Thames River
PHOSPHORUS REDUCTION COLLABORATIVE

June 26, 2019

Projects moving ahead to reduce Lake Erie algae

Phosphorus targeted for removal

Chatham, Ontario - The Thames River Phosphorus Reduction Collaborative (PRC) is moving into summer by installing and testing technologies that intercept and remove phosphorus from agricultural runoff. Phosphorus contributes to the growth of harmful algal blooms in the Thames River and Lake Erie.

In one of the projects near Chatham-Kent, a process is being tested that mimics the way phosphorus is removed naturally in iron-rich soils.

"The Waterloo EC-P™ is a patent pending technology with which we've done a lot of testing on sewage wastewater, so we know it will extract phosphorus from that," said Christopher Jowett, Head of Technology & Government Relations at Waterloo Biofilter Systems Inc. "This is a new application for us, and we believe the demonstration will be successful."

A shipping container has been installed at the Boudreau pump station. Inside are several tanks – two for settling out the solids and silt from the water and a third that contains electrodes made from steel between which a low voltage electrical current is passed.

The electricity dissolves the electrode, releasing iron ions which bind with phosphorus that is dissolved in the water. In a fourth tank, a foam filter causes the iron phosphate to crystallize as insoluble minerals. In another container, the water is first put through a silicate material that captures the removed phosphorus to be re-used as a fertilizer on agricultural crops. Finally, the treated water is pumped back into the river.

"We're basically growing microscopic rocks," Jowett said, adding that, with this process, there's no effect on the pH of the water. In other residential sewage applications, between 90 and 99 per cent of the phosphorus dissolved in the wastewater has been removed.

The Boudreau pump station services approximately 340 acres of land in grain production. Two fields are systematically tiled and drain via two channels. These deliver mostly tile water to the pump station, where it's pumped from the municipal Deary drain to Jeanette's Creek which discharges into the Thames River.

"We are encouraged by the progress we're making and grateful for the support we've received as we work toward finding practical, affordable options to better protect the quality of water in our streams, rivers and lakes," said Mark Reusser, co-chair of the organization and Vice-President of the Ontario Federation of Agriculture (OFA).

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“Our organization is pleased to join with our partners to help support practical, on the ground solutions to reduce phosphorus, and so help keep Lake Erie healthy. “ said Sarah Rang, Deputy Director of the Great Lakes and St.Lawrence Cities Initiative.

Testing sites have been set up in several agricultural fields in the Thames River watershed, the Lake Erie Basin and at two municipal pumping stations near Chatham and in London. The testing will continue through the next three years.

The Thames River PRC is a voluntary initiative cited in the Canada Ontario Lake Erie Action Plan aimed at contributing to the commitment made in 2016 between Canada and the U.S. to a 40 per cent reduction in the total phosphorus entering Lake Erie.

The group represents agricultural organizations, municipalities, conservation authorities, First Nations, 4R Nutrient Stewardship, the drainage sector, and environmental non-governmental organizations. Details of the collaborative, its work, and a full list of steering committee members are at www.thamesriverprc.com

The Thames River PRC is administered by the Ontario Federation of Agriculture and the Great Lakes and St. Lawrence Cities Initiative.

This project is funded through Environment and Climate Change Canada’s Great Lakes Protection Initiative and through the Canadian Agricultural Partnership, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of the Partnership in Ontario.

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Backgrounder outlining all projects is below.

Cutlines for photos:

Photo 1: Waterloo Biofilter’s phosphorus removal equipment is hooked into the Boudreau pump station outside Chatham, Ontario.

Photo 2: Waterloo Biofilter Field Technician Chad Welch installs phosphorus removal and monitoring equipment in late May at a demonstration site beside the Boudreau pump station near Chatham, Ontario. Welch will be operating the system and taking samples.

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Background on Thames River PRC Demonstration Sites

The Thames River Phosphorus Reduction Collaborative (PRC) is led by the Ontario Federation of Agriculture and the Great Lakes and St. Lawrence Cities Initiative. Its purpose is to reduce the amount of phosphorus entering our lakes and rivers and ultimately Lake Erie. The following are demonstration projects that are, or will soon be, under way.

Site 1: Oxford Farm 1

The Upper Thames Conservation Authority in collaboration with Bluewater Pipe Inc. and McCutcheon Farm Drainage is testing the feasibility and efficiency of using slag (leftover material from metal refining) to reduce phosphorus loadings from agricultural field tiles to open watercourses.

Pig manure and commercial fertilizer is spread on the land to grow corn and soybean crops. The farmer follows a nutrient management plan and has a tiled field. Heavy rain and snow melt contribute to the loss of nutrients.

A cartridge containing clean pea gravel and slag – which have been approved by government as low-risk substances - will be inserted into three tiles of different diameters to test and compare the filter sizes and maintenance requirements.

Testing will start in summer, 2019 and samples will be taken for analysis after large rain events.

Site 2: Oxford Farm 2

This farm produces strawberries, asparagus and field crops like corn, soybeans and hay. The land receives one application of liquid dairy cow manure annually on a hay field. Approximately 70 acres of land are drained into the farm drainage system that has two Hickenbottom® drain structures and one municipal surface inlet.

Silt Sock Environmental will assess the feasibility of treating surface water as it enters either of the two kinds of drains. The Hickenbottoms have been fitted with two filter tubes – an outer tube filled with wood chips and an inner tube filled with sponge materials that can absorb phosphorus.

Sampling will be done by the company during spring snow melt and after major rain events. Porous capsules that contain the sorbtive material will be taken to a laboratory once a year where the captured phosphorus will be analyzed.

Site 3: Middlesex Farm 1

This is a small beef farm on which solid manure is spread on fields for cropping. The study is the same as site 1 – testing the difference in phosphorus runoff between solid and liquid manure applications, as well as the different topography of the land.

It will be conducted by the Upper Thames Valley Conservation Authority.

Site 4: Edge of Medway, London

Muddy Rivers Technologies is a Delta, British Columbia based firm that develops water and wastewater treatment systems. The company will use its patent-pending Amprey technology to remove dissolved phosphorus from a stream that flows primarily through agricultural lands. The process involves using electricity to slowly dissolve lava rock with the resulting iron, magnesium, aluminum and calcium ions binding to phosphate ions in the water to form a solid material that can be removed. The system is housed in a 20-foot container and will be situated on a City of London site with access to Medway Creek.

Monitoring will be done monthly under the supervision of Dr. Martha Dagnew of the University of Western Ontario.

The site is in the commissioning stage.

Site 5: Chippewa First Nation Lands

The site is situated on a grain farm operated by a local farmer. A municipal drain outlet that services about 70 acres on several farms provides a flow of tile water to be filtered for phosphorus removal. The fields receive commercial fertilizers, and the testing will be on phosphorus that runs into the system.

The design and technology to intercept tile water was developed by ESSRE Consulting Inc. and the installation has been done by Silt Sock Environmental. An underground tank containing lava rock and sponge materials take water from an underground municipal drain. As the water rises through the tank, phosphorus is absorbed, and the outflow of water empties into an open municipal drain.

Silt Sock Environmental is monitoring the site, and will take samples after significant rainfalls. The sorbent material will be removed annually and the phosphorus will be flushed and recovered under laboratory conditions and analysed for re-use as a fertilizer.

Sites 6 and 7 located in the Chatham-Kent area are inactive as decisions will be made in 2020 on the treatment system designs based on results coming from the other sites.

Site 8: Chatham-Kent Boudreau Pump Station

Waterloo Biofilter is conducting this study. A shipping container has been installed at the station under the supervision of a Chatham-Kent Drainage Supervisor. Inside are two tanks for settling out the solids and silt from the water and a third that contains electrodes made from steel between which a low voltage electrical current is passed.

The electricity dissolves the electrode, releasing iron ions which bind with phosphorus that is dissolved in the water. In a fourth tank, a foam filter causes the iron phosphate to crystallize as insoluble minerals. In fifth container, the water is first put through a silicate material that captures the removed phosphorus to be re-used as a fertilizer on agricultural crops. Finally, the treated water is pumped back into the river.

Monitoring and sampling is being done by Waterloo Biofilter and a McMaster University laboratory will conduct the analysis.

Site 9: Chatham-Kent Farm

This site includes a 25-acre grain field that receives pig manure and commercial fertilizers annually. The field is tiled.

The Lower Thames Valley Conservation Authority is conducting the testing. The authority worked with staff of the Ontario Ministry of Agriculture, Food and Rural Affairs to install a tank that captures water from a tile main which then flows through the Filtrexx Nutriloxx® material that absorbs phosphorus. Water is then discharged into an adjacent municipal drain which flows into the Thames River. Auto samplers have been installed to assess nutrients at both the intake and outlet of the tank.

The tank was installed in the fall of 2017 and data collection began during the spring of 2018.
From April, 2018 to March, 2019, samples were taken and a total of 133 water samples were analysed by Caduceon Environmental Laboratories.

Different sorbtive materials can be tested at the site, and there are plans to test new materials in 2019-20. Gillier Drainage has provided the drainage modifications to support the study.

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