Recommended compounds for water tests around UNGD Compressor Stations (adapted from SWPA-EHP Summary report 2016)

Compound	Collection Method	Analysis Method
2-butoxyethanol	Organics	Alcohols/Solvents
Acetaldehyde	Organics	Aldehydes
Ammonium	Cations	Cations
Arsenic	Metals	Metals/Cations
Barium	Metals	Metals/Cations
Benzene	Hydrocarbons	Aromatics
Boron	Metals	Metals/Cations
Bromide	Anions	Anions
Chloride	Anions	Anions
Cyclohexane	Hydrocarbons	Solvents
Dichloromethane	Organics	Solvents
Ethanol	Organics	Alcohols/Solvents
Ethyl Benzene	Hydrocarbons	Aromatics
Ethylene Glycol	Organics	Alcohols/Solvents
Fluoride	Anions	Anions
Hydrocarbons C1 – C5	Hydrocarbons	Hydrocarbons
Hydrotreated light petroleum distillates	Hydrocarbons	Solvents
Isopropanol	Organics	Alcohols/Solvents
Lead	Metals	Metals/Cations
Manganese	Metals	Metals/Cations
Methane	Hydrocarbons	Hydrocarbons
Methanol	Organics	Alcohols/Solvents
Radium (^{226}Ra and ^{228}Ra)	Radioactive materials	Radioactive materials
Selenium	Cations	Cations
Sodium	Cations	Cations
Strontium	Metals	86Sr/87Sr
Sulfate	Anions	Anions
Toluene	Hydrocarbons	Aromatics
Total Nitrogen	Organics	TN
Total Organic Carbon	Organics	TOC
Xylene	Hydrocarbons	Aromatics

Collection Methods (share with lab)

General

When performing any sort of water chemistry analysis, it's good practice to collect general readings using a YSI multi-meter probe. A YSI multi-meter can obtain several different readings, but focusing on temperature, dissolved oxygen, pH and conductivity are adequate parameters for assessing overall water quality. If collecting from a tap or small source, it may not be possible to obtain this information with this instrument.

Anions, Dissolved Organic Carbon

Purge the source for 10-20 minutes. Use a high density polyethylene sample bottle for collection and filter in the field using 0.45µm syringe filters. Store samples in the dark and on ice during transport [1,10].

Cations and Metals

Purge the source for 10-20 minutes. Use a high density polyethylene sample bottle for collection, bottles should be acid washed prior to use for collection. "Trace metal clean" containers can also be used. Filter in the field using 0.45µm syringe filters. Preserve samples with 10% high purity nitric acid. Store samples in the dark and on ice during transport [1,10]. 9

Hydrocarbons

Purge the source for 10-20 minutes. Use amber septum vials (100mL) for collection, do not filter and leave no headspace. Store samples in the dark and on ice during transport [1].

Radioactive Material

Purge the source for 10-20 minutes. Use a plastic container for sample collection and filter on site using 0.45µm pore size filters. Bring the pH of the sample to ≤2 by using hydrogen chloride or nitric acid. This inhibits biological growth and prevents radium from adsorbing to the wall of the container [8].

Organics

Purge the source for 10-20 minutes.
Hydrophilic: collect sample using a pre-combusted amber glass container and a Teflon cap. Fill container about halfway and freeze sample to preserve prior to analysis.
Hydrophobic: collect sample using a pre-combusted amber glass container. Minimize the headspace in the container and freeze sample to preserve prior to analysis.
Lighter hydrophobic: collect sample using a pre-combusted amber glass container. Do not use a Teflon cap, as heavier hydrocarbons will adsorb to the Teflon polymers over time. Minimize the headspace in the container and freeze sample to preserve prior to analysis [12].

Radium (^{226}Ra and ^{228}Ra)

Analytic Method: Gamma spectrometry, Alpha spectrometry
Protocols:
Gamma spectrometry – Pre-concentration can be done via evaporation. For sample volumes between 0.1-20L, place sample in a 70-100°C environment at atmospheric pressure. The process takes anywhere from less than 1 hour to 3 days, depending upon conditions and sample size.

Other effective preconcentration procedures include: MnO_2 adsorption, $Ba(Ra)SO_4$ and/or $Pb(Ra)SO_4$ coprecipitation, cation-exchange resin adsorption, and Radium Rad Disc adsorption. For Ra purification, crystallization as $BaSO_4$, anion- or cation-exchange resin chromatography, solvent extraction with HDEHP, TBP, HMHN and Cy221C7, and extraction chromatography with Microthene-TOPO, can be used. Then low-background HPGe gamma spectrometry technique can be used for determination of ^{228}Ra and ^{226}Ra in environmental samples [8,9].
Alpha spectrometry – samples can commonly be prepared either in the form of micro-precipitation of $BaSO_4$ or of electrodeposition in the media of oxalate or ethanol. Due to better energy resolution and effective decontamination, electrodeposition is recommended. Then alpha spectrometry technique can be used for determination of ^{228}Ra and ^{226}Ra in environmental samples.

The alpha spectrometry is a better option over gamma spectrometry because it allows for higher sensitivity resulting from the observation of the high-yield alpha decay process, low intrinsic detector background and the elimination of competing radionuclides by chemical separation; the ability to measure concentration of ^{226}Ra without an ingrowth period for ^{222}Rn and daughters; and the ability to measure activity concentrations of all the naturally occurring Ra isotopes (^{226}Ra and ^{228}Ra included) on a single source [8].