Water Withdrawal And Conservation Practices

Prepared for Michigan Chamber of Commerce

February 2008

Submitted by Barr Engineering Company

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1. Introduction

Foreword

The Great Lakes region, with 20 percent of the world's surface freshwater, is not immune to the concerns with water supply and availability. Increasing interest from other areas of the country that are experiencing population growth, but lack the water resources to sustain the growth create greater need for us to develop a basis on which to justify control of water use in the Great Lakes Basin. Additional concerns that are driving increased attention to water efficiency and conservation actions are the increasing costs associated with maintaining and upgrading our nation's water supply and wastewater treatment systems – the EPA estimates the national water infrastructure investment gap will exceed a half-trillion dollars over the next 15 years. Another issue is the increased urbanization and growth of impervious surfaces across our national landscape. Rainfall entering the groundwater is reduced by 15-37 percent due to impervious surfaces preventing water from seeping into the ground. This greatly impacts the quantity and availability of fresh water in many areas of the country.

In response to these concerns, the Great Lakes governors, along with the premiers of Ontario and Quebec, have negotiated a new bi-national compact that is intended to protect the Great Lakes from the potentially adverse consequences of diversions of water to regions outside the Great Lakes basin. As part of the Compact, the governors and premiers have committed to developing regional water conservation and efficiency objectives.

To assist in meeting these water conservation and efficiency objectives, employers are being encouraged to look at water usage at their own facilities and to ask the question, "Are there feasible, cost-effective, water management measures that could improve water use efficiency and create cost-saving opportunities in my industrial processes or in the way I manage my stormwater or landscaping?" Employers can also encourage their own suppliers to be alert to opportunities for reducing costs through water and energy efficiency. For businesses in Michigan, there is a clear relationship between water efficiency and energy efficiency; improving both in a voluntary manner can lead to an improved bottom line and community reputation.

Background and Purpose

Public Act 35 of 2006 required each water use sector to begin designing guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures within 12 months after the effective date of the Act. The business sectors met this requirement on February 28, 2007 (see Appendix A). Within 24 months after the effective date of the Act (on or before February 28, 2008), the Michigan Department of Environmental Quality (MDEQ) must review and report to the appropriate standing committees of the Michigan Legislature on whether there are reasonably detailed criteria for assisting facilities in determining whether water is being used in an efficient manner. The Act allows for established statewide professional or trade associations representing a sector to adopt such guidelines as a means of showing compliance with the provisions of the Act.

In light of the Act's authorization of professional or trade associations to adopt such guidelines as a means of compliance, the Michigan Chamber of Commerce (Chamber) has worked with industry representatives to develop a general model guideline, which can be utilized by industrial and

commercial businesses in Michigan. In addition, members from the Electric Utility, Chemical Manufacturing, Pharmaceutical Manufacturing and Research, Pulp and Paper, and the Beverage Industry sectors developed sector-specific model guidelines that can be used by water users in those sectors. These five sectors represent over 80% of water withdrawals in 2004 according to data available on the MDEQ's "Water Use Program" website. As the program matures, additional business sectors may choose to develop sector-specific model guidelines. This collaborative approach to developing voluntary conservation guidelines on a sector-by-sector basis meets the intentions of Public Act 35 of 2006. By involving a variety of sectors in the discussion, the Chamber has facilitated the sharing of information and experience for the mutual benefit of all of the participants in the discussion.

The Chamber recognizes that the development of the guidelines, as set forth in PA 35 of 2006, also meets the requirements of the Great Lakes Charter Annex Compact, and is consistent with the recommendations of the Groundwater Advisory Council. Specifically, Article 203 of the Proposed Compact (The Decision-Making Standard for Management of Withdrawals and Consumptive Uses within the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement), states:

> *"The withdrawal or consumptive use shall be implemented so as to incorporate environmentally sound and economically feasible water conservation measures."*

The Groundwater Conservation Advisory Council's February 6, 2006 Final Report to the Legislature provided several recommendations. Within them, Recommendation # 10 states:

> *"Each water-use sector should develop its own sector-specific water management practice. These should be reviewed and evaluated by a closely related professional or trade association. Water users within each sector should be encouraged to adopt and implement the water-management practices specific to their sector."*

The Chamber is encouraged by the consistent message from all parties involved with water conservation measures and is committed to the development of a successful program. With the support of highly experienced and motivated membership, the Chamber is confident the General Model guideline and sector-specific guidelines developed for the Electric Utility, Chemical Manufacturing, Pharmaceutical Manufacturing and Research, Pulp and Paper, Beverage, and Wet Cement Manufacturing Industry sectors will exemplify environmentally sound and economically feasible water conservation measures through consideration of generally accepted water management practices.

The general industry model guideline and sector-specific guidelines are intended to satisfy the water withdrawal requirements under PA 35 of 2006. These withdrawals include:

- Increased withdrawal capacity of more than 2 million gallons per day (MGD) for withdrawals from the waters of the state, other than the Great Lakes and their connecting waterways.
- New or increased withdrawals of more than 5 MGD for withdrawals from a Great Lake or one of the connecting channels.

In support of these guidelines, the Chamber has adopted a position statement presented in Section 2.

2. Position Statement

Water Efficiency – Resource Sustainability – Conservation Management

The Michigan Chamber of Commerce (Chamber) supports voluntary water management programs that protect the Great Lake's waters. The Chamber further supports the development of a sustainable approach to water resource management and a goal of water use efficiency by incorporating conservation strategies at the discretion of each sector and the corresponding facilities for their particular circumstance.

Because each facility in a water use sector has distinctive and unique circumstances, the Chamber urges flexibility in developing water conservation and efficiency management plans. Each facility must be attentive to its own operation, and make reasonable decisions to accomplish efficient use of water resources. This is accomplished by conducting its own cost benefit analysis of each feasible and potentially cost-effective water conservation activity.

An abundant, renewable, and safe water supply is an economic advantage Michigan currently enjoys in attracting and retaining business, industry and tourism. Considering the implementation of environmentally sound and economically feasible water conservation measures will continue to provide this economic advantage.

The Chamber and its members have adopted, as its goal, the promotion of sound water conservation and management practices in Michigan.

Our Goal Statement

The goal of the Chamber's Water Withdrawal and Water Conservation initiative is to promote water conservation practices in Michigan, through a partnership with the business sectors that fosters awareness and promotes fiscally responsible and meaningful water management practices.

Our Objectives

The Chamber has established the following objectives:

- To establish a forum that serves to develop and disseminate water conservation information and activities to businesses.
- To accumulate educational materials in the form of generally accepted practices, guidebooks and checklists.
- To facilitate the development of generally accepted practices and water management activities among its members to satisfy the requirements of PA 35 of 2006 and the proposed Great Lakes Compact.

3. Generally Accepted Management Practices for Water Efficiency and Conservation

The following sub-sections list voluntary, generally accepted management practices (GAMPs) to assist the business sectors with their goal of improving water efficiency and water conservation. Factors to consider when evaluating the relative costs and benefits of each of the GAMPs are the potential short- and long-term economic impacts, process efficiency implications and potential impacts on other environmental media such as air, land and waste. For example, one of the management practices recommends considering the use of chemical treatment to reduce the amount of make-up water required for cooling towers. This may not be practical for cooling towers that discharge directly to a river since the permit for this discharge may restrict chemical addition to the cooling tower water. GAMPs include the measures listed below. It is recognized that any given GAMP may be operationally or economically infeasible, or otherwise be inappropriate for a unique industrial operation within the same sector. Each business will need to review and assess which GAMPs are potentially applicable to its specific circumstance.

Communication

- Incorporate water conservation policies and procedures into employee training programs.
- Post water-conservation stickers, signs, and posters in bathrooms, kitchens, cafeterias, conference rooms, and other places where employees congregate, to help raise awareness.
- Participate in water conservation advisory groups or similar organizations.

Process

- Maintain a general water use inventory for the facility and update periodically.
- Consider the impact of future facility modifications or production changes on water usage. Changes to routine operations provide a good opportunity to evaluate current practices for possible water conservation opportunities.
- Shut off faucets and nozzles when not in use.
- Install flow restrictors, aerators, spring-loaded valves and timers on faucets and nozzles.
- Improve rinse cycles by using cascading or counter-current rinsing from processes that require highly pure water to rinse parts from other processes that do not require such high-quality water.
- Investigate potential chemical treatments to reduce the amount of make-up water required for cooling towers, steam boilers, etc.
- Consider retrofit applications that use once-through cooling water (chillers, compressors, condensers etc.) with closed-loop recirculation systems, while keeping in mind that a decrease in water withdrawal for once-through cooling may increase overall process water consumption.
- Consider replacing water-cooled equipment with air-cooled equipment.
- Incorporate water conservation into ISO or other existing QA/QC processes.

Washrooms

- Replace continuous- or timed-flush urinals in restrooms with low-flow manual flush or sensor-controlled equipment. This can be as simple as retrofitting the flush valve with a new spring and diaphragm.
- Replace older toilets that use as much as 22 litres per flush with ultra-low-flush toilets (6 litres per flush) or dual-flush toilets (6 litres for solid waste, 3 litres for liquid waste).
- In new installations consider waterless urinals, which do not consume any water (eliminating water supply lines and flush valves), are easy to install and meet public health standards.

Landscaping

- Install soil-moisture sensors and controllers.
- Install drip irrigation to reduce water use in landscaped areas.
- Use more drought-tolerant native vegetation.
- Install trigger-heads or nozzles on hoses and devices used for cleaning and watering.

Appendix A – Links to Websites

North Carolina Department of Environmental and Natural Resources Water Efficiency Manual – www.p2pays.org/ref/01/00692.pdf

"Water efficiency" means using improved technologies and practices that deliver equal or better service with less water. For example, the use of low flow faucet aerators can be more powerful than no aerators for washing hands. "Water conservation" has been associated with curtailment of water use and doing "less" with less water, typically during a water shortage, such as a drought. Examples are minimizing lawn watering and automobile washing in order to conserve water. Water conservation also includes day-to-day "demand management" to better manage how and when water is used, so it is common to hear the words "water conservation" used synonymously with "water efficiency."

United States Environmental Protection Agency – Water Conservation Plan Guidelines – www.epa.gov/WaterSense/pubs/guide.htm

Water efficiency is the long-term ethic of conserving water resources through the employment of water-saving technologies.

Sandia National Laboratory – Energy-Water Report to Congress – www.sandia.gov/energy-water/congress_report.htm

This report summarizes the relationship between energy production and water use for the entire U.S. The report summarizes water use by sector (e.g., agriculture, power plants, oil and gas production, etc.) and as such, provides a valuable resource for states and regions that are wrestling with the water availability issue.

American Water Works Association

Water Conservation: The U.S. Water Resources Council defines water conservation as activities designed to (1) reduce the demand for water, (2) improve efficiency in use and reduce losses and waste of water, and (3) improve land management practices to conserve water.

Water Use Efficiency: A measure of the amount of water used versus the minimum amount required to perform a specific task. In irrigation, the amount of water beneficially applied divided by the total water applied.

MI-AWWA advocates water use efficiency and conservation planning as a resource management practice that incorporates analysis of costs and uses of water, specification of water-saving solutions, installation of water-saving measures, and verification of savings to maximize the cost effective use of the water resource. Refer to the **MI-AWWA Draft Guidelines for Generally Accepted Water Management Practices for the Public Water Supply Sector** – *http://www.mi-water.org/miawwa/committees/Water_Efficiency/Minutes/MIAWWA%20Water%20Mngmnt%20Guidelines%20Rev%20A%20081406.pdf*

New York State Department of Environmental Conservation – www.dec.ny.gov/lands/313.html

Conservation is simply a protection from loss of waste. Therefore, water conservation activities reduce the demand for water, improve the efficiency in use and reduce losses and waste of water. Short-term conservation measures (such as those for emergency or drought conditions) differ from long-term measures in terms of implementation time, degree of public cooperation, long-term effectiveness and influence on water supply planning.

SAHRA – Sustainability of Semi-Arid Hydrology and Riparian Areas – www.sahra.arizona.edu/programs/water_cons/why/definition.htm

Conservation is the management of resources, such as water, so as to eliminate waste or maximize efficiency of use. A related and complementary concept is sustainability. Activities are sustainable if they can be maintained over time without depleting the natural resource base. While water resources vary over time (as from drought, an abundant snowpack, etc.), sustainable use of water requires a reserve that can be maintained and managed so as to ensure the supply for future generations. Sustainable activities do not reduce options or otherwise impoverish future generations.

Michigan Department of Environmental Quality – Glossary of Terms and Acronyms – www.michigan.gov/documents/GLOSSARYOFTERMSSept13-2005_136497_7.pdf

Water and Soil Conservation: This simply means wisely using and maintaining our soils and water. Soil and water are essential to sustaining life and ecosystems. Soil conservation is wisely maintaining the soils which support forests, shrub lands, and grasslands. Water conservation is maintaining abundant and quality aquatic environments for plants and animals as well as providing quality water for people and wildlife.

Water Conservation and Use in Agriculture – www.wca-infonet.org/iptrid/infonet/index.jsp

With growing water scarcity and increasing competition across water using sectors, the need for water savings and more efficient water use has increased in importance in water resources management. Improvement in the physical efficiency of water use is related to water conservation through increasing the fraction of water beneficially used over water applied, while enhancing economic efficiency is a broader concept seeking the highest economic value of water use through both physical and managerial measures.

United States Department of Agriculture – Agriculture Water Use Efficiency in the United States – www.lanl.gov/chinawater/documents/usagwue.pdf

Conserve Water Georgia – Frequently asked questions – www.conservewatergeorgia.net/Documents/faq.html

Michigan Turf Grass Foundation – Best Management Practices for Non-Agricultural Irrigation – www.michiganturfgrass.org/uploads/Non-Ag_Irrigation_BMP_Oct_2005.pdf

Whole Building Design Guide – Water Conservation – www.wbdg.org/resources/water_conservation.php

Definitions of Water Conservation on the Web:

Water Environment Federation: Practices which reduce water use.

Environment Canada: The care, preservation, protection, and wise use of water. www.ec.gc.ca/water/en/info/gloss/e_gloss.htm

Colorado State University Extension: The wise use of water with methods ranging from more efficient practices in farm, home and industry to capturing water for use through water storage or conservation projects. www.ext.colostate.edu/pubs/crops/04717.html

Las Vegas Valley Water District: For information on rebates, services and products, see the Water Smart pages, call the Conservation Helpline at (702) 258-SAVE, or visit the Southern Nevada Water Authority's Website. www.lvvwd.com/html/pay_ebill_terms.html

Carpinteria Valley Water District: Using water wisely and efficiently so that it is not wasted. www.cvwd.net/water_glossary.htm

North Carolina Rural Economic Development Center: The protection, development, and efficient management of water resources for beneficial purposes. www.ncruralcenter.org/water2030/glossary.htm

EPA – Four Pillars of Sustainable Infrastructure – www.epa.gov/waterinfrastructure

EPA believes that better management practices, efficient water use, full-cost pricing of water and a watershed approach to protection can all help utilities to operate more sustainable now and in the long-term.

Better Management of water and wastewater utilities can encompass practices like asset management and environmental management systems. Consolidation and public/private partnerships could also offer utilities significant savings. www.epa.gov/waterinfrastructure/bettermanagement.html

Rates that reflect the Full Cost Pricing of service and rate restructuring can help utilities capture the actual costs of operating water systems, raise revenues, and also help to conserve water. www.epa.gov/waterinfrastructure/fullcostpricing.html

Efficient Water Use is critical, particularly in those parts of the country that are undergoing water shortages. We need to create market incentives to encourage more efficient use of water and to protect our sources of water. www.epa.gov/waterinfrastructure/waterefficiency.html

Watershed Approaches looks more broadly at water resources in a coordinated way, which is challenging because we have not traditionally thought of infrastructure management within the context of water quality protection. www.epa.gov/waterinfrastructure/watershedapproaches.html

Appendix B - Council of Great Lakes Governor's - Water Conservation and Efficiency Initiative

The following is the Council of Great Lakes Governor's (CGLG) Water Conservation and Efficiency Initiative report which was adopted on December 4, 2007. The objective of the Great Lakes Water Conservation and Efficiency Initiative is to provide recommendation to the CGLG regarding regional water conservation and efficiency goals and objectives.

Background

The Great Lakes governors and premiers signed the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement) on December 13, 2005. This Agreement created the Great Lakes-St. Lawrence River Water Resources Regional Body (Regional Body), comprising the governors and premiers, to further coordinate implementation of its terms.

Pursuant to Article 304(l) of the Agreement, the Regional Body will adopt regional water conservation and efficiency objectives by December 13, 2007. These objectives are intended to be broad, overarching concepts which will provide context for further state and provincial action that will be more specific in nature. The Regional Body met this deadline with its December 4, 2007 action.

The process for developing the regional water conservation and efficiency objectives is intended to be open and transparent. Regional stakeholders have been asked to provide technical information, make recommendations and foster communication with interested organizations and individuals. Representatives of Tribes and First Nations have also been engaged and asked to share their experience and traditional knowledge. Additionally, public input was sought through a formal public comment period.

Once finalized and adopted by the Regional Body, the regional objectives will then be used to inform the development of individual state and provincial water conservation and efficiency goals and objectives. These goals and objectives will in turn shape state and provincial water conservation programs. The Agreement also provides direction to ensure that the states and provinces, along with the Regional Body, undertake periodic reviews of their water conservation programs. Additionally, the regional objectives, as well as reports prepared by each state and province on their programs, will be reviewed by the Regional Body every five years.

Introduction

Efficient and responsible water use is a cornerstone of sound water management policy, whether the resource is considered abundant or scarce. Efficient use and conservation of four water resources can:

- Ensure equitable access to, and long-term availability of, water
- Protect public health and enhance quality of life
- Minimize impacts of water use to support healthy aquatic ecosystems of the Great Lakes and St. Lawrence River Basin

- Minimize costs related to water and wastewater infrastructure
- Preserve social and cultural heritage
- Prevent or minimize conflicts among water users
- Enhance economic viability and competitiveness of the region
- Support reductions in energy use and greenhouse gas emissions
- Improve the ability to manage an uncertain future and growing demand for water
- Demonstrate that the region's citizens are prudent stewards of the resource

These Basin-wide goals and objectives are intended to complement other water conservation and efficiency efforts consistent with water quality objectives. They will accelerate intergovernmental and other partnerships including, for example, partnerships with Basin Tribes and First Nations to build a greater understanding and consideration of traditional knowledge and practices. Whether accomplished through voluntary, mandatory, or a combination of measures, to be successful, these goals and objectives need to be broadly supported.

Goals - As stated in the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement

1. Ensuring improvement of the waters and water dependent natural resources
2. Protecting and restoring the hydrologic and ecosystem integrity of the Basin
3. Retaining the quantity of surface water and groundwater in the Basin
4. Ensuring sustainable use of waters of the Basin
5. Promoting the efficiency of use and reducing losses and waste of water

Draft Objectives

- Guide programs toward long-term sustainable water use.

- Use adaptive programs that are goal-based, accountable and measurable.
- Develop and implement programs openly and collaboratively, including with local stakeholders, Tribes and First Nations, governments and the public.
- Prepare and maintain long-term water demand forecasts.
- Develop long-term strategies that incorporate water conservation and efficient water use.
- Review and build upon existing planning efforts by considering practices and experiences from other jurisdictions.

- Adopt and implement supply and demand management to promote efficient use and conservation of water resources.

- Maximize water use efficiency and minimize waste of water.
- Promote appropriate innovative technology for water reuse.

- Conserve and manage existing water supplies to prevent or delay the demand for, and development of, additional supplies.
- Provide incentives to encourage efficient water use and conservation.
- Include water conservation and efficiency in the review of proposed new or increased uses.
- Promote investment in, and maintenance of, efficient water infrastructure and green infrastructure.

- Improve monitoring and standardize data reporting among state and provincial water conservation and efficiency programs.

- Improve the measurement and evaluation of water conservation and water use efficiency.
- Encourage measures to monitor, account for, and minimize water loss.
- Track and report program progress and effectiveness.

- Develop science, technology and research.

- Encourage the identification and sharing of innovative management practices and state of the art technologies.
- Encourage research, development and implementation of water use and efficiency and water conservation technologies.
- Seek a greater understanding of traditional knowledge and practices of Basin First Nations and Tribes.
- Strengthen scientific understanding of the linkages between water conservation practices and ecological responses.

-Develop education programs and information sharing for all water users.

- Ensure equitable public access to water conservation and efficiency tools and information.
- Inform, educate and increase awareness regarding water use, conservation and efficiency and the importance of water. Promote the cost-saving aspect of water conservation and efficiency for both short-term and long-term economic sustainability.
- Share conservation and efficiency experiences, including successes and lessons learned across the Basin.
- Enhance and contribute to regional information sharing.
- Encourage and increase training opportunities in collaboration with professional or other organizations in order to increase water conservation and efficiency practices and technological applications.
- Ensure that conservation programs are transparent and that information is readily available.
- Aid in the development and dissemination of sector-based best management practices and results achieved.
- Seek opportunities for the sharing of traditional knowledge and practices of Basin First Nations and Tribes.

Appendix C – Michigan Chamber of Commerce Letters to Legislatures

February 28, 2007

MICHIGAN CHAMBER OF COMMERCE

Senator Patty Birkholz
Michigan Senate
P.O. Box 30036
Lansing, MI 48909-7536

Dear Chairman Birkholz,

The purpose of this letter is to inform you that, in compliance with Public Act 35 of 2006, the Michigan Chamber of Commerce has undertaken efforts to develop generally accepted water management practices for business sectors. The new law requires that by Feb 28, 2007 each water use sector shall begin developing water management practices. The law allows established statewide professional or trade associations representing a sector to adopt such guidelines as a means of showing compliance with the provisions of the Act. It is the intent of the Michigan Chamber of Commerce to fulfill this portion of the law.

The Michigan Chamber has established a process with our broad-based membership to develop these new guidelines. Our membership includes water users in the following sectors: manufacturing, energy, construction, mining, food, forestry, transportation, and tourism. The guidelines we are developing will provide direction and parameters to the various sectors within our diverse membership.

To assist us in developing these guidelines we are working with Barr Engineering—an experienced and well-qualified environmental consulting firm located in Ann Arbor. Barr is helping the Chamber stakeholder group with technical expertise including reviews of best water management practices from around the country.

We believe that development of the guidelines as set forth in PA 35 of 2006, should also meet the requirements of the Great Lakes Charter Annex Compact. Specifically, the Compact requires each state to develop and implement voluntary and or mandatory water conservation measures applicable to both existing and new uses.

Finally, we are pleased to take a leadership role in developing voluntary water conservation standards. As we begin this process we are hopeful that you will continue to support efforts to ensure that these new guidelines remain voluntary for water users.

If you have any questions or concerns about our activities related to water conservation, please feel free to contact me at (517) 371-7673.

Sincerely,

Doug Roberts, Jr.
Director of Environmental and Energy Policy

MICHIGAN
CHAMBER
OF
COMMERCE

February 28, 2007

Representative Rebekah Warren
Michigan House of Representatives
P.O. Box 30014
Lansing, MI 48909-7514

Dear Chair Warren,

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Sincerely,

Doug Roberts, Jr.
Director of Environmental and Energy Policy

Water Conservation Plan

[Entity]

Michigan Chamber of Commerce

February 2008

Submitted by Barr Engineering Company

BARR

Water Conservation Plan

Table of Contents

1.0 Introduction

Public Act 35 of 2006 (PA 35 of 06) requires that each water use sector develop voluntary guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures. The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector.

In response to PA 35 of 2006, the Michigan Chamber of Commerce (Chamber) has developed this template for a Water Conservation Plan (Plan) to serve as a guide for general industry.

The Chamber and its constituents recognize that the development of the voluntary guidelines as set forth in PA 35 of 2006, also meet the requirements of the Great Lakes Charter Annex Compact, and are consistent with the recommendations of the Groundwater Advisory Council. Specifically, Article 203 of the Proposed Compact (The Decision-Making Standard for Management of Withdrawals and Consumptive Uses within the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement) states:

> *"The withdrawal or consumptive use shall be implemented so as to incorporate environmentally sound and economically feasible water conservation measures."*

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> *"Each water-use sector should develop its own sector-specific water management practice. These should be reviewed and evaluated by a closely related professional or trade association. Water users within each sector should be encouraged to adopt and implement the water-management practices specific to their sector."*

The guidelines set forth in this Plan exemplify environmentally sound and economically feasible water conservation measures through generally accepted management practices (GAMPs).

2.0 Plan Objectives

The *[Entity]* has developed the following objectives to help define the strategy for implementing voluntary water conservation GAMPs and improving water efficiency as part of this Plan. The objectives for this Plan include the following:

- Establish an understanding of current water use at the facility.
- Develop, evaluate, and document Generally Accepted Management Practices (GAMPs) for water conservation at the facility, as indicated by cost-benefit considerations that could reduce water withdrawal or consumption from the levels that would exist without conservation efforts. Review Section 3 and Appendix A in the "Water Withdrawal and Conservation Practices" document for assistance with developing and evaluating GAMPs.
- Review and modify the Plan on a periodic basis. Maintain documentation related to implementation of the Plan.

Each of these objectives will be further discussed and outlined in the remainder of this document.

3.0 Characterization of Current Water Usage

An important component of a Water Conservation Plan is the characterization of a facility's current water usage. This includes characterizing how water flows through a facility or system, identifying what purpose the water plays within the system, identifying specific equipment that consumes and uses large quantities of water, identifying how water is discharged from the system, and identifying and quantifying, to the extent practicable, the cost considerations associated with the existing water usage.

3.1 Current Water Usage

The following elements provide a guideline for characterizing water usage as part of the Plan:

[Entity, in ADD sector provides information including, but not limited to:]

- Describe the source of water at the facility.
- Identify significant water use processes, operations and equipment and account for significant sources and losses.
- Describe water metering and water use tracking, if any.
- Describe leak detection and repair program, if any.
- Identify current reclamation and reuse of water, including how much water is consumed and not available for reuse.
- Identify how water is discharged.
- Identify and quantify, to the extent practicable, the cost parameters associated with water usage.

3.1.1 Description of Water Sources

[Entity adds description here]

3.1.2 Significant Water Use Processes

[Entity adds description here]

3.1.3 Water Metering and Tracking

[Entity adds description here]

3.1.4 Leak Detection and Repair Programs

[Entity adds description here]

3.1.5 Reclamation and Reuse

[Entity adds description here]

3.1.6 Means of Discharging Water

[Entity adds description here]

4.0 Implementation of GAMPs for Water Conservation

Implementation of GAMPs for water conservation and improving water use efficiency are an important component of this Plan. This section outlines what GAMPs *[entity]* is currently utilizing to meet the Plan's overall conservation goals.

[Entity] utilizes the following GAMPs for water conservation at their facility located in *[insert city/town]*, Michigan.

(Check those that apply)

- ☐ Install water meters in high use areas to encourage conservation and accountability.
- ☐ Install cooling towers to reduce once-through cooling water use, where cost-effective and otherwise appropriate.
- ☐ Retrofit applications that use once-through cooling water (chillers, compressors, condensers, etc.) with closed-loop recirculation systems.
- ☐ Replace water-cooled equipment with air cooled equipment.
- ☐ Replace liquid ring vacuum pumps with mechanical seal vacuum pumps.
- ☐ Use clean in place technologies.
- ☐ Operate pumps to meet, but not exceed, process rates to reduce excessive pumping.
- ☐ Calibrate and clean process equipment to enhance thermal and hydraulic performance efficiency.
- ☐ Consider the installation of surge tanks to prevent overflow or the installation of float-controlled valves on makeup water lines.
- ☐ Turn off water consuming equipment that is not in use and during shutdowns.
- ☐ Install flow restrictors, aerators, spring-loaded valves and timers on faucets and nozzles.
- ☐ Use fogging nozzles or mist eliminators to minimize water losses in cooling towers.
- ☐ Investigate alternative water sources for major processes, including using clarified, cooling or waste water for certain processes.
- ☐ Investigate process and equipment upgrades that result in more efficient operations and water use, (e.g. adjusting water intake design and pump speed, increasing efficiency of the whitewater system in the mill).
- ☐ Consider opportunities for water reclamation and reuse throughout the process and facility.
- ☐ Install high-pressure, low-volume shower heads and low-flow or waterless toilets.
- ☐ Consider chemical treatments to reduce the amount of make-up water required for cooling towers, steam boilers, etc.
- ☐ Consider landscape alterations that demand less watering and prevent less runoff.

- ☐ Monitor drought and water stress conditions regionally and communicate awareness issues throughout the organization.
- ☐ Install drip irrigation to reduce watering use.
- ☐ Include water conservation policies and procedures into employee training programs.
- ☐ Participate in water conservation advisory group or organization to raise awareness.
- ☐ Incorporate water conservation practices into employee training programs.
- ☐ Implement a leak detection and repair program to mitigate water losses.
- ☐ Other

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_____

These are examples of GAMPs that might be considered by a specific business at a specific location and should not be considered either a mandatory or complete listing. No one set of GAMPs would be appropriate for, or applicable to, all facilities. Each business will need to review what GAMPs are applicable in its specific circumstance.

5.0 Evaluation and Modification of the Plan

Upon implementation of this Water Conservation Plan, the *[Entity]* will evaluate and update the Plan on a periodic basis. Modifications to the Plan will be based on an evaluation of the water conservation GAMPs previously implemented and upon any new relevant information. This section is intended to satisfy the requirements under the Great Lake Compact for new or increased water withdrawals by demonstrating progress towards achieving improvements in water conservation. Any water conservations measures for existing water uses is considered entirely voluntary.

The [Entity] will consider documenting the following information to evaluate the existing Plan:

- A list of dates and descriptions of conservation measures implemented

  [Entity adds description here]

- Approximate amounts of water saved for each measure implemented

  [Entity adds description here]

- Discussion about whether or not the goals of the plan have been met

  [Entity adds description here]

- If objectives were not met, an explanation as to the reason why the objectives were not met and a discussion of the specific revisions to the Plan intended to help meet the objectives in the future.

  [Entity adds description here]

Water Conservation Plan

Electric Utilities Sector Plan

Michigan Chamber of Commerce

February 2008

Submitted by Barr Engineering Company

BARR

Water Conservation Plan

Table of Contents

1.0 Introduction

Public Act 35 of 2006 (PA 35 of 06) requires that each water use sector develop voluntary guidelines for generally accepted water management practices (GAMPs) or environmentally sound and economically feasible water conservation measures. The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector.

In response to PA 35 of 2006, the Michigan Chamber of Commerce (Chamber) has developed this template for a Water Conservation Plan (Plan) to serve as a guide for the Electric Utilities sector.

The Chamber and its constituents recognize that the development of the voluntary guidelines as set forth in PA 35 of 2006, also meet the requirements of the Great Lakes Charter Annex Compact, and are consistent with the recommendations of the Groundwater Advisory Council. Specifically, Article 203 of the Proposed Compact (The Decision-Making Standard for Management of Withdrawals and Consumptive Uses within the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement), states:

> *"The withdrawal or consumptive use shall be implemented so as to incorporate environmentally sound and economically feasible water conservation measures."*

The Groundwater Conservation Advisory Council's February 6, 2006 Final Report to the Legislature provided several recommendations. Recommendation No. 10 of the Report states:

> *"Each water-use sector should develop its own sector-specific water management practice. These should be reviewed and evaluated by a closely related professional or trade association. Water users within each sector should be encouraged to adopt and implement the water-management practices specific to their sector."*

The guidelines set forth in this Plan exemplify environmentally sound and economically feasible water conservation measures through GAMPs.

2.0 Plan Objectives

This Utility Water Conservation Measure is being adopted by Michigan's Electric Utilities in response to Michigan P.A. 33 through 37 of 2006 and particularly P.A. 35, Section 32708a, which required "each water user's sector" to designate guidelines for water conservation GAMPs or environmentally sound and economically feasible water conservation measures within that sector.

The Electric Utilities sector has developed the following objectives to help define the strategy for implementing voluntary GAMPs for water conservation and improving water efficiency as part of this Plan. The objectives for this Plan include the following:

- Establish an understanding of current water use at the facility.
- Consider sector specific GAMPs, and document GAMPs either considered or implemented at the facility, as indicated by cost-benefit considerations that could reduce water withdrawal or consumption from the levels that would exist without conservation efforts.
- Maintain documentation related to implementation of the Plan.

Each of these objectives will be further discussed and outlined in the remainder of this document.

3.0 Characterization of Current Water Usage

An important component of a Water Conservation Plan is the characterization of a facility's current water usage. This includes characterizing how water flows through a facility or system, identifying what purpose the water plays within the system, identifying specific equipment that consumes and uses large quantities of water, identifying how water is discharged from the system, and identifying and quantifying, to the extent practicable, the cost considerations associated with the existing water usage.

3.1 Current Water Usage

The following elements provide a guideline for characterizing water usage as part of the Plan:

- Describe the source of water at the facility.
- Identify significant water use processes, sources operations and equipment and account for significant and losses.
- Describe water metering and water use tracking, if any.
- Describe leak detection and repair program, if any.
- Identify current reclamation and reuse of water, including how much water is consumed and not available for reuse.
- Identify how water is discharged.
- Identify and quantify, to the extent practicable, the cost parameters associated with water usage.

3.1.1 Description of Water Sources

Water sources for existing plants were established when the plant was constructed and for most, if not all, electrical generating facilities major changes to those sources is not possible. The existing sources are identified on NPDES Permit applications. The Electric Utilities sector will use information already available to identify water sources.

3.1.2 Significant Water Use Processes

Water processes at electrical generating facilities have been developed for most, if not all, facilities in Michigan in the form of a water flow diagram (also called water balance diagrams) that is part of NPDES Permit applications. As part of the Water Conservation Plan, utilities would review their water flow diagrams to determine if there are ways to further reduce water use.

3.1.3 Water Metering and Tracking

Water metering and tracking is already a part of most NPDES Permits for electrical generating facilities in Michigan. An assessment will be made to determine if the current flow metering and tracking equipment and procedures are adequate and upgraded where it is determined additional metering and tracking is needed for the Water Conservation Plan.

3.1.4 Leak Detection and Repair Programs

Leak detection and repair programs are a part of routine maintenance at electrical generating facilities. Leaks are usually indicative of worn or damaged equipment and the leaks could lead to further damage to the equipment or reduce efficiency of a process. As part of the Water Conservation Plan each facility will evaluate the current leak detection and repair program and determine if there is room for improvement.

3.1.5 Reclamation and Reuse

Reclamation and reuse of water has become a common practice in electrical generating facilities. Plant operators recognize that the water pollution control equipment installed to achieve compliance with NPDES Permit conditions has made the effluent water adequate for reuse. As part of the Electric Utility sector plan, facilities will reassess opportunities to use treated effluent rather than discharging it.

3.1.6 Means of Discharging Water

The means of discharging water from electrical generating facilities has been established by the NPDES Permit and altering discharge locations or means is not usually an option.

4.0 Implementation of GAMPs for Water Conservation

Implementation of GAMPs for water conservation and improving water use efficiency are an important component of this Plan. This section outlines GAMPs for water conservation for the Electric Utilities sector.

The Electric Utilities sector considers water conservation to be either a reduction in water withdrawal or a reduction in consumptive uses. The Electric Utilities sector lays out an array of potential water conservation measures to assist each utility as it moves forward with its complying with both P.A. 33-37 and the Clean Water Act. The cost effectiveness of many of these measures is very site specific. For instance, some power plants are nearing their useful life limit and may be operated infrequently to provide peaking power on only the hottest days during the summer or coldest days during the winter. In such instances, it would be much more difficult to derive any monetary benefits associated with the use of more efficient equipment.

Cooling water is used in the generation of electricity to make the process more efficient. The more efficient generation of electricity reduces the amount of fuel (nuclear, coal, gas, or oil) needed to operate the plant, thereby reducing both air emissions, process wastewater discharges, and operating costs. For this water use, water conservation and energy efficiency should all be considered together with the non-consumptive nature of this use of water. See **Appendix A** – Once Through vs. Closed Cycle Cooling Systems. In addition, it is imperative that each power plant's goals for the water conservation program be harmonized with other programs, including the 316 program to reduce fish loss. See **Appendix B** – Tradeoffs, Alternatives, and the Path Forward.

Most other water uses at power plants are also generally non-consumptive uses. These other uses include steam generator make-up water, ash transport system, pump seal water, bearing cooling water, fire protection, and lawn watering. Drinking water and lawn watering are examples of consumptive uses at power plants that make up less than a fraction of one percent of the total water use.

A number of GAMPs generally applicable within the Electrical Utilities sector include:

- Create a leak detection and repair program with regular inspections of major water systems.
- Educate employees on techniques and benefits of water conservation.

- Identify the water quality, quantity, and temperature of major water uses throughout the facility to determine possible water recirculating or recycling opportunities (see Section 3.1 above).
- Update and calibrate as necessary, methods for calculating condenser thermal performance and acceptance criteria. Clean condensers as necessary to support above.
- Match, as close as practical, service water pumping rates of major water uses, to actual process needs to reduce excessive pumping.
- For major makeup water systems, consider the installation of a surge tank to prevent overflow and/or the installation of float-controlled valves on any makeup water lines.
- To the extent practical, consider turning off water to equipment that is not in use and during shutdowns using a solenoid valve to stop the water flow. Note that safety or reliability constraints may sometimes dictate that critical plant systems not be dependent upon manual shutdown procedures or the expected operation of a solenoid valve.
- Install high pressure, low-volume, nozzles on hoses and spray washers, where practical.
- Use fogging nozzles, mist eliminators or otherwise minimize unnecessary water losses in cooling towers.
- Investigate alternative raw water sources for major processes.
- Investigate variable-speed pumps for cooling water intake.
- Confirm that unnecessary cooling water pumps are not being operated during cooler seasons, within the limits of practicality (Note that at least two cooling water pumps are needed for normal operation to prevent catastrophic damage to the power plant in the event a single pump fails).
- At new facilities, consider configuring intake structures to receive cooler hypolimnion water from lakes and reservoirs.
- At new facilities investigate configuring condensers to double pass water during periods of low water temperature.
- A number of larger power plants that will remain operational for a long period of time, and are consequently able to amortize the costs of large capital improvements, have been able to justify the retrofitting of a new generation of more efficient, steam turbine blades. These are the blades which convert the steam energy from the boiler into mechanical energy (which is then converted into electrical energy by the generator). These upgrades allow those plants to transform more of the energy from the fuel into electrical energy and consequently transfer less energy to the condenser cooling water. The net result is less evaporative (consumptive) losses of water.
- Other

_____
_____
_____
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5.0 Evaluation and Modification of the Plan

Upon implementation of this Water Conservation Plan, the Electric Utilities sector will maintain records regarding the measures taken to implement the water conservation plan. The re-evaluation step will be repeated each time there are changes made to a facility's water flow diagram for the NPDES Permit.

Appendix A

Once Through vs. Closed Cycle Cooling Systems

Steam electric power plants use heat from combusting fossil fuels or reacting nuclear fuels to convert water inside a boiler into steam. The steam drives a turbine connected to a generator, and then the steam is condensed back to water as it exits the turbine shell in the condenser. The condensed steam is pumped back to the boiler and the cycle is repeated.

A condenser is a large heat exchanger in which cooling water passes inside of the tubes and the steam flows over the outside. The cooling water never comes in contact with the steam, only the heat is transmitted across the walls of pipes. This cooling process is referred to as "non-contact cooling." Condensing the steam exiting the turbine shell forms a vacuum into which the steam is exhausted from the turbine, which makes the steam cycle more efficient, producing more electricity per unit of fuel. Cooling water can be provided by either once through or closed cycle systems.

Once through cooling systems withdraw water from a river, lake, Great Lake, or ocean, pumps it through the condenser, and then returns all of this water to the water body. Closed cycle cooling systems circulate water first through the steam condenser and then circulate that water through a cooling tower where the heat collected from the steam is dissipated to the atmosphere by evaporative cooling. An amount of water equal to the amount evaporated must be made-up to the closed cycle system to replace the water lost or consumed by the evaporative process. As water is continually cycled through the cooling towers, evaporation causes the salt concentration of the cooling water to increase. A small amount of the water must be returned to the source water body and more freshwater must also be added to the circulated system to control salinity, also called "dissolved solids."

A typical 1,000 MW new coal-fired power plant might circulate a 1,000 MGD of water per day through its condensers. If that plant were fitted with a once-through cooling system, it would withdraw the entire 1,000 MGD daily from a nearby water body and a tiny fraction approximately 0.5% or 5 MGD of the discharged water would eventually be evaporated in the receiving water body. The cooling water is discharged back to the source water body. Some of the heat is released to the environment (i.e., receiving water body) by convection, which is the simple transfer of heat from one surface to another without any evaporation. About half of the heat loss is accomplished through evaporative cooling off of the heated surface of the cooling water plume in the receiving water body. The exact ratio of how much heat is transferred via convection and how much by evaporation is complex and dependent on wind speed, wind and water temperature, humidity and whether a diffuser is used to promote rapid mixing. In general, something less than half of the heat is dissipated through evaporation and the rest through convection. This evaporation is the incremental amount of evaporation that occurs above and beyond the natural evaporation. It is the result of the surface temperature of the water body being raised.

If that plant were fitted with a cooling tower, it would continuously withdraw only about 20 MGD of water as makeup water to its closed cycle cooling system, but it would evaporate about 13 to 15 MGD of water from its cooling towers. This evaporated water may return to the watershed as precipitation. The above numbers are approximations. The actual rates of withdrawals are dependent upon season, the temperature of the receiving water body, and various plant design parameters. Additionally, the cooling water requirements for a nuclear fueled boiler are somewhat higher.

Regardless of the fuel and the plant design, however, a once through plant will always withdraw more water, but evaporate (or consume) less water than a closed cycle cooling plant. There are other trade offs between these two plant designs that are discussed below.

Appendix B

Tradeoffs, Alternatives and the Path Forward

Cooling systems are designed to make the production of electricity more efficient. They are also designed to limit the impact of a water intake and discharge on fish. In this context, the design must also consider the conservation of water.

Once Through Cooling vs. Closed Cycle Cooling

Once through cooling systems withdraw large quantities of water and, absent the use of innovative designs and locations, will have greater potential impacts on a fishery. Adult and juvenile fish can be impinged on a power plant's intake screens and fish eggs and larvae that are small enough to pass through the intake screens can be damaged as they pass through the power plant's cooling water system. There are a number of ways to mitigate these impacts. In some instances, intakes can be located in locations where there are fewer fish. In other instances, intakes can be angled relative to river flows, so as to deflect rather than impinge fish. Additionally, velocities across the intake screens can be designed to be so low as to allow fish to swim away. Lastly, new technologies are being pursued to further minimize the impacts on a fishery.

Against these potentials problems, once cooling systems offer two large advantages, relative to closed cycle systems. They minimize consumptive (evaporative) losses and they make power plants more energy efficient. Consumptive (evaporative) losses are minimized because about half the heat dissipated to the environment from such systems is dissipated by convection and less by evaporation. The energy efficiency of the plant is increased because large amounts of power are not needed to operate cooling towers and the condensers operate more efficiently at the lower temperature ranges associated with once through cooling.

Closed cycle cooling systems have been installed where cooling water availability was limited or thermal discharge limits were an issue. Also, closed cycle systems may be installed on water bodies where fish friendly intakes for a once through cooling system are too costly to install or locate.

Future Regulations will Influence Designs and Implementation Schedules

Section 316(b) of the Clean Water Act requires electric generating facilities to minimize adverse environmental impact to fish and shell fish from cooling water intakes. The EPA is in the process of promulgating new guidelines for the use of cooling water at power plants. These new guidelines, once written, will be used by states to determine whether existing cooling systems need to be retrofitted. Previous EPA guidance on 316(b) compliance embodied the concept of a "baseline year." Previous EPA guidance also contained the concept that a redesign of a cooling system needed to consider achieving a certain percentage reduction in fish losses. Any new EPA rule is quite likely to consider the same concepts and only credit intake modifications done after a "baseline year."

It is imperative that each power plant's goals for the water conservation program be harmonized with the goals of the 316 program to reduce fish losses. Water conservation goals, as stated earlier, are to reduce either water use or water consumption (i.e. water evaporation). It is also imperative that any modification to a cooling system, required by a state or federal agency, be consistent with both programs, and that it receives credit under both programs. In moving forward with water conservation initiatives, the utility industry will be working with the state to assure that any new practices are recognized and credited under both programs.

Water Conservation Plan

[Entity], a Member of the Chemical Manufacturing Sector

Michigan Chamber of Commerce

February 2008

Submitted by Barr Engineering Company

BARR

Water Conservation Plan

Table of Contents

1.0 Introduction

Public Act 35 of 2006 (PA 35 of 06) requires that each water use sector develop voluntary guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures. The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector.

In response to PA 35 of 06, the Michigan Chamber of Commerce (Chamber) has developed this template for a Water Conservation Plan (Plan) to serve as a guide for the Chemical Manufacturing sector.

The Chamber and its constituents recognize that the development of the voluntary guidelines as set forth in PA 35 of 2006, also meet the requirements of the Great Lakes Charter Annex Compact, and are consistent with the recommendations of the Groundwater Advisory Council. Specifically, Article 203 of the Proposed Compact (The Decision-Making Standard for Management of Withdrawals and Consumptive Uses within the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement), states:

> *"The withdrawal or consumptive use shall be implemented so as to incorporate environmentally sound and economically feasible water conservation measures."*

The Groundwater Conservation Advisory Council's February 6, 2006 Final Report to the Legislature provided several recommendations. Recommendation # 10 of the Report states:

> *"Each water-use sector should develop its own sector-specific water management practice. These should be reviewed and evaluated by a closely related professional or trade association. Water users within each sector should be encouraged to adopt and implement the water-management practices specific to their sector."*

The guidelines set forth in this Plan exemplify environmentally sound and economically feasible water conservation measures through generally accepted management practices (GAMPs).

2.0 Plan Objectives

The *[Entity]*, a member of the Chemical Manufacturing sector, has developed the following objectives to help define the strategy for considering and implementing voluntary GAMPs for water conservation and improving water efficiency as part of this Plan. The objectives for this Plan include the following:

- Establish an understanding of current water use at the facility.
- Consider sector specific GAMPs, and document GAMPs either considered or implemented at the facility, as indicated by cost-benefit considerations that could reduce water withdrawal or consumption from the levels that would exist without conservation efforts.
- Review and modify the Plan on a periodic basis. Maintain documentation related to implementation of the Plan.

Each of these objectives will be further discussed and outlined in the remainder of this document.

3.0 Characterization of Current Water Usage

An important component of a Water Conservation Plan is the characterization of a facility's current water usage. This includes characterizing how water flows through a facility or system, identifying what purpose the water plays within the system, identifying specific equipment that consumes and uses large quantities of water, identifying how water is discharged from the system, and identifying and quantifying, to the extent practicable, the cost considerations associated with the existing water usage.

3.1 Current Water Usage

The following elements provide a guideline for characterizing water usage as part of the Plan:

[Entity, in ADD sector provides information including, but not limited to:]

- Describe the source of water at the facility.
- Identify significant water use processes, operations and equipment and account for significant sources and losses.
- Describe water metering and water use tracking, if any.
- Describe leak detection and repair program, if any.
- Identify current reclamation and reuse of water, including how much water is consumed and not available for reuse.
- Identify how water is discharged.
- Identify and quantify, to the extent practicable, the cost parameters associated with water usage.

3.1.1 Description of Water Sources

[Entity adds description here]

3.1.2 Significant Water Use Processes

[Entity adds description here]

3.1.3 Water Metering and Tracking

[Entity adds description here]

3.1.4 Leak Detection and Repair Programs

[Entity adds description here]

3.1.5 Reclamation and Reuse

[Entity adds description here]

3.1.6 Means of Discharging Water

[Entity adds description here]

4.0 Implementation of GAMPs for Water Conservation

Implementation of GAMPs for water conservation and improving water use efficiency are an important component of this Plan. This section outlines what GAMPs the [entity] is currently utilizing to meet the Plan's overall water conservation objectives.

This section outlines GAMPs to consider for water conservation for the Chemical Manufacturing sector. In addition to the list below, the Entity should review Appendix A (Links to Websites) of the "Water Withdrawal and Conservation Practices" document in establishing GAMPs and conservation goals applicable to its specific business and location. The entity would evaluate options that are applicable to their site that they are implementing, or plan to evaluate for implementation, and list them below.

Communication

- Incorporate water conservation policies and procedures into employee training programs.
- Post water-conservation stickers, signs, and posters in bathrooms, kitchens, cafeterias, conference rooms, and other places where employees congregate, to help raise awareness.
- Participate in water conservation advisory groups or similar organizations.

Process

- Maintain a general water use inventory for the facility and update periodically.
- Consider the impact of future facility modifications or production changes on water usage. Changes to routine operations provide a good opportunity to evaluate current practices for possible water conservation opportunities.
- Shut off faucets and nozzles when not in use.
- Install flow restrictors, aerators, spring-loaded valves and timers on faucets and nozzles.
- Improve rinse cycles by using cascading or counter-current rinsing from processes that require highly pure water to rinse parts from other processes that do not require such high-quality water.
- Investigate potential chemical treatments to reduce the amount of make-up water required for cooling towers, steam boilers, etc.
- Consider retrofit applications that use once-through cooling water (chillers, compressors, condensers etc.) with closed-loop recirculation systems, while keeping in mind that a decrease in water withdrawal may increase water consumption.
- Consider replacing water-cooled equipment with air-cooled equipment.
- Incorporate water conservation into ISO or other existing QA/QC processes.

Washrooms

- Replace continuous- or timed-flush urinals in restrooms with low-flow manual flush or sensor-controlled equipment. This can be as simple as retrofitting the flush valve with a new spring and diaphragm.
- Replace older toilets that use as much as 22 litres per flush with ultra-low-flush toilets (6 litres per flush) or dual-flush toilets (6 litres for solid waste, 3 litres for liquid waste).
- In new installations consider waterless urinals, which do not consume any water (eliminating water supply lines and flush valves), are easy to install and meet public health standards.

Landscaping

- Install soil-moisture sensors and controllers.
- Install drip irrigation to reduce water use in landscaped areas.
- Use more drought-tolerant native vegetation.
- Install trigger-heads or nozzles on hoses and devices used for cleaning and watering.

These are examples of GAMPs that might be considered by a specific business at a specific location and should not be considered either a mandatory or complete listing. No one set of GAMPs would be appropriate for, or applicable to, all members of the Chemical Manufacturing Sector. Each business will need to review what GAMPs are applicable in its specific circumstance.

5.0 Evaluation and Modification of the Plan

Upon implementation of this Water Conservation Plan, the *[Entity]* will evaluate and update the Plan on a periodic basis. Modifications to the Plan will be based on an evaluation of the water conservation GAMPs previously implemented and upon any new relevant information. This section is intended to satisfy the requirements under the Great Lake Compact for new or increased water withdrawals by demonstrating progress towards achieving improvements in water conservation. Any water conservations measures for existing water uses is considered entirely voluntary.

The [Entity] will consider documenting the following information to evaluate the existing Plan:

- A list of dates and descriptions of conservation measures implemented

  [Entity adds description here]

- Approximate amounts of water saved for each measure implemented

  [Entity adds description here]

- Discussion about whether or not the goals of the plan have been met

  [Entity adds description here]

- If objectives were not met, an explanation as to the reason why the objectives were not met and a discussion of the specific revisions to the Plan intended to help meet the objectives in the future.

  [Entity adds description here]

Water Conservation Plan

[Entity], a Member of the Pharmaceutical Manufacturing & Research Sector

Michigan Chamber of Commerce

February 2008

Submitted by Barr Engineering Company

BARR

Water Conservation Plan

Table of Contents

1.0 Introduction

Public Act 35 of 2006 (PA 35 of 06) requires that each water use sector develop voluntary guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures. The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector.

In response to PA 35 of 06, the Michigan Chamber of Commerce (Chamber) has developed this template for a Water Conservation Plan (Plan) to serve as a guide for the electric generation/industrial and commercial sectors.

The Chamber, and its constituents, recognize that the development of the voluntary guidelines as set forth in PA 35 of 06, also meet the requirements of the Great Lakes Charter Annex Compact, and is consistent with the recommendations of the Groundwater Advisory Council. Specifically, Article 203 of the Proposed Compact - The Decision-Making Standard for Management of Withdrawals and Consumptive Uses within the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement, states:

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The Groundwater Conservation Advisory Council's February 6, 2006 Final Report to the Legislature provided several recommendations. Within them, Recommendation # 10 states:

> *"Each water-use sector should develop its own sector-specific water management practice. These should be reviewed and evaluated by a closely related professional or trade association. Water users within each sector should be encouraged to adopt and implement the water-management practices specific to their sector."*

The guidelines developed in this Plan exemplify environmentally sound and economically feasible water conservation measures through best management practices (GAMPs).

2.0 Plan Objectives

The *[Entity]* has developed the following objectives to help define the strategy for implementing voluntary water conservation GAMPs and improving water efficiency as part of this Plan. The objectives for this Plan include the following:

- Establish an understanding of current water use (e.g. system-wide water use audit) to establish an understanding of how water is utilized at the facility.
- Improve, modify, or audit processes to increase efficient water use (e.g. optimize efficiency of cooling systems) to encourage improvement of processes that inefficiently consume water.
- Develop, implement, and document GAMPS for water conservation at the facility to reduce water consumption from the levels that would exist without conservation efforts.
- Incorporate water conservation practices and awareness into employee training programs.
- Review and modify Plan on a periodic basis.
- Provide documentation related to implementation of the Plan (e.g. self certification with oversight provided through the Chamber).

3.0 Characterization of Current Water Usage

An important component of a water conservation Plan is the characterization of a facility's current water usage. This includes characterizing how water flows through a facility or system, identifying what purpose the water plays within the system, identifying specific equipment that consumes and uses large quantities of water, and finally, identifying how water is discharged from the system.

3.1 Current Water Usage

The following elements provide a guideline for performing a water usage characterization as part of a water conservation Plan:

- Describe the source of water and how it flows to and through the facility systems.
- Identify significant water use processes, operations and equipment and account for significant sources and losses throughout the process (e.g. water audit).
- Describe water metering and water use tracking.
- Describe leak detection and repair program, if any.
- Identify current reclamation and reuse of water throughout the process, including how much water is consumed in the production process and not available for reuse.
- Identify how water is discharged from the process.

3.1.1 Description of Water Use

Facilities should:

- Meter all water coming onto site and maintain a documented water balance.
- Undertake annual water usage surveys in order to effectively identify and prioritize new water conservation measures.
- Develop and implement water conservation targets and action plans annually.

3.1.2 Development of a Water Balance

Facilities should develop, maintain and document a water balance, which includes all major sources and uses of water at the facility. Facilities should meter all water coming into the facility. This includes:

- Water purchased from off-site sources (e.g. public or private water suppliers).
- Water extracted from wells.
- Water withdrawn from surface sources by the facility.

Exceptions may be made for small sources (i.e., sources that represent less than 5% of the total facility water usage).

The facility's component water uses should be quantified using measurements or engineering estimates. Facilities should identify component water uses appropriate for their specific circumstances. Examples of component water uses are:

- cooling
- sanitary
- process (possibly several components for separate production departments)
- product use
- utilities
- cleaning
- irrigation

The sum of the component water uses should be reasonably close to the total quantity of water used at the facility.

3.1.3 Water Metering and Tracking

Facilities should measure water use or install additional water meters to improve the quality of their water balance if the sum of the component water uses is not reasonably close to the total water use. The water balance should be updated annually if there is a significant change in water usage.

3.1.4 Leak Detection and Repair Programs

Each facility should have ongoing leak detection and repair programs. In addition, water conservation audits should be carried out on a five-year basis. Major buildings should be audited on a yearly basis for water use.

3.1.5 Reclamation and Reuse

Where possible and economically feasible, opportunities for water reclamation and reuse should be utilized at each facility.

3.1.6 Means of Discharging Water

As part of the water balance, each facility should monitor all means of water discharge.

4.0 Implementation of GAMPs for Water Conservation

Implementation of GAMPs for increasing water conservation and improving water efficiency are an important component of this water conservation Plan. (Entity) utilizes the following GAMPs at their facility located in _____, Michigan.

(Check those that apply)

- ☐ Install water meters in high use areas to encourage conservation and accountability.
- ☐ Install cooling towers to reduce once-through cooling water use, where appropriate.
- ☐ Retrofit applications that use once-through cooling water (chillers, compressors, condensers, etc.) with closed-loop recirculation systems.
- ☐ Replace water-cooled equipment with air cooled equipment.
- ☐ Replace liquid ring vacuum pumps with mechanical seal vacuum pumps.
- ☐ Use clean in place technologies.
- ☐ Operate pumps at minimum process rates to reduce excessive pumping.
- ☐ Calibrate and clean process equipment to optimize thermal and hydraulic performance efficiency.
- ☐ Consider the installation of surge tanks to prevent overflow or the installation of float-controlled valves on makeup water lines.
- ☐ Turn off equipment that is not in use and during shutdowns.
- ☐ Install flow restrictors, aerators, spring-loaded valves and timers on faucets and nozzles.
- ☐ Use fogging nozzles or mist eliminators to minimize water losses in cooling towers.
- ☐ Investigate alternative water sources for major processes, including using clarified, cooling or waste water for certain processes.
- ☐ Investigate process and equipment upgrades that result in more efficient operations and water use (e.g., adjusting water intake design and pump speed, optimization of the whitewater system in the mill).
- ☐ Consider opportunities for water reclamation and reuse throughout the process and facility.
- ☐ Install high-pressure, low-volume shower heads and low-flow or waterless toilets.
- ☐ Consider chemical treatments to reduce the amount of make-up water required for cooling towers, steam boilers, etc.
- ☐ Consider landscape alterations that demand less watering and prevent less runoff.
- ☐ Monitor drought and water stress conditions regionally and communicate awareness issues throughout the organization.
- ☐ Install drip irrigation to reduce watering use.

- ☐ Include water conservation policies and procedures into employee training programs.
- ☐ Participate in water conservation advisory group or organization to raise awareness.
- ☐ Incorporate water conservation practices into employee training programs.
- ☐ Implement leak detection and repair program to mitigate water losses.

These are examples of GAMPs that might be considered by a specific business at a specific location and should not be considered either a mandatory or complete listing. No one set of GAMPs would be appropriate for, or applicable to, all members of the Pharmaceutical Manufacturing and Research Sector. Each business will need to review what GAMPs are applicable in its specific circumstance.

5.0 Evaluation and Modification of the Plan

Upon implementation of this Water Conservation Plan, the *[Entity]* will evaluate and update the Plan on a periodic basis. Modifications to the Plan will be based on an evaluation of the water conservation GAMPs previously implemented and upon any new relevant information. This section is intended to satisfy the requirements under the Great Lake Compact for new or increased water withdrawals by demonstrating progress towards achieving improvements in water conservation. Any water conservations measures for existing water uses is considered entirely voluntary.

The [Entity] will consider documenting the following information to evaluate the existing Plan:

- A list of dates and descriptions of conservation measures implemented

  [Entity adds description here]

- Approximate amounts of water saved for each measure implemented

  [Entity adds description here]

- Discussion about whether or not the goals of the plan have been met

  [Entity adds description here]

- If objectives were not met, an explanation as to the reason why the objectives were not met and a discussion of the specific revisions to the Plan intended to help meet the objectives in the future.

  [Entity adds description here]

Water Conservation Plan

[Entity], a Member of the Pulp and Paper Sector

Michigan Chamber of Commerce

February 2008

Submitted by Barr Engineering Company

BARR

Water Conservation Plan

Table of Contents

1.0 Introduction

Public Act 35 of 2006 (PA 35 of 06) requires that each water use sector develop voluntary guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures. The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector.

In response to PA 35 of 06, the Michigan Chamber of Commerce (Chamber) has developed this template for a Water Conservation Plan (Plan) to serve as a guide for the Pulp and Paper sector.

The Chamber, and its constituents, recognize that the development of the voluntary guidelines as set forth in PA 35 of 06, also meet the requirements of the Great Lakes Charter Annex Compact for existing water users, and is consistent with the recommendations of the Groundwater Advisory Council. Specifically, Article 203 of the Proposed Compact - The Decision-Making Standard for Management of Withdrawals and Consumptive Uses within the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement, states:

> *"The withdrawal or consumptive use shall be implemented so as to incorporate environmentally sound and economically feasible water conservation measures."*

The Groundwater Conservation Advisory Council's February 6, 2006 Final Report to the Legislature provided several recommendations. Within them, Recommendation # 10 states:

> *"Each water-use sector should develop its own sector-specific water management practice. These should be reviewed and evaluated by a closely related professional or trade association. Water users within each sector should be encouraged to adopt and implement the water management practices specific to their sector."*

The guidelines developed in this Plan exemplify environmentally sound and economically feasible water conservation measures through best management practices (BMPs).

2.0 Plan Objectives

2.1 Objectives

The Pulp and Paper sector has developed a broad set of "objectives" identifying the sector's strategy for implementing voluntary water conservation practices and improving water efficiency as part of this Plan. The objectives for this Plan include the following:

- Establish an understanding of current water use (e.g. system-wide water use audit) to establish an understanding of how water is utilized at the facility.
- Improve, modify, or audit processes to increase efficient water use (e.g. optimize efficiency of cooling systems) to encourage improvement of processes that inefficiently use water.
- Develop, implement, and document Best Management Practices (BMPS) for water conservation at the facility to reduce water use from the levels that would exist without conservation efforts. Implementation of these BMPs needs to be based on both technical and economic feasibility.
- Incorporate water conservation practices and awareness into employee training programs.
- Review and modify Plan on a periodic basis.
- Provide documentation related to implementation of the Plan (e.g. self-certification with oversight provided through the Chamber).
- These objectives are currently being met by participants in the Michigan Pulp and Paper Pollution Prevention Program (P5), a government-industry partnership focused on voluntary reductions in emissions and water use in Michigan's pulp and paper industry.

3.0 Characterization of Current Water Usage

An important component of a water conservation Plan is the characterization of a facility's current water usage. This includes characterizing how water flows through a facility or system, identifying what purpose the water plays within the system, identifying specific equipment that uses large quantities of water, and finally, identifying how water is discharged from the system.

3.1 Current Water Usage

The following elements provide a guideline for performing a water usage characterization as part of a water conservation Plan:

[Entity provides information including, but not limited to:]

- Describe the source of water and how it flows to and through the facility systems.
- Identify significant water use processes, operations and equipment and account for significant sources and losses.
- Describe water metering and water use tracking, if any.
- Describe leak detection and repair program, if any.
- Identify current reclamation and reuse of water throughout the process, including how much water is used and not available for reuse.
- Identify how water is discharged from the process.

3.1.1 Description of Water Use

[Entity adds description here]

3.1.2 Significant Water Use Processes

[Entity adds description here]

3.1.3 Water Metering and Tracking

[Entity adds description here]

3.1.4 Leak Detection and Repair Programs

[Entity adds description here]

3.1.5 Reclamation and Reuse

[Entity adds description here]

3.1.6 Means of Discharging Water

[Entity adds description here]

4.0 Implementation of BMPs for Water Conservation

Implementation of BMPs for increasing water conservation and improving water efficiency are an important component of this water conservation Plan. This section outlines what BMPs *[entity]*, in the Pulp and Paper sector, is currently utilizing to meet the Plan's overall conservation goals.

(Check those that apply)

- ☐ Install water meters in high use areas to encourage conservation and accountability
- ☐ Install cooling towers to reduce once-through cooling water use, where appropriate
- ☐ Retrofit applications that use once-through cooling water (chillers, compressors, condensers, etc.) with closed-loop recirculation systems
- ☐ Replace water-cooled equipment with air cooled equipment
- ☐ Replace liquid ring vacuum pumps with mechanical seal vacuum pumps
- ☐ Use clean in place technologies
- ☐ Operate pumps at minimum process rates to reduce excessive pumping
- ☐ Calibrate and clean process equipment to optimize thermal and hydraulic performance efficiency
- ☐ Consider the installation of surge tanks to prevent overflow or the installation of float-controlled valves on makeup water lines
- ☐ Turn off equipment that is not in use and during shutdowns
- ☐ Install flow restrictors, aerators, spring-loaded valves and timers on faucets and nozzles
- ☐ Use fogging nozzles or mist eliminators to minimize water losses in cooling towers
- ☐ Investigate alternative water sources for major processes, including using clarified, cooling or waste water for certain processes
- ☐ Investigate process and equipment upgrades that result in more efficient operations and water use, (e.g. adjusting water intake design and pump speed, optimization of the whitewater system in the mill)
- ☐ Consider opportunities for water reclamation and reuse throughout the process and facility
- ☐ Install high-pressure, low-volume shower heads and low-flow or waterless toilets
- ☐ Consider chemical treatments to reduce the amount of make-up water required for cooling towers, steam boilers, etc.
- ☐ Consider landscape alterations that demand less watering and prevent less runoff
- ☐ Monitor drought and water stress conditions regionally and communicate awareness issues throughout the organization
- ☐ Install drip irrigation to reduce watering use
- ☐ Include water conservation policies and procedures into employee training programs
- ☐ Participate in water conservation advisory group or organization to raise awareness

☐ Incorporate water conservation practices into employee training programs

☐ Implement a leak detection and repair program to mitigate water losses

☐ Other water conservation best management practices as listed in Appendix A (describe which practices are being implemented from Appendix A, below):

☐ Other

5.0 Evaluation and Modification of the Plan

Upon implementation of this Water Conservation Plan, the *[Entity]* will evaluate and update the Plan on a periodic basis. Modifications to the Plan will be based on an evaluation of the water conservation GAMPs previously implemented and upon any new relevant information. This section is intended to satisfy the requirements under the Great Lake Compact for new or increased water withdrawals by demonstrating progress towards achieving improvements in water conservation. Any water conservations measures for existing water uses is considered entirely voluntary.

The [Entity] will consider documenting the following information to evaluate the existing Plan:

- A list of dates and descriptions of conservation measures implemented

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- Approximate amounts of water saved for each measure implemented

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- If objectives were not met, an explanation as to the reason why the objectives were not met and a discussion of the specific revisions to the Plan intended to help meet the objectives in the future.

  [Entity adds description here]

Appendix A - Water Conservation Best Management Practices for Pulp and Paper Mills

Paper mills use water as a medium to transport fibers, energy and chemicals during the production of paper. The volume of water used per ton of paper produced depends on several factors including the types of products, the equipment used, the configuration or arrangements of the equipment, the production process, the operating conditions and parameters. Pulp and paper mills use water in a variety of processes; however, Michigan mills are typically not consumers of water – that is to say that the water which is withdrawn for processes is returned to receiving waters or the atmosphere (evaporative). Depending on the water leaving with the product and the incoming water from raw materials, water may or may not be consumed in the process.

The Michigan Pulp and Paper Pollution Prevention Program (P5), a partnership between government and industry, has had great success over the past decade through voluntary objectives for reducing emissions to the environment as well as for decreasing utilization of water resources. Between 1996 and 2003, P5 members have realized a nearly 2.3 billion gallon reduction in water use[1] in their pulp and paper facilities. This commitment to reducing water use speaks volumes about the worth of such voluntary programs and demonstrates the successes that can be achieved through implementing best management practices, some of which are listed below.

The following voluntary best management practices for water conservation are intended as a guide to address common processes in most pulp and paper mills. While this is not an exhaustive or exclusive list, this document forms a foundation for basic water conservation strategies at many pulp and paper mills. Specific strategies may vary, based on mill age, type, and the mix of products being manufactured at a given location. When selecting best management practices, consideration should be given to their economic and technological feasibility, in order to provide the greatest conservation benefit for the implementation cost. An important component of technological feasibility is the relationship between concentration of effluents due to lower water use and the potential impacts that may have on receiving waters, process equipment due to increased corrosivity, and the finished product.

Generic Recommendations

A significant reduction in fresh water usage can be realized by optimizing the design and operation of the whitewater system in the mill. Whitewater should be the primary source of water for pulping especially when its color is compatible with the color of the paper being produced. The use of fresh water for Headbox, Breast, Knockoff, Forming Fabric, and Wire Return Roll Showers for most paper machines can be substituted with screened and clarified whitewater. Process piping should be inspected for leaks and repaired as soon as possible upon detection. All plant personnel should be educated about these water conservation strategies through a facility-wide program in order to facilitate achieving the water conservation goals specified below.

Pulper

Whitewater should be used for making stock. Whitewater from the machine room or the whitewater chest should be the first source of water for stock preparation, if the color is acceptable for the grade of paper to be produced.

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[1] http://www.michiganforest.com/documents/P5_Annual_Report_2003_Final.pdf

Vacuum Seal Water
The temperature of effluent seal water is higher than that of the feed water. Besides the increase in temperature, the main contaminants in seal water are fiber and felt hair. There could also be some solids pick up from the felt. A cooling tower can be installed to reduce the temperature and screens and filters can be used to remove the other contaminants. However, this system cannot be run as a closed loop due to conductivity build. The high conductivity can greatly decrease the life of the pumps due to attacks on metallurgy. It must be continuously purged. Another option is to route the seal water to a whitewater chest or back to the bleach plant for stock dilution. The cleaned water can then be reused. It is also possible to cascade the cooler seal water effluent from the high vacuum pumps (couch, flat boxes) to the low vacuum pumps (press, felt conditioning, etc.). The hot water now generated can be stored and used for stock preparation.

Non-Contact Cooling Water
Non-contact cooling water should be collected and stored in the hot water storage tank. Water from this tank can be used for stock preparation in the pulper, preparation of additives, colors and finishing materials. The viability of doing this depends on the heat balance in the mill's water system.

Felt Cleaning Water
Fresh water is often utilized for felt cleaning on paper machines and presses and discarded to the sewer thereafter. The used water would typically contain felt (hair) and low concentrations of fiber, color and stock additives. It is possible to separate the felt/hair component and reuse the water upstream in stock preparation.

Showers
Check to see if high-pressure, low-volume showers instead of low-pressure, high-volume showers can be used for every application. Clarified white water can be used for guide edge knock-off showers, guide showers and breast roll showers. Some guide roll showers can be connected in a sequence that allows fresh water supply to only one while the others are fed with filtered effluent from the preceding shower.

Water Conservation Plan

[Entity], a Member of the Beverage Industry Sector

Michigan Chamber of Commerce

February 2008

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VOLUNTARY WATER MANAGEMENT PRACTICES

The beverage industry is a leading industry in the conservation of water. It has taken a comprehensive approach in its efforts to reduce water usage and increase water efficiency across operations and supply chains. Most leading brand beverage companies have already developed their own individual public statements regarding the importance of water conservation and minimization, demonstrating strong sector-wide appreciation of the issue.

The voluntary management practices for water conservation are intended as a guide to address common beverage industry processes. While this cannot be an exhaustive or exclusive list, and certainly the items listed will not all necessarily be applicable to each individual company situation, this document forms a foundation for basic water conservation strategies.

The leading brand beverage companies are characterized by having very active and robust Environmental Management Systems (EMS) that are used to develop annual plans at the individual plant level, drive metrics identification and measurement and continuous improvement. Annual auditing helps drive achievement to the established goals, objectives and action plan. These processes ensure appropriate operational management focuses throughout the organization on the importance of water stewardship to the beverage industry. It should not be assumed, however, that all beverage companies have the ability to be as comprehensive or robust.

When selecting water management practices, consideration should be given to their economic and technological feasibility, in order to evaluate whether the practice can reasonably be undertaken, as well as to consider what might provide the better conservation benefit for the implementation cost. Each company, and each facility within a company, is unique. Thus, the water management practices adopted at the discretion of each company will also vary. For this reason, flexibility of management choices is crucial to considered decision making. Additionally, companies will be better or less able to implement some practices on a year-to-year basis based on the current state of business success and plans for the future.

It should also be recognized that water stewardship practices are but one area in the multi-dimensional quest for environmental sustainability. When a beverage company considers the economic and technological feasibility of engaging a particular water conservation practice, it should also evaluate that practice's potential impact on other areas relevant to environmental sustainability.

A number of conservation practices generally applicable within the beverage industry include:

Water Management Systems

- Establishment of a clear vision, goals and objectives related to water conservation.

- Incorporate water as a primary aspect within the environmental management systems (EMS) and sustainability agendas.

- Quantify internal goals and targets to demonstrate commitment to water management.

- Tie water stewardship performance directly to individual and group Key Performance Indicators and incentives.

Communication and Training

- Pursue a company-wide operating culture to include water conservation, efficiency, and innovation and fundamentally positioning water stewardship as "business as usual" across daily operations.

- Routinely report water use performance across the organization, including the use of scorecards, graphical visuals, and bulletins.

- Incorporate water conservation policies and procedures into employee training programs.

- Participate in water conservation advisory groups, or similar organizations, to promote and advance water conservation practices beyond their own individual operations and employees.

- Hold compliance with applicable regulatory requirements as they apply to water use, extraction and discharge as a primary performance metric for operational management within the organization. Where local regulation or oversight is lacking, apply company standards for performance.

- Incorporate water as a key topic within annual and corporate responsibility reports, as well as corporate WebPages.

Water Conservation Programs and Technologies

- Conduct facility water mass balance studies, using results to benchmark existing and new acquisition facilities.

- Conduct water audits.

- Provide tools to assist operations in assessing their water use and drive attention toward promising reduction or re-use opportunities.

- Routinely conduct maintenance on water distribution systems to minimize leaks.

- Install flow restrictors, aerators, spring-loaded valves and timers on faucets and nozzles as appropriate.

- Optimize water use reducing production "runs" management and Clean-In Place (CIP) practices within beverage production facilities.

- Use chemical treatments when possible to reduce the amount of make-up water required for cooling towers, steam boilers, etc.
- Retrofit applications that use once-through cooling water (Chillers, compressors, condensers etc.) with closed-loop recirculation systems.
- Replace water-cooled equipment with air-cooled equipment.
- Replace continuous or timed-flush urinals in restrooms with low-flow manual flush or sensor-controlled equipment.
- Alter the landscape of properties to less water demanding formats.
- Track and monitor drought or water stress conditions, with some companies developing drought management and mitigation plans.
- Incorporate water assessment and management considerations into capital planning and business-decision making.

Water Conservation Plan

[Entity], a Member of the Wet Process Cement Manufacturing Sector

Michigan Chamber of Commerce

February 2008

GENERALLY ACCEPTED MANAGEMENT PRACTICES FOR WATER EFFICIENCY AND CONSERVATION – PORTLAND CEMENT MANUFACTURING, WET PROCESS

The following lists contains generally accepted management practices (GAMPs) for improving water efficiency and water conservation for Wet Process Cement Manufacturing, with quarry operations (de-watering activities) on the contiguous site. Water conservation strategies that have already been implemented include:

- Reuse of CKD landfill leachate for CKD landfill dust-supressant and process water, as allowed by permit.
- Use of Storm water and quarry dewatering for wet process mix.
- Use of Storm water and quarry dewatering for road watering and storage pile dust suppressant.

GAMPs:

Communication

- Incorporate water conservation policies and procedures into employee training programs.
- Post water-conservation stickers, signs, and posters in bathrooms, kitchens, cafeterias, conference rooms, and other places where employees congregate, to help raise awareness.
- Participate in water conservation advisory groups or similar organizations.

Process

- Maintain a general water use inventory for the facility and update annually or as needed following change management procedures.
- Consider the impact of future facility modifications or production changes on water usage. Changes to routine operations provide a good opportunity to evaluate current practices for possible water conservation opportunities.
- Shut off faucets and nozzles when not in use.
- Re-use waste process water for truck washing and dust suppressant.
- Dewatering of the quarry is required for efficient, economical and safe operation. Continue to optimize water use from this activity.
- Incorporate water conservation into ISO or other existing QA/QC processes.

Washrooms

- In new installations consider waterless urinals, which do not consume any water (eliminating water supply lines and flush valves), are easy to install and meet public health standards.

Landscaping

- Reduce or eliminate landscape watering.
- Install drip irrigation to reduce water use in landscaped areas.
- Use more drought-tolerant native vegetation.