NORTHEAST REGIONAL SLUDGE END-USE AND DISPOSAL ESTIMATE

September 2022

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EXECUTIVE SUMMARY

The Northeast sewage sludge management infrastructure is experiencing short-term and long-term stressors impacting the system's available capacity. Specifically, the COVID-19 pandemic, aging incinerators, reduced landfill capacity, and emerging contaminants are causing the simultaneous, unanticipated potential losses of sludge management alternatives.

The sludge generation and management community has proven resilient in quickly recovering from stressors and providing the required and necessary services. However, these recent issues have brought to light deficiencies in wastewater sludge treatment, transportation, and disposal options and the need for additional capacity.

NEIWPCC proposed the Regional Sludge Generation Estimate Project to our member states and the U.S. Environmental Protection Agency (EPA) as a National Biosolids Data Project was completing their survey development phase. To avoid competing with this second national biosolids survey and produce a comprehensive national data set, NEIWPCC coordinated our project, conducting our survey for both projects in NEIWPCC's seven member states.

A total of 794,563 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018 in the Northeast region. The sludge was primarily landfilled and incinerated, with biosolids beneficially reused at a lower rate. This total is an increase of 74,563 dry U.S. tons from the amount reported in a 2004 national survey. Accurate totals for the end-use and disposal of sludge in the Northeast is difficult to present due to challenges in data collection and reporting. Even with these limitations on the accuracy of totals for each state and the region, the percentages provide a representative snapshot of the end-use and disposal.

The water resource recovery facilities (WRRFs) located throughout Southern New England primarily rely on incineration, and those located in Northern New England rely on landfills and beneficial reuse. Massachusetts, New Hampshire, and New York rely on all three options.

There is a general interest in regional biosolids facilities in the Northeast. Unfortunately, there are few options for WRRFs without contingency plans for sludge end-use and disposal. Since 2018, routine maintenance, operational issues, and emerging contaminants continue to stress the system’s available capacity.

Based on the regional snapshot provided in this report, we recommend the states and community continue discussing the economic feasibility of a regional facility and the specifics needed for regional facility design.

In addition, NEIWPCC is in preliminary discussions with other regional, state, and municipal organizations and universities regarding establishing a regional facility to bring new technologies forward. This will provide resources to the water utility sector currently challenged by the effective disposal of sludge and biosolids.

Introduction

Established by an Act of Congress in 1947, NEIWPCC is a not-for-profit interstate agency that utilizes a variety of strategies to meet the water-related needs of our seven member states. Through this role, NEIWPCC has facilitated considerable discussion and information sharing on the states' sludge management activities and concerns.

Sludge is an organic solid, semi-solid, or liquid by-product of the wastewater treatment process. Sludge characteristics vary depending on each facility's waste stream and treatment processes. Water Resource Recovery Facility[1] sludge end-use and disposal options include incineration, landfilling, and beneficial reuse[2] and must comply with the Clean Water Act and regulations that are protective of the public health and environment. Sewage sludge that is co-disposed with municipal solid waste in landfills is regulated by the U.S. Environmental Protection Agency (EPA) under 40 Code of Federal Regulations (CFR) Part 258 (Part 258 regulations). Sewage sludge used or disposed of through land application, surface disposal, and incineration is regulated by the EPA under 40 CFR Part 503 (Part 503 Rules), which sets minimum quality standards and dictates proper management practices. Many states have more stringent rules.

Sludges that meet the EPA standards for land application, including reduced or eliminated pathogens and very low limits for heavy metals, are referred to as biosolids. The EPA 503 Rules define three classes of biosolids based on pollutant limit, pathogen, and vector attraction reduction requirements and methods to achieve them: Class A Exceptional Quality (EQ), Class A, and Class B. Class A EQ and Class A biosolids have met requirements that allow the materials to be used by the public on lawns and home gardens. These are typically sold or given away in bags or other containers. Class B biosolids have met requirements that are unlikely to pose a threat to public health and the environment under specific use conditions. These are usually applied to agricultural and non-agricultural land.

Our region typically relies more heavily on incineration in Southern New England, and beneficial reuse and landfill disposal in Northern New England. A confluence of pressures has been increasing that may disrupt the end-use and disposal options within the Northeast.

The need to develop reliable, cost-effective, and sustainable long-term measures to address wastewater residuals was identified by NEIWPCC staff and commissioners, and state biosolids coordinators participating in NEIWPCC's Residuals Workgroup. The Regional Sludge Generation Estimate project was developed to gather data to assess the issues and develop the next steps to address them.

Statement of Problem

The Northeast sewage sludge management infrastructure is experiencing short-term and long-term stressors impacting the system's available capacity. Specifically, the COVID-19 pandemic, aging incinerators, reduced landfill capacity, and emerging contaminants are causing the simultaneous, unanticipated potential losses of sludge management alternatives.

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[1] Water resource recovery facility is used throughout this report as a general term for wastewater treatment plant, wastewater treatment facility, water pollution control facility, water pollution control association, and publicly owned treatment works.

[2] Beneficial reuse is the common term for recycling end-use, including land application (agriculture, forestland, and reclamation), composting, and fertilizer product distribution. The use of this term throughout this report does not imply any regulatory definition.

The sludge generation and management community has proven resilient in quickly recovering from stressors and providing the required and necessary services. However, these recent issues have brought to light deficiencies in wastewater sludge treatment, transportation, and disposal options and the need to develop and modernize sewage sludge management infrastructure (and related appurtenances, such as storage).

Our region's reliance on only a few incinerators, landfills, or beneficial reuse (e.g., land application, composting) options has led to the following significant issues.

1. **Local capacity**: Expected or unexpected shutdowns of incinerators, landfills, and land application (or other beneficial reuse) require backup plans and regional coordination to address immediate needs for statewide and region-wide sludge disposal. The expense of developing and using such backup plans may cause privately-run facilities such as incinerators to seek to slow sludge input into secondary transportation and disposal systems. Thus, local WRRFs may be asked to store biosolids at their facilities or reduce their biosolids removal processes, which may result in difficulty maintaining National Pollution Discharge Elimination System ([NPDES] or state-administered) permit compliance. This has recently occurred in Rhode Island, requiring the Rhode Island Department of Environmental Protection (RIDEM) to intervene. In addition, the COVID-19 pandemic disruption of the economy led to a reduced volume of construction material at landfills and composting facilities. Construction material is necessary to mix with high liquid content sludge for safe placement within landfills and as an amendment to composting materials. This reduction in commercial wastes caused Rhode Island's Central Landfill and other landfills in the region to reduce the acceptance of sludge. **Regional capacity**: This concern has been compounded with the closure of several Northeast sludge incinerators due to more stringent EPA air standards and the implications of per- and polyfluorinated alkyl substances (PFAS). Currently available sludge disposal options may not adequately address the destruction of the PFAS group of chemicals. With public awareness and outcry driving quick regulatory actions regarding PFAS, the trace amounts detected in wastewater solids have led to several states currently having restrictions (Vermont and New Hampshire) or bans (Maine) on land applications. With pending legislation and legal responsibility uncertainties, many landfills have become risk-averse, either reducing or altogether stopping the acceptance of sludge containing PFAS.
2. **WRRF plant operations**: Reliance on land application and incineration for several decades has resulted in a reduction in sludge dewatering equipment and systems at wastewater facilities as well as a lack of operators skilled at operating a facility with sludge dewatering. An entire generation of operators has entered management positions with little or no sludge dewatering experience, a critical element of wastewater treatment.
3. **State coordination:** While NEIWPCC recognizes that these issues aren't currently the direct responsibility of our states, they have an active interest in ensuring regional needs are proactively addressed to prevent enforcement actions and threats to the environment and public health in the future. For example, with state programs throughout New England having various regulatory priorities dealing with incinerator shutdowns and other issues, sludge producers may request emergency consideration for disposal options within each of NEIWPCC's member states. The review and approval/denial process may shift staff time from other important functions.

Overall, there is a need for more reliable and cost-effective sludge management alternatives for the Northeast region. The first step to working through these issues and developing recommended actions is to have a clear picture of the quantity of sludge being disposed and re-used across New England and New York. This information will be an important foundation for discussions on regional approaches to management, as well as assist states in planning for future permitting needs. Once an assessment is completed, we envision the next steps for the states will be to assess the current facility capacities to begin to develop recommendations for both short- and long-term actions.

Past Efforts

Sewage sludge disposal and end-use data have been collected at both the state and national levels. However, much of this data is either outdated or not inclusive of all end use and disposal options. The following summarizes recent past efforts.

National Biosolids Regulation, Quality, End-Use & Disposal Survey

The first national biosolids quality and end-use disposal survey, funded through an EPA grant, collected 2004 data through state biosolids coordinator and WRRF surveys (North East Biosolids and Residuals Association [NEBRA], 2007). A total of 7.18 million dry U.S. tons were reported, with 49% beneficially reused, 30% landfilled, 15% incinerated, and 6% undergoing other uses (stored or final use or disposal was not reported). The survey information was compiled and published in 2007 by Ned Beecher (NEBRA), Nora Goldstein (BioCycle), Maile Lono-Batura (formerly Northwest Biosolids, now with Water Environment Federation), and Greg Kester (formerly Wisconsin Department of Natural Resources, now with the California Association of Sanitation Agencies).

The Massachusetts Clean Energy Center Sludge Survey

The Massachusetts Clean Energy Center (MassCEC) commissioned a survey of WRRFs to collect 2018 sludge data. This effort used an online survey and direct communications with facility managers and operators. Eighty-five responses were received, representing 96% of the average daily wastewater flows at Massachusetts WRRFs. A total of 164,000 dry metric tons were produced with 43% incinerated, 38% beneficially reused, 18% landfilled, and 1% for undergoing other or unspecified uses. The survey information final report was published in 2019 by NEBRA (North East Biosolids and Residuals Association, 2019).

EPA Annual Biosolids Report

The EPA implements the federal Biosolids Program within all NEIWPCC states. In accordance with Part 503 Rules, WRRFs that meet specific criteria in these states are required to submit annual reports on biosolids treatment and management practices to the EPA.

The EPA tracks incineration and beneficial reuse of biosolids for facilities with design flow rates equal to or greater than one million gallons per day, serving 10,000 or more people, required to have an approved pretreatment program (Class I Sludge Management Facility), or are otherwise required to report.

This is not a comprehensive data set since sewage sludge co-disposed with municipal solid waste in a landfill under Part 258 Regulations and facilities with design flows less than one million gallons per day (MGD) are not included in the annual survey data.

METHODS

NEIWPCC proposed the Northeast Sewage Sludge Generation Project to our member states and the EPA as a National Biosolids Data Project was completing their survey development phase. To avoid competing with this second national biosolids survey and produce a comprehensive national data set, NEIWPCC coordinated our project, conducting our survey for both projects in NEIWPCC's member states.

To craft their national survey, NEBRA, the National Biosolids Data Project lead, prepared a literature survey, developed and pilot-tested online survey questions for both WRRFs and state biosolids coordinators (National Biosolids Data Project, 2020a; National Biosolids Data Project, 2020b). The National Biosolids Data Project built upon the methods used in the first National Biosolids Regulation, Quality, End Use & Disposal Survey. Techniques used included:

- Collecting data from biosolids coordinators in each state regulatory agency to provide the most comprehensive baseline data.
- Relying on a small team to conduct the survey to ensure consistency in the interpretation of survey questions and responses.
- Compiling data, revising as needed to create consistency amongst all states.
- Using WRRF data to validate and supplement state coordinator baseline data.
- Completing internal quality checks and reviewing with state biosolids coordinators for their acceptance.

The National Biosolids Data Project developed online surveys with review and input from advisors and conducted pilot tests of the two surveys. Data for 2018 was chosen to provide a baseline data year before the stressors of PFAS fully exerted themselves on the wastewater management industry. The following materials were developed to collect data:

- A state biosolids coordinator comprehensive spreadsheet.
- A state biosolids coordinator online survey.
- A WRRF online survey.

SURVEY DEVELOPMENT

NEIWPCC and NEBRA collaborated on the survey data collection, with NEIWPCC administering surveys with our seven member states (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont). For consistency with the national data collection, NEIWPCC used the data fields established by the National Biosolids Data Project. Note that the totals presented are for the sludge that left the WRRF gates and does not include sludge stored at facilities or placed in lagoons.

On November 9, 2020, NEIWPCC convened a stakeholder advisory committee meeting to provide input and direction on the project work. NEIWPCC introduced the project and collaboration with NEBRA, presented the survey approach, and requested feedback from attendees who represented the EPA, Northeast state agencies, Northeast state wastewater treatment associations, New England Water Environment Association, and NEIWPCC (commission and staff).

NEIWPCC also provided the National Biosolids Data draft spreadsheet and online surveys to the Northeast state biosolids coordinators for review and comment. Based on their feedback,

questions were added to the national and northeast WRRF surveys regarding interest in regional biosolids facilities. NEIWPCC also included clarifying language on reporting units.

Because 2018 sludge data was already collected under the project commissioned by the Massachusetts Clean Energy Center, the Massachusetts spreadsheet and surveys requested 2019 data. We also requested that Maine facilities provide both 2018 and 2019 data. Those two states were proposed to be presented as case studies evaluating whether New England PFAS regulations and aging infrastructure immediately began impacting sludge use and disposal.

The spreadsheet and online survey topics are summarized in Table 1, Table 2, and Table 3. An example of a state biosolids coordinator spreadsheet, state biosolids coordinator survey and WRRF survey are included in Appendix A.

Table 1 – State Biosolids Coordinator Spreadsheet Topics

WRRFs Totals	Biosolids Use and Disposal	Biosolids Quality Summary	Biosolids Treatment Practices	State Pollutant Concentration Limits, Testing & Reporting
Number of WRRFs	Summary	Breakdown of Types	Stabilization	Concentration Limits on Biosolids Applied to Land
WRRF & Biosolids Infrastructure	Beneficial Use		Dewatering	Testing Requirements, Frequency & Analytes
Wastewater Flows	Disposal & Alternative Dispositions		Thickening	Reporting Requirements, Frequency & Types

Table 2 – State Biosolids Coordinator Online Survey Topics
Economics of Biosolids
State Regulations & Permitting
Trends in Biosolids Management
Septage & Other Residuals Management

Table 3 – WRRF Online Survey Topics			
Core WRRF Biosolids Survey	**WRRF Infrastructure & Biosolids Treatment**	**Energy-Related Data**	**Economics of Biosolids**
Baseline Data	WRRF Average Flow	Current Systems & Future Plans for Energy Efficiency & Recovery	Biosolids Operating Budget
Biosolids Applied to Soils	Infrastructure Improvements	Anaerobic Digestion	Biosolids Use & Disposal Costs
Biosolids Quality	Pressures on Biosolids Program	Biogas Production	Hauling Distances
Trends in Biosolids Management	Sludge Storage & Treatment Processes	Pyrolysis & Gasification	Tipping Fees
	Dewatering & Thickening Equipment		Pricing of Biosolids Products
			Full Time Employees & Payroll

Data Quality

NEIWPCC completed this project in accordance with the approved Quality Assurance Project Plan (Appendix B). NEIWPCC is presenting data collected by the states or self-reported by WRRFs. We do not have the means, nor was it in the scope of this project, to provide quality control for this data. Limitations on data quality are noted in the results section and challenges are discussed below. Even with these limitations on the accuracy of totals for each state and the region, the percentages provide a representative snapshot of the end-use and disposal.

Challenges And Data Limitations

Collecting the end-use and disposal of sludge in the Northeast is difficult because multiple federal programs manage sewage sludge (e.g., Part 503 Rules and Part 258 Regulations) and, typically, several state divisions (e.g., solid waste and water). In addition, the amount of sludge processing and treatment varies, resulting in different characteristics with a broad range of percent solids. Because of this, sewage sludge is tracked and reported in many different units: gallons, cubic yards, dry tons (U.S. and metric) and wet tons (U.S. and metric). For the purposes of this project all results are reported in U.S. dry tons. An average of 5% solids was used for gallon conversions and an average of 22% solids was used for cubic yard and wet ton conversions.

NEIWPCC's goal was to obtain data representing 95% of the total state wastewater flow within each state. None of the states met that goal despite outreach from state biosolids coordinators and wastewater treatment associations and advertising at New England Water Environment Association and state wastewater treatment association trade shows. Many facilities implemented split shifts in response to the COVID-19pandemic impacting available time to

address non-operational requests. Survey fatigue from competing requests may have also reduced responses.

The lack of response from WRRFs also affected NEIWPCC's ability to perform case study comparisons for Massachusetts and Maine.

Note that the totals presented are for the sludge that left the WRRF gates, not the sludge generated. Therefore, sludge stored at facilities is not included in these totals. Also, Maine WRRFs using lagoon systems do not require a utilization program license and are not tracked (included in) the totals from the Maine biosolids coordinator. Similarly, forty-one WRRFs in New Hampshire utilize monofill and sludge lagoon systems which are not included in the totals.

In 2015 the state of New York conducted a robust sludge survey of its own. They felt those results were still representative of 2018 data so those are the totals we are using in this report.

Structure and Rationale of Reporting

Although the data is presented on a state-specific basis, NEIWPCC recognizes sludge management is a regional issue. Therefore, we are also providing a compilation of all the information from the region. While the focus is on each state, we believe this provides the basic information the region needs to discuss the sludge management issue.

Connecticut

A total of 138,248 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018. The majority of the sludge was incinerated (Figure 1). This data was primarily derived from the state biosolids coordinator spreadsheet, with the beneficial reuse total revised upward based on responses from two WRRFs that used these practices. This total is an increase of 20,248 dry U.S. tons from the amount reported in the 2004 national survey.

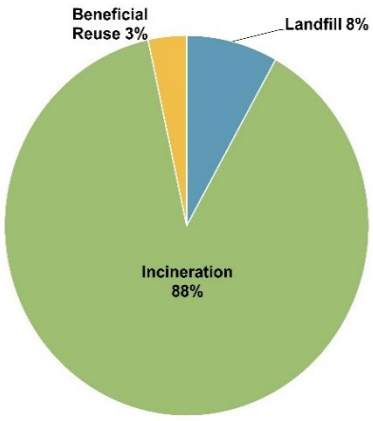

Figure 1- CT Sewage Sludge End-use and Disposal (2018)

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

The total statewide wastewater flow was 441 MGD with an estimated 23 WRRFs comprising 75% of the flow (Appendix C). Forty percent of the state population used on-site septic systems in 2018.

Connecticut Department of Energy and Environmental Protection, Solid Waste program and Department of Agriculture provide regulatory oversight. Biosolids end-use are permitted under the National Pollution Discharge Elimination System (NPDES) and special waste disposal authorization permits. Connecticut Department of Agriculture permits out-of-state biosolids beneficial reuse in Connecticut.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2018 were:

1. Nuisances including mitigating odors, dust, and complaints.

2. Meeting regulatory requirements on biosolids, effluent, and air quality.
3. Meeting core mission of cleaning water.
4. Operating costs and avoiding rate increases.
5. Limited financial resources (tie).
6. Meeting local policy goals (tie).

The top five pressures on WRRFs biosolids management program in 2018 were:

1. EPA and/or state regulation and enforcement on beneficial reuse.
2. Nuisance issues.
3. Environmental issues regarding impacts to soils, organisms, public health, and contaminants.
4. Managing rising costs.
5. Difficulty in changing from known systems and infrastructure (tie).
6. Securing long-term use options (tie).

New Hampshire

A total of 25,781 dry U.S. tons of sewage sludge was disposed of or beneficially reused in 2018. The sludge was landfilled or beneficially reused at similar rates, with less incinerated (Figure 2). This data was primarily derived from the state biosolids coordinator spreadsheet, with the incineration amount revised upward based on the responses from two WRRFs that used these practices. This total is a decrease of 1,240 dry U.S. tons from the amount reported in the 2004 national survey.

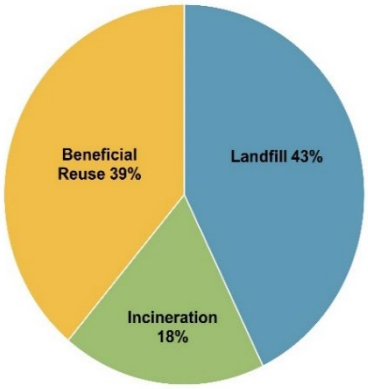

Figure 2 - NH Sewage Sludge End-use and Disposal (2018)

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

The total statewide wastewater flow in 2018 was 168 MGD with an estimated 14 WRRFs comprising 75% of the flow (Appendix C). Seventy-five percent of the state population used on-site septic systems in 2018.

New Hampshire Department of Environmental Services, Wastewater Engineering Bureau, Residuals Management Section provides regulatory oversight. Beneficial reuse of biosolids is permitted through the Sludge Quality Certificate (SQC) program which requires site-specific permits for land application locations and additional site monitoring for the application of Class B biosolids. Biosolids that met both Part 503 Rules and additional management practices and pollutant limits could be land applied in New Hampshire in 2018. Over 45 local governments had enacted ordinances within their jurisdiction. Local land application bans are applied to new sites only, with existing permitted locations allowed to accept biosolids.

In 2018, there was no state legislative or regulatory activity regarding residuals. Although there were 17 acres of newly permitted land application sites in 2018, the beneficial use of biosolids was consistent.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2018 were:

1. Capital costs for infrastructure, new systems, and technologies.
2. Meeting regulatory requirements on biosolids, effluent, and air quality.
3. Limited financial resources.
4. Operating costs and avoiding rate increases.
5. Meeting core mission of cleaning water.

The top five pressures on WRRFs biosolids management program in 2018 were:

1. Environmental issues regarding impacts to soils, organisms, public health, and contaminants.
2. Managing rising costs.
3. Securing long-term options.
4. Hauling distances.
5. Nuisance issues.

New York

A total of 377,663 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2015. The majority of sludge was landfilled, with the remainder incinerated and beneficially reused at similar rates (Figure 3). This data was primarily derived from a state biosolids coordinator survey of WWRFs in 2015 (New York State Department of Environmental Conservation, 2018). This total is an increase of 24,403 dry U.S. tons from the amount reported in the 2004 national survey.

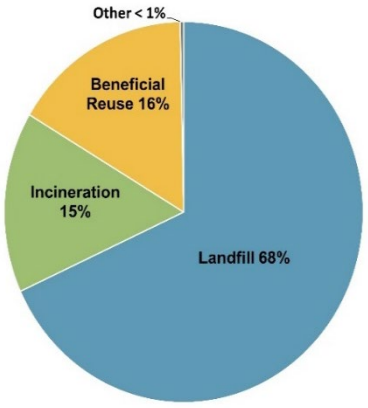

Figure 3 - NY Sewage Sludge End-use and Disposal (2015)

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

The total statewide wastewater flow in 2015 was 2,400 MGD with an estimated 23 WRRFs comprising 75% of the flow (Appendix C). The percent of the state population that used on-site septic systems was not reported.

New York State Department of Environmental Conservation, Solid Waste Program provides regulatory oversight. Beneficial reuse of biosolids and land application sites are permitted through solid waste licenses or permits. There are no additional site monitoring requirements for land application sites. Biosolids that met both Part 503 Rules and additional management practices and pollutant limits could be land applied in New York in 2018. Local governments could enact ordinances within their jurisdiction more restrictive than the state; however, farms in agricultural districts are safeguarded against regulations inhibiting farming operations unless it can be shown that public health or safety is threatened.

In 2018, there was no state legislation or regulation regarding biosolids. Although there was one acre of a newly permitted land application site in 2018, the beneficial use of biosolids was consistent.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2018 were:

1. Operating costs and avoiding rate increases.
2. Capital costs for infrastructure, new systems, and technologies.
3. Meeting regulatory requirements on biosolids, effluent, and air quality.
4. Limited financial resources.
5. Nuisances including mitigating odors, dust, and complaints.

The top five pressures on WRRFs biosolids management program in 2018 were:

1. Managing rising costs.
2. Securing long-term options.
3. Nuisance issues.
4. Environmental issues regarding impacts to soils, organisms, public health, and contaminants.
5. EPA and/or state regulation and enforcement on beneficial reuse.

RHODE ISLAND

A total of 33,076 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018. The majority of sludge was incinerated (Figure 4). This data was derived from the state biosolids coordinator spreadsheet. This total is an increase of 5,643 dry U.S. tons from the amount reported in the 2004 national survey.

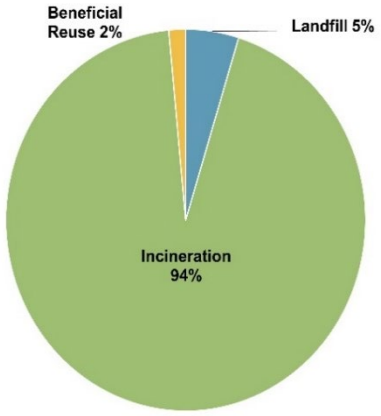

Figure 4 - RI Sewage Sludge End-use and Disposal (2018)

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

The total statewide wastewater flow in 2018 was 120 MGD with an estimated 5 WRRFs comprising 75% of the flow (Appendix C). Thirty-six percent of the state population used on-site septic systems in 2018.

Rhode Island Department of Environmental Management, Water/Wastewater Program provides regulatory oversight. Beneficial reuse of biosolids is permitted through the Departments' sludge management program and Rhode Island requires additional site monitoring at all land application sites. Biosolids that met both Part 503 Rules and additional management practices and pollutant limits could be land applied in Rhode Island in 2018.

In 2018, there was no state legislative or regulatory activity regarding biosolids. There were no newly permitted land application sites in 2018 and the beneficial use of biosolids was consistent.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2018 were:

1. Capital costs for infrastructure, new systems, and technologies.
2. Operating costs and avoiding rate increases.
3. Nuisances including mitigating odors, dust, and complaints.
4. Meeting regulatory requirements on biosolids, effluent, and air quality.
5. Meeting core mission of cleaning water.

The top five pressures on WRRFs biosolids management program in 2018 were:

1. Managing rising costs.
2. Nuisance issues.
3. Regulations or fees on disposal.
4. Tradition in contracting for disposal without concern for where it goes.
5. Environmental issues regarding impacts to soils, organisms, public health, and contaminants.

VERMONT

A total of 10,364 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018. The sludge was primarily beneficially reused and landfilled at a slightly lower rate (Figure 5). This data was derived from the state biosolids coordinator spreadsheet. The total is an increase of 1,391 dry U.S. tons from the amount reported in the 2004 national survey.

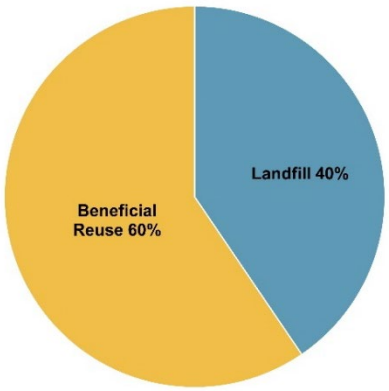

Figure 5 - VT Sewage Sludge End-use and Disposal (2018)

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

The total statewide wastewater flow in 2018 was 42 MGD with an estimated 18 WRRFs comprising 75% of the flow (Appendix C). Fifty-eight percent of the state population used on-site septic systems in 2018.

Vermont Department of Environmental Conservation, Residuals Management & Emerging Contaminants Program provides regulatory oversight. Beneficial reuse of biosolids via land application or distribution is permitted through a Solid Waste Facility Certification. Vermont requires site monitoring of soils and groundwater at all certified land application sites. Biosolids meeting pathogen reduction and vector attraction reduction standards and pollutant limits established in the Vermont Solid Waste Rules could be land applied or distributed, depending on pathogen reduction, in 2018. Local governments could enact ordinances within their jurisdiction more restrictive than the state.

In 2018, the state legislative or regulatory activity had no significant effect on beneficial reuse. However, the proposal process for Solid Waste Management Rule revisions had begun which included establishing a Certificate of Approval system for imported Class A or Exceptional Quality (EQ) biosolids products. This rule was subsequently enacted in October 2020. There

were no newly permitted land application sites in 2018 and the beneficial use of biosolids was increasing.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2018 were:

1. Meeting regulatory requirements on biosolids, effluent, and air quality.
2. Meeting core mission of cleaning water.
3. Operating costs and avoiding rate increases.
4. Capital costs for infrastructure, new systems, and technologies.
5. Managing contaminants and pollutants.

The top five pressures on WRRFs biosolids management program in 2018 were:

1. Managing rising costs.
2. Concerns of neighbors, environmental groups, or others.
3. Environmental issues regarding impacts to soils, organisms, public health, and contaminants.
4. EPA and/or state regulation and enforcement on beneficial reuse.
5. Lack of regulatory support for beneficial reuse.

MAINE

A total of 28,631 dry U.S. tons and 23,345 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018 and 2019, respectively. The sludge was primarily landfilled and beneficially reused at a lower rate (Figure 6 and Figure 7). These were derived from the state biosolids coordinator spreadsheet supplemented with WWRF survey responses for facilities not listed or under-reported in the spreadsheet and a Maine DEP survey conducted by the Bureau of Water Quality in 2021 (Personal communication with Maine DEP, August 17, 2021). These totals are a decrease of 3,577 dry U.S. tons and 8,863 dry U.S. tons from the amount reported in the 2004 national survey, respectively.

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

The total statewide wastewater flow in 2018 was 168 MGD with an estimated 14 WRRFs comprising 75% of the flow (Appendix C). Seventy-five percent of the state population used on-site septic systems in 2018.

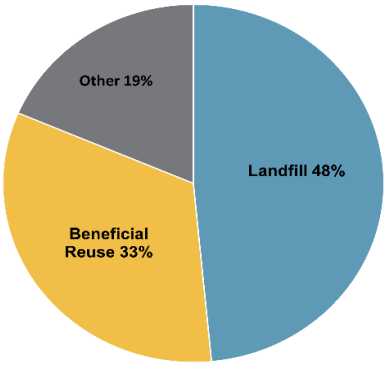

Figure 6 - ME Sewage Sludge End-use and Disposal (2018)

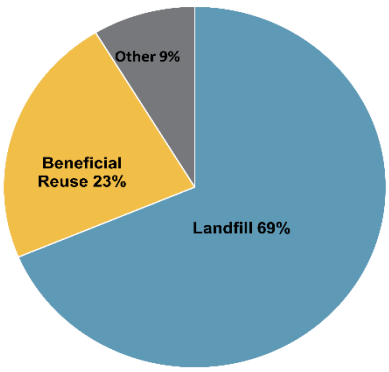

Figure 7 - ME Sewage Sludge End-use and Disposal (2019)

Maine Department of Environmental Protection (DEP), Solid Waste program provides regulatory oversight. Beneficial reuse of biosolids is permitted through a solid waste license or permit which requires site-specific permits for land application locations and additional site monitoring for the application of Class B biosolids. Biosolids that met both Part 503 Rules and additional management practices and pollutant limits could be land applied in Maine in 2018. Local governments could not enact ordinances within their jurisdiction more restrictive than the state.

In 2018, the beneficial use of biosolids was staying the same. However, a new license requirement to sample and analyze for PFAS at facilities that land apply, compost, or process biosolids went into effect in the spring of 2019. A memo dated March 22, 2019 outlined requirements for sampling, analytical testing, and reporting and subsequent use based on the results (Maine DEP, 2019). Biosolids with PFAS results below the screening criteria could continue to be used without restrictions. Biosolids that exceeded the PFAS screening levels could be used depending on further assessment and may have had additional restrictions.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2018 were:

1. Operating costs and avoiding rate increases.
2. Meeting regulatory requirements on biosolids, effluent, and air quality
3. Meeting core mission of cleaning water.
4. Capital costs for infrastructure, new systems, and technologies.
5. Nuisances including mitigating odors, dust, and complaints.

The top five pressures on WRRFs biosolids management program in 2018 were:

1. Managing rising costs.
2. EPA and/or state regulation and enforcement on beneficial reuse.
3. Disposal option is least expensive.
4. Nuisance issues.
5. Environmental issues regarding impacts to soils, organisms, public health, and contaminants.

MASSACHUSETTS

A total of 180,443 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018. The sludge was beneficially reused or incinerated at similar rates, with less landfilled (Figure 8). This data was primarily derived from the Mass Sludge Survey 2018 collected by NEBRA on behalf of MassCEC. This total is an increase of 27,208 dry U.S. tons from the amount reported in the 2004 national survey.

The total statewide wastewater flow in 2018 was 794 MGD with an estimated 11 WRRFs comprising 75% of the flow (Appendix C). Twenty-eight percent of the state population used on-site septic systems in 2018.

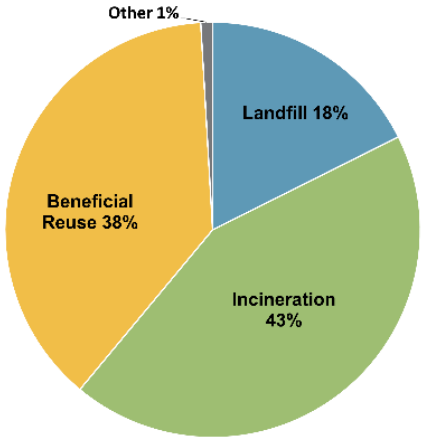

Figure 8 - MA Sewage Sludge End-use and disposal (2018)

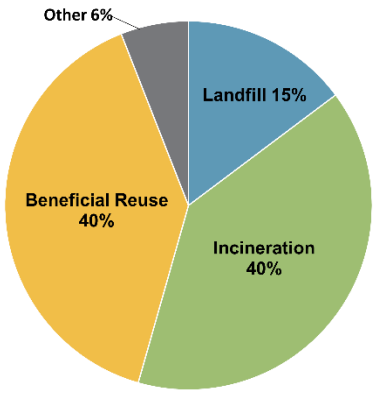

Figure 9 - MA Sewage Sludge End-use and Disposal (2021)

Only 25 WRRFs responded to the 2019 survey the survey and this data is not collected at the state level by the Massachusetts Department of Environmental Protection (MassDEP). Since the WRRF responses did not provide a robust dataset, NEIWPCC used a modified 2021 dataset prepared by the Massachusetts Water Environment Association (MAWEA) for the case study (MAWEA, personal communication, March 15, 2022). The MAWEA data was generated from the WRRF EPA Annual Biosolids Reports entered into the EPA Enforcement and Compliance History Online (ECHO) website. Entries were confirmed through personal communication with WRRFs and facilities. Since sewage sludge co-disposed with municipal solid waste in a landfill under Part 258 Regulations and facilities with design flows less than one MGD are not included in the EPA ECHO website, NEIWPCC entered 2018 MassCEC data for facilities that were missing. A total of 165,327 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2021. The sludge was beneficially reused or incinerated at similar rates, with less landfilled (Figure 9). This total is an increase of 12,092 dry U.S. tons and decrease of 15,473 dry U.S. tons from the amount reported in the 2004 national survey and MassCEC 2018 survey, respectively.

A detailed summary including wastewater, biosolids application, nutrient sources, state regulatory involvement, and trends are presented in Appendix C.

Massachusetts Department of Environmental Protection, Water/Wastewater Program and Department of Agricultural Resources provide regulatory oversight. Beneficial reuse of biosolids and land application sites require Approval of Suitability permits. There are no additional site monitoring requirements for land application sites. Biosolids that met both Part 503 Rules and additional management practices and pollutant limits could be land applied in Massachusetts in 2018. Local governments could enact ordinances within their jurisdiction more restrictive than the state.

In 2018, the state regulatory activity reduced beneficial use and the beneficial use of biosolids was decreasing.

The top five issues of importance in decisions regarding WRRFs sludge or biosolids in 2019 were:

1. Operating costs and avoiding rate increases.
2. Capital costs for infrastructure, new systems, and technologies.
3. Ensuring enough capacity to manage growth.
4. Meeting regulatory requirements on biosolids, effluent, and air quality.
5. Limited financial resources.

The top five pressures on WRRFs biosolids management program in 2019 were:

1. Managing rising costs.
2. EPA and/or state regulation and enforcement on beneficial reuse.
3. Difficulty in changing from known systems and infrastructure.

4. Securing long-term options.
5. Hauling distances.

Regional Snapshot

A total of 794,206 dry U.S. tons of sewage sludge were disposed of or beneficially reused in 2018 in the Northeast region. The sludge was primarily landfilled and incinerated, with biosolids beneficially reused at a lower rate (Figure 10). This data was derived from the state biosolids coordinator spreadsheets, supplemented with some WRRF responses. This total is an increase of 74,206 dry U.S. tons from the amount reported in the 2004 national survey. Note that the totals presented are for the sludge that left the WRRF gates. Sludge stored at facilities and placed in lagoons are not included, impacting the totals, particularly for states in northern New England where lagoon use is more common.

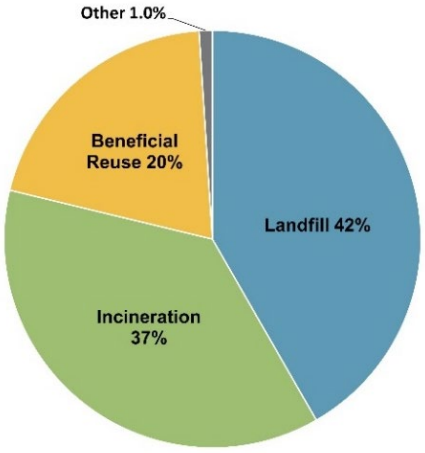

Figure 10 - Regional Sewage Sludge End-use and Disposal (2018)

The WRRFs located throughout Southern New England primarily rely on incineration, and those located in Northern New England rely on landfills and beneficial reuse (Table 4). Facilities in Massachusetts, New Hampshire, and New York rely on all three options (Table 4).

Table 4 – Regional Sludge Disposal Totals (Dry U.S Tons)

State	Landfill	Incineration	Beneficial Reuse	Other	Total
Connecticut	11,213	122,326	4,709		138,248
Maine	13,879		9,435	5,317	28,631
Massachusetts	31,784	78,353	68,651	2,012	180,800
New Hampshire	11,039	4,720	10,023		25,781
New York	257,463	58,031	60,999	1,170	377,663
Rhode Island	1,574	31,004	498		33,076
Vermont	4,196		6,168		10,364
2018 Total	**331,148**	**294,434**	**160,483**	**8,499**	**794,206**

Based on the responses from the WRRF surveys, there is a general interest in regional biosolids facilities in the Northeast. However, the regional biosolid facility questions regarding involvement, hosting, and anticipated use of a regional facility did not include specifics such as type of treatment, cost, and location. Without this information, a few WRRFs noted that they could not assess and provide their intent.

Consistently WRRFs reported capital costs, operating costs, and meeting regulatory requirements issues of importance in decisions regarding their sludge or biosolids. Managing rising costs and environmental issues regarding impacts on soils, organisms, public health, and contaminants were the most common pressures reported on their biosolids management program.

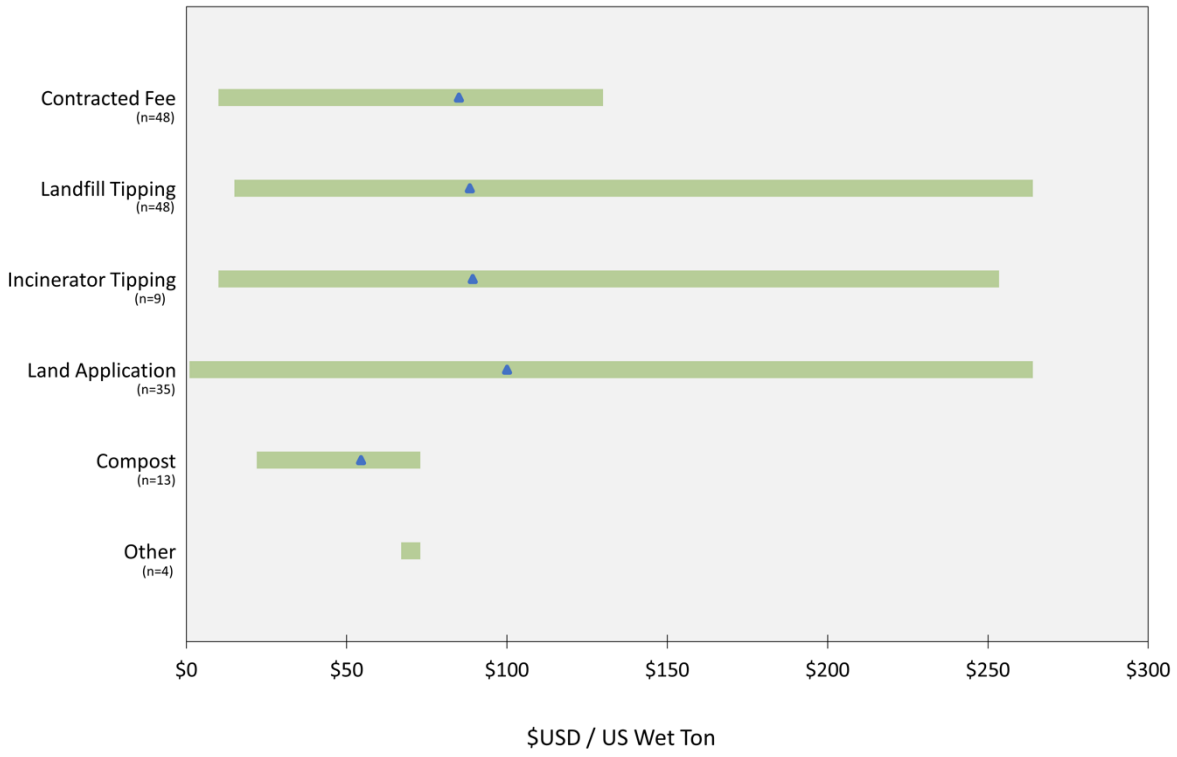

Figure 11 - National End-use and Disposal Cost Ranges. The n-value for each cost category represents the number of responses that indicated a cost for that disposal option. Blue triangles represent the median cost for the Northeast and green bars represent the national range.

There were limited responses from WRRFs in our region and across the country regarding their costs for end-use and disposal. As this is a major driver for management solutions, we compared aggregate cost data in the Northeast with the national results. Nationally, fee ranges per wet ton are presented in Figure 11, with incineration, landfill and land application having the highest costs (Figure 11). Based on the limited Northeast responses, the median costs per wet ton for land application, incineration, and landfilling were consistent with the national level.

Another key factor in developing solutions is the management of end-use or disposal. Nationally, WRRFs and haulers manage sludge options equally, with fewer separate preparers

(i.e., privately owned facilities). The Northeast management breakdown is equal for all three. However, at the state level, Maine and Massachusetts are equally managed by haulers and separate preparers, with less management by WRRFs.

As part of this project, NEIWPCC proposed creating a repository of PFAS wastewater sampling and analysis data collected within NEIWPCC states to facilitate communication and cooperation at the regional level. NEIWPCC used Microsoft Teams platform to include these and other resources. However, this proved largely unsuccessful due to states difficulty or inability to access Microsoft Teams on a network outside of their own. If the states determine that this task still needs to be completed, there will need to be a discussion on a new platform that resolves this problem.

Regional Next Steps

This report presents 2018 municipal sewage end-use and disposal for the Northeast and addresses the following goals for our study.

1. Determination of regional needs and problems surrounding sludge management.
2. Evaluation of whether or not there is a demand for a regional facility.
3. Identification of options for facilities that don't have contingency plans.

Unfortunately, there are few options for facilities without contingency plans. Since 2018, routine maintenance, operational issues, and emerging contaminants continue to stress the system's available capacity. The lack of additional capacity has been shown during occurrences of incinerator maintenance and operational issues. This led to WRRFs transporting sludge to distant states and Canada at increased costs, some using one-fourth of their annual disposal budget in one month. Legislation, enacted and proposed, is further reducing options. Maine LD 1911, An Act to Prevent the Further Contamination of the Soils and Waters of the State with So-called Forever Chemicals bans the land application, sale, and distribution of biosolids-based soil amendments, effective August 8, 2022. Proposed Massachusetts legislation (S2655) would establish a moratorium on the procurement of structures or activities generating PFAS emissions which includes emerging technologies to address PFAS in biosolids. Over time, the Northeast's options have been decreasing.

Based on the regional snapshot, NEIWPCC states recommend the next steps to advance the following discussion topics:

4. Economic feasibility of a regional facility.
5. Inform the specifics needed for regional facility design.

As an example of the types of discussions this data can inform, NEIWPCC, NEBRA, and MEWEA are in the preliminary planning stages with other regional, state, and municipal organizations and universities regarding establishing a regional PFAS/Biosolids Bio-Technology Hub (BioHub). The Hub's goal is to bring new technologies forward, allowing for an active research, testing, and educational facility which can serve as a technical resource for water utilities, regulators, water managers, and others in New England and throughout the United States. The primary functions of the BioHub would be the research and development of PFAS treatment technology systems and to provide resources to the water utility sector currently challenged by the effective disposal of sludge and biosolids.

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APPENDIX A – SPREADSHEET AND SURVEYS

NATIONAL BIOSOLIDS DATA PROJECT

STATE BIOSOLIDS SURVEY

2018 DATA - CONDUCTED 2020-2021

New Hampshire

Sheet 1 of 2 - Biosolids Infrastructure & Quantities

Your name:	INSTRUCTIONS:
Data on left - Columns B & C - are from 2007 report showing 2004 data from your state.	1. Please provide 2018 data for your state as a whole.
	2. Fill in highlighted yellow cells on both sheets. Additional instructions are in red.
Please note that some of the 2004 data below are incomplete. You can see your state's 2004 data in the 2007 report, Appendix D, available at: https://www.nebiosolids.org/national-biosolids-survey-2018-data	3. If no data exist, or data are inaccessible, please enter "no data." If estimating data, please use whole numbers, rather than ranges. Spaces for explanations and comments are provided. Please explain if data are not available, are estimates, if they are not collected at all, are spotty, or etc.
Definitions can be found here.	4. Like-colored highlighted totals should match, if possible (or explain in space provided to right of data).
Definitions: "WWTP" is used here to mean roughly the same as WRRF (water resource recovery facility), POTW, or TWTDS. More precisely, the scope of this survey is treatment works treating domestic sewage (TWTDS), whether public or private.	5. When complete, please send it along with any comments or questions to: NEIWPCC **DUE APRIL 30**

WWTP Totals

	2004 Data	2018 Data	
Total Number of WWTPs:	34 (survey), 88 CWNS		0
WWTP & Biosolids Infrastructure Totals			
Number of Separate Preparers (in- or out-of-state, receiving solids from your state):	4		----------
Total number of your state's WWTPs sending to those Separate Preparers:	8		----------
Number of operating sludge incinerators in your state (total):	1		----------
Fluidized bed:	1		----------
Multiple hearth:	0		----------
Number of Part 258 landfills in your state accepting sewage sludge:	data not requested for 2004		----------
Number of WWTPs in your state with industrial pre-treatment programs:	data not requested for 2004		----------
Number of WWTPs in your state with *sludge* lagoons:	data not requested for 2004		----------
Wastewater Flow Totals			
Total statewide average daily wastewater flow (MGD):	data not requested for 2004		----------
Total statewide WWTP *design* capacity for wastewater flow (MGD):	data not requested for 2004		----------
Total statewide average daily *dry weather* flow (MGD):	data not requested for 2004		----------
Other Totals			
Number of documented odor & nuisance complaints received by state in 2018 related to biosolids transportation and use or disposal outside of the gates of the WWTP:	data not requested for 2004		----------
Number of WWTPs involved in those complaints:	data not requested for 2004		----------
Percent of population served by on-site systems (e.g. septic systems):	60%		----------

Please explain if no data are provided or data are estimated, and add any other notes or comments →

Biosolids Use and Disposal

UNITS:	Dry U.S. tons	(please select)	← Click cell to select from menu the units you use and are reporting here.
		If "other," please describe →	

Summary

	Number of Entities (WWTPs & Sep. Preparers) Going To…	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Going To…	Quantity of Biosolids
Beneficial Use (applied to soils, not including ADC)	17	18,509		
Disposal & Alternative Dispositions	17	8,512		
Other	0	0		
TOTAL	**34**	**27,021**	-	-

NOTE: Quantity of sewage sludge or biosolids used or disposed means the quantity that goes out the gate of the WWTPs. Use the units (the form of measurement) you chose above.

Please explain if no data are provided or data are estimated →

Beneficial Use

	Number of Entities (WWTPs & Sep. Preparers) Going To…	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Going To…	Quantity of Biosolids
Agricultural (EQ, Class A, & Class B)	5	3,908		
Forestland (EQ, Class A, & Class B)	0	0		
Reclamation (EQ, Class A, & Class B)	4	180		
Class A EQ Distribution (bagged or bulk, public distribution, or unsure where it went)	8	14,421		
Beneficial Use Subtotal	**17**	**18,509**	**0**	**0**
Long-term storage	0	0		
Number of *acres* to which biosolids were applied:		1,517		

Please explain if no data are provided or data are estimated →

Disposal & Alternative Dispositions

	Number of Entities (WWTPs & Sep. Preparers) Going To…	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Going To…	Quantity of Biosolids
Landfill (total)	16	4,032		
Burial	data not requested for 2004	data not requested for 2004		
Alternative daily (ADC), intermediate, or final cover	data not requested for 2004	data not requested for 2004		
Surface Disposal (i.e., beneficial reuse)	0	0		
Incineration	1	4,480		
Cement kiln or industrial furnace	data not requested for 2004	data not requested for 2004		
Deep well injection	data not requested for 2004	data not requested for 2004		
Gasification	data not requested for 2004	data not requested for 2004		
Pyrolysis	data not requested for 2004	data not requested for 2004		
Disposal & Alternative Dispositions Subtotal	**17**	**8,512**	-	-
TOTAL	**34**	**27,021**	-	-

Please explain if no data are provided or data are estimated →

Biosolids Quality Summary

	Number of Entities (WWTPs & Sep. Preparers) Producing…	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Producing…	Quantity of Biosolids
Class A EQ	8	14,421		
Other Class A	0	0		
Class B	46	3,908		
Other (no data, etc.)	no data	8,512		
TOTAL	**54**	**26,841**	-	-

NOTE: For "number of entities," the total may not match because some entities go to more than one use or disposal.

Please explain if no data are provided or data are estimated →

Biosolids Treatment Practices

	Estimated Number of WWTPs or Separate Preparers Using…	Estimated Quantity of Biosolids Produced Using…	Estimated Number of WWTPs or Separate Preparers Using…	Estimated Quantity of Biosolids Produced Using…
Stabilization				
Aerobic Digestion (total)	0	0		
Class A (ATAD/Other)	data not requested for 2004	data not requested for 2004		
Class B	data not requested for 2004	data not requested for 2004		
Anaerobic digestion (AD) (total)	3	3,298		
Class A (e.g. thermophilic)	data not requested for 2004	data not requested for 2004		
Class B (mesophilic)	data not requested for 2004	data not requested for 2004		
WWTPs co-digesting (FOG, food, glycol, etc.)	data not requested for 2004	data not requested for 2004		N/A
Biogas used (heating, electicity, fuel, etc.;scf/year)	data not requested for 2004	data not requested for 2004		N/A
Lime/Alkaline (total)	4	5,785		
Class A lime/alkaline	data not requested for 2004	data not requested for 2004		
Class B lime/alkaline	data not requested for 2004	data not requested for 2004		
Composting	5	7,812		
Thermal (e.g. heat drying, not incineration/gasification/pyrol)	0	0		
Gasification	data not requested for 2004	data not requested for 2004		
Pyrolysis	data not requested for 2004	data not requested for 2004		
Hydrolysis (thermal, chemical, etc.)	data not requested for 2004	data not requested for 2004		N/A
Long-term (lagoons, reed beds, etc.)	0	0		N/A
Oxidation ditch / extended aeration	data not requested for 2004	data not requested for 2004		N/A
Other stabilization technology	0	0		
Dewatering				
Belt Filter Press	12	7,850		
Plate & Frame Press	2	930		
Screw Press	0	0		
Centrifuge	0	0		
Vaccuum Filter	0	0		
Drying beds (open-air)	4	no data		
Solar drying (e.g. in greenhouse)	data not requested for 2004	data not requested for 2004		
Other dewatering technology	0	0		
Thickening				
Gravity thickener	data not requested for 2004	data not requested for 2004		
Gravity belt thickener (GBT)	data not requested for 2004	data not requested for 2004		
Centrifuge	data not requested for 2004	data not requested for 2004		
Dissolved air flotation (DAF)	data not requested for 2004	data not requested for 2004		
Other thickening technology	data not requested for 2004	data not requested for 2004		
Other				
Biosolids sold in bags (explain at right what size bags)	data not requested for 2004	data not requested for 2004		

Please explain if no data are provided or data are estimated, and add any other notes or comments →

Proceed to the second sheet via the tab at the bottom of the page

New Hampshire

State Pollutant (trace metal, etc.) Concentration Limits in Biosolids Applied to Land, 2018

Enter numbers only where state limits differed in 2018 from U.S. EPA limits.

	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Zinc (Zn)
EPA Table 1 (mg/kg)	75	85		4300	840	57	75	420	100	7500
EPA Table 3 (mg/kg) & CPLR (kg/ha)	41	39		1500	300	17		420	36 (CPLR = 100)	2800
State ceiling limit (higher limit) (mg/kg)										
State high quality (lower number) limit (mg/kg)										
State CPLR (kg/ha)										
State APLR (kg/ha/365days)										

TESTING

For each of the following constituents, indicate if testing is required by your state, as of 2018.	Is testing required for *all* sewage sludge or biosolids?	Or is testing required only for biosolids being beneficially used as fertilizers and soil amendments?	Frequency of testing (indicate how often testing must be done for each parameter):		If frequency depends on wastewater flow or amount of biosolids used or disposed of, please explain:
			In accordance with Part 503 requirements	In accordance with other frequency required by state (if applicable, please specify)	
	click on cell to use menu	click on cell to use menu	click on cell to use menu		
Part 503 metals (As, Cu, Hg, etc.)	(please select)	(please select)	yes		
Other metals (boron, silver…)	(please select)	(please select)	(please select)		
Dioxins/furans	(please select)	(please select)	(please select)		
PCBs	(please select)	(please select)	(please select)		
Priority pollutants (https://www.epa.gov/sites/production/files/2015-09/documents/priority-pollutant-list-epa.pdf))	(please select)	(please select)	(please select)		
Other organic compounds (e.g. PDBEs, pharmaceutical)	(please select)	(please select)	(please select)		
Radioactive isotopes (alpha, beta, Ra 226, etc.)	(please select)	(please select)	(please select)		
Nutrients (NPK)	(please select)	(please select)	(please select)		
Pathogen reduction (Class A or B)	(please select)	(please select)	(please select)		
Vector attraction reduction (VAR)	(please select)	(please select)	(please select)		
PFAS (as of 2018)	(please select)	(please select)	(please select)		
Microplastics (as of 2018)	(please select)	(please select)	(please select)		
TCLP (toxicity characteristic leaching procedure)	(please select)	(please select)	(please select)		
Paint Filter Liquids Test	(please select)	(please select)	(please select)		

If testing is required for non-503 constituents, any organic compounds, and/or radioactive isotopes, please attach lists of all required analytes (*e.g.* copies of pages or tables from state regulations). Email them with this completed spreadsheet.

Comments or explanations →

REPORTING

For each of the following, indicate what WWTPs and/or biosolids preparers must report to the state:	Is reporting to the state required for these parameters?	Frequency of reporting (indicate how often testing must be done for each parameter):		How are these data stored by the state?	Are data compiled by the state in reports or summaries? If so, please attach.
		In accordance with Part 503 requirements	In accordance with other frequency required (if applicable, please specify)		
	click on cell to use menu	click on cell to use menu		click on cell to use menu	click on cell to use menu
The amounts of biosolids/ sewage sludge used or disposed	(please select)	not applicable (N/A)		(please select)	(please select)
Part 503 metals (As, Cu, Hg, etc.)	(please select)	(please select)		(please select)	(please select)
Other metals (boron, silver…)	(please select)	(please select)		(please select)	(please select)
Dioxins/furans	(please select)	no		(please select)	(please select)
PCBs	(please select)	(please select)		(please select)	(please select)
Priority pollutants (https://www.epa.gov/sites/production/files/2015-09/documents/priority-pollutant-list-epa.pdf)	(please select)	(please select)		(please select)	(please select)
Other organic compounds (e.g. PDBEs, pharmaceutical)	(please select)	(please select)		(please select)	(please select)
Radioactive isotopes (alpha, beta, Ra 226, etc.)	(please select)	(please select)		(please select)	(please select)
Nutrients (NPK)	(please select)	(please select)		(please select)	(please select)
Cumulative Pollutant Loading Rates (CPLR)	(please select)	(please select)		(please select)	(please select)
How biosolids achieve Class A or Class B	(please select)	(please select)		(please select)	(please select)
How biosolids achieve vector attraction reduction (VAR)	(please select)	(please select)		(please select)	(please select)
Solids stabilization process(es) used	(please select)	(please select)		(please select)	(please select)
Other biosolids treatments	(please select)	(please select)		(please select)	(please select)
End use or disposal practice	(please select)	(please select)		(please select)	(please select)
PFAS (as of 2018)	(please select)	(please select)		(please select)	(please select)
Microplastics (as of 2018)	(please select)	(please select)		(please select)	(please select)
TCLP (toxicity characteristic leaching procedure)	(please select)	(please select)		(please select)	(please select)
Paint Filter Liquids Test	(please select)	(please select)		(please select)	(please select)

If your state has *summarized* and/or *reported* data on metals, organic chemical compounds, or other pollutants in biosolids - or other data **(for 2018)**, please send a copy with this survey.

Comments or explanations →

Please provide any additional comments, explanations or information here (optional) →

END

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

1. Welcome

This is the second time this major national survey is being completed; the initial survey was published in 2007, reporting 2004 data.

Before filling out this online portion of the survey please complete the spreadsheet/quantitative survey for your state.

Thank you for completing the quantitative portion of the survey in the spreadsheet. Now that you have completed your state spreadsheet, this online part of the survey will ask questions about:

- economics of biosolids
- state regulations & permitting compared to Part 503
- trends in biosolids management
- septage & other residuals management

The data requested here are about sewage sludge, biosolids, and septage, from public and private wastewater treatment plants (WWTPs) treating domestic sewage, who used or disposed of sewage sludge/biosolids in 2018. **If firm data are not available, estimates are acceptable. Add comments in the spaces provided.**

You can download the PDF version of this survey to use as a reference, but fill it out online here. You might need information from colleagues. We suggest you copy the applicable questions from the PDF into an email for them, and then enter the data they provide. **If your state doesn't collect certain data, please leave those responses blank.**

Click "Next" at the bottom of each page to save your answers. You can start the survey and return to it later using the same computer.

Instructions:
- Please provide the requested information to the best of your knowledge.

- All data and information should be for 2018.
- Please add comments (e.g., if data are estimated). Use the comment boxes provided at the end of each page.
- All data should be in the units you indicate below.

* 1. Your name:

* 2. State / Territory

* 3. How can we reach you?

email:

phone:

4. **State agency's biosolids websites** (if any).... Include links to state biosolids and septage regulations, etc., if available.

* 5. **What unit(s) do you use for sewage sludge and biosolids quantities?** Choose the one that you use usually. Please enter data in the spreadsheet & this online survey using these unit(s).

Other unit and/or comments about units used.

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

2. Biosolids Economic Data

* 1. Does your state collect economic data on biosolids management?

	yes/no
cost per ton to produce biosolids	
tipping fees	
what WWTPs pay contractors for biosolids management, per ton	
revenues from the sale of biosolids	

Other (please specify)

2. **Contracted fee for sludge/biosolids removal:** For this and the rest of the questions on this page, please provide your *best estimate.* If you aren't sure, just put "0" (zero). Please provide your best estimate of the fee/cost per wet U. S. ton paid by WWTPs for contractors to take sludge or biosolids from the WWTP gate for end use or disposal in 2018.

minimum cost per wet U. S. ton (low end of the range):

maximum cost per wet U. S. ton (high end of the range):

3. **Septage disposal fees** charged by WWTPs: Please provide your best estimate of the septage disposal fee/cost per gallon charged by WWTPs in your state in 2018 (cents per gallon).

minimum cost per gallon - low end of the range in cents per gallon:

maximum cost per gallon - high end of the range in cents per gallon:

4. Number of **biosolids management jobs** in your state in 2018 (not including regulatory agency staff). Please provide your best estimate of the total full-time equivalents (FTEs) for all those working on biosolids, including WWTP staff (working on biosolids, not all staff), contractors, engineers, land appliers, etc. who work full or part-time on biosolids, but not including your regulatory agency staff. Enter "0" (zero) if you don't know.

number of biosolids FTEs in state in 2018:

5. **Biosolids product pricing**: Please provide your best estimate of the prices for the following biosolids products in your state:

Biosolids compost, wholesale (to soil brokers, landscapers, garden suppliers, etc.), $/cubic yard:

Biosolids compost, retail (to end users, customers), $/cubic yard:

Heat dried pellets or other biosolids in bags, $/~40 pounds:

Bulk Class A biosolids or ton-bags to farmers, landowners, $/wet ton:

Bulk Class B biosolids to farms, etc., $/wet ton:

6. Percentage (%) of your state's sludge/biosolids managed by **private contractors**:

(%) Percentage managed by private contractors:

7. Additional explanations/comments on any of the questions on this page:

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

3. Biosolids Regulation and Permitting - Part 1

1. As of 2018, which of the following applies regarding U. S. EPA delegation of your state to administer the federal 40 CFR Part 503 biosolids rule?

- ○ Have received delegation from U. S. EPA for full rule
- ○ Have received delegation from U. S. EPA for portion of the rule (indicate which portion(s) in comment box below)
- ○ In process of applying for or having application reviewed
- ○ Planning to seek delegation from U. S. EPA sometime in the future when resources (e.g. time and funding) allow.
- ○ Not planning to seek delegation from U. S. EPA

Please explain, if needed...

2. As of 2018, which division(s) of your state's government regulates and/or oversees biosolids management, disposal, and end use? Check all that apply and explain in comment box below.

- ☐ Environment agency - water / wastewater program
- ☐ Environment agency - solid waste program
- ☐ Public health department or agency (indicate state or county)
- ☐ Agriculture department
- ☐ Other (please specify)

3. What mechanism(s) does the state agency utilize to regulate biosolids **end use and disposal**?

- ☐ specific NPDES type permit
- ☐ general NPDES type permit
- ☐ solid waste license/permit
- ☐ Other (please specify)

4. Indicate how biosolids land application sites are permitted (or planned or other forms of state oversight):

- [ ] under the system described in the previous question
- [ ] issued as a separate general permit
- [ ] issued as separate site-specific permits
- [ ] Other (please specify)

5. Does your state allow **land appliers or land-owners** (who are not the WWTP/ generator) to become the **holder of legal liability for biosolids end use**?

- ( ) Yes
- ( ) No
- ( ) Other

6. Does your state allow **Class B biosolids** from more than one WWTP to be land applied on the **same site in the same crop year**?

- ( ) Yes
- ( ) No

7. If yes, is it actually being done?

- ( ) Yes
- ( ) No

If yes, on how many sites is it done each year?

8. As of today, how many full-time employees and full-time employee equivalents (FTEs) work in your state agency's biosolids regulatory program? Include only the proportion of a person's time spent on biosolids (i.e., one individual biosolids and septage coordinator may spend .7 FTE on biosolids and .3 FTE on septage). Include only the biosolids amount here.

FTEs in state biosolids program:

9. When were your state's biosolids/sewage sludge management regulations last updated formally (year)?

10. Additional explanations/comments on any of the questions on this page:

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

4. Biosolids Regulation and Permitting - Part 2

1. As of 2018, did your state's biosolids regulations have additional requirements above and beyond the federal Part 503 rule?

- Yes
- No

2. If yes, indicate in which areas there are additional requirements:

- [ ] Management practices (setbacks, public access restrictions, etc.)
- [ ] Pathogen and/or vector attraction reduction limits (e.g. your state requires tests or certifications different from Part 503)
- [ ] Pollutant (trace metals, etc.) limits.

Please explain the added management practices and pathogen/VAR requirements here:

3. If your state has **pollutant (trace metals, etc.) limits** different from Part 503, they should be listed in your state spreadsheet that you downloaded. Please confirm by clicking the dropdown menu here:

4. Indicate if any of the following oversight, certification, odor control, or pathogen control requirements are required (as of 2018) for biosolids land application programs in your state:

- [ ] Independent (not from WWTP or contracted land applier) inspectors or monitors at land application sites
- [ ] Certification of biosolids land appliers (land application contractors or WWTP operators) who manage or implement land application programs
- [ ] Numerical odor emission limits at land application sites
- [ ] Other requirements or actions to control odors at land application sites (nuisance restrictions)
- [ ] Sampling and testing of Class A biosolids for the presence of pathogens if three weeks or more have elapsed since processing (e.g. after curing or storage).

Explain (optional):

5. For those that are not required, indicate if any of the following occur voluntarily (as of 2018) for biosolids land application programs in your state:

- [ ] Independent (not from WWTP or contracted land applier) inspectors or monitors at land application sites
- [ ] Certification of biosolids land appliers (land application contractors or WWTP operators) who manage or implement land application programs
- [ ] Numerical odor emission limits at land application sites
- [ ] Other requirements or actions to control odors at land application sites (nuisance restrictions)
- [ ] Sampling and testing of Class A biosolids for the presence of pathogens if three weeks or more have elapsed since processing (e.g. after curing or storage).

Explain (optional):

6. Does your state require any **additional monitoring** (e.g. groundwater, soil, plant) at **land application sites**?

- ( ) Yes, for Class B land application
- ( ) Yes, for all land application (provide details below)
- ( ) No

If yes, please explain at what sites it is required, testing for what parameters, frequency of testing, etc.:

7. As of 2018, what is the basis of your state's **agronomic loading rate** for land application of biosolids?

- [ ] Nitrogen
- [ ] Phosphorus
- [ ] Other (please specify)

8. Does your state biosolids regulatory program require formal **nutrient management plans (NMPs)** for sites where biosolids are land applied? An NMP is a farm-wide plan for tracking all nutrient sources, not just biosolids.

- ○ Yes
- ○ No

9. Does your state manage or control application of **phosphorus** in biosolids in any way? How? Please indicate all that apply:

- ☐ no state restrictions or controls on P applied in biosolids
- ☐ time of year of application
- ☐ based on test of *total* P in soil and/or biosolids
- ☐ site limitations
- ☐ increased distance to surface water
- ☐ based on test of *available* P in soil and/or biosolids
- ☐ slope
- ☐ using a P Index
- ☐ Other (please specify)

10. Additional explanations/comments on any of the questions on this page:

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

5. Biosolids Regulation and Permitting - Part 3

1. Indicate the **total number of acres** in your state that were newly permitted by the state (site-specific permits) to receive land applied biosolids in 2018 (do not include re-permitting of existing sites):

Number of newly-permitted acres:

Indicate the number of those newly-permitted acres that actually had biosolids applied to in 2018:

2. How many **new site permits/approvals** were issued in 2018?

number of new site permits/approvals:

3. From whom does your state require **reporting** of biosolids information and data? Indicate all that apply:

- [ ] only major TWTDS (>1 MGD)
- [ ] majors and minors
- [ ] sludge-only processing facilities (separate preparers)
- [ ] Other (please specify)

4. Specify how the public can access these biosolids reports and/or data summaries (indicate all that apply):

- [ ] From state website
- [ ] From EPA regional office
- [ ] By mail or in person from state agency
- [ ] From regional association website
- [ ] From WWTP websites
- [ ] Other (please specify)

5. If your state compiles and/or reports biosolids data **electronically**, what format(s) are used? Indicate all that apply:

- [ ] Biosolids reports and data are only kept in paper format.
- [ ] Excel
- [ ] Access
- [ ] Filemaker
- [ ] PCR
- [ ] BDMS
- [ ] Other (please specify)

6. Number of **documented inspections** by state regulators of biosolids facilities and field sites in 2018:

number of inspections:

7. Number of **formal regulatory violations** issued by your state to biosolids facilities, operations, and field sites in 2018:

number of violations:

8. Does your state have biosolids **product labeling requirements**, as of 2018?

for EQ products:

for other Class A products:

for Class B:

9. Does your state require registration and/or reporting for **EQ biosolids** entering the state, as of 2018?

registration or permit required:

reporting required about biosolids entering the state:

Please explain...

10. Additional explanations/comments on any of the questions on this page:

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

6. Trends in Biosolids Management

1. Indicate which, if any, **legislative, regulatory, or other activity** was happening or imminent in your state **in 2018** and what its impacts are expected to be:

	This will likely...
No activity in 2018	
Development of, or changes to, state biosolids regulations	
Development of, or changes to, local (county, municipal) biosolids ordinances/regulations	
Change to state statute(s) regarding biosolids management	
Other	

Other (please specify)

2. As of 2018, are local units of government (towns, cities, counties) allowed to enact ordinances that are **more restrictive than state law** regarding biosolids use and/or disposal?

- ○ Yes
- ○ No

Explain (optional)

3. How many local units of government have adopted **more restrictive ordinances**?

number of municipalities:

number of counties:

4. Is the number of local actions increasing or decreasing?

Other (please specify)

5. What do you consider to be the **top five (5) pressures on biosolids recycling programs** in your state, *as of 2018*? Read choices carefully and choose what fits best. Some categories, such as "agricultural issues," have more than one choice.

	1	2	3	4	5
TRADITION – it's difficult to change from long-standing practices or existing and known infrastructure	○	○	○	○	○
TRADITION - WWTP management doesn't care where it goes, just contracts to make it go away	○	○	○	○	○

	1	2	3	4	5
TRADITION - recycling biosolids is not a priority or part of WWTP's core mission	○	○	○	○	○
COST – disposal options are least expensive	○	○	○	○	○
COST – beneficial use options are least expensive	○	○	○	○	○
COST - rising costs generally	○	○	○	○	○
REGULATIONS ON BENEFICIAL USE– strict EPA and/or state regulation and enforcement	○	○	○	○	○
REGULATIONS ON BENEFICIAL USE – restrictive local ordinances	○	○	○	○	○
REGULATIONS ON BENEFICIAL USE – lack of regulatory support for beneficial use	○	○	○	○	○
REGULATIONS ON DISPOSAL – strict regulations or fees on disposal	○	○	○	○	○
PUBLIC INVOLVEMENT- concerns of neighbors, environmental groups, and others	○	○	○	○	○

	1	2	3	4	5
NUISANCE ISSUES – odors, truck traffic, dust, etc.	○	○	○	○	○
AGRICULTURAL ISSUES - declining farmland due to less agriculture or due to development, sprawl, seasonal restrictions, or competition with manures, etc.	○	○	○	○	○
AGRICULTURAL ISSUES - soil compaction, difficulty with timing, stockpiling, etc.	○	○	○	○	○
ENVIRONMENTAL ISSUES - nutrient management, phosphorus (P), nitrogen (N)	○	○	○	○	○
ENVIRONMENTAL ISSUES - impacts to soils, organisms, public health, contaminants (PFAS, pathogens, metals, organic chemicals, etc.)	○	○	○	○	○
MANAGEMENT ISSUES - securing long-term use options	○	○	○	○	○
MANAGEMENT ISSUES - the hassle of biosolids recycling/land application	○	○	○	○	○

	1	2	3	4	5
MANAGEMENT ISSUES - hauling distances	○	○	○	○	○
OTHER	○	○	○	○	○

6. If 'Other' selected above, please explain here:

* 7. Overall, was the **beneficial use** (see Definitions) of biosolids increasing in your state *as of 2018*?

- ○ Yes
- ○ No
- ○ It's staying the same.
- ○ Don't know

Explain (optional):

* 8. Overall, is the beneficial use of biosolids increasing in your state *as of today*?

- ○ Yes
- ○ No
- ○ It's staying the same.
- ○ Don't know

Why or why not? Please explain:

9. Please list up to **6 biosolids management programs in your state that have been particularly successful, well-run, and effective** over the years. These can be WWTPs, separate preparers, marketers/distributors, other businesses, farms, other landowners, etc. Please provide the name and location. Note: The information you provide in this question will not be included in any report; it is only to help the survey team identify additional sources of information.

name, location:

name, location:

name, location:

name, location:

name, location:

name, location:

10. Explanations & comments on any of the questions on this page:

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

7. Septage and Other Residuals

* 1. Do you have data and information on **septage management** in your state?

- ○ Yes
- ○ No

2. If not, indicate whom to contact for septage management information.

Septage program contact name:	
Contact phone number:	
Contact email:	
Agency/Department:	

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

8. Septage Management

1. Estimate the number of **septage haulers** that are based in your state (they may do business in other states as well).

number of septage haulers:	

2. Estimate the number of **separate preparers** (not WWTPs) in your state taking in septage in 2018 (they may also take in sewage sludge).

Number of septage separate preparers:

3. Does your state require any or all WWTPs to accept septage?

- Yes
- No

Explain (optional)

4. Number of WWTPs that accept septage in your state (whether or not they received any septage in 2018).

number of WWTPs that accept septage:

5. How much septage was received by your state's WWTPs in 2018 (gallons/year)?

septage received at WWTPs (gallons/year):

6. Which and how much outside wastes (indicate gallons or tons) were accepted at your state's WWTPs in 2018? Estimates & discussion are welcome.

Food & beverage processing wastes (gallons or tons):

Other WWTP sludge (gallons or tons):

Municipal and/or commercial separated food waste (gallons or tons):

Other outside waste (gallons or tons):

7. Please provide details:

8. When were your state's **septage management regulations** last updated formally (year)?

9. As of today, how many full-time employees and full-time employee equivalents (FTEs) work in your state's **septage program**? Include only the proportion of a person's time spent on septage (i.e., one individual biosolids and septage coordinator may spend .7 FTE on biosolids and .3 FTE on septage). Include only the septage amount here. IF YOUR ANSWER IS NOT A WHOLE NUMBER, PLEASE PUT IT IN THE COMMENT BOX AT END OF THIS PAGE (e.g., Our state agency has 0.3 FTE overseeing septage management and disposal or use.)

FTEs in state septage program:

10. Can septage be **land applied** in your state?

- Yes
- No

11. If yes, what treatment is required prior to **land application**?

- Meet Part 503
- Meet Part 503 and the following additional state requirements:

Please briefly describe additional state requirements:

12. Please estimate the amount (percentage) of **hauled septage** that is (your numbers should add up to 100%):

% land applied directly (with lime or other quick treatment, but not after further treatment or storage):

% hauled to WWTPs:

% disposed in lagoons:

% sent to separate preparer or septage-only treatment facility (e.g. compost operation):

% landfilled:

% incinerated:

% other:

13. Please specify this "other" septage destination and add any further explanations here.

14. Does your state agency and the state's WWTPs consider **fats, oils, and grease (FOG)** to be a significant issue?

- Yes
- No
- Don't know

15. Does your state regulate the use or disposal of **brown grease** (grease trap waste, FOG)?

- Yes
- No
- Don't know

16. If yes, under what rules is it regulated:

- [ ] septage regulations
- [ ] biosolids/sludge regulations
- [ ] health regulations
- [ ] wastewater permits/regulations
- [ ] Other (please specify)

17. Does your state have a proactive program to collect fats, oils, and grease (FOG), keeping them out of the general wastewater flow, and using or disposing of them appropriately?

- ( ) Yes
- ( ) No

18. If yes, please describe this program:

19. Explanations & comments on any of the questions on this page:

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

9. Additional Details & Comments

1. Add further explanations or clarifications here.

NEIWPCC's State Coordinator Biosolids Survey - 2018 Data

10. Complete

Thank you for completing the qualitative portion of the survey!

Please let us know if you have any questions or concerns.

NEIWPCC's WWTP Biosolids Survey - 2018 Data

1. Welcome

If you are filling out this survey on behalf of a WWTP located in CT, ME, NH, NY, RI, or VT, then you're in the right place! Please check here to see if anyone else at your facility has already filled out the survey to avoid duplicates.

This is the second time this survey has been completed; the initial survey, based on 2004 data, was published in 2007. The results of this year's survey will benefit all stakeholders in the management of wastewater and biosolids in the U.S.

You will need your 2018 EPA Part 503 Sludge Report (filed in February 2019) and/or your 2018 report to your state. You can download the PDF version of this survey to use as a reference, but *fill it out online here.* You might need information from colleagues. We suggest you copy the applicable questions from the PDF into an email for them, and then enter the data they provide.

The data requested are about sewage sludge and biosolids from public and private wastewater treatment plants (WWTPs) treating domestic sewage, who used or disposed of sewage sludge/biosolids in 2018. If your facility fits this description, please proceed. **The quantity of biosolids used or disposed means the quantity that goes out the gate of your WWTP(s), even if it goes to another WWTP.**

The Core Survey is ~25 questions. It should take ~30 minutes to complete if you have your 2018 data readily available. If firm data are not available, estimates are fine. Leave blank any questions that don't apply to your WWTP or that you are unable to answer.

After the core survey, we'll ask you to complete additional questions about operations, economics, and energy.

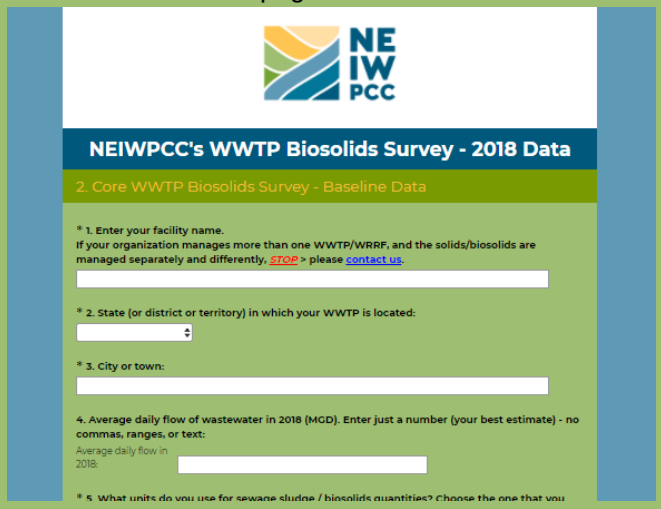
Instructions

The survey support page provides descriptions and definitions for terms and acronyms for both the NEIWPCC

and National Biosolids Data Project (NBDP) surveys. Additional information on this page pertains **ONLY** to states outside of New England and New York completing the NBDP surveys.

Click "Next" at the bottom of each page to save your answers. You can start the survey and return to it later using the same computer.

Here's what the next page should look like:



If boxes are missing or you have trouble entering data, try these:
– see supported browsers
– ensure JavaScript & cookies are enabled in your browser's settings
– increase or decrease font size your browser's +/- zoom controls
– restart your browser
– be sure your system and browser are up-to-date

~ $500 GIFT CARD RAFFLE ~

For filling out all of the survey, you'll be entered for a chance to win $500 to the eatery of your choice for you and your staff.

NEIWPCC's WWTP Biosolids Survey - 2018 Data

2. Core WWTP Biosolids Survey - Baseline Data

* 1. **Enter your facility name.**
If your organization manages more than one WWTP/WRRF, and the solids/biosolids are managed separately and differently, ***STOP*** > please contact us.

* 2. **State** (or district or territory) in which your WWTP is located:

* 3. **City or town**:

4. **Average daily flow of wastewater in 2018 (MGD).** Enter just a number (your best estimate) - no commas, ranges, or text:

Average daily flow in 2018:

* 5. **What units do you use for sewage sludge / biosolids quantities?** Choose the one that you use usually.

***Note: Report dewatered material as wet unless you have calculated [(dry tons) = (wet tons) x (% solids)]*

- Dry U.S. tons**
- Dry metric tons**
- Wet U. S. tons
- Wet metric tons
- Cubic yards
- Gallons
- Other (please specify):

6. What was the **total quantity of sewage sludge/biosolids that left your facility** for use or disposal in 2018? Find the correct row(s) for the measurement units you selected above and enter your number(s) there. **Leave the other rows blank.** For wet measurement units, you will need to include the % solids of the sludge/biosolids. Enter just numbers, no commas or % signs.

Dry **U.S.** tons in 2018

Dry **metric** tons in 2018

Wet **U.S.** tons in 2018 **and...**

...average % solids

Wet **metric** tons in 2018 **and...**

...average % solids

Cubic yards in 2018 **and**...

...density **and**...

...average % solids

Gallons in 2018 **and**...

...average % solids

7. Please indicate the **quantity** of the sewage sludge/biosolids from your WWTP used or disposed in the following ways in 2018. **USE THE UNIT OF MEASUREMENT YOU INDICATED ABOVE.** Enter numbers (your best estimate) in the lines that apply - no ranges, commas, or text. The amounts you include here should add up to the total provided in the previous question (including "other" use or disposal). **Leave other lines blank.**

Agricultural land application (EQ, Class A, and B):

Forestry land application (EQ, Class A, and B):

Reclamation of mine land, gravel pit, final landfill vegetative cap, other disturbed land (EQ, Class A, and B):

Class A EQ distribution to uses other than above (for example: to turf, gardens, etc.) or to unknown use/disposal. Class A EQ products include compost, heat-dried, alkaline stabilized, etc.

Long-term storage/stockpiling (for use after 2018):

Landfill (including burial and alternative daily cover):

Surface disposal (e.g. sludge monofill):

Incineration (sewage sludge incinerators and cement kiln/industrial furnace):

Transported or piped to another wastewater treatment plant (WWTP). Please tell us the name(s) of the WWTP(s) in the comment space below:

Deep well injection:

Gasification:

Pyrolysis:

Other (please describe in the next question):

8. What is the "Other" above? Or what WWTP(s) did your solids go to? Please describe:

9. **Who manages the end use and/or disposal** of solids/sludge/biosolids from your WWTP? Check all that apply.

- [ ] Municipal and/or utility/WWTP staff
- [ ] Handler/hauler/applier - they don't treat the solids further
- [ ] Separate preparer - they further treat the solids and change their quality. Someone who simply transports solids is NOT a separate preparer.
- [ ] Other (please specify):

10. If some or all of your solids go to a **separate preparer**, please provide the following:

Name(s) of separate preparer(s) (company name):

% of your solids that go to separate preparer(s):

Email address(es) for contacting the separate preparer(s):

11. Please indicate your **sludge/biosolids program's level of interest in a regional facility** for sludge/biosolids management:

	Very important or very likely	Somewhat important or likely	Neutral	Unimportant or unlikely	Very unimportant or very unlikely
How important is it to you/your WWTP to collaborate / participate on a regional sludge/biosolids facility?	○	○	○	○	○
How likely would you/your WWTP be to **host** a regional sludge/biosolids facility?	○	○	○	○	○
How likely would you/your WWTP be to **send solids/sludge to** a regional facility nearby (assuming all involved costs are reasonable)?	○	○	○	○	○

12. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

* 13. In 2018, **were any of your WWTP's biosolids (Class A or Class B) applied to soils** by you/your WWTP or someone else?

- ○ Yes
- ○ No

NEIWPCC's WWTP Biosolids Survey - 2018 Data

3. Core WWTP Biosolids Survey - Biosolids Applied to Soils

1. Number of **permitted acres** that your WWTP's biosolids recycling program had available, as of 2018. If managed by a separate preparer, they should be able to provide you this information. Enter just a number (your best estimate) - no ranges, commas, or text. If none (for example: because you produce Class A EQ biosolids), put "0."

Acres **permitted** in 2018:

2. Number of **acres applied** with your WWTP's biosolids in 2018. Enter just a number (your best estimate) - no ranges, commas, or text. If managed by a separate preparer, they should be able to provide you this information. If not known (for example: because not tracked for Class A EQ biosolids), then leave this blank.

Acres **applied** in 2018:

3. What **crop(s) or other vegetation** are grown with biosolids from your WWTP? Check all that apply.

- [ ] Hay or grass for animal feed, including grazing land or rangeland
- [ ] Corn for animal feed
- [ ] Corn for energy (e.g. ethanol)
- [ ] Wheat
- [ ] Soy
- [ ] Other grains / commodity crops (not wheat or soy)
- [ ] Canola or other oil crop for food
- [ ] Woody biomass energy plants, (e.g. willow, sudan grass, etc. - not oil crops)
- [ ] Oil crop for energy use
- [ ] Vegetables for human consumption (e.g. community gardens)
- [ ] Flowers, shrubs, decorative trees
- [ ] Turfgrass (golf courses, parks, lawns, sports field, etc. - not including highway and erosion control)
- [ ] Turfgrass, other vegetation for erosion control (e.g. along highways, stream banks, construction sites)
- [ ] Turf farming (sod production)
- [ ] Fruit trees / shrubs
- [ ] Trees for lumber and/or other wood products (not for biomass energy)
- [ ] Native vegetation / natural ecosystem (e.g. at mine reclamation sites)
- [ ] Other (please specify):

4. What is the **%N** (**nitrogen**) in your WWTP's final biosolids product(s) leaving the gate of your WWTP or leaving your separate preparer (2018 data)? Provide just a number (i.e., don't enter a % sign). Leave blank if not applicable or don't know.

% N of our Class A product:

% N of our Class B product:

5. What is the **%P (phosphorus**) in your WWTP's final biosolids product(s) leaving the gate of your WWTP or leaving your separate preparer (2018 data)? Provide just a number (i.e., don't enter a % sign). Leave blank if not applicable or don't know.

% P in our Class A product:

% P in our Class B product:

6. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

NEIWPCC's WWTP Biosolids Survey - 2018 Data

4. Core WWTP Biosolids Survey - Biosolids Quality

1. What was the **final sewage sludge/biosolids quality** produced at your facility in 2018? Enter the **PERCENTAGE (%)** of all that apply and be sure they total 100%. Provide just numbers (your best estimates) - no ranges or text or % sign.

% Class A EQ:

% Other Class A:

% Class B:

% Other, e.g., no data. Please explain in the next question:

2. What is the "Other" above? Please explain:

3. In 2018, did all of the solids from your facility meet EPA's highest quality **pollutant (metals) concentration limits**, as found in Part 503 - Table 3?

4. **In addition to Part 503 pollutants** (for example: metals), **are your biosolids tested for any of the following** (as of 2018)? Include any testing, whether or not it is required by regulation or permit or is voluntary. Check all that apply.

- [ ] We do not test for anything more than what is required by Part 503.
- [ ] Other metals (boron, silver...)
- [ ] Dioxins/furans
- [ ] PCBs
- [ ] Priority pollutants other than Part 503 pollutants and PCBs, e.g.: pesticides, PAHs, phenols, amines, plasticizers, etc. (https://www.epa.gov/sites/production/files/2015-09/documents/priority-pollutant-list-epa.pdf)
- [ ] Other organic compounds (PBDE flame retardants, pharmaceuticals, personal care products, etc.)
- [ ] Radioactive isotopes (alpha, beta, Ra 224, TENORM, etc.)
- [ ] Nutrients
- [ ] Alum or aluminum
- [ ] Pathogen reduction (Class A and/or B)
- [ ] Vector attraction reduction (VAR)
- [ ] PFAS (as of 2018)
- [ ] Microplastics (as of 2018)
- [ ] TCLP (toxicity characteristic leaching procedure)
- [ ] Paint Filter Liquids Test
- [ ] Other (please specify):

5. Is your facility under new NPDES permitting requirements (i.e. nutrients) that might increase sludge production (as of 2018)?

- ( ) Yes
- ( ) No

Other (please specify)

6. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

NEIWPCC's WWTP Biosolids Survey - 2018 Data

5. Core WWTP Biosolids Survey - Trends In Biosolids Management

1. Please **rank the importance of each** the following in decisions regarding the **management** of your WWTP's sludge or biosolids.

	Very important	Important	Neutral	Unimportant	Very unimportant - not even a consideration	N/A
Managing nutrients - such as phosphorus (P) and/or nitrogen (N) in biosolids and soils	○	○	○	○	○	○
Net energy use - including energy savings and renewable energy production	○	○	○	○	○	○

	Very important	Important	Neutral	Unimportant	Very unimportant - not even a consideration	N/A
Climate concerns - greenhouse gas emissions reductions	○	○	○	○	○	○
Nuisances - mitigating odors, dust, complaints	○	○	○	○	○	○
Capital costs - for infrastructure, new systems and technologies	○	○	○	○	○	○
Operating costs - annual operating budgets, avoiding rate increases	○	○	○	○	○	○
Financial resources - lack of $$ for new infrastructure, cash flow, can't raise rates, payback required	○	○	○	○	○	○
Community goals - meeting local policy goals, such as for energy, climate, costs, or quality	○	○	○	○	○	○
Managing contaminants/pollutants - how best to address trace chemicals, metals, etc.	○	○	○	○	○	○
Capacity - trying to keep ahead of growth, ensuring enough capacity to manage sludge/biosolids	○	○	○	○	○	○
Regulations - meeting regulatory requirements on biosolids, effluent, air quality	○	○	○	○	○	○
Generating revenue - for example: by taking in septage and outside wastes, selling electricity or renewable natural gas, etc.	○	○	○	○	○	○
Limited options - regulations or public pressures don't allow for one of the 3 options (application to soils, incineration, landfill disposal)	○	○	○	○	○	○
Employee resources - how much can be expected of employees, training needs	○	○	○	○	○	○
Core mission - cleaning water is the core mission of most WWTPs; how does biosolids management fit in?	○	○	○	○	○	○
Other - please specify below	○	○	○	○	○	○

Other (please specify):

2. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

NEIWPCC's WWTP Biosolids Survey - 2018 Data

6. Core WWTP Biosolids Survey - Thank You

* 1. We ask for your contact information so we can contact you if we have any questions. Your contact information will not appear in any public reports and will not be shared without your explicit consent.

Your Name:

Email:

Phone number:

* 2. **PRIVACY:** **Unless you provide permission below, your survey responses will be kept confidential and anonymous**; they will appear only in combination with other responses or as part of large datasets (for example: all WWTPs in your state), and your facility will not be specifically identified in any public reports produced by this project.

"I give permission for NEBRA/NEIWPCC to include in public reports my facility's name and/or the associated information that I have provided in this National Biosolids Data Project survey. This does not include my name and contact information."

NEIWPCC's WWTP Biosolids Survey - 2018 Data

7. Please complete the additional survey questions.

Thank you for completing the core survey of the National Biosolids Survey for 2018!

Now please answer the following additional groups of questions:

Just keep going to the next page or choose at the bottom of this page.

WWTP Infrastructure & Biosolids Treatment (30 mins)

These questions ask about:

- WWTP average flow (MGD)
- infrastructure improvements
- pressures on the biosolids program
- sludge storage & treatment processes
- dewatering & thickening equipment

Energy-Related Data (25 mins)

These questions ask about:

- current systems and/or future plans for energy efficiency & recovery
- anaerobic digestion
- biogas production
- pyrolysis and/or gasification

Economics of Biosolids (20 mins)

These questions ask about:

- biosolids operating budget
- biosolids use & disposal costs
- hauling distances
- tipping fees
- pricing of biosolids products
- FTEs & payroll

1. **Which set of questions do you want to do next?**

- ( ) WWTP Infrastructure & Biosolids Treatment
- ( ) Energy-Related Data
- ( ) Economics of Biosolids
- ( ) Back to the Instructions & Core Survey
- ( ) I've done them all!

NEIWPCC's WWTP Biosolids Survey - 2018 Data

8. WWTP Infrastructure & Biosolids Treatment

1. What is the **actual residential population** served by your facility? Do not include industrial flow equivalents. Enter just a number (your best estimate) - no commas, ranges, or text:

Actual residential population served:

2. **Permitted (or design) flow** (hydraulic capacity) of your facility (MGD). Enter just a number (your best estimate) - no commas, ranges, or text:

Permitted (or design) capacity (MGD):

3. Average ***dry weather* flow** in 2018 (MGD). Enter just a number (your best estimate) - no commas, ranges, or text:

Average *dry weather* flow (MGD):

4. Estimate the **volume of sludge or biosolids from other generators** received at your facility in 2018 (in gallons, wet metric tons, or wet U.S. tons). Do not include septage. Enter just numbers (your best estimate) - no commas, ranges, or text. Fill in for the measurement unit(s) that applies. Leave the other rows blank.

Gallons sludge/biosolids received in 2018:

Wet metric tons sludge/biosolids received in 2018:

Wet U. S. tons sludge/biosolids received in 2018:

5. Estimate the volume of **septage received** at your facility in 2018 (gallons per year). Do not include FOG - that goes in the next question. Enter just a number (your best estimate) - no commas, ranges, or text:

Septage received, gallons in 2018:

6. If you are **not** receiving septage, why?

- [ ] Facility is not capable.
- [ ] Not cost effective.
- [ ] Impairs design flow.
- [ ] Other (please specify):

7. Estimate the volume of **trucked-in wastes received** at your facility in 2018 (or waste piped-in through special pipes, not part of regular sewer system). For each kind of waste, indicate how much was fed directly into the WWTP headworks and how much was fed directly into the digesters (without going through the headworks). Enter just numbers (your best estimate) - no commas, ranges, or text, in gallons per year:

Landfill leachate - put into the WWTP headworks (gallons/year):

Landfill leachate - put directly into the anaerobic digester(s) (gallons/year):

FOG - fats, oils, grease - put into the WWTP headworks (gallons/year):

FOG - fats, oils, grease - put directly into the anaerobic digester(s) (gallons/year):

Food waste - put into the WWTP headworks (gallons/year):

Food waste - put directly into the anaerobic digester(s) (gallons/year):

Industrial waste - put into the WWTP headworks (gallons/year):

Industrial waste - put directly into the anaerobic digester(s) (gallons/year):

Slaughterhouse and/or farm waste - put into the WWTP headworks (gallons/year):

Slaughterhouse and/or farm waste - put directly into the anaerobic digester(s) (gallons/year):

Other (gallons/year - describe in next question):

8. What is "Other" above? Please describe:

9. Does your facility have an **active industrial pretreatment** program?

- ○ Yes
- ○ No

10. If "yes" to the last question, **how many industrial user permit-holders** (for example: with categorical standards and/or local limits, etc.) did the WWTP manage in 2018? Enter just a number (your best estimate) - no commas, ranges, or text.

Number of industrial user permit-holders: _____

11. **How long does your WWTP store sludge/solids/biosolids** at the WWTP, on average? For example, how long between cleanouts of sludge storage lagoons? Or how long do compost stockpiles sit at the WWTP? Or how long is sludge or biosolids stored in storage tanks before land application?

- ○ 0 - generally, sludge/solids/biosolids head out the WWTP gate right after they are processed (within days)
- ○ 1 - 3 months
- ○ ~6 months
- ○ ~9 months
- ○ ~1 year
- ○ ~2 years
- ○ ~3 years
- ○ ~5 years
- ○ ~10 years
- ○ ~15 years
- ○ ~20 years or more

Add comments:

12. Did your WWTP **extract phosphorus (P)** from the solids (for example: making struvite or similar fertilizer) in 2018? If so, how much in 2018 (dry U.S. tons)? Enter just a number - no commas or text.

Dry U.S. tons struvite or similar P fertilizer produced in 2018:

13. In what year was the **latest upgrade** (construction/replacement/improvement) for each of the following? Enter the year. For any that are not known or do not apply, leave blank.

Thickening systems:

Anaerobic digesters (tanks):

Anaerobic digestion accessories (covers, mixers, biogas management, etc.):

Aerobic digestion:

Composting:

Alkaline stabilization:

Other stabilization:

Drying:

Dewatering:

Conveyance within the WWTP:

Transporting and applying (trucks, landspreading equipment, etc.):

Incinerator(s):

Incineration accessories (conveyances, injectors, air emissions controls, etc.):

14. What do you consider to be the **top five (5) pressures** on your WWTP's biosolids management program, as of 2018? Read choices carefully and choose what fits best. Some categories, such as "agricultural issues," have more than one choice. "1" is the biggest pressure.

	1 - Biggest pressure	2	3	4	5 - Less pressure, but still in top 5
Tradition - It's difficult to change from known systems and infrastructure.	○	○	○	○	○
Tradition - WWTP isn't concerned where it goes; we just contract to have it disposed.	○	○	○	○	○
Tradition - Recycling biosolids is not a priority or part of the WWTP's core mission.	○	○	○	○	○
Cost - Disposal options are least expensive	○	○	○	○	○
Cost - Beneficial use options are least expensive	○	○	○	○	○
Cost – Rising costs generally	○	○	○	○	○
Regulations on Beneficial Use – Strict EPA and/or state regulation and enforcement	○	○	○	○	○
Regulations on Beneficial Use – Restrictive local ordinances	○	○	○	○	○
Regulations on Beneficial Use – Lack of regulatory support for beneficial use	○	○	○	○	○
Regulations on Disposal – Strict regulations or fees on disposal	○	○	○	○	○
Public Involvement - Concerns of neighbors, environmental groups, and others	○	○	○	○	○
Nuisance Issues – Managing issues related to odors, truck traffic, dust, etc.	○	○	○	○	○
Agricultural Issues - Declining farmland due to less agriculture or due to development, sprawl, seasonal restrictions, or competition with manures, etc.	○	○	○	○	○
Agricultural Issues - Soil compaction, difficulty with timing, stockpiling, etc.	○	○	○	○	○
Environmental Issues - Nutrient management, phosphorus (P), nitrogen (N)	○	○	○	○	○
Environmental Issues - Impacts to soils, organisms, public health, contaminants (PFAS, pathogens, metals, organic chemicals, etc.)	○	○	○	○	○
Management Issues - Securing long-term use options	○	○	○	○	○
Management Issues - The hassle of biosolids recycling / land application	○	○	○	○	○

	1 - Biggest pressure	2	3	4	5 - Less pressure, but still in top 5
Management Issues - Hauling distances	○	○	○	○	○

Other (please specify and add your rating from 1 - 5):

15. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

NEIWPCC's WWTP Biosolids Survey - 2018 Data

9. Biosolids Treatment Practices

1. Which of the following **treatment practices** were used at your WWTP in 2018? Fill in all that apply, providing the **% (percent) of your facility's total sludge that goes to each.** Provide just numbers (your best estimates) - no ranges or text or % sign. Leave blank if not applicable or

don't know. We understand that your numbers may add up to something other than 100%, because sludge may go to two or more of the following.

% of sludge to **Aerobic digestion—Class A** (ATAD or other):

% of sludge to **Aerobic digestion—Class B:**

% of sludge to **Anaerobic digestion of sludge only—Class A** , e.g. thermophilic:

% of sludge to **Anaerobic digestion of sludge only—Class B,** e.g. mesophilic:

% of sludge to **Co-digestion—Class A**, of sludge with FOG, food waste, glycol, etc.:

% of sludge to **Co-digestion—Class B,** of sludge with FOG, food waste, glycol, etc.:

% of sludge to **Lime/alkaline—Class A:**

% of sludge to **Lime/alkaline—Class B:**

% of sludge to **Composting** (if not Class A, specify in comment box below):

% of sludge to **Thermal/heat drying** (not incineration, gasification, or pyrolysis):

% of sludge to **Gasification**:

% of sludge to **Pyrolysis:**

% of sludge to **Hydrolysis** (thermal, chemical, etc.):

% of sludge to **Long-term storage** (lagoons, reed beds, etc.):

% of sludge to **Oxidation ditch/extended aeration:**

% of sludge to some **Other stabilization technology** (specify in the next question):

% of **Biosolids sold in bags** (e.g. Milorganite):

2. What is the "Other stabilization technology" above? Please describe:

3. What was the percentage of **primary sludge compared to total sludge** (primary plus waste activated sludge), generated at your WWTP in 2018? Move the slider to show what percentage was primary sludge. *Leave blank if unable to answer.*

0 % % of primary sludge in 2018 100 %

4. Regarding dewatering technology used at your facility in 2018, what percentage (%) of your facility's total sludge (primary + WAS) was processed with each of the following? Fill in all that apply and provide the **% (percent) of your facility's total sludge that goes to each** . Provide just numbers (your best estimates) - no ranges or text or % sign. Leave blank if not applicable or don't know.

% of sludge to **Belt filter press:**

% of sludge to **Plate and frame press:**

% of sludge to **Screw press:**

% of sludge to **Centrifuge**:

% of sludge to **Vacuum filter:**

% of sludge to **Drying beds:**

% of sludge to **Solar drying:**

% of sludge to **Other dewatering technology** (specify in the next question):

5. What is the "Other dewatering technology" above? Please describe:

6. Regarding thickening technologies used at your facility in 2018, what percentage (%) of your facility's sludge (primary + WAS) was processed with each of the following? Fill in all that apply and provide the **% (percent) of your total biosolids that goes to each** . Provide just numbers (your best estimates) - no ranges or text or % sign. Leave blank if not applicable or don't know.

% of sludge to **Gravity thickener (**i.e. tanks):

% of sludge to **Gravity belt thickener (**GBT):

% of sludge to **Centrifuge** (for sludge thickening):

% of sludge to **Dissolved air flotation** (DAF):

% of sludge to **Other thickening technology** (specify in the next question):

7. What is the "Other thickening technology" above? Please describe:

8. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

9. **Which set of questions do you want to do next?**

- Energy-Related Data
- Economics of Biosolids
- Back to the Instructions & Core Survey
- I've done them all!

NEIWPCC's WWTP Biosolids Survey - 2018 Data

10. Energy-Related Data

1. Is your WWTP planning to become **energy net zero** (able to meet all WWTP energy needs by producing renewable energy from biosolids and co-processed wastes)?

- ○ Yes
- ○ No
- ○ Maybe (e.g. possible long-term goal)
- ○ We have already achieved this goal!

2. **Which of the following is your WWTP focusing on mostly?** Please check all that apply.

- ☐ **We are not focusing on energy consumption or generation.**
- ☐ **Energy efficiency** in wastewater and biosolids processes (for example: air blower or pump replacements, installing more efficient boilers, etc.)
- ☐ Renewable **energy from wind, solar, tidal**
- ☐ Renewable **energy from wastewater** (capturing heat or kinetic energy)
- ☐ Renewable **energy from biosolids - anaerobic digestion & biogas**
- ☐ Renewable **energy from biosolids - pyrolysis, gasification**
- ☐ Renewable **energy from incineration** of solids
- ☐ Renewable **energy from landfilled or injected** sludge/biosolids
- ☐ Other (please specify):

3. **If your WWTP has considered anaerobic digestion (AD) or has AD** , please **indicate your level of agreement** with each of the following statements relating to barriers to your WWTP's use of biogas:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Don't know &/or Not Applicable
Our **core business objective** is to produce clean water and comply with our NPDES permit. CHP (*combined heat and power*) is not part of our core objective.	○	○	○	○	○	○
The **payback** on the investment is not adequate.	○	○	○	○	○	○
Our **electricity is too cheap** to justify the investment.	○	○	○	○	○	○
We cannot obtain an **air permit** for CHP.	○	○	○	○	○	○
Adding CHP will push us into having to get a federal **Clean Air Act Title V** permit.	○	○	○	○	○	○
There are other, more pressing needs for our **limited capital dollars.**	○	○	○	○	○	○
The equipment is **too expensive to buy.**	○	○	○	○	○	○

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Don't know &/or Not Applicable
The equipment is **too expensive to own/operate.**	○	○	○	○	○	○
New equipment will require us to hire **specialized operations and maintenance staff.**	○	○	○	○	○	○
Biogas treatment and/or CHP are **too complicated.**	○	○	○	○	○	○
Our **WWTP does not produce enough gas.**	○	○	○	○	○	○
Our **WWTP is too small.**	○	○	○	○	○	○
The required **equipment does not work/will not last.**	○	○	○	○	○	○
CHP will produce more CO2 and might get us into **greenhouse gas trouble.**	○	○	○	○	○	○
Adding a "stationary combustion" device could subject us to **greenhouse gas regulation.**	○	○	○	○	○	○
Our utility **Board / Commissioners would never be willing** to pay for such a costly upgrade.	○	○	○	○	○	○
We can't get the **political support** needed for this kind of project.	○	○	○	○	○	○
The local **natural gas utility is not willing to work with us**, even if we clean the biogas to their standards.	○	○	○	○	○	○
Our local **electricity utility makes it too difficult** for us to generate power onsite for our own use.	○	○	○	○	○	○
Our local **electricity utility prevents us** from easily benefiting from **sale of renewable energy credits.**	○	○	○	○	○	○
Our local **electricity utility makes it too difficult** for us to **sell produced renewable power back to the grid.**	○	○	○	○	○	○
Utilizing biogas would **reduce our dependency on purchased heat and electricity**, thus reducing our operating costs.	○	○	○	○	○	○
Utilizing biogas would **reduce our "carbon footprint"** (greenhouse gas emissions).	○	○	○	○	○	○

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Don't know &/or Not Applicable
There are many **recent advances in gas treatments** that have made it easier and safer to use biogas.	○	○	○	○	○	○
Some states are providing **incentives for renewable energy projects, and we should be able to get a grant** to help install biogas utilization systems.	○	○	○	○	○	○
The prices of natural gas and electricity are likely to rise, and **if we used biogas, we could more easily predict our operating costs.**	○	○	○	○	○	○
We do not know enough about the **technical merits of CHP.**	○	○	○	○	○	○
We do not know enough about the **financial merits of CHP.**	○	○	○	○	○	○
We have a good energy management program.	○	○	○	○	○	○
Safety issues associated with generating biogas on-site make it undesirable.	○	○	○	○	○	○
Our biogas is **not of adequate quality** for CHP use.	○	○	○	○	○	○

Other (please explain):

4. **Annual energy generation** from your WWTP's biosolids energy recovery system(s) (megajoules/year in 2018, MJ/year). Fill in all that apply. Conversion: 1 kWh = 3.6 MJ

Electricity (MJ in 2018):

Heat (MJ in 2018):

RNG to fuel (MJ in 2018):

RNG to pipeline (MJ in 2018):

Other (please describe in the next question):

5. What is the "Other" above? Please describe:

6. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

* 7. **Does your WWTP use ANAEROBIC DIGESTION (AD) or GASIFICATION or PYROLYSIS to treat sludge/solids?**

- Yes
- No

NEIWPCC's WWTP Biosolids Survey - 2018 Data

11. Anaerobic Digestion & Biogas (for Gasification & Pyrolysis, skip to last 2 questions)

1. **Anaerobic digestion capacity in 2018** (total AD tankage available, whether being used or not, in gallons). Enter just a number (your best estimate) - no commas, ranges, or text. Enter zero (0) if no AD.

Total AD tankage capacity (gallons):

2. What percentage of the above AD capacity was in use in 2018? Move the slider to show what percentage was used. Leave blank if unable to answer.

% of AD capacity used in 2018

0 % used 100 % used

3. Does your WWTP have **excess AD capacity** that could be utilized for co-digestion of food waste, FOG, or other outside wastes?

- Yes
- No
- Maybe

4. Total quantity of **biogas produced** in 2018, including biogas used or flared (standard cubic feet, scf/year). Enter just a number (your best estimate) - no commas, ranges, or text.

Biogas produced (scf in 2018):

5. Quantity of **biogas flared** (scf/year in 2018). Provide your best estimate. You can ignore incidental biogas leakage or release. Enter just a number (your best estimate) - no commas, ranges, or text.

Biogas flared (scf in 2018):

6. **How is biogas utilized?** Please check all that apply.

- [ ] **Not utilized. All biogas is flared**.
- [ ] **Heat digester(s)**
- [ ] **Run machinery** in plant
- [ ] Used by **HVAC**
- [ ] **Compressed natural gas** used on site
- [ ] Upgraded to renewable natural gas (RNG) and **injected into pipeline**
- [ ] Upgraded to renewable natural gas (RNG) and **used to fuel fleet or other vehicles**
- [ ] Generate electricity from **internal combustion engine** (ICE)
- [ ] Generate electricity from **turbine**
- [ ] Generate electricity from **microturbine(s)**
- [ ] Generate electricity from **Stirling Cycle**
- [ ] Generate electricity from **fuel cell**
- [ ] **Combined heat and power (CHP)**
- [ ] **Supply electricity to the grid**
- [ ] **Generate hydrogen** (e.g. for transportation)
- [ ] Other (please specify):

7. If your WWTP **upgraded part(s) of your AD system** in the past 10 years, please briefly describe what was done and how much the project cost:

8. Quantity of **SYNGAS produced** from pyrolysis/gasification (scf/year in 2018). Enter just a number (your best estimate) - no commas, ranges, or text.

Syngas produced (scf in 2018):

9. Quantity of **BIO-OIL produced** from pyrolysis or other process (gallons/year in 2018). Enter just a number (your best estimate) - no commas, ranges, or text.

Bio-oil produced (gallons in 2018):

10. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

11. **Which set of questions do you want to do next?**

- WWTP Infrastructure & Biosolids Treatment
- Economics of Biosolids
- Back to the Instructions & Core Survey
- I've done them all!

NEIWPCC's WWTP Biosolids Survey - 2018 Data

12. Economics of Biosolids

1. What was your **WWTP's total operating budget for 2018** (U.S. $)? Enter just a number - no punctuation or symbols (e.g. no $). You best estimate is fine, rounded to the nearest whole dollar. Count your zeros carefully!

WWTP total budget in 2018 ($):

2. **Total cost for sludge/biosolids treatment and end use/disposal** at your WWTP in 2018 (U.S. $). Sludge/solids treatment begins when sludge/solids are removed from the clarifiers. It includes thickening, stabilization, dewatering, transportation, end use, and/or disposal. Subtract any revenues (e.g. from sales of biosolids products). Please describe in the next question what you have included. For this question, enter just a number (rounded to the nearest whole dollar), no commas or $ - your best estimate is fine. This might be the biosolids portion of your 2018 operating budget.

Net total cost for biosolids treatment, end use, disposal in 2018 ($):

3. Please list **what is included in your estimate** above of the total cost of sludge and biosolids management:

4. How much does your WWTP **expect to invest in biosolids** treatment and management infrastructure in the next 5 years? Include only capital and/or upgrade and/or large maintenance projects. Do not include the costs of normal continuing operations. Provide you best estimate in U.S. $ (rounded to the nearest dollar). Enter just a number, no commas or symbols.

New investments in biosolids in the next 5 years ($):

5. **Average cost per wet U.S. ton or average tipping fee per wet U.S. ton** for biosolids use/disposal in 2018. Do not include hauling/trucking costs. Enter U.S. $ amounts (rounded to the nearest whole dollar) for any of the following outlets that you use. Enter just a number, no commas or $.

Total contracted fee for solids removal and management (average $/wet U.S. ton leaving the WWTP gate in 2018):

Landfill tipping fee, not including hauling cost ($/wet U.S. ton in 2018):

Incinerator tipping fee, not including hauling cost ($/wet U.S. ton in 2018):

Land application tipping fee for farm, forest, reclamation, etc. land application, not including hauling cost ($/wet U.S. ton in 2018):

Compost facility tipping fee, not including hauling cost ($/wet U.S. ton in 2018):

Anaerobic digestion off-site tipping fee, not including hauling cost ($/wet U.S. ton in 2018):

Other off-site use or disposal option tipping fee, not including hauling cost ($/wet U.S. ton in 2018; please describe in next question):

6. What is the "Other" above? And add any additional explanations here:

7. **Transport/hauling distance(s)** to biosolids end use/disposal site(s) in 2018 - **miles <u>one way</u>** from WWTP. Fill in all that apply. Enter just numbers (rounded to the nearest whole mile).

Zero (0) miles because **we manage all biosolids on site**, for example: lagoon storage or compost use at WWTP (enter 0):

Average one-way distance to **landfill** (miles):

Average one-way distance to **incinerator** (miles):

Average one-way distance to **farm, forest, and reclamation, etc. land application site(s)** (miles):

Average one-way distance to **composting facility** off-site (miles):

Average one-way distance to **anaerobic digestion** off-site (miles):

Average one-way distance to **alkaline stabilization** off-site (miles):

Average one-way distance to **other off-site use or disposal option** (miles; please explain in next question):

Average one-way distance for **delivery of final product** (for example: compost) to largest customers (miles):

8. What is the "other" option above? And add any other explanations here:

9. Regarding **biosolids product pricing** in 2018, what is the price charged for your WWTP's biosolids? (average U.S. $/cubic yard or average $/wet U.S. ton in 2018). Fill in all that apply. If the biosolids are free, put "0." If the user is paid to take them, put in a negative price (for example: -$5). Enter just numbers, no commas or $.

What a **wholesale biosolids compost** customer (soil broker, landscaper, garden supply center, etc.) pays for biosolids compost, $/cubic yard:

What a **retail biosolids compost** customer pays for biosolids compost, $/cubic yard:

What a **retail bagged biosolids product** customer pays for bags of heat-dried pellets or other biosolids, $/typical bag of ~40 pounds/40-quarts/1.4 cu. ft:

What a **farmer/landowner** pays for **bulk Class A biosolids or ton-bags**, $/wet or as-is ton:

What a **farmer/landowner** pays for **bulk Class B biosolids** to farms, forest, reclamation, etc. land application, $/wet or as-is ton:

10. **Septage disposal fee(s)** you charge for septage disposal at your WWTP (U.S. cents/gallon) in 2018. Enter just the number of **cents per gallon** (e.g. 5), no text or symbols. Fill in all that apply:

Septage disposal fee **special pricing** (for example: for septage from in-town, etc.), cents/gallon:

Average general septage disposal fee for everyone else, cents/gallon:

11. **Number of employees in your organization (WWTP)** working on sludge and biosolids treatment and end use/disposal (full-time equivalents, or FTEs). Enter just a number (your best estimate) - no ranges or text. If someone works half-time on biosolids and half-time in the lab, they are considered .5 FTE for biosolids. Do not include administrative and management staff time; just include those people whose job descriptions include sludge/biosolids focus.

# of FTEs on sludge and biosolids treatment and end use/disposal:

12. Regarding **biosolids payroll**, please estimate the total payroll (salary and benefits in U.S. $) paid by your organization (WWTP) in 2018 for the biosolids FTEs included in the question above. Enter just a number, no commas, ranges or text.

Total sludge and biosolids treatment and management payroll in 2018 ($):

13. Explanations and comments on any of the questions on this page (please indicate the question number referred to, for example: "Q1: ____"):

14. **Which set of questions do you want to do next?**

- WWTP Infrastructure & Biosolids Treatment
- Energy-Related Data
- Back to the Instructions & Core Survey
- I've done them all!

NEIWPCC's WWTP Biosolids Survey - 2018 Data

13. Privacy

* 1. **We repeat this privacy question because you have provided additional information.** Your response here overrides your earlier response. Unless you provide permission below, your survey responses will be kept confidential and anonymous.

"I give permission for NEBRA/NEIWPCC to include in public reports my facility's name and/or the associated information that I have provided in this National Biosolids Data Project survey."

* 2. **~ $500 GIFT CARD RAFFLE ~**

For filling out all of the survey, you'll be entered for a chance to win $500 to the eatery of your choice for you and staff.

- Yes, please enter me in the raffle.
- No thanks.

NEIWPCC's WWTP Biosolids Survey - 2018 Data

14. End of Survey

Thank you for completing this survey for NEIWPCC and the National Biosolids Data Project! We value your work, your time, and your knowledge - thank you for dedicating some of it to this national effort.

If you need to make changes, you can come back any time before April 30, 2021 and make changes to your answers *using the same computer.*

APPENDIX B – QUALITY ASSURANCE PROJECT PLAN

A. Project Management

A1. Title and Approval

Quality Assurance Project Plan Regional Sludge Generation Estimate

Prepared by: Christina E. Stringer, NEIWPCC

March 10, 2021
Version 1.0

NEIWPCC QAPP ID: Q21-014
NEIWPCC Job Cost Code: 0100-332

A1.1. Signature Page

Prepared by: _____ Date: 03/10/2021

Dr. Christina E. Stringer, Director of Wastewater and Onsite Programs
NEIWPCC

Approved by: _____ Date: 3/10/2021

Peter Zaykoski, Quality Assurance Program Manager
NEIWPCC

A2. Table of Contents

A2.1. Document Control Information

Revised By	Date	Version	Summary of Changes

A3. QAPP Distribution List

The following NEIWPCC staff will need to be included on the QAPP distribution list:

Name	Title	Contact Information
Peter Zaykoski	Quality Assurance Program Manager	pzaykoski@neiwpcc.org
Alexandra Atkinson	Assistant Information Officer	qapps@neiwpcc.org
Christina Stringer	Director of Wastewater & Onsite Programs	cstringer@neiwpcc.org
Jennifer Lichtensteiger	Environmental Analyst	jlichtensteiger@neiwpcc.org
James Plummer	Environmental Analyst	jplummer@neiwpcc.org

A4. Project Organization and Responsibilities

The following NEIWPCC staff are involved in this project. The two Environmental Analysts report to the Director of Wastewater & Onsite Programs.

Name	Title	Role
Christina Stringer	Director of Wastewater & Onsite Programs	Project Manager & QA Officer[1]- project oversight, maintenance and distribution of the QAPP
Jennifer Lichtensteiger	Environmental Analyst	Data aggregation and subject matter expert
James Plummer	Environmental Analyst	Survey response collection & data aggregation
Peter Zaykoski	Environmental Analyst/Quality Assurance Program Manager	Review and approve QAPP and any subsequent versions

[1] Christina Stringer will be performing both the Project Manager and QA Officer roles for these activities. Hereafter, will be referred to as "Project Manager."

A5. Problem Definition/Background

The northeast sewage sludge management infrastructure is experiencing both short-term and long-term stressors that are impacting the system's available capacity. Specifically, the Coronavirus pandemic, aging incinerators, and emerging contaminants are causing the simultaneous, unanticipated potential losses of a number of primary sludge management alternatives.

The sludge generation and management community have proven resilient in their ability to quickly recover from stressors and provide the required and necessary services. However, these recent issues have brought to light deficiencies in wastewater sludge treatment, transportation, and disposal options and the need to develop and modernize sewage sludge management infrastructure (and related appurtenances, such as storage).

Our region's reliance on only a few incinerators, landfills, or beneficial reuse (e.g., land application, composting) options has led to the following significant issues.

- **Local capacity**: Expected or unexpected shutdowns of incinerators, landfills, and land application (or other beneficial reuse) require backup plans and regional coordination to address immediate needs for statewide and region-wide sludge disposal. The expense to develop and use such backup plans may cause privately-run facilities such as incinerators to seek to slow the input of sludge into secondary transportation and disposal systems. Thus, local wastewater treatment facilities (WWTFs) may be asked to store biosolids at their facilities or reduce their biosolids removal processes, which may result in difficulty maintaining NPDES (or state-administered) permit compliance. This has recently occurred in Rhode Island, requiring RIDEM to intervene. In addition, the coronavirus pandemic disruption of the economy has led to the reduced volume of construction material at landfills and composting facilities. Construction material is necessary to mix with high liquid content sludge for safe placement within landfills and as an amendment to composting materials. This reduction has caused facilities to reduce the acceptance of sludge at landfills in Rhode Island.
- **Regional capacity**: This concern has been compounded with the closure of several northeast sludge incinerators due to more stringent EPA air standards and the implications of per- and polyfluorinated alkyl substances (PFAS). Currently available sludge disposal options do not address destruction of the PFAS group of chemicals. With public awareness and outcry driving quick regulatory actions regarding PFAS, the trace amounts detected in wastewater solids have led to several states (VT, NH, ME) currently having restrictions on land applications. With pending legislation and legal responsibility uncertainties, many landfills have become risk averse, either reducing or altogether stopping the acceptance of sludge containing PFAS.
- **WWTF plant operations**: Reliance on land application and incineration for several decades has resulted in a reduction in sludge dewatering systems at wastewater facilities as well as a lack of operators skilled at operating a facility with sludge dewatering. An entire generation of operators has entered management positions with little or no experience in dewatering sludge, a critical element of wastewater treatment.
- **State coordination:** While NEIWPCC recognizes that these issues aren't currently the direct responsibility of our states, they have an active interest in ensuring regional needs

are proactively addressed to prevent enforcement actions and threats to clean water in the future. For example, with state programs throughout New England having various regulatory priorities dealing with incinerator shutdowns and other issues, sludge producers may request emergency consideration for disposal options within each of NEIWPCC's member states. The review and approval/denial process may shift staff time from other important functions.

Overall, there is a need for more reliable and cost effective sludge management alternatives for the Northeast region. The first step to working through these issues and developing recommended actions is to have a clear picture of the quantity and characteristics of sludge being produced across New England and New York. This information will be an important foundation for discussions on regional approaches to management, as well as assist states in planning for future permitting needs. Once an assessment is completed, we envision the next steps will be to assess the current facility capacities to begin to develop recommendations for both short- and long-term actions. The tasks, deliverables and approach to quality management described in this task only encompass the initial assessment of sludge generation and do not apply to any resulting short- or long-term planning or actions.

A6. Project/Task Description

A6.1. Deliverable(s)

The Massachusetts Clean Energy Center (MassCEC) commissioned a sludge survey for the state in 2018, with the final report published in 2019. This effort[2] used an online survey and direct communications with facility managers and operators. Eighty-five responses were received, representing 96% of the average daily wastewater flows at MA WWTFs – including all of the largest facilities (greater than (>) 5 million gallons per day, or MGD). The final report concluded that, based on MA survey respondents, regional collaboration might be a viable approach to strengthening sludge management markets.

Similarly, the USEPA funded a grant administered by the Green Blue Institute to develop a 2nd National Biosolids Regulation, Quality, End Use & Disposal Survey (National Biosolids Survey). This project, which is managed by Northeast Biosolids and Residuals Association (NEBRA), completed a literature survey, developed and pilot tested online survey questions for both WWTFs and state biosolids coordinators, and is poised to conduct the National Biosolids Survey (collecting 2018 data) this fall.

NEIWPCC is conducting a joint project with the National Biosolids Survey to collect and include data at a regional level from the other 6 NEIWPCC states. NEIWPCC will convene a stakeholder advisory committee to provide input and direction on the project work. NEIWPCC will also create a repository of PFAS wastewater sampling and analysis data collected within NEIWPCC states to facilitate communication and cooperation at the regional level.

NEIWPCC also plans to conduct a comparison, evaluating sludge generation data from 2018 and 2019 for two states to evaluate the effects of PFAS regulations, and continually aging

[2] The Mass Sludge Survey 2018 v 1.1: Wastewater Solids Generation and Management in Massachusetts. Northeast Biosolids and Residuals Association for the Massachusetts Clean Energy Center. December 2019.

infrastructure, on sludge management. Providing this information for Massachusetts, who already has 2018 data collected, and Maine, would provide an interesting picture for two states, who, while quite different in demographics, are both currently tackling sludge management issues.

Obtaining a regional snapshot of wastewater solids generation and management has the potential to be the foundation for many pertinent and timely discussion topics, including:

- Determination of regional needs and problems surrounding sludge management
- Evaluation of whether or not there is a demand for a regional facility
    - Economic feasibility of a regional facility
    - Inform the specifics needed for regional facility design
- Identification of options for facilities that don't have contingency plans

A6.2. Description

1. **Introductory Stakeholder Meeting-** NEIWPCC has convened a stakeholder advisory committee comprising of state program staff, EPA Region 1 and 2 staff, NEBRA staff, professional organizations (e.g., NEWMOA, NESCAUM), and representatives from the funding entities. This group advises on the work progress and help frame and shape the project. NEIWPCC plans to organize and host an introductory meeting allowing the advisory committee to come together to discuss project goals and objectives. Discussion will focus on clarifying data needs and appropriate outputs to meet states' goals- ensuring that the work conducted is useful and beneficial to the region.
2. **Administer National Biosolids Survey in Northeast -** NEIWPCC will administer both the state and wastewater treatment plant surveys within the seven NEIWPCC states. The National Biosolids Survey project developed an online survey (using SurveyMonkey) with review and input from Advisors[3], and conducted pilot tests of the two surveys. For consistency, we propose to use the data fields already established by the National Biosolids Survey, with small additions based on Advisory Committee input. NEIWPCC will monitor responses with a goal of obtaining data representing 95% of the average daily wastewater flows at each state's WWTFs. If a state does not meet this goal, NEIWPCC will attempt to contact sludge management facilities that do not respond to collect their information. NEIWPCC will accomplish this by using our database of regional wastewater treatment facilities and operators and working closely with the appropriate state agencies to develop an inclusive list of facilities and contact information. Example data fields are listed below and the complete survey is included in Attachment 1:
    a. Facility name, state, contact information
    b. Sludge/solids/biosolids quantities that left facility in 2018

[3] Advisors comprised of federal and state officials involved in biosolids management, biosolids managers at wastewater utilities, two researchers, a private sector service provider, a consulting engineer, and a national association director.

i. Respondent selects units (e.g., dry U.S. tons, wet U.S. tons, cubic yards)

ii. Average % solids

iii. Sludge/solids and thickening

c. Quantity of septage accepted

d. Recent sludge management/disposal destinations and costs

e. Expected changes to items above, within next 10 years (e.g., due to projected population changes)

f. Plant processes and programs

i. Nitrification/Denitrification

ii. Phosphorous removal

iii. Active industrial pretreatment program

g. Potential interest in access to an in-state sludge management facility

h. Potential interest in exploring or participating in the development of a regional sludge management facility

i. Because 2018 data was already collected for Massachusetts, NEIWPCC proposes to request 2019 data from Massachusetts facilities. This will offer a unique opportunity, through comparison with the 2018 baseline data, to evaluate whether New England PFAS regulations and aging infrastructure have begun impacting sludge management alternatives. Additionally, NEIWPCC proposes to conduct this same 2018 and 2019 comparison in Maine, to compare and contrast with Massachusetts and provide a well-rounded case study.

3. **Aggregation of Information & Final Report-** NEIWPCC will review the collected input, and create a summary report, with results, at a minimum, organized as listed below. Final report content will be guided by check-ins with advisory committee and goals/objectives and data needs identified in our introductory stakeholder meeting.

a. Aggregated, regional figures

i. 2018 volume of material generated

ii. 2018 volumes to each type of disposal or use

iii. Sludge destinations; characteristics of those facilities

iv. Estimate annual volumes of regional sludge to specific destinations

b. Common themes expressed by plant personnel responsible for sludge management

c. Geographic groups reflecting proximity/transportation factors

d. Annual tonnages represented by hypothetical groupings of facilities

e. Comparison between 2018 and 2019 data collected for Massachusetts and Maine

4. **Closing Stakeholder Meeting-** NEIWPCC will hold a final meeting to present final report results to stakeholders and funding entities. This gathering would also allow for extensive discussion on the results, identification of next steps, and future needs, creating a platform for further regional cooperation.

5. **PFAS Wastewater Data Repository** – NEIWPCC will request, collect, and create a repository of PFAS wastewater sampling and analysis data from our member states. Several Northeast states require sampling of wastewater influent, effluent, residuals, biosolids, compost, septage, soil (from land application fields), monitoring wells (in the vicinity of land application fields), and/or drinking water wells (in the vicinity of land application fields) in accordance with permits. NEIWPCC will contact each state to request PFAS wastewater results and upload data tables and/or reports in their raw format to Microsoft Teams. NEIWPCC will also develop a spreadsheet index of wastewater sample type and list the data table or report filename. This effort isn't meant to replace or duplicate the EPA's efforts to collect PFAS data into a national, searchable database. Rather, NEIWPCC envisions this to be a regional opportunity for exchanging more detailed information that is often not included in large-scale databases.

A6.3. Schedule

Task #	Task Title	Description	Start Date	End Date
1	QAPP Development & Maintenance	Quality assurance plan constructed, approved by QAPM and maintained by Project Manager throughout life of project	03/01/2021	12/31/2021
2	Introductory Stakeholder Meeting	Introductory meeting held to review and identify state needs.	11/9/2020	11/9/2020
3	Administration of National Biosolids Survey	Distribute National Biosolids Survey to WWTFs and State Biosolids Coordinators, providing assistance as needed.	03/15/2021	04/30/2021
4	Aggregate Data & Complete Final Report	Collect, organize, and analyze data. Produce summary report for stakeholders.	05/01/2021	12/31/2021
5	Closing Stakeholder Meeting	Closing meeting to review data, final report, and next regional steps.	TBD	12/31/2021
6	PFAS Wastewater Data Repository	Collect PFAS wastewater results and upload in their raw format to Microsoft Teams. Develop a spreadsheet index information collected.	11/9/2020	12/31/2021

A6.4. Geographical Locations

This work is being conducted by NEIWPCC staff in the Lowell, MA office. Data is being gathered from facilities in all seven NEIWPCC member states.

A6.5. Resources and Time Constraints
Not applicable

A7. Quality Objectives and Criteria
This data will be used by NEIWPCC's member states as the foundation for many pertinent and timely discussion topics related to biosolids, including state and regional needs/issues surrounding sludge management. The survey questions have been designed specifically with these goals and state needs in mind, with direct input from member states. All survey materials are included in Appendices I-III.

The data being collected is secondary data that is already being generated to support WWTF operations and meet the requirements of any applicable discharge permits for that facility. Because of these external regulatory requirements, the data must already meet permit requirements.

NEIWPCC will be obtaining data representing 95% of the average daily wastewater flows at each state's WWTFs. By soliciting responses from each WWTF within each state, we are guaranteeing that our sample is representative of the entire population.

A8. Special Training/Certification
No special training or certification is required by any staff participating.

A9. Documentation and Records
All survey data, the surveys themselves, and relevant process documentation will be preserved in electronic format in password-protected folders, drives, servers and/or applications supported and backed up by NEIWPCC.

Upon project completion, electronic copies of all data files, relevant research process documentation and final report deliverables will be provided to the appropriate parties.

The Project Manager is responsible for creating the QAPP and maintaining compliance with the QAPP. If there are any changes to the QAPP, revisions must first be approved by the QA Program Manager and shared with the entire distribution list by the Project Manager before data collection resumes.

B. Data Generation and Acquisition

B1. Sampling Process Designing (Experimental Design)
The survey will be distributed to all WWTF (Appendix I) in our 7 member states, as well as to each state's biosolids coordinator (Appendices II-III). NEIWPCC will accomplish this survey using the Survey Monkey online platform, disseminating survey instructions and appropriate links through email. Distribution lists will be developed using our database of regional wastewater treatment facilities/operators and working closely with the appropriate state agencies to develop an inclusive list of facilities and contact information. We anticipate approximately 1,750 surveys will be distributed. The survey goal is to obtain data representing 95% of the average daily wastewater flows at each state's WWTFs. If a state does not meet this goal, NEIWPCC will attempt to contact sludge management facilities that do not respond to collect their information, via email and phone.

B2. Sampling Methods
Not Applicable

B3. Sample Handling and Custody
Not Applicable

B4. Analytical Methods
Not Applicable

B5. Quality Control
Relevant data and documentation will be fully documented as to source, quality, and history. Data quality control reviews will be conducted by the Project Manager. Project staff will review submissions for repeat responses utilizing email addresses, IP addresses and timings (e.g., by mistake). Any worrisome responses will be reviewed/analyzed and appropriate steps taken to remove duplicate or fraudulent responses.

B6. Instrument/Equipment Testing, Inspection and Maintenance
Not applicable

B7. Instrument/Equipment Calibration and Frequency
Not applicable

B8. Inspection/Acceptance for Supplies and Consumables
Not applicable

B9. Non-Direct Measurements
NEIWPCC will request, collect, and create a repository of PFAS wastewater sampling and analysis data from our member states. NEIWPCC will contact each state to request PFAS wastewater results and upload data tables and/or reports in their raw format to Microsoft Teams. NEIWPCC will also develop a spreadsheet index of wastewater sample type and list the data table or report filename. This is meant to be a regional opportunity for exchanging more detailed information that is often not included in large-scale databases.

B10. Data Management
The NEIWPCC Project Manager will be responsible for organization and oversight of data collection, management, storage, and processing. Data will be documented, secure and accessible to appropriate project staff during the project period and for five years after the project end date.

All project documents and data will be stored in password-protected devices and/or applications for the life of the project and for five years following project completion. All electronic files are backed up on an ongoing basis through the NEIWPCC's backup servers.

Project documents and data will be available in Microsoft Suite product formats including Word and Excel/CSV spreadsheets. Any documents or data in paper format will transitioned to electronic format via scanning, data entry or other means before being properly disposed of.

C. Assessment and Oversight

C1. Assessments and Response Actions

NEIWPCC may implement, at their discretion, various audits or reviews of this project to assess conformance and compliance to the quality assurance project plan in accordance with the NEIWPCC Quality Management Plan. NEIWPCC may issue a stop work order and require corrective action(s) if nonconformance or noncompliance to the Quality Assurance Project Plan is found.

C2. Reports to Management

While no specific QA/QC reports are required for this project, the final project report, shared with the stakeholders and with NEIWPCC Commissioners, will address and outline any data concerns. The final report will also be provided to the Quality Assurance Program Manager for their records.

D. Data Validation and Usability

D1. Data Review, Verification and Validation

The data will be reviewed for logical consistency and any entry errors in survey responses. The Project Manager will be responsible for overall validation and final approval of the data in accordance with project purpose and use of the data.

D2. Verification and Validation Methods

The Project Manager will provide review and approval of the data before closure of the project. Datasets lacking appropriate responses will not be used in any reporting or delivered to stakeholders.

D3. Reconciliation with User Requirements

The Project Manager will conduct ongoing reviews of the data quality to determine if they fall within acceptable limits. Any known limitations and uncertainty of the data will be discussed with the Stakeholder Advisory Committee and documented within the project final report.

E. References

Not Applicable

F. Appendices

F1. Appendix I- WWTF Survey (attached document)

F2. Appendix II- State Biosolids Coordinator Qualitative Survey (attached document)

F3. Appendix III- State Biosolids Coordinator Quantitative Survey (attached document)

APPENDIX C – STATE SUMMARIES

Connecticut Biosolids Summary

2018 Biosolids End Use & Disposal Total: **138,248 dry U.S. tons**

Demographics and Wastewater	2018
State population: [a]	3,572,665
Total land area in state (square miles): [b]	4,842
Total land area in state (acres):	3,098,880
Population density (persons/square mile):	738
Total number of WRRFs reported in state biosolids coordinator survey:	94
Total number of WRRFs permitted/reported elsewhere: [c]	88
Number of WRRFs in EPA ECHO reports: [d]	42
Total number of WRRF survey responses:	16
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [e]	441
Total state wastewater flow reported elsewhere (million gallons/day): [c,e]	390
Number of WRRFs that treat >75% of state flow: [c]	23
Percent of population served by on-site (septic) systems:	40%
Biosolids used or disposed/person (pounds):	77

Biosolids Application	2018
Agricultural land - cropland (acres): [f]	148,609
Percent of state area used for cropland:	5%
Number of farms with cropland: [g]	4,059
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	0.93
Percent of cropland needed if all state biosolids were applied at typical rate (~3 dry U.S. tons/acre):	31%
Comparison of Nutrient Sources	
Total nitrogen (N) in this state's biosolids (metric tons):[h]	6,019
N in this state's animal manures (metric tons): [j]	3,493
N in this state's purchased fertilizer (metric tons, 2011): [k]	8,480
Total phosphorus (P) in this state's biosolids (metric tons): [i]	2,718
P in this state's animal manures (metric tons): [j]	749
P in this state's purchased fertilizer (metric tons, 2011): [k]	722
State Regulatory Involvement	
Biosolids oversight agency/division:	CT DEEP [l] – Solid Waste Program
Biosolids permitting programs:	NPDES [m] & Special Waste Disposal Authorization Permits
Land application site permitting:	–
State Biosolids Regulatory Program full-time equivalents (FTEs):	–
Biosolids program FTEs per million people:	–
Enforcement - inspections of biosolids facilities and field sites:	–
Enforcement - formal biosolids violations issued:	–
State regulations beyond 40 CFR Part 503: [n]	–
Agronomic loading rate basis for land application:	–
Additional monitoring requirements for land application sites:	–

Trends	2018
Newly permitted land application sites in 2018 (acres):	–
Biosolids beneficial use in 2018:	Decreasing
Biosolids beneficial use in 2021:	Decreasing
Changes in Biosolids Use and Disposal, 2004 – 2018 (dry U.S. tons)	↑ 20,248

[a] https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html
[b] https://www.census.gov/quickfacts/fact/table/CT/LND110220
[c] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.
[d] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual
[e] Sum of average daily wastewater flow statewide
[f] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822
[g] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC
[h] Calculated assuming an average of 4.8% nitrogen in biosolids
[i] Calculated assuming an average of 2% phosphorous in biosolids
[j] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure
[k] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased
[l] Connecticut Department of Energy and Environmental Protection
[m] National Pollution Discharge Elimination System
[n] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge

Maine Biosolids Summary

2018 Biosolids End Use & Disposal Total: **28,631 dry U.S. tons**

2019 Biosolids End Use & Disposal Total: **23,345 dry U.S. tons**

Demographics and Wastewater	2018	2019
State population: [a]	1,339,057	1,344,212
Total land area in state (square miles): [b]	30,845	
Total land area in state (acres):	19,740,800	
Population density (persons/square mile):	43	44
Total number of WRRFs reported in state biosolids coordinator survey:	43	41
Total number of WRRFs permitted/reported elsewhere: [c]	135	–
Number of WRRFs in EPA ECHO reports: [d]	7	5
Total number of WRRF survey responses:	29	26
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [e]	–	–
Total state wastewater flow reported elsewhere (million gallons/day): [c,e]	136	–
Number of WRRFs that treat >75% of state flow: [c]	25	–
Percent of population served by on-site (septic) systems:	–	–
Biosolids used or disposed/person (pounds):	43	35

Biosolids Application	2018	2019
Agricultural land - cropland (acres): [f]	472,508	–
Percent of state area used for cropland:	2%	–
Number of farms with cropland: [g]	5,825	–
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	0.06	0.04
Percent of cropland needed if all state biosolids were applied at typical rate (~3 dry U.S. tons/acre):	2%	2%
Comparison of Nutrient Sources		
Total nitrogen (N) in this state's biosolids (metric tons): [h]	1,246	–
N in this state's animal manures (metric tons): [j]	6,109	–
N in this state's purchased fertilizer (metric tons, 2011): [k]	31,078	–
Total phosphorus (P) in this state's biosolids (metric tons): [i]	519	–
P in this state's animal manures (metric tons): [j]	1,391	–
P in this state's purchased fertilizer (metric tons, 2011): [k]	11,325	–
State Regulatory Involvement		
Biosolids oversight agency/division:	ME DEP [l] – Bureau of Remediation and Waste Management, Residuals, Sludge and Composting Program	
Biosolids permitting program:	Solid Waste License/Permit	
Land application site permitting:	Site Specific Permit	
State Biosolids Regulatory Program full-time equivalents (FTEs):	No Biosolids FTE Breakdown [n]	
Biosolids program FTEs per million people:	–	
Enforcement - inspections of biosolids facilities and field sites:	–	
Enforcement - formal biosolids violations issued:	–	
State regulations beyond 40 CFR Part 503: [m]	Management Practices & Pollutant Limits	
Agronomic loading rate basis for land application:	Nitrogen & Phosphorous	

Additional monitoring requirements for land application sites:	Yes for Class B	
Trends	**2018**	**2019**
Newly permitted land application (acres):	0	–
Biosolids beneficial use:	Staying the Same	Decreasing
Biosolids beneficial use in 2021:	Decreasing	
Changes in Biosolids Use and Disposal, 2004 – 2018 or 2004 – 2019 (dry U.S. tons)	↓ 3,577	↓ 8,863

[a] https://www.census.gov/newsroom/press-kits/2019/national-state-estimates.html
[b] https://www.census.gov/quickfacts/fact/table/ME/LND110220
[c] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.
[d] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual
[e] Sum of average daily wastewater flow statewide
[f] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822
[g] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC
[h] Calculated assuming an average of 4.8% nitrogen in biosolids
[i] Calculated assuming an average of 2% phosphorous in biosolids
[j] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure
[k] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased
[l] Maine Department of Environmental Protection
[m] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge
[n] Six employees in unit preforming licensing, compliance and enforcement for sewage, sludge and other materials

Massachusetts Biosolids Summary

2018 Biosolids End Use & Disposal Total: **180,443 dry U.S. tons**

2021 Biosolids End Use & Disposal Total: **165,327 dry U.S. tons**

Demographics and Wastewater	2018	2021
State population: [a]	6,882,635	6,984,723
Total land area in state (square miles):[b]	7,801	–
Total land area in state (acres):	4,992,640	–
Population density (persons/square mile):	882	895
Total number of WRRFs reported in state biosolids coordinator survey:	122	–
Total number of WRRFs permitted/reported elsewhere: [c]	119	–
Number of WRRFs in EPA ECHO reports: [d]	68	79
Total number of WRRF survey responses:	85	–
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [e]	794 [f]	–
Total state wastewater flow reported elsewhere (million gallons/day): [c,e]	748	–
Number of WRRFs that treat >75% of state flow: [c]	11	–
Percent of population served by on-site (septic) systems:	28%	–
Biosolids used or disposed/person (pounds):	53	47

Biosolids Application	2018	2021
Agricultural land - cropland (acres): [g]	171,496	–
Percent of state area used for cropland:	3%	–
Number of farms with cropland: [h]	5,117	–
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	1.05	0.96
Percent of cropland needed if all state biosolids were applied at typical rate (~3 dry U.S. tons/acre):	35%	32%
Comparison of Nutrient Sources		
Total nitrogen (N) in this state's biosolids (metric tons): [i]	7,871	7,198
N in this state's animal manures (metric tons): [k]	3,672	–
N in this state's purchased fertilizer (metric tons, 2011): [i]	13,599	–
Total phosphorus (P) in this state's biosolids (metric tons): [j]	3,280	2,999
P in this state's animal manures (metric tons): [k]	818	–
P in this state's purchased fertilizer (metric tons, 2011): [l]	1,198	–
State Regulatory Involvement		
Biosolids oversight agency/division:	MassDEP [m] – Water/Wastewater Program	
Biosolids permitting programs:	Approval of Suitability Permit	
Land application site permitting:	Approval of Suitability Permit	
State Biosolids Regulatory Program full-time equivalents (FTEs):	2.5	2.5
Biosolids program FTEs per million people:	0.4	0.4
Enforcement - Inspections of biosolids facilities and field sites:	–	–
Enforcement - Formal biosolids violations issued:	–	–
State regulations beyond 40 CFR Part 503: [n]	Management Practices & Pollutant Limits	
Agronomic loading rate basis for land application:	Nitrogen	
Additional monitoring requirements for land application sites:	–	

Trends	2018	2021
Newly permitted land application sites in 2018 (acres):	–	–
Biosolids beneficial use:	Decreasing	
Biosolids beneficial use in 2021:	Decreasing	
Changes in Biosolids Use and Disposal, 2004 – 2018 or 2004 – 2021 (dry U.S. tons)	↑ 27,208	↑ 12,092

[a] https://www.census.gov/newsroom/press-kits/2019/national-state-estimates.html and https://www.census.gov/newsroom/press-kits/2021/2021-national-state-population-estimates.html

[b] https://www.census.gov/quickfacts/fact/table/MA/LND110220

[c] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.

[d] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual

[e] Sum of average daily wastewater flow statewide

[f] Sum of average daily wastewater flow statewide reported by WRRFs in The Mass Sludge Survey 2018

[g] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822

[h] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC

[i] Calculated assuming an average of 4.8% nitrogen in biosolids

[j] Calculated assuming an average of 2% phosphorous in biosolids

[k] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure

[l] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased

[m] Massachusetts Department of Environment Protection

[n] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge

New Hampshire Biosolids Summary

2018 Biosolids End Use & Disposal Total: **25,781 dry U.S. tons**

Demographics and Wastewater	2018
State population: [a]	1,356,458
Total land area in state (square miles): [b]	8,954
Total land area in state (acres):	5,730,400
Population density (persons/square mile):	151
Total number of WRRFs reported in state biosolids coordinator survey:	99
Total number of WRRFs permitted/reported elsewhere: [c]	86
Number of WRRFs in EPA ECHO reports: [d]	23
Total number of WRRF survey responses:	12
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [e]	168
Total state wastewater flow reported elsewhere (million gallons/day): [c,e]	98
Number of WRRFs that treat >75% of state flow: [c]	14
Percent of population served by on-site (septic) systems:	75%
Biosolids used or disposed/person (pounds):	38

Biosolids Application	2018
Agricultural land - cropland (acres): [f]	107,996
Percent of state area used for cropland:	2%
Number of farms with cropland: [g]	2,667
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	0.24
Percent of cropland needed if all state biosolids were applied at typical rate (~3 dry U.S. tons/acre):	8%
Comparison of Nutrient Sources	
Total nitrogen (N) in this state's biosolids (metric tons): [h]	1,122
N in this state's animal manures (metric tons): [j]	2,676
N in this state's purchased fertilizer (metric tons, 2011): [k]	4,243
Total phosphorus (P) in this state's biosolids (metric tons): [i]	468
P in this state's animal manures (metric tons): [j]	581
P in this state's purchased fertilizer (metric tons, 2011): [k]	493
State Regulatory Involvement	
Biosolids oversight agency/division:	NHDES [l] Water Division – Wastewater Engineering Bureau, Residuals Management Section
Biosolids permitting programs:	Sludge Quality Certificate
Land application site permitting:	Site Specific Permit
State Biosolids Regulatory Program full-time equivalents (FTEs):	4
Biosolids program FTEs per million people:	2.9
Enforcement - Inspections of biosolids facilities and field sites:	10
Enforcement - Formal biosolids violations issued:	–
State regulations beyond 40 CFR Part 503: [m]	Management Practices & Pollutant Limits
Agronomic loading rate basis for land application:	Nitrogen

Additional monitoring requirements for land application sites:	Yes for Class B
Trends	**2018**
Newly permitted land application sites in 2018 (acres):	17
Biosolids beneficial use in 2018:	Staying the Same
Biosolids beneficial use in 2021:	Staying the Same
Changes in Biosolids Use and Disposal, 2004 – 2018 (dry U.S. tons)	↓ 1,240

[a] https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html
[b] https://www.census.gov/quickfacts/fact/table/NH/LND110220
[c] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.
[d] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual
[e] Sum of average daily wastewater flow statewide
[f] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822
[g] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC
[h] Calculated assuming an average of 4.8% nitrogen in biosolids
[i] Calculated assuming an average of 2% phosphorous in biosolids
[j] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure
[k] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased
[l] New Hampshire Department of Environmental Services
[m] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge

New York Biosolids Summary

2015 Biosolids End Use & Disposal Total: **377,663 dry U.S. tons** [a]

Demographics and Wastewater	2018
State population: [b]	19,542,209
Total land area in state (square miles): [c]	47,124
Total land area in state (acres):	30,159,098
Population density (persons/square mile):	415
Total number of WRRFs reported in state biosolids coordinator survey: [a]	612
Total number of WRRFs permitted/reported elsewhere: [d]	583
Number of WRRFs in EPA ECHO reports: [e]	125
Total number of WRRF survey responses:	23
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [a,f]	2,400
Total state wastewater flow reported elsewhere (million gallons/day): [d,f]	2,763
Number of WRRFs that treat >75% of state flow: [d]	23
Percent of population served by on-site (septic) systems:	–
Biosolids used or disposed/person (pounds):	39

Biosolids Application	2018
Agricultural land - cropland (acres): [g]	4,291,388
Percent of state area used for cropland:	14%
Number of farms with cropland: [h]	27,676
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	0.09
Percent of cropland needed if all state biosolids were applied at typical rate (~3 dry ton/acre):	3%
Comparison of Nutrient Sources	
Total nitrogen (N) in this state's biosolids (metric tons): [i]	16,442
N in this state's animal manures (metric tons): [k]	85,755
N in this state's purchased fertilizer (metric tons, 2011): [l]	70,747
Total phosphorus (P) in this state's biosolids (metric tons): [j]	6,851
P in this state's animal manures (metric tons): [k]	17,913
P in this state's purchased fertilizer (metric tons, 2011): [l]	11,214
State Regulatory Involvement	
Biosolids oversight agency/division:	NYSDEC [m] – Solid Waste Program
Biosolids permitting programs:	Solid Waste License/Permit
Land application site permitting:	Solid Waste License/Permit
State Biosolids Regulatory Program full-time equivalents (FTEs):	1
Biosolids program FTEs per million people:	0.05
Enforcement - inspections of biosolids facilities and field sites:	–
Enforcement - formal biosolids violations issued:	–
State regulations beyond 40 CFR Part 503: [n]	Management Practices & Pollutant Limits
Agronomic loading rate basis for land application:	Crops are Nutrient Specific
Additional monitoring requirements for land application sites:	–

Trends	2018
Newly permitted land application sites in 2018 (acres):	1
Biosolids beneficial use in 2018:	Staying the Same
Biosolids beneficial use in 2021:	Decreasing
Changes in Biosolids Use and Disposal, 2004 – 2015[a] (dry U.S. tons)	↑ 24,403

[a]Total biosolids and number of WRRFs are 2015 data from "Biosolids Management in New York State" report: https://www.dec.ny.gov/docs/materials_minerals_pdf/bsmgmt2015.pdf
[b] https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html
[c] https://www.census.gov/quickfacts/fact/table/NY/LND110220
[d] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.
[e] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual
[f] Sum of average daily wastewater flow statewide
[g] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822
[h] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC
[i] Calculated assuming an average of 4.8% nitrogen in biosolids
[j] Calculated assuming an average of 2% phosphorous in biosolids
[k] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure
[l] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased
[m] New York State Department of Conservation
[n] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge

Rhode Island Biosolids Summary

2018 Biosolids End Use & Disposal Total: **33,076 dry U.S. tons**

Demographics and Wastewater	2018
State population: [a]	1,057,315
Total land area in state (square miles): [b]	1,034
Total land area in state (acres):	661,690
Population density (persons/square mile):	1,023
Total number of WRRFs reported in state biosolids coordinator survey:	20
Total number of WRRFs permitted/reported elsewhere: [c]	20
Number of WRRFs in EPA ECHO reports: [d]	16
Total number of WRRF survey responses:	17
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [e]	120
Total state wastewater flow reported elsewhere (million gallons/day): [c,e]	132
Number of WRRFs that treat >75% of state flow: [c]	5
Percent of population served by on-site (septic) systems:	36%
Biosolids used or disposed/person (pounds):	63

Biosolids Application	2018
Agricultural land - cropland (acres): [f]	17,654
Percent of state area used for cropland:	3%
Number of farms with cropland: [g]	716
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	1.87
Percent of cropland needed if all state biosolids were applied at typical rate (~3 dry tons/acre):	62%
Comparison of Nutrient Sources	
Total nitrogen (N) in this state's biosolids (metric tons): [h]	1,440
N in this state's animal manures (metric tons): [j]	495
N in this state's purchased fertilizer (metric tons, 2011): [k]	2,047
Total phosphorus (P) in this state's biosolids (metric tons): [i]	600
P in this state's animal manures (metric tons): [j]	120
P in this state's purchased fertilizer (metric tons, 2011): [k]	201
State Regulatory Involvement	
Biosolids oversight agency/division:	RIDEM [l] – Water/Wastewater Program
Biosolids permitting programs:	Non-NPDES Permit (Order of Approval)
Land application site permitting:	Non-NPDES Permit (Order of Approval)
State Biosolids Regulatory Program Number of full-time equivalents (FTEs):	0.1
Biosolids program FTEs per million people:	0.1
Enforcement - inspections of biosolids facilities and field sites:	21
Enforcement - formal biosolids violations issued:	1
State regulations beyond 40 CFR Part 503:[m]	Management Practices & Pollutant Limits
Agronomic loading rate basis for land application:	Nitrogen
Additional monitoring requirements for land application sites:	Yes for All Land Application

Trends	2018
Newly permitted land application sites in 2018 (acres):	0
Biosolids beneficial use in 2018:	Staying the Same
Biosolids beneficial use in 2021:	Staying the Same
Changes in Biosolids Use and Disposal, 2004 – 2018 (dry U.S. tons)	↑ 5,643

[a] https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html
[b] https://www.census.gov/quickfacts/fact/table/RI/LND110220
[c] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.
[d] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual
[e] Sum of average daily wastewater flow statewide
[f] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822
[g] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC
[h] Calculated assuming an average of 4.8% nitrogen in biosolids
[i] Calculated assuming an average of 2% phosphorous in biosolids
[j] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure
[k] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased
[l] Rhode Island Department of Environmental Management
[m] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge

Vermont Biosolids Summary

2018 Biosolids End Use & Disposal Total**: 10,364 dry U.S. tons**

Demographics and Wastewater	2018
State population: [a]	626,299
Total land area in state (square miles): [b]	9,217
Total land area in state (acres):	5,899,168
Population density (persons/square mile):	68
Total number of WRRFs reported in state biosolids coordinator survey:	88
Total number of WRRFs permitted/reported elsewhere: [c]	87
Number of WRRFs in EPA ECHO reports: [d]	7
Total number of WRRF survey responses:	16
Total state wastewater flow reported in state biosolids coordinator survey (million gallons/day): [e]	42
Total state wastewater flow reported elsewhere (million gallons/day): [c,e]	46
Number of WRRFs that treat >75% of state flow: [c]	18
Percent of population served by on-site (septic) systems:	58%
Biosolids used or disposed/person (pounds):	33

Biosolids Application	2018
Agricultural land - cropland (acres): [f]	479,680
Percent of state area used for cropland:	8%
Number of farms with cropland: [g]	4,810
Application rate if all state biosolids were applied to cropland (dry U.S. tons/acre):	0.02
Percentage of cropland needed if all state biosolids were applied at typical rate (~3 dry U.S. tons/acre):	0.7%
Comparison of Nutrient Sources	
Total nitrogen (N) in this state's biosolids (metric tons):[h]	451
N in this state's animal manures (metric tons): [j]	15,934
N in this state's purchased fertilizer (metric tons, 2011): [k]	8,176
Total phosphorus (P) in this state's biosolids (metric tons):[i]	188
P in this state's animal manures (metric tons): [j]	3,047
P in this state's purchased fertilizer (metric tons, 2011): [k]	806
State Regulatory Involvement	
Biosolids oversight agency/division:	VT DEC [l] – Residuals Management & Emerging Contaminants Program
Biosolids permitting programs:	Solid Waste Facility Certification
Land application site permitting:	Site-Specific Permit
State Biosolids Regulatory Program full-time equivalents (FTEs):	1
Biosolids program FTEs per million people:	1.6
Enforcement - inspections of biosolids facilities and field sites:	3
Enforcement – formal biosolids violations issued:	1
State regulations beyond 40 CFR Part 503: [m]	Management Practices & Pollutant Limits
Agronomic loading rate basis for land application:	Nitrogen and Phosphorous

Additional monitoring requirements for land application sites:	Yes for All Land Application
Trends	**2018**
Newly permitted land application sites in 2018 (acres):	0
Biosolids beneficial use in 2018 :	Increasing
Biosolids beneficial use in 2021:	Decreasing
Changes in Biosolids Use and Disposal, 2004 – 2018 (dry U.S. tons)	↑ 1,391

[a] https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html
[b] https://www.census.gov/quickfacts/fact/table/VT/LND110220
[c] Seiple, Timothy E., Richard L. Skaggs, Lauren Fillmore, and André M. Coleman. "Municipal Wastewater Sludge as a Renewable, Cost-Effective Feedstock for Transportation Biofuels Using Hydrothermal Liquefaction." *Journal of Environmental Management* 270 (September 15, 2020): 110852. https://doi.org/10.1016/j.jenvman.2020.110852.
[d] https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual
[e] Sum of average daily wastewater flow statewide
[f] https://quickstats.nass.usda.gov/results/0CBBAD84-6032-3776-AF8B-624DB8825822
[g] https://quickstats.nass.usda.gov/results/F56563D1-C9CD-30EF-9774-2F91CC0640EC
[h] Calculated assuming an average of 4.8% nitrogen in biosolids
[i] Calculated assuming an average of 2% phosphorous in biosolids
[j] https://www.epa.gov/nutrient-policy-data/estimated-animal-agriculture-nitrogen-and-phosphorus-manure
[k] https://www.epa.gov/nutrient-policy-data/commercial-fertilizer-purchased
[l] Vermont Department of Environmental Conservation
[m] 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge