Formerly Utilized Sites Remedial
Action Program (FUSRAP)

# Maywood Chemical Company Superfund Site

# ADMINISTRATIVE RECORD

## Document Number

## MISS- 106.

US Army Corps
of Engineers®

M-626

138-LOA-GAM-00001

# ENVIROCARE OF UTAH, INC.

*THE SAFE ALTERNATIVE*

March 11, 1997

Mr. William M. Seay
Acting Director Former Sites Restoration Division
Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831-8723

Re: Treatment of Maywood soils

Dear Mr. Seay:

Envirocare of Utah, Inc. is pleased to respond to your interrogatory regarding the treatment of contaminated soils from the Maywood FUSRAP Site. Envirocare understands the position of the DOE regarding soil treatment and is actively preparing for treatment of the Maywood soils at the Envirocare Clive site. Envirocare, as committed in its contract with Bechtel National, will treat all contaminated materials from the Maywood site by December 31, 1997.

As outlined in the proposed Maywood Treatment Operations Plan, which is currently pending approval by Bechtel and is enclosed with this letter, various forms of soil treatment will be used for the Maywood soils. All materials from the Maywood site are currently staged at Envirocare's Clive site. Envirocare will utilize two soil washing entities, Alternative Remediation Technologies (ART) and TVIES, to each treat a minimum of 1000 tons of Maywood contaminated materials using their proven soil washing technologies. Treatment by soil washing is scheduled to begin May 12, 1997.

In addition to soil washing, treatment methods including segregation of materials through field survey (including sampling and analysis), as well as screening for removal of oversize materials, are being used to treat the Maywood materials. Some segregation by sampling and analysis was already performed upon arrival of the materials at the Envirocare Clive site. Additional segregation treatment operations were proposed to begin on February 10, 1997, but await Bechtel approval of the Treatment Operations Plan. Screening treatment of the materials is scheduled to begin on April 28, 1997, but also awaits Bechtel approval. For all forms of treatment, radiological analyses are being performed to verify treatment and the results will be compiled in a final summary report

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for submission to Bechtel and DOE. Additionally, monthly analytical reports have been submitted to Bechtel throughout the project summarizing analytical performed as part of segregation treatment.

As requested, a copy of the current Treatment Operations Plan has been enclosed as an attachment to this letter, as well as detailed schedule for treatment. However, this schedule is contingent upon approval of the operations plan by Bechtel so that treatment operations can proceed. If you have any questions or require any additional information, please contact Mr. Larry Shelton or myself at (801) 532-1330.

Sincerely,

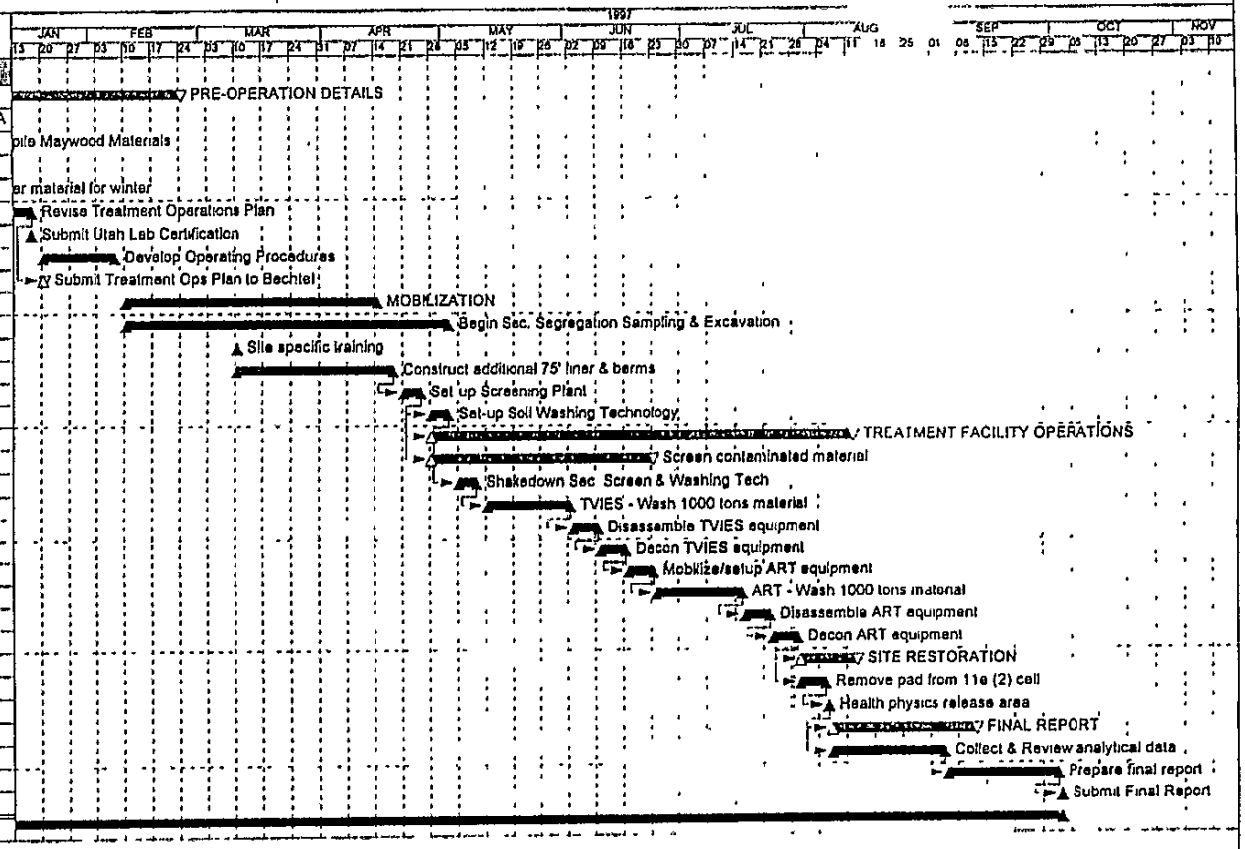
Charles A. Judd

Charles A. Judd
Executive Vice President

# Maywood Treatment Facility

Envirocare
Report Date 17JAN97
Page 1A

| Activity Description | Rem Dur | Early Start | Early Finish |
|---|---|---|---|
| Maywood Treatment Facility | | | |
| PRE OPERATION DETAILS | 84d | 22JUL96 A | 24FEB97 |
| Construct 125' of clay liner and berms | 0 | 22JUL96 A | 23AUG96 A |
| Stockpile Maywood Materials | 45d | 26AUG96 A | 30DEC96 |
| Submit Updated Treatment Schedule | 1d | 30OCT96 * | 30OCT96 |
| Cover material for winter | 3d | 31DEC96 | 03JAN97 |
| Revise Treatment Operations Plan | 10d | 06JAN97 * | 17JAN97 |
| Submit Utah Lab Certification | 1d | 17JAN97 * | 17JAN97 |
| Develop Operating Procedures | 15d | 20JAN97 * | 07FEB97 |
| Submit Treatment Ops Plan to Bechtel | 1d | 20JAN97 | 20JAN97 |
| MOBILIZATION | 46d | 10FEB97 * | 14APR97 |
| Begin Sec Segregation Sampling & Excavation | 60d | 10FEB97 * | 02MAY97 |
| Site specific training | 1d | 10MAR97 * | 10MAR97 |
| Construct additional 75' liner & berms | 30d | 10MAR97 * | 18APR97 |
| Set up Screening Plant | 5d | 21APR97 | 25APR97 |
| Set up Soil Washing Technology | 5d | 28APR97 | 02MAY97 |
| TREATMENT FACILITY OPERATIONS | 75d | 28APR97 | 12AUG97 |
| Screen contaminated material | 40d | 28APR97 | 23JUN97 |
| Shakedown Sec Screen & Washing Tech | 5d | 05MAY97 | 09MAY97 |
| TVIES - Wash 1000 tons material | 15d | 12MAY97 * | 02JUN97 |
| Disassemble TVIES equipment | 5d | 03JUN97 | 09JUN97 |
| Decon TVIES equipment | 5d | 10JUN97 | 16JUN97 |
| Mobilize/setup ART equipment | 5d | 17JUN97 | 23JUN97 |
| ART Wash 1000 tons material | 15d | 24JUN97 | 15JUL97 |
| Disassemble ART equipment | 5d | 16JUL97 | 22JUL97 |
| Decon ART equipment | 5d | 23JUL97 | 29JUL97 |
| SITE RESTORATION | 11d | 30JUL97 | 13AUG97 |
| Remove pad from 11e (2) cell | 5d | 30JUL97 | 05AUG97 |
| Health physics release area | 1d | 06AUG97 | 06AUG97 |
| FINAL REPORT | 26d | 07AUG97 | 12SEP97 |
| Collect & Review analytical data | 20d | 07AUG97 | 04SEP97 |
| Prepare final report | 20d | 05SEP97 | 02OCT97 |
| Submit Final Report | 1d | 03OCT97 | 03OCT97 |
| | 240d | 22JUL96 A | 03OCT97 |




Early start point
Early finish point
Early bar
Progress bar
Critical bar
Summary bar

Progress point
Critical point
Summary point
Start milestone point
Finish milestone point

| | |
|---|---|
| Data date | 25OCT96 |
| Start date | 22JUL96 |
| Finish date | 03OCT97 |
| Must finish date | |
| Target finish date | |



| Date | Revision | Checked | Approved |
|---|---|---|---|
| 1/17/97 | 1 | AJ | JD |

# TREATMENT FACILITY OPERATIONS PLAN

## I. TREATMENT FACILITY OVERVIEW

This plan has been prepared to provide an overview of the operations that will occur at the Treatment Facility, including detailed design drawings and a description of the construction and layout of the facility. The Treatment Facility, located at Envirocare of Utah's 11e.(2) Disposal Facility, will consist of the following: 1) a foundation and liner system over which all Maywood material has been stockpiled and treatment operations will occur; 2) the Staging Pile or stockpile of incoming contaminated Maywood materials; 3) the Clean Materials Section, where materials identified as having a concentration below the release criteria are placed; 4) the Initial Screening area, for segregation of oversize materials; and 5) the Soil Washing Technologies area. The Treatment Facility area has been constructed immediately south of the 11e (2) Disposal cell designated for placement of the Maywood contaminated material. The methods to be used for treatment and disposal of all Maywood materials are outlined in this plan.

### A. Waste Acceptance at the Envirocare South Clive Site

A waste profile has been developed and approved for acceptance of the Maywood pile material at the Envirocare South Clive Disposal Site. This profile was established based on the information previously submitted to Envirocare for the Maywood pile material. Treatment operations at the Treatment Facility will not require the addition of any chemicals or additives that would change the characteristics of the waste stream. As a result, materials can be readily disposed following treatment operations. Of course, verification sampling will occur to ensure that the radioactive concentrations of the material do no exceed the waste profile or Envirocare license limits. Sampling and analysis of the material is described in the Sampling and Analysis Plan portion of this plan.

The waste material from the Maywood pile has been accepted at Envirocare's South Clive Disposal Facility, it has been unloaded and transported by truck to the Treatment Facility. All Maywood shipments arriving at Envirocare have been accompanied by a Radioactive Waste Shipment Record (RSR) which contains the shipping information required by the Envirocare South Clive disposal facility for receipt of waste materials. A copy of each RSR will be included in the final report submitted to Bechtel. The Maywood material has been stockpiled in either the Staging Pile or Clean Materials Section of the Treatment Facility. The entire Treatment Facility has a foundation consisting of the following: a soil foundation consisting of in-situ soils,

compacted to 90% of a standard proctor; a 2 feet thick, low permeability (between 5 X $10^{-7}$ and 1 X $10^{-7}$ cm/sec) clay liner compacted to 95% of a standard Proctor an covered by either: 1) a compacted soil protective cover, or 2) approximately 8 inches of asphalt chips. In addition, the facility has been surrounded by berms to contain any water spills and/or storm run-off.

## B. Treatment Operations

The soil treatment process implemented to reduce the total volume of contaminated material (i.e. material with a concentration in excess of 15 pCi/g above background of combined Ra-226 and Th-232) consists of four different operations: a) Excavation and Segregation, b) Secondary Segregation, c) Initial Screening, and d) Soil Washing. For simplicity, all material with a concentration less than 15 pCi/g above background for combined Ra-226 and Th-232 will be referred to as **"clean" material** throughout this plan, while all material above this release limit will be referred to as **"contaminated" material**. A detailed description of the treatment operations is provided below:

### 1. Segregation

The first operation in the treatment process begins upon arrival of the Maywood material at the Envirocare Clive site. This approach is based on sample analyses that indicate the Maywood pile consists of sections of "clean" materials that were created during the excavation and compilation of the contaminated properties from the Maywood area. As a result, the Segregation Operation for the Maywood Site material is a process of identifying sections of the Maywood pile with concentrations below the 15 pCi/g release limit.

Excavation of the pile began at the southwest corner and proceeded to the north. As sections of the Maywood pile were excavated and loaded into gondola cars, each car was then sampled and analyzed prior to shipment to the Envirocare Treatment Facility. The rail car sample consisted of at least six aliquots. Each aliquot was obtained from a separate location and depth within the rail car shipment. The sample was then taken for analysis using gamma spectroscopy at the Zhagrus laboratory located at the Wayne, New Jersey site. When the gamma spectroscopy analysis results indicated that the concentration of combined Ra-226 and Th-232 for the material is less than 15 pCi/g above background, the rail car was identified as a LESS-THAN shipment. The waste manifest was then marked as a LESS-THAN shipment for identification purposes. Hence, materials with a concentration below the release limit were readily identified and segregated upon arrival at the Clive site.

2. Secondary Segregation

After the Maywood pile materials were accepted at the Envirocare South Clive site, they were stockpiled at the lined Treatment Facility section of the 11e.(2) facility. All material from shipments previously identified as LESS-THAN shipments have been segregated and placed in the Clean Materials Section of the Treatment Facility footprint. The remainder of the incoming material has been placed in the Staging Pile portion of the Treatment Facility. Subsequently, the second treatment operation will be conducted for all materials in the Staging Pile. This operation will involve further sampling, analysis, and segregation of the stockpiled material to identify any additional "clean" materials from the pile.

As indicated in section B.1 above, measurements indicate that a fair portion of the Maywood materials already have a concentration below the release limit for the project. Hence, discrete sampling efforts will be conducted to remove and segregate already "clean" soil from the Staging Pile. This will be accomplished by dividing the Pile into a grid system. Grids of 25' x 25' will be established over the top face of the stockpile. Samples will then be taken to a depth of 1 foot for each grid and will consist of a minimum of 5 aliquots. The aliquots will be composited, in accordance with section IV, Sampling and Analysis, and analyzed using gamma spectroscopy.

Once the results from a sampling grid are received, the material from that grid will be excavated and positioned according to the following criteria: 1) if the analysis indicates that the material can be defined as "clean," it will be placed with the other materials in the Clean Section of the facility; or 2) if the analysis indicates the material concentration exceeds release limits, it will be screened as described in part b, Oversize Materials, below. This process will then continue over the top face of the Staging Pile until the top foot is removed from the Pile. At this point, the new top face of the Staging Pile will be divided into a grid system again and the process will be repeated until all materials in the Pile have undergone Discrete Sampling and Analysis.

3 Initial Screening

A significant portion of the Maywood pile (approximately 10 to 20 percent) consists of boulders, gravel, and debris. Measurements of the Maywood pile soils indicate that the concentration levels for oversize particles should be below the release criteria. Consequently, Envirocare will segregate all oversize materials from the contaminated soil materials by screening of the Maywood soils

through a 3/4 inch screen. The segregated oversize material will be periodically analyzed, in accordance with C.2.b. below, to verify that it is below the release criteria.

Following completion of the Initial Segregation and Screening operation, all of the Maywood material will have been treated and the volume of contaminated materials should have been reduced by as much as 70%. However, a final operation will be conducted to evaluate other treatment technologies and to try and achieve the volume reduction goals proposed by Envirocare for the project.

4. Soil Washing Technologies

Some of the contaminated materials that have been graded to less than a 3/4-inch particle size will also be processed through the Soil Washing Technologies operation. Specifically, soil washing operations will include: 1) loading materials into a feed hopper for the treatment/volume reduction technology, 2) processing/washing material by dividing the coarse particles from the fines and removing contamination from the coarser particles, 3) sampling the coarser particles to verify concentration levels, and 4) disposing of contaminated materials. This operation will consist of two different systems operated by Envirocare and its subcontractors (TVIES and ART).

Initially, approximately 1000 tons of material will be processed through the TVIES system. The process flow will be carefully monitored and sampled (in accordance with section IV, Sampling and Analysis) to verify results. Upon completion of the TVIES demonstration test, 1000 tons will be processed through the ART technology. The process flow will be sampled and analyzed in a manner similar to the methods used for TVIES. The results of the two systems will then be reviewed and analyzed. Additional material may also be processed through either or both of the systems. Upon completion of the Soil Washing operation, any remaining contaminated material will be disposed in the Envirocare 11e.(2) embankment.

a. TVIES - This technology utilizes the concept of countercurrent extraction augers for performance of soil washing operations. This is accomplished by using augers for separation of the material into the coarse and fine particle sizes. While the soil travels through the auger system, scouring jets, located directly above the soil, spray the material. The spray (which may be hot or chemically enhanced as necessary) from the jets scour silt, clay, and contaminant particles from the sand and gravel.

The water and contaminants then flow down the other side of the auger. A countercurrent extraction is performed, since soil is washed and drained several times with clean water while the contaminated water flows in the opposite direction. Shaker screens then dewater the "clean" sandy soil that exits the top of the Coarse Augers.

The silt, fine sand, and debris that flows out of the back of the augers drops into a countercurrent extraction loop after the organic debris and material larger than 30 mesh are removed. In the loop, the silt falls through rising water and very fine air bubbles and is subsequently pumped into cyclone separators placed above the next tank in the series. The overflow from the cyclones is injected near the bottom of the first tank. Froth from the tanks is collected for concentration. This process is repeated until finally, the silt is dewatered on another shaker. The silt extraction loop, like the previous auger system, creates a countercurrent extraction process since clean extraction solution is injected into the last tank of the series, cyclone overflow is pumped into the previous tank, and the froth concentrate is separated. All contaminated fines and froth concentrate are ultimately pumped into Container Filter Boxes where they are dewatered and prepared for disposal. The water in the system is flocculated, clarified, filtered and then recycled through the system.

The TVIES system will not require any treatment products. In order to supply the water required for the soil washing, a 10,000 gallon tank will be installed and will be filled daily to provide the amount of water required by the system. The washing system requires 8400 gallons of water, and recycles the process water for repeat usage after each process run. The process separates the soil into gravel, sand, silt fines, and clay fines. The gravel, sand, and silt fines are considered to be the "clean" material, with the resulting contaminated material consisting of clay fines. All clean material will be discharged onto a conveyor belt and will be discharged into a segregated, clean pile. This pile will be regularly sampled (at the rate of 1 sample per 30 tons of material processed) to ensure the concentrations are below the criteria of 15 pCi/g above background combined Ra-226 and Th-232. The contaminated material will be discharged into a pile on a different side of the washing equipment and then sampled to ensure that the concentrations do not exceed Envirocares 11.e.(2) Waste acceptance criteria. This material can then be either retreated, as necessary, or loaded into trucks and transported to the disposal cell for placement.

b ART - This system consists of a series of treatment units, each designed to separate larger, clean materials from contaminants. Material is introduced into the system by a front-end loader dumping into a feed hopper designed to allow continuous processing of material. Next, the first treatment unit employs mechanical wet screening to allow an initial cut of the material. This screening will remove particles larger than 2 mm from the process, rinsing any soil bound to the gravel particles and allow it to pass through the 2 millimeter screen. The materials passing through the screen will now be in a slurry form and can be pumped into the next treatment unit, whereas the gravel particles should be "clean."

A series of Mozely hydrocyclones make up the next treatment unit. The hydrocyclones will separate the soil slurry into a sand stream and a fines stream. The cut point between the sand and fines will be .045 mm. Sand materials should be "clean" material and would not require further treatment. Hence, the sand will be transferred to a fixed dewatering screen and will be composited into a pile. Water resulting from dewatering will be returned to the water storage tank for reuse on the wet screen.

The fines stream leaving the hydrocyclones unit will be contacted with a synthetic polymer to coagulate the fines, making a larger, heavier agglomeration of particles. The coagulated material will then be mixed to make even larger particles, will be settled in a clarifier, and the solids will be consolidated in a cone section at the bottom of the clarifier. The thickened fines, will finally be pumped to a plate and frame filter press for dewatering into a sludge cake. The sludge cake will be a 50 to 60% dry solids cake that has passed through the filter press. This material will be the resulting "contaminated" materials from the process, will be piled for disposal or re-treatment. The supernatant water will be returned for reuse with the system.

## II. SITE SET-UP

The Treatment Facility will be located in the Southeast corner of Envirocare's 11e.(2) embankment area, located in South Clive, Utah. Due to the on-going waste disposal and excavation activities that occur at Envirocare's South Clive facility, the site is already equipped for proper unloading, handling, and controlling of the Maywood material. The Maywood waste has been unloaded from the gondola cars and transported by dump truck to the Treatment Facility.

The footprint for the entire 11e.(2) embankment is approximately 2250 feet East-West by 1775 feet North-South. Currently, about 520 feet East-West by 600 feet North-South is being used as active disposal cell area. The Treatment Facility will extend this area by 200 feet to the south. Hence, the total footprint of the facility will be roughly 200 feet north-south by 520 feet east-west. The base floor of the facility will be a compacted, low-permeability, 2-foot thick clay liner, spanning the entire footprint of the facility. This liner will be covered by a compacted soil cover, which may be removed as part of the restoration efforts to remove all material from the facility.

As shown in the Site Set-up drawing, a large portion of the facility area is dedicated for stockpiling of the waste material prior to processing. This area, designated as the Staging Pile, is large enough to allow stockpiling of all the material shipped from the MISS. Another portion of the facility is designated as the Clean Section. This section will consist of all materials that have been sampled, analyzed, and found to be below the release limit. The remainder of the liner area will be used for the treatment processes. One of the processes will be the initial screening of the material to separate oversize material from finer particles. This will occur immediately south of the Staging Pile. Two soil washing technologies will also operate at the south end of the facility. TVIES will process 1000 tons of material initially at the far south end of the facility. ART will process another 1000 tons of material following completion of the TVIES operations. A separate area has been designated for TVIES operation. However, in the event that TVIES demobilizes from the site following processing, the ART operation may occur where TVIES' operation occurred. The flow process for TVIES and ART processes are provided in the layout drawings and flow diagrams enclosed with this plan.

The Treatment Facility is, of course, located inside the Radiologically Controlled Area. The entire facility will be enclosed by perimeter berms to control sediment/erosion as well as any water loss during soil processing. All water will be stored inside the 10,000 gallon water storage tank at the south end of the facility (see TVIES layout drawing #2). Water will be transported from a well, located approximately 5 miles to the north, and the tank will be filled regularly. The perimeter berms will also serve as fire breaks. In addition, fire extinguishers will be maintained in the TVIES support trailer located at the Treatment Facility (see TVIES layout drawing #2).

The two evaporation ponds on site are also shown in the Site Set-up Drawing. These ponds will be used for disposition of any contaminated water not used for dust suppression during the soil washing process. The office space that will be provided for Bechtel representatives will be located in the large building owned by Broken Arrow, Envirocare's main contractor at the South Clive site. This building is located at the north end of the site, outside of the Radiation Controlled Area.

## III. WATER MANAGEMENT

Water and soil erosion will be managed using several control measures at Envirocare of Utah's 11e.(2) Disposal Facility. All control measures shall be in place prior to stockpiling of the Maywood waste material at the Treatment Facility and will be maintained until completion of site restoration processes for the facility.

### A. Treatment Facility Pad

The first method that will be instituted for water management is the construction of a pad over which treatment operations will occur. The pad will consist of: a clay liner and soil protective cover (with a possible asphalt base). The liner is constructed of 2 feet of low-permeability clay to minimize water and contaminant infiltration rates. This liner is surrounded by containment berms to control any water runoff. To protect the liner, a soil protective cover will be placed and compacted over the clay liner. This protective cover will be placed 10 feet from where the clay liner intersects the containment berms. The 10-feet section that exists between the protective cover and the berms forms a drainage ditch for collection of any rain water or process leakage water. The protective cover will be sloped to encourage any rain water to flow toward the drainage ditches. Any standing water in the ditches will be collected using a vacuum truck and will be either: a) sprayed over the 11e.(2) disposal cells as dust suppressant or b) expelled into one of the two evaporation ponds that exist at the Envirocare South Clive Site.

The liner and protective cover pad will be constructed prior to performance of the Initial Segregation and Screening Operation and/or the Soil Washing Technology Operation phases of the treatment process. This pad will provide a low permeability base to minimize the infiltration rate of contaminants. In addition, an asphalt chip surface may be placed over the soil protective cover prior to performance of the Soil Washing Technology Operations phase of the project. The asphalt surface would enhance the runoff of any process leakage water towards the edges of the pad and into the drainage ditches for collection. Leakage water will be collected and handled using the same methods described above for rain water collection.

### B. Groundwater Sampling

Although the possibility for contamination of any groundwater at the South Clive Treatment Facility is highly unlikely due to the existence of both the clay liner and the silty-clay subsurface soils at South Clive, groundwater monitoring will also take place on a regular basis. As a part of Envirocare of Utah's environmental monitoring program, groundwater wells have been drilled at strategic locations both inside and outside the

11e.(2) facility disposal area (see enclosed layout). These groundwater wells are routinely sampled and analyzed by Envirocare of Utah to ensure that no groundwater contamination occurs.

### C. Control of Waste Water/Contaminated Water

Waste water or contaminated water that may be generated in association with the Treatment Facility could occur during three different operations: a) Initial Screening, b) Soil Washing Technology Operations, or c) Equipment Decontamination. In each case, water will be collected in a similar manner.

For the Initial Screening operation, waste water will be created when oversize particles require rinsing to remove contaminants. This water will run off onto the protective cover or asphalt covering and collect in the runoff ditch, similar to rain water runoff (as described in section III.A, Treatment Facility Pad, above). As a result, the water will be collected and controlled using the same process outlined for rain water collection.

For the Soil Washing Technology operations, water will be processed and recycled within the operating systems. However, process water will need to be collected and replenished periodically. This will occur by using a vacuum trailer. Once the water is collected into the vacuum trailer, it will be used as either a dust suppressant for the 11e.(2) disposal cells or it will be expelled into one of the two evaporation ponds at the Envirocare South Clive Site.

Decontamination efforts for equipment release from the site will occur at the decontamination pad that exists at the Envirocare South Clive Site. This pad is equipped with high-pressure washers to remove contamination prior to exiting items from the Restricted Area. The pad also includes a large collection sump and 5,000 gallon tank that contain all waste water used during decontamination processes. Any waste water collected in the sump and tank system from the decontamination of 11e.(2) equipment will be removed from the tank using the vacuum trailer. The water will be controlled using the same guidelines as those indicated above for contaminated water.

## IV. SAMPLING AND ANALYSIS

This plan describes the process by which Envirocare/Zhagrus will determine the treatability and the successful treatment of waste removed from the Maywood site. Sample collection, analysis and data evaluation will be performed by Envirocare at its 11e (2) waste disposal facility near Clive, Utah, concurrently with waste treatment and disposal. Incoming

waste material, clean product, and waste for disposal will be sampled and analyzed during the treatment process. On-going analysis during treatment will assure that the desired goals of waste reduction and radiological standards set for the clean product are met.

## A. Waste Characterization

The waste to be removed under this project has been characterized as 11e.(2) byproduct and samples have previously been collected and analyzed to provide the necessary information for its handling. The waste profile record has already been developed for the Maywood pile material under this project for acceptance of materials at the Envirocare South Clive Disposal Site. Because the treatment operations to be used for the Maywood material will not include the use of any chemicals or additives that would change the characteristics of the waste material, no additional characterization will be necessary.

## B. Treatability Analysis

### 1. Pre-Operational

A pre-operational treatability study, as described in the Treatability Study Work Plan, was conducted by TVIES to determine the operating parameters necessary to successfully treat the Maywood waste. Additional studies may be performed to establish optimum treatment processes for the material.

### 2. Sample Shipping

Samples will be placed in one-gallon metal paint cans fitted with lid retainer clips, surveyed for surface radioactivity and shipped in Styrofoam padded cardboard boxes via UPS ground. Samples which meet the US Department of Transportation definition of radioactive (2,000 pCi/g total radioactivity) will be shipped as an excepted package - limited quantity radioactive shipment in compliance with 49 CFR 173.

### 3. Sample Control

Treatability samples will be shipped - maintaining chain-of-custody control to the Sample Control Officer who will prepare the samples for laboratory analysis. The Sample Control Officer will prepare the samples, filling one-liter Marinelli beakers for gamma spectrometry. Samples will be delivered to the radiological counting laboratory for counting, maintaining chain-of-custody control.

## C. Treatment Sampling

Envirocare will periodically sample and analyze the waste stream and clean product. The waste stream is analyzed to comply with license requirements to determine the concentration of radionuclides in waste placed in the disposal cell. Segregation Sampling occurs both at the Maywood site prior to shipment of material, and at the Treatment Facility for materials in the Staging Pile. Segregation sampling is used to identify materials below the release criteria for placement as "clean" materials. Secondary Segregation Sampling is performed for materials processed through the Initial Screening operations or through Soil Washing Technology operations. This sampling and analysis is to confirm compliance with DOE release standards established for this project and Envirocare license limits. Both the final "contaminated" material and the "clean" material from these two operations will be sampled and analyzed.

### 1. Segregation Sampling

The MISS materials have been systematically separated into discrete lots and will be again to identify "clean" materials. The first separation occured at the MISS when the materials were separated into lot sizes of 70 to 75 cubic yards (size of a gondola car). The lot was then sampled by collecting a minimum of six aliquots from random locations throughout the rail car. The aliquots (grab samples) were then be combined into one representative sample and analyzed using gamma spectroscopy prior to shipment of material to the Treatment Facility in Utah. Each composite sample will be given an identifying number (the rail car ID# combined with the shipment number), entered into a log book, and maintained under chain-of-custody control.

The second separation will occur at the Treatment Facility for the material in Staging Pile. This sampling and segregation will divide the material into smaller lot sizes. Each sampling lot will be a 25' X 25' grid size with a 1 foot depth (23 cubic yard size lot) A minimum of 5 grab samples will be collected from the grid and composited into one representative sample for analysis. A diagram of the grid system will be constructed prior to conducting the sampling event. Each grid, upon sample collection, will be assigned an individual ID by date and order of samples collected that day (e.g. the first sample collected on March 1 would be 3-1-1, the second sample that day would be 3-1-2, etc ), entered into the field log book, and maintained under chain-of-custody control.

### 2. Secondary Treatment Sampling

Secondary Treatment consists of: a) screening the contaminated materials to less than 3/4-inches, and b) soil washing. For both of these operations, "clean" materials and "contaminated" materials should result. Both clean and contaminated materials will be sampled following secondary treatment to verify treatment and material concentrations. The 3/4-inch screening operation assumes that oversize materials will be "clean" materials and will be sampled and analyzed as such.

a. Waste Stream (Contaminated Material) Sampling

A composite sample consisting of 3 aliquots (grab samples) will be collected at a minimum frequency of 1 sample per 250 cubic yards of material prior to disposal. Aliquots (grab samples) will be approximately 200 grams each and will be collected from random locations in the contaminated material piles. Each composite sample will be given an identifying number (Comp-1A, Comp-1B; Comp-2A, Comp-2B; etc.), entered into the field log book, and maintained under chain-of-custody control. Two composite samples will then be composited into one sample for gamma spectral analysis. These samples will be identified as WASTE-1, WASTE-2, etc. For example, Comp-1A plus Comp-1B = WASTE-1.

b. Clean Product Sampling

Clean product will be subject to frequent sampling and analysis to confirm effectiveness of treatment and to preclude releasing contaminated soil as "clean." For verification of Initial Screening Treatment, Envirocare will collect a sample at a rate of one sample per 250 cubic yards of oversize material. Oversize particles (greater than 3/4-inch), due to the average concentrations of the Maywood pile, material size and weight, and nature of contaminants, will be considered "clean." An oversize sample will be a composite of 10 aliquots (grab samples). The oversize particles will be broken or crushed to allow analysis using gamma spectroscopy. Grossly oversize materials may also be scanned using radiation detection instrumentation for determination of surface contamination.

For verification of Soil Washing Treatment, a sample will be collected for every 20 cubic yards of "clean" product. Processed materials will be segregated into discrete piles of approximately 20 cubic yards. A composite sample will then be created from 25 random grab samples, taken at different times durinng pile formation, from the pile.

The sample will be analyzed using gamma spectroscopy to verify the concentration of the 20-yard pile.

Each clean sample, regardless of particle size, will be given an identifying number, entered into the field sample log, and maintained under chain-of-custody control. In the event that a "clean" sample is analyzed and is found to have a concentration in excess of the release limit, all material in the clean pile (20 cubic yards for soil washed materials and 250 cubic yards for oversize materials) will be considered to be "contaminated" and will either be reprocessed or disposed.

3. Sample Control

Samples collected for treatment confirmation will be placed in a locked storage box under the control of the technician collecting the sample. At least once each day, all samples will be transferred, under chain-of-custody, to Sample Control where Sample Control personnel will prepare the samples for laboratory analysis. Composite waste stream samples and clean product samples will be placed in one-liter Marinelli beakers for gamma spectrometry. Samples will be delivered to the radiological counting laboratory for immediate counting, maintaining chain-of-custody control.

4. Re-Cycled Wash Water Sampling and Analysis

Water used in the Soil Washing Technology Operation process will be passed through a filter press as part of the separation, thus removing most of the suspended particulate material. The particulates will be the contaminated particles. This material will be either retreated or disposed of as contaminated materials. If the material will be disposed, it will be allowed to dry to near its optimum moisture content prior to disposal in the 11e.(2) cell.

The radionuclides included in the Maywood waste are typically quite insoluble; however, there is a potential for some radioactivity to accumulate in the water through re-cycling. To help minimize the potential buildup, the process water will be removed from the Soil Washing Technology system periodically using a vacuum trailer. This water will then be applied for dust control on the 11e.(2) disposal cell and will be replaced with fresh water. To determine when the process water needs to be replaced, testing may occur for the presence of soluble radionuclides. This sampling will occur at least monthly prior to removal for dust suppression or disposal. Samples will be analyzed by gamma spectrometry at the Envirocare radiological analytical laboratory and at least one sample will be

submitted for radiochemical analysis for soluble thorium isotopes, total uranium and Ra-226, -228. These analyses will be used to support gamma spectral analysis of waste and clean fractions of the treated waste by demonstrating any fractionation which might take place during the washing process.

## D. Sample Identification

Samples will be identified by means of pre-printed, self-adhesive labels placed on the sample container at the time of collection. The label will include:

Sample Number
Sample Type
Date
Time
Name of Person Collecting Sample

Sample collection data will be recorded in a field sample log book containing the following information

Sample Number
Sample Type
Date
Time
Initials of Person Collecting Sample
Chain of Custody form number

## F. Sample Analysis

1. Radiological Analysis

All samples will be analyzed by gamma spectral analysis for the gamma-emitting radionuclides in the material. The nuclide of concern is expected to be Th-232. Although Th-232 is not a gamma-emitter, it has decay products which are now in secular equilibrium and which can be used to quantitate the Th-232 present. Samples will be counted sufficiently long that the radiological counting error associated with the calculated concentration does not exceed 10 percent of the release limit.

For soil materials that are processed through the Soil Washing Technology, samples collected from the first day's process run will be sent to Mountain States Analytical Laboratory, a Utah-certified laboratory for

radiochemical analysis. Results will be used to determine the degree of fractionation of the radionuclides, if any, between the waste stream and clean product. These results will also make it possible to use the gamma spectrometry results from Th-232 decay products to determine the concentration of Ra-226 by scaling, thus saving the time which would, otherwise, be lost while awaiting ingrowth of Rn-222. A copy of Mountain States' current Utah certification has been included with this plan.

2. Quality Assurance/Quality Control

Envirocare's gamma spectrometry facility has been accepted as a qualified analytical facility by the Utah Division of Radiation Control (UDRC) and operates under a quality assurance plan approved by the UDRC. In addition to the initial laboratory accreditation, the laboratory is a successful participant in the USEPA-EMSL gamma cross-check program.

### G. Chain of Custody

Zhagrus and Envirocare have in place well-developed procedures for maintenance of samples under chain-of -custody control. This process, described in Operating Procedure COC-1 requires that all samples be under the direct control of a responsible individual at all times from collection to ultimate disposal. Chain-of-custody form EC-0101 provides the documentation of this control. Operating Procedure COC-1 was specifically developed for the collection of incoming waste and environmental samples at the Clive, Utah, site. However, the same procedure will be followed for any samples collected in support of this project.

## V. TRANSPORTATION AND LOGISTICS

The Treatment Facility will be located directly adjacent to the disposal cell designated for final placement of the Maywood material at the Envirocare site (see Site Set-up Design drawing). Hence, once the rail shipments containing Maywood material arrive at the Envirocare site, they will be unloaded and transported to the Treatment Facility where the material will be stockpiled.

### A. Segregation

MISS material arriving at the Clive Site has been divided and placed in two sections: the Staging Pile (for materials above the release criteria), and the Clean Materials Area. When rail cars arrived the Envirocare South Clive Disposal Site, the RSR was reviewed to identify if the shipment is a LESS-THAN shipment (as described in section I.A of this plan). If the material was a LESS-THAN shipment, it was recorded in

the Treatment Documentation Log Book by rail car number and shipment number and transported to the Treatment Facility. The clean material was then placed in the Clean Materials Area. Otherwise, all material was taken to the Staging Pile area of the Treatment Facility to await performance of additional treatment operations. Unloading, transport, and stockpiling of the material from the rail spur to the Treatment Facility has been performed by Broken Arrow, Envirocare's prime contractor at its disposal facility.

**B. Secondary Segregation**

Material from the Staging Pile will divided into a grid system. Grids of 25' X 25' by 1 foot depth will be established over the top face of the stockpile for sampling and analysis of the pile. Once a 25' x 25' grid has been analyzed, material will be excavated to a one foot depth and will be moved to either the Clean Materials area (if the material has been determined to be "clean"), or to the Screening Area for further treatment.

**C. Initial Screening**

Contaminated materials will be processed through a screening plant to separate oversize, cleanable materials from the smaller particles. The screen size will be 3/4-inch, and material will be handled using proper loading equipment. The material less than 3/4-inch size will be moved to either the Soil Washing area of the Treatment Facility, or will be taken and disposed in the 11e.(2) cell. The material greater than 3/4-inch size will be segregated, washed, sampled and analyzed (or screened using radiation detection scanning meters for grossly oversize materials), and then transferred to the Clean Materials Area of the Treatment Facility. Any materials found to be "contaminated" will either be rewashed or disposed in the 11e.(2) cell.

**D. Soil Washing**

The treatment equipment processes, as illustrated in the Process Flow Diagrams for both TVIES and ART equipment (included with this plan) will discharge soil at two different locations, "clean" material discharge and contaminated material discharge. The clean material will be discharged by a conveyor belt that will extend away from the processing operation to allow stockpiling of the material into discrete piles of approximately 20 cubic yards. Each pile will be sampled and analyzed to verify treatment success. Following analyses, the clean material will be transferred by loader to the Clean Materials Area of the Treatment Facility.

The contaminated material will also be discharged by conveyor belt into a pile. This material will subsequently be loaded into dump trucks and transported directly to the 11e.(2) cell for disposal in the Maywood section of the cell. All material will be placed

in accordance with Envirocare's Construction Quality Assurance/Quality Control Manual requirements, as approved by the Nuclear Regulatory Commission.

## E. Treatment Documentation Logbook

Once Maywood material has been treated and determined to be "clean," it must be entered in the Treatment Documentation Logbook (TDL). Each entry in the TDL will be recorded as a batch and will be singularly identified. The categories for entry in the TDL are as follows:

1: LESS-THAN Shipments

Material that has been segregated at the Maywood site and identified as a LESS-THAN shipment has been recorded in the TDL with the following information:

- Rail Car Number
- Shipment Number
- Date Treated (shipment date from Maywood to Clive)
- Volume of Clean Material
- Combined Concentration of Th-232 and Ra-226

2. Clean Grid (25' x 25') Sections

Material that has been determined to be "clean" following sampling and analysis of the Staging Pile will be identified by considering each 25' x 25' grid as one section. When a grid section is sampled, the area will be marked using a stake and flag with the ID # for the section. The ID # will be by sequence for a particular day of sampling (e.g. the first section sampled on March 1, 1997 would have an ID # of Section 3-1-1). Following determination that the section is clean, the section of material will be recorded in the TDL with the following information:

- Section Number (e.g. Section 3-1-1)
- Date Analyzed
- Volume of Clean Material (625 cubic feet)
- Combined Concentration of Th-232 and Ra-226

3. Oversize Screen Batches (greater than 3/4-inch)

Material that has been processed through the Initial Screening and Segregation Operation, classified as greater than 3/4-inch diameter, and has been verified to have concentrations below the release criteria will be recorded in the TDL with the following information:

- Batch Number (OVER-961022-1)
- Date Screened
- Volume of Clean Material
- Combined Concentration of Th-232 and Ra-226

4. Soil Washing Clean Batches

Materials that have been processed through a soil washing technology and determined to be clean (by sampling and analysis of discrete 20-yard piles) will be recorded in the TDL with the following information:

- Batch Number (WASH-3/7/97-1)
- Date Treated
- Volume of Clean Material
- Combined Concentration of Th-232 and Ra-226

## F. Measurement of Treatment Success

An important part of the treatment process is to establish the success of treatment for the Maywood material. Due to the variety of different treatment processes that will be used to reduce the volume of contaminated Maywood Pile material, a cumulative error for measuring volume of clean materials could become significant. As a result, volumes of clean material for each of the four treatment process will only be estimates and will be used for informational purposes to evaluate production rates and probable success during operations.

However, a precise number for total treatment success will be determined at the conclusion of the project. This will be accomplished by comparing the total weight of contaminated material to the total weight of the Maywood pile. To accomplish this, the following procedure will be implemented:

1. All contaminated materials taken to the 11e.(2) cell for disposal will be weighed. This will be accomplished by using a front end loader equipped with a payload scale similar to the one used at the MISS for loading the material. The payload scale system will be calibrated at a minimum rate of once every 10,000 tons of material loaded. A source with known weight will also be used to check the system once every week and a daily "ZERO" check will be performed in accordance with manufacturers recommendation.

2. The weight of each load will be recorded in the Treatment Documentation Log. Upon completion of the project, all entries will be summed to determined the final weight of contaminated Maywood materials.

3. The total weight of material for the Maywood pile will also be determined. A payload system with a front end loader was also used for loading of all shipments from the Maywood site. The total weight of each shipment is included on the Envirocare RSR. The weight of all shipments will be summed to develop a total pile weight.

4. The final weight of contaminated material will then be compared to the total Maywood pile weight to establish the percentage of success for the project.

# VI. TREATMENT FACILITY RESTORATION

Restoration processes following completion of treatment for the Maywood material will be very minimal Because the Treatment Facility will be located inside Envirocare of Utah's

11e.(2) Disposal Facility, operated over a clay liner designed for waste placement, and covered by 6 to 12 inches of a compacted clay/sand cover, the area used for waste treatment will require very little decontamination and/or remediation efforts following completion of the project. Essentially, all Maywood material will merely be removed, as will the clay/sand cover, and disposed in the 11e.(2) disposal cell The previously used clay liner will then be used for regular disposition of 11e.(2) waste.

Once all waste material from the Maywood site has been successfully treated at the treatment facility, Zhagrus/Envirocare will decontaminate the treatment equipment and remove it from the Envirocare site. Equipment decontamination activities will take place at the decontamination pad located at the main entrance to the Restricted Area. This facility, as well as the measures used to control waste water generated from decontamination efforts, is described in the Water Management Plan.

The area within the 11e.(2) disposal cell that was previously designated as the Treatment Facility will be scraped using a bulldozer or a loader to remove all visible waste material from the liner area. During this process, some of the clay/sand cover over the clay liner will also be removed and considered waste material. The waste material removed will be placed with the other Maywood material within the 11e.(2) embankment. Following visible inspection of the scraped surface by a radiation technician to ensure all waste material has been sufficiently removed, the area will then be designated as a regular portion of the 11e (2) disposal cell and will be used for the placement of 11e.(2) waste material.

## VII. QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control for the Treatment Facility will be managed by the Zhagrus/Envirocare Quality Assurance Officer (QAO). The QAO will be on-site throughout the operation of the Treatment Facility to ensure total project quality control. The overview responsibilities of the Quality Assurance Officer and Quality Assurance staff are outlined in the Envirocare Quality Assurance Manual.

An important of part of maintaining quality control at the Treatment Facility through the performance of audits and assessments of the standard operating procedures for the project. Operating procedures will be developed for the Treatment Facility operations by the Quality Assurance Staff. All audits and assessments for the Treatment Facility will be specified in the facility operating procedures, and will be carried out by the Quality Assurance staff. This staff will also include the Site Radiation Safety Officer and Health Physics staff who will be involved in the sampling and analysis for the treated/processed material (as outlined in the Treatment Facility Sampling and Analysis Plan).

As a part of regular embankment construction activities, the Envirocare Construction Quality Assurance/Quality Control (CQA/QC) Manual is used to ensure all construction operations are performed correctly and in accordance with government licenses and permits at the Envirocare South Clive site. This manual includes plans and specifications designated for construction of liner foundation, clay liner, run-off/run-on control berms, and soil cover in the 11e.(2) embankment area. The guidelines and control checks provided in these portions of the Envirocare CQA/QC Manual will be implemented for construction of the soil portions of the Treatment Facility.