

Appendices

Onsite Wastewater of NW MI & NWMCOG. Wastewater Infrastructure Study 2008
{all documents are available on the accompanying CD}

A. Regional Survey of Sanitary Sewer and Storm water Infrastructure

1. Survey Format File.
2. **Topographical maps, filed by County**, suitable for overlay printing.
The topography maps were created by draping a transparent Digital Elevation Model (DEM) over a hillshade data layer. The hillshade was rendered from 30 meter DEMs using the Spatial Analyst extension for ArcGIS 9.2. The DEMs were downloaded from MCGI's Geographic Data Library. Each map's elevation range was set to the range of the entire OWNWMI region, which is 420 feet to 1,720 feet. The sewer service data layer boundaries were added to show the approximate topography within areas that have existing sewer service. Included is an indication of municipal systems locations. Maps were created for Antrim, Benzie, Charlevoix, Crawford, Emmet, Grand Traverse, Kalkaska, Lake, Leelanau, Manistee, Mason, Mecosta, Missaukee, Newaygo, Oceana, Otsego and Wexford Counties.
3. **Political Boundary and primary features maps filed by County** for the following counties: Antrim, Benzie, Charlevoix, Crawford, Emmet, Grand Traverse, Kalkaska, Lake, Leelanau, Manistee, Mason, Mecosta, Missaukee, Newaygo, Oceana, Otsego and Wexford Counties. Including Sewer Service Area Maps by same County - created by NWMCOG
4. **Critical Impact Area Maps filed by County** by same County (i.e. wetlands, sensitive and hydric soils, slopes greater than 15%) - created by NWMCOG. The critical impact area data layers were created from a combination of three other data layers. They are the National Wetlands Inventory (NWI); hydric soils; and slopes greater than 15%. Each data set was classified into critical or non critical features. This was done by giving each feature in the dataset a '1' if it was considered critical or a '0' if it was considered noncritical. For the NWI data, uplands were considered noncritical and all other features were considered critical. The NWI data was downloaded from MCGI's Geographic Data Library as were the SSURGO soil layers. SSURGO (Soil Survey Geographic Database) soil data was developed by the USDA Natural Resources Conservation Service (NRCS).
Web Reference: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov>
Hydric soils were selected out of each soil data layer and marked as critical. A soil type was determined to be hydric if it appeared on the NRCS 2007 National Hydric Soils List of Michigan. All other soils were determined to be noncritical. A slope layer for each county was rendered from 30 meter DEMs using the Spatial Analyst extension for ArcGIS 9.2. The slope data layer was then reclassified so that slopes greater than 15% were marked as critical and slopes less than or equal to 15% were marked as noncritical. With each data layer now containing attributes of '1' for critical or '0' for noncritical the three separate layers were added together using the Raster Calculator in Spatial Analyst to create one new layer with three levels of critical areas. Areas determined to be a '3' are high impact critical areas; '2' are medium impact critical areas; and '1' are low impact critical areas. If an area came back as '0' it was not considered to be a critical impact area.
5. **Failed/Replaced OSS New Systems Maps** – Failed and replaced, or new onsite wastewater system data was collected from the Health Departments of 7 counties in the OWNWMI region. However, due to the unavailability of parcel data for Otsego

County the only counties that could be mapped included: Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, and Leelanau. The collected data consisted of the following attributes: the parcel identification number (PIN) and whether or not the system was replaced without a failure (Replaced System) or replaced because of a failure (Failed System). The datasets were linked to parcel line data in ArcGIS 9.2. The failed/replaced parcels were selected out and converted to polygon centroids, or single points instead of areas. The maps display the points in two categories: Failed Systems or Replaced Systems. Also mapped were the location of systems for new construction in Antrim, Emmet, Charlevoix, Benzie and Leelanau Counties.

6. Population:

- a. 2007 Estimate (On CD as [lm_census_County0007_228493_7.pdf](#))
- b. 2007 Estimate Components of Population Change (On CD as [lm_census_CountyComp0007-vs_228500_7.pdf](#))
- c. 2007 Estimate Population of Regions (On CD as [lm_census_Regions0007_228494_7.pdf](#))
- d. Historic Population by County 1890 - 2000 (On CD as [Pop_by_County_NW_MI_1890-2000.pdf](#))
- e. Population by Township/Village 1960 - 2000 (On CD as [Pop_by_MCDs-Villages_NW_MI_60-00.pdf](#))
- f. U.S.State Reports on Population and the Environment: Michigan by National Wildlife Federation (On CD as [MIReport FINAL.pdf](#))
- g. Council of Governments Benchmark Reports 2004 (On CD as [COG Folder](#))
- h. *Web reference: Northwest Michigan Council of Governments Data: <http://www.nwmcog.org/population.html>*
- i. *Web reference: Michigan Department of History, Arts and Libraries Census Statistics and Demographic Data.<http://www.michigan.gov/hall/0,1607,7-160-51170---,00.html>
http://www.michigan.gov/hall/0,1607,7-160-51170_51713_51716-187899--,00.html*

B. Regional Onsite Systems Survey Result Table

1. Maps **by County** showing 2002-7 new construction/failed/replaced onsite permit locations - created by NWMCOG from District Health Department data sets: Emmet, Charlevoix, Antrim, Grand Traverse, Leelanau, Benzie.

C. Sanitary/Health Codes & Regulation

1. Benzie-Leelanau District Health Department Code Annual Onsite Reports 2002-2007
2. Health Department of Northwest Michigan Code - Annual Onsite Reports 2002-2007
3. Grand Traverse County Health Department Code and Regulations Annual Onsite Reports 2002-2007
GTCHD - ATS Policy and Procedure Manual
Pressure Mound System policy and procedure manual
4. District Health Department #10 Revised Unified Code (On CD as [Sanitary_code_dhd10_2008.pdf](#)) and proposed septic inspection ordinance. (On CD as [Manistee_Kalkaska_POS.pdf](#))
5. *Strengths and Weaknesses of Great Lakes Onsite Sewage System Regulatory Programs: Authors: Kathleen E. Halvorsen, Hugh S. Gorman, and Kristine Bradof*

Michigan Technological University August 2004 Funded by the Joyce Foundation
(ON CD as [khalvorsen.pdf](#))

6. Washtenaw County Department of Environment and Infrastructure Services Environmental Health Division ENGINEERING GUIDELINES FOR ON-SITE SEWAGE DISPOSAL SYSTEMS. (ON CD as [eh_engguide.pdf](#))
7. REGIONAL COLLABORATION IN RESOLVING LOCAL WASTEWATER CHALLENGES IN NORTHWEST LOWER MICHIGAN. William A. Crawford, R.S., MSA and Dendra Best (ON CD as [finalpaper.pdf](#))
8. Point-Of-Sale Inspection Resources [ON CD as POS Folder]

D. Michigan Department of Environmental Quality

1. White Paper on a proposed Statewide Code for Onsite Wastewater Treatment (On CD as [white_paper.pdf](#))
2. Rebuttal Opinion by Mark Wyckoff (On CD as [whitepaper_rebuttal.pdf](#))
3. Surface Water Quality Division (SWQD), Part 117 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. (On CD as [mcl-451-1994-ii-3-117.pdf](#) and [2004-PA-0381.pdf](#))
http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3717-102106--,00.html
4. Web Link to Title 40--Protection of Environment
CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY (CONTINUED)
PART 503--STANDARDS FOR THE USE OR DISPOSAL OF SEWAGE SLUDGE
http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfr503_03.html
5. Strategic Water Quality Initiative. (On CD as [deq-essd-mfs-swqif-QandA.pdf](#))
6. Subdivision Control Act, Act 288 of 1967, (On CD as [wb-groundwater-Act288_248139_7.pdf](#)) Land Division Act, Act 591, 1977.
7. Pressure Mound Systems Technical Guidance for Site Suitability, Design, Construction and Operation and Maintenance 2003. (On CD as [deq-wb-dwehs-osw-mounds_240550_7.pdf](#))
8. Michigan Department of Environmental Quality 2002-2007 Combined Sewer Overflow (CSO) & Sanitary Sewer Overflow (SSO) Annual Reports. (On CD as SSOS Folder)

E. US Environmental Protection Agency - Water, Wastewater, Decentralized and Onsite System Information and Resource References. www.epa.gov/owm/onsite

1. *Handbook for Managing Onsite and Clustered (Decentralized) Wastewater Treatment Systems. An Introduction to Management Tools and Information for Implementing EPA's Management Guidelines.* (On the CD as [epa_onsite_handbook.pdf](#))
2. *Voluntary National Guidelines for Managing Onsite and Clustered (Decentralized) Wastewater Treatment Systems.* (On the CD as [epaseptic_management_handbook.pdf](#) plus [epa_septic_program_strategy.pdf](#))
3. A Homeowner's Guide to Septic Systems. (On the CD as [eh_septicguide.pdf](#))
4. Protecting Water Resources with Smart Growth 2004
(On the CD as [waterresources_with_sg.pdf](#))
3. [Emerging Technologies for Wastewater Biosolids Management \(PDF\)](#)
(ON CD as [epa-biosolids.pdf](#) 133pp., 1.51Mb)
4. [Emerging Technologies for Conveyance Systems: New Installations and Rehabilitation Methods \(PDF\)](#) (ON CD as [epa-conveyance-report.pdf](#) 98pp., 752Kb)
5. [Emerging Technologies Report on Wastewater Treatment \(PDF\)](#)
(ON CD as [emerging_technologies.pdf](#) 190pp., 18.2mb) -This technology guide will

help municipal wastewater treatment system owners and operators find information on emerging wastewater treatment and in plant wet weather management technologies to help them meet their current and future treatment requirements. Technical and cost data for more than sixty innovative technologies and more than twenty five embryonic technologies are provided.

6. US Environmental Protection Agency released “The Wastewater Information System Tool” (TWIST) (ON CD as [twist_userguide.pdf](#))
7. Financing Alternatives Comparison Tool (ON CD as [facthandout.pdf](#))
8. Source Water Protection Practices Bulletin Managing Turfgrass and Garden Fertilizer Application to Prevent Contamination of Drinking Water EPA 816-F-01-029 2001 (ON CD as [fw_swpp_turfgrass.pdf](#))
9. ON-SITE WASTEWATER MANAGEMENT IN NEW MEXICO- A CASE STUDY OF PEÑA BLANCA WATER AND SANITATION DISTRICT Prepared by Richard P. Rose, Ph.D., P.E., DEE August 1999 (ON CD as [PenBlancaOnsiteStudy.pdf](#))
 - a. Reliability Study Case Study – Pena Blanca Water and Sanitation District 03-1421-W May 18, 2004 Interviewer: Mary Clark, Project Scientist Stone Environmental, Inc. (ON CD as [PenBlanca.pdf](#))
10. Septic Systems Fact Sheet. Office of Wastewater Management Decentralized Wastewater Program. This fact sheet presents data on soil-based septic systems collected by the U.S. Census Bureau for the 2007 American Housing Survey, based on a sampling of 55,000 housing units. (ON CD as [EPA_onsitefactsheet_Oct2008.pdf](#))
11. EPA Municipal Treatment Technologies Portal at <http://www.epa.gov/owm/mtb/index.htm>
12. EPA Manual of how to properly assess and set rates is available (On the CD as [final_ratesetting_guide.pdf](#) Though aimed at water system rate assessment, the principles apply equally to wastewater.
13. EPA_onsitefactsheet_Oct2008.pdf
14. EPA “Protecting Water Resources with Smart Growth” (on CD as [waterresources_with_sg.pdf](#))
15. Green Infrastructure Municipal Handbook. The Municipal Handbook is a series of documents to help local officials implement green infrastructure in their communities. Handbook topics cover issues such as financing, operation and maintenance, incentives, designs, codes & ordinances, and a variety of other subjects. The handbook documents are intended to serve as "how to" manuals on these topics, written primarily from the standpoint of municipal implementation. The handbook is being produced in sections, with each new element being released as it is completed. [Managing Wet Weather with Green Infrastructure Handbook Series](#)
16. [Combined Sewer Overflows](#): Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Most of the time, combined sewer systems transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. These overflows, called combined sewer overflows (CSOs), contain not only stormwater but also untreated human and industrial waste, toxic materials, and debris. They are a major water pollution concern for the approximately [772 cities in the U.S.](#)

that have combined sewer systems.

- F. **National Environmental Services Center** Fact Sheets and Supplemental Information Pipeline and Small Flows Quarterly on wastewater education, management, treatment technology, package plants, evaluation, testing, local official education, public policy (ON CD as Small Flows Folder Includes 2007 Product list [ww_products_2007.pdf](#))

G. **MAPS**

1. Population Density Map
Web reference: Michigan Department of History, Arts and Libraries Census Statistics and Demographic Data.
http://www.michigan.gov/hal/0,1607,7-160-17451_18668_41233---,00.html
2. Topography Maps by County
Web reference: <http://gwmap.rsgis.msu.edu/viewer.htm>
3. WellLogic Maps by County: >Ground Water Inventory>Supplemental Well Data>Wells Complete. Zoom In. Web reference: <http://gwmap.rsgis.msu.edu/viewer.htm>
4. See http://www.michigan.gov/cgi/0,1607,7-158-52927_53037_12540_22351-58858--,00.html for wetlands maps online.

H. **Resources, References, Glossary**

1. **Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT)**
 - a. Glossary of Terms (ON CD as [GlossaryFinal_12-19-07.pdf](#))
 - b. CIDWT is working cooperatively with NOWRA and NEHA to establish and communicate a set of minimum guidelines for the installation of onsite wastewater treatment systems. The curriculum is designed to support installer credentialing programs such as the NEHA Certified Installer of Onsite Wastewater Treatment Systems (CIOWTS) credential. **CO-SPONSORS:**
U.S. Environmental Protection Agency
Water Environment Research Foundation
National Decentralized Water Resources Capacity Development Project
National Onsite Wastewater Recycling Association
National Environmental Health Association
USDA-Cooperative State Research, Education, and Extension Service (CSREES)
 - c. CIDWT has also developed Practitioner materials and the Operation and Maintenance curriculum See: <http://www.onsiteconsortium.org>
2. **The National Decentralized Water Resources Capacity Development Project (NDWRCDP)** The following *can be downloaded at* <http://www.ndwrcdp.org/publications/index.htm>
 - a. 2009 [Project No. DEC1R08, "Smart, Clean & Green: 21st Century Sustainable Water Infrastructure"](#)
 - b. 2008 [Project No. 04-DEC-9, "Analysis of Existing Community-Sized Decentralized Wastewater Treatment Systems."](#) Principal Investigator: Susan Parten, Community Environmental Services, Inc. and [Research Digest](#)
 - c. [Project No. 04-DEC-5SG, "New Approaches in Decentralized Water Infrastructure."](#) Principal Investigator: Valerie Nelson, Coalition for Alternative Wastewater Treatment (final report)

- d. Pinkham, R. D., J. Magliaro, and M. Kinsley. 2004.
Case Studies of Economic Analysis and Community Decision Making for Decentralized Wastewater Systems. Project No. WU-HT-02-03.
Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by Rocky Mountain Institute, Snowmass, CO. Full Report as WU-HT-02-03.PDF is contained on the CD or can be downloaded at <http://www.ndwrcdp.org/publications/index.htm>
 - e. 2006 BUSINESS ATTRIBUTES OF SUCCESSFUL RESPONSIBLE MANAGEMENT ENTITIES Tom Yeager, P.E. Kennedy/Jenks Consultants Hamilton Brown-National Rural Electric Cooperative Association John Murphy, P.E. and Ray Ehrhard, P.E., Community Environmental Center at Washington University
Thomas Hall, National Rural Electric Cooperative Association
(ON CD as 04DEC4SG.pdf)
 - f. *National Research Needs Conference Proceedings: Risk-Based Decision Making for Onsite Wastewater Treatment*, EPRI, Palo Alto, CA, U.S. Environmental Protection Agency, and National Decentralized Water Resources Capacity Development Project: 2001. 1001446 (ON CD as RESEARCH_NEEDS_PROCEEDINGS.pdf)
 - g. *Creative Community Design and Wastewater Management*: University of Rhode Island Cooperative Extension Kingston, Rhode Island March 2004 (ON CD as WUHT0030_post.pdf)
 - h. *Expanding Communication in Communities Addressing Wastewater Needs* : Green Mountain Institute for Environmental Democracy Montpelier, VT June 2005 (ON CD as WUHT0334_post.pdf)
3. **Water Environment Research Foundation (WERF)**
- a. 2007 “Overcoming Barriers to Evaluation and Use of Decentralized Wastewater Technologies and Management” by Carl Etnier, Richard Pinkham, Ron Crites, D.Scott Johnston, Mary Clark, Amy Macrellis. {On CD as 04-DEC-full2.PDF}
 - b. 2008 “Factors Affecting the Performance of Primary Treatment in Decentralized Wastewater Systems” by Victor A. D’Amato, Aniata Bahe, Terry Bounds, Billie Comstock, Thomas Konsler, Sarah K. Liehr, Sharon Long, Krich Ratanaphruks, Chet A. Rock, Kevin Sherman (On CD as 04-DEC-7ResDigest.PDF)
 - c. 2008 “Analysis of Existing Community-Sized Decentralized Wastewater Systems” by Susan M. Parten P.E. Community Environmental Services Inc. (On CD as 04DEC9.PDF)
4. **NOWRA (NOWRA)**
- a. Chair Jerry Stonebridge in Onsite Magazine
(on CD as OSJ_Winter_2008_web_REV.pdf)
 - b. Certification of Onsite Practitioners NOWRA Point of View June 23, 2004
Presented by Mike Corry NOWRA Model Code Committee Chair
(on CD as CertificationofOnsitePractitioners.pdf and CertificationViewpoint.pdf)
5. **Coalition for Alternative Wastewater Treatment**

- a. NEW FEDERAL FINANCING DIRECTIONS: DECENTRALIZED WATER RESOURCE INFRASTRUCTURE by Valerie I. Nelson, Ph.D. Coalition for Alternative Wastewater Treatment 2008 (On CD as [04DEC5WPFinancing.pdf](#))
- b. 2008 INSTITUTIONAL CHALLENGES AND OPPORTUNITIES: DECENTRALIZED AND INTEGRATED WATER RESOURCE INFRASTRUCTURE by Valerie I. Nelson, Ph.D. CAWT (On CD as [white1.pdf](#))
- c. 2008 SUSTAINABLE INFRASTRUCTURE MANAGEMENT by Valerie I. Nelson, Ph.D. CAWT (On CD as [white4.pdf](#))
- d. 2008 NEW APPROACHES IN DECENTRALIZED WATER INFRASTRUCTURE by Valerie I. Nelson, Ph.D. Coalition for Alternative Wastewater Treatment 2008 (On CD as [04DEC5Report.pdf](#))
- e. SOFT PATH INTEGRATED WATER RESOURCE MANAGEMENT UPDATE on Training, Research, and Development Activities of NDWRCDP and Opportunities for New Projects and Collaboration National Decentralized Water Resources Capacity Development Project (NDWRCDP) Research Project Final Report, November 2003 by Valerie I. Nelson, Ph.D. Coalition for Alternative Wastewater Treatment (On CD as [SOFT_PATH_TRDACTIVITIES_WEB.pdf](#))

6. NSF International

- a. PROTOCOL FOR THE VERIFICATION OF WASTEWATER TREATMENT TECHNOLOGIES Prepared by: NSF International Ann Arbor, MI 48113-0140 with support from the U.S. Environmental Protection Agency (On CD as [04_vp_wastewater.pdf](#))

7. Other

- a. 2006 Michigan Zoning Enabling Act (On CD as [general_law_mzea_information_packet_w_checklists_july_2006.pdf](#))
- b. Michigan's Land, Michigan's Future: Final Report of the Michigan Land Use Leadership Council August 15, 2003. Prepared for Governor Jennifer Granholm and the Michigan Legislature. (On CD as [MLULC_FINAL_REPORT_08032.PDF](#) and [MLULC_GLOSSARY.PDF](#))
- c. Michigan Rural Water Association: The Clarifier. Winter 2008: A Brief History of The Sewer. (On CD as [mrwa_winter2008.pdf](#))
- d. TWENTY YEARS OF SUCCESSFUL ONSITE WASTEWATER MANAGEMENT – THE OTTER TAIL, MINNESOTA WATER MANAGEMENT DISTRICT. Sara Christopherson and Jim Anderson University of Minnesota. (On CD as [OtterTail20YearReview.pdf](#))
- e. 2009 Water Efficiency Conference Program - (On CD as [wec_confprog.pdf](#))
- f. Fuller, L.M., and Minnerick, R.J., 2008, State and regional water-quality characteristics and trophic conditions of Michigan's inland lakes, 2001–2005: U.S. Geological Survey Scientific Investigations Report 2008–5188, 58 p. Date Posted: December 17, 2008: [<http://pubs.water.usgs.gov/sir20085188/>] (On Cd as [Information Folder> sir2008-5188_web.pdf](#))