

Appendix A

Smoke Testing Report  
September 2007



## MEMORANDUM

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**TO:** Pete Clark, Tony Hayes - Town of Falmouth      **DATE:** 09/24/2007

**FROM:** Paul Birkel, Kattie Collins - W-P      **PROJECT No.:** 10876C

**SUBJECT:** Falmouth on the Green - Smoke Testing Results

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### Introduction

As requested, we have smoke tested the sewer collection system that services the Falmouth on the Green (FOG) subdivision. The smoke testing was performed on September 18-19, 2007 by Wright-Pierce (W-P) personnel with the assistance of Mark Damon from the Town of Falmouth.

### Methodology

The collection system was broken down into a number of smaller sections and the smoke testing was completed in eleven setups or tests. Before each smoke test, the section to be tested was isolated using 8" sewer plugs provided by the Town. Once the area to be tested was isolated, smoke was blown into the system using a smoker and liquid smoke. The smoke used was non-toxic and non-staining. After the smoke had time to make its way through the system, personnel from W-P and the Town walked along the sewer line and around each residence looking for areas where smoke was escaping from the system.

A smoke testing log form was completed for each setup noting all pertinent information to the test including date and time, area tested, location of sewer plugs, houses inspected, whether or not the standpipes were venting for each residence, as well as any other issues discovered. These have been included as Appendix A. The problems that were found were documented using photographs and sketches with dimensional swing ties to identified problems and these have been included as part of the smoke testing logs. Maps of the sewer system have also been included for manhole number references as Appendix B. The manhole numbers on the maps reference the original FOG design drawings prepared for Dictar Associates, Inc. with the exception of the manholes in Medinah Circle and the last manhole on Muirfield Road. The manholes in Medinah Circle were not labeled on the design drawings and the last manhole on Muirfield Road was not shown on the drawings. These manholes have been labeled using the last manhole number in the line and a letter (i.e. SMH 75A, 75B, etc.).

There were two setups where the smoker was moved part of the way through the test due to wastewater backing up in the line and preventing the smoke from circulating through the system. Also, there were a number of houses that had more than one standpipe and often they were not all venting. These houses were denoted on the log forms under the "Smoke Venting?" column

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by indicating the number of standpipes venting out of the total number of standpipes (i.e. 3/4 would mean three out of four standpipes were venting).

### **Discussion of Findings**

The following is a summary of findings from the smoke testing:

<b>Location</b>	<b>Remarks</b>
Hazeltine Drive, SMH 4 to SMH 5	Noted a lot of clear water coming from upstream of SMH 5 but very minimal water coming from upstream of SMH 4. Further investigation is recommended.
27 Hazeltine Drive	Smoke coming from ground behind house, likely septic tank. Roof drains were piped into ground, could be day-lighted.
22 Hazeltine Drive	Roof drains were piped into ground, termination unknown.
13 Hazeltine Drive	Roof drains were piped into ground, termination unknown.
7 Merion Way	Toilet in downstairs bathroom gurgling, noted sewer smell.
3 Hoylake Circle	Toilets were gurgling, downstairs toilet backed up with solids, noted sewer smell.
1 Prestwick Circle	Smoke coming from ground in front of house, smoke from the downstairs bathroom which was under construction.
3 Prestwick Circle	Smoke coming from buried septic tank in front of house.
4 Prestwick Circle	Smoke coming from buried septic tank in front of house.
8 Birkdale Road	Smoke coming from buried septic tank in front of house.
9 Birkdale Road	Smoke coming from buried septic tank in front of house.
16 Birkdale Road	Smoke coming from buried septic tank in front of house.
1 Muirfield Road	Sewer smell noted in laundry room, owner reported being able to smell and taste smoke in the laundry room and in the downstairs bathroom.
3 Muirfield Road	Smoke coming from buried septic tank in front of house.
6 Baltusrol Circle	Smoke coming from exposed septic tank cover beside house.
8 Baltusrol Circle	Smoke coming from buried septic tank in front of house.
4 Medinah Circle	Smoke coming from buried septic tank in woods in front of house.
6 Medinah Circle	Owner noted toilet gurgling in bathroom and sewer smell.

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7 Medinah Circle	Roof drains were piped into ground, termination unknown.
4 Inverness Road	Roof drains were piped into ground, termination unknown.
6 Inverness Road	Smoke coming from ground near risers at the side of the house, likely the septic tank.
SMH 67, Inverness Road	Riser and joints leak, noted a "running" leak in the manhole invert.

Greater than 13 percent of the houses (12 out of 88) in FOG were identified during smoke testing as having leaking septic tanks. Sketches from Blow Bros. reports provided by FOG were used to confirm that the areas identified corresponded to the location of the septic tanks. It is also likely that more septic tanks leak than the ones identified during testing. At the time of the tests the grounds surrounding many of the homes were very damp and may have contributed to suppressing smoke. In addition, the Town noted that the groundwater table in this area is very high. Smoke leaking from other tanks may not have been able to reach the surface due to the depth of the tank and the presence of saturated soils.

The line between SMH 4 and SMH 5 noted on Hazeltine Drive is a prime area for infiltration of clear water. The source of this high quantity of clear water could be defects in the pipe such as cracks or leaking joints as well as defects in a service connection or septic tank. SMH 67 in Inverness Road is also a prime source of clean water as there was a seeming continuous leak in the invert and evidence of additional leaking from the riser and joints. These items were identified from the manholes that were opened during smoke testing. As not all of the manholes in the system were opened and as there may be other similar defects within the collection system that are contributing to the high inflow and infiltration rate, manhole inspections are slated for the spring during high groundwater conditions. It should be noted that the pavement in all of the areas tested is in good condition with very few cracks. This is important because if there were any cracks in the pipe, the smoke would most likely be suppressed beneath the pavement.

As shown above, there were four houses where it was noted that toilets was gurgling and that there was a sewer smell; one of these houses also had solids back up into the downstairs toilet. The gurgling and the sewer smell seem to be somewhat normal occurrences during smoke testing. Because the areas tested were isolated, a low amount of pressure was allowed to build in the lines (one could hear the smoke forcing its way out at manhole frames and covers). It is possible that this pressure was enough to force sewer gases back through the service into the house causing the gurgling and sewer smells. Solids backing up into the toilet is not a normal occurrence during smoke testing, however if the toilet plumbing was blocked prior to testing it is possible that the sewer gases could have forced the solids back into the toilet.



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It is unclear why almost 45 percent of the standpipes noted did not vent during testing. There are several potential explanations. It is possible that rather than having a baffle on the effluent end of the tank, the effluent line tees down into the tank creating a permanent water seal that would prevent smoke from reaching the house. Another possibility would be that there is a depression in the service between the main sewer line and the tank which would prevent smoke from passing. Other potential causes may be that the internal plumbing is not operating properly or that there is a trap on the standpipe or service into the house. Using traps on the standpipe or on the service, however, does not meet current code requirements. It may be beneficial to suggest that the owners have their plumbing inspected to ensure that they are venting properly and/or to perform house inspections of the houses that were not venting.



### Smoke Testing Log

Client: Town of Falmouth  
Weather: Sunny, 60's  
Personnel: W-P - KMC, MCJ  
Falmouth - Mark Damon

Job Number: 10865C  
Date/Time: 9/18/07 9:00 AM  
Setup No: 1

Location: Street Name: Hazeltine Dr.  
From: SMH 5 To: SMH 1

Isolation: 2 Plugs in SMH 5, 1 to PS  
and 1 to SMH 6

House No.	Smoke Venting?	Other Issues
18	⓪ / N	
14	Y / ⓪	Sitting on hill with gravity drainage to sewer, should be venting
13	Y / ⓪	Downspout into ground, Blo-Bros. indicated a pumped discharge to sewer
17	⓪ / N (2/3)	Town indicated line piped through septic tank
9	⓪ / N	
	Y / N	
8 Winn Rd	⓪ / N	
	Y / N	
	Y / N	
	Y / N	
	Y / N	
	Y / N	
Catch Basins:	None	
Other Issues:	Noted a lot of clear water at SMH 5 but minimal at SMH 4	
	Dew on ground, very damp soil	



### Smoke Testing Log

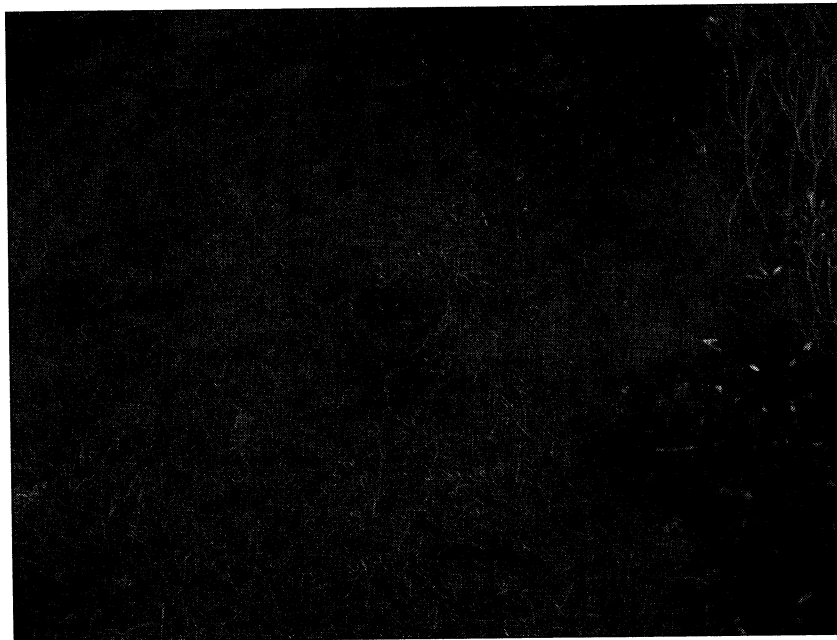
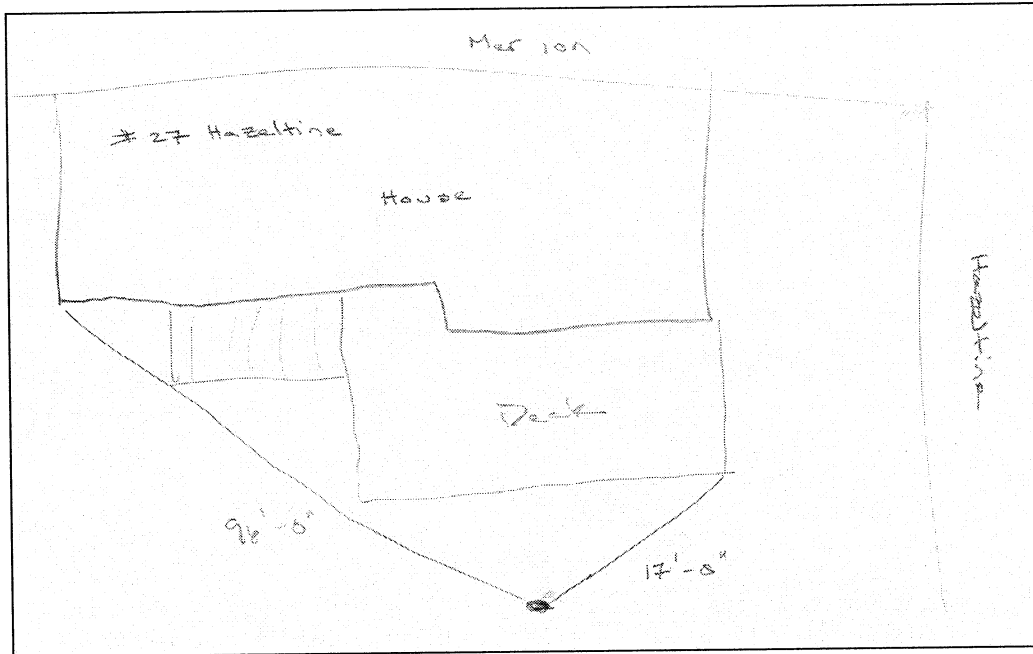
Client: Town of Falmouth  
Weather: Sunny, 60's  
Personnel: W-P - KMC, MCJ  
Falmouth - Mark Damon

Job Number: 10865C  
Date/Time: 9/18/07 9:30 AM  
Setup No: 2

Location: Street Name: Hazeltine/Merion Isolation: Plug at SMH 5  
From: SMH 5 To: SMH 8 (Hazeltime)  
From: SMH 7 To: SMH 10 (Merion)

House No.	Smoke Venting?	Other Issues
5	Y/N	
7	Y/N	Town said septic tank was bypassed, toilet gurgling - plumber verified that there were no internal plumbing issues
8	Y/N (1/2)	
22	Y/N	Roof leader piped into ground
31	Y/N	
28	Y/N	
*27	Y/N	Roof leader piped into ground (site topography could allow daylighting). Smoke rising from garden behind house, ground very saturated. No Bros sketch. See sketch and photos.
	Y/N	
	Y/N	
Catch Basins:		None
Other Issues:		Dew on ground, damp soil
		*No. 27 Hazeltine Dr. from Blow Bros. map is No. 4 Merion Way.

**Smoke Testing Log**  
**Setup No. 2 - 27 Hazeltine Drive**





*Smoke Testing Log*  
*Setup No. 2 - 27 Hazeltine Drive, cont.*





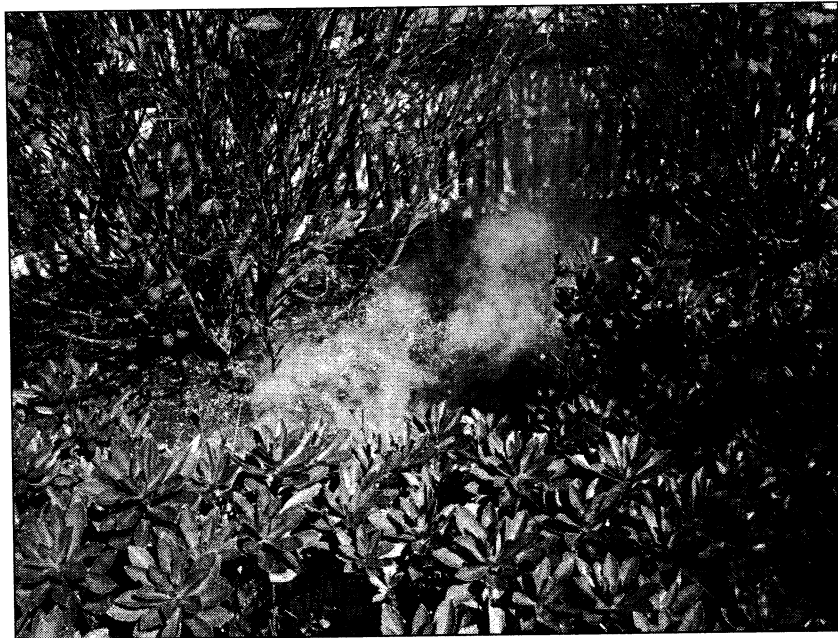
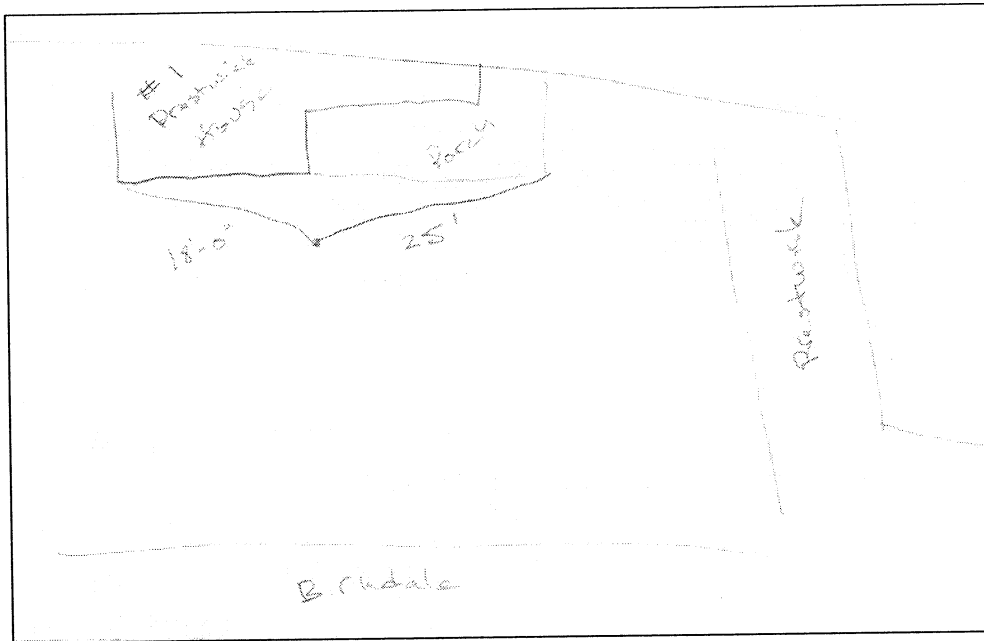
### Smoke Testing Log

Client: Town of Falmouth Job Number: 10865C  
 Weather: Sunny, high 60's Date/Time: 9/18/07 11:00 AM  
 Personnel: W-P - KMC, MCJ Setup No: 3  
Falmouth - Mark Damon

Location: Street Name: Prestwick/Birkdale/Hoylake Isolation: Plug at SMH 37  
 From: SMH 37 To: SMH 44 (Birkdale) Smoker in at SMH 38  
 From: SMH 41 To: SMH 60 (Prestwick)  
 From: SMH 39 To: SMH 58 (Hoylake)

House No.	Smoke Venting?	Other Issues
1 Hoylake	Y / (N)	
3	Y / (N)	Ben & Judy Bertrans/878-6466, solids backed up into 1st floor bathroom toilet, upstairs gurgling as well. See photos.
4	Y / (N)	
17 Birkdale	(Y) / N	
19	(Y) / N	
21	(Y) / N	
20	(Y) / N	
18	(Y) / N 1/2	
1 Prestwick	(Y) / N	Smoke from depression in ground on roadside, toilet under construction and smoking. See sketch and photos.
2	(Y) / N	
3*	Y / (N)	Smoke rising from front of house. See sketch and photos.
4*	(Y) / N 2/3	Smoke rising from ground in front of house, very saturated. See sketch and photos.
Catch Basins:		
	None	
Other Issues:		
	SMH 58 was checked to verify that smoke was reaching the end as none of the vents were going. Smoke was reaching the end.	
	*These houses are located in very marshy areas. See photos. These houses also do not have Bros. sketches.	

*Smoke Testing Log*  
*Setup No. 3 - 1 Prestwick Circle*





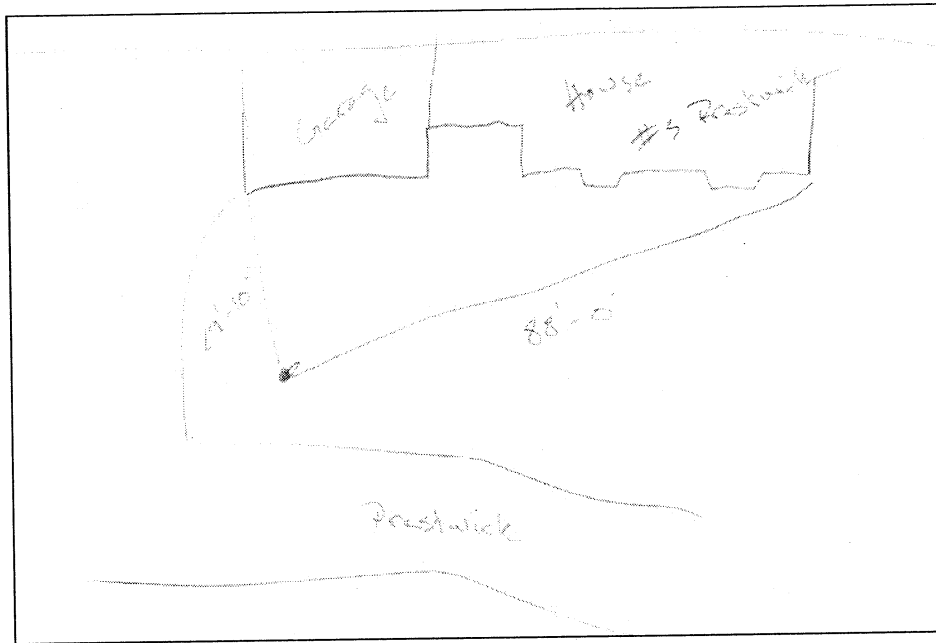
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*Setup No. 3 - 1 Prestwick Circle, cont.*







*Smoke Testing Log*  
*Setup No. 3 - 3 Prestwick Circle*



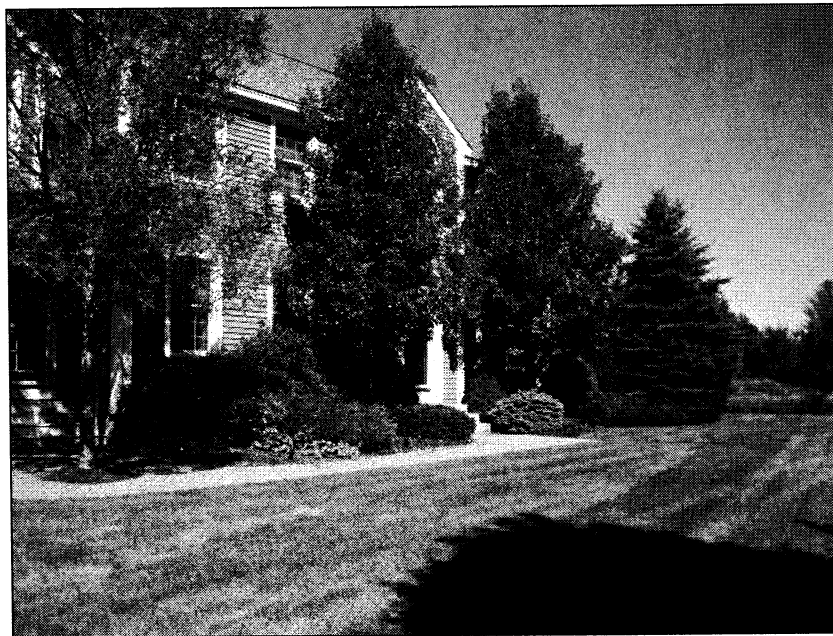
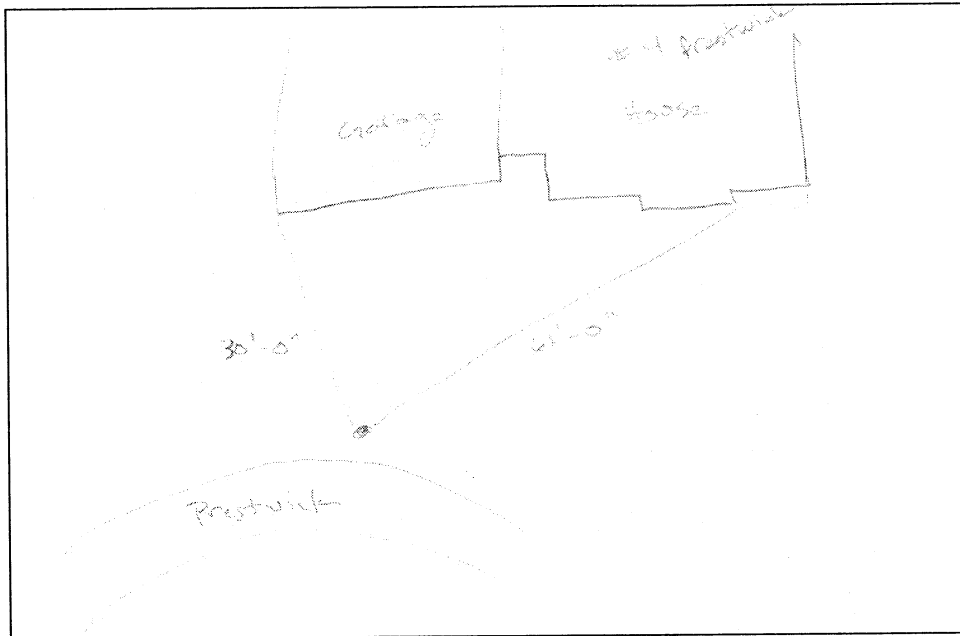


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*Setup No. 3 - 3 Prestwick Circle, cont.*



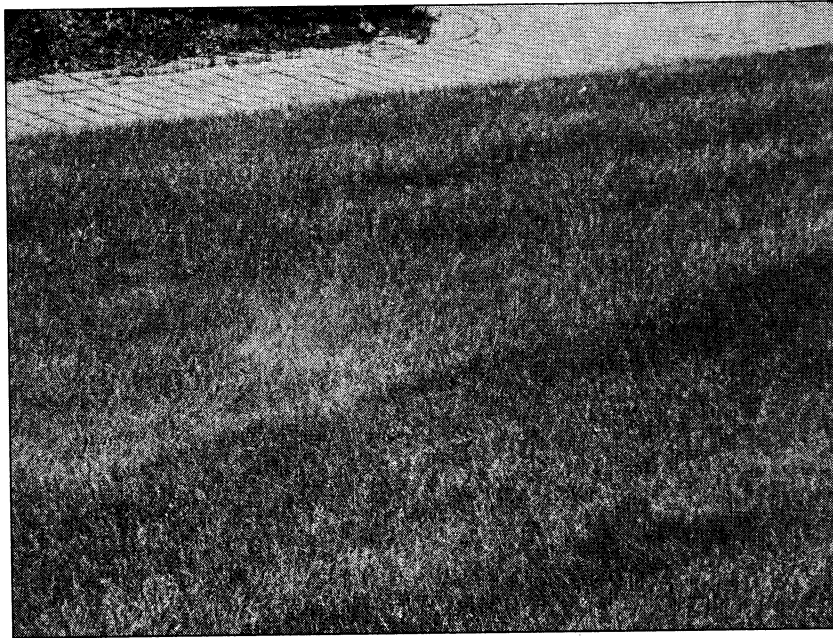


*Smoke Testing Log*  
*Setup No. 3 - 4 Prestwick Circle*



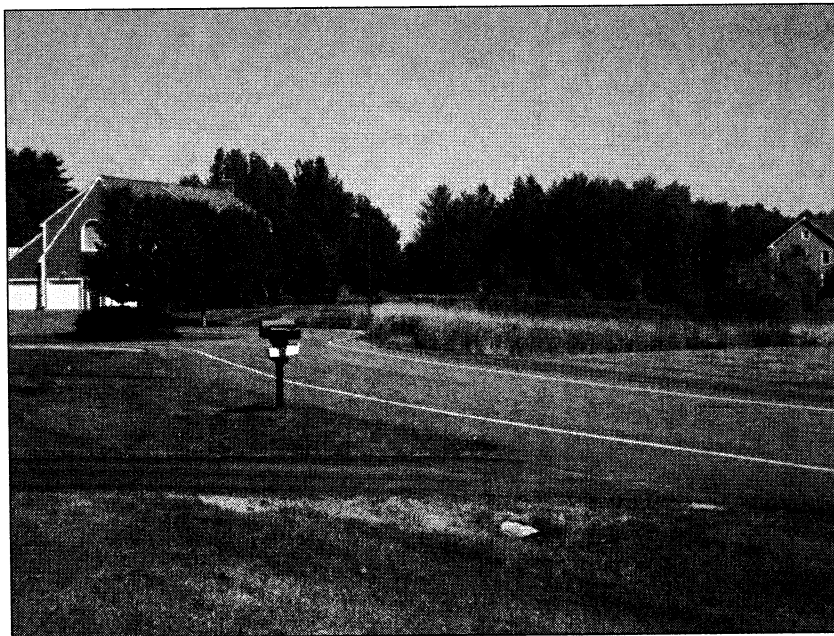
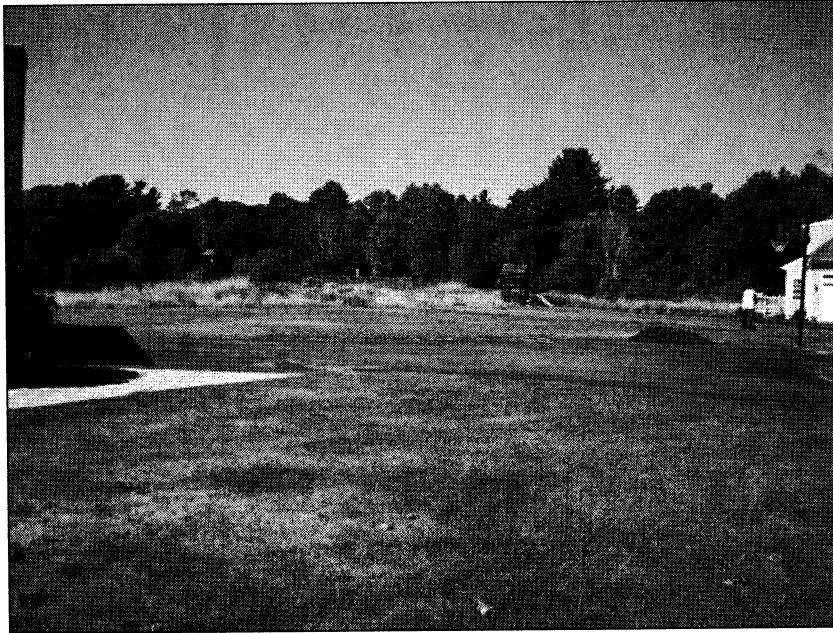


*Smoke Testing Log*  
*Setup No. 3 - 4 Prestwick Circle, cont.*





*Smoke Testing Log*  
*Setup No. 3 - Prestwick Marshes*





### *Smoke Testing Log*

Client: Town of Falmouth  
 Weather: Sunny, high 60's  
 Personnel: W-P - KMC, MCJ  
Falmouth - Mark Damon

Job Number: 10865C  
 Date/Time: 9/18/07 1:40 PM  
 Setup No: 4

Location: Street Name: Birkdale Road  
 From: SMH 36 To: SMH 25

Isolation: Plug at SMHs 36 and 25, smoker  
at SMH 36, then moved to SMH 28

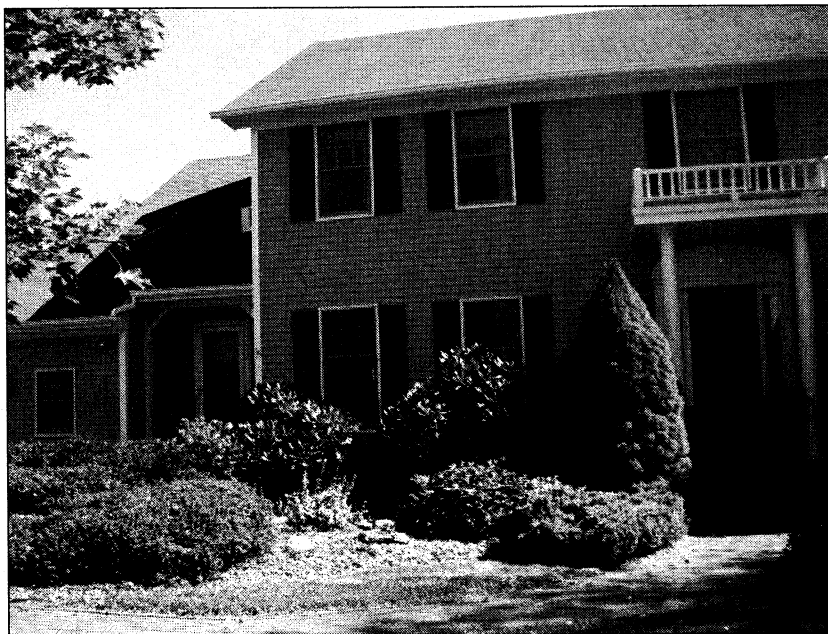
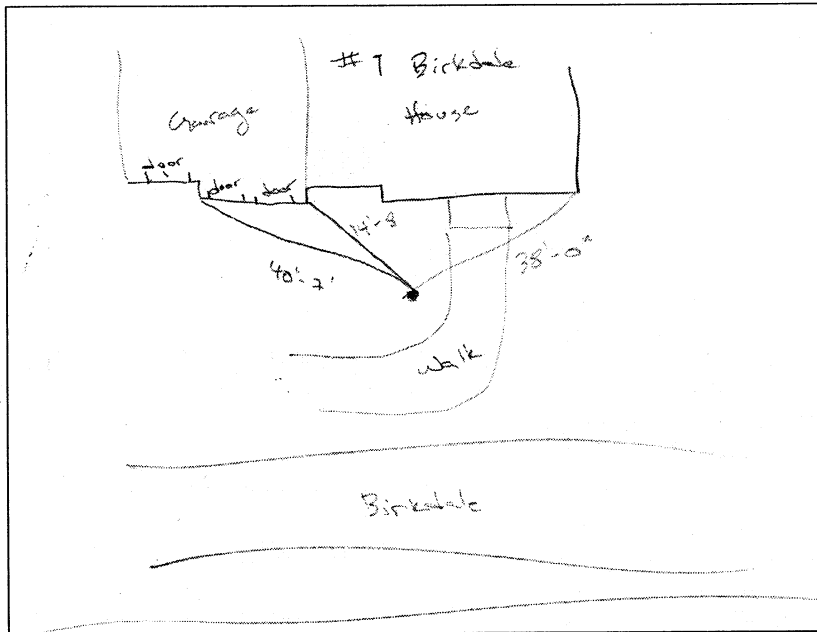
House No.	Smoke Venting?	Other Issues
15	Ⓢ/N	
13	Ⓢ/N	Town indicated they were piped through tank
11	Ⓢ/N	
9	Ⓢ/N	Smoke rising from ground. See sketch and photos.
16	Ⓢ/N	Smoke from ground in front of house. See photos.
14	Ⓢ/N	
12	Y/Ⓢ	
10	Ⓢ/N (1/2)	
7	Y/Ⓢ	
6	Y/Ⓢ	
8	Y/Ⓢ	Smoke rising from ground in front of house. See photos
5	Ⓢ/N	
4	Ⓢ/N (1/2)	
3	Y/Ⓢ	
2	Y/Ⓢ	Town thinks they're on a pump
1	Ⓢ/N (3/4)	Piped through tank per Town
Catch Basins: <u>None</u>		
Other Issues:		



*Smoke Testing Log*  
*Setup No. 4 - 8 Birkdale Road*



*Smoke Testing Log*  
*Setup No. 4 - 9 Birkdale Road*





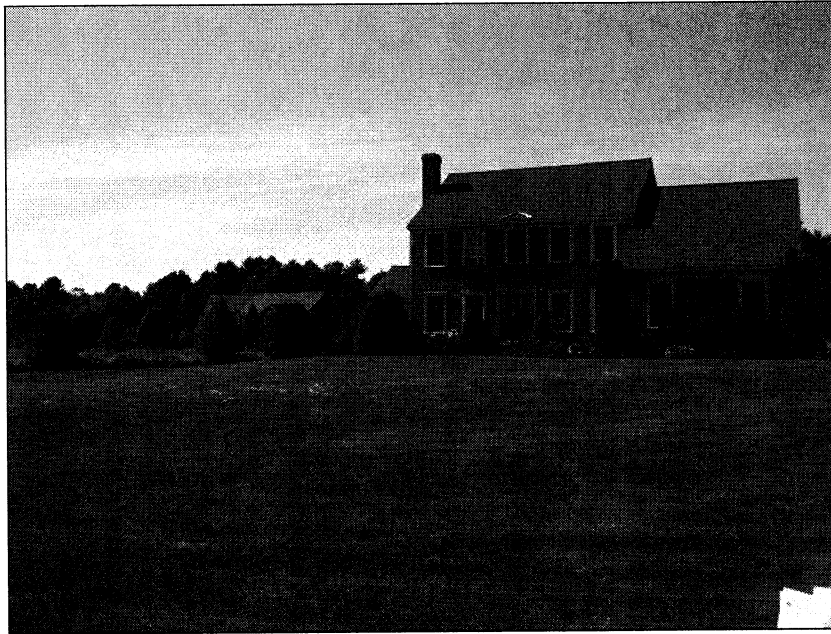


*Smoke Testing Log*  
*Setup No. 4 - 9 Birkdale Road, cont.*





*Smoke Testing Log*  
*Setup No. 4 - 16 Birkdale Road*







### *Smoke Testing Log*

Client: Town of Falmouth  
 Weather: Sunny, low 60's  
 Personnel: W-P - KMC, BRW  
Falmouth - Mark Damon

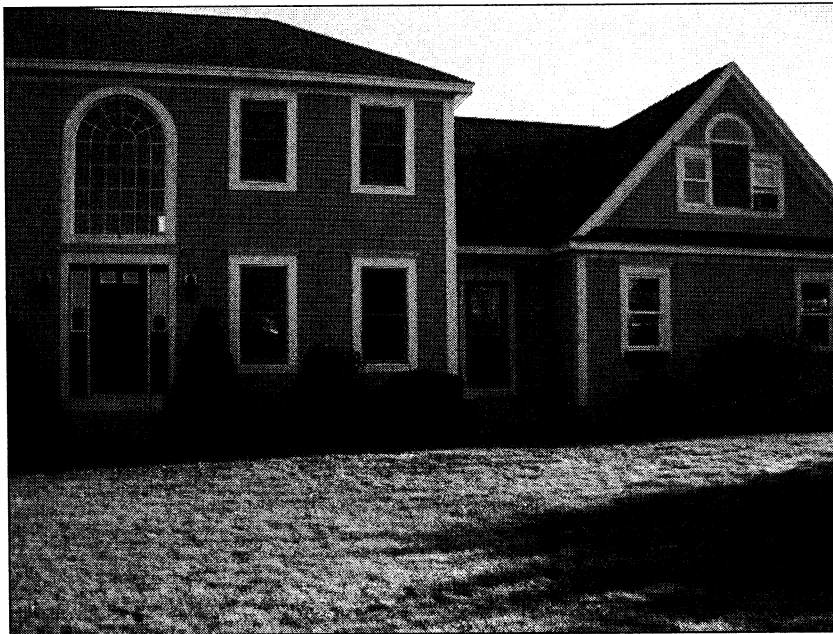
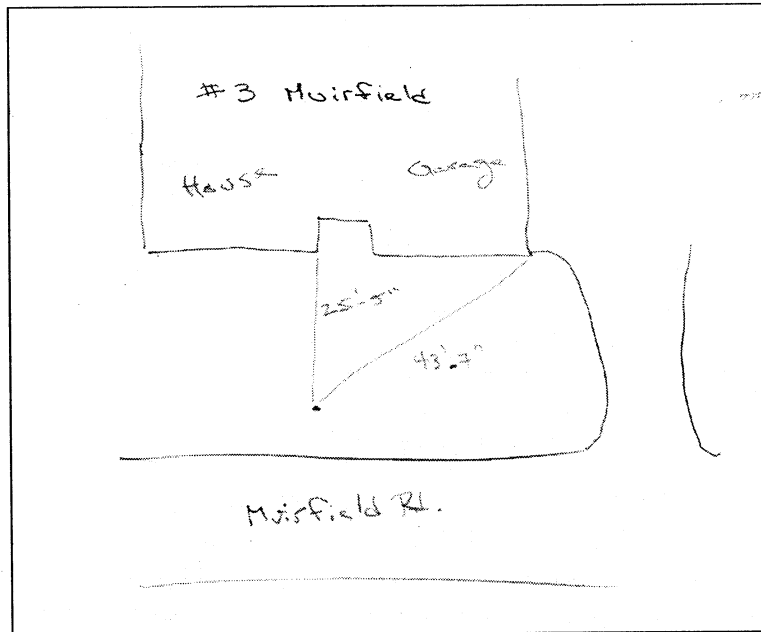
Job Number: 10865C  
 Date/Time: 9/19/07 8:00 AM  
 Setup No: 6

Location: Street Name: Muirfiled Road  
 From: SMH 18 To: SMH 11A

Isolation: Plug at SMH 18, Smoker at SMH 18  
then moved to SMH 17 & SMH 15

House No.	Smoke Venting?	Other Issues
5	Ⓢ/ N	
3	Ⓢ/ N (1/2)	Smoke rising from ground in front of house. See sketch and photos.
1	Ⓢ/ N (3/4)	Laundry room smelled like sewer*
10	Y /Ⓢ	
2	Y /Ⓢ	Likely on Carnoustia low pressure force main
12	Y /N	No house on lot
10	Y /Ⓢ	
8	Ⓢ/ N	
6	Ⓢ/ N (2/3)	
4	Ⓢ/ N (3/4)	
2	Y /Ⓢ	
	Y / N	
	Y / N	
Catch Basins:	None	
Other Issues:	Noted smoke coming from flow meter box at end of Turnberry. Smoke venting through conduit from manhole.	
	*The owner said that this had only happened once 2-3 yrs. earlier and that they had to have the tank pumped. They haven't had the tank pumped since then and may need to have the tank pumped again. The owner said they saw and smelled smoke as well, but I wasn't able to detect anything.	

*Smoke Testing Log*  
*Setup No. 6 - 3 Muirfield Road*



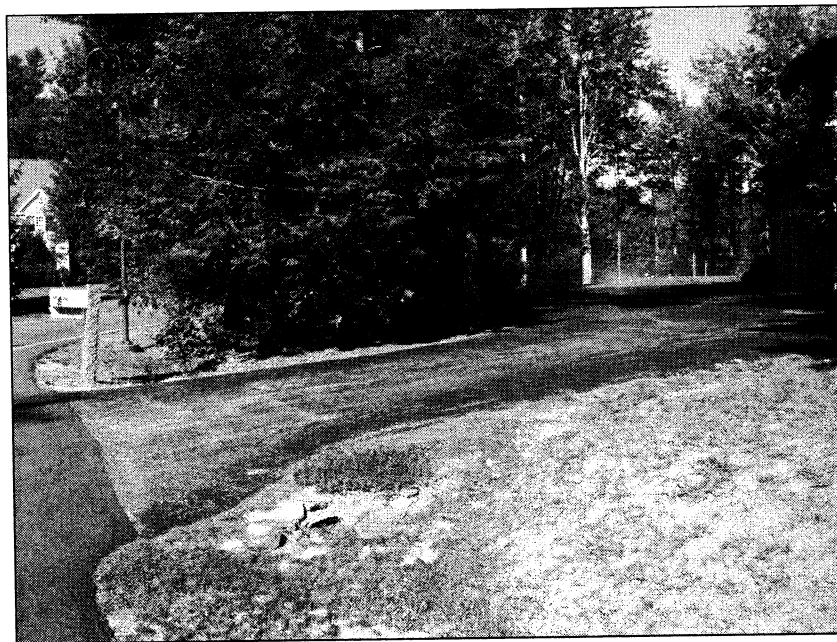
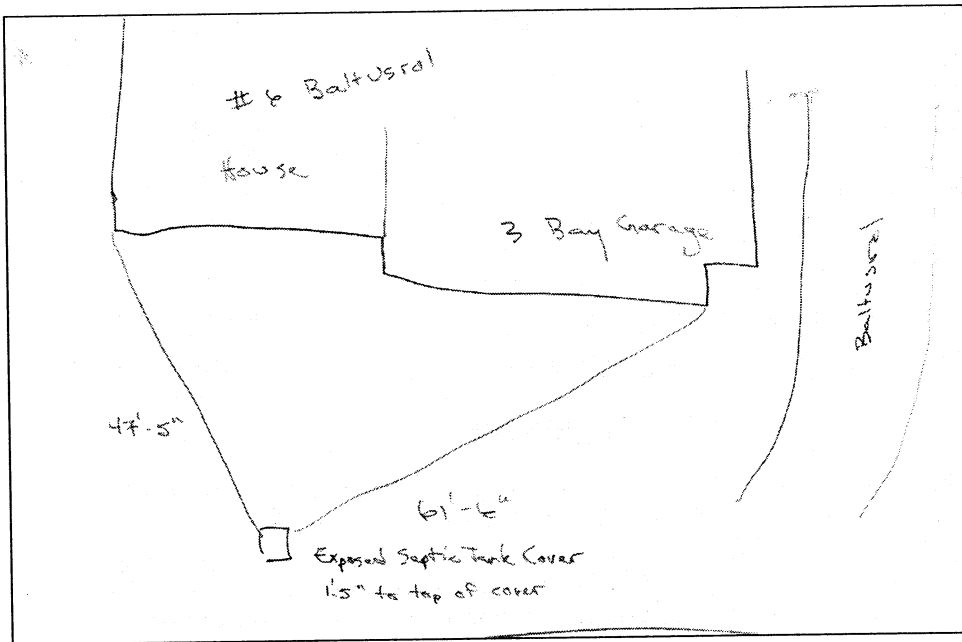


*Smoke Testing Log*  
*Setup No. 6 - 3 Muirfield Road, cont.*





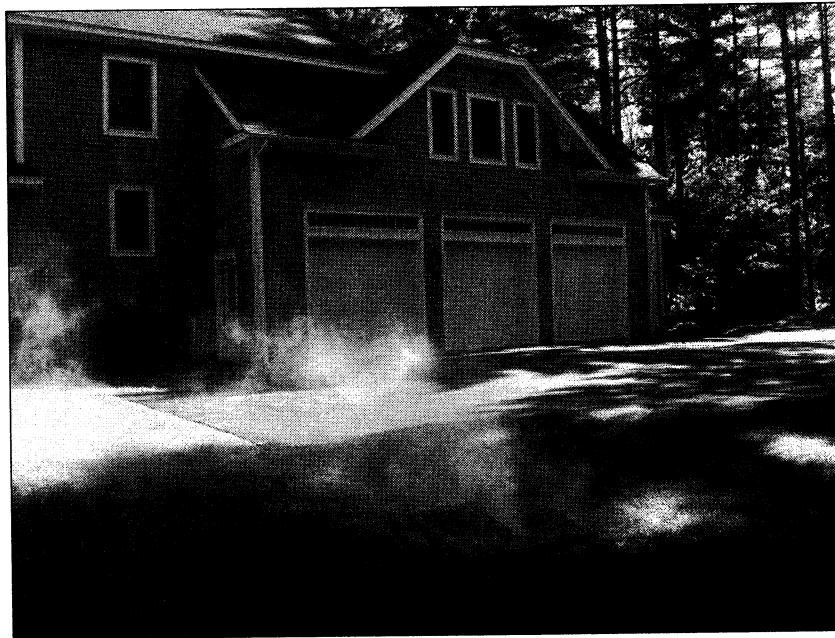
**Smoke Testing Log**  
**Setup No. 7 - 6 Baltusrol Circle**



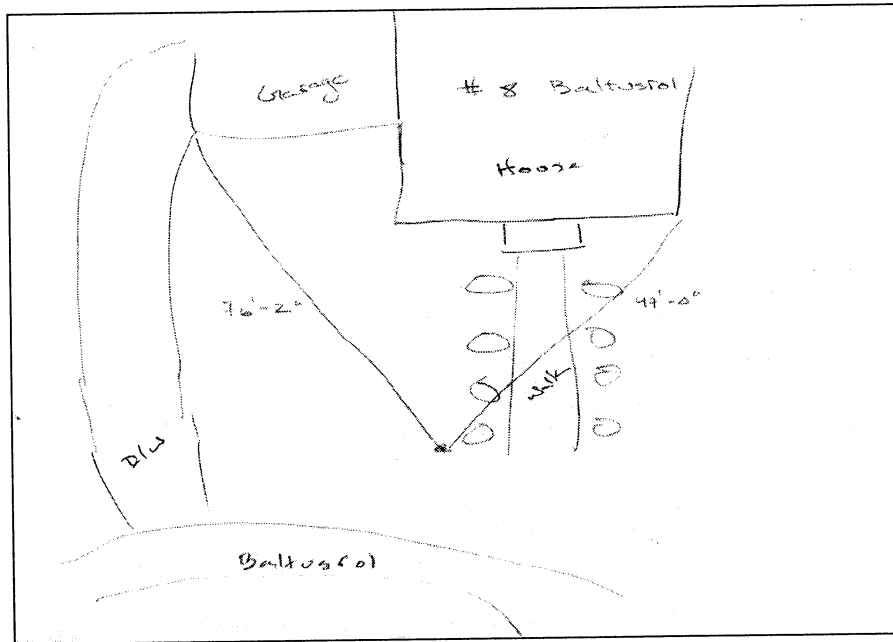




*Smoke Testing Log*  
*Setup No. 7 - 6 Baltusrol Circle, cont.*



*Smoke Testing Log  
Setup No. 7 - 8 Baltusrol Circle*



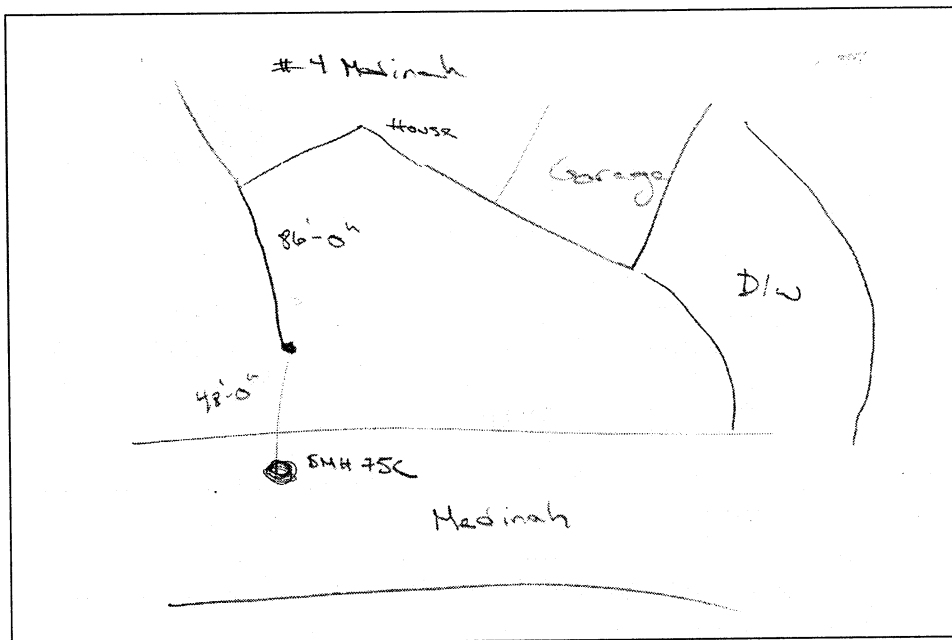


*Smoke Testing Log*  
*Setup No. 7 - 8 Baltusrol Circle, cont.*



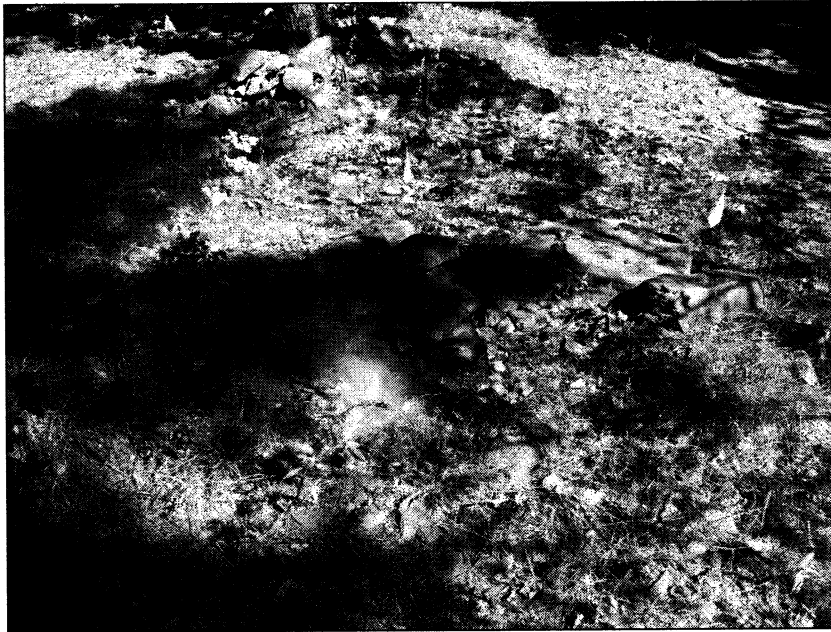


*Smoke Testing Log*  
*Setup No. 8 - 4 Medinah Circle*



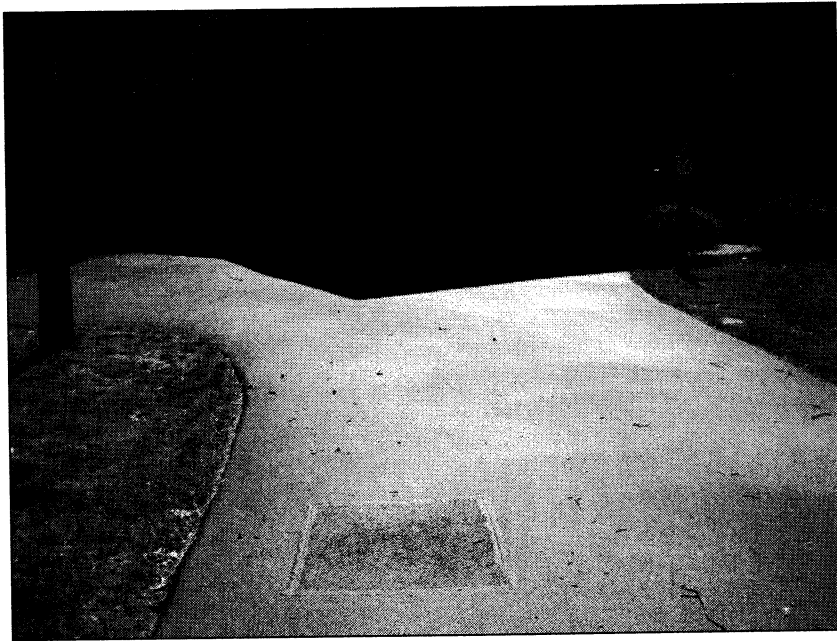


*Smoke Testing Log*  
*Setup No. 8 - 4 Medinah Circle, cont.*





*Smoke Testing Log*  
*Setup No. 8 - 5 Medinah Circle*

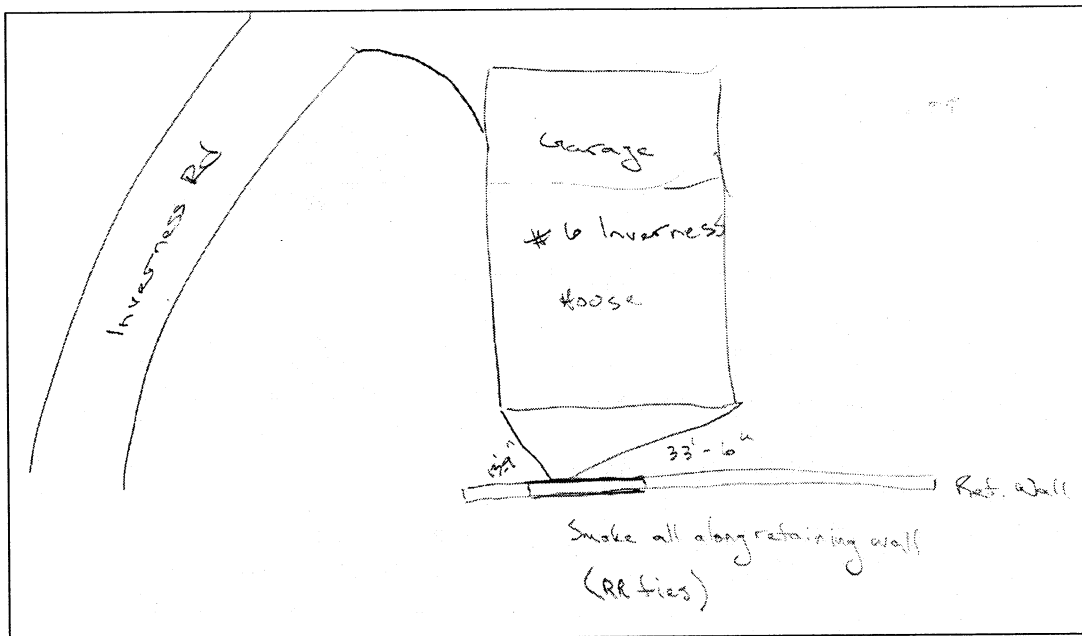








*Smoke Testing Log*  
*Setup No. 10 - 6 Inverness Road*





*Smoke Testing Log*  
*Setup No. 10 - 6 Inverness Road, cont.*





### Smoke Testing Log

Client: Town of Falmouth  
 Weather: Sunny, high 60's  
 Personnel: W-P - KMC, BRW  
Falmouth - Mark Damon

Job Number: 10865C  
 Date/Time: 9/19/07 1:30 PM  
 Setup No: 11

Location: Street Name: Inverness Road  
 From: SMH 67 To: SMH 74

Isolation: Plug at SMH 67

House No.	Smoke Venting?	Other Issues
8	Y / <del>N</del>	Roof drain into ground, could daylight
10	Y / <del>N</del> (P)	Smoke rising from ground on right side of house. See sketch and photos.
12	Y / <del>N</del> (P)	
14	Y / <del>N</del>	
16	<del>Y</del> / N (1/2)	
9	<del>Y</del> / N	
11	Y / <del>N</del> (P)	
	Y / N	
2 Oakmont	<del>Y</del> / N	Marked as No. 1.
	Y / N	
	Y / N	
	Y / N	
	Y / N	
Catch Basins:	None	
Other Issues:	SMH 67: Leaking invert. See photo. Indications that riser and manhole joints also leak.	
	Nos. 1 and 4 Oakmont were checked as well. No vent pipes were smoking, so it is assumed that they are on the low pressure force main.	
	Note: P in vent column indicates that the septic tanks likely have pumps based on elevation.	



*Smoke Testing Log*  
*Setup No. 11 - SMH 67, Inverness Road*

