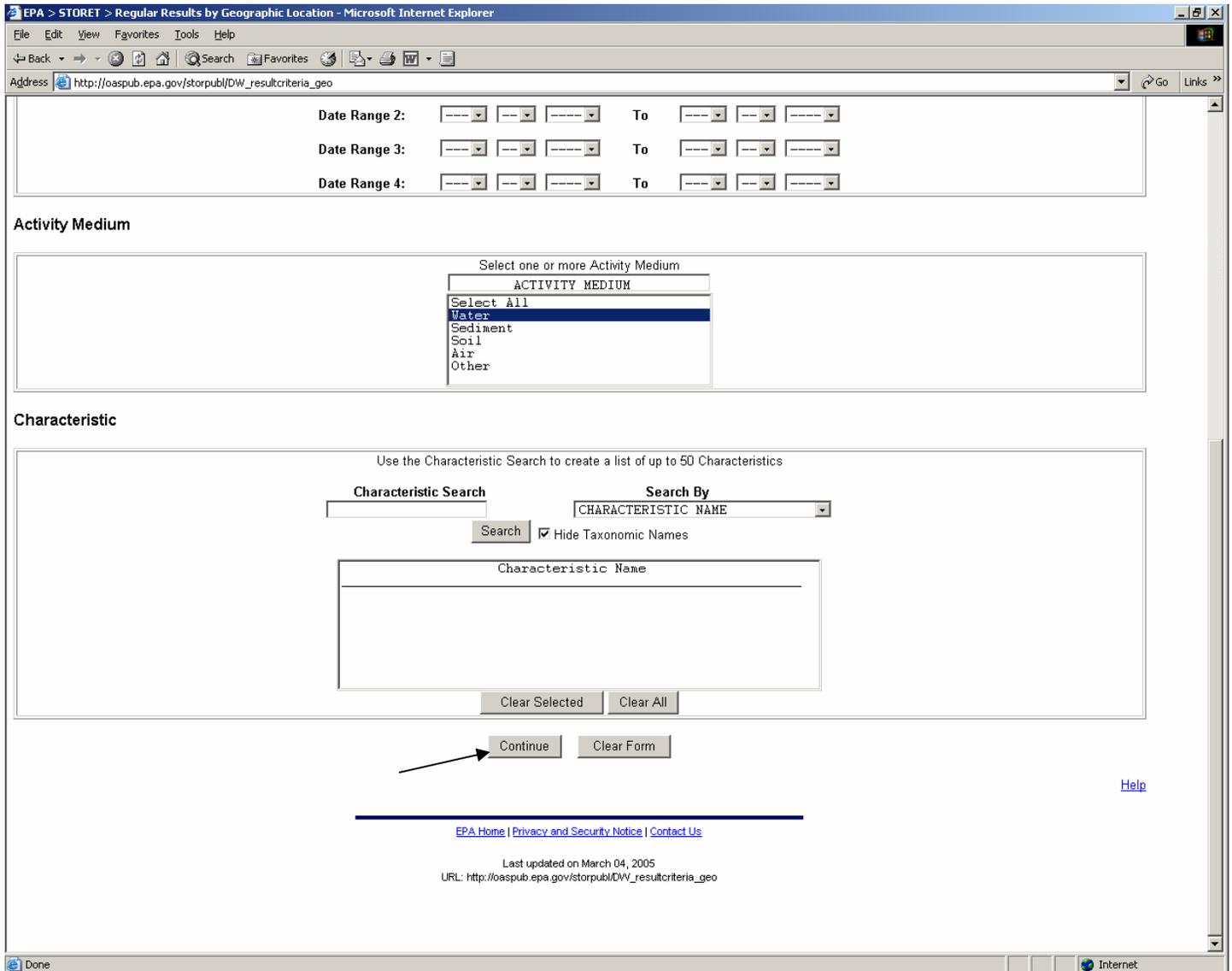
- State/County: "State Name" dropdown is set to "MICHIGAN" and "County Name" dropdown is set to "WAYNE". A "Look Up" button is next to the county dropdown.
- Latitude/Longitude (in decimal degrees): "North Limit" is 90, "West Limit" is 180, and "East Limit" is 0. "South Limit" is 0.
- Drainage Basin/HUC: "Cataloging Unit" dropdown is set to "ALL". A "Look Up" button is next to the dropdown.

The "Date" section is titled "Specify Activity Start Date range(s)". It contains four rows of date range selectors:

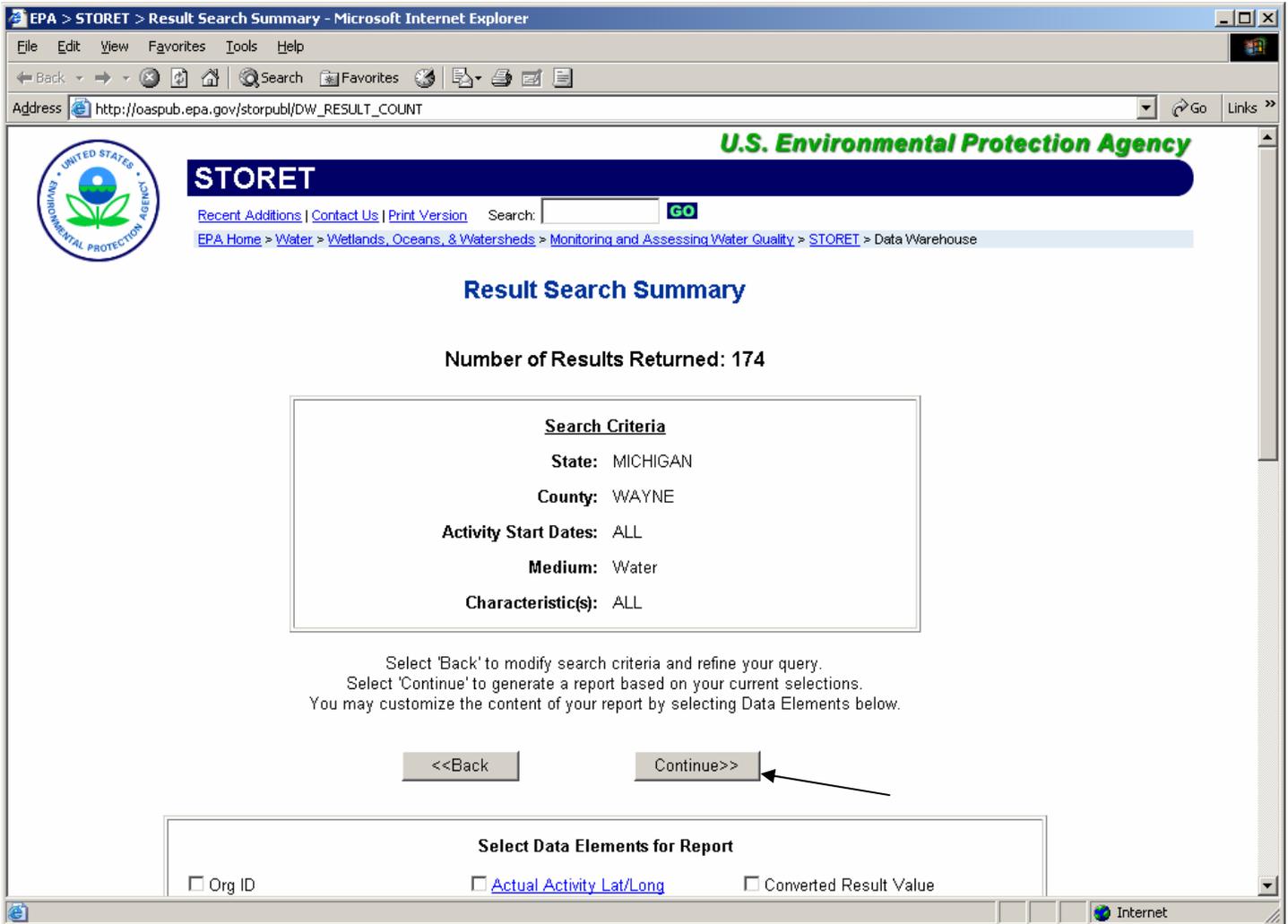
- Date Range 1: JAN 1 1900 To JUL 26 2005
- Date Range 2: --- -- ---- To --- -- ----
- Date Range 3: --- -- ---- To --- -- ----
- Date Range 4: --- -- ---- To --- -- ----

The "Activity Medium" section is titled "Select one or more Activity Medium". A dropdown menu is open, showing the following options: "ACTIVITY MEDIUM", "Select All", "Water", "Sediment", "Soil", "Air", and "Other". The "Water" option is currently selected.

2.6 Your screen should now look like the image below. Next, click on the button labeled “Continue.” On the image below, an arrow points to the correct button.



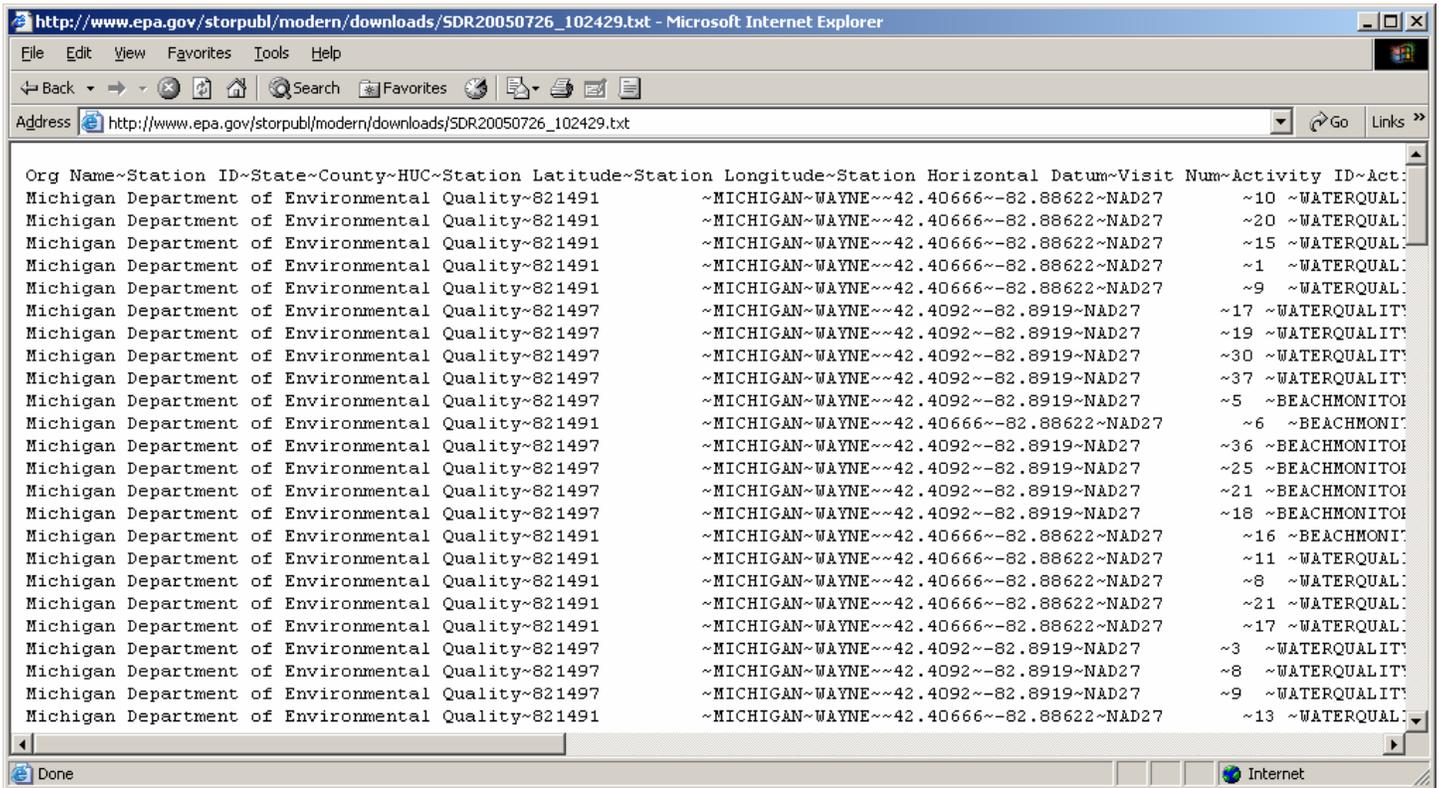
2.7 A new window will open, and the image below shows what it will look like. Note that the Number of Results Returned shown on your screen will likely be larger than the 174 shown on the screen image below. Next, click on the button labeled “Continue>>.” On the image below, an arrow points to the correct button.



2.8 A new window will open, and the image below shows what it will look like. Note that the size of the report download shown on your screen will likely be larger than the 46.5KB shown on the screen image below. Next, click on the link titled [Download your file now...](#) On the image below, an arrow points to the correct link.



2.9 The image below shows a portion of the resulting data retrieval. Notice that it is a tilde(~) delimited text file. Next, go to step 1.15 of the previous example in this tutorial, for instructions on what to do with the file to make it more user-friendly.



Prepared by: Christine Aiello, Environmental Quality Analyst
MDEQ-WB-SWAS
July 26, 2005 (Revised)

APPENDIX 2

EXAMPLE REQUEST FOR MDEQ WATER QUALITY MONITORING LOCATIONS



JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING



STEVEN E. CHESTER
DIRECTOR

August 31, 2004

TO: All Interested Parties

FROM: Gary Kohlhepp
Surface Water Assessment Section
Water Bureau

SUBJECT: Water Quality Monitoring Recommendations
For Fiscal Year 2005

The Michigan Department of Environmental Quality (MDEQ), Water Bureau (WB), is soliciting water quality monitoring recommendations for Fiscal Year (FY) 2005 to support implementation of the watershed-specific component of our Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters (Strategy). The primary goals of the Strategy include:

- Assess the current status and condition of individual waters of the state and determine whether water quality standards are being met.
- Provide data to support the MDEQ water quality protection programs (i.e., National Pollutant Discharge Elimination System Permits, Nonpoint Source (NPS), and site remediation) and evaluate their effectiveness.
- Detect new and emerging water quality problems.

In FY 2005, the WB intends to target the majority of our monitoring resources to those watersheds highlighted in the attached Figure to remain consistent with our watershed permitting process and monitoring strategy. However, we will consider water quality monitoring recommendations for other Michigan watersheds, including the Great Lakes and their connecting channels. We are particularly interested in designing and conducting monitoring studies to help evaluate the effectiveness of individual NPS water quality improvement/protection projects that were funded using Clean Michigan Initiative or federal 319 monies.

The availability of Clean Michigan Initiative - Clean Water Fund monies have allowed the WB to greatly enhance its water quality monitoring capabilities. As a result, several types of monitoring activities can be recommended for consideration, including:

- Water chemistry monitoring.
- Sediment chemistry monitoring.
- Fish contaminant monitoring.
- Caged fish chemical bioconcentration studies.
- Fish and/or macroinvertebrate community assessment studies.
- Aquatic toxicity tests (ambient waters or effluents).
- Nuisance aquatic plant or algae growth assessment studies.

- Inland lake trophic status investigations.
- *Escherichia coli* (*E. coli*) bacteria monitoring.
- Channel morphology studies.

A Water Quality Monitoring Request form is attached to help communicate your monitoring recommendations to the WB for consideration. The form is also available on the WB web site at http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-12735--,00.html. It is available as both a .PDF file and a Microsoft word document, making it possible to electronically submit your surface water monitoring recommendations to the WD. All monitoring recommendations should be mailed, faxed, or e-mailed by October 1, 2004 to Mr. Gary Kohlhepp at the following address:

Michigan Department of Environmental Quality
Water Division
P.O. Box 30273
Lansing, Michigan 48909-7773
kohlhepp@michigan.gov
Fax: 517-373-9958

Also, please feel free to forward this letter to other organizations or individuals who have an interest in contributing to FY 2005 water quality monitoring planning. Again, we appreciate your willingness to participate in this planning effort and look forward to receiving your water quality monitoring recommendations.

Please contact me (517-335-1289) or Ms. Roxanne Ramirez (517-373-8567) if you have questions about water quality monitoring recommendations for 2005.

gs:wc:yg

Attachments

cc/att: Ms. Diana Klemans, MDEQ
Mr. Gerald Saalfeld, MDEQ
Ms. Brenda Sayles, MDEQ

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APPENDIX 3

ASSESSING SOCIAL CHANGE

Includes:

Links for Program Evaluation Surveys

Evaluation Methods from DEQ PEP Guidance

Links for Program Evaluation Surveys

Environmental Education

- <http://www.cpawscalgary.org/education/evaluation/#download>
- <http://www.cpawscalgary.org/education/evaluation/ee-success.pdf>
- <http://eelink.net/pages/Assessment+and+Evaluation>
- <http://www.ens.gu.edu.au/ciree/LSE/mod10.htm>
- <http://www.ecy.wa.gov/biblio/0407017.html>
- <http://www.wkkf.org/Programming/Overview.aspx?CID=281>
- <http://oerl.sri.com/>
- <http://www.wmich.edu/evalctr/>
- <http://www.nsf.gov/ehr/rec/nsfresources.jsp>
- <http://www.ssi.nrcs.usda.gov/> This site provides a method of assessing locally led conservation projects. It has a section on how to take the evaluation. It allows local projects to be graded A, B, C, D, or F.

Links for Indicator Development Surveys

Sustainability

International

- <http://www.iisd.org/measure/compendium/>
- <http://www.sustainabilityindicators.org/>
- <http://www.iclei.org/us/communities21.html>
- <http://www.worldbank.org/data/wdi2004/index.htm>

U.S.

- <http://www.sustainablemeasures.com/Indicators/index.html>

- <http://www.sustainableseattle.org/>
- <http://www.rprogress.org/>
- <http://www.rprogress.org/newprograms/sustIndi/index.shtml>
- <http://www.sustainable.doe.gov/measuring/meintro.shtml>

Watershed

- <http://www.nsci.plu.edu/~jwhitman/envt350/indicator/indicator.html>

Environmental

- <http://www.epa.gov/iwi/>

Quality of Life

- <http://www.co.pierce.wa.us/PC/services/family/benchmrk/qol.htm>

Community

- <http://www.rprogress.org/newprojects/commIndi/index.shtml>
- http://ag.arizona.edu/fcs/cyfernet/nowg/comm_index.html

Social

- <http://www.ncrcrd.iastate.edu/indicators/entry2.html>

EVALUATION MECHANISMS (Excerpt from MDEQ's Storm Water Guidance for Public Education Plans)

The permit requires a method to determine the effectiveness of educational efforts. Again, effectiveness may be gauged in a number of ways. Examples include:

- Changes in public awareness of pollution and possible solutions,
- Changes in environmental attitudes,
- Behavioral changes, or
- Water quality changes.

Following are several examples of evaluation mechanisms to aid permittees in meeting their obligation to describe a method for determining the effectiveness of their public education activities:

Measure the usage of facilities or materials

Consider amounts and numbers of:

- Materials collected or visitors at household hazardous waste or recyclable collection centers
- Calls to report problems or to solicit information
- People buying or using low phosphorous fertilizers
- People composting or purchasing compost bins
- Charity car washes that eliminate discharges
- People using travel trailer sanitary waste disposal facilities
- Requests for educational materials

Participation

- Increased or sustained attendance at meetings, workshops, or events
- Increased or sustained number of partners that support meetings, workshops, or events
- Increased or sustained number of volunteers for pollution reduction projects
- Increased or sustained number of septage haulers that accept coupons for pumpout service, and track their change in business volume
- Pledge cards from residents pledging to take action to protect our water resources
- Attention given to the issue by the media (e.g editorials, articles, interviews, PSAs)

Websites

These can be used to economically measure the effectiveness of an education program.

- Website hits. We suggest the use of embedded counters within the website. These can be used to measure changes in the interest levels of general public.
- Brochures can direct responders to surveys within the website. This can give an indication the effectiveness of the brochure to encourage the public to find more information.

Surveys to measure changes in awareness, attitudes, or behavior

Surveys should be carefully developed to avoid leading questions or questions that can produce other types of invalid responses. Guidance to help with the development of useful and valid surveys is available on line at www.michigan.gov/deqnonpointsourcepollution; click on Social Surveys under Information/Education. To become familiar with social surveys, the DEQ recommends reading through all of the guidance provided, including information on Quality Assurance Project Plans.

- A survey after a presentation or workshop can be compared to a baseline or to a survey given prior to the presentation or workshop
- General informational surveys: These surveys are a viable tool to gauge the public's current activities and behavior changes that have taken place during the public education campaign. A survey at the beginning of the program can serve as a benchmark for future

surveys. These surveys can take place at the community, watershed, regional, or state level. Examples of existing surveys may be found at www.michigan.gov/degwater. Click on Surface Water, then Storm Water, and finally on Municipal Program/MS4 Permit Guidance (**links may be under construction**).

- Telephone surveys can be broad or simple. Simple surveys can focus on just a few questions and assess how well people understand selected storm water or water pollution issues.
- Small communities with few residents may be able to reach a significant portion of the population by door-to-door surveys
- Surveys on websites

Water Quality Data

DEQ recognizes that there are several programs under the Phase II program that contribute to improved water quality. It is often difficult, and often inappropriate to associate these water quality improvements with any one single activity, including public education. Recognizing this, there are two levels of water quality data that can be used in evaluating progress:

- 1) general water quality in the area, and
- 2) targeted water quality monitoring related solely to public education in small study areas.

- General Water Quality

Improvements in the water quality in the community can be due to numerous activities, including a strong public education program. This data can be used in conjunction with other evaluation mechanisms to illustrate success of your program.

- Targeted Water Quality Monitoring.

Specified monitoring can take place to evaluate progress of your public education program or provide direction for it. Examples include:

- Outfalls where residential fertilizer education might result in reduced nutrient discharges
- Areas where education targeted illicit dumping
- Areas of failing septic system education programs
- Evidence of grease deposits from commercial areas where restaurants are concentrated

Reporting Effort

The Watershed Permit requires documentation of the public education effort and a summary of the evaluation of its effectiveness. The evaluation of effectiveness is addressed in the Evaluation Mechanisms section above. Reporting the public education effort might include information like the following:

- Number of materials developed
- Numbers of pieces of informational materials distributed -Number of workshops or presentations held -Number of households where materials were distributed
- Demonstration that school curriculum was developed and used in classes
- Description of unique public education methods that might be helpful for other communities

These are generic examples for guidance only. Individual permittees should report their actual efforts, which may differ from the examples above.

APPENDIX 4

RESOURCE LIST

Appendix 4

Resource List

Filling the Gaps: Environmental Protection Options for Local Governments, MDEQ
http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3696-73358--,00.html

Describes federal, MI State, and local roles in environmental protection. Identifies gaps in existing natural resource, and environmental protection policy and explains opportunities for local regulation. Provides information about planning and zoning tools related to resource management and protection. Includes numerous example ordinances.

Great Lakes Better Backroads Guidebook, Clean Water by Design
<http://www.huronpines.org/Downloads/BetterBackroads.pdf>

Cost effective techniques for the design and maintenance of non-paved back roads to control erosion and reduce sediment and other pollutants from entering surface waters

Hydrologic Impacts Due to Development: The Need for Adequate Runoff Detention and Stream Protection, MDEQ
http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714-57034--,00.html

Identifies stream impacts caused by urbanization, along with best management practices addressing water quality, stream channel protection, and flood control. Discusses channel-forming flows. Includes case studies and examples.

International Stormwater Best Management Practice (BMP) Database, several sponsors, including the USEPA
<http://www.bmpdatabase.org/>

The purpose of the site is to provide scientifically sound information to improve the design, selection and performance of BMPs. Includes technical documents, software and database developed over the past decade.

Landscaping for Water Quality, Center for Environmental Study and MDEQ
http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714-93304--,00.html

How-to instructions for landscaping in a manner that enhances and protects water quality. Includes information on the importance of landscaping for water quality, as well as planning, design, and installation guidance. Provides example garden lay-outs, plant lists, and potential sources for nursery plants.

Low Impact Development Center
<http://www.lowimpactdevelopment.org/>

Low-Impact Development Design Strategies: An Integrated Design Approach, and companion document, ***Low-Impact Development Hydrologic Analysis***, Prince George's County, Maryland

http://www.co.pg.md.us/Government/AgencyIndex/DER/PPD/LID/pdf/lid_hydr.PDF
<http://www.co.pg.md.us/Government/AgencyIndex/DER/PPD/LID/LiDNatl.pdf>

Extensively describes and details low-impact design principles. Companion document provides procedures for hydrologic analysis and computations utilized for determining low-impact development storm water management requirements. Includes comparisons of conventional and low-impact development.

National Menu of Best Management Practices for Stormwater Phase II, USEPA

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm>

The menu is intended to provide guidance to regulated small MS4s as to the types of practices they could use to develop and implement their stormwater management programs.

Michigan's Water Quality Standards. Part 4 Rules, R 323.1041 - 323.1117, MDEQ

http://www.michigan.gov/deq/0,1607,7-135-3313_3682-14902--,00.html Scroll down to "Water" and then further to "Part 4, Water Quality Standards."

Model Ordinances to Protect Local Resources, USEPA

<http://www.epa.gov/owow/nps/ordinance/>

NEMO, Non-point Education for Municipal National Network

<http://nemo.uconn.edu/national/index.htm>

An organization working to educate municipalities regarding non-point source issues

Nonpoint Source News-Notes, USEPA

<http://www.epa.gov/owow/info/NewsNotes/>

A periodic report on the Condition of the Water-Related Environment, The Control of Nonpoint Sources of Water Pollution, and the Ecological Management and Restoration of Watersheds. #75, May 2005, has article on economics of Low Impact Development.

Opportunities for Water Resource Protection in Local Plans, Ordinances, and Programs, Southeast Michigan Council of Governments (SEMCOG)

<http://www.semco.org/Products/pdfs/WaterQualityWorkbook.pdf>

Provides tools for planning and design that consider water quality protection and restoration. Designed to assist local governments with making the appropriate linkages between plans and ordinances. Special notations throughout the document describe relationships to Phase II Storm Water requirements.

Protecting Water Resources with Smart Growth, USEPA

http://www.epa.gov/smartgrowth/water_resource.htm

Describes use of smart growth at the regional level to minimize impacts to water from new development. Includes site-level techniques used by local governments to prevent, treat, and store storm water runoff on site. Highlights examples throughout the U.S.

The Practice of Watershed Protection, Center for Watershed Protection

<http://www.stormwatercenter.net/> (excerpts available for download)

A compilation of articles from *Watershed Protection Techniques*. Presents what the Center knows about both the science and management of small watersheds.

Protecting Water Quality in Urban Areas— A Manual, Minnesota Pollution Control Agency

<http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html>

The Minnesota Pollution Control Agency has developed a manual, *Protecting Water Quality in Urban Areas*, to help local government officials, urban planners, developers, contractors and citizens prevent stormwater-related pollution. The manual includes a chapter on models and modeling.

Spillage of Oil and Pollution Materials. Part 5 Rules, R 324.2001 - 324.2009, MDEQ
http://www.michigan.gov/deq/0,1607,7-135-3313_3682-14902--,00.html Scroll down to “Land” and then further to “Part 5, Spillage of Oil and Polluting Materials.”

The Rules provide requirements for storage and spill containment for oil, salt, and chemicals that a municipal operation may store and handle.

AUTHORITY: PA 451 of 1994, as amended
TOTAL COPIES: 450
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COST PER COPY: \$3.82
Michigan Department of Environmental Quality



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