Heckmann Water Resources, Inc.

DRAFT
Radiological Response Action Plan
Goff USTS

Prepared by:
Tetra Tech, Inc. &
APPLIED HEALTH PHYSICS, INC.

- water received and targeted for UIC need not be tested.
- Solids generated = TENORM
- out of state - lawful disposal

The Heckmann Water Resources, Inc. (HWR) facility located at the Goff UIC well in Muskingum County, Ohio is designed to support the processing and storage of waters from HWR and non-HWR oil and gas-related drilling projects. These projects could include drilling activities for conventional and unconventional wells. The use of these waters at drilling sites could potentially disturb the geological make-up of the sub-surface soils and rock formations and expose the water to both *naturally occurring radioactive material* (NORM) and/or *technically enhanced naturally occurring radioactive material* (TENORM). The water shall arrive at the HWR site via commercial trucks.

The intent of regulatory oversight and enforcement is to ensure the protection of HWR employees, contractors and the public health and safety, as well as the environment. HWR shall conduct operations at the facility under the terms and conditions of their permit.

Radiation surveys shall be performed with a calibrated Ludlum Measurements Model 193-6 Survey Meter or equivalent. This instrument has a maximum range of 1 mR/hour (1000 µR/hour) and is capable of monitoring anticipated background radiation levels at the site. HWR shall have access to additional survey instruments for higher range radiation and contamination surveys as necessary.

TENORM Waste Stream Generation

The TENORM waste stream generation is variable at the HWR plant. It is dependent on the plant throughput, types of water recycled and the amount of solids in the water.

At other facilities, HWR has historically generated one to three roll off boxes per week depending on production and level of solids. Roll offs typically contain 15-20 tons of filter cake.
The wier tank underflow is currently sent as a slurry to the HWR Appalachian Water Services (AWS) plant in Masontown, PA for dewatering.

The TENORM waste stream filter cake generated is ~50 % solids (note lab analysis is done on a dry basis).

Waste analysis of the material at the HWR facility will be tested before disposal for Ra-226. ? Ra-228

All TENORM waste generated that will be disposed of in Ohio is done so only after approval is secured. No TENORM solid waste is currently disposed of in Ohio.

Some TENORM materials have been, and likely will be disposed of out of state at facilities that can handle TENORM waste streams that cannot be disposed of in Ohio landfills.

On Site TENORM Waste Stream Storage

Storage of TENORM waste on site at the HWR plant will be kept to a minimum. Storage time is largely dictated by regulatory approvals and landfill restrictions. Our goal is to move material to a landfill within 14 days of regulatory approval. Absent regulatory restrictions,

HWR prefers to ship waste as it is generated, but will follow all regulatory requirements for filter cake disposal.

Policy Statement

It is HWR's policy that all vehicles containing drilling impacted waters shall be surveyed for radiation 100 percent of the time upon entry to the HWR facility. It is HWR's policy not to knowingly accept any inbound vehicle containing drilling impacted waters exhibiting radiation levels that exceed 10 µR/hour above natural background levels. In addition, only individuals trained in the use of portable radiation detection equipment and this Action Plan shall provide response.

If incoming shipments are identified as emitting radiation levels in excess of 10 µR/hour above natural background, HWR management personnel and responsible individuals are to follow the applicable safe operating procedures contained in this plan.

HWR personnel shall investigate each radiological situation thoroughly, take appropriate radiation measurements with a hand-held survey meter, complete the required documentation and make notifications as required. The Facilities Manager or designee will make the final decision to reject any materials due to radiological issues only after receiving permission from the ODNR. Any rejected shipments containing suspect material will not be permitted to exit HWR property until written authorization has been received from the ODNR.

All individuals involved in performing surveys and/or responding to emergencies involving radiation shall be trained in radiation safety and detection. Radiation surveys with levels in excess of 1,000 µR/hour shall be performed by a radiological consultant.

Any proposed revisions to the approved HWR Action Plan that could affect personnel safety shall be submitted to the ODNR for review and approval prior to implementation.

Transportation of TENORM Waste Stream

All TENORM Waste Stream Material shipped from the HWR facility will be properly placarded and documented as applicable under ODNR and DOT regulations.

RADIATION DETECTION EQUIPMENT

HWR shall obtain a Ludlum Model 193-6 Survey Meter (or equivalent) for screening of inbound vehicles containing drilling impacted waters. This instrument is designed to measure environmental levels of gamma and x-ray radiations. A typical natural background radiation level at the site would average between 4 and 15 µR/hour.

The instrument shall be calibrated by a properly licensed facility at a frequency not to exceed annually. The calibration shall include electronic pulsing of lower ranges and gamma radiation testing for higher ranges. The results of the calibration shall not exceed +/-

20% of the calibration source value and the certificate of calibration retained for at least five years.

Operators shall ensure the proper operation of the survey meter as described in the Safe Operating Procedure. If any of the operational checks fail the instrument shall be taken out of service.

HWR shall have access to additional survey meters to include:

- High range beta/gamma survey meters
- Removable contamination survey meters
- Back-up µR survey meter
- Multi-channel gamma spectroscopy instrument.

These meters shall be provided by the radiological consultant.

ACTION LEVELS

Two Action Levels have been identified and steps to be taken are provided if the presence of radioactive material has been confirmed.

distance, time, shielding

Action Level #1

If the measured radiation levels at 5 centimeters (2 in.) from the vehicle exceed 10 µR/hour above the documented natural background reading, the following actions are to be taken:

1) Continue to survey vehicle levels and document highest result up to 1,000 µR/hour above background. Any reading in excess of 1,000 µR/hour above background constitutes an Action Level #2 situation.

2) Do not allow the vehicle to leave the facility without the permission of the ODNR.

3) Contact HWR emergency personnel for guidance. Follow the Safe Operating Procedure.

4) HWR management shall contact the appropriate ODNR Area Health Physicist for guidance. – plan should documentactions

ODH is our consultant

Action Level #2

If the measured radiation level at 5 cm from the surface of the vehicle is equal to or greater than 1,000 µR/hour or the radiation level in the cab of the truck is greater than 1000 µR/hour the following steps should be taken:

1) Remove all personnel from the vehicle and complete a survey of occupants for the possibility of nuclear medicine testing or treatment.

2) If occupants are the cause of the elevated readings have them moved to a safe distance from the vehicle (25 feet) and re-survey the vehicle.

3) If the radiation levels are confirmed as less than 10 µR/hour above the documented natural background reading allow the vehicle to enter the facility.

4) If the measured radiation levels still exceed greater than 1000 µR/hour the following steps should be taken:

1) Move the vehicle to the designated isolation zone.

2) Erect a physical barrier to keep all personnel at least 10' from the vehicle.

3) Notify HWR emergency contacts immediately.

5) HWR management shall notify the ODNR Area Health Physicist for further direction.

Safe Operating Procedure for Responding Personnel

All personnel involved in radiological screening are required to follow this SOP:

1. Obtain the appropriate radiation survey meter (Ludlum Model 193-6 Survey Meter or equivalent) and verify the following:

- Ensure that the instrument has been calibrated within the last twelve months with an NIST traceable Cs-137 source.
- Ensure that the battery check is satisfactory (if low, change the batteries).
- Ensure that the meter is not physically damaged.
- Ensure that the meter responds to the appropriate check source.
- Return the check source to its secure storage location.

DO NOT USE SURVEY INSTRUMENTS THAT FAIL ANY OF THE ABOVE CHECKS

1. Obtain an initial background radiation measurement before surveying the vehicle. The reading should not exceed 15 µR/hour.

2. Approach the vehicle slowly with the meter set on the X10 scale.

3. Perform the radiation survey at 5 cm (2") from the surface of the vehicle, slowly monitoring both sides and the rear

IF	THEN
The radiation level does not exceed 10 µR/hour above natural background.	Complete appropriate form and allow the vehicle to proceed.
IF	**THEN**
The radiation level exceeds 10 µR/hour above natural background this constitutes Action Level #1.	Check the driver for nuclear medicine testing. Continue to monitor the vehicle (upscaling as necessary) and verify the highest surface reading (to not enter field in excess of 1,000 µR/hour), Document the results on the appropriate form. Make Immediate notification as required.

IF	THEN
The radiation level exceeds 1000 µR/hour in the cab of the vehicle or at the external surface this could constitute an Action Level #2	HALT IMMEDIATELY. Isolate the vehicle. Estimate distance from highest reading to vehicle surface. Perform immediate notifications as required.

4. If radiation levels are in excess of 1000 µR/hr in the cab or at 5 centimeters, the vehicle must be isolated away from employee work or traffic areas. The vehicle must be barricaded at 1000 µR/hr and posted as a "Restricted Area" until authorization is given for disposition.

5. Any rejected vehicles will not be permitted to exit company property until written or electronic notification authorization is provided. In the event that the driver leaves the

facility with the vehicle prior to approval, HWR management shall notify the OH State Police and provide a full description of the vehicle.

6. Maintain a copy of all completed forms and forward copies to responsible individuals.

7. The following personnel are to be notified of all radiological issues involving elevated measurements

Name	Phone #
Rick Bartkowski	412-474-3833 (office) 412-354-8883 (cell)
Leo Gismondi	724-757-6010

RSO ? consultant ?

Additional Notifications

8. Notify the following:

   Applied Health Physics, Inc. Todd Mobley 800-332-6648

consultant or RSO should be first person contacted.

9. The consultant (Applied Health Physics) shall be responsible for the following:
   a. Immediate notification of the ODNR Area Health Physicist.
   b. Responding to the facility within 8 hours of Emergency Notification.
   c. Performing a comprehensive radiation and contamination survey.
   d. Determining isotopic identification for characterization of the material.
   e. Confirming the Action Level and appropriate response.
   f. Make recommendation on ODNR notification.

Training of Response Personnel

All individuals involved in the screening of vehicles for radiation shall receive training prior to assignment of that responsibility. The training shall be in the form of a lecture/demonstration and include as a minimum the following:

- Radiation Fundamentals
- Methods of Minimizing Exposure (ALARA)
- Portable Detection Equipment
- Units of Measurement
- Proper Survey Techniques
- Action Plan Content
- Standard Operating Procedure
- Residual waste sampling and handling
- Documentation Completion and Record-keeping
- Notification Requirements

Rejection of Vehicles

As previously stated, HWR shall not accept the contents of any vehicle emitting radiation levels in excess of 10 µR/hour above natural background. The vehicle shall be isolated and HWR emergency responders notified.

Notifications to the ODNR shall be made as necessary and the vehicle shall remain onsite until a signed exemption form is received.

In the event that a vehicle exits the site prior to authorization, HWR shall notify the OH State Police and the ODNR immediately.

Liquid/Sludge Disposal

The need exists for the disposal of residual wastes as liquid or solids. These wastes could be generated from processing of conventional or unconventional drilling waters. The roll off box containing the waste shall be screened for radioactivity in accordance with the Action Plan Procedure. The results of the monitoring shall be maintained and available upon request from the ODNR. The HWR management representative shall ensure that radiological sampling and analysis have been completed as specified. HWR management shall coordinate with ODNR solid waste manager for guidance on sampling, analysis and review of the results

req'd by code/statute

→ HWR's responsibility - see OPH sampling protocol.

Employee Exposure

It is expected that radiation exposures to HWR Muskingum County, OH, employees will not exceed limits for members of the general public. In the event of an actual or suspected exposure in excess of those limits (100 mR/year), HWR management shall immediately contact the ODNR and the radiological consultant. The consultant shall perform and document a dose assessment for all individuals involved.

Studies from the Interagency Steering Committee on Radiation Standards (ISCORS) evaluated the worker radiation health and safety issues associated with radioactivity in sludge from treatment of water and concluded that the two highest types of radiation exposure anticipated are due to direct radiation and radon exposure.

To determine the radon exposure, HWR will use the services of a Certified Radon Inspector to deploy sufficient number of devices to evaluate the radon levels at the facility. To determine the potential for exposure to direct radiation, HWR will conduct a radiation survey of the facility to identify locations with elevated radiation levels as well as locations that have low levels of radiation.

It is expected that following evaluation of the above situation will determine locations where administrative controls will be needed including posting signs to notify workers not to linger in the area. In other areas, additional engineering controls may be needed, such as increasing the ventilation rate to keep radon concentrations low.

In this initial phase, weekly radiation measurements will be taken to ensure that the facility locations with the highest radiation level(s) are identified. Once the radiation levels are determined, annual direct radiation doses can be projected using estimates of time in these areas. Similarly, once radon concentrations are determined, the annual doses to personnel from radon concentrations and stay times in those areas can projected. If the projected worker exposure to radiation is expected to exceed 100 mrem in a year, additional requirements for training and treating the workers as radiation workers will considered subject to the annual dose limits allowable.

If it is anticipated, by these initial measurements and calculations that worker exposures are likely to exceed 10% of the occupational exposure limit for direct radiation exposure or for exposure to radon, appropriate additional monitoring including use of monitoring devices (NVLAP accredited TLD or OSL) and additional radon monitoring and stay time calculations will be implemented.

Documentation

HWR shall complete all documentation as required and maintain records for inspection by the ODNR and include this information in both the daily operational records and the annual report.

Action Plan Revision

Any proposed revisions to the approved HWR Action Plan shall be submitted to the ODNR for review and approval prior to implementation.

EMERGENCY CONTACTS

Organization	Contact	Phone #
HWR	Rick Bartkowski	412-474-3833 (office) 412-354-8883 (cell)
HWR	Leo Gismondi	724-757-6010
Applied Health Physics	Todd Mobley	800-332-6648 (office) 412-580-5235 (cell)
ODNR	Radiation Protection	
Police	Police	
Fire Station	Fire	
Hospital	EMS	

Action Plan Preparation

This Action Plan was prepared by Todd Mobley of Applied Health Physics, Inc. Mr. Mobley has over 32 years of experience in radiation safety. A copy of his resume is available upon request.