WHAT?

Post-Closure Care
• Obligations
• How Long

Post-Closure Use
• It’s Optional
• Post-Closure Uses
• Examples
• Regulatory Considerations
• Got an Idea, Now What?
• For a Solid Waste Landfill

Contacts
Questions
POST-CLOSURE CARE
OBLIGATIONS

Inspect, Monitor, Maintain, and Repair
• Semi-annual inspections
• Groundwater & LFG monitoring
• Perform maintenance
• Make repairs

Financial Assurance
• Rolling 30-year period

Reporting
• Annual Post-Closure Report
• Incident Report
“The post-closure period of a landfill shall be the period of time required to demonstrate the facility has achieved the performance standards ...”

[ref. Env-Sw 807.05(a)]
“Performance Standards. The permittee shall implement an approved closure plan requiring that:

(a) The facility and site effectively cease generating leachate;

(b) The facility and site effectively cease generating decomposition gases;

(c) The facility and site achieve maximum settlement, with the capping system intact and no reasonable expectation that integrity of the capping system will be at risk without regular maintenance;

(d) The facility and site have no adverse impact to air, groundwater or surface water; and

(e) The facility and site not otherwise pose a risk to human health or the environment.”

[ref. Env-Sw 807.04]
HOW LONG?

A Long Time
POST-CLOSURE USE
IT’S OPTIONAL

Don’t Use It: Isolate the facility

Do Use It: Reuse the landfill footprint (i.e., cap space)

Hybrid: Reuse off-footprint space (isolate the landfill & infrastructure)
Every closed landfill and site has a quirk; you need to find the post-closure use that is right for your facility.

Uses Approved to Date:
- Transfer stations
- Recreational areas
- Parking areas
- Solar arrays
- Off-cap gun range

Not recommended:
- Buildings or permanent structures
- Penetrations of the cap and/or waste mass
EXAMPLES – NOT SO SUCCESSFUL

Webster Square (Former Blueline Express), Nashua: Retail Center

- Structural deficiencies have resulted in unusable retail space
- Multiple retrofit projects required
- On-going issues in keeping landfill gas systems operational
EXAMPLES – MIXED RESULTS

Old Nashua Landfill, Nashua: Parking Lots
• Frequent shimming of parking areas required due to settlement
• Landfill gas system being compromised by settlement
• Provides parking spaces for adjacent commercial development

Shady Lane Landfill, Nashua: Recreational Fields and Parking Lot
• Indoor air quality monitoring required at adjacent school
• Landfill gas system monitoring and maintenance required
• Provides parking and recreational fields for school
EXAMPLES – SO FAR, SO GOOD

Goffstown Municipal Landfill, Goffstown: Recreational Fields

- No known issues
- Proper planning for recreational fields
EXAMPLES – SO FAR, SO GOOD

NH/VT Ash Landfill, Newport: Off-Cap Gun Range
- No known issues
- Generates limited income
- Hosts training for police department, and testing for local gun manufacturer

Milton Municipal Landfill, Milton: Solar Array
- No known issues
- Generates income
- Puts otherwise unusable space to work
REGULATORY CONSIDERATIONS

• Must **not** interfere with achieving the *Performance Standards*
  • Must not compromise the waste containment system and infrastructure, including the groundwater monitoring network
  • Must not interfere with continued inspection, monitoring, and maintenance
  • Must not restrict access for repairs, if needed
• Likely need to update the Closure Plan, which includes the post-closure requirements
• The **permittee** is responsible
GOT AN IDEA, NOW WHAT?

Rules and NHDES program lead varies:
- Pre-’81 (Remediation Programs)
- Post-’81 (Solid Waste Bureau)
- 40 CFR 258, RCRA Subtitle D (Solid Waste Bureau)
- Superfund (Federal Sites Section and EPA)

Also consider:
- Alteration of Terrain Permit
- NPDES Permit
- Local Approval
- Other permits/approvals
FOR A SOLID WASTE LANDFILL

Requires NHDES approval

• File an application for permit modification (Type I-B)

In addition to completing the application form, provide:

• Information and calculations demonstrating stability (e.g., cap integrity, global stability)

• Information regarding changes to stormwater design/run-off

• Information regarding protection from landfill gas/explosion hazards

• Design plans showing layout, including access roads and setbacks from landfill infrastructure and monitoring points

• Explain how vegetation control will be accomplished

• Explain plans for removal, and returning the site to pre-existing conditions (i.e., landfill with no post-closure use)
FOR A SOLID WASTE LANDFILL

NHDES approval may include:

- Pre-construction requirements
- Construction requirements
- Post-construction requirements

Remember: The **PERMITTEE** is responsible.
CONTACTS

Hazardous Waste Remediation Bureau

• Site-specific project manager or
  • Federal Sites: Robin Mongeon, P.E., Tel. (603) 271-7378, email: robin.mongeon@des.nh.gov
  • State Sites: Amy Doherty, P.G., Tel. (603) 271-6542, email: amy.doherty@des.nh.gov
  • Brownfield Sites: Mike McCluskey, P.E., Tel. (603) 271-2183, email: michael.mccluskey@des.nh.gov

Oil Remediation & Compliance Bureau

• Site-specific project manager or
  • Peg Bastien, P.E., Tel. (603) 271-7372, email: margaret.bastien@des.nh.gov

Solid Waste Management Bureau

• Jaime M. Colby, P.E., Tel. (603) 271-5185, email: jaime.colby@des.nh.gov

Terrain Alteration Bureau

• Bethann McCarthy, P.E., Tel. (603) 271-1087, email: bethann.mccarthy@des.nh.gov
RECAP

Post-Closure Care
• Obligations
• How Long

Post-Closure Use
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Contacts
Questions
QUESTIONS?
Evaluation of PFAS Impacts to the City of Portsmouth Water Supply and Evaluation of Treatment Alternatives

Blake Martin, Vice President
Kyle Hay, Project Engineer

2019 NH Waste and Contaminated Sites Conference
September 11, 2019 – Manchester, NH
History Pease Tradeport Water System

- 1797 - Portsmouth Aqueduct Company formed by act of NH Legislature
- 1950’s - Pease Air Base takes over Pease portion of the water system
- 1990’s - Pease Air Base closes and water system turned over to Pease Development Authority for the Pease Tradeport
- 1992 – City of Portsmouth takes over operation of water system
The Pease Tradeport

- 250 Businesses employing 9,500 workers
- Golf course
- Commercial airport
- 5 Secondary education institutions
- Various restaurants
- Daycare providers
Pease Water System

- 3 Wells
- 2 Storage Tanks
- Booster from Portsmouth to Pease
- 30 Miles of water main
- 0.4 – 1.0 MGD demand
Previous Ground Water Contamination

• VOCs plumes (TCE/PCE) found around Haven Well

• A WTP constructed in the mid 1980’s to treat for VOCs

• 1990 site remediation started under CERCLA

• Due to low demand (base closure) and steadily improving GW quality, WTP never activated, equipment removed in 2013
Pease Well Is Shut Down After Unregulated Contaminant Discovered

By SAM EVANS-BROWN  •  MAY 22, 2014

May 2014
Contaminated well shut down at Pease Tradeport

PORTSMOUTH — A well that serves the Pease International Tradeport has been shut down after testing positive for a chemical contaminant, according to the state Department of Environmental Services.
Local and Federal Legislative Delegation

March 18, 2015 - Senator Shaheen addresses Pease PFC contamination to U.S. Air Force

2016 – Governor (now Senator) Hassan meets with Testing for Pease representatives
Technical Response Team Forms

- **Weekly meetings (initially) either in-person or via teleconference:**
  - City of Portsmouth Staff
    - City consultants
  - Pease Development Authority
  - Environmental Protection Agency
  - New Hampshire Department of Environmental Services
    - Waste Division
    - Drinking Water and Groundwater Bureau
  - Air Force Civil Engineering
    - Air Force Consultants
  - New Hampshire Health and Human Services
  - Agency for Toxic Substances and Disease Registry (ATSDR)
  - Others, depending on topic
Public Involvement:

- Presentations to Portsmouth City Council
- Haven Well Community Advisory Board
  - 14 public meetings in 2014
- Blood Testing
  - Three public meetings announcing blood test results
- ATSDR Community Assistance Panel
  - Formed in 2016 to address long-term health concerns
- Pease Restoration Advisory Board
  - Reestablished in 2016
Former Pease Air Force Base

- Three treatment systems
  - Site 8 (remediation)
  - AIMS (remediation)
  - Grafton Road (drinking water)
Drinking Water Sources

Initial Haven Well sample came back at 2.5 µg/L

<table>
<thead>
<tr>
<th>Well</th>
<th>Flow Rate (gpm)</th>
<th>PFOA+PFOS (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harrison</td>
<td>286</td>
<td>0.029</td>
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<tr>
<td>Smith</td>
<td>343</td>
<td>0.012</td>
</tr>
<tr>
<td>Haven</td>
<td>534</td>
<td>1.495</td>
</tr>
</tbody>
</table>

Existing Facility
Drinking Water Technologies

• Granular Activated Carbon
  - Advantages – cost effective, several systems in use, PFAS can be transported offsite for destruction
  - Disadvantages – may be costly to changeout for short chain breakthrough, footprint/building height
Drinking Water Technologies

• Ion Exchange Resins

  – Advantages – custom designed treatment, long service life, smaller vessels required

  – Disadvantages – expensive if single use, newer technology with limited data
Drinking Water Technologies

• Membranes
  - Advantages – >99% removals
  - Disadvantages – waste stream, high capital and O&M costs, expertise required to operate system
GAC Piloting – Harrison and Smith

Purpose – monitor GAC effects on pH
  – Potential issues with orthophosphate effectiveness
Demonstration Study

Purpose

- Test GAC effectiveness on Pease (Harrison and Smith) water
- Test new media
- Further research treatment alternatives
- Evolving regulations
- Design of permanent facility
Demonstration Filter Schematic
GAC Filter Installation
Demonstration Filter Results
(September 2016 – present)

• 35 months of operation, ~425,000,000 gallons treated
  – GAC works well for low levels of PFOA/PFOS

• Media in PV2 replaced March 2018, All media replaced in November 2018

• Most recent sampling event (July 8, 2019 - 79,000,000 gallons/15,000 BV):
  – Trace levels of PFHpA, PFOA, PFBS, PFHxS, PFOS at 50% sample port of PV1
  – Trace levels of PFPeA, PFHxA at 100% sample port of PV1
  – PFBA at 100% sample port of PV2

• Concentrations near detection limits are difficult to trend
  – Now using 2 ppt reporting limit
Objectives of Haven Well Pilot Test  
(November 2017 – December 2018)

• Uncertain if GAC would perform well for significantly higher levels of PFAS.

• Compare the ability of media to remove PFAS from the Haven Well
  – IX Resin = ECT’s SORBIX LC1
  – GAC = Calgon’s F400

• Confirm design parameters and system sizing to be used in the preparation of the full-scale treatment system technology evaluation.

• Select PFAS-removal technology for full-scale implementation based on lifecycle cost comparison and risk
Haven Pilot Setup

- Fabricated dual sided pilot skid for side-by-side testing: IX Resin vs. GAC
  - Each side:
    - Design flowrate of 112 gpd
    - 4 columns in series, 2.5-min EBCT each
    - 1.25-inch column diameter
    - 30-inch media bed height
- Sampled & analyzed for 23 PFAS compounds out of each column
Haven Pilot Results

GAC - TOTAL PFAS

IX - TOTAL PFAS
Haven Pilot Results

GAC - PFHxS

IX - PFHxS
Haven Pilot Results

**GAC - PFOS**

- **IX - PFOS**

- Date: 10/15/112, 101/7, 2/4, 3/4, 4/1, 4/245, 276, 247, 228, 199, 160, 141, 112, 9, 1/6

- Concentration (ppb)

- Line colors:
  - GAC 10.0 min
  - GAC 5.0 min
  - GAC 2.5 min
  - IX 10.0 min
  - IX 5.0 min
  - IX 2.5 min
  - INFLUENT
Haven Pilot Results
Haven Pilot Results

GAC - PFNA

Concentration (ppb)

Date

IX - PFNA

Concentration (ppb)

Date
Haven Pilot Conclusions

• Resin significantly outperforms GAC when raw water PFAS concentrations are high

• Resin removed short chain compounds better than GAC

• As regulations move PFAS limits lower, the advantages of resin over GAC goes up
Grafton Road Water Facility Process Schematic
New Treatment System

Haven Harrison Smith Wells
Booster Pumps

Cartridge Filters

Pair Resin Filters

GAC Filters
To Distribution System

- Chlorine
- Fluoride
- Orthophosphate
Proposed Final Layout

GAC Vessels

Resin Vessels

Influent Well Manifold
### Twenty Year Present Worth Analysis

**Grafton Road Drinking Water Treatment Plant**

<table>
<thead>
<tr>
<th>Treatment Option</th>
<th>Construction Cost</th>
<th>Operations Costs</th>
<th>Present Worth Cost (20 year, 4%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Vessels and Media</td>
<td>Credits*</td>
<td>Annual Media Cost</td>
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<tr>
<td>GAC Only Treatment</td>
<td>$2,140,000</td>
<td>-</td>
<td>$304,000</td>
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<tr>
<td>Resin in Parallel and GAC in Series</td>
<td>$2,430,000</td>
<td>-</td>
<td>$91,300</td>
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<tr>
<td>Resin in Series and GAC in Parallel</td>
<td>$2,625,000</td>
<td>$(910,000)</td>
<td>$99,300</td>
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</table>

* Credits associated with reduction in building footprint and elimination of backwash supply and recycle tanks.

- Third-party estimated construction cost - **$14,000,000**
- Low Bid - **$10,343,000**
Anticipated Construction Schedule

### Milestones:
- Spring 2019 – Begin Construction
- June 2020 – New GAC Filters (switchover of Harrison/Smith Wells)
- Spring 2021 – Startup with Resin/GAC filters (Harrison/Smith Wells)
- Summer 2021 – Haven Well Startup
Questions?
SAFETANK FINANCIAL ASSISTANCE PROGRAM

AND

HOW IT RELATES TO PETROLEUM REIMBURSEMENT FUND ELIGIBILITY

Genevieve Al-Egaily
New Hampshire
Department of Environmental Services
SAFETANK is important part of the process for low income homeowner’s.

Fuel Oil Discharge Cleanup Fund for On-Premise-Use Heating Oil Use
Eligibility for the Petroleum Reimbursement Fund is Determined Based on the Presence of a “Compliant” AST System
Financial Assistance Program

- Available to income qualified homeowners
  - Upgrade home heating oil tank system

- Provides up to $2,250
  - Upgrade or removal & replacement aboveground tank system

- Provides up to $2,500
  - Remove underground home heating oil tank

- Minimize Risk of Contamination
  - Best Management Practices (BMP)’s

The SAFETANK Program averages 162 tank installations per fiscal year
Fund Eligible sites with SAFETANK

<table>
<thead>
<tr>
<th>Year</th>
<th>SAFETANK Sites</th>
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</thead>
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<tr>
<td>2000</td>
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<tr>
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<td>2015</td>
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<tr>
<td>2016</td>
<td>16</td>
</tr>
<tr>
<td>2017</td>
<td>16</td>
</tr>
<tr>
<td>2018</td>
<td>29</td>
</tr>
</tbody>
</table>
Removal of Underground Home Heating Oil Tank up to $2,500
Upgrade, or Remove and Replace Aboveground Residential Tank System up to $2,250
Replace tanks that are not up to code and NH DES Best Management Practices
Less expensive to replace a tank than to clean up a leak!
## SAFETANK PROGRAM

**Financial Assistance For Residential On-Premise-Use Fuel Oil Facility Tank Upgrade Application**

**Oil Remediation & Compliance Bureau**

**RSA 146-D.8, III.**

Owners of on-premise heating oil facilities, who demonstrate financial need, may apply for reimbursement of costs to meet the requirements of RSA 146-D.8, III in amounts not to exceed $2,250. Reimbursement may be to the owner, or to the contractor, after inspection of the completed work and a review of itemized invoices to verify the work was: (1) completed in a satisfactory manner, and (2) the costs are appropriate.

To qualify for the program, the owner shall meet the definition of “low-income” by U.S. Department of Housing and Urban Development. “Low-income” is defined as 80% of the area Median Income (Income criteria is provided on the last page of this application).

### Providing documentation of total household income is required and is described in more detail below. Additional qualifying requirements are addressed by answering the following questions.

### Be advised that applications must be processed and approved obtained from New Hampshire Department of Environmental Services (NHDES) prior to any work being performed, to qualify for reimbursement.

If you have any questions regarding this program or this application, please contact the OPUF Release Prevention Coordinator at (603) 271-3577.

**IMPORTANT:** Answer all four of the following questions to determine if you should submit this application.

1. Do you, as the applicant, own or are you an owner of the subject dwelling and tank system? Yes ___ No ___

2. Is the subject location your primary residence, and is it a single-family home, a duplex, a manufactured home, a farm, or a property where you also operate a small business? Yes ___ No ___

3. Do you hold title, or have an interest in, any income-producing property, other than your primary residence, including but not limited to, stocks or real property held either individually, or through a business trust, or other related entity? Yes ___ No ___

4. Is the Total Household Annual Income at or below the income criteria on the chart included in this application for the town, city, or county of residence, based on Household Size? Total Household Income includes the income for all occupants of the household and all other household members. (NOTE: All income includes and tax-exempt income, and income tax returns filed. However, if the owner generates any income from property other than the Primary Residence, see Question 2.) Yes ___ No ___

**Owner Information:** (be sure to include location address if different from mailing address)

Name(s): ________________________________

Physical Address: ________________________________

City/Town: __________________ State: ______ Zip: ______ County: ______

Mailing Address: (if different) ________________________________

Name of mobile home park if applicable: ________________________________

Home phone: __________________ Cell: __________________ Work: __________________

Email: ______________________________

**Site (Property) Information:**

Is the property served by (check one): private well ______ public water supply ______

If a private well, is it: a shallow well (dug or point well) ______ a drilled or bedrock well ______

Approximate distance between oil tank and well: ______ feet

If public water is it: Community water supply ______ municipal (town or city) water supply ______

Does the property abut surface water? Yes ___ No ___ If yes, name or description of the body of water: ______________________________

**Income:**

To qualify for the SAFETANK program, annual Total Household Income (whether that income is taxable or not) must be at or below 80% of the area (county) median income as calculated by the U.S. Department of Housing and Urban Development. The income criteria for the ten New Hampshire counties, is provided on the last page of this application. When submitting this application for approval, provide written documentation of Total Household Income. The documentation may include: a copy of the most recent federal tax return(s), Social Security benefit statement(s), W-2 forms from the previous tax year, annual pension or retirement statement(s), annual statement(s) or indication of direct deposit(s) of other benefits or income(s). As an alternative, include a copy of the two most recent pay stubs for those household members that are employed. Please note that tax documentation including but not limited to federal tax return(s), Social Security benefit statement(s) and W-2 forms cannot be accepted via email.

Total Annual Household Income: $ ______

Household Size: (including yourself, the total number of occupants other than tenants living in the subject household) ______

**Affirmation:** I declare under penalty of perjury that the representation made in this application is, to the best of my knowledge, true, complete, and correct. I agree to reimburse the fund for any payments made to me based on incorrect or inaccurate information.

Owner’s signature __________________________ Date signed __________________

**Pages 3-4 to be completed by contractor or oil company technician**
## Safetank Application
### Third Party Verification

<table>
<thead>
<tr>
<th>Fuel Oil Facility Condition Checklist</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there evidence that the tank or any portion of the facility is presently leaking?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the tank legs unstable, tilting or on an uneven foundation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the tank resting on or in contact with the ground?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there visible signs of rust, weeps, wet spots, or dents on the tank surface?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there any drips or signs of leakage around the oil filter or valves?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the fuel line underground or through concrete without being encased in a non-metallic sleeve?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the tank located outside where it can be damaged by falling ice or snow from the roof?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there signs of the vent pipe being clogged with ice, snow, or insect nests?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the overfill vent whistle missing or obstructed and silent when the tank is being filled?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there any signs of spills around the fill pipe or from the area of the vent pipe?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the tank sight gauge missing, cracked, stuck or frozen? Is there oil or staining on the top of the tank?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is the existing tank located: (check all that apply) Indoors? ____ On a concrete floor? ____ On a dirt floor? ____
Partially buried? ____ Fully underground? ____ Other? (such as in shed or out building) ____

**IMPORTANT!!** Contractor - Provide a brief narrative describing the condition of the existing tank system.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
## HUD Income Criteria for NH

<table>
<thead>
<tr>
<th>COUNTY (1)</th>
<th>1 PERSON</th>
<th>2 PERSON</th>
<th>3 PERSON</th>
<th>4 PERSON</th>
<th>5 PERSON</th>
<th>6 PERSON</th>
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<tbody>
<tr>
<td>BELKNAP</td>
<td>$45,150</td>
<td>$51,600</td>
<td>$58,050</td>
<td>$64,500</td>
<td>$69,700</td>
<td>$74,850</td>
</tr>
<tr>
<td>CARROLL</td>
<td>$45,150</td>
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<tr>
<td>CHESHIRE</td>
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<tr>
<td>HILLSBOROUGH</td>
<td>$49,200</td>
<td>$56,200</td>
<td>$63,250</td>
<td>$70,250</td>
<td>$75,900</td>
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<td>(a) Nashua MSA</td>
<td>$50,350</td>
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<td>$64,750</td>
<td>$71,900</td>
<td>$77,700</td>
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<td>(b) Manchester MSA</td>
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<td>$64,750</td>
<td>$71,900</td>
<td>$77,700</td>
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<td>(c) Boston MSA</td>
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<td>$73,000</td>
<td>$81,100</td>
<td>$87,600</td>
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<td>(d) Lawrence MSA</td>
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<td>$71,900</td>
<td>$77,700</td>
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<tr>
<td>(e) Western Rockingham</td>
<td>$50,350</td>
<td>$57,550</td>
<td>$64,750</td>
<td>$71,900</td>
<td>$77,700</td>
<td>$83,450</td>
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<tr>
<td>(f) Portsmouth-Roch MSA</td>
<td>$50,350</td>
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<tr>
<td>STRAFFORD</td>
<td>$50,350</td>
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<td>$83,450</td>
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<td>SULLIVAN</td>
<td>$45,150</td>
<td>$51,600</td>
<td>$58,050</td>
<td>$64,500</td>
<td>$69,700</td>
<td>$74,850</td>
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</table>

*Note: April '18 edition.*
Compliant System
NHDES Best Management Practices (BMP’s)

- Concrete pads - reinforced
- Proper location of the tank
- Tank coating
- Poly-coated copper lines
- Floor flanges
- Unprotected outdoor filters - Not permitted
- **Compliance with fire code NFPA 31**
- Local codes

Fund eligibility for sites using SAFETANK require written confirmation from the program that the new tank system is “compliant”
Concrete Pad or Floor
Proper Location of the Tank

- Gabel end
- Ice and snow protection
- 18 inches from drip line
Floor Flanges on Tank Legs
Tank Coating
Repair Scratches
Poly-Coated Copper Lines

- Continuous from tank to furnace
- One horizontal coil at both ends
Unprotected Outdoor Filters
Not Permitted
Vent Cap
NFPA 31 compliant required

Screen No. 4 mesh or coarser compliant

Mushroom vent cap No. 30 mesh noncompliant
Secondary Containment
Questions?

Genevieve Al-Egaily
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Waste Management Division

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(603) 271-3577