Request for Proposals – Responses Due: 5:00pm EDT Tuesday, February 28, 2018 to mbrown@wef.org

Preparation of Baseline Data to Establish the Current Amount of Resource Recovery at Water Resource Recovery Facilities (WRRFs)

The Water Environment Federation (WEF) is inviting letter proposals for the provision of data to develop a baseline of the current resource recovery activity at Water Resource Recovery Facilities (WRRFs) in the United States and Canada.

1 Background

With challenges such as population pressures, climate change, aging infrastructure, and funding shortfalls, water resources are being stressed at unprecedented levels. The sustainable management of water resources for the next century requires bold action to address these challenges. We can no longer view wastewater treatment plants as waste disposal facilities, but rather water resource recovery facilities that produce clean water, recover nutrients (such as phosphorus and nitrogen), and have the potential to reduce the nation's dependence upon fossil fuel through the production and use of renewable energy.

One of WEF's strategic objectives is to *Collaborate with water sector partners to define and create a bold, aspirational, and public call to action to accelerate resource recovery.* To help achieve these objectives, WEF is developing a program to set strategic resource recovery goals for the US & Canada Water Sector, specifically for water reuse, and nutrient (focusing on nitrogen and phosphorus) and energy recovery. The primary purpose is to encourage the adoption of the resource recovery mindset in the water sector by *quantifying* and *publicizing progress* towards these goals (potentially analogous to the UN's Sustainable Development Goals, or SDGs). To set goals, a baseline of current resource recovery practices must be established.

WEF proposes to use a mass-balance approach to determine the recovered amount of each resource. For example, the percent recovery of phosphorus will be calculated as "total mass (kg) of phosphorus recovered as a reusable product divided by the total mass (kg) of phosphorus received in the raw wastewater and any other waste sources entering the WRRF and processed by the WRRF." Definitions of each resource is provided, along with end uses that are considered beneficial reuse. A proposed list of data requirements needed to calculate the percent recovery of each resource is also included.

WEF is seeking proposals that present innovative approaches to acquiring the information required to address these identified information gaps.

2 Scope of Work

WEF's goal is that the Final Report will provide baseline data that can be used to develop resource recovery targets for water reuse, nutrients, and energy. Proposals should describe how the potential contractor would approach collecting the data needed to establish the baseline discussed in the background section of this Request for Proposals (RFP). It is anticipated that the contractor will perform the following tasks:

- Identify existing data sources (including those of Reseau-Environnement's PEX StaRRE program, the Sustainable Phosphorus Alliance, or other entities);

- Develop sampling and data collection strategy to develop aggregate annual US baseline of resource recovery performance by the wastewater sector;
- Develop sampling and data collection strategy to develop aggregate annual Canadian baseline of resource recovery performance by the wastewater sector, beginning with Quebec;
- Collect data across the wastewater sector to approximate resource recovery at other utilities;
- Data analysis;
- Development of a draft analytical report detailing findings;
- Development of a final report that incorporates comments from the Project Advisory Group for release at WEFTEC 2018 (September 29-October3, 2018).

The work of the selected contractor will be guided by WEF staff working with a Project Advisory Group, which includes representatives of WEF's Technical Committees, Utility of the Future partnering organizations (NACWA, WateReuse, and The Water Research Foundation), and staff experts from WEF's Water Science & Engineering Center.

3 Contractor Attributes

The contractor should bring the following to the project:

- Understanding of current trends in resource recovery related to water reuse, nutrients, and energy in the municipal wastewater treatment sector and relevant sources of information and data;
- Understanding of specific data needed to establish a resource recovery baseline;
- Experience with the conduct of technical assessments and studies of the highest technical caliber.

4 Budget and Proposal Evaluation

The budget for this technical assistance effort is $50,000. This is a not-to-exceed amount that must cover all salary, overhead and other direct expenses. It is expected that the contractor will provide an in-kind contribution of a minimum of 25% of the total project effort. Proposal evaluation criteria will include project approach, qualifications and experience of contractor and project team, demonstrated understanding of project technical issues and challenges, (including expected usability of the proposed outputs), and cost effectiveness (including the ability to leverage existing resources and research efforts).

5 Proposal Submittal/ Additional Information

Individuals or firms with an interest in this work should submit a proposal that includes a description of the proposed technical approach, qualifications and experience, and a detailed cost proposal. The proposal should be no more than ten (10) pages in length (not including resumes of key project personnel) and should be submitted to Morgan Brown, Program Manager in WEF's Water Science & Engineering Center (mbrown@wef.org), no later than 5:00 PM EDT on February 28, 2018. Questions can be directed to Ms. Brown at the e-mail above or by calling (703) 684-2400 x7467. Any relevant questions and their answers will be posted on www.wef.org .

6 Appendix A: Expected Data for Collection (Annual amounts)

Source	Analyte	Unit
Influent	Flow	m3/day
	Total Phosphorus	mg/L
	OrthoP	mg/L
	TKN	mg/L
	Total Nitrogen	mg/L
	bCOD	mg/L
	total dynamic head	m
Co-digestion of other organics	Wet mass Feedstock	kg or tonnes
	% Volatile Solids	%
Effluent	Flow	m3/day
	Total Phosphorus	mg/L
	OrthoP	mg/L
	TKN Concentration	mg/L
	TN Concentration	mg/L
Water reuse for irrigation	Flow	m3/day
	Total Phosphorus	mg/L
	OrthoP	mg/L
	Total Nitrogen	mg/L
Other water reuse (not irrigation)	Flow	m3/day
Land Application Biosolids	Wet Mass Biosolids	kg
	% Solids	%
	Total Phosphorus	mg/L
	Total Nitrogen	mg/L
Extracted Struvite	Mass of recovered precipitate	kg
Extracted Vivianite	Mass of recovered precipitate	kg
Extracted Brushite	Mass of recovered precipitate	kg
Extracted Berlinite	Mass of recovered precipitate	kg
Recovered Energy	Electricity produced	kWh
	Renewable natural gas	J
	Compressed natural gas	J
	CHP	J
	boiler	J
	biosolids to fuel energy value	J
Energy Used	Electricity used	kWh
	Natural gas used	J

7 Appendix B: Discussion of Goals and Indicators

7.1 Water Reuse

7.1.1 Goal

- Make water reuse an element of a diverse and resilient water management strategy. (WEF Water Reuse Roadmap Primer, 2016)

7.1.2 Definition of Resource

- Water reused instead of discharged to the receiving environment requiring a discharge permit

7.1.3 End Uses of Resource

- Non-potable uses both inside and outside WRRF fence;
- outside uses include restricted irrigation uses (golf courses, restricted landscape, recharge of non-potable aquifer, stream augmentation where minimum stream flow is required by permit, cooling water, other);
- Indirect Potable Reuse (IPR) by others, including ground water recharge of potable aquifer; surface water reservoir augmentation, other.

7.1.4 Proposed Indicator

Percent: total volume of water (m3) reclaimed for reuse divided by the total volume (m3) of wastewater received and treated at the WRRF

7.1.5 Sampling/ analysis/ operational data needed

- Flow measurement of influent and reuse water

7.2 Nutrient Recovery Goals

7.2.1 Goal

- The next generation of wastewater treatment has zero net impact with regard to energy use, greenhouse gas emissions and nutrient discharge by 2040. (WEF Nutrient Roadmap Primer, 2014)

7.2.2 Definition of Resource

- Phosphorus recovered for beneficial reuse, instead of discharged via a permitted outfall, disposed of in landfill, or bound in such a way that it is not available for beneficial reuse. Examples include phosphorus within land-applied biosolids, and phosphorus recovered via chemical means for further reuse.
- Nitrogen recovered for beneficial reuse instead of discharged via a permitted outfall, disposed of in landfill, or bound in such a way that it is not available for beneficial reuse. Examples include nitrogen within land-applied biosolids, and nitrogen recovered via chemical means for further reuse.

NOTE: Nitrogen and phosphorus that is contained within biosolids that are disposed in a landfill (rather than land-applied), or nitrogen or phosphorus that is contained within biosolids but is chemically bound such that it is not agronomically available, is not considered a recovered product.

7.2.3 End Uses of Resource

- Agricultural irrigation water as part of a nutrient management plan;
- Land application of biosolids as part of a beneficial reuse program within a nutrient management plan;
- Element within a commercial product recovered by a commercial process and available as a nitrogen-based fertilizer or fertilizer ingredient
- Element within a commercial product recovered by a commercial process and available as a phosphorus-based fertilizer or fertilizer ingredient

7.2.4 Proposed Indicators

Percent: total mass (kg) of phosphorus recovered as a reusable product divided by the total mass (kg) of phosphorus received in the raw wastewater and any other waste sources entering the WRRF and processed by the WRRF

Percent: total mass (kg) of nitrogen recovered as a reusable product divided by the total mass (kg) of nitrogen received in the raw wastewater and any other waste sources entering the WRRF and processed by the WRRF

7.2.5 Sampling/ analysis/ operational data needed

- Flow and TP concentration of influent and effluent for calculating total mass of TP entering (raw influent) and exiting (final effluent);
- Measure mass of TP in residual streams (e.g., primary solids, waste activated solids, digested solids, etc.) disposal streams that are not part of a recovery stream;
- Measure mass of TP in any and all dedicated phosphorus recovery streams.
- Flow and TN concentration of influent and effluent for calculating total mass of TN entering (raw influent) and existing (final effluent);
- Measure mass of TN in (e.g., primary solids, waste activated solids, digested solids, etc.) disposal streams that are not part of a recovery stream;
- Measure mass of TN in any and all dedicated nitrogen recovery streams.

NOTE: Though measurement of NO2/NO3 concentrations entering and exiting dedicated anoxic zones is useful for estimating N2 release, it is not necessary for the purpose of estimating the overall mass balance for establishing nitrogen resource recovery, as the N2 release can be estimated simply by subtraction).

7.3 Energy Recovery and Management Goals

7.3.1 Goal

- To reduce the nation's dependence upon fossil fuel through the production and use of renewable energy from water resource recovery facilities. (adapted from WEF Renewable Energy Position Statement, 2011)

7.3.2 Definition of Resource

- Energy extracted from:
  1) organic carbon present in influent wastewater;
  2) heat from influent wastewater;
  3) heat from treated effluent, and used in beneficial energy uses;
  4) from hydraulic dynamics of fluid flow

7.3.3 End Uses of Resource

- Inside or outside the fence uses for power utilizing electrical power or combustible fuels (including pipeline quality biomethane, and biomass for biofuels) generated from inside the fence of the WRRF;
- Heating of buildings and facilities inside or outside the fence of the WRRF

7.3.4 Proposed Indicator

Percent: Sum total of all equivalent energy units of waste stream "elements" that result in energy directly by generation or indirectly through a transformation to a usable energy form and used for energy purposes inside or outside the fence of the WRRF, divided by the sum total of all equivalent energy units of waste stream "elements" that are <u>available</u> for energy generation or transformation

7.3.5 Sampling/ analysis/ operational data needed

- Flow and total COD concentration of influent and effluent for calculating mass of degradable organic carbon entering (raw influent) and existing (final effluent);
- Measure total COD mass in thickened primary, secondary and tertiary residuals streams that feed an anaerobic digestion process train or for streams that fuel for gasification, pyrolysis, incineration or pelletization processes;
- Measure total COD mass in digested and/or dewatered residual solids from anaerobic digestion;

- Measure total COD mass of external degradable organic carbon not delivered to WRRF through collection systems and feeds the anaerobic digestion process train or to streams that feed biofuel generation processes;
- Measure volume of biogas produced;
- Measure volume of biomethane where prepared for pipeline or vehicle fuel quality;
- Measure COD mass of all streams of biomass prepared as a biofuel feedstock;
- Measure temperature of raw influent and final effluent streams for thermal energy capture;
- Measure elevation difference at plant outfall to point of discharge for capture of kinetic energy.