WASTE MANAGEMENT

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November 8, 2006

Mr. James Strickland, P.E.
New York State Department of
Environmental Conservation
Region 9
270 Michigan Avenue
Buffalo, New York 14203-2999

Re: Revised Radiological Survey Plan

Dear Mr. Strickland:

On November 2, 2006, CWM Chemical Services, LLC (CWM), submitted a revised Sitewide Radiological Survey Plan, as required by Module II, Condition J(2), of CWM's Part 373 Permit No. 9-2934-00022/00097, which addressed New York State Department of Environmental Conservation (NYSDEC) comments dated October 18, 2006. Subsequently, Ms. Barbara Youngberg, NYSDEC, verbally requested one additional change. Attached please find a revised page to incorporate the requested change. The attached revised page replaces the corresponding page from the November 2, 2006, submission.

Please call Mr. John Hino at (716) 754-0278 or myself at (716) 754-0246 if you have any questions or comments.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Sincerely,
CWM CHEMICAL SERVICES, LLC

Jill A. Banaszak

Jill A. Banaszak
Technical Manager
Model City Facility

JBH/JAB/jbh
Attachment

cc:	B. Rostami	- NYSDEC/Region 9	- W/O Attachment
	P. Kutlina	- NYSDEC/On-site Monitor	- W/Attachment
	E. Dassatti	- NYSDEC/Albany, NY	- W/Attachment
	B. Youngberg	- NYSDEC/Albany, NY	- W/Attachment
	S. Gavitt	- NYSDOH/Troy, NY	- W/Attachment
	J. Devald	- NCHD/Lockport, NY	- W/Attachment
	R. Sturges	- CWM/Model City, NY	- W/O Attachment
	M. Mahar	- CWM/Model City, NY	- W/O Attachment
	J. Hino	- CWM/Model City, NY	- W/Attachment
	S. Rydzyk	- CWM/Model City, NY	- W/Attachment
	CAC		- W/Attachment
	EMD Subject File		
	Q & A		

CWM Chemical Services, LLC.
Site Radiological Survey Plan
September 2005

Response to NYSDEC Comments dated October 18, 2006

NYSDEC Comment #1: *CWM provided a schedule for completing the tasks in the plan. Please explain why it will take one year to complete the gamma walkover survey and 18 months to complete the detailed investigation and soil sampling. Both of these time periods seem unnecessarily long.*

CWM Response – Currently, CWM has completed approximately 90% of the gamma walkover survey scan of the accessible and partially accessible areas as shown on Figure 1 of the Survey Plan. The remaining areas to be scanned are generally located in the partially accessible areas which are difficult to access, and as such, require more time to survey. For selecting the one year time period from Plan Approval, in order to complete the gamma walkover survey, CWM had to consider several factors that affect the ability to gather data. First of all, weather conditions are a key factor in completing survey activities. For instance, surveying activities cannot proceed during precipitation events and temperatures below 40°F. Rain and low temperatures affect the instrument readings and can potentially damage the equipment. Secondly, ground surface conditions such as slippery surfaces, puddle water, and snow cover prevent the collection of data. Finally, additional time is required between actual field surveying and reviewing the data collected to insure no data gaps exist. After reviewing the GPS and radiation level data, the gamma walkover survey crew may have to be re-mobilized several times to re-walk areas that were either missed during the initial walkover, or even re-scan areas that appear to have questionable results. Based upon the experience gained from the gamma walkover survey to date, the factors discussed above, and the fact that CWM will not be able continue scanning the facility until April or May 2007, CWM believes the one year request is reasonable.

As for the time requested for completing the detailed investigation and soil sampling (ie., 18 months from Plan Approval), until a complete review of the walkover survey data is completed by the New York State Department of Environmental Conservation (NYSDEC), and CWM understands the number of areas which require additional investigation and sampling, a more refined schedule cannot be proposed at this time. As the NYSDEC and CWM know, it is in the best interest of CWM to complete these activities expeditiously, and as such, CWM will do so as conditions permit.

NYSDEC Comment#2: *CWM states that Figure 1 had been replaced with a figure showing the area they originally proposed to survey, areas that are partially accessible, and areas that are inaccessible. The response to the comment is unclear as to whether or not CWM intends to survey the partially accessible areas. Please clarify (see also item 16).*

CWM Response – Areas that have been designated as partially accessible by CWM, will be scanned to the extent that, accurate location and radiological survey data can be obtained, that the safety of the workers is not compromised, and there is no potential for equipment damage. A partially inaccessible area means that some of the area will be scanned, but 100% coverage cannot be accomplished. Additional wording has been added to the plan describing this.

NYSDEC Comment #3, #4, #5: *Regarding the use of the terms "acceptance limits, acceptance units, and reference criteria," please see Additional Comments below.*

Additional Comments: *This survey is to be a scoping survey, not a final status survey. It is a primarily a walkover radiation survey, with biased sampling of locations where the count rate exceeds the investigation level. That is the extent of the work required by the permit. At this stage, there is no need for DCGLs or any other concentration- based criteria. The permit condition only requires CWM to perform the survey and report the results to DEC and DOH. If the State Agencies determine that any remediation is needed, decontamination criteria will be developed later.*

The plan still refers to applying concentration criteria over a 100 m^2 area. This approach is not appropriate for a scooping survey of the CWM Site.

Therefore, please remove all references to "acceptance limits," "acceptance criteria," "DCGLs", "acceptance units," and any other similar terms. The only concentration to which an analytical result should be compared is the background concentration, if applicable. In addition, delete all references to averaging over a 100 m^2 area.

CWM Response – The terms "acceptance limits," "acceptance criteria," "DCGLs", "acceptance units," and any other similar terms have been removed from the plan. In Section 2.3 of the Plan, "Survey Sensitivities, Detection Limits and Field Instrumentation," for the determination of the adequacy of instrument survey detection sensitivity, CWM had to include an assumed criteria for Ra-226, U-238, and Th-230 which is typical used for other site investigation plans. Also, CWM has deleted all references to averaging over a 100 m^2 area.

NYSDEC Comment #16: *CWM added a paragraph to section 6 regarding the areas to be surveyed, those that are partially accessible, and those that are inaccessible for GPS. It is not clear from this text whether or not CWM proposes to survey the partially accessible areas. Also, the fact that GPS logging is difficult or impossible in an area does not mean that the area cannot be surveyed for radiological contamination. Please clearly identify those areas CWM proposes to include in the survey, and explain why the rest of the site is excluded.*

CWM Response – As stated in the response to NYSDEC comment #2, CWM will scan the partially inaccessible areas to the extent where an accurate location and radiological survey data can be obtained; that the safety of the workers is not compromised, and; there is no potential for equipment damage. A partially inaccessible area means that some of the area will be scanned, but 100% coverage cannot be accomplished. As discussed in the Plan, "Inaccessible areas have characteristics where there is dense vegetation, thick brush, trees, steep slopes, and ponds. Accurate survey data and GPS coordinates cannot be obtained in these areas." In the second sentence, "survey data" refers to radiological survey data where the technician is able to reasonably access the area, and scan the area in accordance with the Plan, ie. serpentine survey traverse pattern 1 foot above the surface, without entangling the probe and cables in the brush, and vegetation. Location surveying in dense vegetation and thick brush is still very difficult to complete, either with GPS, traditional surveying equipment, or even with non-traditional surveying techniques since each method still requires the technician to be able to access the area, and generally have line of sight to the survey equipment. The most critical factor as to whether an area is inaccessible is the ability to scan the area with the radiological meters.

Figure 1 generally outlines the M3 Heavy Industrial zoned property located at the Model City Facility. This boundary represents areas in which CWM may be able to perform excavations or soil disturbance activities once all procedures and plans are approved. This area also represents the main operational area of the CWM Facility, which is routinely occupied by CWM personnel, and therefore, represents the potential, if any, for radiological exposure due to excavation activities. Accessible and partially inaccessible areas within the boundary will be surveyed as discussed in the Plan. The remaining CWM property outside of the proposed boundary, the southeast portion of the property located in the Town of Lewiston, and the western side of the property (Sym's and Old Administration areas), are not zoned M3 and are not in any of CWM's current operational plans. These areas are not occupied and excavations or soil disturbance activities by CWM are not planned at this time. In addition, most of these two areas would be categorized as inaccessible or partially accessible due to the overgrown vegetation and heavily wooded area. Since little to no useful data could be obtained for the protection of CWM personnel and the community, CWM does not wish to expend additional resources or funds to perform a gamma walkover survey at this time of the area outside of the boundary proposed by CWM. As stated in the Plan, for areas that are not scanned at this time, CWM will perform a gamma walkover survey prior to future use.

WASTE MANAGEMENT

SITE RADIOLOGICAL SURVEY PLAN

SEPTEMBER 2005
(REVISED November 2006)

MODEL CITY, NY

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List of Abbreviations, Acronyms and Symbols

%.................................. percent

AEC.............................. Atomic Energy Commission

cpm or c/m.................... counts per minute

$DCGL_W$.......................... Derived Concentration Guideline Level–wide area average
DOD.............................. United States Department of Defense
DOE.............................. United States Department of Energy

EPA.............................. United States Environmental Protection Agency

ft/s.................................. feet per second

GPS.............................. global positioning system

KAPL............................. Knolls Atomic Power Laboratory

m/s................................. meter per second
m^2................................... square meters
MARSSIM..................... Multi-Agency Radiation Survey and Site Investigation Manual

NaI................................. sodium iodide
NRC.............................. United States Nuclear Regulatory Commission

pCi/g.............................. picocuries per gram

Ra................................. radium

Th.................................. thorium

U.................................... uranium
U_{tot}................................. total uranium
UR.................................. University of Rochester
USACE.......................... United States Army Corps of Engineers

1. INTRODUCTION

Prior to being operated as a Treatment, Storage and Disposal Facility (TSDF), the property currently owned by CWM Chemical Services, LLC (CWM), was utilized by the U.S. Government from the early 1940s to the mid 1960s as part of the Lake Ontario Ordinance Works (LOOW). The Niagara Falls Storage Site (NFSS) and associated vicinity properties are historically known as the Atomic Energy Commission (AEC) portion of the LOOW. The site is located in Lewiston and Porter New York and originally included 1,511 acres. Currently, the NFSS is only 191 acres. Historically, the site was used for research, processing of uranium (U) and thorium (Th) ores, storage and burial of radioactive ores and residue. In the mid-1950's the federal government sold much of the property. Predecessor companies to CWM Chemical Services, LLC (CWM) bought a portion of the surplus property. Some of the U.S. Government activities resulted in the contamination of certain areas of the Model City Facility with chemical and radioactive wastes. On April 27, 1972, the New York State Department of Health (NYSDOH) issued an order relating to approximately 614 acres of former LOOW property, which imposed certain restrictions on the use of said property. On June 21, 1974, NYSDOH issued a supplemental order to amend the 1972 order.

As a result of extensive corrective remedial actions taken at the CWM property since the 1972 Order, on May 7, 1992, the Department of Energy (DOE) certified that the majority of the CWM property was "in compliance with applicable (radiological) decontamination criteria and standards" and provided "assurance that future use of the property will result in no radiological exposure above DOE criteria and standards established to protect members of the general public or site occupants". Decontamination was certified for all properties owned by CWM, with the exception of three properties designated as E, E' and G. These properties were excluded from the decontamination certification because an area within each property could not be properly assessed due to inaccessibility and the DOE could not confirm that contamination did not exist in these areas. The three inaccessible areas were (1) soil beneath Lagoon 6 and the berm surrounding that lagoon on Property E, (2) soil beneath a roadway and PCB storage tanks on Property E', and (3) soil beneath the liquid treatment pond on the western edge of Property G.

Based on the May 7, 1992, DOE letter, on December 23, 2003, CWM requested that the NYSDOH execute an order to rescind and vacate the 1972 and 1974 Orders for all CWM property, except properties E, E' and G. After reviewing all historical documentation and data related to the areas covered by the Orders, both in the NYSDOH files and provided by CWM, the NYSDOH determined a potential for residual radiological contamination still exists and that a survey be performed identifying any surface areas above a target investigation level.

As required by condition J.1 of Module II (Corrective Action) of CWM's Sitewide 6 NYCRR Part 373 Permit issued 8/5/05, a revised Site Radiological Survey Plan was submitted and approved by the Department. The principles guiding the development of this radiological survey plan include:

- Continue to protect worker health and safety
- Continue to protect public health and safety
- Continue to protect the environment
- Survey plan is not linked to historical information
- Provide for positive identification and control of any Manhattan Engineer District (MED), Knolls Atomic Power Laboratory (KAPL), and University of Rochester (UR) materials encountered
- Provide a new baseline for future CWM operational plans and programs
- Apply latest technology and Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (DOD 2000) methodology

The major elements of the plan include:

- Site wide surface survey methodology
- Identify areas needing special attention
- Survey protocols for Gamma Walkover Survey
- Survey Sensitivities, Detection Limits and Field Instrumentation
- Report Preparation and Format
- Detailed Investigations
- Interior building surveys of "Legacy" structures
- Radon testing of facility buildings
- Contractor/Consultant qualifications
- Health & Safety Plan for survey activities

2. RADIOLOGICAL SURVEY

Guidance provided in the MARSSIM will be the basis for the radiological survey. The MARSSIM process was developed collaboratively by the U. S. Nuclear Regulatory Commission (NRC), the U. S. Environmental Protection Agency (EPA), the DOE, and the U. S. Department of Defense (DOD), for use in designing, implementing, and evaluating surveys for sites contaminated with radionuclides. The result of the implementation of this survey plan will be to identify those areas that will require additional investigation through sampling and radiochemical analysis. All survey work will be performed under a Health and Safety Plan that includes controls and requirements for activities, including personnel protective equipment, and personnel monitoring.

An initial gross-count Investigation Level of 16,000 counts per minute (cpm, c/m) (10,000 cpm plus 6,000 cpm net) has been selected based on the Investigation Level used at Western New York FUSRAP sites and preliminary results gathered to date, which indicate a site background of about 10,000 cpm. Data collection thus far appears to indicate a lower background level for asphalt/paved areas vs soil/vegetated areas. The investigation value for asphalt/paved areas may need to be adjusted accordingly. The Investigation Level(s) will be used as the criterion for screening the investigation units and determining which areas require a detailed investigation.

2.1 Gamma Walkover Survey

The objective of the gamma walkover survey is to provide a 100%-coverage gamma radiation map of approximately 450-acres of the CWM site with nominal 1-meter (m) resolution. The map, in digital form, will be used for screening each of approximately 18,200 investigation units, contained within the 912 site survey units, for more detailed investigation and soil sampling. Because of the large areas and quantities of data from this high-resolution survey, the identification of investigation units that require detailed investigation and soil sampling will be performed electronically during analysis of the gamma walkover survey data. The coordinates of the investigation units that fail the screening will be determined during the analyses of the walkover survey data. The physical marking of the field locations of the units that fail the screening will be performed as part of the detailed survey and soil sampling tasks.

2.2 Survey Protocol

Accessible areas of the CWM site (Figure 1) which are currently operational or may be developed in the near future (approximately 450 acres) will have a 100%-coverage scanning walkover survey to determine the levels of gross gamma radiation from the surface soil and materials of the site and from designated background areas. The 450-acre area will be divided into approximately 912 survey units (2,000 m^2 each), consistent with MARSSIM guidance. Each survey unit will be further divided into twenty (20) 100-m^2 areas that will be reviewed to identify whether there are any individual readings above the Investigation Level.

The walkover surveys will utilize gamma ray scintillation detectors coupled to count rate meters, a sub-meter global positioning systems (GPS), and data loggers to automatically record the radiation levels and their locations as the field operator performs the walkover. The electronic records of survey results will be downloaded and transferred to computers for processing, entry into a geographical information system (GIS), and analysis of results (see Figure 2).

To obtain 100% coverage, the walkover surveys will be guided by real-time GPS positioning relative to waypoints that define straight-line traverses across given portions of the site. This approach provides the field survey operator with continuous measures (once per second) of the distance to the right or left of a target traverse line, guiding the course corrections to follow the target line within approximately ± 0.5 m. Together, the successive traverses form a serpentine pattern (Figure 3) that provides approximately one radiation measurement in every 1 m^2 area based on a traverse spacing of s = 1 m; v = 0.5 m/s velocity; and $v \cdot t$ = (0.5 m/s)·(2 s) = 1 m field of view.

One or more background survey units (approximately 2,000 m^2 each) will be identified and surveyed by the same walkover method used at the rest of the CWM site for comparison with the site readings in each survey unit. The background survey unit(s) will be chosen to approximate similar soil/geology to the units found at the other areas of the CWM site. The background unit(s) may be located on CWM property at the site if it is known to have not been affected by operations with radioactive materials. The background unit(s) may also be located off-site. Prior to their use for comparisons with the CWM walkover surveys, the background-unit walkover surveys will be analyzed to assure that they do not contain anomalous hot-spots or gamma radiation levels that are significantly elevated above the baseline levels found at the CWM site.

All analyses and interpretations of the walkover surveys will be performed by off-site computers, which will receive the field data at least daily and will provide performance reports to the field operators. The reports will summarize the preliminary status of each investigation unit, the locations of any units that appear to be excessively higher than typical background readings, and survey management metrics. The daily metrics include the acres covered by each field survey operator, the mean and standard deviation of his scan velocities, and other statistics that will help track and improve performance.

2.3 Survey Sensitivities, Detection Limits and Field Instrumentation

The following radiological field survey instruments (or their functional and performance equivalent, as determined by a Certified Health Physicist) will be used (Table 2-1). Detection sensitivities have been determined following the guidance of NUREG-1507 (NRC 1998) using nominal literature values for background, response, and site conditions for the Ludlum detectors.

Table 2-1 Detection Sensitivities for Radiation Survey Instrument

Description	Application	Approximate Detection Sensitivity
2-inch x 2-inch NaI gamma scintillation detector with a scaler/ratemeter	Surface scans of all soil areas.	^{230}Th – 2120 pCi/g ^{226}Ra – 2.8 pCi/g ^{238}U – 39 pCi/g

Refinements to these detection sensitivity estimates will be made, as necessary, based on actual instrument response and background data gathered during site survey activities.

The walkover surveys will be performed using 2" x 2" sodium iodide (NaI) scintillation detectors (Model 44-20, Ludlum Measurements Inc., Sweetwater, TX or equivalent) coupled serially to count rate meters (Model 2221, Ludlum, or equivalent). The count rate meters are coupled in turn to sub-meter global positioning systems (GPS) (Trimble Pro XRS or equivalent) to automatically record detector positions every second. The data logger used to store the detector positions will also record the gamma radiation count rates (counts per minute) every two seconds. The logged data from the survey meters and GPS systems will be downloaded once or twice daily to field computers for transfer and analysis

The gamma scintillation detectors used in the walkover surveys will be mounted at 30.5-cm (1-ft.) elevations above ground surface in baby strollers or equivalent carriages (Figure 3). The GPS antenna will be mounted directly above the gamma radiation detector at a measured distance above ground surface, which distance will be entered into the corresponding GPS data logger. For surface gamma walkover surveys, the surveyor will walk at a speed of approximately 2 feet per second (ft/s) (0.5 meters per second [m/s]) while passing the detector/carriage over the surface in a Serpentine Survey Traverse Pattern (Figure 3).

If more than one detector system is mounted on a movable carriage unit, the systems will be mounted with a rigid bar to maintain a 1-m spacing between the detectors. If more than one GPS system is mounted on the unit, the GPS systems will also utilize rigid bar(s) to maintain 1-m antenna spacing. If multiple detectors are linked to a single GPS antenna, the horizontal spacing between each detector and the GPS antenna will be recorded and used in determining individual detector positions. If two detectors are mounted 1 m apart on a carriage, the traverse spacing will be increased to s = 2 m to continue providing approximate 1-m spacing between the individual rows of detector positions. The field manager may modify this method, as needed, due to terrain anomalies, obstructions, or other complications.

If areas are encountered where it is impractical to utilize the carriage-mounted detector/GPS system (dense brush, trees, etc.), grids of survey stakes will be established at 10-m spacing to define 100 m^2 units that will be surveyed in serpentine scanning patterns with a similar measurement density of one 2-

second measurement for every square meter of the staked area. If anomalous readings are observed, then more detailed static surveys will be performed to define the anomaly.

Other radiation survey equipment that will be used at the CWM site includes beta/gamma detectors (Model 44-9, Ludlum, or equivalent) that will also be coupled to survey meters (Ludlum Models 3, 2221, or equivalent). The beta/gamma survey instruments will be used to scan workers and equipment for surface radioactive contamination before leaving the work areas of the site.

All instrumentation will have current calibration (within the past 12 months, or more frequently if recommended by the manufacturer). Daily field performance checks (i.e., background and source check) will be conducted in accordance with individual instrument use procedures. These performance checks will be performed prior to daily field activities and at any time, the instrument response appears questionable. Only data obtained using instruments that satisfy the performance requirements will be accepted for use in the evaluation.

The scanning results will be recorded in counts per minute (cpm). For the walkover surveys, a gross gamma sensor will be combined with a Global Positioning System (GPS) to record the coordinates of the individual gross gamma measurements.

Based on the configuration of the scanning equipment, the sensitivity of 2" x 2" gamma ray scintillation detectors for detecting Ra-226, Th-230, and U_{tot} is analyzed here to estimate their capabilities for finding these radionuclides. The minimum detectable concentrations and associated sensitivity parameters are estimated by the methods described in NRC 1998 and NRC 2000 using the following values for survey parameters:

- Background count rate: 10,000 c/m
- Detector elevation: 30.48 cm
- Detector scan velocity: 0.5 m/s
- Count interval: 2 s

The minimum detectable number of counts in a 2-second count interval is

$$b_i = (10{,}000\,\text{c/m}) * (2\text{s}) * (1\,\text{min}/60\text{s}) = 333\,\text{counts}. \tag{1}$$

The minimum detectable count rate (using d' = 1.38 for 95% true positives and 60% false positives) is

$$MDCR = (1.38) * (\sqrt{333}) * (60s/1\,\text{min})/2s = 756\,\text{c/m}. \tag{2}$$

The surveyor MDCR, assuming 50% efficiency in detecting hot spots, is

$$MDCR_{\text{surveyor}} = \frac{756\,\text{c/m}}{\sqrt{0.5}} = 1{,}069\,\text{c/m}. \tag{3}$$

The minimum detectable exposure rate for scanning (MDE_{scan}) with a 2" x 2" NaI scintillation detector is

$$MDE_{scan,i} = \frac{1{,}069\ \text{c/m}}{Efficiency_{2x2,i}} \quad , \tag{4}$$

where $Efficiency_{2x2,i}$ is the efficiency for detecting radionuclide set i with the 2" x 2" detector (cpm per μR/h).

The $Efficiency_{2x2,i}$ was obtained for each radionuclide set i as the weighted average of the energy-partitioned efficiencies for a 2" x 2" detector. The weighted averaging was performed as

$$Efficiency_{2x2,i} = \frac{\sum_j Eff_{i,j} G_{i,j}}{\sum_j G_{i,j}} \quad , \tag{5}$$

where $Eff_{i,j}$ is the efficiency (c/m per μR/h) for energy j as listed in Table 6.3 of NRC 1998 and G_j is the gamma ray intensity calculated by MicroShield (v. 5.01, Grove Engineering, Rockville, MD) for energy j.

The minimum detectable concentration for scanning (MDC_{scan}) is

$$MDC_{scan} = \frac{MDE_{scan,i}}{Gamma_i} \quad , \tag{6}$$

where $Gamma_i$ is the total modeled gamma radiation intensity from the reference hot spot as computed by MicroShield ($Gamma_i = \sum_j G_{i,j}$)

Separate MicroShield analyses were performed for the Ra-226, U-238, and Th-230 radionuclide sets to characterize their gamma radiation from cylindrical hot spots of 1 m^2 area and 15 cm depth. The analyses utilized unit activity concentrations (1 pCi/g) for the parent nuclide and its equilibrium decay products in the hot-spot volume, which was assumed to have a density of 1.6 g/cm^3. The activity concentrations of U-235 and its first two equilibrium decay products were defined as 0.046 pCi/g, corresponding to the isotopic abundance of U-235 in natural uranium. The following suites of radionuclides were included in the MicroShield analyses: Ra-226 (Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, and Po-210); U_{total} (Th-234, Pa-234m, and U-234 plus U-235, Th-231, and Pa-231); and Th-230 (analyzed with no decay products).

The calculated efficiency factors from Equation (5) were used in computing minimum gamma ray exposure rates using Equation (4). The resulting values were then used in Equation (6) for calculating values of MDC_{scan} for each radionuclide set. The results of these analyses are presented in Table 2-2. The MDC_{scan} for Ra-226 is less than half its 5 pCi/g criterion typically used for other site investigation plans, indicating that the proposed 0.5 m/s scan velocity with a 2" x 2" detector is very adequate to detect a 1 m^2 hot spot containing Ra-226. The MDC_{scan} value for U-238 is similarly about half of its 60 pCi/g criterion, again suggesting adequate detection of U_{total}.in 1 m^2 hot spots. Only the Th-230 MDC_{scan} value exceeds its riterion, indicating that the 0.5 m/s scan velocity would not detect a 1 m^2 hot spot if its only radioactive contaminant were Th-230. Again, the criteria values for Ra-226, U-238, and Th-230 above are assumed for purposes of confirming the detection sensitivities of the instrumentation and are not to be utilized as remedial decontamination criteria for the CWM Model City Facility.

Table 2-2 Calculated Values of Detector Efficiency, $MDE_{scan,i}$, and MDC_{scan}

Radionuclide	Ra-226 + dp	U_{total} + dp	Th-230 + dp
$Efficiency_{2x2,I}$	847 c/m per μR/h	3,879 c/m per μR/h	9,514 c/m per μR/h
$MDE_{scan,I}$	1.26 μR/h	0.276 μR/h	0.112 μR/h
MDC_{scan}	2.1 pCi/g	31.9 pCi/g	1,850 pCi/g

Although the gamma walkover survey will not detect Th-230 directly, Th-230 is frequently found in association with the other uranium-series contaminants. Therefore, the adequacy of detecting Ra-226 and U_{total} may also indicate the locations where Th-230 may be located. Since soil sampling will be performed on samples from the locations exceeding the investigation levels, and these analyses will give analytical data on Th-230, the extent of Th-230 contamination is expected to be reasonably characterized.

Confirmation procedures for the screening level count rate, after the data is accumulated and downloaded from the data loggers, includes verifying the average walking speed parameter of 0.5 m/s is maintained by the field technician while scanning; the positioning of the detector, whether in the cart or other apparatus is fixed at the beginning of the day and visually checked thereafter; and, the count interval of 2 seconds relates to the speed and "field of view" of the detector so that it covers an average area of 1 m^2 every 2 seconds. Additional procedures include performing daily field checks of the instruments to verify the instruments response. This is accomplished by using a radioactive source and obtaining a measurement on each detector/meter combination. Deviations should not exceed ±20%. Deviations greater than ± 20% will be investigated. If the unit is not performing properly, it will be replaced. Performing the daily source check validates the instrument performance. During field scanning activities, the instrument is checked several times to insure that it is at the proper height. This is needed to validate the calculation in Microshield that determines the exposure rate from a particular concentration of Ra-226. All data that is collected is reviewed routinely and data gathering parameters are assessed. Coverage maps are developed and reviewed to demonstrate 100 percent scanned area completion.

2.4 Gamma Walkover Survey Schedule

CWM initiated the Gamma Walkover Survey of this Plan in July 2005. CWM will complete the walkover survey phase of this Plan within one (1) year of NYSDEC and NYSDOH approval of the Plan.

3. REPORT OF GAMMA WALKOVER SURVEY FINDINGS

Each data file received from the gamma walkover survey will be processed, entered into a GIS, and analyzed. Reports from the data processing will be sent daily to the field operators to guide and improve their daily survey performance. Entry of each data set into the GIS will maintain the set identity and will occur as the files are accumulated. Analysis of the combined data will occur on completed portions of the site and will be compared to the site Investigation Level.

The data processing step includes four sub-steps: (a) differential corrections (as needed); (b) export of tabular positions, count rates, and descriptors; (c) data cleanup; and (d) analysis for the field report. Differential corrections utilize Pathfinder software (Trimble, v 2.9 or equivalent) to refine GPS position data (Easting and Northing) using web-based reference data. The need for differential corrections depends on the frequency and accuracy of the real-time radio-beacon corrections during the walkover survey. The corrected position data are exported, with the measured count rates, measurement times, and other identifiers into spreadsheets (Excel, Access, or equivalent). Data cleanup primarily involves parsing count rates from their unit identifier. If two detectors share a common GPS antenna, the actual locations of each detector are computed from the antenna position and the relative detector offsets. Analyses for field reports summarize each data file for total area covered, average scan velocity, coverage gaps, and count rate distribution statistics.

Merging individual data files into the overall CWM site GIS database is accomplished by simply importing the individual files. The analyses of the combined GIS data will operate on each investigation unit to compare its mean count rate with the Investigation Level; to demonstrate adequate coverage of survey points over the unit; and to determine the distribution of any individual elevated measurements to identify the location and extents of potential hot spots. Individual elevated measurements above the Investigation Level will be further investigated. The investigation may include, but is not limited to, re-evaluating the data files, re-surveying the area, verifying calibration of survey equipment, investigating historical use of area, and evaluating surface media to see if the elevated measurements are confirmed.

Posting plots of gamma-ray intensities at each measurement location will be generated over maps that show measurement locations, gamma ray intensity, and survey-unit boundaries. Separate posting plots will be generated for each of the 912 survey units. A key map will also be developed to identify the location of each survey unit at the CWM site.

Static background readings will be made with each survey instrument at least daily, in triplicate, in connection with equipment performance checks. The reference background location used for these readings will be kept constant so that any temporal trends that are noted can be reasonably interpreted. Instrument performance will also be monitored at the reference background location at the same frequency using check sources. Instruments whose net readings with the check-source fall outside a ±

20% range from the reference value or with low-battery or other service indicators will be removed from service until they are brought back into satisfactory performance condition.

Survey procedures and results will be documented in a report, following the general guidance in the MARSSIM. The Survey Report will at a minimum, contain the following information:

- Survey maps (Figure 2) that show the gross gamma walkover scan data;
- Summary statistics for surface walkover scan data;
- Field instrument daily performance data;
- Results of daily background measurements from various non-impacted areas (e.g., pavement, gravel, grass); and
- An interpretation of the survey data;

3.1 Reporting Schedule

Development of the report has been initiated by CWM and will continue throughout the survey field activity. CWM will complete and forward to the NYSDEC and NYSDOH a detailed report, as described above, of the Gamma Walkover Survey no later four (4) months upon completing the site walkover activities.

4. DETAILED INVESTIGATIONS AND SOIL SAMPLING

Any individual reading that exceeds the 16,000 cpm gross count rate investigation level or other agreed upon media specific investigation level(s) will be further investigated and considered for soil sampling utilizing the Sitewide Radiological Investigation Soil Sampling Plan. The first level of detailed investigation for the units failing the investigation level will be further computer analyses and data file review for the walkover survey data to determine the likelihood that anomalous data or localized hot spots are dominating the area for the investigation unit. Additionally, a review of field notes and daily equipment calibration sheets will be made to determine if any factors were present which would effect the accuracy of the survey data. A review of the historical usage of the area will be made, if known, to determine if any specific past practices could affect the survey data. The second level of detailed investigation will be to re-survey the elevated areas to confirm the previous elevated measurements. In addition, the surface media will be evaluated to identify obvious items, i.e, slag, that may be the cause for the elevated measurement. If a reading above the investigation level is confirmed, the final level of investigation will be the implementation of the Sitewide Radiological Investigation Soil Sampling Plan. This plan includes the following procedures to further characterize and define the nature and extent of the elevated levels:

- Detailed delineation of elevated areas;
- Soil sampling procedures for an isolated location and for a general area of elevated activity;
- Sampling identification, chain of custody, and sample handling procedures;
- Data quality objectives;
- Analytical procedures;
- Data review; and,
- Data Assessment.

Investigation survey locations/units exceeding the investigation limit will be marked by stakes and/or paint in the field. If there is a potential for employee exposure in the areas identified as needing further investigation, access to the area will be restricted.

4.1 Soil Sampling Schedule

CWM will complete the soil sampling activities and submit a report with the results no later than 18 months after the NYSDEC and NYSDOH have approved of the Site Radiological Survey and Sitewide Radiological Investigation Soil Sampling Plans.

5. BUILDING SURVEYS

As required by condition J.1.b of Module II (Corrective Action) of CWM's Sitewide 6 NYCRR Part 373 Permit, an interior survey will be performed on all "legacy" buildings currently used by CWM personnel. The term "legacy" building includes all buildings that were utilized by the federal government during the 1940's and LOOW activities. The legacy buildings found at CWM include:

Building Name	Location
PCB Warehouse	East of SLF 11
Building South of PCB Warehouse	East of SLF 11
Laboratory/Maintenance Shop	East of AWTS, North of "M" Street
Transformer Operations Building	South of Closed Lagoons
Maintenance/Utility Building	South of Closed Lagoons
Main Compressor Building Area (2 rooms)	South of Closed Lagoons

Prior to use, legacy buildings not currently being used by CWM will be surveyed using the same procedures as outlined below.

The interior building surveys will be performed using the following procedures and equipment:

A. Each of the buildings interiors will be cleaned with a vacuum equipped with a HEPA filter in order to collect dirt and dust particulates. Specifically, the floor and the walls, up to six feet high, will be vacuumed.

B. One sample of the dirt/dust collect from the vacuuming effort will be collected from each building and analyzed for the radionuclides as those listed in Section 5 of the Sitewide Radiological Investigation Soil Sampling Plan.

C. Survey methods will use either the carriage method or by manually walking the areas in a manner similar to the performance of the Gamma Walkover Survey except that no Global Positioning System (GPS) equipment will be used since satellite signal is not likely to be present in the buildings. Buildings will be cleared by CWM of obstacles that would prevent detecting radiation and sampling of surface radioactivity. Major grids will be marked in ten (10) meter increments and one-meter grid divisions except when the building dimension is smaller and only the one-meter grids will be used. The grids will be used by field survey crew to ensure survey coverage. The building floors will be surveyed, except where physical restrictions prevent, using a Ludlum Floor Monitoring System, Model 239-1F with 43-37 probe ($425cm^2$). The walls, up to six feet, and floors that cannot be surveyed with the floor monitor will be surveyed with the same technology using a smaller ($100cm^2$) probe (Model 43-68). Areas that indicate elevated radiation levels will be marked for follow up measurements. Follow-up measurements will be made using the Ludlum-2360 with the Model 43-68 100cm^2-detector in a static one-minute count mode.

D. After the survey is completed, a field technician will obtain a minimum of two surface wipes (per building), approximately 100 cm^2 each, where either elevated levels were detected or the potential of radiological contamination could exist. The purpose of the wipes will be to distinguish between surface contamination or fixed contamination. The wipes will be tested on-site utilizing a Ludlum Model 2929 Dual Channel Scaler (or equivalent) to obtain a quantitative measurement of alpha/beta/gamma radiation levels.

E. For the PCB Warehouse where previously elevated levels of radiation have been detected, 5 concrete floor core samples located adjacent to building roof column supports, or other locations as determined from the survey, will be obtained and analyzed for the radionuclides as those listed in Section 5 of the Sitewide Radiological Investigation Soil Sampling Plan.

F. The sample collector will enter the grid reference points, date of sampling, sampler initials and other pertinent information on the appropriate forms and on the sample container/envelope. The container will be marked with black pen or use pre-prepared labels. The sample collector is responsible for maintaining custody of all samples. If requested, tamper proof seals will be placed on the sample container prior to shipment to the laboratory. In lieu of a sample label, the information may be placed on the sample envelope provided only one envelope is used per swipe. The envelope will be prepared with the surveyor name, date and unique identifier prior to placing the swipe in the envelope. Evidence of tampering and/or deviations must be explained in the remarks section of the chain of custody form. If a sample's integrity is questioned, a "Non-conformance Report" will be initiated and resolved, or that sample's result may not be used.

G. The data and analytical results from the building vacuuming, survey, surface wipe samples, and concrete core samples will be tabulated and reviewed by CWM's Health Physicist in order to determine potential radiation exposure to CWM and facility employees. If elevated levels are found, and there is a potential for employee exposure in the building areas identified as needing further investigation, access to the area may be restricted. Remediation or administrative controls to minimize occupational radiation exposure will be considered if any measurements exceed the criteria as determined by the Health Physicist.

In addition to the interior surveys, all facility buildings (except for wooden sheds or trailers mounted above grade) will be tested for radon gas levels. A detailed list of the buildings is included in Appendix 1. The radon test protocol, as prepared by URS Corporation, is also included in Appendix 1. The protocol includes information as to the types of buildings, proposed monitoring device, description on how they work, a brief discussion on how and where the monitors are placed in a building, how many monitors per building, testing duration, effective area of the canisters, how the canisters are tested, and review of data collected. The testing protocol is based upon the New York State Education Department and Department of Health Guidance for Radon Measurement in Schools and Large Buildings (November 2003).

5.1 Building Survey and Sampling Schedule

CWM will initiate Building Survey and Sampling activities upon approval of this Plan. CWM will complete the Building Survey and Sampling activities, with supporting documentation and report, within one (1) year of NYSDEC and NYSDOH approval of the Plan. The testing for radon gas within the CWM buildings was initiated in October 2005. CWM anticipates that completion of this testing and submittal of test results to the NYSDEC and NYSDOH will be accomplished within two (2) months upon approval of this Plan.

6. SPECIAL INTEREST AREAS

CWM has identified several areas at the Model City Facility as "Special Interest Areas." The term "Special Interest Area" means that these areas have characteristics that differ from most of the general facility with respect to knowledge of the property or physical attributes. The following list of areas have been identified as "Special Interest Areas" by CWM and includes the type of radiological survey to be performed. Several of the areas listed below will not be surveyed due to lack of access or are outside the scope of this radiological survey plan. Refer to Figure 4 for the location of the "Special Interest Areas."

- Vicinity Property B
  - PCB Warehouse – This building was classified as a Special Attention Area based upon its historical use and preliminary data obtain by CWM (above background readings found in concrete grout). This building is listed as one of the legacy buildings at the Facility and will be surveyed in accordance with the procedures outline in Section 5 of this plan.
- Vicinity Property E
  - Lagoon 6 Berm – This area was excluded from the DOE decontamination certification because it could not be properly assessed due to inaccessibility and the DOE could not confirm that contamination did not exist in these areas. A gamma walkover survey will be performed over the cap of this impoundment, which was closed and capped as a landfill, in accordance with the procedures outlined in Section 2 of this plan.
- Vicinity Property E'
  - Area of former PCB storage tanks (T-64, T-65) - – This property was excluded from the DOE decontamination certification because the area could not be properly assessed due to inaccessibility and the DOE could not confirm that contamination did not exist in the area beneath the tanks. CWM will not be performing a gamma walkover survey of this area since above background readings were identified by USACOE and that the area is currently covered by an high density polyethylene liner which prevents precipitation from contacting the underlying soils.
- Vicinity Property G
  - Area of Facultative Pond 1 and 2 (Southeast corner) - This area was excluded from the DOE decontamination certification because it could not be properly assessed due to inaccessibility and the DOE could not confirm that contamination did not exist under the pond and its berms in these areas. CWM will not be performing a gamma walkover survey of the pond since it is still currently used as a treatment storage pond. The pond

berms, that can be accessed safely, will be surveyed in accordance with the procedures outlined in Section 2 of this plan. As a note, the Fac Pond 1 and 2 pond water is transferred to Fac Pond 3, sampled and tested (including radiological analysis) and qualified prior to discharging to the Niagara River.

  - University of Rochester Burial Area – This area has been researched and investigated over the past several years by the USACOE. CWM will be performing additional surveys in the accessible areas of University of Rochester Burial Area, but it will be limited to due to the existing brush and dense vegetation.

- Vicinity Property H'

  - CMSA Pad - This area has been surveyed by the USACOE. CWM will not be performing any additional surveys of this area since information and data can be obtained from the USACOE and that the area is beyond the scope of this plan's investigation.

- Central Drainage Ditch – CWM will not be performing any surveys of this area since the area is beyond the scope of this plan's investigation.

- Area southwest corner of site potentially may be influenced by gamma radiation originating from the Niagara Falls Storage Site Interim Storage Cell. This will be determined during the survey (not shown in Figure 4). CWM will attempt a gamma walkover survey of this area in accordance with the procedures outlined in Section 2 of this plan.

In addition to the radiological survey, these areas may require special procedures to assess possible MED contamination in excess of survey limits. These procedures will be developed prior to disturbance of these areas.

In addition, Figure 1 delineates the areas of the Facility in which CWM can perform the gamma walkover survey while still obtaining a GPS signal and reliable radiological measurements. Also, the figure identifies areas which are inaccessible and partially accessible. Inaccessible areas have characteristics where there is dense vegetation, thick brush, trees, steep slopes, and ponds. Accurate radiological survey data and GPS coordinates cannot be obtained in these areas. Partially accessible areas are areas in which at least 10% of the area can be surveyed while still obtaining reliable data. CWM will scan partially accessible areas to the extent that, accurate location and radiological survey data can be obtained; that the safety of the workers is not compromised; and there is no potential for equipment damage. For areas that cannot be scanned at this time, CWM will perform a gamma walkover survey prior to future use. Additional permits, clearing and grubbing, and modified scanning techniques, equipment and procedures will be necessary to perform surveying in the currently inaccessible areas.

7. CONTRACTOR QUALIFICATIONS

The contractor selected to implement the Site Radiological Survey Plan is URS. URS has a radiological group based in their Buffalo office. The Project Manager for the detailed investigation phase is B. Scott Davidson, CHP,CSP. Mr. Davidson has an MS in Radiological Health from Rutgers University. He has 31 years of experience in radiological and environmental management. His most recent assignments include Radiation Safety Officer and Site Safety and Health Officer at a USACE FUSRAP site in Western Pennsylvania (the site had been used for the disposal of uranium wastes) and Nuclear Engineer/Health Physicist an the Plum Brook Reactor Facility Decommissioning Project. The Team Leader for the initial sitewide walkover/data collection is Eric Olson. Mr. Olson has a BS in Civil Engineering and is a certified Radiation Worker. His most recent projects include Team Leader for health physics support and remediation verification for the remediation of uranium and thorium contaminated soils in Hicksville, NY and Radiological/Project Engineer for remediation of radiologically contaminated buildings and equipment at Bettis Laboratory. Additional support is provided by Dr. Kirk Nelson from URS' Salt Lake City office. Resumes for Mr. Davidson, Mr. Olson, Dr. Nelson as well as for four of the field technicians performing the site walk over and data collection (Jeff Day, Amy Jones, Mark Passiute and Tom Urban) are included in Appendix 2.

8. HEALTH AND SAFETY

Site specific contractor safety training is provided by CWM for the URS workers. The workers will be expected to comply with CWM's safety rules. For performing the site walkover, Level D safety equipment is required (hard hat, safety glasses, high visibility safety vests, long sleeved shirts and sturdy shoes with ankle support). Safety hazards associated with performing the sitewide survey include slips, trips and falls, heat exhaustion and biological hazards (insects, snakes, animals). Due to the past history of the site, there is also the potential for radiation exposure. During any soil disturbance activities associated with this plan, the URS Safety Officer may elect to increase the level of PPE or stop work if on-site monitoring indicates levels of concern. The details of this determination are included in the project Health and Safety Plan (Appendix 3).

REFERENCES

ANSI 1999 — American National Standards Institute, Inc. *Surface and Volume Radioactivity Standards for Clearance.* ANSI/HPS N13.12-1999. August 1999.

DOD 2000 — U. S. Department of Defense et al.. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1.* NUREG-1575, EPA 402-R-97-016. August 2000.

EPA 2000 — U. S. Environmental Protection Agency. *Guidance For the Data Quality Objectives Process.* EPA QA/G-4, EPA/600/R-96/055. August 2000.

NRC 1998 — U. S. Nuclear Regulatory Commission. *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions.* NUREG-1507. June 1998.

NYSDEC 2003 — New York State Department of Environmental Conservation, Division of Solid & Hazardous Materials Bureau of Radiation. *Review Plan for Class 2 Final Status Survey Units at the Linde FUSRAP Site, Rev. 0.* January 2003.

Shaw 2004 — Shaw Environmental, Inc. *Summary Report: Historical Radiological Assessment, Niagara Falls Storage Site, Vicinity Properties E, E', and G.* July 2004.

NRC 2000 — U.S. Nuclear Regulatory Commission et.al., *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) Revision 1, *NUREG-1575*, August 2000.

New York State Education Department and Department of Health Guidance for Radon Measurement in Schools and Large Buildings, November 2003.

SITE RADIOLOGICAL SURVEY PLAN FIGURES

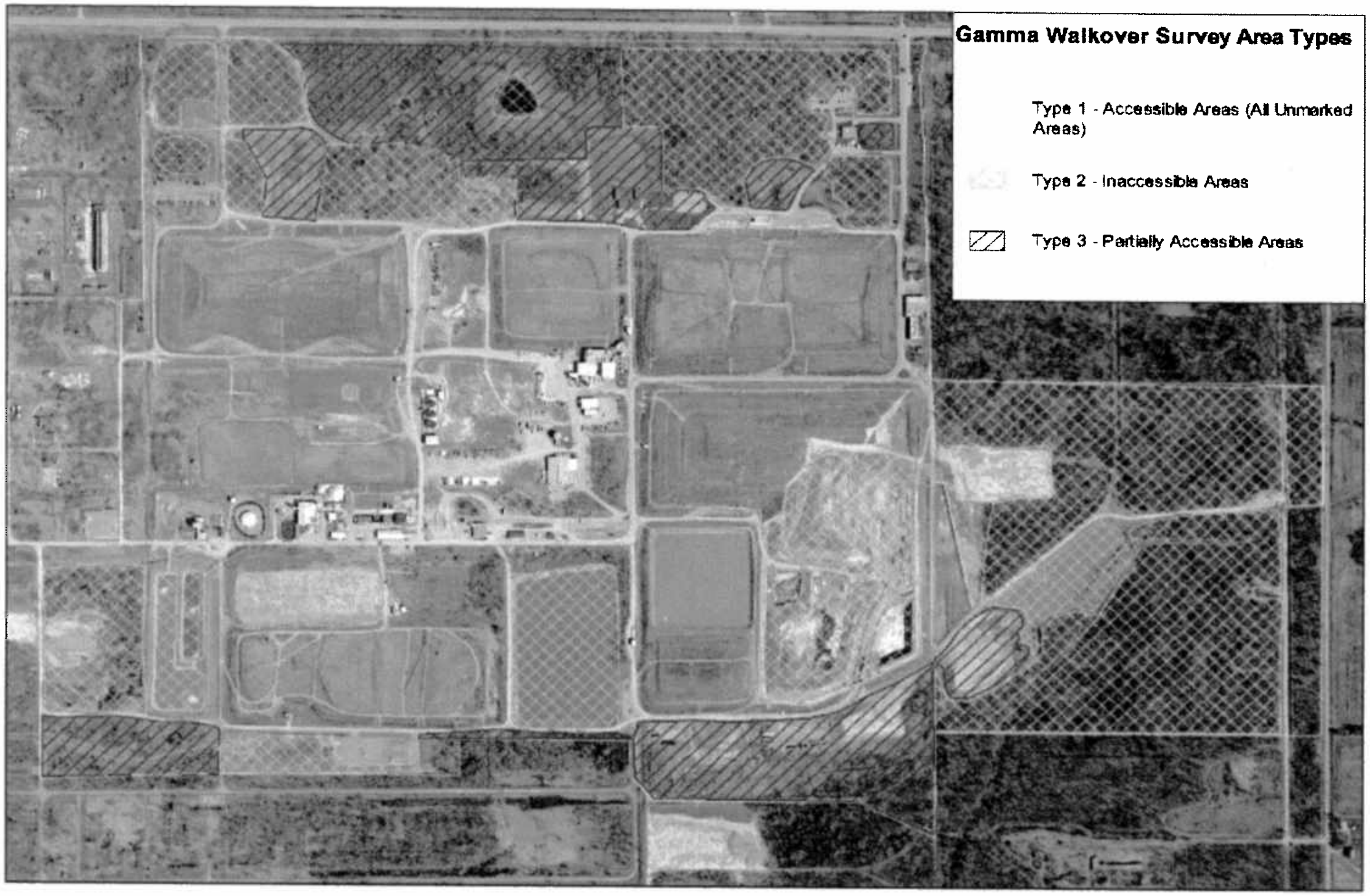


Figure 1 - Site Aerial and Survey Boundary

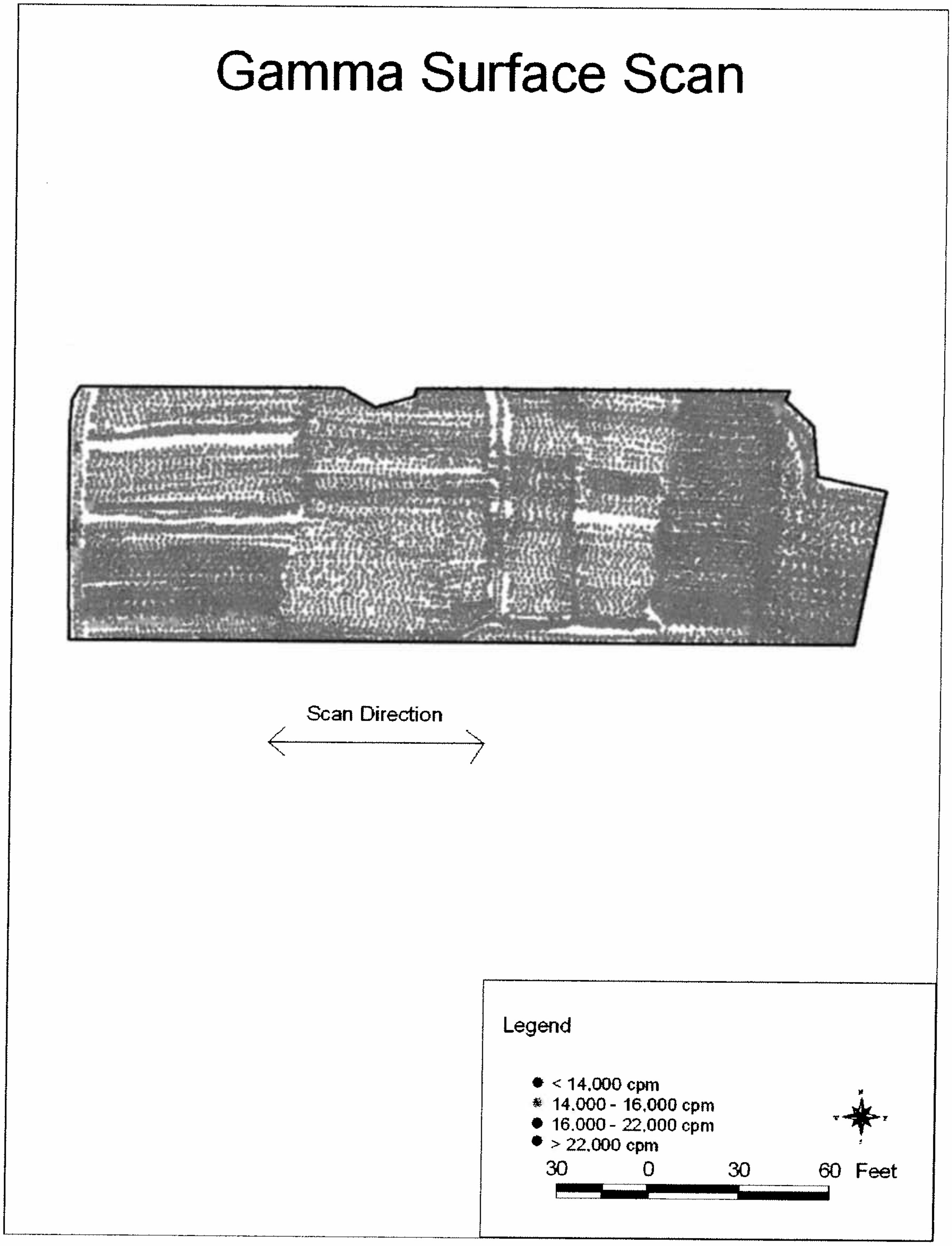


Figure 2 - Example of GPS Logged Gamma Walkover

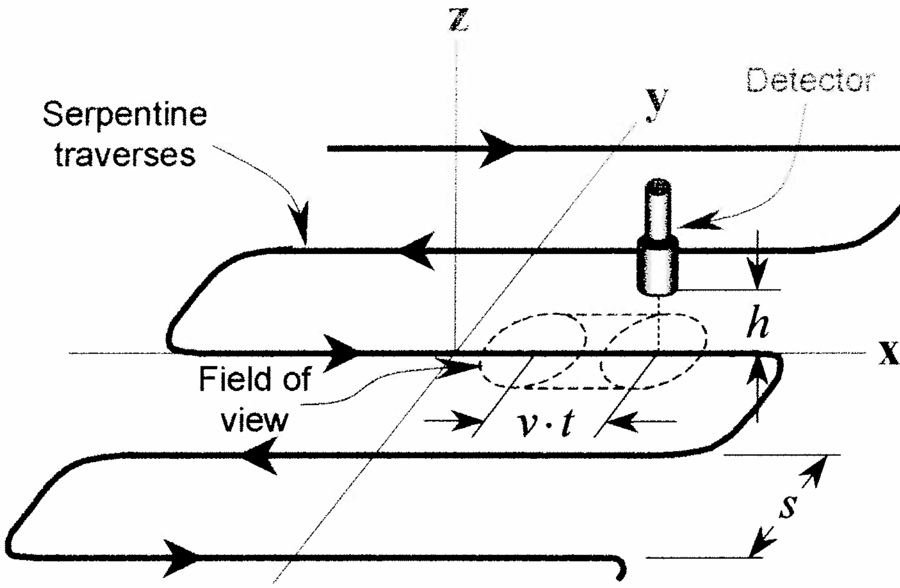


Figure 3. Serpentine Survey Traverse Pattern for Providing 100% Coverage.

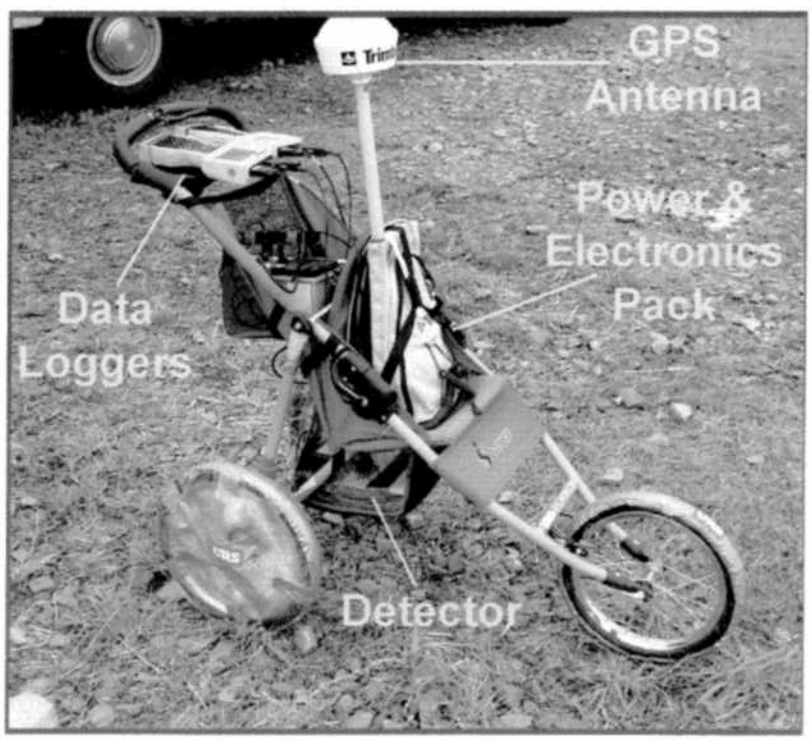


FIGURE 4 – SPECIAL INTEREST AREAS

APPENDIX 1

RADON TESTING DETAILS

URS-39400093.20201

Facility Radon Testing Plan for CWM Buildings in Model City, NY

prepared for

CWM Chemical Services, LLC
Model City, NY

CWM Site Engineer: Steve Rydzyk

September 21, 2005

by

URS Corporation
756 East Winchester Street
Salt Lake City, UT 84107

Table of Contents

1. Introduction

This report presents a Facility Radon Testing Plan to characterize indoor radon (Rn-222) levels in buildings at the CWM Chemical Services, LLC (CWM) facility in Model City, New York. The report summarizes properties of individual buildings to be tested, including their occupancy, uses, size, and the numbers and types of radon samples required to characterize their indoor radon levels.

1.1 Background and Purpose

The CWM Site, located at 1550 Balmer Road in Model City, NY, lies on the boundary between the towns of Lewiston and Porter in Niagara County in Western New York. The site contains the Model City Treatment, Storage, and Disposal Facility (TSDF), which is permitted (EPA ID No. NYD049836679) for liquid, solid, and semi-solid organic and inorganic hazardous waste and industrial non-hazardous waste. The TSDF includes an aqueous wastewater treatment system and facilities for waste stabilization, secure landfilling, and storage and disposal of wastes under the Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA). The TSDF operations date back to 1971.

Before commercial TSDF operations, the Site was owned by the U.S. Government (early 1940s through the mid 1960s). The Site constituted part of the Lake Ontario Ordinance Works, which conducted explosives/propellant research, detonation of explosives, and research and waste storage related to the Manhattan Project. Although extensive remedial actions at the site have since removed residual radiological contaminants from the previous U.S. Government activities, CWM has agreed to conduct additional radiological characterization of the site to assure protection of human health and the environment.

The state permit under which CWM operates its Model City facility requires that CWM conduct a Building Interior Survey to investigate radon levels inside all facility buildings [Part 373 Permit, Module II – Corrective Action Requirements, (J)(1)(b)]. This report constitutes the Facility Radon Testing Plan to fulfill the radon investigation requirements of the Building Interior Survey.

1.2 Technical Approach and Scope

This Facility Radon Testing Plan evaluates current radon measurement technologies to select the radon testing duration and method that are best suited to determining the radon levels in CWM buildings. Technical guidance is also reviewed for selecting the optimal sampler placement, density, and sensitivity. The buildings at the CWM Site are then identified and characterized for selecting those that should be tested for indoor radon levels. The last section of the Plan proposes the radon sampler configuration, placement methods and locations, retrieval, and data analysis.

The technical approach proposed in this Facility Radon Testing Plan is consistent with U.S. Environmental Protection Agency (EPA) guidance for indoor radon characterization,[1,2] including that aimed at schools and other large buildings,[3,4] and with EPA measurement device protocols.[5] It is also based on general[6] and specific[7] guidance from the New York State Department of Health (DOH), which recommended the sampling density and indicated that the radon tests need not be performed on garden-storage-type sheds or office trailers on blocks.

2. Radon Measurement Methods

Technical guidance from EPA and other agencies helps define the best sampling duration, radon measurement method, sampling locations, sampling density, and sensitivity requirements. This section summarizes the guidance and recommends the best radon testing parameters for the CWM Site.

2.1 Radon Sampling Time and Duration

The time period over which radon should be sampled depends on the purpose of the sampling. Indoor radon levels vary naturally from, hour to hour, day to day, and season to season, depending on the succession of changes in building ventilation, weather, and other factors. For diagnosing radon responses to heating, ventilating, and air conditioning (HVAC) cycles, grab samples or continuous radon monitors are best because they can detect radon variations on the same time scale as the HVAC cycles. For rapidly screening building radon levels for a real estate transaction, 2- to 4-day charcoal canister samplers, short-term electrets, or similar integrating devices are often best because they average over diurnal, HVAC, and occupancy cycles but give a rapid enough result for decisions about a sale. For determining low-level radon risks or the need for building remediation, long-term tests are best because they average over cycles in building operations, weather, and possibly seasons.

Radon is generally measured in units of its concentration in air (pico-Curies of radon per Liter of air, or pCi/L), or less-commonly by the concentration of its decay products (working levels, or WL). The threshold for recommending remedial actions to reduce indoor radon levels is 4 pCi/L, averaged over a one-year period,[1-2] and the same threshold is applied to schools and other large buildings.[3-4] Short-term follow-up testing is recommended by EPA for homes over 8 pCi/L to reduce health risks to occupants.[1] Without administrative or risk-related urgency, however, EPA recommends long-term (annual-average) testing because it demonstrates more accurately whether a home is above or below the 4 pCi/L threshold, particularly if it is close (i.e., 4.1 pCi/L vs. 3.9 pCi/L).

Radon testing at the CWM Site is recommended to occur over an approximate 4-month period beginning in October, 2005. This recommendation is based on the lack of any evidence of risk-related urgency for completing the tests, the precision and accuracy advantages of averaging over a relatively long period, and the worst-case nature of testing during the winter months in New York. Indoor radon levels are expected to be highest during the winter because of reduced ventilation through windows and other sources of outdoor air. Outdoor radon levels are normally about 0.4 pCi/L, compared to average US indoor levels of about 1.3 pCi/L.[1]

The recommended 4-month period may be shortened or extended for the convenience of CWM Site operations. Longer sampling periods, up to a year, are more representative of the annual-average conditions in CWM buildings; however they could expose the samplers to greater risk of loss or damage. Shorter sampling periods, as little as 3 months, are still conservative in representing mostly winter months; however, they are slightly less representative of an annual cycle. Sampling intervals of 3 months or less are deemed short-term by EPA, and are subject to closed-building sampling conditions,[1] which could potentially constrain building operations. Furthermore, short-term tests have a higher probability of requiring follow-up testing to determine whether the annual-average level is actually above or below the 4 pCi/L threshold.

2.2 Radon Test Method

The alpha track method was selected for measuring the indoor radon levels at the CWM Site. It was selected from the 15 different radon measurement methods recognized by EPA[5] based on its capability for long-term integrated measurements, its minimal interference by radiation from other (non-radon) sources, and its robustness in the industrial environment.

The 15 radon test methods recognized by EPA include four grab-sampling methods (GS, GC, GB, and GW) that are limited to very-short-term sampling; two continuous methods (CR and CW) that focus on repetitive measurements over minute- to hour-time scales; five sampling methods (ES, AC, LS, SC, and PB) that are limited to short-term sampling periods up to several days; and one method (RP) that integrates over longer time periods but is more costly than passive long-term sampling methods. The remaining three methods AT, UT, and EL were considered in greater detail because they potentially offer cost-competitive, long-term integrated radon measurements.

The Alpha Track (AT) method uses a piece of plastic or film in a small container to register alpha-particle damage tracks from radon and its decay products. The container entrance is covered by a filter to reject entry of outside radon decay products and other alpha emitters. At the end of testing, the container is re-sealed for return to the laboratory for analysis. Analysis consists of etching the plastic or film detector to enhance the damage tracks and then counting the tracks in a pre-determined area using a microscope or optical reader. The radon concentration is calculated from the number of tracks per unit area using empirical calibrations. Typical exposure times are 3 to 12 months.

Unfiltered Track detectors (UT) use a similar plastic or film to register alpha particle damage tracks, but the UT detectors lack the entrance filter to remove external radon decay products and other alpha emitters. While processed and calibrated similarly to AT detectors, the UT detectors have a greater dependence on the equilibrium ratio between radon concentrations and decay-product concentrations. EPA currently recommends that UT detectors not be used when equilibrium fractions are less than 0.35 or greater than 0.60 unless calibration factors are specially adjusted. Because of the unknown equilibrium states in the industrial settings of the CWM Site, the use of UT detectors was rejected.

Long-term electret ion chambers (EL) utilize an electrostatically-charged disk detector (electret) situated in a small container (ion chamber). During the measurement period, radon diffuses through a filter-covered opening in the chamber and causes, along with its decay products, a decreased voltage charge on the electret. A calibration factor relates the measured voltage drop to the radon concentration. Specially-designed electrets are suitable for long-term measurements over 1- to 12-month periods.

URS's experience suggests that electret samplers are less robust for an industrial environment such as the CWM Site than alpha track detectors because of the sensitivity of electrets to other types of radiation (beta and gamma) that could potentially occur unpredictably at the CWM Site from variations in natural background and from proximity to materials with slightly-elevated levels of naturally-occurring radioactive materials. The Alpha Track detectors are therefore recommended as the method of choice for the CWM Site radon testing.

2.3 Radon Sampling Density

Radon samplers will be deployed at an approximate density of one sampler for every 2,000 square feet of area in each building. This density corresponds to that recommended by the New York Department of Health for schools and other large buildings,[6] and was applied to each building to determine its minimum number of samplers. A minimum of one sampler was applied to small buildings with less than 2,000 square feet.

The sampling density criteria are applied to all CWM Site buildings, even including those that are not frequently occupied. Although sampling of seldom-occupied buildings exceeds the New York guidance for schools,[6] it is consistent with CWM's Part 573 New York Permit, which requires radon testing of all site buildings. The only buildings excluded from radon testing are those such as garden storage sheds or office trailers that have no foundations but are set on concrete blocks or similar supports. The New York Department of Health has concurred with this exclusion.[7]

2.4 Location of Radon Samplers

General guidance for selecting locations to deploy any kind of radon sampler in any type of building is given by both New York DOH[6] and EPA.[5] Their guidance is generally consistent. New York DOH indicates that testing should include all frequently occupied spaces that are in contact with the ground or directly above crawl spaces or unoccupied basements. Based on the occupancy consideration, the samplers allocated for a building should be placed in the most commonly-occupied area(s) if the building has multiple work areas.

The following location criteria are summarized from the EPA and New York DOH guidance, which seeks to locate the samplers in the breathing zone of a residential environment:

Location Guidelines for Radon Samplers

- Near the interior of the room (at least 1 foot from walls)
- Between 2 feet and 8 feet above the floor
- Away from drafts (HVAC vents, doors, windows)

Figure 1. Location Guidelines for Radon Samplers.

Additional criteria, such as avoiding heat sources, water sources, direct sunlight, and high humidity, are aimed at charcoal canister samplers whose efficiency changes with temperature and humidity. They are not included above because temperature and humidity changes are relatively unimportant for alpha track detectors.

The deployment location should provide adequate space for undisturbed hosting of the sampler throughout the sampling interval. They may be placed on file cabinets, exposed shelves, or similar surfaces, but should not become covered by papers or other objects that could hinder the diffusion of radon to the sampler entrance. They may also be suspended by a durable string tied to an overlying support. They are sufficiently robust that small bumps will not affect their performance.

The above location guidelines are adapted to the CWM Site to accomplish the sampling objective: to obtain radon measurements that are representative of the occupants' breathing zone. For example, vented laboratory hoods and associated air inlets will also be avoided as though they were HVAC vents. In a few buildings that are highly ventilated by outdoor air for temperature or other engineering controls, avoiding ventilation drafts is neither possible nor necessary unless they also contain less-ventilated areas that are also occupied. Other adaptations may also be made as required to implement the radon testing plan.

Exceptions to the above guidelines will be noted at the time of sampler deployment and/or collection for inclusion in the radon measurement report.

Experience has shown that long-term radon samplers are least-disturbed when accompanied with an explanatory note about their purpose and retrieval time frame. The alpha track detectors will be deployed with an accompanying, visible notice that is designed to not cover any sampler openings. The text of the notice will be similar to the following example (Figure 2).

Long-Term Radon Sampler This sampler measures radon, as required by CWM's Part 373 New York Permit. Please do not disturb it. It will be retrieved by approximately February, 2006. Contact Stephen Rydzyk (754-0325) regarding removal, obstruction, alteration, damage, or misuse.

Figure 2. Explanatory Label to be Attached to Radon Samplers.

2.5 Radon Sampler Analysis and Sensitivity

The alpha track radon samplers will be retrieved and returned for laboratory analysis according to the supplier's directions. The samplers will be deployed for sufficient time and analyzed over sufficient area that they are capable of detecting radon concentrations at least as low as 0.4 pCi/L, which is the approximate outdoor radon concentration quoted by EPA.[1] The specification quoted by Landauer Inc. for their standard sensitivity alpha track radon sampler is 30 pCi/L days based on a 90-day exposure. This corresponds to a detection limit of approximately 0.33 pCi/L, or for a 120-day exposure, approximately 0.25 pCi/L.

3. CWM Building Characterization

All buildings at the CWM Site were identified by the CWM Site engineer, who also provided information on the building sizes and foundation/construction categories. The list of buildings was analyzed and used to select the radon sampling density for each building.

Table 1 lists the buildings in which radon testing will be performed. The list does not include garden storage sheds or office trailers that have no foundations but are set on concrete blocks or similar supports because they do not require radon sampling.[7]

As suggested by New York guidance for indoor air sampling,[8] a pre-sampling characterization inspection was performed for each building in Tables 1 and 2. The inspection was intended to identify features or conditions that could affect or interfere with radon testing. It was performed on September 13-14, 2005 by Stephen Rydzyk (CWM Site Engineer, Model City, NY), Bryan Pell (URS Corporation, Buffalo, NY), and Kirk Nielson (URS Corporation, Salt Lake City, UT).

Mr. Rydzyk, who had previously generated the list of buildings, areas, and foundation properties, took the URS staff to each building, explained its operations, and estimated its typical occupancy rate. Mr. Pell checked the exterior and interior gamma radiation levels for each building using a gamma radiation MicroR Meter (Model 12S, Ludlum Measurements, Inc., Sweetwater, TX). The calibration sheet for the meter is shown in Appendix A. The presence or absence of significant indoor radon sources was estimated from any potential excess of indoor gamma radiation compared to exterior background radiation. Dr. Nielson visually assessed the building leakage potential from cracks and openings, and took photographs of prospective locations for deploying the radon samplers.

In addition to the building identity, Table 1 lists estimates by the CWM Site engineer of the building size (square feet), foundation level (above grade or below grade), floor level (above grade or below grade) and material (wood or concrete), and crawl space (yes or no). The other columns in Table 1 list information determined for the buildings during the pre-sampling inspection, as described in the next section.

Table 1. CWM Site Buildings, Properties, and Sample Locations.

Bld	Building Name	Area[a]	Fnd.[b]	Floor[c]		CS[d]	Src[e]	Vnt[f]	Occ[g]	OG[h]	IG[i]	Smp[j]	Samp. Loc.[k]
1	Guardhouse	150	BG	AG	Conc	N	N	L	2	2	4.5	1	shelf by phone
2	Scalehouse	720	BG	AG	Wood	Y	N	T	1	5	5	2	over cabinets
4	Administration Building	11,760	BG	AG	Wood	Y	N	T	30	2	2	3	NE Cabinets
4	Administration Building	11,760	BG	AG	Wood	Y	N	T	30	2	2	4	NW Cabinets
4	Administration Building	11,760	BG	AG	Wood	Y	N	T	30	2	2	5	Lunch Rm
4	Administration Building	11,760	BG	AG	Wood	Y	N	T	30	2	2	6	SE Conf Rm
4	Administration Building	11,760	BG	AG	Wood	Y	N	T	30	2	2	7	SW Conf Rm
4	Administration Building	11,760	BG	AG	Wood	Y	N	T	30	2	2	8	Velma Office
5	SLF 7/11 Leachate Collection Building	550	BG	BG	Conc	N	N	M	0	4	2	9	tank support post
6	SLF 7 Lift Station Building	170	BG	BG	Conc	N	N	M	0	4	4	10	on control box
7	SLF 10 Leachate Collection Building	550	BG	BG	Conc	N	N	M	0	3	3	11	tank support post
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	12	SW ramp wall
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	13	S Rm SE Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	14	S Rm 3rd E Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	15	W end N Rm Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	16	N Rm Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	17	N Rm 2nd E Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	30	18	N Rm 2nd N Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	19	Office wall
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	20	S Rm W 1 Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	21	S Rm W 2 Pillar
8	PCB Warehouse	22,500	BG	AG	Conc	N	U	L	0.2	5	5	22	N Entr Rm W end
9	GWES South of PCB Warehouse	225	BG	AG	Conc	N	N	T	0	3	3	23	On control box
12	Old Scalehouse Building	900	BG	AG	Conc	N	N	T	0	2	3	24	File cabinet
13	Transportation Garage	4,200	BG	AG	Conc	N	N	L	0	3	3	25	by Drill Press
14	Old Truckwash Building	1,120	BG	AG	Conc	N	N	L	0	3	3	26	Light on left
15	Emergency Response Garage/Safety Room	2,460	BG	AG	Conc	N	N	L	0.4	3	3	27	On railing
15	Emergency Response Garage/Safety Room	2,460	BG	AG	Conc	N	N	L	0.4	3	3	28	Shelf or table

Bld	Building Name	Area[a]	Fnd.[b]	Floor[c]		CS[d]	Src[e]	Vnt[f]	Occ[g]	OG[h]	IG[i]	Smp[j]	Samp. Loc.[k]
17	Laboratory	4,200	BG	AG	Conc	N	N	T	5	3	3	29	West Lab, over shelves
17	Laboratory	4,200	BG	AG	Conc	N	N	T	5	3	3	30	East lab, over book shelves
19	Block Bldg North of Lab	72	BG	AG	Conc	N	N	M	0	2		31	
20	Maintenance Building	1,428	BG	AG	Conc	N	N	M	2	3	3	32	on Locker
21	Maintenance Pump Repair Building	910	BG	AG	Conc	N	N	L	1	3	3	33	Inner room, front of shelf
22	Transformer Operations Building	2,200	BG	AG	Conc	N	N	M	0.2	3	3	34	On post bracket
23	Storage Building North of TO Bldg	240	BG	AG	Conc	N	N	M	0	3	3	35	
24	Boiler Room North American	525	BG	AG	Conc	N	N	M	0.2	3	3	36	On control box
25	Boiler Room Clever Brooks	490	BG	AG	Conc	N	N	L	0.2	3	3	37	On control box
26	Main Compressor Room	294	BG	AG	Conc	N	N	V	0	3	3	38	On electrical box
27	Joy Air Compressor Room/Storgae Room	490	BG	AG	Conc	N	N	L	0	3	3	39	Shelf front
28	Training/Lunch Rooms	2,220	BG	AG	Conc	N	N	T	2	4	4	40	Lunch Rm on vending machine
28	Training/Lunch Rooms	2,220	BG	AG	Conc	N	N	T	2	4	4	41	
29	Water Treatment Building (WWT)	1,250	BG	AG	Conc	N	N	L	1	3	3	42	On valve
31	Electrical Building across from WWT	252	BG	AG	Conc	N	N	M	0	3	6	43	On control panel
32	A/T Building	6,000	BG	AG	Conc	N	N	M	1	5	5	44	On control panel
32	A/T Building	6,000	BG	AG	Conc	N	N	M	1	5	5	45	Foreman office file cabinet
32	A/T Building	6,000	BG	AG	Conc	N	N	M	24	5	5	46	On pillar
32	A/T Building	6,000	BG	AG	Conc	N	N	M	24	5	5	47	Control Panel
32	A/T Building	6,000	BG	AG	Conc	N	N	M	24	5	5	48	Process area pillar
33	Clarifier Building	510	BG	AG	Conc	N	N	T	0	3	3	49	On power box
39	Block Building West of A/T	200	BG	AG	Conc	N	N	L	0	3	3	50	On control box
40	Arc Furnace Building	2,500	BG	AG	Conc	N	N	L	0	3	3	51	
41	T-8001 Collection Building	400	BG	BG	Conc	N	N	V	0	3	3	52	On control box
42	SLF 3 GWES Building	170	BG	AG	Conc	N	N	L	0	3	3	53	On control box
43	Building North of Lagoons	170	BG	AG	Conc	N	N	L	0	3	3	54	On control box
44	BW02s GWES Building	224	AG	AG	Conc	N	N	M	0	3	3	55	On tank/pipe
45	SLF 12 GWES Building	224	AG	AG	Conc	N	N	L	0	3	3	56	On tank/pipe
46	SLF 12 Lift Station	572	BG	BG	Conc	N	N	L	0	3	3	57	On tank or rails

Bld	Building Name	Area[a]	Fnd.[b]	Floor[c]		CS[d]	Src[e]	Vnt[f]	Occ[g]	OG[h]	IG[i]	Smp[j]	Samp. Loc.[k]
47	RMU-1 O/W Seperator Building	3,300	BG	BG	Conc	N	N	M	0	3	3	58	On scaffold
47	RMU-1 O/W Seperator Building	3,300	BG	BG	Conc	N	N	M	0	3	3	59	On scaffold
48	RMU-1 Lift Station	270	BG	BG	Conc	N	N	M	0	4	4	60	on Tank
49	Pump Shed in Leachate Tank Farm	168	AG	AG	Conc	N	N	M	0	3	3	61	On pipe
50	Block Bldg West of Leachate Tank Farm	72	BG	AG	Conc	N	N	L	0	3	3	62	On control box
51	Drum Warehouse	24,030	BG	AG	Conc	N	U	L	9	3	3	63	Lab on control box
51	Drum Warehouse	24,030	BG	AG	Conc	N	U	L	9	3	3	64	Office on file cabinet
51	Drum Warehouse	24,030	BG	AG	Conc	N	U	L	9	3	3	65	On drum puncture unit
51	Drum Warehouse	24,030	BG	AG	Conc	N	U	L	9	3	3	66	On center string
51	Drum Warehouse	24,030	BG	AG	Conc	N	U	L	9	3	3	67	Far wall
51	Drum Warehouse	24,030	BG	AG	Conc	N	U	L	9	3	3	68	Right wall
54	Fire Water Tank Block Building	440	BG	AG	Conc	N	N	L	0	3	3	69	On wall box
55	Heavy Equipment Garage/Offices	7,200	BG	AG	Conc	N	N	L	3	2	2	70	On south wall beam
55	Heavy Equipment Garage/Offices	7,200	BG	AG	Conc	N	N	L	3	2	2	71	On north wall cabinet
55	Heavy Equipment Garage/Offices	7,200	BG	AG	Conc	N	N	L	3	2	2	72	Upstairs shelf front
55	Heavy Equipment Garage/Offices	7,200	BG	AG	Conc	N	N	L	3	2	2	73	Office shelf
56	Stabilization Facility Northern Expansion	9,375	BG	AG	Conc	N	N	V	4	3	3	74	Therm Box
56	Stabilization Facility Northern Expansion	9,375	BG	AG	Conc	N	N	V	4	3	3	75	N Conduit
56	Stabilization Facility Northern Expansion	9,375	BG	AG	Conc	N	N	V	4	3	3	76	West wall
56	Stabilization Facility Northern Expansion	9,375	BG	AG	Conc	N	N	V	4	3	3	77	South railing
57	Stabilization Facility Macro/SCTR Areas	14,775	BG	BG	Conc	N	U	L	3	2	2	78	Power Box
57	Stabilization Facility Macro/SCTR Areas	14,775	BG	BG	Conc	N	U	L	3	2	2	79	Center post
57	Stabilization Facility Macro/SCTR Areas	14,775	BG	BG	Conc	N	U	L	3	2	2	80	Downstairs office shelf front
57	Stabilization Facility Macro/SCTR Areas	14,775	BG	BG	Conc	N	U	L	3	2	2	81	Upstairs kitchen
57	Stabilization Facility Macro/SCTR Areas	14,775	BG	BG	Conc	N	U	L	3	2	20	82	East wall box
65	SLF 1-6 Pretreat Building	441	BG	AG	Conc	N	N	L	0	3	3	83	Elec box right
66	SLF 1-6 Lift Station	624	BG	BG	Conc	N	N	M	0	3	3	84	On railing
67	SLF 1-6 Control Room Building	60	BG	AG	Conc	N	N	T	0	3	3	85	Cabinet wall
69	SLF 1-11 O/W Separator Building	1,010	BG	BG	Conc	N	N	M	0	3	3	86	Power box

Bld	Building Name	Area[a]	Fnd.[b]	Floor[c]		CS[d]	Src[e]	Vnt[f]	Occ[g]	OG[h]	IG[i]	Smp[j]	Samp. Loc.[k]
70	Water Inlet Building	300	BG	AG	Conc	N	N	T	0	5	5	87	On valve
72	Locker Building	3,000	BG	AG	Conc	N	N	T	40	5	3	88	Locker top
72	Locker Building	3,000	BG	AG	Conc	N	N	T	40	5	3	89	Threshold top
73	SLF 1-6 Electrical Block Building	100	BG	AG	Conc	N	N	M	0	3	3	90	Far wall panel

[a] Building floor area (square feet).
[b] Building foundation (AG = above grade; BG = below grade).
[c] Building floor (AG = above grade; BG = below grade; Conc = concrete floor; Wood = wood floor).
[d] Building has a crawl space? (Y = yes; N = no).
[e] Potential radon sources observed in the building? (Y = yes; N = no; U = undetermined).
[f] Building Ventilation (T = tight, < 0.5 ach; M = medium, ~1 ach; L = leaky, > 2 ach; V = mechanically ventilated).
[g] Building occupancy (person hours per day; 0 indicates less than 1 hour/week).
[h] Outdoor gamma radiation exposure rate (uR/hour).
[i] Indoor gamma radiation exposure rate (uR/hour).
[j] Proposed radon sample number.
[k] Proposed radon sample location.

4. Radon Testing Plan and Data Analysis

The following radon testing plan summarizes the procedures that will be followed for determining the radon levels in the buildings at the CWM Site. The plan addresses the configuration of the radon samplers, how and where they are deployed, how they are retrieved, and how their analytical data will be evaluated.

4.1 Sampler Configuration

Radon samplers are to be obtained from Landauer Inc., Glenwood, IL, and will consist of their Radtrak, standard sensitivity (30 pCi/L days), thoron-filtered samplers. The samplers are provided in cylindrical containers of a few centimeters diameter, as illustrated in Figure 2. The cylinders are closed on all surfaces except the top face (as illustrated), which contains nine holes that allow radon gas to diffuse into the container. The explanatory notice (Figure 2) will be attached to the samplers by taping around the curved surface of the sampler and attaching to the notice at both ends of the tape, as illustrated in Figure 4.

Figure 3. Illustration of a Radtrak Radon Sampler Provided by Landauer Inc.

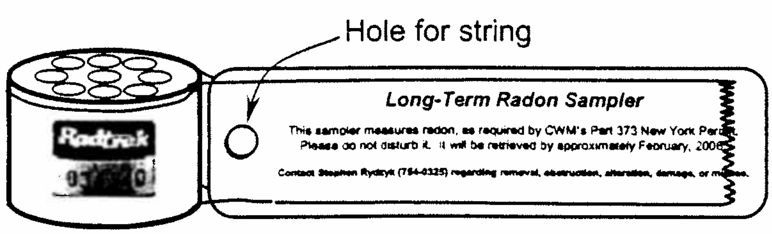
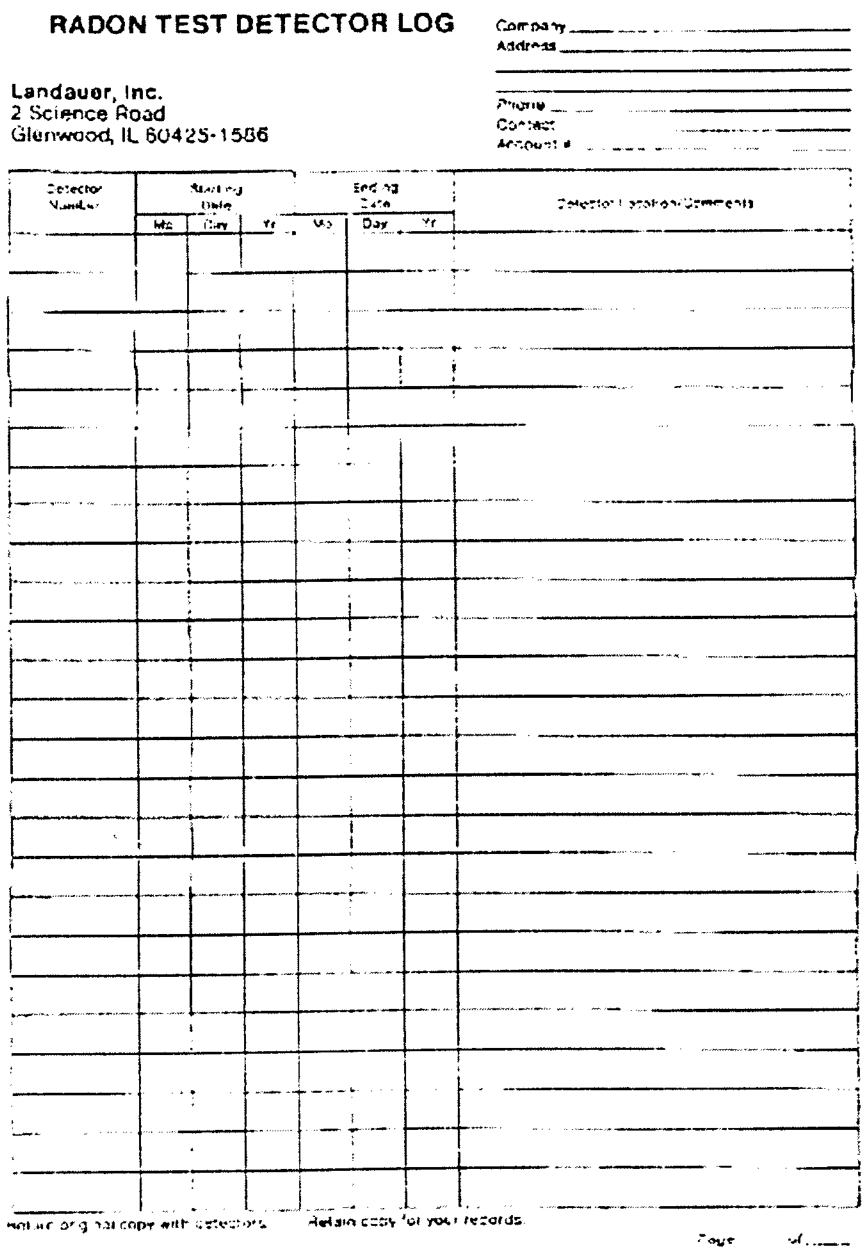


Figure 4. Attachment of the Notice to the Radtrak Radon Sampler.

4.2 Sampler Placement

A total of 90 radon samplers will be placed in the 52 buildings identified by the first column of Table 1. The samplers, identified sequentially by the location numbers in the next-to-last column in Table 1, will be placed in the locations described by the last column in Table 1 or in a suitable alternative determined at the time of sampler deployment. A Detector Log, furnished by Landauer Inc. or a similar one prepared by the URS sampling technician, will be used to record the sampler deployment details (Figure 5).



RADON TEST DETECTOR LOG

Company ____________
Address ____________

Phone ____________
Contact ____________
Account # ____________

Landauer, Inc.
2 Science Road
Glenwood, IL 60425-1586

Detector Number	Starting Date Mo	Day	Yr	Ending Date Mo	Day	Yr	Detector Location/Comments

Return original copy with detectors. Retain copy for your records.

Page ____ of ____

Figure 5. Example of a Landauer Radon Test Detector Log.

The deployment of each radon sampler will involve the following procedure. The sampling technician will (a) open the mylar shipping bag for one detector; (b) tape the detector to a notice tag; (c) record the sampler ID number (from the sampler) on the Detector Log; (d) record the starting date on the detector log; (e) record the location number and description on the Detector Log; (f) place the tagged detector in its sampling location; and (g) retain the opened detector bag and the detector seal for use upon sampler retrieval. If the detector is to be hung from an overlying support, rather than placed on a horizontal surface, the sampling technician will punch a hole in the notice tag, attach a string to the tag, and hang the detector in the desired location as part of step (f). The detector may also be attached to a surface with tape as long as the sampler inlet holes are not covered. The location description will indicate which samplers are hung and any other pertinent description of the deployment conditions.

In addition to deploying samples in each of the 90 locations listed in Table 1, nine field duplicate samples (10 % of the number of sampling locations) will be deployed alongside their counterparts (generally within about 15 cm). Each field duplicate sample will be entered on the Detector Log as a separate sample from its mate, and its identity will be described in terms of an offset distance from its predecessor. The sample should not be directly identified as a field duplicate; but should be identifiable to the sampling technician and data analyst from the building number, location number, and offset distance.

Five field blank samples (5 % of the number of sampling locations) will be retained sealed in their original shipping bags and not deployed. The five sealed bags will be stored in a clean environment along with the opened bags from the 99 samplers that were deployed.

Site personnel will make occasional inspections of the sampling sites to verify that the detectors are undisturbed from their intended locations and are not covered by papers or otherwise obstructed by materials that could limit their access to the building atmosphere.

4.3 Sampler Retrieval

At the end of the sampling period, approximately 4 months after sampler deployment, each sampler will be retrieved. Sampler retrieval from each of the 90 locations will consist of (a) verifying from the Detector Log (Figure 5) that the correct sampler number is being retrieved; (b) removing the notice tag from the detector and removing any loose dust or dirt from the entrance face of the detector; (c) removing the round seal from the detector bag and affixing it to the detector's entrance face; (d) record the retrieval date and any additional comments on the Detector Log; (e) seal the detector into its mylar shipping bag according to Landauer instructions; and (f) accumulate all other detectors being retrieved and shipping them, with a copy of the Detector Log, to Landauer for analysis.

Each of the five field-blank samples will be prepared for return by (a) opening its bag, (b) affixing the round seal to the detector face; (c) entering the retrieval date and a location description on the Detector Log; (d) entering a deployment date on the detector log that corresponds to the dates of deployment of the other 99 detectors; (e) entering fictitious building and location numbers on the detector log (locations 100 through 104); (f) re-sealing the detector into its mylar shipping bag according to Landauer instructions; and (g) combining the field blank detectors with the other retrieved samples for shipment to Landauer for laboratory analysis. The location names, numbers, and descriptions used for the five field blank samples should be logged in URS records such that the sampling technician and data analyst will recognize them as field blanks, but so that the laboratory will not know from the Detector Log that they are field blanks.

4.4 Radon Data Analysis

The radon concentrations reported by Landauer from their analysis of each of the 104 samplers returned to them will be reported as required by the CWM Part 373 Permit. Results (in pCi/L) for each of the 90 sampling locations will be reported in tabular format as they are listed above in Table 1. The results from the 14 quality assurance samples will be analyzed to determine the average agreement with duplicate analyses and the average field blank radon concentration on the unexposed detectors.

The 9 field duplicate samples will be compared with their counterparts to compute a coefficient of variation (*COV*) as[5]:

$$COV_i = 100\,\frac{\sqrt{2\left(R_i - R_{d,i}\right)^2}}{R_i + R_{d,i}}$$

where COV_i = coefficient of variation for pair *i* (%),
R_i = measured radon level (pCi/L), and
$R_{d,i}$ = duplicate radon measurement (pCi./L).

A precision of $COV_i < 10\%$ for measured radon levels above 4 pCi/L indicates satisfactory performance, with somewhat greater variations expected for lower levels because of the smaller number of tracks on which the lower levels are based.

The 5 field blank values will be directly averaged to determine the magnitude of any systematic blank value that should be considered for subtraction from all of the 99 other measurements. Ideally, the five field blank values, or at least their mean, should be near zero.

5. Literature References

(1) U.S. Environmental Protection Agency, A Citizen's Guide to Radon: The Guide to Protecting Yourself and Your Family from Radon, Washington DC: US EPA Indoor Environments Division, *EPA 402-K-02-006*, May 2004.

(2) U.S. Environmental Protection Agency, Technical Support Document for the 1992 Citizen's Guide to Radon, Washington DC: US EPA, *EPA 400-R-92-011*, May 1992.

(3) U.S. Environmental Protection Agency, Building Air Quality: A Guide for Building Owners and Facility Managers, Washington DC: US EPA, *EPA 402-F-91-102*, December 1991.

(4) U.S. Environmental Protection Agency, Radon in Schools (2nd Ed.), Washington DC: US EPA, *EPA 402-F-94-009*, October 1994.

(5) U.S. Environmental Protection Agency, Indoor Radon and Radon Decay Product Measurement Device Protocols, Washington DC: US EPA, EPA Office of Air and Radiation, *EPA 402-R-92-004*, July 1992.

(6) New York State Education Department and Department of Health, Guidance for Radon Measurement in Schools and Large Buildings, November 2003.

(7) Gavitt, Stephen M., CWM Building Survey, NY Department of Health memo to Jill Banaszak, September 14, 2005.

(8) New York State Department of Health, Indoor Air Sampling and Analysis Guidance, Division of Environmental Health Assessment, Center for Environmental Health, February 1, 2005.

Appendix A

Gamma Radiation Meter Calibration

INSTRUMENT CALIBRATION

CAL# 11377
Prev. 9894

health physics instruments
330 D South Kellogg Ave, Goleta, CA 93117 Tel 805.967.8422 Fax 805.964.3162 Division of Far West Technology, Inc.

INSTRUMENT OWNED BY:	EQUIPMENT NO.	DATE:
URS		September 23, 2004
MFG.:	**MODEL:**	**DATE DUE:**
Ludlum	12S	September 23, 2005
SERIAL NUMBER:	**BATTERIES:**	**DETECTOR:**
11095	Two D cell	N/A

CALIBRATION DATA :

Source	Type	Cal Constant		Due Date	Source	Type	Cal Constant		Due Date
CS1:	CS137		mR/h @ 1 m	5/05	S:	Ra-226	1.929	mR/h @ 1 m	5/05
CS2:	CS137		mR/h @ 1 m	5/05	W:	Ra-226	0.128	mR/h @ 1 m	5/05
CS1-1:	CS137		mR/h @ 1 m	5/05	N1:	Cf252		mrem/h@ 1 m	Assay 1/91
CS1-2:	CS137		mR/h @ 1 m	5/05	N2:	Cf252		mrem/h@ 1 m	Assay 1/99
CS1-3:	CS137		mR/h @ 1 m	5/05	Pulser:	Model: MP2	Serial No.:	001	7/05

Source	Distance	Exposure	Scale Readings					
	cm	µR/h	X 1000	X 100	X 10	X 1		
W	25.2	2000	2,000					
	46.2	600	700					
	80.0	200		200				
	146.0	60		70				
	292.1	15			13			
	461.8	6			6			
		Background			4	O/S		

BAROMETER mmHg:	TEMPERATURE °C	AM 241
761	27	Yes

COMMENTS:

CPM ranges set electronically. Background subtracted from all readings. ( ) indicates reading as found. Gamma calibrations from the side of all GM tubes. Calibrations traceable to the National Institute Of Standards And Technology.

☒ Instrument OK

CALIBRATION BY: RON GODDEN	DATE	CHECKED BY: JOHN S. HANDLOSER, JR.	DATE
Ron Godden	9-27-04	JSH Jr	9.27.04

APPENDIX 2

URS CORPORATION
PERSONNEL RESUMES

URS

B. Scott Davidson, CHP, CSP

Principal Health Physicist

Areas of Expertise

Radiological Health, Engineering, and Assessment

Radioactive Waste Management and Disposal

Years of Experience

With URS: 1.5 Year

With Other Firms: 30 Years

Education

M.S./1975/Radiological Health Option/Rutgers University, New Brunswick, New Jersey

B.S./1973/Environmental Sciences/Rutgers University, New Brunswick, New Jersey

Registration/Certification

1984/CHP/#2292

2001/CSP/#16766

Overview

Mr. Davidson has 31 years of professional experience in radiological and environmental management. Specialties include program development, assessment and implementation, instrumentation, air monitoring, radiological risk assessment, data management, licensing, permits, and training.

Project Specific Experience

Remedial Investigation

Consultant Certified Health Physicist, USACE FUSRAP sites (2003–2004):

Radiation Safety Officer and Site Safety and Health Officer for remedial investigation of shallow land disposal area in Western Pennsylvania. The disposal area was used primarily for uranium wastes. Conduct comprehensive health and safety program during remedial investigation activities at a radioactive and hazardous waste disposal facility including use of Level B personnel protective equipment. Routine radiation and contamination surveys, RWPs, external dosimetry and internal dosimetry, RP instrumentation, four-gas and PID measurements. Compressed gas and hazardous energy control, fire safety, daily toolbox briefing, etc. Site Manager/SSHO and RSO during abandoned warehouse site investigation and Class 3 MARSSIM survey – reviewed and implemented survey design. RSO/SSHO for groundwater delineation project at FUSRAP project. Used CAP-88 to determine annual radiation doses to members of the public from FUSRAP project.

Research Reactor Decommissioning

Nuclear Engineer/Health Physicist, Plum Brook Reactor Facility D&D Project, Sandusky, Ohio (2001–2003):

Senior advisor to the team on all aspects of radiological safety and decommissioning for NASA research reactor. This work included working with the client (NASA) and the prime contractor to USACE to develop and review the remedial design plans and procedures for the demolition and decommissioning of two research reactors. Radiological Functional Team Lead – review and concur with the NASA RSO on key elements of the radiological program. Development of QA procedures and conducted field oversight of characterization surveys, demolition and other contractor-performed work. Ensure that the integration of industrial safety and health program including Be, LO/TO, cranes, confined space, machine guarding, etc. and radiological safety met client requirements. Assisted USACE and NASA Environmental Scientists in environmental and safety program areas including development of environmental sampling plans, groundwater and air monitoring program and data review.

Radiological Consultant

NORM

Radiological risk assessment for source material licensee facility (Molycorp, Inc.) in Pennsylvania for interim storage facility. Risk assessment included dose calculations to workers and the environment. Performed dose calculations to personnel from radium scale in pipes used in gas and oil industry. .

Radiological Closure

Health Physicist, DOE Ohio Field Office (1997–1998):

Oversight of management, bioassay, and radiation protection program. Health Physics subject matter expert for Operational Readiness Review for restart of activities involving enriched restricted materials. Reviewed Contractor's Implementation Plan and Basis for Interim Operations (remedial design and demolition plans). Performed plant hazard analyses including determination of credible accident scenarios during remediation work. Development of potential source terms and consequences; and determination of preventive and compensatory measures in support of IP/BIO development.

Medical Products

Health Physicist (2001):

Day-to-day responsibility for radiation protection program at a facility with four cyclotrons. Wrote procedures, prepared Radiation Work Permits, and trained facility staff. Performed extremity dose reconstruction. Implemented electronic dosimeter use and improved whole body multi dosimetry.

Independent Review

Lead Health Physicist and Project Manager (1998–2001):

Expert review of the DOE-Mound Bioassay and Internal Dosimetry and Radiological Protection Program.

Agreement State Program

Staff Health Physicist (1997):

Developed and implemented licensing and inspection program for Ohio Department of Health, Columbus, Ohio. Inspection of radioactive materials licensees, including medical and industrial facilities.

Radiological Decommissioning

Senior Radiological Consultant, Site remediation (1994–1996):

Developed radiological protection program for drug delivery system NRC applicant. This included license application and conducted training for radiation safety personnel and investigators Performed chemical and ecological risk assessment. Designed experiments to determine site-specific K_d partition coefficient for contaminated soil to determine radionuclide fate and transport. Developed site-scoping procedures for D&D.

<u>Commercial Power</u>

Radiological Operations Support Division Manager, Pilgrim Nuclear Power Station (1989–1993):

Responsible for:

- Calibration of fixed and portable radiation detection instrumentation including area and process radiation monitoring equipment used for normal and emergency plant monitoring.
- Respiratory protection including maintenance, inspection, and sanitization of full face and PAPR respirators, SCBA, and bottle charging equipment. Use of breathing air system, as needed.
- Personnel radiation monitoring including issuance of TLDs and Self-Reading Pocket Optical Dosimeters.
- Radiation records.
- Litigation research and support.
- Operation and maintenance of whole body counting equipment (closed chair and standup monitors).
- Operation and maintenance of intrinsic germanium detector systems.
- Supervision of four professional, four technicians, and several clerical staff.
- Wrote application to the NRC for removal and placement of 65,000 ft^3 of radioactively contaminated soil under 10 CFR 20.302
- Emergency Plan Dose Assessor.

Radiation Specialist, U.S. Nuclear Regulatory Commission, King of Prussia, Pennsylvania (1986–1989):

Responsible for performing safety inspections at commercial nuclear power plants in the following areas: solid, liquid, and gaseous waste systems, transportation and disposal, confirmatory measurements, radiological environmental monitoring, etc.

Staff Health Physicist, South Carolina Electric and Gas, VC Summer Nuclear Station (1981–1986):

Procedure development for start up and testing of commercial nuclear plant, training and personnel dosimetry issues. Developed radiological laboratory intercomparison program, performed power entries to perform neutron spectral measurements at 50 & 100% power, etc.

<u>Health Physicist</u>

Development of radiation safety program for rare earth facility decommissioning. Implemented compliance activities for radiography program.

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<u>Military Installation Radiation Safety Program Implementation</u>

Radiation Safety Officer, Charleston, SC, Naval Shipyard, U.S. Army R&D facility (1977–1979):

Responsible for NRC license compliance regarding radiography, calibration, and DOT shipping, and transportation activities. Assisted in baseline environmental monitoring at future shipyard and emergency planning and response.

Professional Societies/Affiliates

Health Physics Society (Plenary Member since 1974)

American Academy of Health Physics (Certified Health Physicist)

Board of Certified Safety Professionals (Certified Safety Professional)

Languages

English

Specialized Training

Confined Space/PCB/Lead Awareness

Asbestos Abatement Contractor/Supervisor

HAZWOPER Refresher

MARSSIM

RESRAD/RESBUILD

Hazardous Waste/Radioactive Waste Manifest Refresher

HM-230 Radioactive Material Transportation Refresher

Security Clearance

Inactive DOE Q Clearance

Publications

"Independent Expert Review of the DOE-Mound Bioassay/Internal Dosimetry and Radiological Programs", work performed by Davidson & Associates, LLC under contract to the DOE Ohio Field Office, December 2000

"Discovery of Five-Year Old Unanalyzed Bioassay Samples", Smith, David G. (Team Lead), Davidson, B. Scott (Team Member) et al.

Chronology

08/03–Present, URS Group

07/01–08/03, USACE

07/98–07/01, Davidson & Associates, LLC

07/97–07/98, Jason Associates Corporation

12/1996–06/97, Ohio Department of Health

10/94–12/96, ICF Kaiser Engineers
01/94–10/94, Sole Proprietor
01/89–12/93, Boston Edison Company
03/86–01/89, U.S. Nuclear Regulatory Commission
10/81–03/86, South Carolina Electric & Gas Company
10/80–10/81, Catalytic, Inc.
03/80–09/80, Rad Services, Inc.
10/79–03/80, Yankee Atomic Electric Company
04/78–10/79, U.S. Navy Shipyard Charleston, SC
07/77–04/78, U.S. Army Fort Monmouth, NJ
10/75–06/77, University of Illinois, Chicago, IL
11/74–10/75, Hines VA Hospital, Hines, IL

Oak Ridge/9-8-04/Rev. 1]

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Eric W. Olson

Environmental Engineer

Overview

Mr. Olson has over 12 years of experience in field engineering and management. He prepares work plans and specifications for environmental remediation projects, and provides field supervision and support for characterization and remediation projects.

Areas of Expertise

Radiological Remediation
Field Engineering
Facility Decontamination

Years of Experience

With URS: 3 Years
With Other Firms: 9 Years

Education

BS/Civil Eng/Michigan Technological University

Registration/Certification

Engineer-In-Training
Yearly/Radiation Worker Requalification
Yearly/HAZWOPER

Project Specific Experience

Hicksville Soil Remediation Project (Verizon), Hicksville, NY

- Team Leader for health physics support and remediation verification for the remediation of uranium- and thorium-contaminated soils. Manages field group of health physics technicians that perform MARSSIM final status surveys and associated soil sampling,
- Primary Investigator for evaluation of on-site Gamma Spectroscopy results and Alpha Spectroscopy results, which are analyzed at an independent off-site laboratory. Used a regression analysis to compare the results of the two labs and to develop a standard-error correction factor.
- Prepared Standard Operating Procedures for radiological work involving elevated levels of Uranium-235, Uranium-238, and Thorium-232. The work also involves high levels of Tetrachloroethene (PCE) and Trichloroethene (TCE). These procedures provide instructions for the operating radiological field equipment, air monitoring, analyzing air and soil sample analysis, sample preparation, and Radiation Health instructions. The QA/QC specifications for the work processes and instrument checks were incorporated into each procedure.
- Analyzes environmental samples on the project's on-site Gamma Spectroscopy Detectors. Assisted in the development of the Quality Assurance program, as it applies to Gamma Spectroscopy.
- Assisted in the development of an automated process of real-time output of Gamma Spectroscopy analytical results into the project's sample database. This process involves several different work groups and companies. Over 15,000 samples have been analyzed by the site's Gamma Spectroscopy Units and the results have been compiled into the master on-site database.
- Developed the project's Anomaly Database, used to record information on sub-surface anomalies found during excavation. This database tracks anomalies and compares them to the field instrument readings, VOC analysis results, and on-site Gamma Spectroscopy results.

Radiological/Project Engineer, Bettis Laboratory (1999-2002) Developed technical work documents and provided project-engineering support for the remediation of radiologically contaminated buildings and equipment from the initial research phase to final package closeout. Responsible for issuing project cost estimates, exposure estimates, man loading, and schedules. Work includes hazardous/mixed waste identification, minimization, storage, and disposal requirements. Responsible for selecting the required personal protective equipment for projects under his cognizance. Tasks involves developing procedures for

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work with 1R/hr controls and >1,000,000 pCi/100 cm^2 conditions, selection and configuration of Lifting and Handling equipment including structural calculations and welding specifications, and coordinating several simultaneous work crews. Conducted Quality Assurance (QA) audits of projects not under his cognizance.

Completed Projects:

GMTR Pump Room (Assistant and later Lead Engineer)

- Prepared technical work documents and specifications for removal of water and sludge from a pump room that used to transfer radiological liquids. The waste material contained high levels of Tetrachloroethene, Xylene, Dichloroethane, Thorium-232, and Cesium-137.
- Designed the engineering controls and the pumping system used to transfer the water and sludge from the sump up 30 feet to the Mixed Waste Storage Area.
- Developed the sampling plan used to characterize each container of waste. Trained the Radiation Technicians and Radiation Workers on the sampling methods to be used.

MEL MET and Central Fan Rooms (Lead Engineer)

- Prepared technical work documents for the remediation of approximately 5000 square feet of Cobalt-60 and Uranium-238 contaminated test facility in a High Radiation Area.
- Performed the engineering calculations needed to select the lifting and handling equipment needed to move heavy waste items from the fan room to the main floor. Prepared the required Lifting and Handling Authorization Forms, which required the engineer to prove through calculations that the lifting configuration selected was adequate for proposed loading.
- Supervised the removal of over 500 cubic feet of contaminated waste, which was removed and packaged for disposal. Waste items included equipment containing PCB's, Lead, Chromium, Cadmium, and Asbestos. Designed the Asbestos controls needed for the disassembly of Asbestos Containing Materials (ACM) and prepared the Asbestos Work Permits needed for this project.
- Two obsolete gloveboxes were dismantled and packaged for disposal. Designed two large ventilated glovebags which fully encased each glovebox.
- The project was completed 2 months ahead-of-schedule and under budget.

Sampling of Contaminated Storm Drain (Lead Engineer)

- Developed the Sampling Plan for the characterization of future site work involving a contaminated storm sewer line. The drain contained Uranium-235, Uranium-238, and Cobalt-60 contaminated debris from a nearby shop facility. The area is also suspected to contain hazardous contaminates above the RCRA and TSCA limits. The sample plan was developed by using the guidelines in the EPA's Test Methods for Evaluating Solid Waste (SW 846) and the site's Environmental Engineering Manual.
- Trained the Radiation Workers and Technicians on the sampling methods to be used when collecting the radiological samples, to minimize the spread of

contamination and to reduce the chance of cross-contamination.

- Supervised the collection of soil and debris samples that were sent to Gamma Spectroscopy for analysis. Prepared and maintained the QA/QC documents used during sample collection.

Demolition of Uranium Fuel Storage Vault (Lead Engineer)

- Prepared work documents and specifications for the complete removal of a 2000 cubic feet nuclear fuel storage vault. The vault was made of extremely high density and strength concrete (nuclear grade concrete). The fuel storage compartments were wrapped in Cadmium sheeting. Some materials of the vault also contained high level of PCB's and Asbestos.
- Prepared and maintained the Cadmium Compliance Document used to describe what engineering and administrative controls would be used during demolition. Developed the engineering controls used to minimize Cadmium airborne concentrations, which included the use of localized work-site ventilation, hooded ventilation workstations, and a large work-site enclosure. Selected the locations, frequency, and methods used to collect air samples (both area and personnel air samples). These samples were analyzed for Cadmium fume, Silica dust, and radioactive particulates.
- Prepared the Contract of Analytical Services for an off-site laboratory that was used to analyze the air samples for Cadmium and Silica dust. Calibrated the air sampling equipment. Completed and maintained the QA/QC paperwork for the air sampling program. Reviewed the air sample results daily for action limits and trend analysis.
- Provided training for the assigned Radiation Workers and Technicians on the hazards of PCB's and Cadmium, and how these hazards were to be mitigated during the course of the project.
- The demolition was designed in a manner to segregate the different types of wastes and to prevent the spread of contamination to other materials. The result was the generation of no Mixed Waste with this project, saving the client time and money that would have been needed for waste processing. concentrations did not exceed the Permissible Exposure Level specified by 29CFR1926.
- Due to needs of the client, a majority of this project was performed after normal working hours. Designated by the site manager as his representative after normal working hours.
- Documented and tracked the quantity and disposition of hazardous waste as it was generated.

Removal of Thoria Exhaust Filters (Lead Engineer)

- Prepared technical work documents and specifications for the removal of highly contaminated lab ventilation filters. The filters were used to trap airborne contaminates from the exhaust ventilations from Uranium and Thorium contaminated gloveboxes which were used in the preparation and testing of fissile and fertile materials. Each filter contained approximately one curie of radioactivity.
- Developed a sampling plan used to determine the spread of contamination through various components of the ventilation system. Used these sample results to specify the engineering controls needed to dismantle specific ventilation components.

- Developed a mock-up training program that was used to simulate the removal of the filters and to train the assigned work crew. This program was also used to test engineering controls that would be used during the actual removal process and to identify potential problems.
- Supervised the removal of the filters, which was performed using the High Risk Radiological Controls program, used for task involving contamination levels in excess of 1,000,000-pCi/100 cm2.

Specialized Training

Hazardous Waste Generator/Transporter (Commonwealth of Pennsylvania)

Chronology

2002 – Present: URS, Buffalo, N.Y.

1999 – 2002 - Philotechnics Ltd., West Mifflin, PA

1993 – 1999 – US Navy

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Jeffrey S. Day

Senior Environmental Engineer/Physicist

Overview

Mr. Day has over 5 years of experience in Radioactive Waste Management and Applied Radiation Protection for clients in government and private sectors and over 7 years experience in Programming, Data reduction, Instrumentation, and Physics. He has provided technical and computer support to both state and federal government agencies. Mr. Day has participated in demolition and decontamination activities for the control and containment of waste and has performed surface and subsurface characterization.

Areas of Expertise

Radiological Measurements
Physics
Environmental Engineering
Information Systems

Years of Experience

With URS: 5 Years
With Other Firms: 3 Years

Education

MS/Instrumentation, Physics/1999/University of Utah
BS/Physics/1998/University of Utah

Registration/Certification

National Registry of Radiation Protection Technologist (RRPT)

Project Specific Experience

Federal Projects

Instrumentation Specialist, SLDA Parks – Site Characterization, Parks, PA, ACOE, 2004: Performed 100% coverage survey on 45 acre site using Sodium Iodide detector and fidler. Radiation instrumentation was connected to Global Positioning System with all data recorded electronically.

Instrumentation Specialist, Bone Break Seminary & Adjacent School/Chemfirst, Dayton, OH, ACOE,2003: Investigated sites, Bone Break Seminary and Adjacent School, and Chemfirst both are in Ohio, for the Army Corps of Engineers using a global positioning system in conjunction with radiation survey equipment. Provided all necessary support to log, differentially correct, and export data.

Instrumentation Specialist, Bone Break Seminary & Adjacent School – Site Characterization, Dayton, OH, ACOE, 2003: Provided radiological support for Army Corps of Engineers for site characterization and collection of geoprobe samples at the Bone Break Seminary and Adjacent School. Maintained, packaged, shipped samples according to Army Corps of Engineers' strict protocol and procedures.

Hazardous Waste Management Projects

Technical Support, Radiological Investigation of the Agrico Site, Carteret, NJ (2005): Performed GPS-linked gamma radiation surveys of 35 acres of former industrial land to identify areas of contamination. Performed 20%-coverage surveys site-wide and 100%-coverage fill-in surveys to characterize contaminated areas. Set up GPS systems and performed data transfers.

Technical Support, Field Survey of NORM Radioactivity in Oilfield Pipes in Santa Maria, CA (2005): Performed gamma- and beta-gamma radiation surveys of used oilfield pipe to characterize radiation levels at 30-cm intervals in hundreds of pipes using a high-efficiency scintillometer coupled to a data logger.

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Health Physicist, Radiological Surface Surveys at Colorado School of Mines, Golden, CO, 2001: Performed radiological surface surveys and support during characterization phase of clean up at Colorado School of Mines. Using a global positioning system connected to radiation survey equipment the 6 acre site was characterized in preparation for decommissioning activities.

Health Physicist, BP, Health Physics and Radiological Support, Warrensville, OH, 2003: As decontamination and decommissioning contractor provided health physics and radiological support for BP Warrensville, OH. Provided air monitoring, dosimetry, and final status survey support for license termination of the facility. Ensured all activities were conducted in accordance with the methodology as presented in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NUREG-1575).

Health Physicist, BP, QA for D&D Activities, Warrensville, OH, 2001-2003: Provided over-site and quality assurance (QA) for decontamination and decommissioning activities to allow unrestricted use of BP Warrensville facility, in Ohio, and license termination. Ensured all activities were conducted in accordance with the methodology as presented in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)(NUREG-1575). Performed formal review of multiple reports submitted to the state of Ohio.

Professional Societies/Affiliates

Health Physics Society, Member #30943

Languages

English

Specialized Training

2002/LANL Rad Worker II Training
2000/Respirator Certified
1999/40-hour Hazardous Waste Operations and Emergency Response Training (29 CFR 1910.120)
Engineer In Training – Passed FE Exam (EIT)
2004/National Registered Radiation Protection Technologist (RRPT)

Security Clearance

DOE Clearance C, Badge #171634

Contact Information

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Jeff_Day@urscorp.com

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Amy Robin Jones

Environmental Engineer

Overview

Ms. Amy Jones is a registered radiation protection technologist with over 12 years experience conducting radiological assessment and verification surveys; and analyzing radiological and site data. She has developed, reviewed and implemented radiological work plans and project specific procedures. She assisted in the development of procedures and data management practices to handle the large volume of electronic data generated by combining GPS data with radiological survey data.

Areas of Expertise

Data Analysis and Interpretation
Radiological Assessment and Verification

Years of Experience

With URS: 3 Years
With Other Firms: 9 Years

Education

MS/2000/Environmental Policy and Management/University of Denver
BS/1990/Science Biology/Mesa State College

Registration/Certification

Registered Radiation Protection Technologist

Project Specific Experience

Technical Support, Radiological Investigation of the Agrico Site, Carteret, NJ (2005): Performed GPS-linked gamma radiation surveys of 35 acres of former industrial land to identify areas of contamination. Set up and verified instrument performance. Performed 20%-coverage walk-over surveys and 100%-coverage fill-in surveys. Developed isopleth maps of Ra-226 contamination.

Radiological Survey Team Member, Kraft Site (2003): Radiological assessment of building and parking lot at the Kraft site in West Chicago.

Radiological Survey Team Member, Norton Air Force Base (2001): Radiological verification and data analysis of final status surveys at Building 752, Norton Air Force Base. Specific duties included conducting surveys, oversight of remediation contractor, analysis of radiological data and review of data for final report.

Inclusion and Verification Radiological Team Leader, Monticello Vicinity Properties (1992-1999): Radiological Team Leader for Inclusion and independent verification of the 424 Monticello vicinity properties. Specific duties included conducting radiological surveys, evaluating survey data, and generating project reports. Preformed independent evaluation of radiological survey methods and procedures used to verify sites meet site criteria. Reviewed historical assessment, construction, remedial action, and verification data to ensure sites meet criteria to support deletion from the NPL.

Professional Societies/Affiliates

Health Physics Society

Specialized Training

1991/40-hour Hazardous Waste Operations and Emergency Response Training

1994/8 Hour Supervisor Hazardous Waste Operations and Emergency Response Training

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Mark F. Passuite

Senior Environmental Scientist

Areas of Expertise

Facilities Assessment
Data Validation
Radiation Health and Safety

Years of Experience

With URS: 13 Years
With Other Firms: 2 Years

Education

BA/1982/Biology/State University of New York at Buffalo

Registration/Certification

1983/Certified Nuclear Medicine Technologist/Nuclear Medical Institute
Yearly/Radiation Worker Requalification
2004/Safe Transportation of Hazardous Materials (HM126F)

Overview

Mr. Passuite has fifteen years of experience in site characterization, environmental monitoring, data assessment, quality assurance and radiation science. His current assignment is in radiochemical data validation and quality assurance supporting environmental monitoring, hazardous waste programs, and internal dosimetry.

Project Specific Experience

Senior Environmental Scientist, WVDP (2003-Present): Perform radioanalytical and chemical data validation for the Department of Energy's (DOE) West Valley Demonstration Project (WVDP). This includes various environmental and waste stream data.

Radiation Safety Officer, FUSRAP (2000-2001, 2003-Present): Health Physicist for a field investigations at the Middlesex Sampling Plant. This site is a part of the DOE's Formerly Utilized Sites Remedial Action Program (FUSRAP).

Senior Environmental Scientist, USACE (2003-Present): Performed radioanalytical validation of data collected at various U.S. Army Corps of Engineers (USACE) sites. These included the Middlesex Sampling Plant and the Shallow Land Disposal Area Site at Parks Township.

Senior Environmental Scientist, DOE/USACE (2003-Present): Responsible for interacting with contract laboratories to resolve analytical discrepancies with the DOE and USACE.

Lead Scientist, WVDP (1990-2001): Lead scientist responsible for field team coordination and sample management during numerous investigations of environmental samples collected at the WVDP. The sampling events involved subsurface soils, surface soils, sediments and groundwater for radiological and chemical parameters. These programs were done in accordance with the U.S. Department of Energy (DOE) and WVDP Radiological and Industrial Work Permits.

Lead Scientist, WVDP (1990-2001): Lead scientist for conducting near-site surface soil surveys at the WVDP to evaluate airborne deposition of radionuclides. This included performing an overland gamma survey, analyzing data, and preparing a report of the results.

Co-Preparer, WVDP (1990-2001): Co-preparer of the WVDP site radiological surveys environmental information document in support of the environmental impact statement (EIS).

Chronology

2003 – Present: URS, West Valley, N.Y.
2001 – 2003: Niagara County, New York
1990 – 2001: URS/Dames & Moore, West Valley, N.Y.
1983 – 1990: Erie County Medical Center, New York

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Thomas J. Urban

Environmental Engineer

Overview

Mr. Urban provides field and project support for environmental programs. He combines a familiarity with radiological and chemical monitoring instrumentation with capability for data management through Geographic Information Systems (GIS).

Areas of Expertise

Radioactive Materials Handling
Environmental Monitoring
Geographic Information Systems

Years of Experience

With URS: 3 Years
With Other Firms: 2 Years

Education

BS/1997/Environmental Studies/SUNY College of Env Science and Forestry
MS/2000/Environmental Studies/Univ of Rochester

Project Specific Experience

SLDA – Vandergrift, PA: Responsibilities included site health physicist and safety officer. Conducted groundwater sampling and sampling soil for the presence of radioactive contamination. Provided health & safety monitoring for level B (supplied air) operations during trench soil borings. Collecting monthly air monitoring samples.

Temple University - Associate Health Physicist/Industrial Hygienist, Temple University, Philadelphia, PA: Responsibilities included performing general, biological, chemical, and radiation safety inspections of laboratories. Responding to chemical and radiological emergencies, collecting and segregating hazardous waste in compliance with RCRA regulations. Inspection of hazardous material storage areas and radioactive waste facilities. Collecting and analyzing drinking water samples. Identifying unknown substances. Performing calibrations on various chemical and radiation monitoring equipment and performing respirator fit-testing to ensure proper fit and usage.

NYPA-ROW Inventory, Throughout New York State: Digitally map vegetation along NYPA owned power lines to determine compatible and non-compatible species and relative densities of each.

NYPA – Invasive SPP – Throughout Niagara County, NY: Digitally map invasive species on NYPA owned land.NYPA – Niagara Power Plant Relicensing: Perform groundwater sampling via low flow purge methods throughout Niagara County.

Buffalo Sewer Authority (BSA), Buffalo, NY: Conduct routine monitoring and sampling of various industries throughout the Buffalo region to assure compliance with BSA wastewater discharge limitations.

APPENDIX 3

CWM HEALTH AND SAFETY PLAN

WASTE MANAGEMENT

CWM CHEMICAL SERVICES, LLC.
MODEL CITY FACILITY

HEALTH AND SAFETY PLAN FOR THE SITE RADIOLOGICAL SURVEY PLAN

September 2005

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TABLES

ATTACHMENTS

ACRONYMS AND SYMBOLS

AHA	Activity Hazard Analysis
ALARA	As Low As Reasonable Achievable
ANSI	American National Standards Institute
APR	Air Purifying Respirator
CPR	Cardio-Pulmonary Resuscitation
CHP	Certified Health Physicist
CIH	Certified Industrial Hygienist
CSP	Certified Safety Professional
EMR	Experience Modification Rate
FSP	Field Sampling Plan
GPS	Global Positioning System
HASP	Health and Safety Plan
HEPA	High Efficiency Particulate Air
LWCR	Lost Workday Case Rate
MSDS	Material Safety Data Sheet
MSL	mean sea level
OSHA	Occupational Safety and Health Administration
PE	Professional Engineer
PPE	Personal Protective Equipment
Ra	Radium
Scan MDC	Scan Minimum Detectable Concentration
SMS	Safety Management Standards
SSHP	Site Safety and Health Plan
Th	Thorium
U	Uranium

1.0 PURPOSE AND OBJECTIVE

The purpose of this Health and Safety Plan (HASP) is to present guidelines to be utilized by CWM, Contractor, and Consultant personnel for site activities involving the gamma walkover survey and facility building radiological investigations, at the CWM Model City Facility. The intent of this plan is to focus on the radiological investigations, testing and sampling rather than actual remedial activities such as excavation and equipment operation.

The objective of this HASP is to provide a mechanism for establishing safe working conditions for personnel of contracted companies working for CWM at the Model City Facility. The safety organization, procedures, and protective equipment have been established based upon an analysis of potential physical, chemical, radiological, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident, injury, and exposure.

Activities covered under this HASP include a gamma walkover surveys, minor sampling activities, and radiological interior building surveys, ie. radon testing. CWM, contractor, and consultant personnel on a project must meet the training requirements of 29 CFR 1910.120(e) and participate in a medical surveillance program per 29 CFR 1910.120(f).

The Project Manager and Site Health & Safety Specialist are responsible for implementation of this plan with assistance from the Site's Technical Manager. Safety procedures will be performed in accordance with applicable OSHA standards and established CWM Health & Safety procedures and requirements.

2.0 PROJECT LOCATION

The CWM Chemical Services, LLC (CWM) Model City facility site occupies approximately 710 acres comprising approximately 450 developed acres and approximately 260 acres of wooded space that surrounds the developed portion. The site is located in the Erie-Niagara Region of western New York State. The facility is situated on the boundary between the Towns of Lewiston and Porter in Niagara County. Lake Ontario is north of the site. The site's address is 1550 Balmer Road, Model City, New York 14107.

3.0 SITE DESCRIPTION AND HISTORY

The CWM Model City Facility is a hazardous waste management landfill. Its active units are permitted as part of the Model City Treatment, Storage, and Disposal Facility (TSDF). The site uses permitted state of the art technologies for the proper storage, treatment, and disposal for a variety of liquid, solid and semi-solid organic and inorganic hazardous waste and industrial non-hazardous waste. Site capabilities include Aqueous Wastewater Treatment System, waste stabilization, secure landfilling of approved waste solids and semi-solids including PCBs, solvent and fuel blending processes, and storage and disposal of wastes regulated under the Resource conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA).

The Model City facility began TSDF operations in 1971 as Chem-Trol Pollution Services, Inc. Due to corporate acquisitions and name changes, CWM Chemical services, LLC, a subsidiary of Waste Management, Inc. (WMI) is the present owner and operator of the facility. WMI is based in Houston, Texas.

Prior to operation as a commercial waste facility, the site was owned by the U.S. Government (early 1940s through the mid 1960s) and was part of the Lake Ontario Ordinance Works (LOOW). U.S. Government activities at and in the vicinity of the site included:

- Explosives and solid/liquid fuel propellant research, development and production.
- Research, development and waste storage related to the Manhattan Project.
- Detonation of outdated or off-specification explosives.

Some of these activities resulted in the contamination of certain areas of the site with organic and inorganic chemicals and low level radioactive wastes. During the 1960s, prior efforts to decontaminate the site were made by the U.S. Atomic Energy Commission (AEC) and the U.S. Department of Energy (DOE). In 1993, CWM concluded its own investigation into the nature and extent of contamination in soil and groundwater throughout the facility (including low level radioactive contamination) with the submission of a RCRA Facility Investigation (RFI) Summary Report to the New York State Department of Environmental Conservation (NYSDEC). The corrective Measures Study was completed in 1996, proposing measures to address the contaminated areas. In 2001, NYSDEC revised the CWM permit to include these corrective measures, which were recently completed by CWM.

Due to potential for historical residual radiological contamination from the previous U.S. Government activities, the New York State Department of Health (NYSDOH) issued an order (4/27/72) for approximately 614 acres of former LOOW property which imposed certain restrictions on the future use of said property, until such time that the radioactive emissions were reduced to acceptable levels. On June 21, 1974, NYSDOH issued a Supplemental Order which amended the 1972 Order related to 240 acres of the property then owned by Chem-Trol.

As a result of extensive corrective remedial actions taken at the CWM property since the 1972 Order, on May 7, 1992, the DOE certified that the majority of the CWM property was "in compliance with applicable (radiological) decontamination criteria and standards" and provided "assurance that future use of the property will result in no radiological exposure above DOE criteria and standards established to protect members of the general public or site occupants". Decontamination was certified for all properties owned by CWM, with the exception of three properties designated as E, E' and G. These properties were excluded from the decontamination certification because an area within each property could not be properly assessed due to inaccessibility and the DOE could not confirm that contamination did not exist in these areas. The three inaccessible areas were (1) soil beneath Lagoon 6 and the berm surrounding that lagoon on Property E, (2) soil beneath a roadway and PCB storage tanks on Property E', and (3) soil beneath the liquid treatment pond on the western edge of Property G.

Based on the May 7, 1992, USDOE letter, on December 23, 2003, CWM requested that the NYSDOH execute an order to rescind and vacate the 1972 and 1974 Orders for all CWM property, except properties E, E' and G. After reviewing all historical documentation and data related to the areas covered by the Orders, both in the NYSDOH files and provided by CWM, the NYSDOH determined a potential for residual radiological contamination still exists and that monitoring is necessary prior to and during any excavation activities. In order to address this concern, the NYSDEC included permit condition J.1 in Module II (Corrective Action) of CWM's Sitewide Permit.

4.0 RESPONSIBLE PERSONNEL

Position	***Name***	***Site Phone#***
Project Manager	Stephen Rydzyk	716-754-0325
Site Technical Manager	Jill Banaszak	716-754-0246
Site H & S Specialist/EMT	Tim Fogarty	716-754-0331
District Manager	Richard Sturges	716-754-0230
Certified Health Physicist	Scott Davidson	412-414-6673
Site Health Physicist	Eric Olsen	716-316-3362
Site Maintenance Manager	Gary Wilczek	716-754-0240
Site Engineer	Stephen Rydzyk	716-754-0325
Environmental Monitor	Greg Zayatz	716-754-0233
Laboratory Manager/EMT	James Lis	716-754-0342

All personnel must adhere to these procedures during the performance of their work. Each person is responsible for completing tasks safely, and reporting any unsafe acts or conditions to his immediate supervisor. No person may work in a manner which conflicts with these procedures. After due warnings, the Project Manager will dismiss from the site any person who violates the safety procedures.

The Project Manager is ultimately responsible for verifying that all project activities are completed in accordance with the requirements of this HASP. The Project Manager is also responsible for providing project personnel with the appropriate information regarding the project activities to insure compliance with this HASP.

A Certified Health Physicist developed the technical health and safety aspects of this plan. The Site H & S Specialist and/or a Certified Health Physicist may be consulted at any point during the *Site Radiological Survey Plan*. The Project Manager or Site H & S Specialist is responsible for:

- Conducting on-site safety orientation for contractors/consultants (URS),
- Conducting safety audits of work activities to insure compliance with this HASP,
- Maintaining required H & S documents and records,
- Stop project activities when threshold chemical or radiological levels are reached.

All personnel must read and acknowledge their understanding of this HASP, abide by the requirements of the HASP, and cooperate with site supervision in ensuring a safe work site. Site/contractor/consultant personnel will report any of the following to the Project Manager or Health & Safety Specialist:

- Accidents or injuries, no matter how minor,
- Unexpected or controlled releases of chemical substances,
- Symptoms of chemical or radiological exposures,
- Unsafe or malfunctioning equipment,
- Changes in site conditions that may affect the health and safety of project personnel,
- Damage to equipment and property, and;
- Situations or activities for which they are not properly trained.

5.0 EMERGENCY CONTACT INFORMATION

Hospital/Clinic:	Mount St Mary's Hospital 5300 Military Rd, Lewiston, NY 14092, US
Paramedic:	Site Extension 200 (Emergency Number)
Fire:	Site Extension 200 (Emergency Number)
Police Department:	Site Extension 200 (Emergency Number)
Site Guard House:	Site Extension 221
Site Health/Safety ERT Incident Commander	Tim Fogarty (716) 754-0331

6.0 EMERGENCY/CONTINGENCY PLAN

Refer to Attachment A for details regarding CWM's Emergency Evacuation and Response Procedures. Summarizing the procedure:

In the event the first siren alarm is activated,

- Remain at work location unless in the immediate danger area.
- Vehicular traffic will pull as far to the right side of the road as possible and stop unless directed otherwise.
- EMERGENCY VEHICLES HAVE THE RIGHT OF WAY AT ALL TIMES
- Follow instructions of facility personnel if roads passage is obstructed.
- FACILITY TELEPHONES AND PLANT RADIOS ARE RESTRICTED TO EMERGENCY COMMUNICATION ONLY.

If the second siren is activated,

- Report to Old Transportation Garage area or Alternate Locations which are Main Plant Entrance, SPEC (Admin) Building or SPEC Building East Parking Lot
- Check in with CWM personnel to insure accountability
- Wait for further instructions from CWM.

Following initiation of emergency notifications, all personnel will remain at either Primary or Secondary Reporting Location until directed to leave by the Emergency Coordinator. No one may leave without notification to the Emergency Coordinator.

7.0 CHEMICAL HAZARDS

A variety of chemical non-radiological wastes were disposed of at the CWM Facility. However, the site has stable cover over all areas that will be assessed during this survey, which will minimize any potential for worker exposure to these wastes. Volatile and/or soil-borne exposures are not anticipated based on the presence of the cover. As a result, the typical level of protection will be Level D.

If sampling activities will take place in an area identified as having VOAs >1 ppm during the facility's RFI, chemical contamination will be expected to be present. In these areas, or if obvious chemical contamination is noted in any area (eg. odor, discoloration) CWM's Contamination Control Program (HS-1144) and Personal Protective Equipment (HS-1161) (refer to Attachment B) procedures will be followed.

During the interior building surveys and radon testing activities, field technicians will be required to adhere to the appropriate operational PPE typical worn in that area.

8.0 RADIOLOGICAL ASSESSMENT, FIELD SAMPLING AND EVALUATION

This section is specific to on-site, radiological investigation survey activities in order to conduct radiological measurements, assess those measurements, and characterize the facility so that CWM may evaluate the potential radiological exposures to employees and the surrounding community.

During survey activities, personnel from the radiological support staff will evaluate field instrument readings to determine the extent of the hazard potential based on known or suspected radionuclides present at the facility. Based on knowledge of site contaminants being from the U-238 decay chain, survey instruments will be selected based on response to gamma emissions. The usual instrumentation will be a 2" x 2" sodium iodide (NaI) detector. A graded approach to the radiation protection of personnel performing the surveys is presented in this section. Site activities may also involve collecting soil and sediment samples and the shipment of the samples to a pre-qualified laboratory for analysis.

8.1 RADIOLOGICAL ASSESSMENT

The radionuclides that are suspected to be of a concern at the Model City Facility include the following:

- Ra-226 (includes progeny through stable Pb-206)
- Th-230 (does not include any progeny)
- U-238 (includes progeny Th-234, Pa-234m and Pa-234)

In general, the radionuclides listed above are readily detectable except for the Th-230. Because of this technological shortfall, it must be assumed that the Th-230 will not exist in the absence of other more detectable radionuclides. This is a reasonable assumption since any thorium-only waste streams would include Th-232 and all associated decay products, which would emit detectable levels of gamma radiation. Because the activities addressed in this section are related to site workers, the exposure routes are limited to external exposure to radiation and internal exposure to radioactive materials by inhalation, ingestion or wounds. Site workers covered by this section are considered to be Members of the Public from an exposure control perspective. The limit for members of the public from a licensed activity is 100 mrem per year. Though these workers have been trained in radiation protection and might otherwise be considered to be radiation workers who could receive up to 5,000 mrem per year, this section covers site activities at a much lower level of risk.

If this limit is divided equally between internal and external dose, each is equal to 50 mrem. Assuming that excavation work is not the primary function of the personnel, it has been estimated that such activities would take no more than 200 hours per year, on average. Based on this amount of time, the average exposure should not exceed 50 mrem/200 hours or 0.25 mrem/hour. The field instruments consist of sodium iodide detectors and pancake Geiger Mueller (PGM) detectors. The response of these instruments, based on their manufacturer's literature, are 900 counts per minute (cpm) per urem h^{-1} and 3300 cpm/mrem h^{-1}, respectively. Therefore, the 0.25 mrem/h (which is equal to 250 urem/h) corresponds to a value of 225,000 cpm for the NaI. The corresponding equivalent for the PGM is significantly lower at approximately 800 cpm. With either of these instruments, field assessment of the exposure potential is possible.

The 50 mrem internal dose limit is addressed by a review of the published information on the regulatory Annual Limit of Intake (ALI), as set by the Nuclear Regulatory Commission in 10 CFR 20, Appendix B, and repeated in 6 NYCRR 380, Table 1. For the purpose of this Addendum, the ALI is the amount of radioactivity for a particular isotope that corresponds to a dose to a person of 5 rem per year (5,000 mrem). Therefore, 1% of the ALI is equal to 50 mrem. The ALIs for these radionuclides, based on assumed conditions of equilibrium and implied radionuclides present are:

TABLE 8-1

	Regulatory Levels (ALI)		**Allowable Intake (1% of ALI)**	
Parent Radionuclide	***Ingestion (µCi)***	***Inhalation (µCi)***	***Ingestion (µCi)***	***Inhalation (µCi)***
Ra-226	0.4	0.05	0.004	0.0005
Th-230	4	0.006	0.04	0.00006
U-238	9.6	0.04	0.096	0.0004

It is important to observe that the above values reflect the assumption that Ra-226 is in equilibrium with its progeny through to stable lead and that U-238 is in equilibrium with Th-234 and Pa-234m/Pa-234. Very little additional U-234 would be added from the U-238. Th-230 decays to Ra-226 but very little additional Ra-226 would be present from decay of Th-230. The ALIs were calculated as mixtures as discussed in 10 CFR 20 Appendix B.

The annual level of effort of 200 hours of work at 8 hours per day corresponds to 25 days. The ingestion of soil incident to excavation work is assumed at a rate of 400 mg per day. The total amount of soil ingested in 25 days would be 10 grams. Using 1% of the lowest ingestion ALI (Ra-226), this corresponds to 0.004 uCi/10 grams or 0.0004 uCi/g. This is also equal to 400 pCi/g. The dose rate from a small patch of (~1 ft^2) soil 15 cm deep at only 40 pCi/g of Ra-226 is about 13 urem/h at 6"; a 1 m^2 area at this concentration would result in a dose rate of ~44 urem/h. These are a very detectable condition that is readily identifiable by the radiological control staff. U-238 and its progeny (discussed above) will result in a 10% higher dose rate than this. Elevated readings at these concentrations would be investigated and would be within the level of risk assumed for this phase of work.

The lowest inhalation ALI is for Th-230, with an allowable inhalation uptake of about 60 pCi for a dose of 50 mrem. Dust is generally controlled when it is visible, which is at approximately 5 mg/m^3. An inhalation uptake of 60 pCi over an exposure period of 200 hours would correspond to a soil concentration of about 50 pCi/g. It is unlikely that Th-230 would exist by itself, but would instead be associated with Uranium-238 decay chain members, including Ra-226, or would be present with processed thorium, which would consist predominantly of Th-232. It is therefore likely that gamma-emitters would be present in sufficient concentrations to indicate Th-230.

Observing that the Ra-226 ALI is a factor of 8 greater than that for Th-230 indicates that the corresponding soil concentration would also be a factor of 100 times greater, or 400 pCi/g to reach the inhalation dose limit.

A worker exposure of 50 mrem over 200 hours is an average of 250 μrem/hr, which would correspond to a concentration of about 350 pCi/g for the Ra-226. This would be below the action level based on allowable soil ingestion (1,500 pCi/g) and that for inhalation (5,000 pCi/g). The external dose criterion is thus the controlling level for allowable worker dose. As discussed above, this corresponds to a NaI instrument response of about 225,000 cpm, as compared to a nominal background of 10,000 cpm.

8.2 ACTION LEVELS

The limiting concentrations identified above are based on an assumed exposure period of less than 200 hour per year for the excavation workers that could result in a worker dose of 50 mrem. Survey activities at FUSRAP sites in Western New York have identified 16,000 cpm for a 2x2 NaI detector as roughly corresponding to soil investigation levels. Therefore, administrative levels are established to protect workers and minimize the potential for exceeding the non-radiation worker dose limit of 100 mrem/yr.

The first administrative limit is based on reducing exposure to soil above the FUSRAP investigation limits. During soil disturbance activities, ie. sampling, if soil screening measurements exceed 16,000 cpm, then workers should don full Level D PPE, and dust suppression should be used to limit levels to less than 5 mg/m3. Alternatively, the crew can implement Level C PPE in the investigation area. This level (16,000 cpm) corresponds to the FUSRAP survey investigation level and is also about 10% of the external dose rate limit.

A second administrative limit is set at 110,000 cpm, about 50% of the external dose rate limit plus background. If readings exceed 110,000 cpm, then sampling work will cease, and the area will be secured in a safe and orderly manner. An area-specific plan will be developed to respond to this contamination. While the level of contamination suggested by such instrument readings does not pose a significant risk to workers, the concentrations of radionuclides associated with those radiation levels are not expected for the Model City site, and should be dealt with in an appropriate and planned manner.

8.3 SUMMARY

Qualified personnel will perform radiation surveys in accordance with the *CWM Site Radiological Survey Plan* (September, 2005). These surveys will be done using appropriately calibrated 2" x 2" sodium iodide detectors. In the event that elevated levels above 16,000 cpm are found, the field technician will flag the location and document the measurements in the daily logbook. In addition, the field technician will notify the Project Manager (PM) of the findings so that the PM may perform additional non-soil disturbance evaluations. In the event that elevated levels above 110,000 cpm are found, the field technician will flag the location, leave the immediate area and contact the PM immediately. The PM will notify the CWM Project Manager in order to restrict site personnel from this area. All activities will be documented in the daily logbook. The field technician will follow the decontamination procedures as outlined in Section 14.0 of the HASP. During soil sampling events in elevated areas, and based on a nominal background rate of 10,000 cpm, the following action levels will be implemented:

TABLE 8-2

SURVEY LEVEL	ACTION
≤16,000 cpm	Level D
>16,000 cpm, but <110,000 cpm	Level D and dust suppression to 5 mg/m3. Level C respiratory protection can be used in the excavation area in lieu of dust suppression
≥110,000 cpm	Cease operations and secure site. Prepare area-specific work plan.

9.0 PHYSICAL HAZARDS

Physical hazards will be present during field activities. Common physical hazards include sampling, mechanical hazards, slip-trip-fall hazards associated with the field environment; hazards associated with weather conditions and musculoskeletal injury from lifting tasks. The typical physical hazards anticipated being present on the site and the methods for preventing injury to these hazards is described below.

Sampling – radiation exposure will be minimized by ensuring that personnel are experienced in the task, thus reducing their time in the area. Personnel protective equipment will be used to prevent skin contamination.

Noise – not anticipated to be a hazard on this project.

Slip-Trip-Fall Hazards - Slip-trip-fall hazards are common at field sites due to slippery or unstable surfaces, and due to the sloped surfaces on the site. While it is difficult to eliminate all slip-trip-fall hazards, implementing safe work practices, and using proper footwear will minimize risk of injury.

Lifting Hazards - Field operations often require the performance of laborious tasks. All employees must implement proper lifting procedures, such as keeping the load close to the body, and using leg muscles instead of back muscles to perform lifting tasks. Additionally, employees will not attempt to lift large, heavy, or awkwardly shaped objects without assistance.

Weather - Weather conditions are an important consideration in planning and conducting site operations. Extremely hot or cold weather can cause physical discomfort, loss of efficiency and personal injury.

Lightning may accompany storms, creating an electrocution hazard during outdoor operations. To eliminate this hazard, weather conditions will be monitored and work suspended during electrical storms.

Cold stress is not anticipated to be a concern during these operations, which are expected to take place during the summer and fall months. Heat stress is anticipated to be a concern during these operations.

Underground Utilities – No ground-penetrating activities for the gamma walkover survey are anticipated which would necessitate the location of buried utilities. In the event that utilities may be present during sampling or excavation activities, the established CWM policies and procedures for an Excavation Permit will be followed.

Overhead Hazards - Overhead power lines do not pose a danger during the task of the gamma walkover survey and associated sampling activities. CWM procedures for working near or beneath overhead lines will be followed..

Work Area Protection - Various tasks related to site survey may be undertaken in a roadway and motor vehicles may be a hazard. Personnel are to wear high visible vests and utilize orange construction cones and barriers when working in traffic areas.

10.0 BIOLOGICAL HAZARDS

Biological hazards will be present during field activities. In particular, these will be more abundant when the ground cover is thicker but in general, biological hazards may even be present when there is little ground cover. This includes but may not be limited to ticks and spiders, poisonous plants and snakes.

Be careful to wear long sleeved shirts and pants. Pant cuffs may be tucked into a boot if needed. Apply insect repellant and use caution when removing any ticks that are imbedded in skin.

Venomous snakes are best left alone. None of our species are particularly aggressive animals, but they will attempt to bite when handled. Insects (mosquitos, wasps and bees) should be avoided if noticed in areas that are to be scanned.

Ticks do not jump, crawl or fall on a person but are picked up when clothing or hair brushes a leaf or other object the tick is on. Poisonous plants should be recognized and avoided.

11.0 MONITORING EQUIPMENT

The following monitoring equipment will be used for health and safety purposes during field activities:

Meters

- Ludlum Survey Meter Model 3 (or equivalent)
- Ludlum Model 2221 (or equivalent)

Detectors

- Ludlum GM Pancake Probe Model 44-9 (or equivalent)
- Ludlum Model 44-10, 2"x2" NaI(Tl), (or equivalent)

The monitoring equipment will be calibrated in accordance with the manufacturer's instructions. In addition, the results of daily instrument calibration checks or calibrations shall be logged in the field logbook.

12.0 ACTION LEVELS

Field investigations will be initiated in Level D PPE, which includes the use of work boots, and safety glasses, hard hats, long sleeve shirts and long pants during survey activities. As the work progresses, the Project Manager or Site H & S Specialist may elect to increase the required level of PPE to Level D with dust suppression or the addition of Level C respiratory protection, or stop work if on-site monitoring indicates that any of the action levels presented in Table 8-1 are exceeded. Respiratory protection will be used when airborne contaminants, either radioactive material or chemicals, exist at levels that require personnel protection that cannot otherwise be provided. Monitoring results that exceed the action levels will be recorded in the field log book by the Site H & S Specialist or Certified Health Physicist representative. Cotton coveralls or tyvec suits may be used for field sampling. Work gloves are not required unless physical hazards are expected (e.g., pinch hazard).

13.0 SITE CONTROL

Active areas of the site are secured by fencing and gated access. All visitors and workers will sign in and sign out at the Guard Station which is maintained by CWM Access to the area of small project excavation will be limited to the project team. If a reading greater than 16,000 cpm is obtained, access will be limited to necessary personnel only. If a reading greater than 110,000 cpm is obtained, a barrier or other warning device will be established to restrict access to the project area pending further review with the Health Physicist and the agencies.

14.0 DECONTAMINATION PROCEDURES

It is not anticipated that workers will become contaminated to a level that warrants their decontamination. If workers have come into contact with soil above the action levels, they will frisk or be frisked with the GM probe using a criterion of 100 counts above background (ccpm). If contamination is on shoes an attempt to reduce radioactivity levels may consist of the use of a boot wash. If the levels persist above the 100 ccpm, the PPE will be placed into a steel drum or other container and staged in a location designated by CWM. After sampling and prior to eating, drinking, smoking, chewing, or the use of cosmetics, workers will wash their hands and face thoroughly.

If the monitoring instrument readings indicate a radiological hazard, the following steps will be followed whenever personnel leave the work area. The following may be altered by the Certified Health Physicist as conditions necessitate:

1. Don two pairs of removable gloves if not already in place.
2. Place bag over boot if contaminated.
3. Untie boot and step out of boot, while keeping it in its bag.
4. Remove outer gloves; discard in provided container
5. Remove Tyvek® or cotton coverall; discard in provided container.
6. Remove inner gloves.
7. Re-scan for contamination. Health physicist/technician to assist.
8. Wash hands and face with wet wipes or damp towels. Discard of wipes in provided container.

Deviations from this process will be noted in the field logbook. All spent decontamination fluids (rinse waters, etc.) shall be handled as directed by the Field Manager and in accordance with relevant regulations.

15.0 PERSONNEL PROTECTIVE EQUIPMENT

Typical Personnel Protective Equipment to be utilized by field personnel during the survey and sampling activities include the following:

- ANSI-Approved Safety glasses with side shields (or goggles) for sampling
- ANSI-Approved Hard hat when overhead hazards are present

- Ordinary coveralls (e.g., cotton) (Tyvek® may be substituted)
- Ordinary work gloves (e.g., leather) when pinch hazards are likely
- Hiking boot with ankle support or ANSI-Approved Steel-toe, steel-shank work shoes or boots with ankle support. Soles should be appropriate for field conditions with sloped hills.

In the event that site conditions change, or specified radiological or chemical contamination action levels are approached, the Site Safety Specialist or Health Physicist may increase the PPE level to C or higher if necessary.

16.0 HAZARD COMMUNICATION

Chemicals will not be required for site work; therefore, Material Safety Data Sheets (MSDSs) will not have to be provided. Requirements for an initial safety meeting and daily safety meetings ("tailgate" meetings) are presented in the Accident Prevention Plan (Attachment C) and Activity Hazard Analysis (Attachment D).

17.0 SUBSTANCE ABUSE POLICY

Contractor/Vendor shall disseminate to its employees, agents and subcontractors the following text of the CWM Chemical Services, LLC. Substance Abuse Policy as follows and require such persons and their employees to abide by the terms of such policy:

CWM Chemical Services, LLC. is vitally concerned with the safety and well-being of the employees of its contractors. Therefore, it is important for you to be aware of CWM's policy regarding alcoholic beverages and controlled substances:

The use, possession, sale, transfer, or purchase of alcoholic beverages and controlled substances on the work site is prohibited.

"The work site" means any property or facility under the control of CWM wherever located, including land, buildings, structures, installations, cars and trucks.

"Controlled substances" means any drug or other ingestible, inhalable, or injectable substance for the use, sale, or possession of which is prohibited or restricted by law except drugs prescribed for the user by a licensed physician.

"Use" means ingesting, inhaling, or injecting alcoholic beverages or controlled substances either during the time an individual is present on the work site or within such time prior to entering upon or returning to that his or her coordination, visual perception, or reaction time is, or is likely to be, affected by such beverage or substance.

Entry into the work site constitutes consent to inspection of the individual's person and his or her personal effects upon entering or while remaining present on the work site. Any Individual who is found in violation of this Substance Abuse Policy or who refuses to permit inspection is subject to be removed and barred from the work site at the discretion of CWM.

REFERENCES

MARSSIM, 2000. *Multi-Agency Radiation Survey and Site Investigation Manual*, EPA 402-R-97-016, USEPA, August 2000

CWM Chemical Services, LLC, Model City, New York 14107, Safety Procedures and Requirements for Outside Contractors

CWM Chemical Services, LLC, Model City, New York 14107, Major Emergency Evacuation and Response Procedures

CWM Chemical Services, LLC, Model City, New York 14107, Standard Division Practices

CWM Chemical Services, LLC, Model City, New York 14107, Health & Safety Manual

Golder Associates, CWM RCRA Facility Investigation, 1992

URS Corporation, Gamma Walkover Survey Site Safety and Health Plan for CWM Chemical Services, LLC. and Addendum, August 2005

Shaw Environmental Services, Site Wide Radiological Investigation Plan, April 2005

Shaw Environmental Services and CWM Chemical Services, LLC, Site Wide Radiological Investigation Plan, September 2005

CWM Chemical Services, LLC, Model City, New York 14107, Contingency Plan

ATTACHMENT A

CWM MAJOR EMERGENCY EVACUATION AND RESPONSE PROCEDURE

Major Emergency Evacuation and Response Procedure

The primary purpose of this procedure is the accurate accounting of every person within the CWM Chemical Services, LLC. Model City facility.

In the event of an emergency, the Emergency Sirens will be sounded for two (2) minutes. When the sirens are activated, the following procedures shall be in effect:

1. Emergency Response Team Personnel will report to the Response Unit Garage (Team members should, if possible, notify their Supervisor, that they are reporting to the Response Unit Garage).

2. Department Supervision will be on an alert status. Supervisors will determine the location of their personnel and be prepared to account for them.

3. <u>All</u> other Facility Personnel will remain at their work location unless they are within the immediate danger area.

4. All vehicular traffic will pull as far to the right side of the road as possible and stop until directed otherwise. This includes facility equipment, Contractors, Drivers and Visitors.

5. <u>EMERGENCY VEHICLES HAVE THE RIGHT-OF-WAY AT ALL TIMES</u>.

6. Facility personnel will keep roads clear of any equipment and have the authority to direct non-plant personnel to stop and/or clear the road.

7. **DURING AN EMERGENCY, FACILITY TELEPHONES AND PLANT RADIOS ARE RESTRICTED TO EMERGENCY COMMUNICATIONS ONLY.**

IN THE EVENT THE POSSIBILITY OF EVACUATION BECOMES NECESSARY, THE EMERGENCY SIRENS/ALARMS WILL BE SOUNDED FOR A SECOND TWO (2) MINUTE INTERVAL. WHEN THE SIRENS ARE ACTIVATED FOR THE SECOND TIME, THE FOLLOWING PROCEDURE WILL BE IN EFFECT:

1. Everyone not engaged in the emergency response <u>MUST</u> report to:

Primary Facility Site	Scalehouse / Roll off Garage
Alternate Locations	Plant Main Entrance Gate (1550 Balmer Road) SPEC (Admin) Building SPEC Building East Parking Lot

2. Guard will fax to scale house all on-site contractors and drivers list. Guard will also transmit current list of all CWM Personnel to Scalehouse. Scales individual will obtain lists and assist CWM designee who is responsible for the site head count.

3. Operations Manager and Department Supervisors not involved in response – are responsible for recording all persons reporting to the site primary or secondary reporting location (Current employee and contractor list will be available at the Scalehouse/Roll-off Garage).

4. CWM employees will line up inside the Roll-off Garage. Contractors will gather at the west side of the Roll-off garage.

5. Department Supervisors are responsible for an accurate account of individuals from their respective Department.

6. Supervisors are responsible for checking and clearing their work areas of Contractors, Visitors, Truck Drivers, etc.
7. The Emergency Coordinator or designee is responsible for coordinating Search and Rescue Operations for unaccounted individuals.

8. No CWM or private vehicle will obstruct emergency response equipment or emergency operations.

9. All personnel will remain at the Primary or Secondary Reporting Location until directed to leave by the Emergency Coordinator.

10. No one will exit the facility without giving notice to the Emergency Coordinator or designee.

Department supervision shall have a prearranged plan established for SECURING vital records and/or process shut-down procedures.

CONTRACTORS

In addition to following the Evacuation Plan, Contractors may be requested by the Emergency Coordinator to assist with heavy equipment.

LANDFILL SUPERVISION

When the second siren alarm is sounded, Supervision will shut down all landfill operations immediately. No one will remain in the landfill, i.e., truck drivers who may wish to continue unloading. All individuals, including truck drivers, will be directed or provided with transportation to the Primary or Secondary Site Reporting Location.

TRUCK DRIVERS/BROKERS

Truck Drivers/Brokers who are in the process of unloading trucks when the second siren alarm is sounded will immediately shut off their truck engine, secure records and report to the Primary or Secondary Site reporting Location for further directions.

GUARD HOUSE

The Security Guard will **NOT ALLOW ANYONE** to enter the facility during a major emergency except Emergency Equipment/Personnel, and CWM Supervision. NYSDEC and USEPA Representatives will only be admitted upon approval of the Emergency Coordinator or Engineering and Environmental Manager or Health & Safety Manager or General Manager.

ADMINISTRATION BUILDING AND ENVIRONMENTAL MONITORING PERSONNEL

Personnel in the SPEC Center (Administration Building) and environmental monitoring personnel will evacuate to the Spec Center East Parking lot. The Environmental Compliance Specialist or Designee is responsible for recording all personnel who report to the SPEC Center Parking Lot. This individual will notify the Emergency Coordinator by radio the status of the personnel recording list. The list of SPEC Center current employees utilized for head count purposes will be posted in the SPEC Center Mail Room.

COMMUNICATIONS

The SPEC Center telephone person will maintain open outside telephone lines for emergency use. Two way radio communications will be established as quickly as possible from the response incident site to the Emergency Coordinator & Operation Center.

TESTING

Testing of the siren(s) for operation will normally be conducted at 12:00 noon every Wednesday of each month. No response by any personnel is needed.

ATTACHMENT B

CONTAMINATION CONTROL PROGRAM (HS-1144) & PERSONAL PROTECTIVE EQUIPMENT (HS-1161) AND ACTIVITY HAZARD ANALYSIS

1.0 PURPOSE:

1.1 This program describes the contamination control procedures within the CWM Model City Facility. The intent of the program is to minimize and control the spread of contamination within the facility, and to prevent accidental chemical contact to employees and visitors of the facility.

2.0 SCOPE

2.1 This procedure applies to CWM Chemical Services, Inc. employees that enter work areas where the potential for contact with hazardous substances exist.

3.0 RESPONSIBILITY

3.1 CWM Health & Safety Manager is responsible for overall administration of the Contamination Control Program.

3.2 CWM Health & Safety Manager is responsible to insure employees are trained and understand all conditions of this program.

3.3 CWM Operations Manager is responsible for insuring that employees understand the necessity of complying with this program.

3.4 All employees have the responsibility to adhere to all conditions stated in this program

4.0 DOCUMENTATION/FORMS

4.1 Attachment #1, List of Standard Division Practices affecting contamination control.

4.2 Attachment #2, Personal Protective Equipment Debris and Contaminated Equipment Disposal.

5.0 DEFINITIONS OF CONTAMINATION CONTROL AREAS

5.1	Clean Area	Chemical contamination is not expected to be present.
5.2	Controlled area	Chemical contamination may be present due to residual contamination from past spills, leaks, or from contact with contaminated equipment or shoes. Processes within the controlled areas are enclosed or controlled to minimize employee exposure and spillage.
5.3	Exclusion area	Chemical contamination is likely to be present due to the nature of the operation(s) within the area.
5.4	Transition area	Area where personnel leaving an exclusion area remove potentially contaminated clothing or decontaminate their protective equipment.

6.0. CONTAMINATION CONTROL AREAS

6.1	Clean areas	Administrative offices, lunchroom, heavy equipment and facility maintenance shops, plant entrance thoroughfares.
6.2	Controlled areas	Drum Handling Building; Aqueous Treatment Building; Truck Wash; Fuels Area; PCB Warehouse, Oil/Water Separator - SLF 1-6 and SLF 12; Tank Containment - Tanks 101-103.
6.3	Exclusion areas	Stabilization Facility; T/O Building; SLF's 1-6, 7, 10, 11, 12; RMU-1; Salts Area - North, East, West; Aqueous Treatment; Lagoons - 1, 2, 5, 6, 7; excavation in Process Area + other areas identified as > 1 ppm VOAs in RFI
6.4	Transition areas	Access areas to exclusion areas; Stabilization Facility; T/O Building; SLF's 1-6, 7, 10, 11, 12; Salts Areas - North, East, West; Aqueous Treatment; Lagoons - 1, 2, 5, 6, 7

7.0 PROCEDURES GOVERNING CONTAMINATION CONTROL AREAS

7.1 Clean areas

7.1.1 All forms of protective equipment with the exception of hard hats, safety glasses, and safety shoes are prohibited from clean areas.

7.1.2 Process or waste samples are prohibited from being stored or handled in clean areas.

7.2 Controlled areas

7.2.1 Controlled areas are delineated by signs at building or operations entrance locations which:
1) specify personal protective equipment requirements.
2) specify that entrance is limited to authorized personnel only.

7.2.2 Safety glasses, hard hat, and safety shoes shall be worn by all individuals entering the controlled areas. Additional protective equipment may be required in controlled areas as defined in the CWM Chemical Services Health & Safety Program: MDC HS-1161, "Personal Protective Equipment".

7.2.3 Disposable protective equipment used for specific operations within the controlled areas shall be disposed of in designated receptacles before entering clean areas of the facility. Receptacles are located at entrance/exit locations of the Stabilization Facility; Drum Handling Building; Aqueous Treatment Building; Truck Wash; Fuels area; PCB Warehouse and RMU-1.

7.2.4 Reusable protective equipment shall be decontaminated after use and stored in designated locations. Reusable Personal Protective Equipment items that may require decontamination include hard hats, safety glasses, respirators, gloves and boots.

A cloth or brush shall be used to remove surface contamination. Cleaning is considered complete when visible signs of contamination are removed.

7.0 PROCEDURES GOVERNING CONTAMINATION CONTROL AREAS (cont):

Respirator cleaning shall be accomplished as specified in the CWM Chemical Services Health & Safety Program, #38 Respiratory Protection.

PCB contaminated articles shall be cleaned with an organic solvent such as kerosene.

Decontamination of highly contaminated articles or articles contaminated with extremely toxic materials shall be performed as prescribed by the CWM Health and Safety Manager or Laboratory Manager on a case-by-case basis.

7.2.5 All equipment in the controlled areas shall be decontaminated prior to removal for maintenance activities or before maintenance activities are performed on the equipment in the controlled areas. This equipment includes but is not limited to pipes, pumps, tanks, filters and hoses.

7.3 Materials from the controlled areas of the plant shall be discarded by placing the items in designated site containers destined for proper disposal.

7.4 Employees and visitors leaving the controlled areas should wash their hands and face before engaging in other activities.

7.5 Employees and visitors leaving the controlled areas shall remove loosely bound contaminated material from their shoes or boots before entering the clean area. Shoe/boot cleaning stations are located in the Aqueous Treatment Building; Stabilization Facility and RMU-1 entrance/exit area.

8.0 EXCLUSION AREAS

8.1 Safety glasses, eye protection and safety shoes are the minimum protective equipment required in the exclusion areas. Additional protective equipment may be required in the exclusion areas as defined in the CWM Chemical Services Health & Safety Program, MDC HS-1161 "Personal Protective Equipment".

8.2 Disposable PPE worn in the exclusion areas shall be removed and placed in the proper receptacle in the transition area before entering the clean areas of the plant. Refer to Attachment 2 Flow Sheet.

8.3 Reusable protective equipment shall be decontaminated after use and stored in designated locations.

Reusable Personal Protective Equipment items that may require decontamination include hard hats, safety glass, respirators, gloves and boots.

A cloth or brush will be used to remove surface contamination. Cleaning is considered complete when visible signs of contamination are removed.

Respirator cleaning will be accomplished as specified in the CWM Chemical Services Health & Safety Program, MDC HS-1162 "Respiratory Protection".

PCB contaminated articles shall be cleaned with an organic solvent such as kerosene.

9.0 WORK PRACTICES TO MINIMIZE OR ELIMINATE POTENTIAL EXPOSURE TO HAZARDOUS MATERIALS

9.1 Division Standard Operating Procedure include work practices to minimize or eliminate potential exposure to hazardous materials. Refer to Attachment #1.

10.0 PROCEDURES TO ASSURE VISITORS AND CONTRACTORS ARE ADEQUATELY PROTECTED FROM POTENTIAL CONTAMINATION

10.1 CWM Health and Safety Procedure MDC HS-1105, "Visitor Safety Program"; and MDC HS-1105.1, "Contractor Safety Procedure", address procedures to assure visitors and contractors are adequately protected from potential contamination.

11.0 PROCEDURE TO HANDLE CONTAMINATED PERSONNEL OR EQUIPMENT DURING EMERGENCIES

11.1 Decontamination is required for all personnel that enter an emergency contaminated zone. All personnel exiting the contaminated zone must decontaminate at the perimeter of that zone, in order to minimize the exposure of uncontaminated employees.

11.2 Decontamination shall be accomplished by removing or decontaminating all personal protective equipment that could have come in contact with a potential contaminated material. The PPE must be discarded or decontaminated using the decontamination protocol specified in this procedure and the Division's Contingency Plan.

12.0 CLEANING AND DECONTAMINATION OF VEHICLES PRIOR TO PERFORMANCE OF MAINTENANCE, ANNUAL TESTING, OR REMOVAL FROM ACTIVE AREAS

12.1 Standard Division Practice #2021, addresses cleaning and decontamination of vehicles exiting the landfill.

13.0 MISCELLANEOUS PROCEDURES

13.1 Spills in the facility will be cleaned up as quickly as possible according to the procedures described in the CWM Chemical Services Facility's Contingency Plan; Spill Prevention, Control and Counter Measures Plan and PCB Spill Cleanup Policy.

13.2 Leaks and spills shall be reported to the supervisor on duty as soon as possible after they are discovered.

13.3 All company supplied clothing worn in the controlled areas of the facility shall be removed before leaving the premises and placed in the "dirty" clothes receptacle located in the Employee Locker Room.

13.4 For personnel assigned a locker in the Employee Locker Room, safety shoes shall be removed before leaving the premises and stored in the employees "dirty" locker section of the Employee Locker Room.

13.5 Reusable protective equipment shall be frequently inspected. It shall be discarded if the contamination is likely to cause employee skin contact with the contaminants or if the integrity of the protective equipment appears to be compromised.

14.0 LOCKER ROOM FACILITIES

14.1 The locker room is divided into two (2) basic sections, a clean and dirty area. Lockers are provided in each section for individual storage of street clothes (clean section) or work clothes (dirty section). Employees will park their personal vehicle in the north parking lot and enter the locker room through the north entrance door.

14.2 Individuals will proceed to the locker room clean section where they will store their street clothes in assigned lockers, then progress to the locker room dirty section where again each employee is assigned a locker for the change into work uniforms. Individuals will exit through the south exit door and be transported by company vehicle to the site operations. When returning to the locker room from the site, entrance will be through the south entrance door into the dirty locker room section.

14.3 Showers are located in the dirty section. Only toiletry items are allowed in the shower room drying area. Soiled work uniforms should be placed in hampers located in soiled laundry room area. Clean uniforms are available from linen lockers located in the main laundry room.

14.4 Contaminated Personal Protective Equipment, i.e, coveralls, boots, etc. MUST be disposed of in the appropriate work area. NO CONTAMINATED PPE WILL BE TAKEN INTO THE LOCKER ROOM. A boot wash is located inside the south entrance door to the dirty section. Soiled boots must be cleaned before transporting them in the locker room area. Eating is prohibited in ALL areas of the locker room and smoking is permitted only in the clean section of the locker room.

15.0 POTENTIAL FOR SPILLS

15.1 There are several operations within the facility which have the potential for spills if not performed properly. The CWM Chemical Services Standard Division Practices for these operations follows; refer to Attachment #1.

16.0 FUGITIVE DUST CONTROL PLAN

16.1 Fugitive dust control shall be accomplished as specified in the Site Wide NYSDEC Permit #373, Section "J".

ATTACHMENT #1

STANDARD DIVISION PROCEDURES	NUMBER
Sampling of Solids and Semi-solids in Drums and Pails	2001
Sampling of Liquids and Sludges in Drums and Pails	2002
Sampling Tankers	2003
Sampling of Bulk Solids and Semi-Solids	2004
Sampling Liquid Fuel Tanks	2005
Sampling Aqueous Tanks	2006
Bulk Liquid Tank Truck Unloading	2019
Cleaning and Decontamination of Vehicles Exiting Landfill	2021
Taking Fuel Tank Level Measurements	2034
Transformer Handling	2044
Transformer Draining and Flushing	2045
Disposal and Stabilization of DuPont Sodium Waste	2046
Measuring Landfill Leachate Levels	2055
Monitoring Caustic Levels and Concentrations in the Aqueous Treatment Scrubber	2061
Removal of Accumulated Rainwater From Containment Areas	2063
Leachate Collection Pit Transfer	2064
Operation of the SLF-12 Oil/Water Separator System	2067
Operation of the Mechanized Stabilization Process Train	2068
Stabilization Using Backhoe and Roll-off Box	2069
Cleaning of the Mechanized Stabilization Process Train	2078
Stabilization of PCB Wastes	2079
PLC Decant of Fuels Materials	2080
Stabilization of Wastes in Dump Trucks and Trailers	2081
PLC Decant of Aqueous Materials	2082
Landfill Disposal of Asbestos Material	2083
Stabilization of Asbestos Wastes	2085
Sampling of Stabilized Residuals	2092
Tank to Tank Product Transfer	2110
Bulk Tank Truck Loading	2111

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11/19/96

MODEL CITY's SDP's

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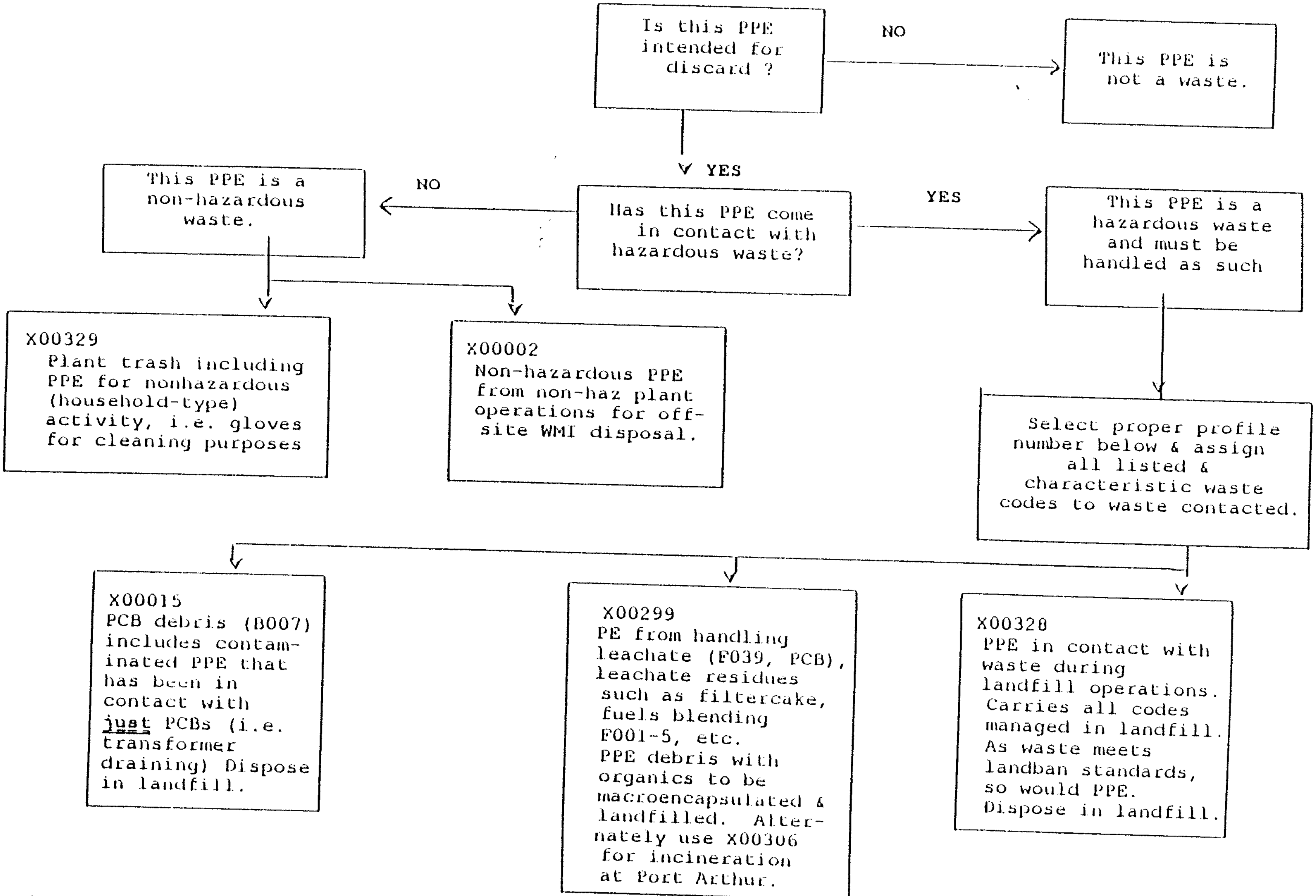
PPE[1] Characterization and Disposal



E includes all types of equipment including tyveks, respirator cartridges, gloves, etc..

ppedisp4.flw

Updated: 08/18/95

MODEL CITY FACILITY	Title: Personal Protective Equipment	Date: Apr 1997 Page: 1 of 11
		Revision Date: April 2005
	MDC HS-1161	Supersedes: Aug 1999
Health and Safety Program	Approval: [signature]	Title: District Manager

1.0 PURPOSE

This procedure defines the minimum CWM Chemical Services, L.L.C. requirements and responsibilities for the implementation of CWM personal protective equipment programs designed to protect employees from hazards during the performance of work activities.

2.0 SCOPE

This practice describes the minimum PPE that must be donned prior to entering specific work areas at the CWM Chemical Services, L.L.C., Model City, NY facility. It also includes the minimum PPE required to perform various jobs or tasks. Depending upon the hazard and/or the job, it may be necessary to don additional PPE. Personnel will be informed of additional PPE requirements through Material Safety Data Sheets (MSDSs), Waste Profile Sheets, Standard Division Practices and work area supervisors.

3.0 PROGRAM RESPONSIBILITIES

3.1 Safety Specialist is the personal protective equipment administrator and has the responsibility to:

3.1.1 Coordinate the program.

3.1.2 Ensure that annual training is conducted in accordance with Section 8 of this Program.

3.1.3 Review the program annually.

3.1.4 Safety Specialist is responsible for maintaining the site PPE inventory control program.

3.1.5 Safety Specialist is responsible for the purchase of PPE, including respiratory protection.

3.2 Supervisors are responsible for informing workers of the personal protective equipment requirements within their department/area. The supervisor will also ensure that workers have been instructed in the proper donning, wearing, removal and the cleaning or disposal procedures for such equipment, and that the worker has understood the instructions. The supervisor will provide additional instructions, as needed.

3.3 Supervisors are responsible for ensuring employees have no facial hair which will interfere with a proper respirator face seal.

3.4 Workers are responsible for properly donning, wearing, removing, cleaning, and disposing of the required protective equipment.

3.5 Project Engineers/Contact Person are responsible for ensuring that contractors provide their own protective equipment as specified in the Division's "Contractor Safety Procedure", MDC HS-1105.1 and wear protective equipment as specified in this Program.

4.0 GENERAL REQUIREMENTS

Personal Protective Equipment (PPE) refers to the broad category of safety equipment into which is placed virtually any wearable item designed to protect the worker. Subcategories of PPE would include, but are not limited to: chemical protective clothing, respiratory protection, head and eye protection, hearing protection, and special hazards equipment such as life-lines and harnesses, cooling vests, hot work clothing, and others. The requirements for CWM's "Respiratory Protection Program", are described in Health and Safety Program procedure under MDC HS-1162. Selection and use requirements for hearing protectors are described in Health and Safety Program Procedure under MDC HS-1123, "Hearing Conservation". Guidelines for the selection and use of chemical protective clothing are provided in "Guidelines for the Selection of Chemical Protective Clothing" published by the American Conference of Governmental Industrial Hygienists (ACGIH).

4.1 CWM employees shall only use personal protective equipment supplied by the company.

4.2 Visitors will be supplied with the following personal protective equipment as outlined in the Division's Health & Safety Program, "Visitor and Contractor Safety", MDC HS-1105.

4.3 Disposal of PPE and cleaning of reusable PPE is governed by the procedures specified in the Division's Health & Safety Programs for "Respiratory Protection Program", MDC HS-1162, and "Contamination Control Program", MDC HS-1144. Disposal of PPE should be in accordance to SDP 3001 Site Generated Waste.

4.4 Written procedures governing the safe use of PPE that might be required in an emergency are contained in the division's Health & Safety Program, "Guidelines & Procedures for Hazardous Material Emergencies", MDC HS-1181.1, CONTINGENCY PLAN. SPCC PLAN, SPILL ABATEMENT, etc.

5.0 GENERAL CLOTHING (WORK UNIFORM)

5.1 Shorts are prohibited and employees must wear clothing which covers the upper portion of the body and arms.

5.2 Long-sleeved shirts and long pants, are required for employees working on the active areas of the facility and in the Maintenance and Heavy Equipment shops.

5.3 Long sleeved shirts may be turned up to just below the elbow when doing so either: does not jeopardize the protection of the employee (e.g. driving through the active areas of the facility), provides the employee greater protection (e.g. when the sleeves of the uniform may interfere with the task being performed) or when employee protection is provided through another means (e.g. tyvek coverall sleeves extend well into employees gloves).

6.0 EYE AND FACE PROTECTION

The following shall be used to assist in the selection of eye and face protection:

6.1 Selection of eye and face protection will conform to ANSI Standard, Z87.I-I989 and OSHA 29 CFR I9I0.I33.

6.0 EYE AND FACE PROTECTION

6.2 Minimum eye protection consists of spectacles with industrial safety lenses and half side shields. In addition, suitable eye and face protectors will be provided as specified in the Task/Area PPE Requirement Sheets.

6.3 Eye protection (safety glasses with side shields) are required to be worn at all times while on the site other than in offices, the SPEC center (including parking lot), break and lunch rooms, entering and leaving employee's work station (including from a vehicle to an office), at the beginning and end of shift, etc.

6.4 Prescription safety glasses with side shields shall be provided to employees requiring corrective lenses.

6.5 Eye Protection for contact lens wearers shall be selected using the same criteria as for individuals not wearing contact lenses to ensure protection against the anticipated hazard (e.g. eye protection for handling of liquids posing a chemical splash hazard must include splash goggles, full-face shield or full-face respirator). Contact lenses may be worn when wearing a full-face respirator. Personnel shall not be allowed to wear contact lenses in dusty environments (e.g., landfills, stabilization buildings).

6.7 Face shields do not provide adequate eye protection and shall not be worn as a substitute for full face piece respirators.

The use of a full face piece air purifying full face piece supplied air respirator or a half face piece air purifying with chemical goggles shall be worn when chemical liquid splashing may occur.

7.0 PROTECTIVE HEADWEAR

7.1 All head protection (hard hats) will comply with ANSI Standard Z89.I-I997 and OSHA Standard 29 CFR Part I9I0.I35

7.2 Hard hats are required to be worn in all areas of operations.

7.3 Hard hats are not required to be worn while inside vans, pick up trucks, automobiles, and buses at any time, or while operating heavy equipment, tractors, fork lifts, etc equipped with rollover protection.

7.4 Hard hats are required to be worn at all times while on the site other than in offices, the SPEC Center (including parking lot), break and lunch rooms, entering and leaving employee's work station (including from a vehicle to an office), at the beginning and end of shift, etc.

8.0 PROTECTIVE FOOTWEAR

8.1 Selection of foot protection will conform with ANSI Standard Z4I.I991, which has been adopted by reference in OSHA 29 CFR I9I0.I36. If purchased prior to July 5, 1994 it will conform to ANSI Standard Z41.1-1967.

8.2 Safety shoes (steel toe cap - 6" upper) are required for employees working on active work areas of the facility and in the Maintenance and Heavy Equipment shops.

9.0 HIGH VISIBILITY VEST

9.1 All employees working in or near motor vehicle traffic must wear a high visibility vest per ANSI Standard ISEA 107-1999 Conspicuity Class 2 High Visibility Safety Apparel.

10.0 TRAINING

Training on the contents of this program shall be conducted annually and shall include the following:

10.1 Proper selection, use and maintenance of the equipment, including capabilities and limitations.

10.2 The nature of potential hazards and the consequences of not using the appropriate equipment.

10.3 Procedures for inspecting, donning, doffing, checking, and fitting equipment.

10.4 Emergency procedures in the event of equipment failure.

10.5 A review of the area and task specific protective equipment requirements of Appendix G of this procedure.

11.0 PROCEDURES

NOTE: It must be understood that this practice describes the minimum PPE requirements for entering a contaminated area or performing a specific job. Minimum PPE requirements are based on data collected through the industrial hygiene air sampling program, hazard evaluation, incident investigation, job safety analysis, observation and experience. However, not all hazards can be anticipated and occasionally different or additional PPE may be required depending upon the circumstances. Therefore, it is equally important that employees learn to identify and evaluate hazards to ensure that the proper PPE is selected.

11.1 Identify and evaluate hazards encountered on the job.

11.1.1 Determine the physical hazards.

11.1.1.1 Consider sharp or falling objects.

11.1.1.2 Consider overhead obstructions.

11.1.1.3 Consider slippery surfaces.

11.1.1.4 Consider heat or cold.

11.1.1.5 Consider flying particles.

11.1.1.6 Consider pinch points.

11.1.2 Determine the health hazards.

11.1.2.1 Consider splashes or vapors from corrosive or toxic substances.

11.1.2.2 Consider harmful dusts, fogs, fumes, mists, gases, smokes and sprays.

11.1.3 Review hazard information sources.

11.0 PROCEDURES (cont):

11.1.3.1 Consider Material Safety Data Sheets (MSDSs), Warning Labels and Signs, Profile Records Hazardous Waste Manifests, Treatment and Disposal Slips, Work Permits, Lab Approval Notifications, Special Waste Analysis Reports (SWARs), and Standard Division Practices (SDPs).

11.1.4 Utilize test and/or sampling equipment (i.e., Noise Level Meter, LEL/0_2 Meter, Drager Tubes, Air Sampling Pumps, etc.) to evaluate hazards like noise, flammable gases, atmospheres that are Immediately Dangerous to Life and Health (IDLH) and exposure to contaminants at levels above the established Time Weighted Average - Threshold Limit Value (TWA-TLV).

NOTE: Employees must be trained and qualified prior to operating test equipment.

11.2 Once the hazard identification and evaluation process is completed, match the PPE to the hazard.

11.2.1 Refer to "Criteria for the Selection of PPE" at Exhibit #1.

11.2..2 Refer to "Gloves Selection" at Exhibit #2.

11.2.3 Refer to "Selection Chart for Eye and Face Protectors" at Exhibit #3.

11.2.4 Refer to "Respirator Selection Flow Chart" at Exhibit #4.

11.2.5 Refer to "Cartridge Selection Guide" at Exhibit #5.

11.3 Select PPE that will provide adequate protection against hazards faced on the job.

11.3.1 Determine area or job specific PPE requirements.

11.3.1.1 Refer to "PPE Certification of Hazard Assessment and Equipment Selection", Exhibit #6.

CAUTION: The PPE Certification of Hazard Assessment and Equipment Selection Sheets does not cover all the hazards that an employee may face during job performance. Employees must remain alert for any new hazard(s) and take appropriate action to protect themselves.

11.3.1.2 Prior to handling any hazardous chemicals, read the MSDS.

NOTE: Pay particular attention to those sections on the MSDS that address PPE. MSDSs are available in department computers.

11.3.1.3 Prior to handling hazardous waste, review the Waste Profile Record for information concerning PPE.

11.3.1.4 Read PPE requirements on work permits.

11.0 PROCEDURES (cont):

11.3.1.5 Prior to job performance, study written procedure (i.e., SDP, SOP, etc.).

NOTE: All personnel not assigned to a specific operating or maintenance area shall consult with the area supervisor before entering the area so they can be briefed on any additional hazards and PPE requirements that may exist.

11.3.2 Determine the level of protection needed to enter the work areas.

11.3.2.1 If you enter an immediate work area without the proper PPE, promptly leave the area where the work is being performed or don the PPE required for that work.

11.3.2.2 Refer to "PPE Certification of Hazard Assessment and Equipment Selection" in Exhibit #6 for job specific requirements.

11.3.3 Recognize and distinguish between areas where PPE is required and areas where PPE is not required.

11.3.4 Warn any individual not wearing the required PPE.

NOTE: Every CWM employee has the responsibility of warning any individual not wearing the required PPE in a specific area or while performing a specific task.

NOTE: High heels, sandals, tennis shoes, tank tops, sleeveless shirts, short pants or dresses are prohibited in operating areas.

NOTE: Site tour personnel (i.e., guide, visitors, etc.) are exempt from the no dress/no high heel rule, as long as they remain in the site tour bus or are walking from the bus to the training room for orientation.

11.4 Test and inspect PPE prior to use.

11.4.1 Ensure that a qualitative fit test is completed each time you are issued a new respirator and/or yearly. (Refer to Health & Safety Procedure, MDC HS-1162, "Respiratory Protection Program").

11.4.2 Ensure that the correct filters are installed on air purifying respirators.

11.4.2.1 Match the chemical cartridge to the hazard.

11.4.2.2 Read the chemical cartridge label.

NOTE: The label will describe the chemical(s) that the cartridge will protect against.

11.4.2.3 Refer to the "Cartridge Selection Guide" at Exhibit #5.

11.4.2.4 If you are not sure what filter to use, ask your supervisor.

11.0 PROCEDURES (cont):

11.4.3 Inspect air purifying respirators.

11.4.3.1 Check rubber face piece for dirt, pliability of rubber, deterioration, cracks, tears and holes.

11.4.3.2 Check straps for breaks, tears, loss of elasticity, broken attachments or snaps and proper tightness.

11.4.3.3 Check exhalation and inhalation valves for holes, warpage, cracks and dirt.

11.4.4 Check all PPE for tears, leaks, punctures, or signs of wear.

NOTE: Tearing tyvek or poly tyvek suits for any reason, other than removal, is prohibited.

11.4.5 Ensure that non-disposable PPE is not contaminated from it's last use.

11.4.5.1 Refer to Health & Safety Program, MDC HS-1144, "Contamination Control".

11.4.6 Check safety glasses, goggles, face shields, or full face respirator lens for obstructed vision (i.e., nicks, scratches, stains, dirt, etc.).

11.5 Don PPE correctly.

11.5.1 Always make sure that everything fits.

WARNING: Loose clothing can get caught in machines.

11.5.2 Ensure that all buttons and snaps are fastened.

11.5.3 Ensure that all straps are secure.

11.5.4 Ensure that all zippers are up.

11.5.5 If necessary, use tape to seal zippers or secure cuffs and pants.

11.5.6 Ensure that there is an air tight seal between your face and the respirator.

CAUTION: Facial hair (i.e., all beards, beard stubble, side burns, long mustaches, etc.) will prevent adequate face seal. Male employees must shave daily to ensure proper seal.

11.5.6.1 Prior to each use, conduct a field fit (positive/negative) test on all air-purifying respirators. (Refer to Health & Safety Procedure, MDC HS-1162, "Respirator Protection Program".)

11.6 Remove PPE correctly.

11.6.1 Decontaminate non-disposal PPE clothing (i.e., slicker suit, acid suit, rubber boots, etc.) prior to removal.

11.0 PROCEDURES (cont):

11.6.1.1 Refer to Health & Safety Program, MDC HS-1144, "Contamination Control".

11.6.2 Remove disposable PPE carefully so as not to contaminate yourself.

11.6.2.1 Remove outer gloves first.

11.6.2.2 Leave inner gloves on when removing contaminated PPE.

NOTE: The ideal way to remove contaminated PPE is to take off items on the upper body first and then work down. Inner gloves should be the last item removed.

CAUTION: Be careful and try not to contaminate your bare hand when taking off inner gloves. Grasp inner glove at wrist and peel off.

11.6.3 Place disposable PPE in proper container.

11.6.4 Clean and inspect your respirator.

11.6.5 Store all non-disposable PPE in designated location.

11.7 Maintain non-disposable PPE.

NOTE: PPE is provided by the Division as a line of defense against potential hazards that exist at our facility. To afford maximum protection, the PPE must be properly maintained. Respirators must be cleaned after each day's use or more often, if necessary. When not in use, respirators must be stored in appropriate storage.

11.7.1 Clean and disinfect PPE regularly.

11.7.2 Inspect PPE before and after each use.

11.7.3 Replace any punctured, leaking, torn, worn or damaged PPE and/or accessories.

11.7.4 Replace safety glasses, goggles, or face shields if vision is obstructed.

11.7.5 Replace respirator dust filters and chemical cartridges daily or more often if wearer detects odor, taste, irritation or plugging.

11.7.6 Store PPE in designated location.

11.8 Recognize and understand PPE limitations.

11.8.1 If available, read instructions provided by the manufacturer.

NOTE: Instructions usually accompany new equipment.

11.8.2 Use boot covers to protect leather footwear from contamination.

CAUTION: Leather absorbs and cannot be decontaminated.
CAUTION: Boot covers may be slippery on wet or dusty surfaces.

11.0 PROCEDURES (cont):

11.8.3 Do not wear shaded safety glasses during night time or indoor operation.

CAUTION: Shaded safety glasses reduce vision at night and are prohibited on evening shifts, or indoor activities.

11.8.4 Do not use air purifying respirators in oxygen deficient atmospheres.

WARNING: Never use air purifying respirators in oxygen deficient atmospheres (less than 19.5% oxygen) or atmospheres immediately dangerous to life and health (IDLH).

11.8.5 Use air purifying respirators around chemicals with adequate warning properties (i.e., offensive odor, irritant, etc.).

11.8.6 Use supplied air respirators around chemicals with little or no warning properties.

11.8.7 Determine the degree of protection afforded by a respirator.

11.8.7.1 Refer to "Respirator Protection Factors" at Exhibit #10.

11.8.8 Replace chemical cartridges often enough to prevent break-through.

11.8.8.1 Refer to Health & Safety Procedure, MDC HS-1162, "Respiratory Protection Program".

NOTE: Break-through occurs when the sorbent material and filter pads in the cartridge are no longer effective due to excessive contaminants.

CAUTION: High humidity can reduce chemical cartridge effectiveness.

12.0 EVALUATION OF PPE PROGRAM

The Division shall annually evaluate its PPE program to ensue its effectiveness and that it meets all regulatory and company requirements. Exhibit #7.

USER RESPONSIBILITIES

12.1 Identifies and evaluates hazards encountered on the job.

12.2 Determines what the physical and health hazards are.

12.3 Reviews hazard information sources.

12.4 Matches the PPE to the hazard.

12.5 Selects PPE that will provide adequate protection.

12.6 Utilizes the PPE Certification of Hazard Assessment and Equipment Selection Information.

12.7 Consults with supervisor prior to entering work area(s).

12.0 EVALUATION OF PPE PROGRAM (cont):

USER RESPONSIBILITIES (cont):

12.8 Warns any individual not wearing the required PPE.

12.9 Tests and inspects PPE prior to use.

12.10 Maintains respirator and other PPE in good working condition.

12.11 Dons and removes PPE properly.

12.12 Recognizes and understands PPE limitations.

12.13 Complies with PPE policy and procedures.

13.0 USER PERFORMANCE CRITERIA

13.1 Safely performs all steps of the practice.

13.2 Meets minimum section demands for speed and accuracy.

13.3 Can explain why and when the job must be done.

13.4 Can explain why each step in the practice is needed.

13.5 Can identify basic facts and terms about the job.

13.6 Utilizes equipment, tools, and supplies as they were designed and intended to be used.

13.7 Recognizes and reports any unsafe conditions/acts immediately.

13.8 Recognizes, understands, and complies with Federal, State and local standards that apply throughout this practice.

13.9 Uses good oral and written communications skills.

14.0 CROSS REFERENCES:

14.1 Health & Safety Program, MDC HS-1144, "Contamination Control".

14.2 Health & Safety Program, MDC HS-1105, "Visitor and Contractor Safety".

14.3 Health & Safety Program, MDC HS-1162, "Respirator Protection Program".

15.0 REGULATORY/PERMIT REQUIREMENTS

15.1 CFR 29 Part 1910.132: PPE shall be provided, used and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards that could be encountered in a manner capable of causing injury in the function of any part of the body through absorption, inhalation or physical contact.

15.2 CFR 29, Part 1910.133: Protective eye and face equipment shall be required where there is a reasonable probability of injury that can be prevented by such equipment.

15.3 CFR 29, Part 1910.134: The employee shall use the provided respiratory protection in accordance with instruction and training received. Respirators shall be regularly cleaned and disinfected. Respirators shall be stored in a convenient, clean, and sanitary location. Respirators shall be inspected routinely.

15.4 CFR 29, Part 1910.120: Whenever engineering controls and work practices are not feasible, PPE shall be used to reduce and maintain exposures to or below the permissible exposure limits of substances regulated by CFR 29, Part 1910, Subpart Z (Toxic and Hazardous Substances).

16.0 GLOSSARY OF TERMS

16.1 Permissible Exposure Limit (PEL): The legally established time-weighted average (TWA) concentration or ceiling concentration that shall not be exceeded.

16.2 Time Weighted Average (TWA): The average concentration of a contaminant in air during a specific time period (usually 8 hours).

16.3 Threshold Limit Values (TLVs): Time-weighted concentrations of airborne substances to which nearly all workers may be continuously exposed (during 8-hour work days and 40 hour work weeks) without adverse effects.

16.4 Threshold Limit Value - Ceiling (TLV-C): The concentration that should not be exceeded during any part of the working exposure.

16.5 LEL/Meter: Instrument used to determine the Lower Explosive Limit (LEL) and/or oxygen content of an atmosphere.

16.6 Break-through: Occurs when a respirator filter fills up with contaminants and no longer protects the wearer.

EXHIBIT 1

CRITERIA FOR THE SELECTION OF PPE

EYE/FACE PROTECTION

Personal Hazard	Protection Required
❍ Low Energy flying solids	Safety glasses with side shields
❍ High energy flying solids	Face shield or goggles and safety glasses with side shields
❍ Low energy flying liquids	Face shield and safety glasses with side shields
❍ High flying liquids and corrosive liquids	Face shield and goggles

(Note: when respiratory protection is required, a full face respirator can be utilized in lieu of face shield and safety glasses or goggles.)

HEAD PROTECTION

Worn in "hard hat areas" due to the potential for exposure to overhead obstructions or falling objects that sometimes exist in various areas.

FOOT PROTECTION

- Steel toed footwear is required any time personnel are working with tools or objects that could be dropped or otherwise contact and damage the foot.
- Highly impermeable footwear is required when foot contact with waste is possible. Leather footwear, once contaminated, cannot be decontaminated properly. Leather footwear is acceptable when worn with impervious boot covers.

PROTECTIVE CLOTHING

- Tyvek suit is adequate for possible brush contact with solids.
- Highly impermeable clothing is required for possible contact with sludges or liquids. This clothing includes slicker suits, long slicker coats, polytyvek suits and saranex coveralls.

HAND PROTECTION

- Leather gloves are adequate for possible abrasion or finger pinches from non-contaminated surfaces.
- Gloves constructed of synthetic materials are required for possible contact with contaminated surfaces or materials. The chemical/waste being handled dictate the specific type of synthetic glove to be worn.

RESPIRATORY PROTECTION

- Respiratory protection is required when exposure to contaminants at levels that could exceed ACGIH 8 hour TLV is <u>possible</u>.
- Supplied air respiratory protection is required when exposure to contaminants at levels that exceed ACGIH 8 hour TLV is <u>imminent, confirmed, or required by specific OSHA standards</u>.

EXHIBIT 2

GLOVE SELECTION

The following lists the type of gloves used at the Model City Facility along with the type of chemicals resistant to them. Discard gloves if they become ripped, torn or discolored due to chemical action.

TYPE OF GLOVE	CHEMICAL GROUP
Nitrile/Neoprene	Acids, caustics, petroleum solvents, aromatic solvents, chlorinated solvents
Rubber or PVC	Acids, caustics, alcohols, low level organic solvents
Latex/Vinyl	Acids, caustics, alcohols
Leather	To protect against injuries; not resistant to chemicals.

CWM Chemical Services, LLC.
Certification of Hazard Assessment and Equipment Selection

Department: Environmental	
Routine Task: Excavation in areas with VOAs > 1 ppm per RFI*	
Assessment Reviewed By: Jill Banaszak	
Signature: Jill Banaszak	**Date:** 9/9/05

PROTECTION	POTENTIAL (Yes or No)	PPE REQUIREMENT
Eyes and Face • Flying particles • Non-corrosive liquid chemicals • Corrosive liquid chemicals • Optical radiation	 Yes No No No	X Safety Glasses Full Face Respirator Face Shield Welding Helmet Welding Shield Other (s) Describe:
Foot • Falling/Rolling Objects • Sole Piercing • Chemical hazards • Electrical hazards	 No No Yes – if excavation will be entered. No	X Work shoes (steel toe, steel midsole, min 6" high with laces X Rubber boots Other (s) Describe:
Head	Yes – Required in operating areas.	X Hard Hat Other (s) Describe:
Hand • Non-corrosive liquid chemicals • Corrosive liquid chemicals • Solid chemicals • Severe cuts or lacerations (cutting tools) • Severe abrasions • Punctures (sharp tools/objects) • Burns (Thermal)	 No No Yes – Contam. soil No No No No	Fabric work gloves with/or abrasion /cut resistant gloves X Chemical protective gloves Type: Neoprene or Nitrile Other (s) Describe:
Body • Non-corrosive liquid chemicals • Corrosive liquid chemicals • Solid chemicals • Burns (Thermal) • Visibility	 No No Yes No No	X Work Uniform with: X Coverall PE (Saranex with hood Other (s) Describe:
Respiratory Nuisance Dust Toxic Dust Chemical gases or vapors	 Yes – if soil dry No Yes	X Half mask respirator with: X Acid/organic cartridge HEPA P100 Filter Full Face Respirator with: Acid/organic cartridge HEPA P100 Filter SCBA Other (s) Describe:
Hearing Loud noise	 No	Ear Plus (Optional) Canal Caps Ear Muffs Other (s) Describe:

* PPE also required if air monitoring is performed with Foxboro TVA100 GC/FID and a reading above 50 ppm (as methane) or if a significant chemical order is noted.

ACTIVITY HAZARD ANALYSIS (AHA)

Model City Facility

Activity: Radiation Survey/Sampling

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Walk over and property line measurements	Stepping on sharp and/or protruding objects	• Recent mowing will enhance visibility • Surveyor must be aware of changing terrain when performing survey • Proper safety footwear will minimize the potential for foot injury • Be aware of damaged fencing wire and posts
	Slips, trips, falls	• Recent mowing will enhance visibility • Surveyor must be aware of changing terrain, wet ground, animal burrows and general debris • Ensure instrument wires, straps and cables do not interfere with walking
	Potential exposure to chemical and radiological contaminants	• Avoid activities that disturb areas with distressed vegetation • Avoid areas that exhibit unusual characteristics (odor, color) or other signs of contamination until properly evaluated • Modify PPE as required by conditions
	Biological Hazards	• Wear light colored clothing or white Tyvek® to allow you to see ticks that are crawling on your clothing. • Tuck your pant legs into your socks or boots, wear high rubber boots, or use tape to close the opening where they meet so that • Wear a hat, tie back long hair. • Apply repellents to discourage tick attachment. Repellents containing permethrin can be sprayed on boots and clothing and will last for several days. Repellents containing DEET (n,n-diethyl m-toluamide) can be applied to the skin, but will last only a few hours before reapplication is necessary. Apply according to Environmental Protection Agency guidelines to reduce the possibility of toxicity. • Learn to identify the toxic plants and avoid them. • Wear long pants and long sleeves, boots and gloves. • Barrier skin creams may offer some protection if applied before contact. • Avoid indirect contact from tools, clothing or other objects that have come into contact with a crushed or broken plant. Don't forget to wash contaminated clothing and clean up contaminated equipment. • If you can wash exposed skin areas within 3-5 minutes with cold running water, you may keep the urushiol from penetrating your skin. • Proper washing may not be practical in remote areas, but a small wash-up kit with pre-packaged alcohol-based cleansing tissues can be effective. • Wear long pants and long sleeves, boots and gloves. • Barrier skin creams may offer some protection if applied before contact.

		• Avoid indirect contact from tools, clothing or other objects that have come into contact with a crushed or broken plant. Don't forget to wash contaminated clothing and clean up contaminated equipment. • If you can wash exposed skin areas within 3-5 minutes with cold running water, you may keep the urushiol from penetrating your skin. • Proper washing may not be practical in remote areas, but a small wash-up kit with pre-packaged alcohol-based cleansing tissues can be effective.
	Heat Stress	• Provide water and electrolyte replacement drinks • Allow employees who are not accustomed to working in hot environments appropriate time to become acclimated • Investigate use of auxiliary cooling devices in extreme conditions • Conduct briefings for employees regarding health hazards and control measures associated with heat stress whenever conditions require the implementation of heat stress monitoring
	Cold Stress	• Proper clothing for weather conditions • Available warming stations and warm, non-dehydrating beverages • Survey teams should be reminded to observe physiological indications • Protect instruments from thermal shock and other weather impacts
EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
1. Level D PPE 2. Radiation Detection Instrumentation 3. GPS Equipment	1. Inspect PPE prior to use 2. Source check daily 3. Ensure reception is satisfactory / Ensure that instrumentation is secure in backpack.	• HAZWOPER 40 hour or current 8 hour refresher • Radiation Worker Training • Equipment Operator Specific Training • Safety and health briefing prior to initial operations
PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Vehicular traffic onsite Travel to and at the site	Struck by vehicles Operation of Motor Vehicles	• Be alert to the presence of vehicles • Ensure reflective vest is worn at all times when onsite • Comply with all federal, state, local and site regulations • Inspect vehicles daily and document inspections • Drive defensively • Wear seatbelts while vehicles are in motion • Avoid backing vehicles when possible
EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	TRAINING REQUIREMENTS
Vehicles Trucks/Trailers	Vehicle Inspections	• Licensed for the operation of vehicle

ATTACHMENT C

ACCIDENT PREVENTION PLAN

ACCIDENT PREVENTION PLAN

RESPONSIBILITIES

Project responsibilities are specified in Section 4.0 of the Health and Safety Plan.

SUBCONTRACTORS/CONSULTANTS

All contractors/consultants are required to comply with the CWM safety programs. A contractor/consultant health and safety representative will be designated to serve as the direct contact with CWM in matters of health and safety.

TRAINING

All contractor/consultant personnel are required to attend a safety orientation prior to commencing activities on site. These orientation sessions are documented and filed with other project records. This site orientation will be conducted by a CWM representative. At a minimum, the following topics relevant to this particular project will be presented:

- Chemical and radiological contaminants expected to be encountered on site;
- Slips, trips, and falls;
- Overhead and buried utilities;
- Hazard Communication;
- Appropriate use of PPE (head, eye, hand, and hearing protection);
- Motor vehicle safety;
- Fire prevention;
- Housekeeping;
- Emergency response; and
- Back injury prevention

Safety briefings will be conducted prior to beginning work every day. Topics for the day will be chosen based upon recent activities, worker concerns, near misses, and program requirements. Attendance at these briefings will be recorded and filed with other project safety documentation.

Periodic Safety Committee meetings will take place as deemed necessary. The total number of personnel plus management on site is expected to be small (5-10 people) and so it is expected that the morning "tailgate" will serve the purpose of these program planning and evaluation sessions.

Field personnel will be trained as radiation workers and have OSHA 40 hour Hazardous Material Worker qualification. In addition, workers will have training in the proper response to emergency conditions that may arise during field activities

INSPECTIONS

Periodic health and safety inspections by CWM will be conducted during field operations to identify conditions which have the potential to cause illness or injury to workers, damage equipment, or put the general public at risk from site operations.

A portion of these inspections will be conducted by the Site's Health & Safety Specialist but some inspections (such as motor vehicles or heavy equipment) will be conducted by qualified individuals responsible to the URS safety organization.

ACCIDENT REPORTING

Contractor/consultant shall report to CWM Project Manager as soon as possible all accidents or occurrences (including spills) resulting in injuries to contractor's employees or third parties or damage to property of third parties or CWM, arising out of or during the course of service for CWM by contractor or of any subcontractor of contractor, and when requested, shall furnish CWM with a copy of reports made by contractor's insurers or to others of such accidents and occurrences. For purposes of this paragraph, notice is to be given to at:

CWM Chemical Services, L.L.C.
Model City Facility
P.O. Box 200
1550 Balmer Road
Model City, New York 14107
Attn: Site Health and Safety Specialist
(716) 754-0331

In case of an accident, the contractor/consultant shall furnish his own First Aid treatment care. CWM will assist in any emergency upon request of the contractor/consultant.

MEDICAL SUPPORT

CWM has first aid kits located throughout the facility to aid in the support of minor injuries. CWM will, upon request of the contractor/consultant, supply medical care for the contractor/consultant. CWM currently has on staff, two certified Emergency Medical Technicians to assist in the event of a medical emergency. Additional Ambulatory, Paramedic and Fire Department support is available on the 911 system.

PERSONAL PROTECTIVE EQUIPMENT

The selection of personal protective equipment is based upon an Activity Hazard Analysis performed in accordance with 29 CFR 1910.132 (d). The personal protective equipment that has been selected based on the anticipated hazards is listed in the Health and Safety Plan. This equipment list may be modified as safety conditions warrant.

SAFETY PROGRAMS

CWM will be responsible for reviewing all contractor/consultant company safety program documentation to insure compliance with CWM, OSHA, and project standards.

Description of work

The primary field activity is a radiological survey (walkover) and associated investigative sampling. The physical hazards associated with these activities are discussed in the Health and Safety Plan. The programs described below are implemented to minimize these potential hazards.

Near Miss Reporting

All project personnel are encouraged to report "near miss" occurrences. A "near miss" report is a worker's evaluation of a situation that, if left uncorrected, could cause an accident. The importance of reporting a "near miss" is that it raises awareness of the problem and contains information helpful in avoiding the same situation in the future.

Housekeeping

Poor housekeeping has the potential to play a role in a wide range of accidents. As such, the importance of housekeeping and the expectation that good housekeeping be maintained will be emphasized regularly during safety meetings.

Mechanical Equipment Inspection

No heavy mechanical equipment is expected to be used by CWM's consultants for the gamma walkover field survey or investigative sampling activities. In the event that heavy equipment is required, the equipment shall be in good working condition with Daily Vehicle Inspection Reports (DVIRs) completed.

Activity Hazard Analysis

Activity Hazard Analyses (AHAs) are used to identify potential safety and health hazards associated with specific project tasks. The AHA is developed prior the beginning activities. The AHA is reviewed periodically during operations and modified as necessary. The Activity Hazard Analysis can be found in Attachment B.

Fire Prevention and Protection

Fire prevention and protection procedures and resources at this project include:

- Emergency services are obtained by calling site extension #200 in accordance with facility's Contingency Plan. This service will contact the site's Incident Commander for Emergency Response actions. Based upon the hazard, the site's Emergency

Response Team may be activated, or local Police/Fire Department support may be requested.

- Hot work permits are required prior to performing any flame or spark producing activity.
- Flammable and oxidizing materials are to be properly marked and stored in NO SMOKING areas. Fire extinguishers are to be available in this area.

ALARA Program

The ALARA (As Low As Reasonably Achievable) program describes the approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. As used, ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits as is reasonably achievable, based on professional judgment.

ALARA principles will be applied to minimize the following types of exposure during operations:

- internal exposure due to airborne radioactive material;
- external exposure due to beta-gamma emitting nuclides; and
- personnel contamination due to direct contact with radioactive material.

Strategies to minimize exposure include:

- the use of coveralls, gloves and shoe covers if necessary to prevent direct contact with radioactive material;
- the use of radiation detection equipment to assess general area radiation levels;
- the use of air sampling devices to assess the airborne concentration of radioactive material;
- the use of respiratory protection if necessary to minimize internal exposure; and
- Administrative controls such as Radiation Worker Training and the use of Radiation Work Permits, which specify radiological controls and access requirements.

Hazard Communication

This program incorporates the OSHA standards and specifically requires:

- a hazardous material inventory that lists the hazardous being used at the work site;
- that Material Safety Data Sheets be obtained before the chemical is used and that they be available to workers for reference at all times;
- that chemical containers be properly labeled; and
- that all subcontractors be provided information regarding the hazards associated with the substances and the proper protective measures against them.

Emergency Response

All personnel on-site will be briefed on the appropriate responses to emergencies that may occur. This will be a component of comprehensive safety indoctrination. Topics covered will include:

- emergency egress;
- responsibilities and lines of authority;
- alarms;
- congregation points and personnel accountability;
- notification of off-site emergency support personnel; and
- types of potential emergencies.

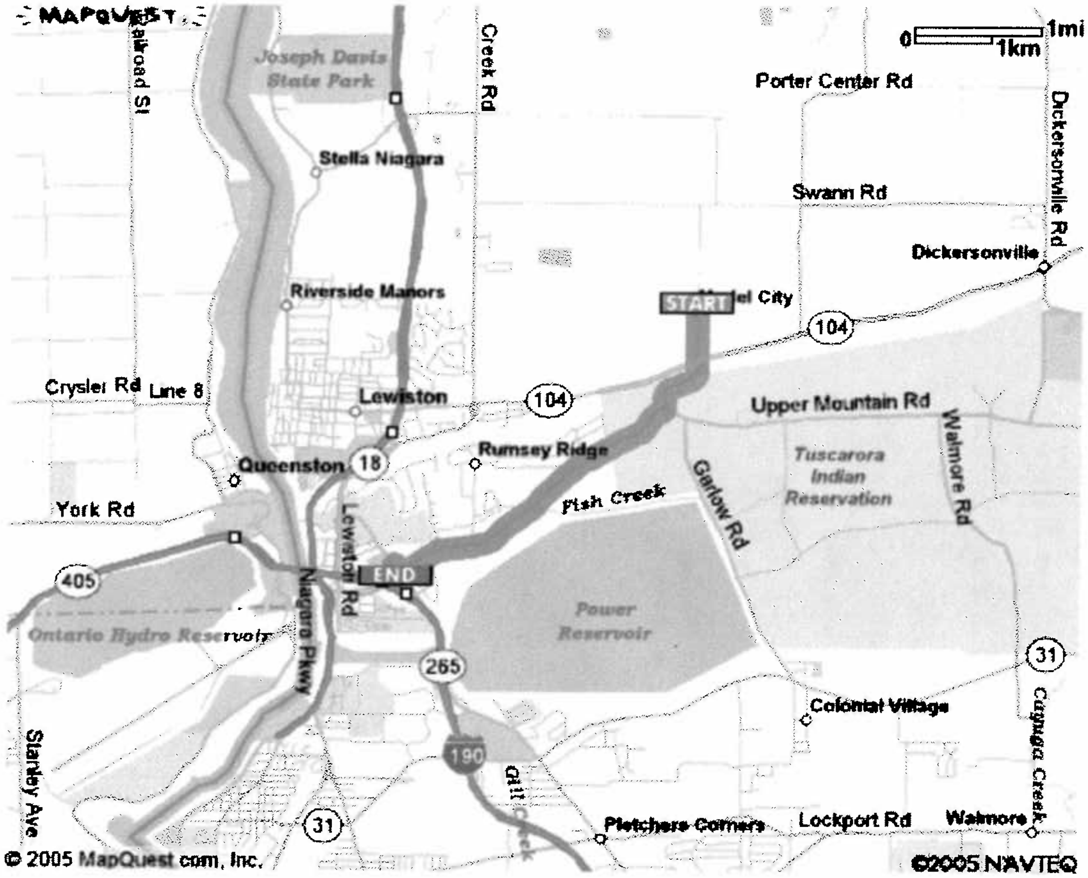
Respiratory Protection Plan

Respiratory protection will be used when airborne contaminants, either radioactive material or chemicals, exist at levels that require personnel protection that cannot otherwise be provided. All personnel requiring the use of respiratory protection will be qualified in its use. This qualification includes a medical exam, a respirator fit-test and a discussion of the purpose and limitations of respirators.

Site Layout

In addition to presenting the route to the closest hospital, Appendix E indicates the site location and surrounding Model City Facility area.

ATTACHMENT D HOSPITAL ROUTE MAP



	1: Start out going SOUTH on MODEL CITY RD toward NY-104 / RIDGE RD.	0.4 miles	Map
	2: MODEL CITY RD becomes INDIAN HILL RD / CR-11.	0.5 miles	Map
	3: Turn SLIGHT RIGHT onto UPPER MOUNTAIN RD / CR-11.	2.5 miles	Map
	4: Turn RIGHT onto NY-265 / MILITARY RD.	<0.1 miles	Map
END	5: End at **Mount St Mary's Hospital** 5300 Military Rd, Lewiston, NY 14092, US		Map

END OF CWM HEALTH AND SAFETY PLAN FOR GENERIC SMALL PROJECT SOIL EXCAVATION AND MONITORING PLAN