System Failure Identification
Presented by: Jim King
Why do Septic Systems Fail?

• Inaccurate soil and site evaluation
• Improper design
• Improper construction
• Not using specified materials
• Homeowner abuse
Why do Septic Systems Fail?

- High strength waste on a residential design
- Lack of maintenance
- Excessive water usage
- Old age
- Cracked tanks, risers & pipes
Why do Septic Systems Fail?

- Power off to the System
- Chemicals
  - Household
- Medical
- Industrial
Why do Septic Systems Fail?

- Pumps not calibrated or operating properly
- Clogged or collapsed distribution pipes
- Bending to homeowners will
- Look for the not obvious
The above-ground septic system access pipe (left) and below-ground oil fill pipe located behind Medomak Middle School in Waldoboro. Rockland-based Maritime Energy delivered 2,087 gallons of heating oil to the school Feb. 4 and inadvertently pumped it into the septic system, according to Principal Katherine Race.
Site #1
Site #1
Problem System Investigation

Gather information on the site
• Do your homework
  • Plans
  • Permits
  • As-built
• Available pictures

Contact the homeowner, health department and contractor
Invite everyone

• Local regulator
• Contractor
• Engineer
• Builder
• Homeowner
Documents

Match the as-built to the property
Other Documents

• Inspection Reports
• Water Usage (if available)
• Talk to the homeowner, contractor, regulator
Tools of the Investigation

- Probe
- Auger
- Tape Measure
- Gloves
- Camera
- Shovel
- Marking Paint
- Flashlight
- Laser Level
- Sampling Equipment
Questions to ask

When does the problem occur?
Seasonal… Weekends… Always…

How long have they noticed the problem?

How long have they been in the home

How many occupants

Any changes in water usage habits
Site facts

9-year-old system

3-bedroom home

15 MPI perc (2010)

Single Trench Row

Reported wet spots in dog play area
Site facts

3 Adults

1 Child

New Owners

Purchased 1 year prior

No knowledge of previous use

No reports of previous issues
Consult as-built

Locate system
Probe area

Dig up the Septic Tank & D-box
Site Facts – Septic Tank

Effluent filter present

1,000-gallon dual compartment tank

Tank pumped 3 times in last year
Site Facts – D-Box

Concrete 6-hole

1-inlet

1-outlet

Signs of deterioration

Same skin as in tank
Site Facts – Field Investigation

Aggregate sample taken

More signs of breakout

Biomat observed in upper portions of the field
Site Facts – What the Film?!?
What to do when you have a WTF moment

1. Grab samples
2. Requestion the occupant
3. Call a friend
## Lab Results - Aggregate

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
<th>ASTM C-33</th>
</tr>
</thead>
<tbody>
<tr>
<td>½&quot; (12.5mm)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>¾&quot; (9.5mm)</td>
<td>99 *</td>
<td>100</td>
</tr>
<tr>
<td>#4 (4.75mm)</td>
<td>90 *</td>
<td>95-100</td>
</tr>
<tr>
<td>#8 (2.36mm)</td>
<td>70 *</td>
<td>80-100</td>
</tr>
<tr>
<td>#16 (1.18mm)</td>
<td>57</td>
<td>50-85</td>
</tr>
<tr>
<td>#30 (600μm)</td>
<td>45</td>
<td>25-60</td>
</tr>
<tr>
<td>#50 (300μm)</td>
<td>30</td>
<td>10-30</td>
</tr>
<tr>
<td>#100 (150μm)</td>
<td>12 *</td>
<td>2-10</td>
</tr>
<tr>
<td>#200 (75μm)</td>
<td>4.5 *</td>
<td>0-3</td>
</tr>
<tr>
<td>Fineness Modulus</td>
<td>2.97</td>
<td>2.3-3.1</td>
</tr>
</tbody>
</table>

* Indicates out of specification limits.
Lab Results – Septic Tank

BOD – 300 mg/l

Chloride 22.5 mg/l

pH – 7.32

TSS – 1,000 mg/l
### Analysis Report
May 29, 2019

**Sample Information**
- **Matrix:** WASTE WATER
- **Location Code:** SPECIAL2
- **Rush Request:** Standard
- **P.O. #:**

**Client ID:** D-BOX

**Custody Information**
- **Collected by:**
- **Received by:** SW
- **Analyzed by:** see "By" below

**Laboratory Data**
- **SDG ID:**
- **Phoenix ID:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>RU/PQL</th>
<th>Units</th>
<th>Dilution</th>
<th>Date/Time</th>
<th>By</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.O.D./5 day</td>
<td>120</td>
<td>17</td>
<td>mg/L</td>
<td>30</td>
<td>05/22/19 14:20</td>
<td>RM/MLT SM5210B-11</td>
<td></td>
</tr>
<tr>
<td>B.O.D./5 day End Incubation</td>
<td>38.9</td>
<td>3.0</td>
<td>mg/L</td>
<td>1</td>
<td>05/27/19 17:26</td>
<td>RM/MLT SM5210B-11</td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>7.61</td>
<td>1.00</td>
<td>pH Units</td>
<td>1</td>
<td>05/23/19 09:55</td>
<td>RR/EG SIM4500-H B-11</td>
<td></td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>150</td>
<td>17</td>
<td>mg/L</td>
<td>3.3</td>
<td>05/23/19 09:55</td>
<td>RM/MLT SM2540D-11</td>
<td></td>
</tr>
</tbody>
</table>

**RL/PQL:** Reporting/Practical Quantitation Level  
**ND:** Not Detected  
**BRL:** Below Reporting Level

**Comments:**
The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director  
May 29, 2019  
Reviewed and Released by: Helen Geoghegan, Project Manager

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**Lab Results – D-Box**

**BOD – 120 mg/l**

**Chloride 38.9 mg/l**

**pH – 7.32**

**TSS – 150 mg/l**
**Analysis Report**  
**August 01, 2019**

### Sample Information
- **Matrix:** WASTE WATER  
- **Location Code:** SPECIAL2  
- **Rush Request:** Standard  
- **P.O. #:**

### Custody Information
- **Collected by:**  
- **Received by:** SW  
- **Analyzed by:** see “By” below

### Laboratory Data
- **SDG ID:**  
- **Phoenix ID:**

### Parameter | Result | RL/PQL | Units | Dilution | Date/Time | By | Reference
--- | --- | --- | --- | --- | --- | --- | ---
B.O.D./5 day | 320 | 140 | mg/L | 100 | 07/25/19 13:19 | RV/MRM SM5210B-11 |
B.O.D./5 day End Incubation | 25.0 | 3.0 | mg/L | 1 | 07/25/19 14:00 | RV/MRM SM5210B-11 |
Chloride | 25.0 | 1.00 | pH Units | 1 | 07/25/19 02:37 | RR/EG SM4500-H B-11 |
**pH** | 7.10 | 17 | mg/L | 3.3 | 07/26/19 02:37 | BMDJJO SM25400-11 |
**Total Suspended Solids** | 290 | | | | |

**RL/PQL=** Reporting/Practical Quantitation Level  
**ND=** Not Detected  
**BRL=** Below Reporting Level

**Comments:**  
The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

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**Lab Results – Septic Tank (reverified)**

**BOD** – 320 mg/l

**Chloride** 25.0 mg/l

**pH** – 7.10

**TSS** – 290 mg/l
Conclusion

Verify perc/soil evaluation

New field

Get correct materials

Remove water softener from septic system
Match the as-built to the property
**Analysis Report**  
August 12, 2019

### Sample Information
- **Matrix:** WASTE WATER  
- **Location Code:** SPECIAL2  
- **Rush Request:** Standard  
- **P.O. #:**

### Custody Information
- **Collected by:**  
- **Received by:** LB  
- **Analyzed by:** see "By" below

### Laboratory Data
- **SDG ID:**  
- **Phoenix ID:**

### BOD Data
- **B.O.D./5 day:** < 350 mg/l  
- **B.O.D./5 day End Incubation:**
- **Chloride:** 30.1 mg/l  
- **pH:** 7.13  
- **Total Suspended Solids:** 80 mg/l

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>RL/PQL</th>
<th>Units</th>
<th>Dilution</th>
<th>Date/Time</th>
<th>By</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
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<td>&lt; 350</td>
<td>350</td>
<td>pg/L</td>
<td>300</td>
<td>08/06/19 14:00</td>
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<td>SM5210B-11</td>
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<tr>
<td>B.O.D./5 day End Incubation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>08/06/19 14:53</td>
<td>LB</td>
<td>SM5210B-11</td>
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<tr>
<td>Chloride</td>
<td>30.1</td>
<td>3.0</td>
<td>mg/L</td>
<td>1</td>
<td>08/06/19</td>
<td>LB</td>
<td>SM5210B-11</td>
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<tr>
<td>pH</td>
<td>7.13</td>
<td>1.00</td>
<td>pH Units</td>
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<td>08/07/19 17:44</td>
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<tr>
<td>Total Suspended Solids</td>
<td>80</td>
<td>10</td>
<td>mg/L</td>
<td>2</td>
<td>08/07/19</td>
<td>LB</td>
<td>SM5210B-11</td>
</tr>
</tbody>
</table>

**RL/PQL = Reporting/Practical Quantitation Level  ND = Not Detected  BRL = Below Reporting Level**

### Comments:
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*Phyllis Shiller, Laboratory Director*  
August 12, 2019  
Reviewed and Released by: Helen Goshogho, Project Manager

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**Lab Results – D-Box**

- **BOD** – <350 mg/l
- **Chloride** – 30.1 mg/l
- **pH** – 7.13
- **TSS** – 80 mg/l
Analysis Report
August 12, 2019

Sample Information
Matrix: WASTE WATER
Location Code: SPECIAL2
Rush Request: Standard
P.O.#: ...

Custody Information
Collected by:...
Received by: LB
Analyzed by: see "By" below

Date/Time
08/06/19 11:30
08/06/19 13:57

Laboratory Data
SDG ID:...
Phoenix ID:...

Parameter | Result | RL/PQL | Units | Dilution | Date/Time | By | Reference
---|---|---|---|---|---|---|---
Chloride | 6.3 | 3.0 | mg/l | 1 | 08/06/19 | BS/GD E300.0 |

RL/PQL=Reporting/Practical Quantitation Level  ND=Not Detected  BRL=Below Reporting Level

Comments:
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Phyllis Shiller, Laboratory Director
August 12, 2019
Reviewed and Released by: Helen Geoghegan, Project Manager

Lab Results – Old D-Box
Chloride 6.3 mg/l
Conclusion

Water softener still connected to septic system
Site #2
Problem System Investigation

Gather information on the site
• Do your homework
  • Plans
  • Permits
  • As-built
• Available pictures

Contact the homeowner, health department and contractor
Site #2

SDS DESIGNED FOR
4 BEDROOMS MAX.
32 L.F. PER ROW
128 L.F. TOTAL

LOT #15
1.08 acres
Match the as-built to the property
Site Facts

5-year-old system

4-bedroom home

8-10 MPI perc (2014)

Reported water surfacing and running off
Site facts

2 Adults

2 Children

New home owners
  - Original owner
  - Issues since installation
Site Facts – What’s the Mottle with you?

<table>
<thead>
<tr>
<th>Cluster 15</th>
<th>Test Pit #3 Results</th>
<th>Test Pit #4 Results</th>
<th>PT1: 8 min. Depth: 24&quot;</th>
<th>PT2: 7 min. Depth: 24&quot;</th>
<th>PT3: 8 min. Depth: 24&quot;</th>
<th>PT4: 8 min. Depth: 24&quot;</th>
<th>PT5: 7 min. Depth: 24&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
<td>00&quot; - 08&quot; Topsoil</td>
</tr>
<tr>
<td>No Seepage No Seepage No Seepage No Seepage</td>
<td>Mottling @ 15&quot; Mottling @ 14&quot; Mottling @ 24&quot; Mottling @ 24&quot;</td>
<td>Mottling @ 24&quot; Mottling @ 24&quot; Mottling @ 24&quot; Mottling @ 24&quot;</td>
<td>Mottling @ 24&quot; Mottling @ 24&quot; Mottling @ 24&quot; Mottling @ 24&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diagram:

- FINISHED GRADE
- UNDISTURBED SOIL
- 2 MIN. UNDISTURBED SOIL
- GROUNDWATER, BEDROCK OR OTHER IMPERVIOUS LAYER OR BOUNDARY CONDITION
- GROUNDWATER, BEDROCK OR OTHER IMPERVIOUS LAYER OR BOUNDARY CONDITION

50% FUTURE EXPANSION AREA:
- 2 MIN. UNDISTURBED SOIL
- MOUND BACK FILL SLIGHTLY TO ALLOW FOR SETTLEMENT
- BACK FILL IMMEDIATELY OR PROVIDE TEMPORARY IMPERVIOUS COVER

6" TOPSOIL (FINISH GRADE AND SEED)
Site facts – Field Investigation

Questions raised during the document collection process

- Curtain drain present?
- Depth of System
- Soils
Site facts – Septic Tank

Effluent filter present

1,250-gallon single compartment septic tank
Site facts – Distribution Box

Concrete 6-hole

1-inlet

2-outlet

Signs that laterals are full
Site facts – Field Investigation

Top of system located at 24” – 30”

No mottles observed in any excavation holes/pits

Soil has high clay content, not as described on plan
Conclusion

Perc conducted, builder then removed 2 feet of soil from site (later verified through builder)

New Field

3rd party confirmation
Discussion
Special Thanks

Matt Vinson – Vinson Septic Solutions, LLC

Mark Prevost – 1\textsuperscript{st} Supply

Marty DeRocco – Milan Supply