MEMORANDUM OF UNDERSTANDING
ON NUTRIENT SCIENCE AND INNOVATION AND WATERSHED APPROACHES
BETWEEN THE
U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF WASTEWATER MANAGEMENT
AND
THE WATER RESEARCH FOUNDATION

I. PURPOSE/OBJECTIVES/GOALS

A. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to build on the successes of the U.S. Environmental Protection Agency's (EPA's) Nutrient Recycling Challenge by collaborating to build capacity for and awareness of programs and tools that support watershed- and market-based approaches to nutrient management in the U.S, with a focus on the role that agricultural stakeholders can play in reducing nutrient impacts by employing new technologies and practices. To that end, the EPA and The Water Research Foundation (WRF) intend to focus on supporting evaluation and demonstration of innovative manure and nutrient management technologies/practices that can provide environmental and economic benefits for end-users, advancing the state of knowledge on nutrient science and research underpinning innovation, considering market mechanisms and financing strategies in the context of resource recovery/reuse, and connecting key stakeholders across the nutrient value chain.

B. OBJECTIVES

1. Improve the state of knowledge of: nutrient recovery technology systems; their performance in agricultural settings; cost considerations; and associated water quality and other environmental benefits.
2. Encourage problem solving through communities of practice that include diverse stakeholders with expertise and interest in agricultural systems, watershed management, and market-based approaches.
3. Empower agricultural producers who are making decisions about nutrient management technologies and practices.
4. Support opportunities for on-farm technology demonstrations and installations.
5. Identify and document innovative approaches for watershed-based approaches for nutrient management.

The EPA and WRF intend to accomplish these objectives by working collaboratively to:

- Facilitate collaborations between the regulated water community, technology developers, technology providers, and agricultural producers.
- Match technologies, testing sites, and funders for technology demonstrations and associated third-party evaluation.

- Enable producer-to-producer information exchange regarding technology performance.
- Develop and disseminate information on specific topic areas related to manure management and resource recovery and reuse.

II. BACKGROUND

In 2015, the EPA, in collaboration with Water Research Foundation (formerly Water Environment & Reuse Foundation) and 19 other organizations, launched the Nutrient Recycling Challenge, a global prize competition aimed at spurring the development of technologies that can recover nitrogen (N) and phosphorus (P) from dairy and swine manure.

All dairy and swine producers must manage manure, which contains N and P that plants need to grow. Livestock producers are looking for affordable technologies and approaches to manage and realize the full value of manure, as well as protect the environment. Manure is used as a renewable fertilizer source and soil amendment, but needs to be used properly to minimize water pollution and build healthy soils. Just like other fertilizer sources, if manure is applied to crops from the right source, at the right rate and time, using the right methods, and in the right place, its nutrients can be recycled safely through agricultural systems.

Animal manure can be costly to transport and is commonly applied to land near where animals are raised. It can also be challenging for farmers to apply the precise levels of N or P that crops need by using raw manure, because the nutrient content of manure can vary, and N and P occur together in a fixed ratio. Use of the nutrients in this renewable resource could be better optimized if they could be more efficiently captured and easily transported to be reused.

One promising class of technologies is nutrient recovery technologies. They can reduce the water weight of manure and concentrate N and P into products with potentially higher fertilizer and economic value than raw manure. However, these technologies are not yet economically feasible in all situations, and the markets for products they yield are immature or non-existent.

In Phase I of the Nutrient Recycling Challenge, the EPA received 75 concept papers from around the world and selected 34 submissions to continue to Phase II of the challenge. The EPA awarded a total of $30,000 in cash prizes to the top 10 submissions and invited innovators to the Nutrient Recycling Challenge DC Summit, which provided a forum for innovators to meet experts and other innovators and learn about resources to develop their ideas into real-life technologies. Phase II was structured as a non-competitive incubation program that supported innovators as they developed Technology Designs based on the Concept Papers submitted in Phase I. The EPA and collaborating organizations supported the innovators with informational webinars and workshops, individualized feedback, and other resources to maximize their ability to develop designs for effective and affordable technologies.

Innovators from the Nutrient Recycling Challenge and beyond have expressed to the EPA the types of support that would be beneficial as they develop their technology systems. In addition to financial support, and networking opportunities, the need for technology evaluation platforms is often voiced. While technology evaluation programs are established for municipal water treatment technologies, until very recently, similar programs have not been available to developers of manure treatment technologies.

Technology evaluation platforms can provide innovators with a range of benefits and opportunities, such as:

- Independent, critical assessment of technology performance;
- Assessment of technology market-readiness;
- Increased credibility when communicating technology benefits to potential buyers, end users, and investors;
- Access to testing/demonstration locations; and
- A forum for peer-to-peer information and data exchange.

Relevant Program Areas at WRF

WRF has invested over $10 million over the last 30 years to develop a broad portfolio of research on nutrients. In 2006, WRF initiated the Nutrients Challenge program with the intent of providing sound research to inform regulatory decision making and to help practitioners comply with increasingly high levels of nitrogen and phosphorus removal, with a focus on improving plant performance. This portfolio has expanded to the other major research areas such as Agricultural Water Reuse, Resource Recovery, Source and Receiving Waters, Sustainable Integrated Water Management, and Water Reuse.

In 2012, WRF added to the research portfolio, with a program focused on accelerating the adoption of innovation technologies in the water sector, called the Leaders Innovation Forum for Technology (LIFT). This program supports the research efforts by focusing on identifying promising innovative technologies, supporting pilots and technology evaluations, and disseminating the results of this work. More information on each of these programs is below.

Agricultural Water Reuse

The WRF agricultural research efforts aim to explore and recommend ways to overcome the challenges facing agricultural water use. WRF has been engaged with the agricultural community for over a decade. This effort includes numerous research studies, meetings with stakeholders in the agricultural and water industries, and workshops in the areas of agricultural water reuse, nutrient recovery, and codigestion. The WRF agricultural sector research portfolio contains projects in economics and policy, sustainable practices, and management approaches.

Resource Recovery

The WRF resource recovery research portfolio aligns with an emerging trend in the wastewater treatment sector, to re-envision "wastewater treatment" facilities to "resource recovery facilities" with the vision that most, if not all, materials in wastewater can be commoditized. WRF provides information to help agencies meet receiving water body requirements and other wastewater treatment goals, such as sustainability, cost-effectiveness, reliability, and climate resilience. The research informs regulatory decision making and helps practitioners comply with increasingly high levels of nitrogen and phosphorus removal, with a focus on improving plant performance.

Source and Receiving Waters

Building on more than twenty years of nutrients research, WRF continues to produce relevant findings that can be used to help improve and protect our watersheds. The linkages in the water quality portfolio examine state-of-the-art methods, relevant accurate data, and tools used to evaluate potential human health risk from waterborne microbes. The intent of this research is to enable the water community to fully participate in the development and implementation of water quality-based discharge with methods to confirm linkages between receiving water quality, ecological impacts, wastewater and stormwater discharges, and other sources.

Sustainable Integrated Water Management (SIWM)

The goal of the WRF SIWM area is to create a new paradigm surrounding water use to emphasize integrated and flexible water systems and management practices that can adapt and evolve over time. SIWM takes a holistic approach to wastewater, stormwater, drinking water, and reclaimed water to achieve the goal of "One Water". This includes a portfolio of centralized and decentralized systems, a mix of gray and green infrastructure, increased recycling of water and nutrients, and resource recovery implemented at a variety of levels. A core project is the International Stormwater BMP Database that was recently expanded to include performance data on agricultural BMPs. The Ag BMP Database includes information on the geographic area, field conditions such as soils and slopes, tillage and nutrient management practices, and the existence of buffers, constructed wetlands, and other edge-of-field practices. The database's initial release focuses on row crops, particularly corn and soybeans, and its primary analytical focus is on phosphorus, nitrogen, and sediment.

Water Reuse

The goal of the WRF water reuse research portfolio is to advance the science and acceptance of potable and non-potable reuse water. This is accomplished through extensive collaboration with utility subscribers, state and federal government agencies, academia, and consultants to develop a comprehensive research agenda with cutting edge research projects. The research results provide a conceptual approach for best management action plans (BMAPs) that employ reclaimed water nutrient load allocations that are based on quantifiable fractional load assessments.

LIFT

Nutrient management technology providers have difficulty moving their new technologies into practice due to numerous barriers to implementation of new technologies at scale and under real world conditions. LIFT has developed tools and resources to identify and accelerate promising new nutrient technologies into practice. LIFT program benefits include: a credible vetting system to screen new technologies, peer-reviewed information about emerging technologies, facilitation of collaboration among end users for the evaluation, and testing of new technologies.

III. AUTHORITIES

The EPA enters into this MOU pursuant to Section 104 of the Clean Water Act, 33 USC 1254.

IV. ROLES AND RESPONSIBILITIES

A. WRF intends to:

a. Engage with agricultural, water reuse, drinking water, wastewater, stormwater, groundwater stakeholders to identify and prioritize research needs.

b. Engage with the EPA on research planning and prioritization so each organization can build on the research efforts and benefits from the findings of research previously conducted.

c. Identify research projects that may be of interest to the EPA and engage the EPA through volunteer review committees.

d. Engage with the EPA on ongoing activities.

e. Coordinate on webinars and publications.

f. Facilitate collaborations between technology providers and technology end-users through LIFT.

g. Match technologies, test sites and funders for third party evaluations through LIFT.

h. Enable information exchange between agricultural producers on the actual performance of innovative technologies through LIFT.

B. Through a combination of direct staff technical assistance and in-kind contractor support, the EPA intends to, as appropriate:

a. Identify opportunities for developers of nutrient recovery technologies to access technology evaluation support via WRF's LIFT program.

b. Coordinate with WRF and other agricultural stakeholders to identify "test bed" locations for technology demonstrations and opportunities to share information about technology performance via LIFT's *Facilities Accelerating Science & Technology (FAST) Water Network.*

c. Assist in development and dissemination of communication and outreach materials; establish a link to the MOU on the EPA website; promote the partnership and associated activities through the appropriate communication channels.

d. Leverage existing stakeholder forums to communicate activities taken in support of this MOU.

e. Support planning and execution of meetings and webinars.

f. Use available platforms (e.g., Adobe Connect) to engage relevant stakeholders and execute informational sessions.

g. Participate in calls and meetings as necessary to carry out the objectives of the MOU.

h. As appropriate, develop co-sponsorships for discrete activities (e.g., meetings and summits) that are carried out in support of the objectives of the MOU.

i. Include WRF staff in webinars, meetings, and publications applicable to the research topics identified in Section II.

V. LIMITATIONS OF THE MOU BETWEEN THE EPA AND WRF

1. This MOU is a voluntary agreement that expresses the good-faith intentions of the parties, is not intended to be legally binding, does not create any contractual obligations, and is not enforceable by any party.

2. All commitments made in this MOU are subject to the availability of appropriated funds and each party's budget priorities. Nothing in this MOU, in and of itself, obligates the EPA to expend appropriations or to enter into any contract, assistance agreement, interagency agreement, or other financial obligation. WRF agrees not to submit a claim for compensation for services rendered to the EPA or any other federal agency for activities it undertakes in carrying out this MOU.

3. This MOU is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this MOU will be handled in accordance with applicable laws, regulations, and procedures, and will be subject to separate subsidiary agreements that will be effected in writing by representatives of both parties.

4. This MOU does not supersede, alter, supplement, vary or otherwise change financial assistance agreements entered into by the EPA with WRF. It does not relieve WRF of obligations or duties contained in law, regulations, or financial assistance agreements.

5. Under Federal ethics rules, federal employees may not, with limited exceptions, endorse or promote products or services offered by or provided by any non-federal entities. Nothing in this MOU constitutes an endorsement of any party by the EPA, including any products or services, or any fundraising activity or promotion. WRF agrees not to make statements to the public at workshops and meetings, in promotional literature, on their websites or through any other media that imply that the EPA or the EPA employees endorse WRF or any of their services or products. In addition, WRF agrees not to make statements that imply that the EPA supports their efforts to raise public or private funds. Any statements or promotional materials prepared by WRF that describe this MOU must be approved in advance by the EPA.

VI. PROPRIETARY INFORMATION

To carry out the joint work resulting from this MOU, WRF may need to disclose proprietary information to the EPA. For the purpose of this MOU, proprietary information is defined as information that an affected business claims to be confidential and is not otherwise available to

the public. WRF agrees to clearly identify as such confidential information disclosed to the EPA in writing; and to clearly memorialize in writing, within a reasonable time, any confidential information initially disclosed orally. The EPA agrees not to disclose, copy, reproduce or otherwise make available in any form whatsoever to any other person, firm, corporation, partnership, association or other entity information designated as proprietary or confidential information without consent of WRF except as such information may be subject to disclosure under the Freedom of Information Act (5 U.S.C. § 552), and the EPA's regulations at 40 C.F.R. Part 2, or as otherwise authorized by law.

VII. INTELLECTUAL PROPERTY

The parties agree that any copyrightable subject matter, including but not limited to journal articles, training, educational or informational material or software, created jointly by the parties from the activities conducted under the MOU may be copyrighted by WRF. WRF hereby grants to the government a royalty-free, nonexclusive, irrevocable right to reproduce, distribute, make derivative works, and publish or perform the work(s) publicly, or to authorize others to do the same on its behalf.

VIII. POINTS OF CONTACT

The following individuals are designated points of contact for the MOU:

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IX. MODIFICATION/DURATION/TERMINATION

This Memorandum of Understanding is to take effect upon signing by the parties and remain in effect for a period of three years. This MOU may be modified or extended at any time by the mutual written consent of the parties. This MOU may be terminated by either party at any time

by one party notifying the other party in writing at least 30 days in advance of the desired termination date.

X. APPROVAL

The Water Research Foundation

Robert C. Renner

1/28/19

(Date)

U.S. Environmental Protection Agency

David P. Ross

1/29/19

(Date)