Town of Charlestown, R.I.
On-Site Wastewater
Management Program

2020
ANNUAL REPORT

Town of Charlestown, R.I.
On-Site Wastewater Management Program

A DEPARTMENT OF CHARLESTOWN PUBLIC WORKS

Cover Figures from top left

1.) Nitrogen reduction efficiency sampling of a N-reducing OWTS in Charlestown
2.) Freshwater wetlands in Salt Ponds Critical Resource Area protected by the Charlestown EPA SNEP Grant
3.) Ninigret Pond backbarrier flat at East Beach
4.) Drone photo of a nitrogen reducing OWTS installed to replace a failing metal tank system located less than 100-feet from a coastal wetland under the EPA SNEP Grant
5.) Presentation of N-reducing technology efficiency monitoring to the Charlestown Town Council
6.) Installation of a conventional OWTS to replace a failing system
7.) Drone footage of Charlestown Barrier looking west, an area protected by the EPA SNEP Grant

Town of Charlestown, R.I. On-Site Wastewater Management Program

A DEPARTMENT OF CHARLESTOWN PUBLIC WORKS

Annual Report

FOR THE CALANDER YEAR ENDED DECEMBER 31, 2020

PREPARED BY: MATT DOWLING, ON-SITE WASTEWATER PROGRAM MANAGER

VISION STATEMENT

Protecting the quality of Charlestown's drinking water, groundwater and surface water resources for public health and environmental management by using septic systems as a cost-effective alternative to a municipal sewer system.

MISSION STATEMENT

The Charlestown Onsite Wastewater Management Program is committed to serving the needs of Charlestown residents, businesses, and visitors by protecting our groundwater quality, the only source of drinking water in Charlestown, and surface water quality through the management of on-site wastewater treatment systems (OWTS) while providing funding, educational outreach, and technical assistance to property owners; and facilitating future economic growth balanced with resource protection.

(This page intentionally left blank.)

TOWN OF CHARLESTOWN

Mark Stankiewicz
Administrator

TOWN OF CHARLESTOWN

Deborah Carney
Town Council President

WASTEWATER MANAGEMENT COMMISSIONERS

Thomas Ferrio
Commission Chair

Elizabeth V. Richardson,
Vice Chair

Robert D. Frost

Fredrick H. Klinger

Margot Willis-Doyle

PROGRAM STAFF

Matthew J. Dowling
On-Site Wastewater Management Program Manager

Alan Arsenault
Director of Public Works

Rebecca Crosby
Program Assistant

Bonnie Langlois
Program Assistant

Wyatt Brochu
Program Attorney

(This page intentionally left blank.)

TOWN OF CHARLESTOWN

Charlestown On-Site Wastewater Management Program
Charlestown Town Hall
4540 South County Trail
Charlestown, RI 02813
T 401-364-5030

charlestownri.org

February 1, 2021

Honorable Deborah Carney, Charlestown Town Council President
Honorable Members of the Charlestown Town Council
Thomas Ferrio, Commission Chair
Mark Stankiewicz, Charlestown Town Administrator
Amy Weinreich, Charlestown Town Clerk
Irina Gorman, Charlestown Finance Director

All:

I am pleased to submit this Annual Action Report for the activities conducted by the Charlestown Office of Wastewater Management and Environmental Scientist for the calendar year ending 2020. In 2020 this office not only continued its successful implementation of Town Ordinance 210, but also managed the Town's EPA Southeast New England Program (SNEP) Charlestown Coastal Watershed Protection and Restoration project, has conducted research on the effects of septic systems and groundwater quality in Charlestown and applied to the RIDEM to assess new experimental septic system technology. Further, this office has provided technical assistance to multiple Town Departments including Building, Zoning, Parks and Recreation, Planning, Public Works and GIS with technical aspects of specific projects. The digital version of this report contains clickable hyperlinks to many pertinent referenced documents and informational website as appropriate.

DEPARTMENT PROFILE

The responsibility of the On-site Wastewater Management Program Office is to implement Town Ordinance 210, which provides a cost effective means for protecting the Town's most important natural resource, our ground water and surface water bodies through the management of every septic system in Charlestown. The Town of Charlestown relies solely on groundwater for drinking water through public and private

wells and every household and business in Town relies only on local soils for disposal and treatment of sewage and wastewater. Although an effective means of wastewater treatment, on-site wastewater treatment systems (OWTS) have been shown to be the largest contributor of nutrients to groundwater in Charlestown and are a potential vector for harmful bacteria through drinking water if misused or not properly maintained.

Recent well water testing in Charlestown indicates that in its most densely developed areas, concentrations of nitrate-nitrogen in groundwater are exceeding and/or approaching the safe drinking water thresholds. Nutrient and bacteria laden groundwater also recharges into our sensitive surface water bodies. Water quality in Green Hill and Eastern Ninigret Ponds currently fails to meet shell fishing standards and the RIDEM has established a regulated "total maximum daily load" (TMDL) discharge regulation for bacteria to these ponds. The RIDEM attributes this contamination specifically to septic systems.

Protection of these resources is implemented by the department through;

- Requiring monitoring and closely tracking maintenance for every OWTS in Charlestown,
- Managing the required removal and replacement of all cesspools and failing and malfunctioning septic systems town wide,
- Mitigating any potential or existing impacts to human health from wastewater,
- Managing ground water quality and impacts to drinking water resources,
- Requiring septic system effluent quality monitoring of all Nitrogen reducing septic systems to ensure compliance with the treatment performance standards (to be implemented), and
- Quantifying environmental impacts to surface water bodies from OWTS (and storm water and wildlife, outside of Ordinance 210).

Failure to manage any of these potential issues may result in the following;

- Since RIDEM has jurisdiction of all State groundwater, a RIDEM requirement for municipal sewer systems and stormwater runoff measures could be imposed.

In fact, per RIDEM, the Town of Charlestown's OWTS Program acts "in lieu of" a centralized municipal wastewater collection and treatment system. If our groundwater and surface water impacts continue to degrade, the **RIDEM could implement a sewering requirement**. Cost in tens of millions (estimate in 2009 to sewer Charlestown Beach Road and adjacent side streets only was $49 Million). See recent Town of Portsmouth, RI RIDEM Consent Order,

- **Contamination of drinking water** and the resulting requirements for treatment of private water supplies or municipal water systems. Cost $100k - $1M's, and/or
- **Reduction in home values** in response to water quality issues. With assistance from Charlestown, Suffolk County, NY published a study last year that indicates through linear regression that properties with newly installed N-reducing OWTS sold at a premium when compared to other similar real estate.

Current Status of OWTS in Charlestown

There are currently **5,141 septic systems in Charlestown,** an increase of **24** systems from the previous reporting year 2019. All OWTS are tracked under an individual operating permit through the Town's Carmody RIWIS Septic System Database. The town has delineated septic systems into five distinct categories based on system type. The types and numbers installed throughout the town are summarized below in **Table 1**.

System Category	Number Installed	Change from 2019	Percent of Total
Conventional	4,212	-6	81.8%
Advanced/Nitrogen Reducing	801	+39	15.6%
Substandard	111	-3	2.2%
Metal Tank	18	0	0.4%
Cesspool	5	-6	0.1%
Total	5,135	+18	100%

Charts graphically representing the breakdown of all septic system types in Charlestown are provided in **Figure 1**.

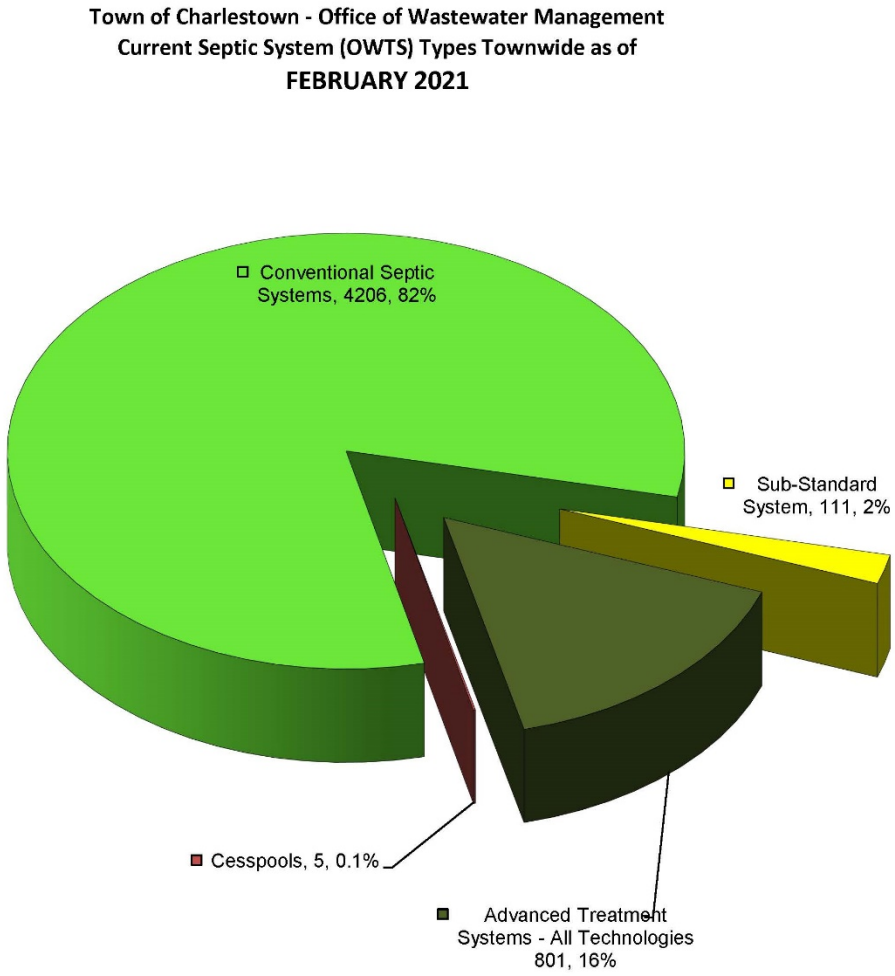


Figure 1 – Septic system types installed in Charlestown as of February 2021

Under the existing state of Rhode Island Department of Environmental Management (RIDEM) *Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment System* (the "OWTS Rules"), any new septic system installed within the Salt Ponds Watershed, the "Salt Ponds Critical Resource Area" portion of Charlestown must utilize nitrogen reducing technology. Further, advanced technologies that are not specifically nitrogen reducing may be required town wide under certain site constraint conditions. There are currently 15 specific types of advanced/nitrogen reducing OWTS technologies installed in

Charlestown with a total of **795** installed units, representing **15.8%** of all septic systems town wide. Within the Salt Ponds Watershed, advanced/nitrogen reducing OWTS compromise approximately **20%** of septic system types. The types and numbers of advanced systems installed in Charlestown are summarized in **Table 2**.

System Category	Number Installed	Percent of Advanced	Percent of Total (5,117)
AdvanTex Textile Filter	521	65.0%	10.1%
Aerobic FAST	115	14.4%	2.2%
Aerobic Hydro-Kinetic	7	0.9%	0.1%
Aerobic Singulair	92	11.5%	1.8%
Composting Toilets	9	1.1%	1.1%
Holding Tank[1]	15	1.9%	0.2%
Peat Biofilter	1	0.1%	0.02%
Ruck[2]	22	2.8%	0.4%
Sand Filter Recirculating[2]	10	1.3%	0.2%
Septitech	6	0.8%	0.12%
White Knight[3]	2	0.3%	0.04%
Total	801	--	--

Notes: 1– Holding tanks are only allowed for dwellings that are occupied less than 120-days per year and are non-rental units. The majority of holding tank OWTS were installed on the coastal barrier following Superstorm Sandy at sites where systems or dwellings were damaged and a 50 foot OWTS setback to the actively eroding edge of the coastal feature could not be achieved.

2 – Old technology not currently installed

3 – White Knight is a system component add on used to attempt system mitigation.

Each of these systems requires a maintenance contract be in place at all times with an approved service provider. Additionally, at least one annual inspection and maintenance event is required under Ordinance 210. The numbers and types of Advanced/N-reducing OWTS currently installed in Charlestown are summarized in **Figure 2**.

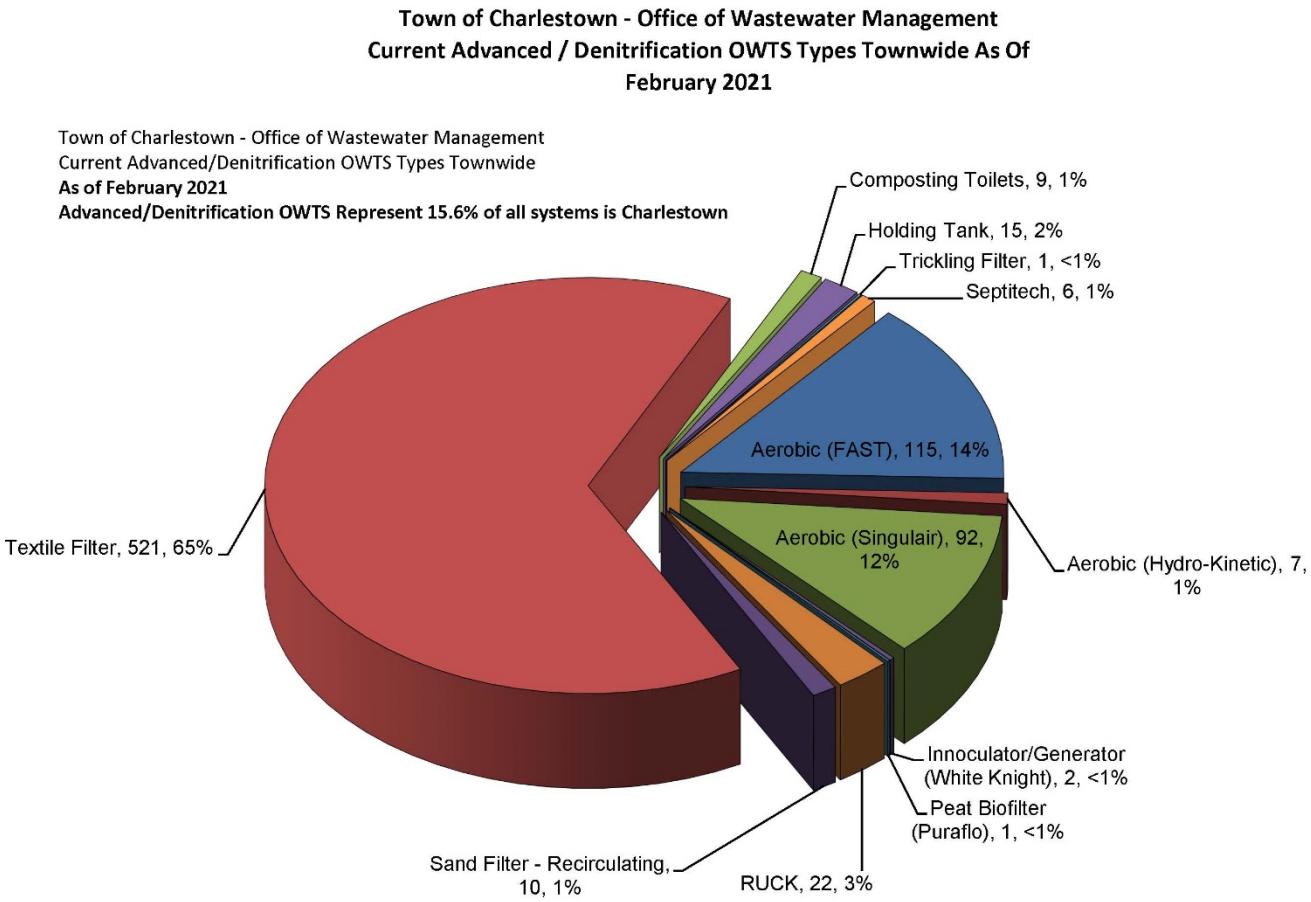


Figure 2 – Advanced / N-reducing OWTS installed in Charlestown as of February 2021

Outside of the Salt Ponds Watershed, conventional septic systems including a septic tank and conventional drainfield may be installed. These types of septic systems make up over **82%** of all systems in Charlestown. Conventional OWTS require an initial First Maintenance Inspection three years after startup. Following the First Maintenance Inspection, subsequent Routine Maintenance Inspections are required on a reoccurring schedule set at the previous inspection. The schedule can range from one to five years depending on the system condition, use and age. The inspection program is designed to enhance septic system longevity and performance while minimizing cost by avoiding unnecessary tank pumping, and identifying issues and implementing repairs

before system failure occurs requiring complete system replacement.

Substandard septic systems are classified by the town by any septic system that is not permitted by RIDEM and/or was installed before 1968, and/or utilizes a primary septic tank of less than 1,000 gallon capacity. There are currently **111** substandard septic systems in Charlestown representing **2.2%** of the total. The majority of the substandard septic systems are clustered together in the Green Hill / Eastern Ninigret Pond subwatershed in the vicinity of Charlestown Beach Road.

Metal tank systems and cesspools represent non-compliant types of wastewater disposal and present public health and environmental risks. Cesspools are not permitted and are required to be replaced with an OWTS suitable for the Charlestown Wastewaters Management District. Metal tanks are considered cesspools under town ordinance 210.

Major Initiatives - 2020

Water Protection

Cesspool Phase-out

The office continued the ongoing required elimination of all cesspools in Charlestown. **7 additional cesspools were removed and replaced in 2020**. As a point of reference, in January 2008, there were a total of **616** cesspools and "unknown" septic systems combined. Today there are no unknown septic systems and only **5** cesspools in Town, constituting a **99.3% reduction**. All remaining cesspools are currently being managed through the Charlestown Municipal Court by Court Order or by a granted Hardship Waiver through the Charlestown Wastewater Management Commission. A graph of the number of cesspools in Charlestown over time is below in **Figure** 3.

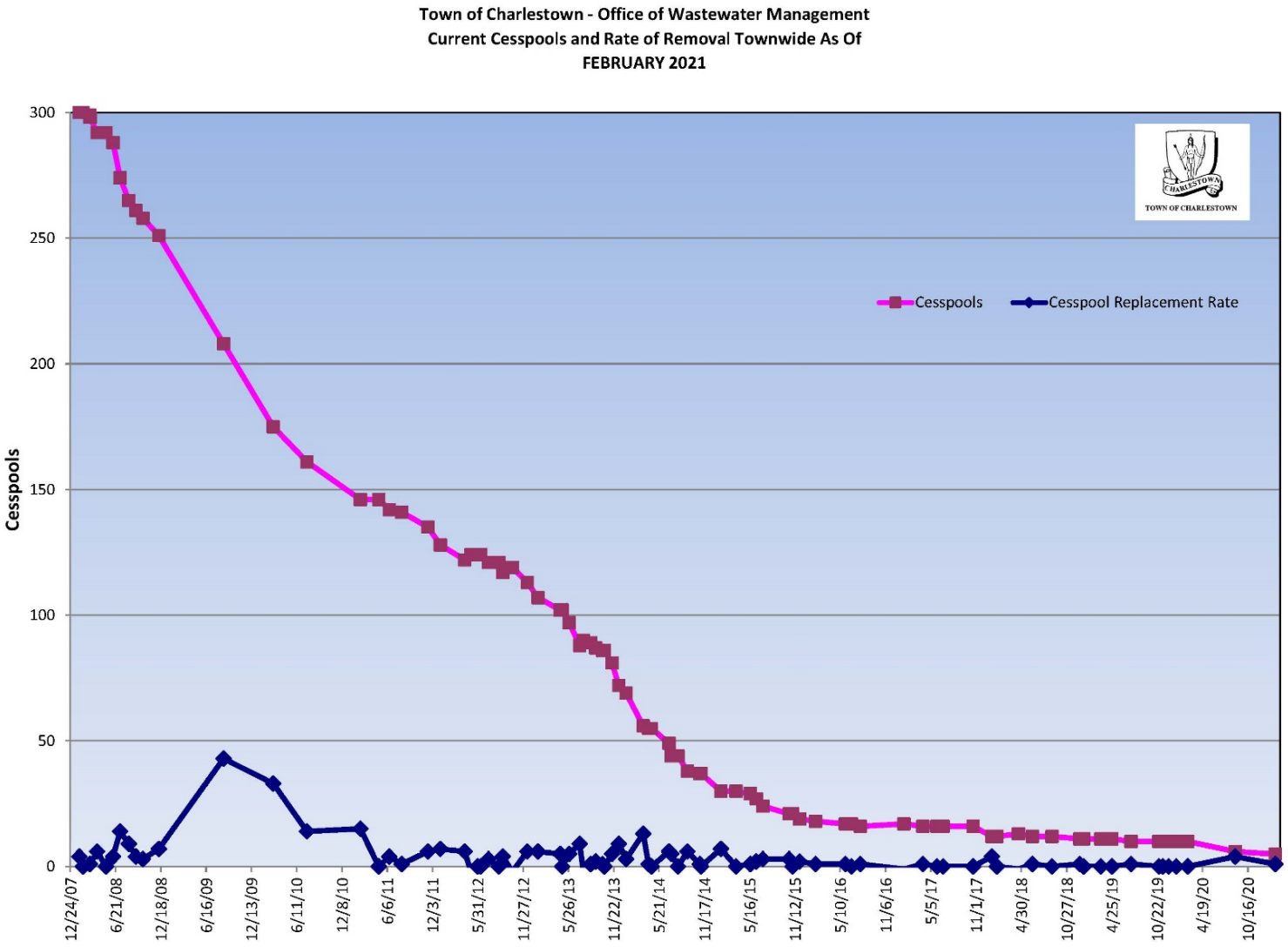


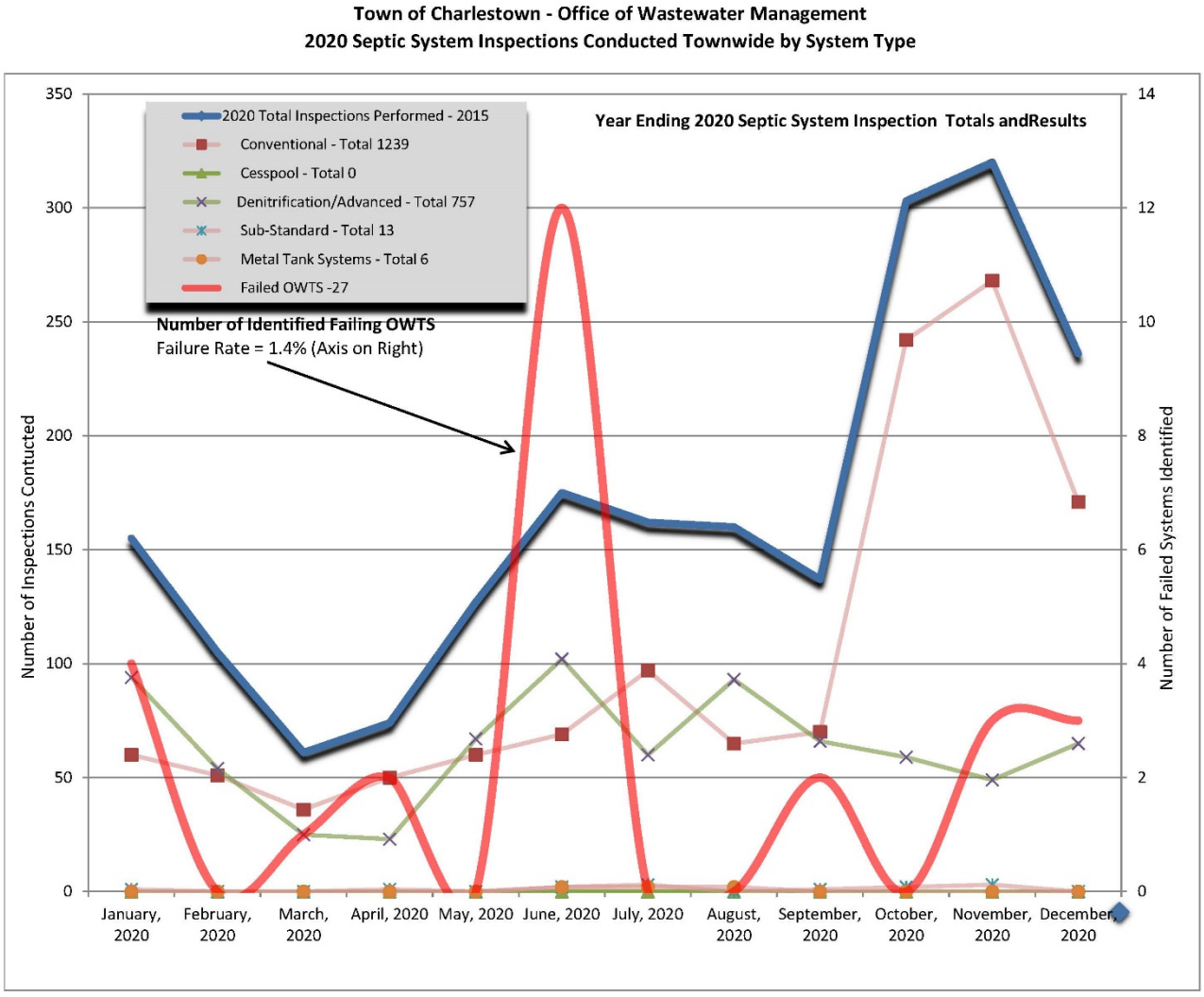
Figure 3 – Cesspool Phaseout removals over time and rate of removal December 2007- February 2021

OWTS Management

Inspections

In 2020, the program oversaw and reviewed over **2,015 OWTS inspections** and/or maintenance activities. The department identified and managed **29 Failing OWTS**, each

with the potential for causing threats to human health and/or the environment. Failing septic systems represent approximately **1.4%** of all systems inspected in 2020, which is **lower than the previous year's findings**. Of the **29** failing systems, **all** have subsequently been permitted for repair and **90%** (a total of **26** systems) were repaired or replaced this calendar year. A summary of septic system inspections and identification of failing OWTS is provided in **Figure 4** below.



A total of **121** Point of Sale inspections were performed including a functional flow test of the septic system hydraulic capacity were conducted as part of property transactions in 2020.

There are currently **32** registered Town Approved OWTS Service Providers who conducted the **2,015** OWTS inspection in 2020. Three service providers conducted 1/3 of all conventional septic system inspections and two service providers conducted 1/3 of all advanced wastewater treatment system maintenance activities. 2020 OWTS inspections by service provider are detailed in **Figures 5 and 6.** A tabulated summary of all OWTS reporting activities conducted by the Wastewater Management Program is included as **Figure 7**.

OWTS Applications and Installations

Over **70** Applications for New Septic System Installations were reviewed, and plans were electronically scanned and entered into the Town's septic system database. Applications for septic systems are summarized in **Figure 8** attached. Additionally, **42** new septic systems were installed, nearly half of which were to replace failing systems (**16** systems), **27** systems were installed for new buildings constructed and **10** new systems were installed as part of building modification or remodeling. All new systems were assigned individual operating permits and entered into the Towns database for inspection, monitoring and maintenance tracking.

Correspondence

All owners of new septic systems were submitted correspondence introducing them to the Charlestown Wastewater Management Program and detailing owner requirements for their septic system maintenance under town Ordinance. New OWTS installations by month and type are summarized in **Figure 9** attached. A graph of the numbers and types of all OWTS in Charlestown since 2008 is included in **Figure 10**.

The department submitted over **1,280** written correspondences to property owners, state agencies and interested parties, and received over **2,000** inquiries from the public.

OWTS Ordinance Enforcement

To ensure compliance with Town Ordinance 210 to protect public health, safety and welfare, the Wastewater Management Ordinance Enforcement Officer implemented enforcement of **1 Ordinance Violation Case** for prosecution to the Charlestown Municipal Court System. As part of this enforcement, the office submitted **4** Notices of Intent to Enforce and **29** Notices of Failing OWTS. Additionally, the department issued **30** Notice

of Violation Releases for systems that achieved compliance with Town ordinance. (39 for OWTS inspections and 3 for failing systems).

Local Assessment of New Non-Proprietary N-Reducing Design – Layered Nitrogen Reducing Soil Treatment Area

The Town's OWTS Management Program has prepared a comprehensive RIDEM Application for Alternative OWTS Technology: Nitrogen Reducing Layered Soil Treatment Area, seeking approval to install and assess the efficacy of low cost, passive and effective Nitrogen reducing OWTS technology in Charlestown. This technology has been recently extensively studied by the Barnstable County Department of Health and Environment at the Massachusetts Alternative Septic System Test Center. The Town's application is comprehensive and was developed from June 2020 through January 2021. Work was completed by the Town with the OWTS experts and researchers at the University of Rhode Island Laboratory of Soil Ecology (LSEM) and the New England Onsite Wastewater Training Program. The project is summarized below.

Existing N-reducing OWTS technologies are an effective method to mitigate and reduce nutrient loading from on-site wastewater which has been demonstrated to be an issue for groundwater and surface waters of Charlestown. However, these systems are often costly and complex. The development of non-proprietary, lower cost, effective N-reducing technologies could provide an alternative option for property owners and would foster additional upgrades from older conventional and substandard OWTS within our highly developed critically sensitive coastal watersheds.

Over the last ten years, an average of 40 N reducing OWTS have been installed per year in Charlestown at an average cost of approximately $27,000 each, at a total cost of approximately $1.2M per year. Since the inception of RIDEM OWTS Rules requirement for OWTS to utilizing N-reducing technology within the Salt Ponds Critical Resource Area, system cost and complex engineering has been a concern for the Town and surrounding communities. A lower cost, non-proprietary and less technologically complex N-reducing OWTS alternative has been a long sought-after goal.

Barnstable County, Massachusetts and other agencies have been actively researching

the use of a conventional septic system that pump discharges wastewater to a new simple drainfield design. Unlike all other N-reducing OWTS, this system discharges untreated wastewater (straight septic tank effluent) into a new type of drainfield construction. The drainfield resembles a familiar bottomless sand filter but is comprised of layered air rich sand over a layer of sand containing a sawdust mixture. The aerated sand allows for nitrification of the ammonia rich wastewater. As the nitrified wastewater percolates through the sand and sawdust layer, which becomes air starved, anaerobic microbes along with the sawdust carbon source facilitate denitrification of the wastewater before gravity discharge into the native soil profile and subsoil. The systems have recently been studied and the results are quite promising, with all sites consistently achieving apparently better total N reduction than any approved engineered technology currently in use in RI.

In 2019 the Wastewater Management Office along with our partners the URI LSEM and the NEOWTP introduced this concept to the Town to seek potential sources of funding for its assessment. The proposal was to assess the technology at between 3 and 10 sites, monitor the efficacy of the technology for a period two years, compile data and ultimately seek approval of the technology as an approved N-reducing system for general use in Rhode Island.

The Town Council subsequently approved capitol budgetary funding for $250,000 over two years to assess this technology, collect necessary data and submit findings to RIDM for potential approval as a standard N-reducing OWTS option statewide. By implementing a two-year project starting in 2021 to install test systems, final approval at the state level could be obtained by 2023. The Town and its partners, LSEM and NEOWTP are currently in a strong position to implement the project based on the recent collaboration through the nearly completed Town's $888,000 EPA SNEP Grant.

The technology is non-proprietary. Therefore, the financial incentive for a private vendor to seek its approval simply does not exist. Without the involvement of municipal, academic institutional or state agency, the technology will not become approved in RI. Charlestown could continue its role as the leader in municipal onsite wastewater management in RI by fostering the testing and subsequent statewide approval of this so called "layered sawdust" septic system. The system has been shown quantitatively by

the Barnstable County Health Department and URI to achieve higher returns of nitrogen reduction than other approved nitrogen reducing septic systems in RI. URI is actively involved in the Barnstable test sites and the results are promising. There has been some published research and Barnstable County has detailed results of their findings over the course of several years.

To achieve RIDEM approval of this non-proprietary technology for property owners in RI, eight or ten test sites would be required to be installed, monitored, tested, and reported to RIDEM. Seven sites are already installed in Massachusetts, four are proposed for Charlestown and four are proposed for Suffolk County with Charlestown and LSEM assistance. The state could then approve the technology for general use statewide. The benefit to the town here would ultimately be access to a cost-effective alternative to standard "denitrification" systems. These benefits would also be available to property owners statewide. Further, with a demonstrated N reducing capability potentially greater than existing approved N reducing technologies, total N loading to the coastal watershed may be reduced with the expanded use of this system. An additional immediate benefit is that the test sites would be employed in a similar manner as the EPA grant sites and replace existing polluting substandard or failing septic systems in the coastal watershed.

Test systems will be installed at private dwellings based on application process which was developed by the Town as part of the EPA SNEP Grant project. Sites where systems need current replacement are prioritized as part of a numerically ranked nine established criteria protocol. Property owners will be selected based on the rank, enter into an agreement, and understand that in the unlikely case of system failure, they would be responsible for compliance with RIDEM rules.

If this project produces an approved simple, low cost RIDEM approved N-reducing OWTS technology that costs 1/3 less than the standard N-reducing system, approximately $20,000 and 1/3 of property owners utilize the new technology, approximately 13 per year, **Charlestown taxpayers could save $130,000 per year**. Using these metrics and assumptions, the project could pay for itself in two years. At this cost, it becomes more cost effective for property owners to replace substandard non-nitrogen reducing OWTS with n reducing technology.

FUNDING

EPA SNEP Grant

Continued the implementation of the **$674,201** in grant funding from the EPA Southeast New England Program (SNEP), (**total grant $878,857.25**). Funding a four year project for watershed restoration by implementing projects to quantifiably reduce and mitigate nutrient impacts to groundwater and surface water bodies located within Charlestown's South Shore Salt Ponds Watershed (the "Watershed") of Green Hill, Ninigret, and Quonochontaug Salt Ponds. Project consists of:

- OWTS Final Effluent Monitoring and Optimization,
- OWTS Upgrades to Reduce N inputs by 150 lb/yr, and
- Nutrient Reduction through Storm-water and Fertilizer Management,

RIIB Community Septic System Loan Program

Successfully applied for and received **$300,000** in funding from the Rhode Island Infrastructure Bank (RIIB) through the State Revolving Fund to be utilized as 1% low Interest Loans for cesspool replacement and failing and substandard OWTS replacement through the Charlestown Community Septic System Loan Program (CSSLP). In 2020, the Town of Charlestown along with RI Housing provided low interest loan funding for four septic system replacements amounting to a total loan disbursement of **over $86,800.** Three of the loans were closed following successful replacement of the failing systems and one is currently pending installation. **The current available balance of the Towns existing loan allocation fund is $155,2828.06.**

To date the Town through RIIB has provided over $**2.1M in low interest financing** to assist property owners manage significant issues with their OWTS with no default. Once the remaining funds are nearing exhaustion, my office will coordinate the next installment of loan funding by standard agreement with the Town Council, RIIB and RI Housing. A chart of annual CSSLP disbursements since 1999 is included in **Figure 11.**

Washington County Community Development

Community Development Block Grant funding through HUD is managed by Washington County Community Development Consortium for the Town of Charlestown. Funds allocated for housing rehab including emergency septic system repair or

replacement are available as low interest or deferred loans for income eligible applicants who are denied CSSLP funding. This calendar year, the town along with Washington Community Development finalized the replacement of one actively failing septic system on Nancy Lane in the sensitive Eastern Ninigret Pond watershed.

Town of Charlestown Capital Expenditure Line Item 01.990.9997.000

The Town of Charlestown allocated $250,000 over two fiscal years ($125,000 per year) as part of its capital improvement budget to fund the previously mentioned Experimental LSTA OWTS technology. Given RIDEM permitting issues, the project has seen unexpected delays, but is slated to move forward in 2021. The requisite RIDEM application has been submitted and we are awaiting swift state approval. Site selection is currently in process and contracts will be secured with URI LSEM and RIDEM licensed OWTS designers and installers.

ADDITIONAL ACCOMPLISHMENTS

Grant Program Manager for the EPA SNEP Grant

Continued to manage and implement three distinct projects under the Town's EPA Grant. The grant was completed in January 2021. This year the department coordinated all meetings, correspondence, outreach, document preparation, submittals, policy review, project management, and data collection. Specific accomplishments are detailed below with weblinks to pertinent work products and partner organizations.

- **Coordinated and financed costs to upgrade 15 sub-standard septic systems to efficient Nitrogen Reducing Technology** in the nutrient impacted Eastern Ninigret/Green Hill Pond Watershed. **This project has reduced the nitrate-nitrogen input to this fragile subwatershed by over 350 pounds per year.** Over the course of 10 years this project will have **reduced the nitrogen loading** to the watershed by nearly **2 tons**, significantly protecting drinking water and coastal pond resources,
- **Partnered** with URI Laboratory of Soil Ecology Microbiology (LSEM) to finalize quarterly effluent discharge laboratory sampling of **50** residential advanced wastewater treatment systems in Charlestown to gain an understanding of the variability of Nitrogen reducing septic system functionality and to develop low

cost accurate field sampling methods,

- **Presented** EPA SNEP Grant findings in a Seminar held by the Salt Ponds Coalition on December 9, 2020
- **Presented** Charlestown's success in fostering replacement of 15 substandard systems to N-reducing technology in the Green Hill /Eastern Ninigret Pond Watershed,
- **Developed** a public outreach video series posted on the Town of Charlestown website along with the Salt Ponds Coalition detailing the water protection and ecosystem challenges addressed through the EPA SNEP Grant,
- **Prepared posted** a Grant Status Poster for public observation at the Town Hall,
- **Developed and implemented** field protocol to conduct New low cost N-reducing OWTS efficiency testing developed by Ross et al., 2018 at LSEM. Conducted in partnership with LSEM by the WW Office to sample and maximize nitrogen reduction efficiency of installed Nitrogen reducing septic systems. This development will collectively save our nitrogen reducing septic system owners tens of thousands of dollars in laboratory sampling fees and will protect our coastal watershed from nitrogen loading by assuring N-reducing OWTS are operating at the highest efficiency. See:
  - Ross, B.N., Loomis, G.W., Hoyt, K.P. et al. Water Air Soil Pollut (2018) 229: 389. User-Based Photometer Analysis of Effluent from Advanced Nitrogen-Removal Onsite Wastewater Treatment Systems, https://doi.org/10.1007/s11270-018-4039-z
- **Provided input** to develop educational course for regulators, educators and OWTS practitioners at the New England On-Site Wastewater Training Program at URI and the URI Laboratory of Soil Ecology and Microbiology entitled: *OWT192 Recent Advances in Onsite Wastewater Research*,
- **Coordinated and installed** three demonstration rain gardens with Save the Bay. Site located at the Charlestown Senior Center, Sam Ferretti Blue Shutters Town Beach and Charlestown Town Beach in 2020 along with three previously installed in 2019 to demonstrate how these gardens manage pollutants from stormwater and illustrates layout and techniques for residential applications. Project incorporated Town of Charlestown cub scouts, elementary school children and summer campers as an education outreach opportunity. Published in Westerly Sun,
- **Established** two new surface water sampling stations with the Salt Ponds

Coalition in the nutrient impacted portions of Eastern Ninigret Pond and Green Hill Pond to monitor nutrient and bacteria impacts to the area over time and conducted field and laboratory sampling **12** times in 2020 (Green Hill Pond at Creek Bridge, and Eastern Ninigret Pond at Pond Street)

- **Published a series of documentary videos** with Salt Ponds Coalition detailing various aspects of the EPA SNEP Grant in Charlestown (Videos #1 through #5),
- **Sampled** surface water quality of Allen's Cove with field YSI multi-meter from June through November 2020,
- **Implemented and bolstered** the Town of Charlestown Recommended Landscaper Process.

Other General Accomplishments

- **Authored** comprehensive RIDEM Application for Alternative OWTS Technology: Nitrogen Reducing Layered Soil Treatment Area, June 2020-January 2021,
- **Authored**: Cox, A. H., M. Dowling, G. W. Loomis, S. E. Engelhart, and J. A. Amador. 2020. **Geospatial modeling suggests threats from stormy seas to Rhode Island's coastal septic systems**. Journal of Sustainable Water in the Built Environment 6(3) https://doi.org/10.1061/JSWBAY.0000917
- **Partnered and Assisted with LSEM and the publications of:**
  - Ross, B. N., K. P. Hoyt, G. W. Loomis, and J. A. Amador. 2020. **Effectiveness of advanced nitrogen-removal onsite wastewater treatment systems in a New England coastal community**. Water, Air and Soil Pollution 231(11): 1-10.
  - Ross, B. N., B. V. Lancellotti, E. Q. Brannon, G. W. Loomis, and J. A. Amador. 2020. **Greenhouse gas emissions from advanced nitrogen-removal onsite wastewater treatment systems**. Science of the Total Environment https://doi.org/10.1016/j.scitotenv.2020.140399
  - Wigginton, S. K, G. W. Loomis, and J. A. Amador. 2020. **Greenhouse gas emissions from lignocellulose-amended soil treatment areas for removal of nitrogen from wastewater**. Science of the Total Environment https://doi.org/10.1016/j.scitotenv.2020.140936
  - Wigginton, S. K., E. Q. Brannon, P. J. Kearns, B. V. Lancellotti, A. Cox, S. Moseman-Valtierra, G. W. Loomis, and J. A. Amador. 2020. **Nitrifying and denitrifying microbial communities in centralized and decentralized biological**

nitrogen removing wastewater treatment systems. Water 12,1688 https://doi.org/10.3390/w12061688

- Ross, B. N, S. K. Wigginton, A. H. Cox, G. W. Loomis, and J. A. Amador. 2020. **Influence of season, occupancy pattern, and technology on structure and composition of nitrifying and denitrifying bacterial communities in advanced nitrogen-removal onsite wastewater treatment systems**. Water (In revision)
- Cox, A. H., S. K. Wigginton, and J. A. Amador. 2020. **Structure of greenhouse gas-consuming microbial communities in surface soils of a nitrogen-removing experimental drainfield**. Science of the Total Environment (In revision).
- Cox, A. H., D. Surabian, G. W. Loomis, J. D. Turenne, and J. A. Amador. 2020. **Temporal variability in the vertical separation distance of septic system drainfields along the southern Rhode Island coast**. Water, Air & Soil Pollution 231, 107. https://doi.org/10.1007/s11270-020-04488-z

- Findings from Charlestown WW Office included in two **Seminars** by LSEM:
- **Innovative and Alternative Septic Systems Research Webinar** - invited talks by Sara Wigginton, Bianca Ross, and Alissa Cox. Sponsored by the US EPA Southeast New England Program for Watershed Restoration (SNEP) (May, 2020)
- **Coastal New England Septic System Drainfields: Groundwater Table and Greenhouse Gas Dynamics** - doctoral defense talk by Alissa Cox, at the Coastal Institute, University of Rhode Island, Kingston, RI (March 2020)

- **Author** of Charlestown's Community Firewise Protection Plan
- Utilized statistical analysis to **compare measured shallow groundwater nitrogen concentrations to density of development** (i.e. density of OWTS) and geology and develop a program to manage, track and synthesize collected groundwater nitrogen data,
- **Developed a model** of predicted shallow groundwater nitrogen concentrations across the Salt Ponds Region and prepare maps,
- **Authored** white paper currently in review with URI LSEM detailing findings of the septic system density to groundwater quality relationship,
- **Partnered** with Suffolk County NY Department of Health Services Division of Environmental Quality, Office of Ecology for successful acquisition of **funding** through the National Estuary Program Coastal Watershed Grant Program for the installation and monitoring of 4 LSTA OWTS in Suffolk County "*Installation of innovative low tech, passive layered soil treatment areas septic systems to*

quantifiably reduce nitrogen loading within three NEP nutrient impacted coastal estuarine watersheds", November, 2020,

- **Coordinated** septic system design and installation for the failing Charlestown Animal Shelter system and prepare bid for installation May 2020,
- **Partnered** with URI Geosciences department to determine prevalence and spatial distribution of saltwater intrusion in groundwater in Charlestown's salt pond regions and barrier and headland complexes,
- **Coordinate and assist** with monitoring well installation for the URI Geosciences department to examine flux of saltwater wedge and groundwater dynamics in coastal environments, November 2020
- **Coordinated the implementation** of OWTS data to be available on the Charlestown Web GIS Program for public access and use,
- **Reviewed** RIDOH Private Well Potability Water Analytical Reports as a RI Licensed Drinking Water Interpreter (License # IPW00005) for **31** dwellings and provided letter reports and data summaries for each to the Building Official as a requirement for issuance of Certificates of Occupancy,
- **Monitored** tributary surface water inflow to Allen's Cove of Green Hill Pond as required by the RIDEM MS4 Stormwater Discharge Permit and submit samples for laboratory analyses, review, prepare and summarize analytical data,
- **Managed** the preparation of the 2019 Annual MS4 stormwater report to RIDEM for submittal in February 2020,
- **Compiled** case data, prepared summonses and assisted with prosecution of Building/Zoning matters in Municipal Court,
- **Implemented, coordinated, and managed** the annual Town of Charlestown's Resident Canada Goose Population Mitigation Program,
- **Assisted the URI New England On-Site Wastewater Training Program** with coordinating two training seminars for regulators, educators and practitioners licensing requirements entitled INSP100B Conventional Onsite Wastewater System Inspection Field Training, held in Charlestown,
- **Prepared several presentations** entitled "*Septic System Basics/On-site Wastewater Treatment 101*", "*On-site Wastewater Management in Charlestown",* and *"Groundwater Nitrate in Charlestown"* for presentation to community groups,
- **Submitted FY 21 RIDEM Project Priority List** Application to be eligible for

CSSLP Loan funding for 2021-22,

- **Worked with RI Infrastructure Bank** CSSLP marketing group to finalize promotional OWTS CSSLP funding materials for RI Cities and Towns and disseminate materials,
- **Established a protocol** and methodology and continue digitizing and scanning all existing and new RIDEM OWTS permits, maps and plans into a Town database,
- **Principal author** of the stormwater Illicit Discharge Detection and Elimination (IDDE) Ordinance to satisfy the RIDEM MS4 Municipal Stormwater Control requirements,
- **Assisted** with authoring Comprehensive Plan Update,
- **Attended** meetings with the RIDEM On-Site Wastewater Treatment Technical Review Committee, URI, New England Onsite Wastewater Training Program, Salt Ponds Coalition, and others,
- **Provided technical assistance** to the Tiverton Wastewater District, Town of Jamestown OWTS Enforcement, Town of South Kingstown OWTS Program, Town of Portsmouth On-Site Wastewater Management Office, Town of New Shoreham, Suffolk County, NY,

FUTURE OUTLOOK

I am proud of the hard work and dedication this office and my staff continue to provide to the Town of Charlestown. This calendar year (2021), I look forward to continuing the above referenced projects and accomplishing even more including;

- Work with the WWMC, Planning and Zoning and work with State Legislature, RIDEM, State OWTS Technical Review Committee and CRMC to identify and implement best policies to reduce and mitigate nutrient impacts to the groundwater resource within densely developed areas of the coastal zone to protect public drinking water and protect surface water quality,
- Expedite the replacement of the 5 remaining cesspools and 18 metal tank systems,
- Complete a final report for the EPA SNEP Grant to summarize accomplishments,
- Continue to Implement the following established under the EPA SNEP Charlestown Coastal Watershed Protection and Restoration Program;

- Foster Nitrogen reducing OWTS sampling as part of the septic system optimization program,
- Implement the published methodologies for sampling final Nitrogen effluent concentrations for N-reducing OWTS installed under the EPA SNEP grant,
- Continue field monitoring of the 15 systems installed under the SNEP grant to quantify nutrient reduction,
- Share findings through reporting, and presentations at public and academic forums,
- Promote Charlestown Recommended Landscaper Program, and
- Assist with public outreach through the demonstration rain gardens.

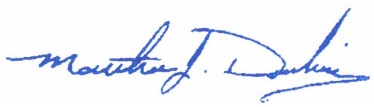
- Optimize performance of all IA/Denitrifying OWTS by assisting homeowners to establish the required preventive maintenance schedules and Maintenance Contracts,
- Continue to seek RIDEM approval for experimental installation and conduct testing required for RIDEM approval of N-reducing LSTA OWTS,
- Assess feasibility of sampling select groups of IA OWTS in Charlestown using the newly established **low cost** methods to ensure N-Reducing OWTS are in compliance with Ordinance 210 as an alternative to the Ordinance required property owner expenditure to hire a lab or service provider to conduct sampling,
- Continue to study groundwater quality to further quantify and refine statistical analyses and GIS models of groundwater Nitrogen impacts with relationship to OWTS in the Salt Ponds Region,
- Seek funding opportunities to assist property owners with substandard OWTS upgrade to N-reducing technology in the densely developed areas to continue to incrementally reduce nitrogen loading to these critical areas,
- Examine town land use development and existing policy frameworks to explore potential methods to site new construction or redevelopment to maximize drinking water, groundwater and surface water protection,
- Sample water quality of additional tributaries relating to source of elevated bacteria levels in Eastern Ninigret and Green Hill Ponds (relating to Green Hill Pond Bacteria TMDL established by RIDEM),
- Continue to digitize all OWTS permits and plans and work with GIS Office to provide a link to these documents on the web GIS,

- Oversee the removal of the 5 remaining cesspools,
- Continue to provide low interest loan funding and apply for other grant opportunities as they arise, and
- Continue to foster and broaden our working partnerships with nationally recognized onsite wastewater treatment academic experts at URI Laboratory of Soil Ecology and Microbiology and URI New England Onsite Wastewater Training Program and also with URI NEMO Cooperative Extension and URI Geosciences Department.

Acknowledgements

The Onsite Wastewater Management Program Office would like to thank our partners and supporters. Without the leadership of the Town of Charlestown, the Town residents and property owners, the Charlestown Town Council, the Charlestown Budget Commission, the Wastewater Management Commission and the Town Administrator, the program would not have the necessary tools to implement this work. Further, we would like to thank our partners at the University of Rhode Island Laboratory of Soil Ecology and Microbiology including Dr. Jose Amador, Dr. Bianca Ross, Dr. Alissa Cox, Kevin Hoyt and Owen Placido and George Loomis and Dr. Alissa Cox of the New England Onsite Wastewater Training Program for providing scientific and technical expertise and analytical capabilities of their laboratory and staff. Art Ganz, Alicia Eichinger and Claire Hodson of the Salt Ponds Coalition provided essential knowledge of Salt Ponds ecosystems, surface water sampling, public outreach and designed and published our EPA SNEP video series. Dave Prescott and all the volunteers coordinated through Save The Bay made the installation of our rain garden demonstration projects a reality. Steve McCandless was instrumental in providing GIS resources for mapping and statistical and analytical resources.

Respectfully Submitted

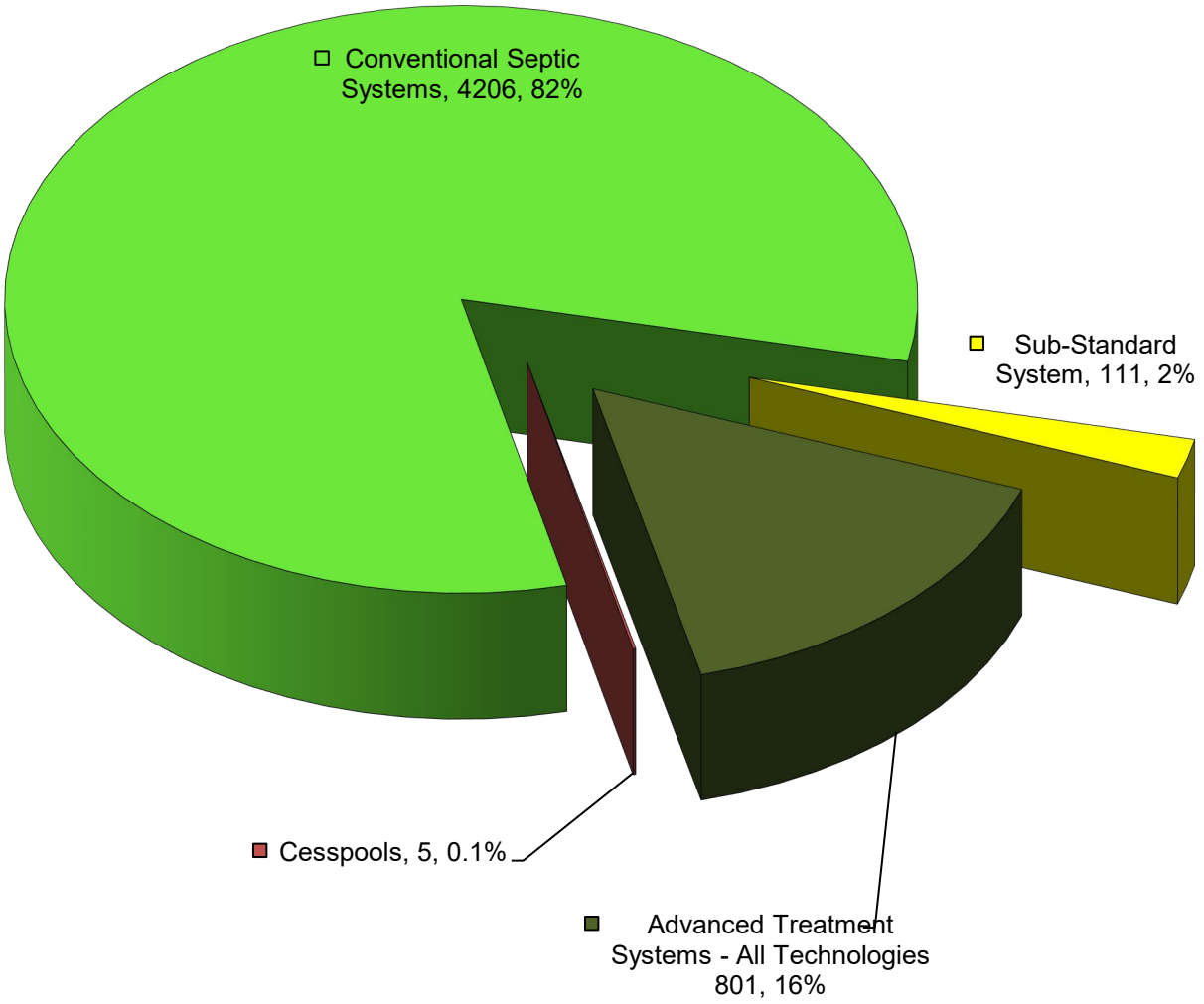


Matthew J. Dowling
On-Site Wastewater Program Manager / Environmental Scientist

FIGURES AND ATTACHMENTS

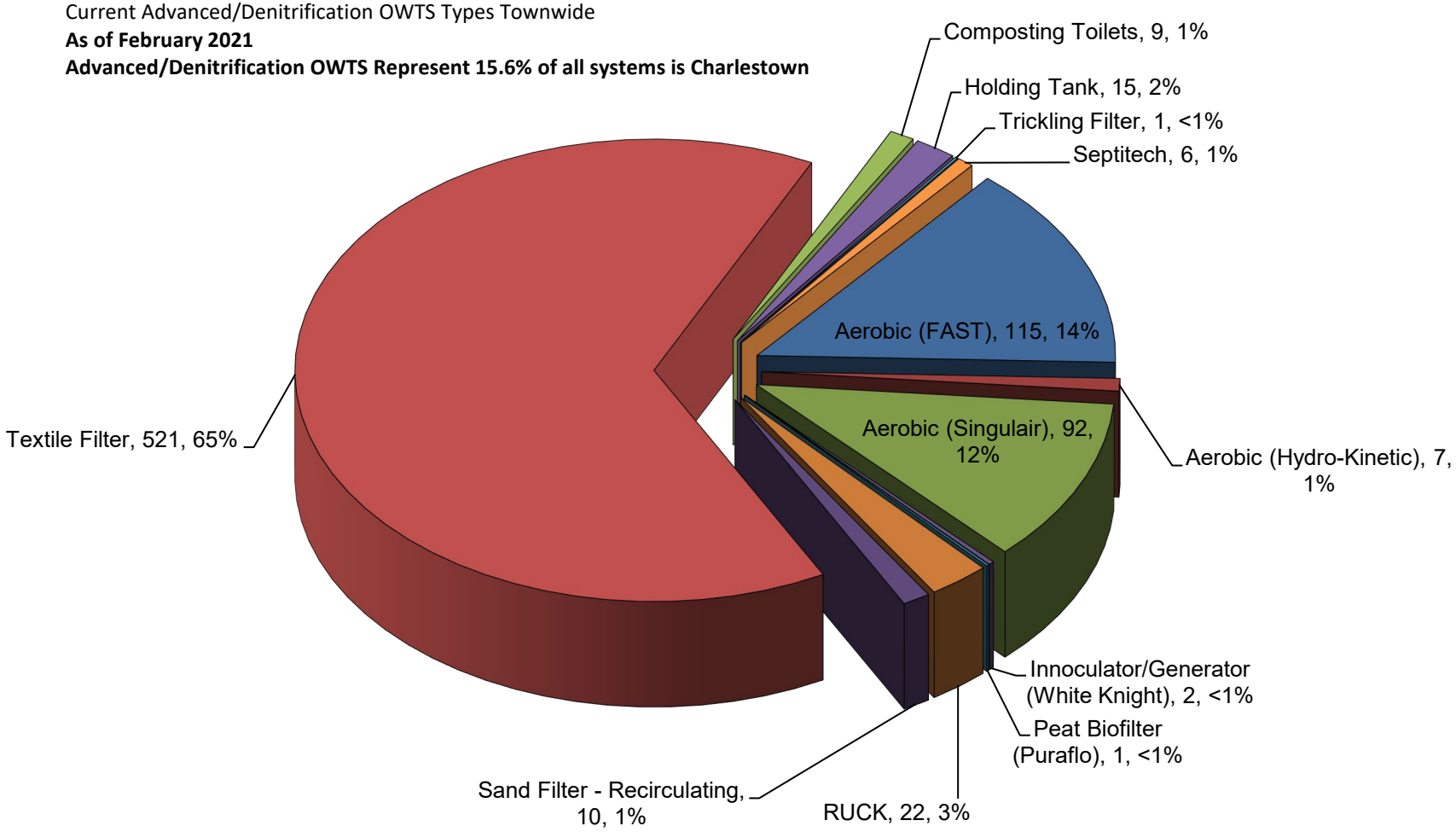
(This page intentionally left blank.)

Town of Charlestown - Office of Wastewater Management
Current Septic System (OWTS) Types Townwide as of
FEBRUARY 2021

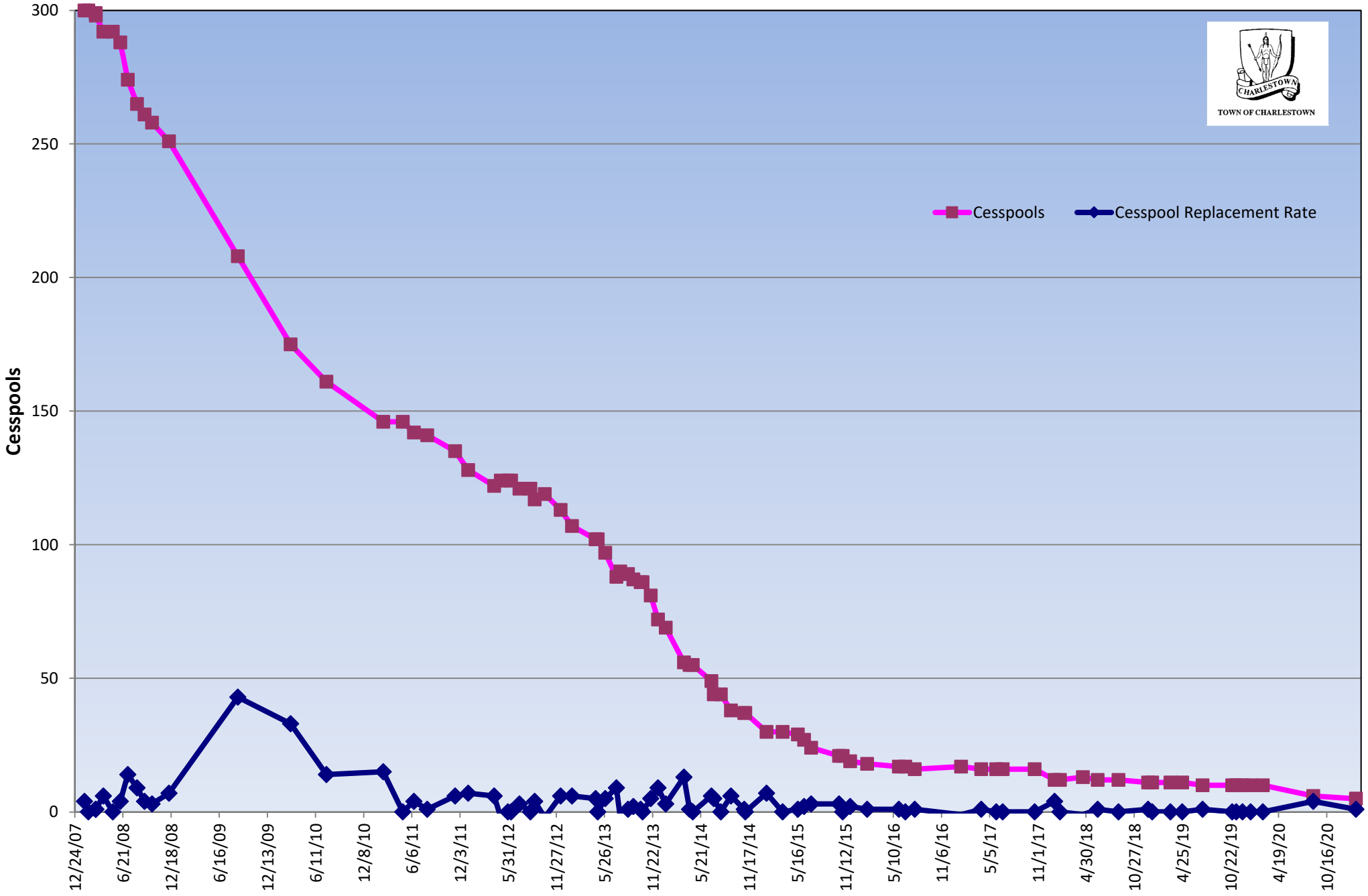


Town of Charlestown - Office of Wastewater Management
Current Advanced / Denitrification OWTS Types Townwide As Of February 2021

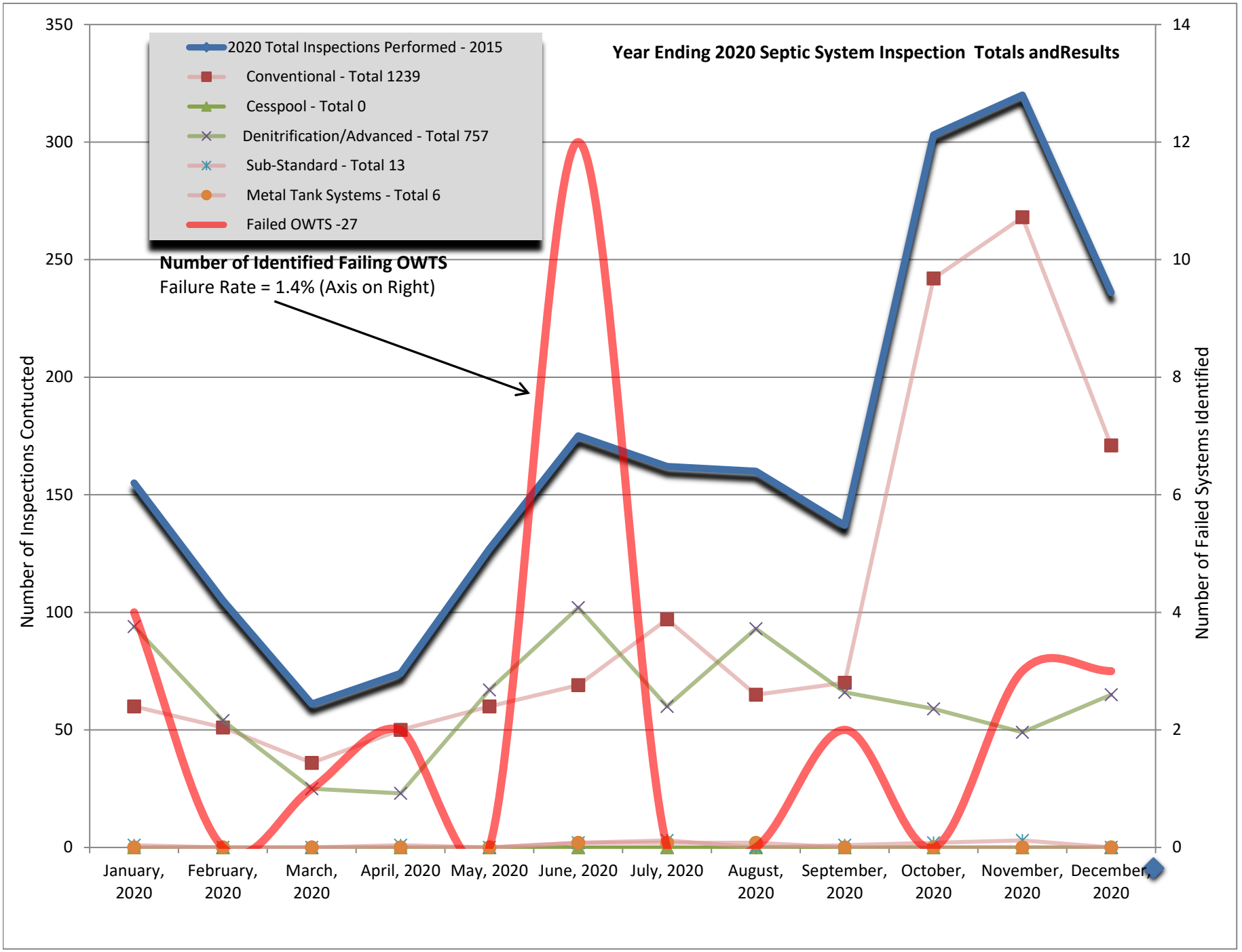
Town of Charlestown - Office of Wastewater Management
Current Advanced/Denitrification OWTS Types Townwide
As of February 2021
Advanced/Denitrification OWTS Represent 15.6% of all systems is Charlestown



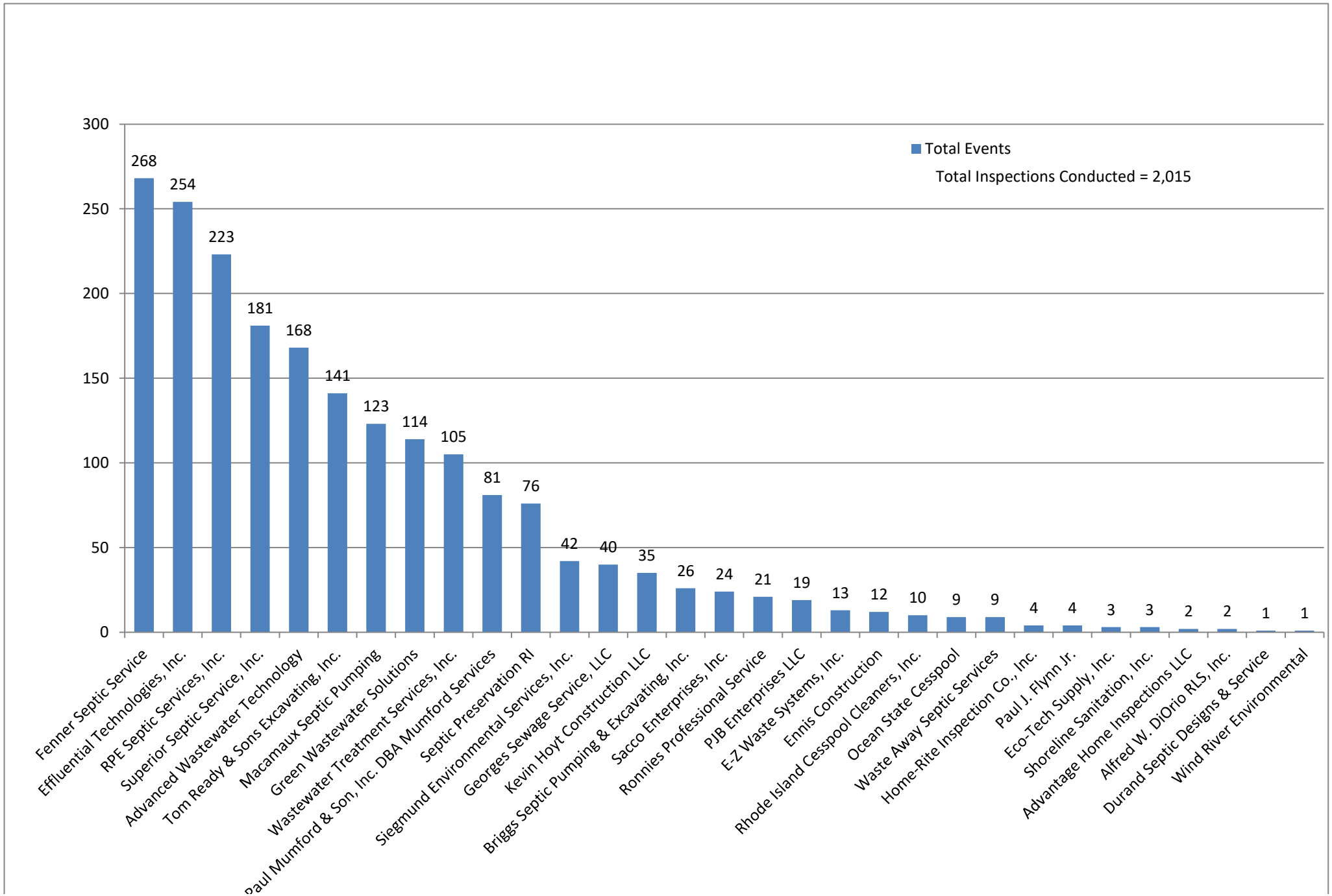
Town of Charlestown - Office of Wastewater Management
Current Cesspools and Rate of Removal Townwide As Of
FEBRUARY 2021



Town of Charlestown - Office of Wastewater Management
2020 Septic System Inspections Conducted Townwide by System Type



Town of Charlestown - Office of Wastewater Management
Total OWTS Inspections Performed
by Service Provider January Through December 2020



Percent of Total OWTS Inspections Performed by Service Provider 2020

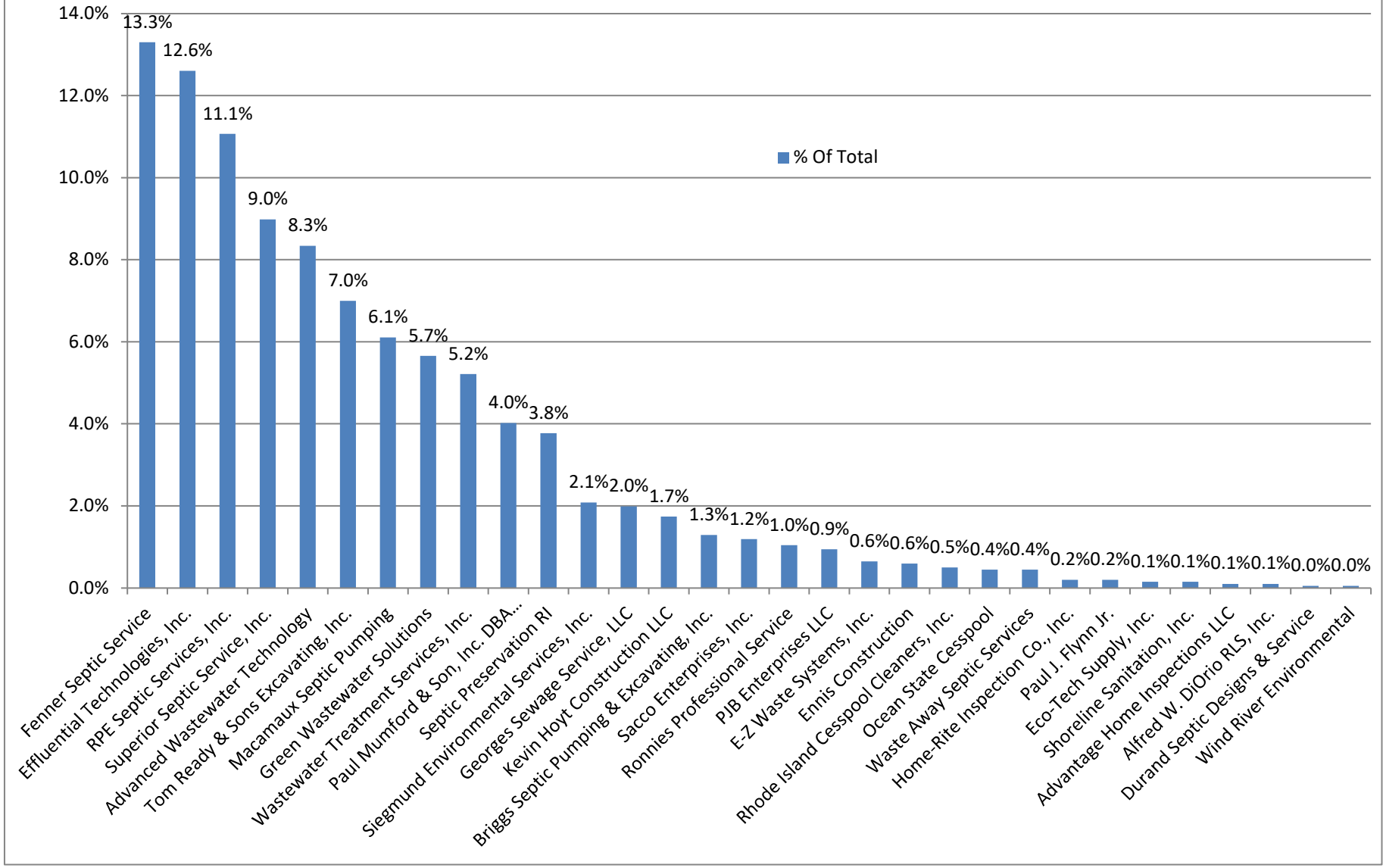


Figure 7 - Town of Charlestown
Office of Wastewater Management
2020 Annual Report Data Sheet
January 2020 through December 2020

	TOTAL	January, 2020	February, 2020	March, 2020	April, 2020	May, 2020	June, 2020	July, 2020	August, 2020	September, 2020	October, 2020	November, 2020	December, 2020
Phone Calls and Office Visits	**0**												
Inspections performed	**2015**	155	105	61	74	127	175	162	160	137	303	320	236
Conventional	**1239**	60	51	36	50	60	69	97	65	70	242	268	171
Cesspool	**0**	0	0	0	0	0	0	0	0	0	0	0	0
Advanced	**757**	94	54	25	23	67	102	60	93	66	59	49	65
Substandard	**13**	1	0	0	1	0	2	3	0	1	2	3	0
Metal Tank	**6**	0	0	0	0	0	2	2	2	0	0	0	0
Failed Systems Identified	**27**	4	0	1	2	0	12	0	0	2	0	3	3
Notices of Intent to Enforce	**4**	0	0	0	0	0	1	0	0	1	0	2	0
Notices of Violation	**30**	30	0	0	0	0	0	0	0	0	0	0	0
Notices of Violation Releases	**16**	0	3	2	1	0	0	6	2	1	1	0	0
Cesspool Phaseout	**2**	0	0	2	0	0	0	0	0	0	0	0	0
Inspections	**13**	0	3	0	0	0	0	6	2	1	1	0	0
Failures	**1**	0	0	0	1	0	0	0	0	0	0	0	0
Complaints	**4**	0	0	0	2	0	1	0	0	0	1	0	0
Certificates of Conformance	**42**	1	5	5	14	0	3	6	6	2	0	0	0
Cesspool Phaseout	**4**	0	2	0	0	0	0	0	0	0	0	0	2
Other Repairs	**16**	0	0	0	5	0	0	4	1	1	2	3	0
Alterations	**10**	0	2	1	2	0	1	0	2	1	0	1	0
New Building Construction	**27**	1	1	4	7	0	2	2	3	0	2	2	3
OWTS Applications Received	**70**	5	4	1	12	2	12	1	3	10	4	8	8
Cesspool Replacements	**1**	0	0	0	1	0	0	0	0	0	0	0	0
Other Repairs	**29**	3	0	0	1	0	9	0	0	5	2	5	4
Alterations	**13**	1	0	0	4	2	1	0	1	3	0	0	1
SSD	**3**	0	0	0	0	0	0	0	0	0		2	1
New Building Construction	**24**	1	4	1	6	0	2	1	2	2	2	1	2
Total Correspondences	**0**												

Figure 8 - Town of Charlestown - Office of Wastewater Management
2020 RIDEM Septic System Applications Received Townwide by Type

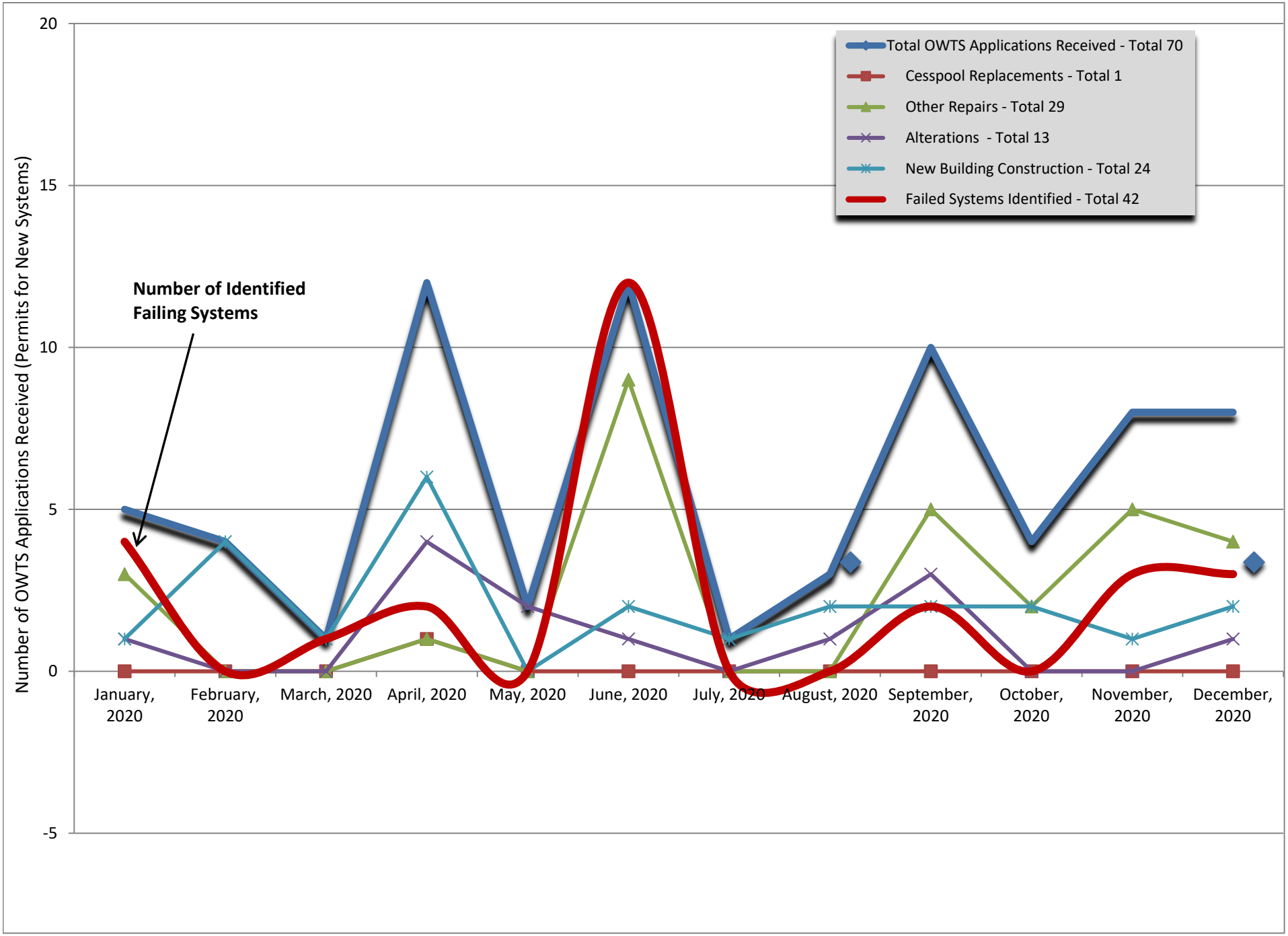
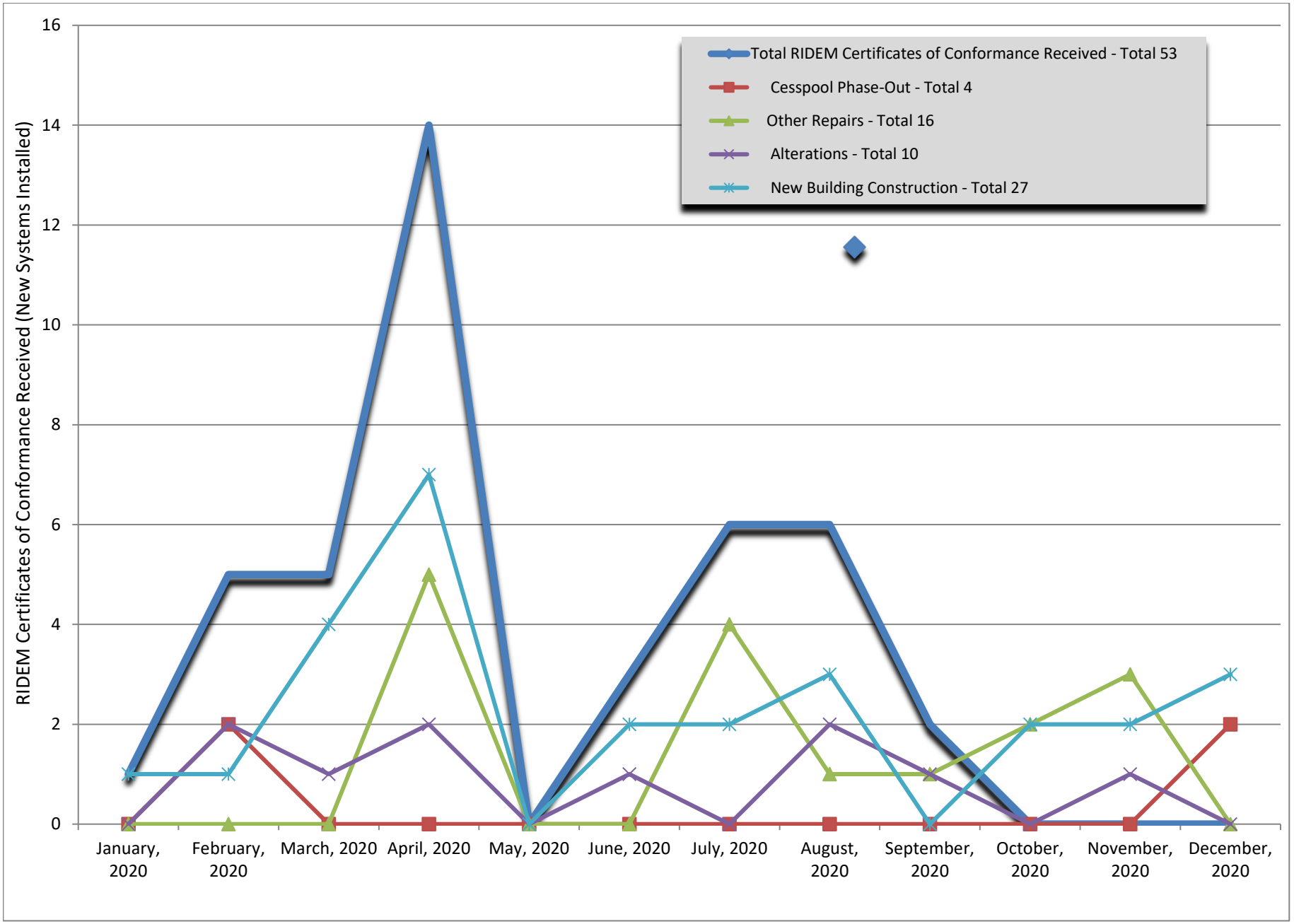


Figure 9 - Town of Charlestown - Office of Wastewater Management
2020 RIDEM Septic System Certificates of Conformance (Installations) Received Townwide by OWTS Type



Town of Charlestown - Office of Wastewater Management

OWTS Types Townwide vs Time As Of

JANUARY 2020

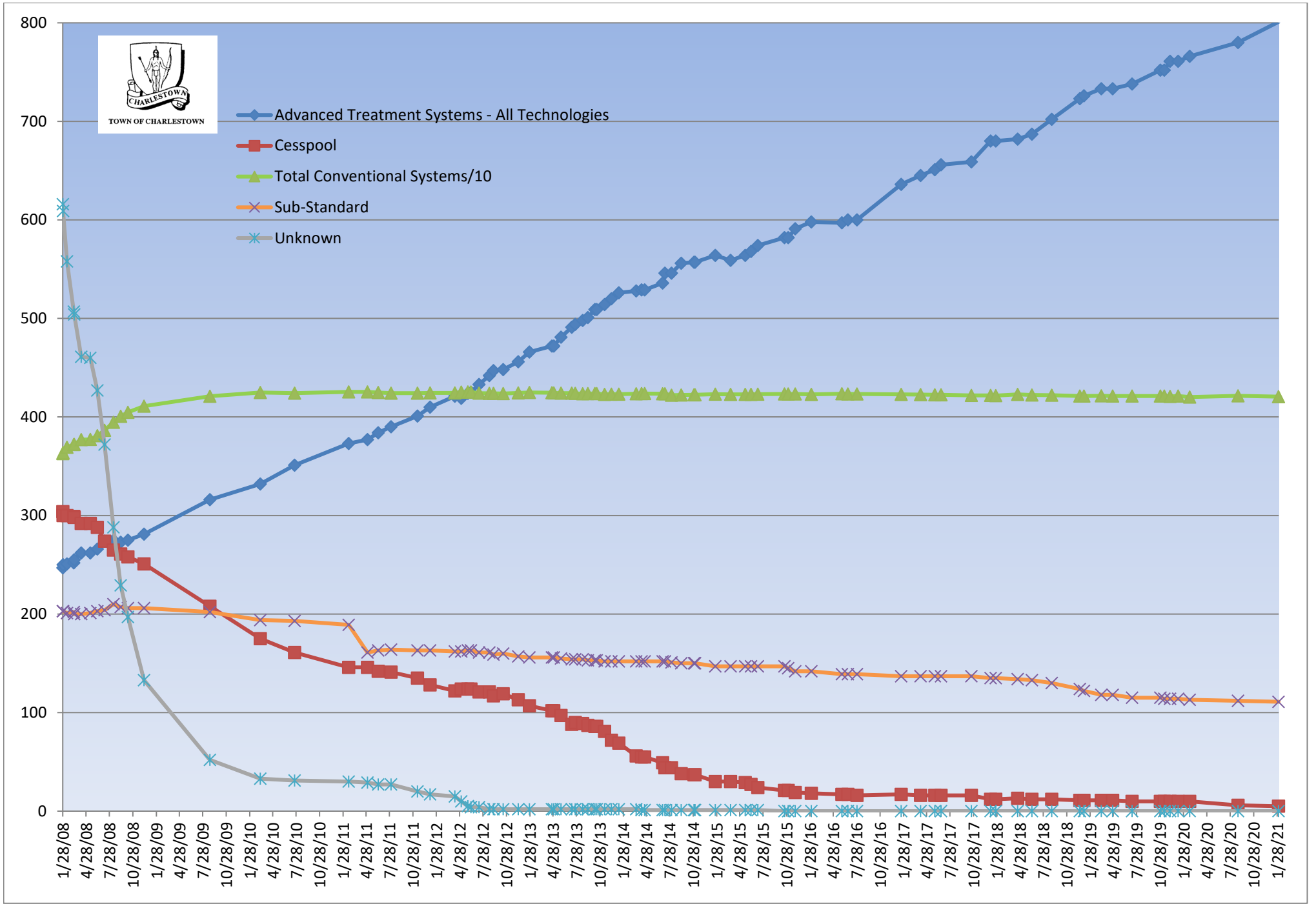
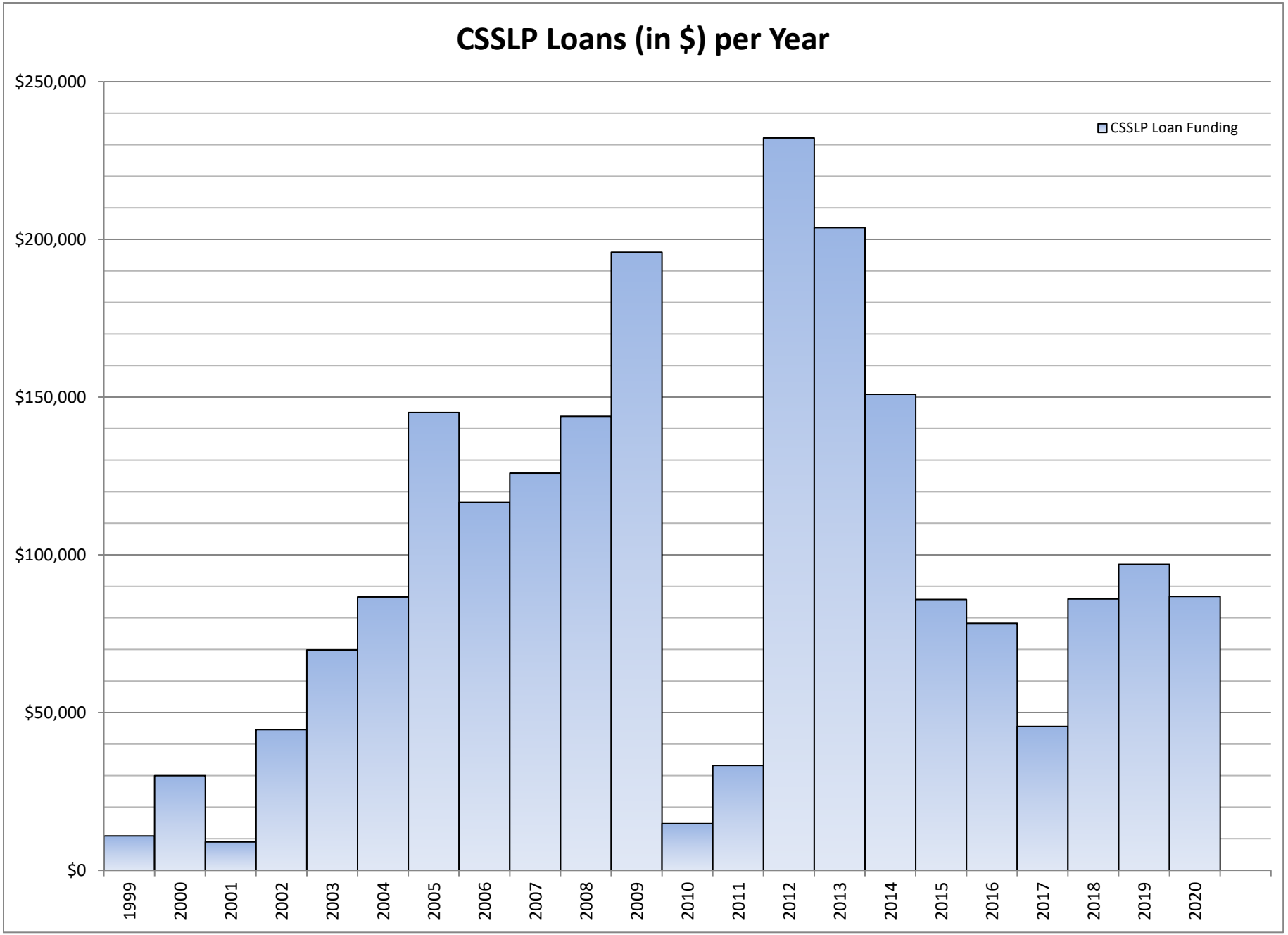


Figure 11 - Town of Charlestown - Office of Wastewater Management
Community Septic Loan Disbursements Per Year 1999-2020



(This page intentionally left blank.)

Town of Charlestown, R.I.
On-Site Wastewater Management Program
A Department of Charlestown Public Works
4540 South County Trail
Charlestown, RI 02813
(4010 364-5030