environmental science & engineering

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September 26, 2016

Mr. Lewis Sumner
Selectboard Chair
Town of Halifax
P.O. Box 127
Halifax, VT 05358

Via Email to lsumner@myfairpoint.net

Re: Perfluorinated Compound Groundwater Sampling - Work Plan
Halifax Landfill, Halifax, Vermont

Dear Mr. Sumner:

1.0 Introduction

KAS, Inc. (KAS) has prepared this work plan to sample one monitoring well for perfluorinated compounds (PFCs) at the Halifax Landfill located in Halifax, Vermont (Site). This work plan was prepared in accordance with requests made in a letter correspondence from Ms. Kasey Kathan of the Vermont Department of Environmental Conservation (VTDEC) to the Halifax Selectboard dated September 1, 2016. Activities included in this work plan are: 1) collection of a groundwater sample from monitoring well MW-3 for PFC analysis, and 2) preparation of one summary letter report for submittal to the VTDEC.

2.0 Scope of Work

The following specific tasks will be performed.

2.1 Groundwater Monitoring

A groundwater sample will be collected from existing monitoring well MW-3. Prior to collecting the groundwater sample, KAS will measure the water table elevation in the well with an interface probe. The well will be sampled via bailer method as previously done during semi-annual groundwater monitoring events. PFC testing requires specialized bailers. As such, KAS will bring a specialized bailer (PVC) to the site for this sampling event. The purged water will be disposed of on the ground. The groundwater sample will be placed in laboratory provided containers, properly preserved, placed on ice and submitted under proper chain of custody procedures to Northern Lake Service, Inc. in Crandon, Wisconsin for PFC analysis via EPA Method 537 (short list). The analysis will be performed such that detection limits of 20 parts per trillion are achieved. One duplicate sample will also be collected for analysis via EPA Method 537 (short list). A trip blank will be prepared with laboratory provided PFC-free "blank water" and submitted to the laboratory along with the samples for PFC analysis. The groundwater sample will be collected in accordance with KAS' specific groundwater sampling protocol for PFC sampling, which is enclosed.

2.2 Summary Letter Preparation

At the conclusion of the site activities, the data will be compiled into a summary letter report. Specifically, the report will include a description of sampling methodology and results, a discussion of any significant deviations from the approved work plan,

tabulated representations of analytical data (as appropriate), a site map, a sensitive receptor survey (as appropriate) and conclusions and recommendations.

3.0 Schedule

Sampling efforts will be performed within 10 business days after VTDEC work plan approval is received.

Please feel free to contact me if you have questions.

Sincerely,

Rebecca Treat
Project Geologist

cc. KAS # 610110045

1.0 Scope and Application

This protocol specifies the purpose, qualifications, equipment, supplies, and procedures to be employed for collection of groundwater samples from monitoring wells using disposable bailers for perfluorinated compound (PFCs) analysis.

The procedures and other aspects of this protocol will be the sole means of accomplishing the tasks described herein during work on all KAS projects, unless an alternate methodology is specified in an approved project work plan.

2.0 Purpose

The purpose of this protocol is to standardize the described procedures to enhance reproducibility, accuracy and precision among multiple users. This protocol addresses user qualifications, equipment, supplies, procedure, and monitoring well maintenance.

3.0 User Qualifications

This protocol will be implemented only by personnel who have 40-hour OSHA training (29 CFR 1910.120), in addition to in-house training.

4.0 Equipment

a) **No potential PFC containing materials (Tyvek, waterproofing, gore-tex etc.) can be used. See enclosed list of prohibited and acceptable materials. This list also includes restrictions on food/drink, field clothing/PPE, sample containers, and much more so care should be taken to thoroughly review the list prior to any field preparation.**
b) Nitrile Powder-free gloves.
c) PFC free notepad (loose paper, no rite in the rain).
d) PFC free writing instrument (Sharpie).
e) Magnetic locating device for finding steel road boxes.
f) Shovel and crow bar.
g) Hand tools, including ratchet, extensions, sockets (1/2", 7/16", 9/16", 5/8" and ¾"), hammer, screwdrivers, pry bars.
h) 5 gallon plastic pails (2 or 3).
i) Pentagonal well key for sites with compression road box covers.
j) Equipment is also needed to implement closely related protocols (see **KAS Protocol #003**).

5.0 Supplies

a) **No potential PFC containing materials (Tyvek, waterproofing, gore-tex etc.) can be used. See enclosed list of prohibited and acceptable materials. This list also includes restrictions on food/drink, field clothing/PPE, sample containers, and much more so care should be taken to thoroughly review the list prior to any field preparation.**
b) Suitable number of new, factory packaged disposable PVC bailers.
c) Sufficient number of laboratory supplied containers and preservatives. Typical kit will include 2 Trizma preserved sample bottles. PFC free water must be obtained from the laboratory for preparation of the trip blank.
d) Personal protective equipment as specified in the project Health and Safety plan. (Refer to PFC list for prohibited iems).
e) New sampling rope consisting of cotton, nylon, or polypropylene. (Refer to PFC list for prohibited iems).
f) Extra gripper caps in case replacement is necessary.

6.0 Calibration

There are no calibration procedures associated with this protocol.

7.0 Operation

a) First, and after notifying on site personnel of the sampling event, don appropriate reflective vest and personal protective gear.

b) Locate each monitoring well to be sampled. Typically, monitoring wells are inside of flush mounted steel road boxes, but aluminum road boxes, unprotected plastic well casings, or metal stand pipes are also possible. Use the magnetic locator if needed to find well boxes beneath soil or snow. Tie off distances to permanent fixed points such as telephone poles, building corners and fire hydrants are particularly useful. If these are not available, use a tape measure and collect them for inclusion on the field map.

c) Deploy road cones in areas of possible vehicle traffic. Always be aware of vehicles and try to work facing the most probable approach. Use the KAS truck or other vehicles for protection if necessary. In high traffic situations a 2nd person should be deployed for traffic control.

d) The order of sample collection should progress from the least to the most contaminated station. This will normally be specified on the field data sheet.

e) Use hand tools to open the road box or standpipe. Temporarily replace road box screws to avoid loss and possible entry of dirt or debris into the road box flanges.

f) Remove the gripper cap and allow the well to stabilize for a few minutes. If the gripper cap is worn or broken, replace it.

g) Prior to sampling, the liquid level measurements will be collected as specified in **KAS Protocol #003**. If measurable free product is present, a groundwater sample will not be collected.

h) Prior to sample collection, water will be purged from the well to ensure the collection of a groundwater sample representative of the targeted aquifer. The volume of water purged from the well before sampling will be approximately three times the volume of water in the well before purging.

The following table shows the volume of water in gallons inside the well casing according to inside pipe diameter and depth of water column. These volumes must be tripled to obtain the necessary well purge volume. Use a 5-gallon pail to estimate the volume of purge water as the well is purged.

Pipe Size (ID)	**1”**	**2”**	**4”**
2’ Water Column	**0.07 gallons**	**0.30**	**1.17**
4’	**0.14**	**0.60**	**2.34**
6’	**0.21**	**0.90**	**3.51**
8’	**0.29**	**1.19**	**4.68**
10’	**0.36**	**1.49**	**5.85**
12’	**0.43**	**1.79**	**7.02**
14’	**0.50**	**2.09**	**8.19**
16’	**0.57**	**2.39**	**9.36**
18’	**0.64**	**2.69**	**10.53**
20’	**0.71**	**2.99**	**11.70**

i) Remove the bailer from its protective sleeve and set the protective sleeve aside. Take care to keep the bailer from touching the ground or other sources of potential contamination. Inspect the bailer to make sure it is clean and intact, especially the top tie off and the ball check valve, before using.

j) Tie the sampling rope to the bailer using a triple overhand knot or other durable knot. Partial pieces of unused ropes shall not be pieced together to form sampling ropes. Inspect the knot each time the bailer is brought up to make sure it is not untying. The sampling rope should be coiled and held aloft as it is retrieved from the well to minimize contamination.

k) If the well is bailed dry before three well volumes are evacuated, the well will be allowed to recharge for at least ten minutes, and a sample of the recharging water will then be collected.

l) New gloves will be donned by the sampler prior to sample collection. Water samples will poured or drained from the bailer into the laboratory provided containers.

m) Quality Assurance/Quality Control (QA/QC) samples are to be collected from each site, as stated in the project work plan. If more than one site is sampled during the course of a given day, a full set of QA/QC samples will be collected for each site.

n) Sample containers will be individually labeled and handled as per **KAS Protocol #006**. Each sample will be identified with a unique number which corresponds to the sample station from which it was collected. If multiple sample containers for various analytical methods are collected from the same sample station, the sample identification should be the same on each of the containers.

o) Purge water will be disposed of by pouring it onto the ground surface in most cases. An effort should be made to minimize the visibility and the impact of disposal of purge water especially during the winter when icing of ground surfaces can result. Usually, purge water can be inconspicuously disposed of in grassy areas, landscaped areas, drainage ditches, or snow banks. Purge water should not be disposed of directly into standing or flowing water but instead should be allowed to infiltrate the ground.

p) Once completed, cut the rope from the spent bailer and slide the spent bailer into the protective sleeve for disposal. Do not re-use spent bailers. Used sampling ropes will be properly discarded after each well is sampled. Place them along with used gloves, paper towels, sample label sheets, etc. into a plastic garbage bag for disposal at KAS' office. Do not use on site facilities to dispose of trash.

8.0 Maintenance

Monitoring wells must be properly maintained to avoid having to replace them. The most common maintenance required is road box repairs. Damaged pavement or concrete around the well should be repaired as soon as it is discovered to avoid accidental damage to the road box. Stripping or breaking of road box bolts can be avoided by not over-tightening the bolts, and by cleaning the threads each time the bolts are removed. Bolts can be temporarily replaced

into their bolt holes during sampling and this helps keep the threads clean and keeps the bolts from getting lost. Gripper caps must function properly to keep surface water out of the well. If a gripper cap locks up and can not be tightened, it should be replaced as soon as it is discovered. A record of all maintenance performed should be recorded on the project field work sheet.

9.0 References

Garrett, Peter, How to Sample Groundwater and Soils, National Water Well Association, 1988.

PFC Sampling – Prohibited and Acceptable Items

Prohibited	Acceptable
Field Equipment	
Teflon® containing materials	High-density polyethylene (HDPE) materials
Low density polyethylene (LDPE) materials	Acetate Liners
	Silicon Tubing
Waterproof field books	Loose paper (non-waterproof)
Plastic clipboards, binders, or spiral hard cover notebooks	Aluminum field clipboards or with Masonite
	Sharpies®, pens
Post-It Notes®	
Chemical (blue) ice packs	Regular ice
Field Clothing and PPE	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex™	Well-laundered clothing made of natural fibers (preferable cotton)
Clothing laundered using fabric softener	No fabric softener
Boots containing Gore-Tex™	Boots made with polyurethane and PVC
Tyvek®	Cotton clothing
No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling	**Sunscreens** - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, Baby sunscreens that are "free" or "natural" **Insect Repellents** - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics **Sunscreen and insect repellant** - Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion
Sample Containers	
LDPE or glass containers	HDPE or polypropylene
Teflon-lined caps	Unlined polypropylene caps
Rain Events	
Waterproof or resistant rain gear	Gazebo tent that is only touched or moved prior to and following sampling activities
Equipment Decontamination	
Decon 90®	Alconox® and/or Liquinox®
Water from an on-site well	Potable water from municipal drinking water supply
Food Considerations	
All food and drink, with exceptions noted on right	Bottled water and hydration fluids (i.e, Gatorade® and Powerade®) to be brought and consumed only in the staging areas