APPENDIX A

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

SUMMARY OF SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN

I. SWMUs and AOCs requiring further action:

I.A SWMUs requiring further action:

4. Three Mile Ditch and Evaporation Pond 1 (Evaporation Pond 1 was formerly designated as SWMU #5);
6. NCL Container Storage Area (requirements are included in the post-closure care requirements for the North Colony Landfarm regulated unit therefore further action is not required under 20.4.1.500 NMAC incorporating 40 CFR 264.101);
16. Old API Separator;
17. Clarified Slurry Oil Tanks;
18. North API Separator;
19. South API Separator;
20. North Bundle Cleaning Pad;
21 South Bundle Cleaning Pad;
22. Main API Separator;
23. South Alkylation Unit;

I.A AOCs requiring further action:

1. Diesel Tank Farm (Tanks 834 and 838);
2. Former Diesel Storage Tanks at North Plant Process Area;
3. Southeast Tank Farm Area (Tanks 11, 12, 107, 108, 109, 114, 115, 117, 401, 402, 411, 412, 415 and 450 and Tanks 106, 110, 116, 119, 431, 432, 433 and 438);
4. Southwest Tank Farm (Tanks 111, 112, 113, 124, 128, 129, 413, 417, 418, 419 and 434);
5. Crude Tank Farm (Tanks 400, 437 and 439);

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A SPECIFIC CORRECTIVE ACTION REQUIREMENTS FOR THREE MILE DITCH AND EVAPORATION POND 1 (SWMU #4)

The specific requirements for investigation of Pond 1 are included in Section 4.1.4 of this Permit. The Permittee shall identify and characterize the source of petroleum-related and hazardous constituents detected in soils and groundwater beneath and in the vicinity of the Three Mile Ditch. The Permittee shall submit to the Secretary for approval a work plan to characterize soils and groundwater beneath the Three Mile Ditch in order to identify the source, magnitude and extent of residual petroleum-related and hazardous constituents at and in the vicinity of the unit. The work plan shall be prepared in accordance with the format described in Appendix E of this Permit.

The following minimum corrective action requirements shall be conducted at the Three Mile Ditch to evaluate for the presence, nature and extent of petroleum-related and hazardous constituents in soil and groundwater at the unit:

(i) Soil Investigation

(a) The Permittee shall conduct subsurface soil investigations within the boundaries of the Three Mile Ditch. Soil borings shall be advanced to minimum depths of five (5) feet below the water table or five (5) feet below the maximum depth of contamination as detected by field screening whichever is deeper.

(b) At a minimum, the Permittee shall advance 30 soil borings at approximately 500-foot intervals along the Three Mile Ditch. The Permittee shall advance eight additional soil borings along Three Mile Ditch at locations east of Bolton Road in the vicinity of sampling points where contamination was detected during previous investigations. The soil borings shall be advanced through the ditch at each location. In addition, soil samples shall be collected from the sludge that formed the banks of the ditch at each boring location. The soil boring locations shall be approved by the Secretary prior to the start of field activities.

(c) At a minimum, the Permittee shall collect soil samples from each boring from the sludge or sediment located at the base of the ditch directly above the contact with native soils, from the native soils located directly below the base of the ditch, from the soils located at the water table interface and from the maximum depth of each boring.

(d) The soil samples shall be submitted to an analytical laboratory for chemical analysis of one or more of the following: GRO, DRO, ORO, VOCs, SVOCs and RCRA metals.

(e) The Permittee shall submit to the Secretary for approval, an investigation report summarizing the results of the investigations in the format described in Appendix E of this Permit within 150 days of the completion of field activities at the Three Mile Ditch.

(i) Groundwater Investigation

(a) The Permittee shall collect groundwater samples from each soil boring, described in B.5.a.(i).a above, at the completion of drilling. The Permittee also shall collect groundwater samples from all existing monitoring wells associated with the Three Mile Ditch in conjunction with the drilling activities. The monitoring wells include MW-1, MW-8, MW-9, MW-15, MW-16, MW-20, MW-21 and MW-25 through MW-29.

(b) At a minimum, Permittee shall submit the groundwater samples obtained from the soil borings to an analytical laboratory for chemical analysis for VOCs, GRO and DRO.

(c) At a minimum, the groundwater samples obtained from the existing monitoring wells shall be submitted to an analytical laboratory for chemical analysis of one or more of the following: VOCs, GRO, DRO, RCRA metals, SVOCs and major cations/anions.

(d) The Permittee shall prepare a report summarizing the results of the investigations in the format described in Appendix E of this Permit within 150 days of the completion of field activities at the Three Mile Ditch.

The Permittee shall properly abandon the soil borings at the completion of collection of the required soil and groundwater samples. The results of the investigations will be used by the Secretary to evaluate the need for additional investigation, additional monitoring points, remedial action and/or groundwater monitoring at the Three Mile Ditch.

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APPENDIX B

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

CONSTITUENTS OF CONCERN FOR WASTES FROM PETROLEUM PROCESSES

Reference: Page 29, Exhibit 3, EPA RCRA Delisting Program Guidance Manual for the Petitioner, March 23, 2000

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APPENDIX C

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

SAMPLING METHODS AND PROCEDURES

C SAMPLING METHODS AND PROCEDURES

The methods used to conduct investigation, remediation and monitoring activities shall be sufficient to fulfill the requirements of this Permit and provide defensible data for the evaluation of site conditions, the nature and extent of contamination and contaminant migration, and for remedy selection and implementation, where necessary. The methods presented in Appendix C below are minimum requirements for environmental investigation and sampling but are not intended to include all methods that may be necessary to fulfill the requirements of this Permit. The methods for conducting investigations, corrective actions and monitoring at the Facility must be determined based on the unique conditions and contaminants that exist at each location or unit.

.C.1 INVESTIGATION, SAMPLING AND ANALYSES METHODS

C.1.a INTRODUCTION AND PURPOSE

The Investigation, Sampling and Analyses Methods section of this Permit provides minimum requirements for field investigations, sample collection, handling and screening procedures, field and laboratory sample analysis, and quality assurance (QA) procedures for samples of the medium being investigated or tested at the Facility.

The purpose of this section of the Permit is to (1) provide minimum requirements for drilling and sample collection in exploratory borings and other excavations, (2) provide minimum requirements for sampling of the target media, (3) provide minimum requirements for monitoring of groundwater and vadose zone conditions, and (4) identify minimum required screening, analytical and QA procedures that shall be implemented during field sampling activities and laboratory analyses.

The QA procedures referenced in the previous paragraph include (1) the Facility investigation data quality objectives, (2) the requirements for quality assurance/quality control (QA/QC) to be followed during field investigations and by the chemical analytical laboratories, and (3) the methodology for the review and evaluation of the field and laboratory QA/QC results and documentation.

C.2 FIELD EXPLORATION ACTIVITIES

Exploratory borings shall be advanced at locations specified in the work plans referenced in Sections 4.1. and Appendix A of this Permit and at all other locations required by the Secretary. The depths and locations of all exploratory and monitoring well borings shall be specified in the unit-specific work plans submitted to the Secretary for approval prior to the start of the respective field activities.

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C.2.a Subsurface Feature/Utility Geophysical Surveys

The Permittee shall conduct surveys, where appropriate, to locate underground utilities, pipelines structures, drums, debris and other buried features in the shallow subsurface prior to the start of field exploration activities. The methods used to conduct the surveys such as magnetometer, ground penetrating radar, resistivity or other methods shall be selected based on the unique characteristics of the site and the possible or suspected underground structures. The results of the surveys shall be included in the investigation reports submitted to the Secretary.

C.2.b Drilling and Soil Sampling

C.2.b.i Drilling

Exploratory and monitoring well borings shall be drilled using the most effective, proven and practicable method for recovery of undisturbed samples and potential contaminants. The Secretary must approve the drilling methods selected for advancement of each boring prior to the start of field activities. Based on the drilling conditions, the borings shall be advanced using one of the following methods:

- Hollow-stem auger
- Direct Push Technology (DPT)
- Air rotary

Hollow-stem auger or DPT drilling methods are preferred based on the local subsurface conditions and the anticipated investigation requirements at the time of Permit issuance.

All drilling equipment shall be in good working condition and capable of performing the assigned task. Drilling rigs and equipment shall be operated by properly trained, experienced and responsible crews. The Permittee and its contractors are responsible for ensuring that imported contaminants are not introduced into the unit under investigation due to malfunctioning equipment or poor housekeeping. The drilling equipment shall be decontaminated before drilling each boring.

Exploratory borings shall be advanced to unit- and location-specific depths specified or approved by the Secretary. The Permittee shall propose drilling depths in the site-specific work plans submitted for each unit. Generally, the borings shall be advanced to the following minimum depths:

1. Five feet below the deepest detected contamination,
2. Five feet below the base of shallow structures,
3. Five feet below the shallow water table,
4. Depths specified by the Secretary based on regional or unit specific data needs.

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The Secretary shall be notified as early as is practicable if conditions arise or are encountered that do not allow the advancement of borings to the depths specified by the Secretary so that alternative actions may be discussed. Precautions shall be taken to prevent the migration of contaminants between geologic, hydrologic or other identifiable zones during drilling and well installation activities.

The drilling and sampling shall be accomplished under the direction of a qualified engineer or geologist who shall maintain a detailed log of the materials and conditions encountered in each boring. Sample information and visual observations of the cuttings and core samples shall be recorded on the boring log. Known site features and/or site survey grid markers shall be used as references to locate each boring prior to surveying the location as described in Section C.2.f below. The boring locations shall be measured to the nearest foot, and locations shall be recorded on a scaled site map upon completion of each investigation. Trenching and other exploratory excavation methods shall follow the applicable general procedures outlined in this section. The particular methods proposed for use by the Permittee for subsurface explorations and sampling shall be included in the unit-specific investigation work plan submitted to the Secretary. The Secretary will include any changes or additional requirements for conducting exploratory excavation and sampling activities at the subject unit in their response to the Permittee after review of the investigation work plan.

C.2.b.ii<u>Soil Sampling</u>

Relatively undisturbed discrete soil samples shall be obtained during the advancement of each boring for the purpose of logging, field screening and analytical testing. Generally, the samples shall be collected at the following intervals and depths:

1. Continuously, at 2.5-foot intervals, at 5-foot intervals or as approved by the Secretary,
2. At the depth immediately below the base of the unit structures and at the fill-native soil interface,
3. At the maximum depth of each boring,
4. At the shallow water table,
5. From soil types relatively more likely to sorb or retain contaminants than the surrounding lithologies,
6. At intervals suspected of being source or contaminated zones,
7. At other intervals approved or required by the Secretary.

The sampling interval for the borings may be modified, or samples may be obtained from a specific depth, based on field observations. A decontaminated split-barrel sampler lined with brass sleeves, a continuous coring device or other method approved by the Secretary shall be used to obtain samples during the drilling of each boring.

The split barrel sampler lined with brass sleeves or a coring device is the preferred sampling method for borehole soil, rock and sediment sampling. The following procedures should be followed if a split barrel sampler is used. Upon recovery of the sample, one or more brass sleeves

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shall be removed from the split barrel sampler and the open ends of the sleeves shall be covered with Teflon tape or foil and sealed with plastic caps fastened to the sleeves with tape for shipment to the analytical laboratory. If brass sleeves are not used, a portion of the sample shall be placed in precleaned, laboratory-prepared sample containers for laboratory chemical analysis. The use of an Encore® Sampler is preferred by the HWB if sample collection in brass sleeves is not used during collection of soil samples for VOC analysis. The remaining portions of the sample shall be used for logging and field screening, as described in Sections C.2.c and C.2.d below, respectively.

Discrete samples shall be collected for field screening and laboratory analyses. Homogenization of discrete samples collected for analyses other than for VOC analyses shall be performed by the analytical laboratory, if necessary. The Permittee may submit site-specific, alternative methods for homogenization of samples in the field to the Secretary for approval.

Samples to be submitted for laboratory analyses shall be selected based on: (1) the results of the field screening or mobile laboratory analyses, (2) the position of the sample relative to groundwater, suspected releases, and/or site structures or features, (3) the sample location relative to former or altered site features or structures, (4) the stratigraphy encountered in the boring and (5) the specific objectives and requirements of the project. The proposed number of samples and analytical parameters shall be included as part of the unit-specific work plan submitted to the Secretary for approval prior to the start of field investigation activities at each unit. The work plans shall allow for flexibility in modifying the project-specific tasks based on information obtained during course of the investigation. Modifications to site-specific work plan tasks shall be approved by the Secretary prior to implementation.

C.2.b.iii <u>Surface Sampling</u>

Surface samples shall be collected using decontaminated, hand-held stainless steel coring device, shelby tube, thin-wall sampler or other method approved by the Secretary where surface or sediment sampling is conducted without the use of the drilling methods described in Section C.2.a above. The samples shall be transferred to precleaned laboratory prepared containers for submittal to the laboratory. Samples obtained for volatiles analysis shall be collected using Encore® samplers, shelby tubes, thin-wall sampler or other method approved by the Secretary. Except in the case of the use of Encore® samplers, the ends of the samplers shall be lined with Teflon tape or aluminum foil and sealed with plastic caps fastened to the sleeves with tape for shipment to the analytical laboratory.

The physical characteristics of the sediment (such as mineralogy, ASTM or AGI classification, moisture content, texture, color, presence of stains or odors, and/or field screening results), depth where each sample was obtained, method of sample collection and other observations shall be recorded in the field log.

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C.2.b.iv. Drill Cuttings (Investigation Derived Waste)

Drill cuttings, excess sample material and purge/development/decontamination fluids [investigation derived waste (IDW)] shall be contained and characterized using methods based on the boring location, boring depth, drilling method and type of contaminants suspected or encountered. An IDW management plan shall be included with the unit-specific investigation work plan submitted to the Secretary for approval prior to the start of field investigations. The Secretary shall approve the method of containment for drill cuttings prior to the start of drilling activities. Borings not completed as groundwater or vapor monitoring wells shall be properly abandoned. Borings completed as monitoring wells shall be constructed in accordance with the requirements described in Section C.2.b.v below.

C.2.b.v. Monitoring Well Construction

C.2.b.v.a Well Construction Materials

Well construction materials shall be selected based on the goals and objectives of the proposed monitoring program and the geologic conditions at the site. The materials selected shall not contribute foreign constituents, or remove constituents of concern from the groundwater. The well construction materials shall be selected based on the tensile strength, compressive strength, and collapse strength of the materials, length of time the monitoring well will be in service, and the material's resistance to chemical and microbiological corrosion.

C.2.b.v.b Well Construction Techniques

The borehole shall be bored, drilled, or augured as close to vertical as possible, and checked with a plumb bob or level. Slanted boreholes shall not be acceptable unless specified in the design. The borehole shall be of sufficient diameter so that well construction can proceed without major difficulties. To assure an adequate size, a minimum 2-inch annular space is required between the casing and the borehole wall (or the hollow-stem auger wall). The 2-inch annular space around the casing will allow the filter pack, bentonite seal, and annular grout to be placed at an acceptable thickness. Also, the 2-inch annular space will allow up to a 1.5-inch outer diameter tremie pipe to be used for placing the filter pack, bentonite seal, and grout at the specified intervals.

It may be necessary to overdrill the borehole so that any soils that have not been removed (or that have fallen into the borehole during augering or drill stem retrieval) will fall to the bottom of the borehole below the depth where the filter pack and well screen are to be placed. Normally, 2 to 5 feet is sufficient for overdrilling shallow wells. The borehole also may be overdrilled to allow for an extra space for a well sump to be installed. If the borehole is overdrilled deeper than desired, it can be backfilled to the designated depth with bentonite pellets or the sand that will be used for the filter pack.

The well casings (riser assembly) shall be secured to the well screen by flush-jointed threads and

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placed into the borehole and plumbed by the use of centralizers and/or plumb bob or level. No lubricating oils or grease shall be used on casing threads. Teflon tape may be used to wrap the threads to insure a tight fit and minimize leakage. No glue of any type shall be used to secure casing joints. Teflon "O" rings also may be used to insure a tight fit and minimize leakage; however, "O" rings made of other materials are not acceptable if the well is going to be sampled for organic compound analyses. Before the well screen and casings are placed at the bottom of the borehole, at least 6 inches of filter material shall be placed at the bottom to serve as a firm footing. The string of well screen and casing should then be placed into the borehole and plumbed. Centralizers can be used to plumb a well, but centralizers shall be placed so that the placement of the filter pack, overlying bentonite seal, and annular grout will not be hindered. Centralizers placed in the wrong locations can cause bridging during material placement. If centralizers are used, they shall be placed below the well screen sections and above the bentonite annular seals. After the string of well screen and casing is plumb, the filter material shall be placed around the well screen up to the designated depth. After the filter pack has been installed, the bentonite seal shall be placed directly on top of the filter pack up to the designated depth or a minimum of 2 feet above the filter pack, whichever is greater. After the bentonite seal has hydrated for the specified time, the annular grout shall be placed into the annular space around the casing (riser assembly) up to within 2 feet of the ground surface or below the frost line, whichever is greater. A surface pad and protective steel casing (or monument if the well is flush-mounted) shall be installed to protect the well casing.

C.2.b.v.c <u>Well Screen and Filter Pack Design</u>

Well screens and filter packs shall be designed to accurately sample the aquifer zone that the well is intended to sample, minimize the passage of formation materials (turbidity) into the well, and ensure sufficient structural integrity to prevent the collapse of the intake structure. The selection of the well screen length depends upon the objective of the well. Piezometers and wells where only a discrete flow path is monitored are generally completed with short screens (two feet or less). While monitoring wells are usually constructed with longer screens (usually 5 to 10 feet), they shall be kept to the minimum length appropriate for intercepting a contaminant plume. Wells designed to monitor light non-aqueous phase liquids (LNAPLs) shall be constructed so that the well screen extends across the zone of seasonal high and low water table fluctuation. The screen slot size shall be selected to retain from 90 to 100 percent of the filter pack material in artificially filter packed wells, and from 50 to 100 percent of the formation material in naturally packed wells. All well screens shall be factory slotted.

A filter pack shall be used when: 1) the natural formation is poorly sorted, 2) a long screen interval is required and/or the screen spans highly stratified geologic materials of widely varying grain sizes, 3) the natural formation is uniform fine sand, silt, or clay, 4) the natural formation is thin-bedded, 5) the natural formation is poorly cemented sandstone, 6) the natural formation is highly fractured or characterized by relatively large solution channels, 7) the natural formation is shale or coal that will act as a constant source of turbidity to groundwater samples, and 8) the diameter of the borehole is significantly greater than the diameter of the screen. The use of

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natural formation material as filter pack is only recommended when the natural formation materials are relatively coarse-grained, permeable, and uniform in grain size.

Filter pack materials shall consist of clean, rounded to well-rounded, hard, insoluble particles of siliceous composition (industrial grade quartz sand or glass beads). The required grain-size distribution or particle sizes of the filter pack materials shall be selected based upon a sieve analysis of the aquifer materials and/or the formation to be monitored. To select the appropriate filter pack particle size, the results of a sieve analysis of the formation materials are plotted on a grain-size distribution graph, and a grain-size distribution curve is generated. The 70 percent retained grain size value should be multiplied by a factor between 4 and 6 (4 for fine, uniform formations, and 6 for coarse, non-uniform formations). A second grain-size distribution curve is then drawn on the graph for this new value, ensuring that the uniformity coefficient does not exceed 2.5. The filter pack that shall be used will fall within the area defined by these two curves. Once the filter pack size is determined, the screen slot size shall be selected to retain at least 90 percent of the filter pack material.

The filter pack shall be installed in a manner that prevents bridging and particle-size segregation. Filter packs placed below the water table shall be installed by the tremie pipe method. Filter pack materials shall not be poured into the annular space unless the well is shallow (e.g., less than 30 feet deep) and the filter pack material can be poured continuously into the well without stopping. At least two inches of filter pack material shall be installed between the well screen and the borehole wall, and one foot of material shall extend above the top of the well screen. A minimum of 6-inches of filter pack material shall also be placed under the bottom of the well screen to provide a firm footing and an unrestricted flow under the screened area.

C.2.b.v.d <u>Annular Sealant</u>

The annular space between the well casing and the borehole must be properly sealed to prevent vertical migration of contamination to the groundwater. The materials used for annular sealants shall be chemically inert with respect to the highest anticipated concentration of chemical constituents expected in the groundwater at the facility. In general, the permeability of the sealing material shall be one to two orders of magnitude lower than the least permeable parts of the formation in contact with the well.

During well construction, an annular seal shall be placed on top of the filter pack. This seal shall consist of a high solids (10 to 30%) bentonite material in the form of bentonite pellets, granular bentonite, or bentonite chips. The bentonite seal shall be placed in the annulus through a tremie pipe if the well is deep (greater than 30 feet), or by pouring directly down the annulus in shallow wells (less than 30 feet). If the bentonite materials are poured directly down the annulus, a tamping device shall be used to ensure that the seal is emplaced at the proper depth and the bentonite has not bridged higher in the well casing. The bentonite seal shall be placed above the filter pack for a minimum of two feet vertical thickness. The bentonite seal shall be allowed to completely hydrate in conformance with the manufacturer's specifications prior to installing the

overlying annular grout seal. The time required for the bentonite seal to completely hydrate will differ with the materials used and the specific conditions encountered.

A grout seal shall be installed on top of the filter pack annular seal. The grout seal may consist of either a high solids (30%) bentonite grout, a neat cement grout, or a cement/bentonite grout. All grouts shall be prepared in accordance with the manufacturer's specifications. High solids (30%) bentonite grouts shall have a minimum density of 10 pounds per gallon (as measured by a mud balance) to ensure proper setup. Cement grouts shall be mixed using 6.5 to 7 gallons of water per 94-pound bag of Type I Portland cement. Bentonite (5 to 10 percent) may be added to delay the setting time and reduce the shrinkage of the grout.

C.2.b.v.e <u>Well Development</u>

All monitoring wells shall be developed to create an effective filter pack around the well screen, correct damage to the formation caused by drilling, remove fine particles from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the well. A minimum of five well volumes shall be removed from newly installed shallow monitoring wells during development. A newly constructed monitoring well shall be developed until the column of water in the well is free of visible sediment, and the pH, temperature, turbidity, and specific conductivity have stabilized. If the well is pumped dry, the water level shall be allowed to sufficiently recover before the next development period is initiated. Common methods used for developing wells include pumping and over pumping, backwashing, surging (with a surge block), bailing, jetting and airlift pumping.

These development procedures can be used, either individually or in combination, to achieve the most effective well development. However, the most favorable well development methods include pumping, over pumping, bailing, surging, or a combination of these methods. Well development methods and equipment that alter the chemical composition of the groundwater shall not be used. Development methods that involve adding water or other fluids to the well or borehole, or that use air to accomplish well development shall not be used. If water is introduced to a borehole during well drilling and completion, then a greater volume of water shall be removed from the well during development. In addition, the volume of water withdrawn from a well during development shall be recorded.

C.2.b.v.f <u>Surface Completion</u>

Monitoring wells may be completed either as flush-mounted wells, or as aboveground completions. A surface seal shall be installed over the grout seal and extend vertically up the well annulus to the land surface. The lower end of the surface seal shall extend a minimum of one foot below the frost line to prevent damage from frost heaving. The composition of the surface seal shall be neat cement or concrete. In aboveground completions, a three-foot wide, four-inch thick concrete surface pad shall be installed around the well at the same time the protective casing is installed. The surface pad shall be sloped so that drainage will flow away from the protective casing and off the pad. In addition, a minimum of one inch of the finished pad shall be below the surface grade or ground elevation to prevent washing and undermining by

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soil erosion.

A locking protective casing shall be installed around the well casing (riser) to prevent damage or unauthorized entry. The protective casing shall be anchored in the concrete surface pad below the frost line and extend several inches above the well riser stickup. A ¼-inch weep hole shall be drilled into the protective casing just above the top of the concrete surface pad to prevent water from accumulating and freezing inside the protective casing around the well riser. A cap shall be placed on the well riser to prevent tampering or the entry of foreign materials, and a lock shall be installed on the protective casing to provide security. If the wells are located in a high traffic area, a minimum of three bumper guards consisting of steel pipes 3 to 4-inches in diameter and a minimum of 5-foot length should be installed. The bumper guards should be installed to a minimum depth of 2 feet below the ground surface in a concrete footing and extend a minimum of 3 feet above ground surface. The pipes should be filled with concrete or sand to provide additional strength.

If flush-mounted completions are used, a traffic-grade surface monument or a protective structure such as a utility vault or meter box should be installed around the well casing. In addition, measures should be taken to prevent the accumulation of surface water in the protective structure and around the well intake. These measures should include outfitting the protective structure with a steel lid or manhole cover that has a rubber seal or gasket, and ensuring that the bond between the cement surface seal and the protective structure is watertight.

C.2.c <u>Logging of Soil Samples</u>

Samples obtained from all exploratory borings and excavations shall be visually inspected and the soil or rock type classified in general accordance with ASTM (American Society for Testing and Materials) D2487 [Unified Soil Classification System] and D2488 and/or AGI (American Geological Institute) Methods for soil and rock classification. Detailed logs of each boring shall be completed in the field by a qualified engineer or geologist. Additional information, such as the presence of water-bearing zones and any unusual or noticeable conditions encountered during drilling shall be recorded on the logs. Field boring, test pit logs and field well construction diagrams shall be converted to the format acceptable for use in final reports submitted to the Secretary.

C.2.d <u>Soil Sample Field Screening</u>

Samples obtained from the borings shall be screened in the field for evidence of the presence of contaminants. Field screening results shall be recorded on the exploratory boring and excavation logs. Field screening results are used as a general guideline to determine the nature and extent of possible contamination. In addition, screening results shall be used to aid in the selection of soil samples for laboratory analysis. The Secretary recognizes that field screening alone will not detect the possible presence or full nature and extent of all contaminants of potential concern (COPCs) that may be encountered at the site.

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The primary screening methods to be used shall include (1) visual examination, (2) headspace vapor screening for volatile organic compounds, and/or (3) metals screening using X-ray fluorescence. Additional screening for site- or release-specific characteristics such as pH or for specific compounds using field test kits shall be conducted where appropriate.

Visual screening includes examination of soil samples for evidence of staining caused by petroleum-related compounds or other substances that may cause staining of natural soils such as elemental sulfur or cyanide compounds.

Headspace vapor screening targets volatile organic compounds and involves placing a soil sample in a plastic sample bag or a foil sealed container allowing space for ambient air. The container shall be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container shall be allowed to rest for a minimum of 5 minutes while vapors equilibrate. Vapors present within the sample bag's headspace will then be measured by inserting the probe of the instrument in a small opening in the bag or through the foil. The maximum value and the ambient air temperature shall be recorded on the field boring or test pit log for each sample. The monitoring instruments shall be calibrated each day to the manufacturers standard for instrument operation. A photo-ionization detector (PID) equipped with a 10.6 or higher electron volt (eV) lamp, combustible gas indicator or other instrument approved by the Secretary shall be used for VOC field screening. The limitations, precision and calibration of the instrument to be used for VOC field screening shall be included in the site-specific investigation work plan prepared for each unit.

X-ray fluorescence (XRF) may be used to screen soil samples for the presence of metals or isotopes. XRF screening requires proper sample preparation and proper instrument calibration. Sample preparation and instrument calibration procedures shall be documented in the field logs. The methods and procedures for sample preparation and calibration shall be approved by the Secretary prior to the start of field activities. Field XRF screening results for selected metals may be used in lieu of laboratory analyses upon approval by the Secretary; however, the results shall, at a minimum, be confirmed by laboratory analyses at a frequency of 20 percent (1 sample per every five analyzed by XRF analysis).

Field screening results are site- and boring-specific and the results vary with instrument type, the media screened, weather conditions, moisture content, soil type, and type of contaminant, therefore, all conditions capable of influencing the results of field screening shall be recorded on the field logs. The conditions potentially influencing field screening results shall be submitted to the Secretary as part of the site-specific investigation, remediation and/or monitoring reports.

At a minimum, samples with the greatest apparent degree of contamination, based on field observations and field screening, shall be submitted for laboratory analysis. The location of the sample relative to groundwater, stratigraphic units and/or contacts and the proximity to significant site or subsurface features or structures also shall be used as a guideline for sample selection. In addition, samples with no or low apparent contamination, based on field screening, shall be

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submitted for laboratory analysis if the intention is to confirm that the base (or other depth interval) of a boring or other sample location is not contaminated.

C.2.e Soil Sample Types

Soil samples shall be obtained at the frequencies outlined in the site-specific investigation work plans for each unit submitted by the Permittee for approval by the Secretary. The samples collected shall be representative of the media and site conditions being investigated or monitored. QA/QC samples shall be collected to monitor the validity of the soil sample collection procedures. Field duplicates will be collected at a rate of 10 percent. Equipment blanks shall be collected from all sampling apparatus at a frequency of 10 percent for chemical analysis. Equipment blanks shall be collected at a frequency of one-per-day if disposable sampling equipment is used. Field blanks shall be collected at a frequency of one per day for each media (with the exception of air samples) at each unit. Reagent blanks shall be used if chemical analytical procedures requiring reagents are employed in the field as part of the investigation or monitoring program. The resulting data will provide information on the variability associated with sample collection, handling and laboratory analysis operations. The blanks and duplicates shall be submitted for laboratory analyses associated with the project-specific contaminants, data quality concerns and media being sampled.

C.2.f Sample Point and Structure Location Surveying

The horizontal coordinates and elevation of each surface sampling location, the surface coordinates and elevations of each boring or test pit, the top of each monitoring well casing, the ground surface at each monitoring well location and the locations of all other pertinent structures shall be determined by a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System (NMSA 1978 47-1-49-56 (Repl. Pamp. 1993). The surveys shall be conducted in accordance with Sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico. Horizontal positions shall be measured to the nearest 0.1-foot, and vertical elevations shall be measured to the nearest 0.01-foot. The Permittee shall prepare site map(s), certified by a registered New Mexico professional land surveyor, presenting all surveyed locations and elevations including relevant site features and structures for submittal with all associated reports to the Secretary.

C.2.g Vapor-phase Monitoring and Sampling

Vapor monitoring and sampling shall be conducted if considered necessary by the Secretary. The methods and frequency of vapor monitoring and sampling shall be outlined in the unit-specific work plans, prepared in accordance with the requirements described in Appendix E of this Permit, if required.

Vapor samples analyzed by the laboratory for percent moisture and VOCs shall be collected using SUMMA canisters or other sample collection method approved by the Secretary. The samples

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shall be analyzed for VOC concentrations by EPA Method TO-14 or equivalent VOC analytical method.

Field vapor measurements and the date and time of each measurement shall be recorded on a vapor monitoring data sheet. The instruments used for field measurements shall be calibrated in accordance with the manufacturers specifications and as described in Section C.2.d and C.4 of this Module. The methods used to obtain vapor-phase field measurements and samples shall be approved by the Secretary prior to the start of air monitoring at each Facility unit where vapor-phase monitoring is conducted.

C.2.h Groundwater Monitoring

C.2.h.i Groundwater Levels

Groundwater levels shall be measured in all monitoring wells on a semi-annual basis. Groundwater levels also shall be obtained prior to purging in preparation for a sampling event. Measurement data and the date and time of each measurement shall be recorded on a site monitoring data sheet. The depth to ground water shall be measured to the nearest 0.01 foot. The depth to groundwater shall be recorded relative to the surveyed well casing rim or other surveyed datum. The method of water level measurement shall be approved by the Secretary. Groundwater levels shall be measured in all wells within 48 hours of the start of obtaining water level measurements.

C.2.i Groundwater Sampling

Groundwater samples shall initially be obtained from newly constructed monitoring wells between 10 and 30 days after the completion of well development. Groundwater monitoring and sampling shall be conducted on a semi-annual basis or other interval approved by the Secretary after the initial sampling event. All monitoring wells scheduled for sampling during a groundwater sampling event shall be sampled within 15 days of the start of the monitoring and sampling event. The Permittee shall sample all saturated zones screened to allow entry of groundwater into each monitoring well during each sampling event. All requests for variances from the groundwater sampling schedule shall be submitted to the Secretary, in writing, at least 30 days prior to the start of scheduled monitoring and sampling events. Groundwater samples shall be collected from all exploratory borings not intended to be completed as monitoring wells prior to abandonment of the borings, where practicable.

Water samples shall be analyzed for one or more of the following general chemistry parameters as required by the Secretary:

nitrate/nitrite	sulfate	chloride
dissolved CO_2	alkalinity	carbonate/bicarbonate
fluoride	manganese	calcium
ferric/ferrous iron	ammonia	potassium

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phosphate sodium methane
total kjeldahl nitrogen (TKN) total organic carbon (TOC)
total dissolved solids (TDS) total suspended solids (TSS)
additional analytes as required by the Secretary

C.2.i.i Well Purging

All zones in each monitoring well shall be purged by removing groundwater prior to sampling in order to ensure that formation water is being sampled. Purge volumes shall be determined by monitoring, at a minimum, groundwater pH, specific conductance, temperature and dissolved oxygen concentrations during purging. Water samples may be obtained from the well after the measured parameters of the purge water have stabilized to within ten percent for three consecutive measurements. A minimum of one well volume shall be purged from each monitoring well prior to obtaining measurements for use in determining whether the groundwater parameters have stabilized. The groundwater quality parameters shall be measured using instruments approved by the Secretary. The volume of groundwater purged, the instruments used and the readings obtained at each interval shall be recorded on the field monitoring log. Well purging also shall be conducted in accordance with the NMED HWB Draft Position Paper "Use of Micropurging and Low-flow Sampling Techniques for Compliance Groundwater Monitoring" (October 2001). The Permittee may submit, to the Secretary for approval, a written request for a variance from the described methods of well purging for individual wells no later than 90 days prior to scheduled sampling activities. The Secretary will respond to the request, in writing, within 60 days of receipt of the variance request.

C.2.i.ii Groundwater Sample Collection

Groundwater samples shall be obtained from each well after a sufficient amount of water has been removed from the well casing to ensure that the sample is representative of formation water. Groundwater samples shall be obtained using methods approved by the Secretary within 24 hours of the completion of well purging. Sample collection methods shall be documented in the field monitoring reports. The samples shall be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody procedures are described in Sections C.2.j and C.6.b below. Decontamination procedures shall be established for reusable water sampling equipment as described in Section C.3.

All purged groundwater and decontamination water shall be temporarily stored at satellite accumulation areas or transfer stations in labeled 55-gallon drums or other containers approved by the Secretary until proper characterization and disposal can be arranged. The methods for disposal of purge/decontamination water shall be approved by the Secretary prior to removal from the temporary storage area. Disposable materials shall be handled as described in Section C.5 of this Permit.

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Groundwater samples intended for metals analysis shall be submitted to the laboratory as total metals samples. Groundwater samples also may be obtained for dissolved metals analysis and shall be filtered using disposable in-line filters with a mesh size approved by the Secretary.

C.2.i.iiiGroundwater Sample Types

Field duplicates, field blanks, equipment rinseate blanks, reagent blanks, if necessary, and trip blanks shall be obtained for quality assurance during ground water and surface water sampling activities. The samples shall be handled as described in Section C.2.j below.

Field duplicate surface water and groundwater samples shall be obtained at a frequency of ten percent. At a minimum, one duplicate sample per sampling event shall always be obtained.

Field blanks shall be obtained at a minimum frequency of one per day per site or unit. Field blanks shall be generated by filling sample containers in the field with deionized water and submitting the samples with the groundwater samples to the analytical laboratory for the appropriate analyses.

Equipment rinseate blanks shall be obtained for chemical analysis at the rate of ten percent or a minimum of one rinseate blank per sampling day. Equipment rinseate blanks shall be collected at a rate of one per sampling day if disposable sampling apparatus is used. Rinseate samples shall be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinseate sample then shall be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses.

Reagent blanks shall be obtained at a frequency of twenty percent or a minimum of one per day per unit if chemical analyses requiring the use of chemical reagents is conducted in the field during water sampling activities.

Trip blanks shall accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks shall consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank shall be prepared by the analytical laboratory prior to the sampling event and shall be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks shall be analyzed at a frequency of one for each shipping container of samples.

C.2.j Sample Handling

At a minimum, the following procedures shall be used at all times when collecting samples during investigation, corrective action and monitoring activities.

1. Neoprene, nitrile or other protective gloves shall be worn when collecting samples. New disposable gloves shall be used to collect each sample.
2. All samples collected of each media for chemical analysis shall be transferred into clean sample containers supplied by the project analytical laboratory with the exception of soil or

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sediment samples obtained in brass sleeves or in Encore® samplers. Upon recovery of the sample collected using split barrel samplers with brass sleeves, the brass sleeves shall be removed from the split barrel sampler and the open ends of the sleeves shall be lined with Teflon tape or foil and sealed with plastic caps. The caps shall be fastened to the sleeve with tape for storage and shipment to the analytical laboratory. The sample depth and the top of the sample shall be clearly marked. Sample container volumes and preservation methods shall be in accordance with EPA SW-846 and established industry practices for use by accredited analytical laboratories. Sufficient sample volume shall be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.

3. Sample labels and documentation shall be completed for each sample following procedures approved by the Secretary. Immediately after the samples are collected, they shall be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Section C.6.b below, shall be followed for all samples collected. All samples shall be submitted to the laboratory soon enough to allow the laboratory to conduct the analyses within the method holding times. At a minimum, all samples shall be submitted to the laboratory within 48 hours after their collection.

Shipment procedures will include the following:

1. Individual sample containers shall be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler shall be sealed and secured in case of sample container leakage. Temperature blanks shall be included with each shipping container.
2. Each cooler or other container shall be delivered directly to the analytical laboratory.
3. Glass bottles shall be separated in the shipping container by cushioning material to prevent breakage.
4. Plastic containers shall be protected from possible puncture during shipping using cushioning material.
5. The chain-of-custody form and sample request form shall be shipped inside the sealed storage container to be delivered to the laboratory.
6. Chain-of-custody seals shall be used to seal the sample shipping container in conformance with EPA protocol.
7. Signed and dated chain-of-custody seals shall be applied to each cooler prior to transport of samples from the site.

C.2.k <u>In-situ Testing</u>

In-situ permeability tests, remediation system pilot tests and other tests conducted to evaluate site and subsurface conditions shall be designed to accommodate specific site conditions and to achieve the test objectives. The testing methods shall be approved by the Secretary prior to implementation. The tests shall be conducted in order to appropriately represent site conditions and in accordance with USGS, ASTM or other methods generally accepted by the industry. Detailed logs of all relevant site conditions and measurements shall be maintained during the

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testing events. A summary of the general test results, including unexpected or unusual test results and equipment failures or testing limitations shall be reported to the Secretary within 30 days of completion of the test. The summary shall be presented in a format acceptable to the Secretary and in general accordance with the report formats outlined in Appendix E of this Permit. A formal report summarizing the results of each test shall be submitted to the Secretary within 120 days of completion of each test.

C.3 DECONTAMINATION PROCEDURES

The objective of the decontamination procedures is to minimize the potential for cross-contamination. A designated decontamination area shall be established for decontamination of drilling equipment, reusable sampling equipment and well materials. The drilling rig shall be decontaminated prior to entering the site or unit. Drilling equipment or other exploration equipment that may come in contact with the borehole shall be decontaminated by steam cleaning, by hot-water pressure washing or by other method approved by the Secretary prior to advancing each new exploratory boring of excavation.

Sampling or measurement equipment, including but not limited to, stainless steel sampling tools, split-barrel or core samplers, well developing or purging equipment, groundwater quality measurement instruments and water level measurement instruments, shall be decontaminated in accordance with the following procedures or other methods approved by the Secretary before each sampling attempt or measurement.

1. Brush equipment with a wire or other suitable brush, if necessary or practicable, to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with nonphosphate detergent or other detergent approved by the Secretary (examples include Liquinox,™ Alconox™ or Fantastik™) followed by a tap water rinse.
4. Rinse with 0.1 M nitric acid (to remove trace metals, if necessary) followed by a tap water rinse.
5. Rinse with methanol (to remove organic compounds, if necessary) followed by a tap water rinse.
6. Rinse with potable tap water.
7. Double rinse with deionized water

All decontamination solutions shall be collected and stored temporarily as described in Section C.5 below. Decontamination procedures and the cleaning agents used shall be documented in the daily field log.

C.4 FIELD EQUIPMENT CALIBRATION PROCEDURES

Field equipment requiring calibration shall be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. At a minimum, calibration checks shall be conducted daily, or at other intervals approved by the Secretary, and the instruments shall

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be recalibrated, if necessary. Calibration measurements shall be recorded in the daily field logs. If field equipment becomes inoperable, its use shall be discontinued until the necessary repairs are made. In the interim, a properly calibrated replacement instrument shall be used.

C.5 COLLECTION AND MANAGEMENT OF INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) includes general refuse, drill cuttings, excess sample material, water (decontamination, development and purge) and disposable equipment generated during the course of investigation, corrective action or monitoring activities. All IDW shall be properly characterized and disposed of in accordance with all federal, state and local rules and regulations for storage, labeling, handling, transport and disposal of waste. The Permittee shall include an IDW management and disposal plan as part of the unit-specific work plans submitted to the Secretary. The IDW management and disposal plan must be submitted prior to disposal of any IDW produced during investigation, corrective action or monitoring activities. The Permittee may submit a request to the Secretary to dispose of IDW on a case-by-case basis prior to submittal of the IDW management and disposal plan.

All water generated during sampling and decontamination activities shall be temporarily stored at satellite accumulation areas or transfer stations in labeled 55-gallon drums or other containers approved by the Secretary until proper characterization and disposal can be arranged. The IDW may be characterized for disposal based on the known and/or suspected contaminants potentially present in the waste. The methods for waste characterization and disposal of IDW shall be approved by the Secretary prior to removal from the temporary storage area. Purge/decontamination water generated during investigation and monitoring activities at the Facility may be disposed in the refinery wastewater collection system upstream of the refinery wastewater treatment system.

C.6 DOCUMENTATION OF FIELD ACTIVITIES

C.6.a General

Daily field activities, including observations and field procedures, shall be recorded on appropriate forms. The original field forms shall be maintained at the Facility. Copies of the completed forms shall be maintained in a bound and sequentially numbered field file for reference during field activities. Indelible ink shall be used to record all field activities. Photographic documentation of field activities shall be performed, as appropriate. The daily record of field activities shall include the following:

1. Site or unit designation.
2. Date.
3. Time of arrival and departure.
4. Field investigation team members including subcontractors and visitors.
5. Weather conditions.
6. Daily activities and times conducted.

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7. Observations.
8. Record of samples collected with sample designations and locations specified.
9. Photographic log.
10. Field monitoring data, including health and safety monitoring.
11. Equipment used and calibration records, if appropriate.
12. List of additional data sheets and maps completed.
13. An inventory of the waste generated and the method of storage or disposal.
14. Signature of personnel completing the field record.

C.6.b Sample Custody

All samples collected for analysis shall be recorded in the field report or data sheets. Chain-of-custody forms shall be completed at the end of each sampling day, prior to the transfer of samples off site, and shall accompany the samples during shipment to the laboratory. A signed and dated custody seal shall be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form shall be signed as received by the laboratory and the conditions of the samples shall be recorded on the form. The original chain-of-custody form shall remain with the laboratory and copies shall be returned to the relinquishing party. The Permittee shall maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records shall be included with all draft and final laboratory reports submitted to the Secretary for review.

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APPENDIX D

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

CHEMICAL ANALYTICAL PROCEDURES

D. CHEMICAL ANALYSES

The Permittee shall use the most recent standard EPA and industry-accepted analytical methods for chemical analyses for target analytes as the testing methods for each media sampled. Chemical analyses shall be performed in accordance with the most recent EPA standard analytical methodologies and extraction methods.

The Permittee shall submit a list of target analytes and analytical methods to the Secretary for approval as part of each site-specific investigation, corrective action and/or monitoring work plan. The detection limits for each method shall be less than applicable background, screening and regulatory cleanup levels. Analyses conducted with detection limits that are greater than applicable background, screening and regulatory cleanup levels shall be considered data quality exceptions and the reasons for the elevated detection limits shall be reported to the Secretary.

D.1 LABORATORY QA/QC REQUIREMENTS

The following requirements for laboratory QA/QC procedures shall be considered the minimum QA/QC standards for the laboratories employed by the Facility that provide analytical services for environmental investigation, corrective action and monitoring activities conducted at the Facility. The Permittee shall provide the names of the contract analytical laboratories and copies of the laboratory quality assurance manuals to the Secretary within 180 days of awarding a contract for analytical services to any contract laboratory.

D.1.a Quality Assurance Procedures

Contract analytical laboratories shall maintain internal quality assurance programs in accordance with EPA and industry-wide accepted practices and procedures. At a minimum, the laboratories shall use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicate (MS/MSD), blank spike/blank spike duplicate (BS/BSD) and laboratory control samples to demonstrate analytical QA/QC. The laboratories shall establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories shall establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following subsections.

D.1.b Equipment Calibration Procedures and Frequency

The laboratories' equipment calibration procedures, calibration frequency and calibration standards shall be in accordance with the EPA test methodology requirements and documented in laboratories' quality assurance and SOP manuals. All instruments and equipment used by the laboratory shall be operated, calibrated and maintained according to manufacturers' guidelines and recommendations. Operation, calibration and maintenance shall be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance shall be kept on file at the laboratory.

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D.1.c Laboratory QA/QC Samples

Analytical procedures shall be evaluated by analyzing reagent or method blanks, surrogates, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (BS/BSDs) and/or laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed shall be documented in the cited EPA test methodologies. At a minimum, the laboratory shall analyze laboratory blanks, MS/MSDs, BS/BSDs and laboratory duplicates at a frequency of one in twenty for all batch runs requiring EPA test methods and a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples shall be project specific.

D.1.d Laboratory Deliverables

The analytical data package shall be prepared in accordance with EPA-established Level III analytical support protocol. The following shall be provided in the laboratory reports submitted either electronically or in hard (paper) copy for this project.

1. Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report.
2. Sample analytical results, including sampling date, date of sample extraction or preparation, date of sample analysis, dilution factors and test method identification; soil sample results in consistent units (milligrams per kilogram or micrograms per kilogram) in dry-weight basis, water sample results in consistent units (milligrams per liter or micrograms per liter), vapor sample results in consistent units (parts per million or ppmv) and detection limits for undetected analytes. Results shall be reported for all field samples, including field duplicates and blanks, submitted for analysis.
3. Method blank results, including reporting limits for undetected analytes.
4. Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only).
5. MS/MSD and/or BS/BSD spike concentrations, percent recoveries, relative percent differences (RPDs) and corresponding control limits.
6. Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits.
7. Sample chain-of-custody documentation.
8. Holding times and conditions.
9. Conformance with required analytical protocol(s).
10. Instrument calibration.
11. Blanks.
12. Detection/quantitation limits.
13. Recoveries of surrogates and/or matrix spikes (MS/MSDs).
14. Variability for duplicate analyses.
15. Completeness.

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16. Data report formats.
17. The following data deliverables for organic compounds shall be requested of the laboratory:
    - A cover letter referencing the procedure used and discussing any analytical problems, deviations and modifications; including signature from authority representative certifying to the quality and authenticity of data as reported,
    - Report of sample collection, extraction and analysis dates, including sample holding conditions,
    - Tabulated results for samples in units as specified; including data qualification in conformance with EPA protocol, including definition of data descriptor codes,
    - Reconstructed ion chromatograms for gas chromatograph/ mass spectrometry (GC/MS) analyses for each sample and standard calibration,
    - Selected ion chromatograms and mass spectra of detected target analytes (GC/MS) for each sample and calibration with associated library/reference spectra,
    - Gas chromatograph/electron capture device (GC/ECD) and/or gas chromatograph/flame ionization detector (GC/FID) chromatograms for each sample and standard calibration,
    - Raw data quantification reports for each sample and calibrations, including areas and retention times for analytes, surrogates and internal standards,
    - A calibration data summary reporting calibration range used and a measure of linearity [include decafluorotriphenylphosphine (DFTPP) and p-bromofluorobenzene (BFB) spectra and compliance with tuning criteria for GC/MS],
    - Final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitation limit for each analyte,
    - Analyte concentrations with reporting units identified, including data qualification in conformance with the contract laboratory protocol statement of work (CLP SOW) (include definition of data descriptor codes),
    - Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample,
    - Recovery assessments and a replicate sample summary [includes all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts)],
    - Report of tentatively identified compounds with comparison of mass spectra to library/reference spectra.
18. The following data deliverables for inorganic compounds shall be requested of the laboratory:
    - A cover letter referencing the procedure used and discussing any analytical problems, deviations and modifications; including signature from authority representative certifying to the quality and authenticity of data as reported,
    - Report of sample collection, digestion and analysis dates, with sample holding conditions,
    - Tabulated results for samples in units as specified; including data qualification in conformance with the CLP SOW, including definition of data descriptor codes,
    - Results of all method QA/QC checks including inductively coupled plasma (ICP) Interference Check Sample and ICP serial dilution results,

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- Tabulation of instrument and method practical detection/quantitation limits,
- Raw data quantification report for each sample,
- A calibration data summary reporting calibration range used and a measure of linearity, where appropriate,
- Final digestate volumes (and dilutions required), sample size, and wet-to-dry weight ratios,
- Quantification of analytes in all blank analyses, as well as identification of method blanks associated with each sample,
- Recovery assessments and a replicate sample summary (includes post-digestate spike analysis, all MS data [including spike concentrations] for each sample, if accomplished, all MS results [recoveries and spike amounts] and laboratory control sample analytical results).

The Permittee shall present summary tables of these data in the formats described in Appendix E of this Permit. The raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory support data for samples from this project, shall be compiled and kept on file at the Facility for reference. The Permittee shall make the data available to the Secretary upon request.

D.2 REVIEW OF FIELD AND LABORATORY QA/QC DATA

The sample data, field and laboratory QA/QC results shall be evaluated for acceptability with respect to the data quality objectives (DQOs). Each group of samples shall be compared with the DQOs and evaluated using data validation guidelines contained in the following EPA guidance documents: *Guidance Document for the Assessment of RCRA Environmental Data Quality, National Functional Guidelines for Organic Data Review*, and *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*.

The laboratory shall notify the Permittee's project manager of data quality exceptions within 24 hours in order to allow for sample re-analysis, if possible. The Permittee's project manager shall contact the HWB within 24 hours of receipt of laboratory notification of data quality exceptions in order to discuss the implications and determine whether the data will still be considered acceptable or if sample re-analysis or re-sampling is necessary. The Permittee's project manager shall summarize the results of the discussion with the HWB project leader regarding the data quality exceptions in a memorandum. The memorandum shall be submitted to the HWB by fax or electronic mail within three working days of the conclusion of the data quality discussion.

D.3 BLANKS, FIELD DUPLICATES, REPORTING LIMITS AND HOLDING TIMES

D.3.a Blanks

The analytical results of field blanks and field rinseate blanks shall be reviewed to evaluate the adequacy of the field handling and equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of

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trip blanks shall be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks shall be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If contaminants are detected in field or laboratory blanks, the sample data shall be qualified, as appropriate.

D.3.b Field Duplicates

Field duplicates shall consist of two samples either split from the same sample device or collected sequentially. Field duplicate samples shall be collected at a minimum frequency of ten percent of the total number of samples submitted for analysis. RPDs for field duplicates shall be calculated. A precision of not less than 80 percent for duplicates shall be considered acceptable for soil sampling conducted at the Facility. The analytical DQO for precision shall be used for water duplicates.

D.3.c Method Reporting Limits

Method reporting limits for sample analyses for each media shall be established at the lowest level practicable for the method and analyte concentrations and shall not exceed soil, groundwater or vapor emissions background levels, cleanup standards and screening levels. Detection limits that exceed established soil, groundwater or air emissions cleanup standards, screening levels or background levels and are reported as "not detected" shall be considered data quality exceptions and an explanation for the exceedance and its acceptability for use shall be provided.

D.3.d Holding Times

The sampling, extraction and analysis dates shall be reviewed to confirm that extraction and analyses were completed within the recommended holding times as specified by EPA protocol. Appropriate data qualifiers shall be noted if holding times are exceeded.

D.4 REPRESENTATIVENESS AND COMPARABILITY

D.4.a Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the specific characteristics of concern. Procedures shall be implemented to assure representative samples, such as repeated measurements of the same parameter at the same location over several distinct sampling events. Any procedures or variations that may affect the collection or analysis of representative samples shall be noted and the data qualified, as appropriate.

D.4.a Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, analytical results shall be reported in appropriate units for comparison

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with other data (past studies, comparable sites, screening levels and cleanup standards), and standard collection and analytical procedures shall be implemented. Any procedure or variation that may affect comparability shall be noted, and the data shall be qualified, as appropriate.

D.5 LABORATORY REPORTING, DOCUMENTATION, DATA REDUCTION AND CORRECTIVE ACTION

Upon receipt of each laboratory data package, data shall be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria shall be noted, and the data will be qualified, as appropriate. A full review and discussion of analytical data QA/QC and all data qualifiers shall be submitted as appendices or attachments to reports prepared in accordance with Appendix E of this Permit. Data validation procedures for all samples shall include checking the following, when appropriate:

1. Holding times,
2. Detection limits,
3. Field equipment rinseate blanks,
4. Field blanks,
5. Field Duplicates,
6. Trip blanks,
7. Reagent blanks,
8. Laboratory duplicates,
9. Laboratory blanks,
10. Laboratory matrix spikes,
11. Laboratory matrix spike duplicates,
12. Laboratory blank spikes,
13. Laboratory blank spike duplicates, and
14. Surrogate recoveries.

If significant quality assurance problems are encountered, corrective action shall be implemented as appropriate. All corrective action shall be defensible, and the corrected data shall be qualified.

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APPENDIX E

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

REPORTING REQUIREMENTS

E REPORTING REQUIREMENTS

E.1 GENERAL

This Appendix provides the general reporting requirements and report formats for corrective action activities required under this Permit. This Appendix is not intended to provide reporting requirements for every potential corrective action conducted at the Facility; therefore, the formats for all types of reports are not presented below. The described formats include the general reporting requirements and formats for site-specific investigation work plans, investigation reports, routine monitoring reports, risk assessments and corrective measures evaluations. The reports shall generally be considered equal to RFI work plans, RFI reports, periodic monitoring reports, risk assessments and CMS reports, respectively for the purposes of RCRA compliance and NMED oversight fee assessments.

The reporting requirements listed in this section do not include all subsections that may be necessary to complete each type of report listed. Additional subsections may be needed to address additional site-specific issues or information collected during corrective action or monitoring activities not listed below. Individual reports may be tailored to unit-specific conditions or requirements; however, variations to the general report format and the formats for reports not listed in this section must submitted in outline form to the Secretary for approval prior to submittal. The Secretary will approve or disapprove, in writing, the proposed report outline within 60 days of receipt of the outline. If the Secretary disapproves the report outline, the Secretary will notify the Permittee, in writing, of the outline's deficiencies and will specify a date for submittal of a revised report outline. All reports submitted by the Permittee shall follow the general approach and limitations for data presentation described in this section.

E.2 INVESTIGATION WORK PLAN

The format listed below fulfills the requirements of the Secretary for the preparation of a work plan for unit-specific or aggregate unit site investigation or corrective action activities at the Facility. This section provides a general outline for work plans. The minimum requirements for describing proposed activities within each subsection when preparing work plans for Facility site investigations are included. All research, locations, depths and methods of exploration, field procedures, analytical analyses, data collection methods and schedules shall be included in each work plan. In general, interpretation of data acquired during previous investigations shall be presented only in the Background sections of the work plans. At a minimum, detections of contaminants encountered during previous investigations shall be presented in the work plan in table format with an accompanying site plan showing sample locations. The other text sections of the work plans shall be reserved for presentation of anticipated site-specific activities and procedures relevant to the project. The general work plan outline is provided below.

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E.2.a TITLE PAGE

The title page shall include the type of document, Facility name and SWMU, AOC and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.2.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose and scope of the investigation to be conducted at the subject site. The Facility name and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary.

E.2.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the work plan. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.2.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the current site usage and status shall be included in this section. A brief description of the purpose of the investigation and the type of site investigation to be conducted shall be provided in this section.

E.2.e BACKGROUND

Relevant background information shall be provided in this section. This section shall briefly summarize historical site uses including the locations of current and former site structures and features (a labeled figure shall be included in the document showing the locations of current and former site structures and features). The locations of pertinent subsurface features such as pipelines, underground tanks, utility lines and other subsurface structures shall be included in the background summary and labeled on the site plan.

This section shall identify potential receptors, including groundwater, and include a brief summary of the type and characteristics of the waste or contaminants and the known and possible source(s), release history and extent of contamination. This section shall include brief summaries of the results of previous investigations including references to pertinent figures, data summary tables and text in previous reports. References to previous reports shall include page, table and figure numbers for referenced information. Summary data tables and site plans showing relevant investigation locations shall be included in the Tables and Figures sections of the document, respectively.

E.2.f SITE CONDITIONS

E.2.f.i Surface Conditions

This subsection shall provide a brief, detailed description of current site topography, features and structures including a description of drainages, vegetation, erosional features and current site uses. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff or contaminant fate and transport shall be included in this subsection.

E.2.f.ii Subsurface Conditions

A detailed description of the site conditions observed during previous subsurface investigations shall be included in this section including relevant soil horizon, stratigraphic, groundwater and other relevant information. A site plan showing the locations of all borings and excavations drilled or excavated during previous investigations shall be included in the Figures section of the work plan. A brief description of the anticipated stratigraphic units that may be encountered during the investigation may be included in this subsection if no previous investigations have been conducted at the site.

E.2.g SCOPE OF SERVICES

This section shall provide a list of all anticipated activities to be performed during the investigation including, but not limited to, background information research, health and safety requirements that may affect or limit the completion of tasks, drilling, test pit or other excavations, well construction, field data collection, survey data collection, chemical analytical testing, aquifer testing, remediation system pilot testing, investigation derived waste (IDW) storage and/or disposal and reporting.

E.2.h INVESTIGATION METHODS

This section shall provide a list of all anticipated locations and methods for conducting the activities to be performed during the investigation. This subsection shall include but is not limited to, research methods, health and safety practices that may affect the completion of tasks, drilling, test pit or other excavation methods, sampling intervals and methods, well construction methods, field data collection methods, geophysical and land survey methods, field screening methods, chemical analytical testing, materials testing, aquifer testing and pilot testing and other proposed investigation and testing methods. This information may also be summarized in table format, if appropriate.

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E.2.i MONITORING AND SAMPLING PROGRAM

This section shall outline the anticipated monitoring and sampling program to be conducted after the initial investigation activities are completed, if applicable. This section shall provide a description of the anticipated groundwater, ambient air, subsurface vapor, remediation system, engineering controls and/or other monitoring and sampling programs to be implemented at the unit.

E.2.j SCHEDULE

This section shall provide the anticipated schedule for completion of field investigation, pilot testing and monitoring and sampling activities. In addition this section shall provide a schedule for submittal of reports and data to the Secretary including a schedule for submitting all status reports and preliminary data, if required.

E.2.k TABLES

The following summary tables may be included in the investigation work plans, if previous investigations have been conducted at the unit. Data presented in the tables shall include information on dates of data collection, analytical methods, detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections.

1. Summaries of regulatory criteria, background and/or applicable cleanup levels (may be included in the analytical data tables instead of as separate tables).
2. Summaries of historical field survey location data.
3. Summaries of historical field screening and field parameter measurements of soil, sediment, groundwater, surface water and/or air quality data.
4. Summaries of historical soil, sediment, groundwater and/or surface water laboratory analytical data. The tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
5. Summaries of historical groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
6. Summaries of historical groundwater laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
7. Summary of historical air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
8. Summary of historical pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements.

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E.2.l FIGURES

The following figures shall be included with each investigation work plan for each unit including presentation of data where previous investigations have been conducted. All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers.

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan, if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figures showing historical and proposed soil boring or excavation locations and sampling locations.
4. Figures presenting historical soil sample field screening and laboratory analytical data, if applicable.
5. Figures presenting the locations of all existing and proposed borings and vapor monitoring well locations.
6. Figures showing all existing and proposed wells and piezometers and presenting historical groundwater elevation data and indicating groundwater flow direction(s).
7. Figure(s) presenting historical groundwater laboratory analytical data, if applicable. The chemical analytical data corresponding to each sampling location can be presented in tabular form on the figure or as an isoconcentration map.
8. Figures presenting historical and proposed surface water sample locations and field measurement data, if applicable.
9. Figure(s) presenting historical surface water laboratory analytical data, if applicable.
10. Figures showing historical and proposed air sampling locations and presenting historical air quality data, if applicable.
11. Figures presenting historical pilot testing locations and data, if applicable, including site plans and/or graphic data presentation.
12. Figures presenting geologic cross-sections based on outcrop and borehole data acquired during previous investigations, if applicable.

E.2.m APPENDICES

An IDW management plan shall be included as an appendix to the investigation work plan. Additional appendices may be necessary to present additional data or documentation not listed above.

E.3 INVESTIGATION REPORT

The format listed below fulfills the requirements acceptable to the Secretary for the reporting of site investigations at the Facility. This section provides a general outline for site investigation

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reports and also lists the minimum requirements for reporting within each subsection when preparing site investigation reports for Facility units. All data, collected during each site investigation event in the reporting period, shall be included in the reports. In general, interpretation of data shall be presented only in the Background, Conclusions and Recommendations sections of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications. The general report outline is provided below.

E.3.a TITLE PAGE

The title page shall include the type of document, the Facility name and SWMU, AOC, and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.3.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose, scope and results of the investigation conducted at the subject site during the reporting period. The Facility name and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary. In addition, this section shall include a brief summary of conclusions based on the investigation data collected and recommendations for future investigation, monitoring, remedial action or site closure.

E.3.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the report. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.3.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the site usage and status shall be included in this section. A brief description of the purpose of the investigation, the type of site investigation conducted and the type of results presented in the report also shall be provided in this section.

E.3.e BACKGROUND

Relevant background information shall be provided in this section. This section shall briefly summarize historical site uses including the locations of current and former site structures and features (a labeled figure shall be included in the document showing the locations of current and former site structures and features). The locations of subsurface features such as pipelines, underground tanks, utility lines and other subsurface structures shall be included in the

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background summary and labeled on the site plan. In addition, this section shall include a brief summary of the possible sources, release history, known extent of contamination and the results of previous investigations including references to previous reports. The references to previous reports shall include page, table and figure numbers for referenced information. A site plan, showing relevant investigation locations, and summary data tables shall be included in the Figures and Tables sections of the document, respectively.

E.3.f SCOPE OF SERVICES

This section shall provide a summary listing of all activities actually performed during the investigation event including, but not limited to, background information research, implemented health and safety measures that affected or limited the completion of tasks, drilling, test pit or other excavation methods, well construction methods, field data collection, survey data collection, chemical analytical testing, aquifer testing, remediation system pilot testing, and IDW storage and/or disposal.

E.3.g FIELD INVESTIGATION RESULTS

This section shall provide a summary of the procedures used and the results of all field investigation activities conducted at the site including, but not limited to, the dates that investigation activities were conducted, the type and purpose of field investigation activities performed, field screening measurements, logging and sampling results, pilot test results, construction details and conditions observed. Field observations or conditions that altered the planned work or may have influenced the results of sampling, testing and logging shall be reported in this section. Tables summarizing all pertinent sampling, testing and screening results shall be prepared in a format approved by the Secretary. The tables shall be presented in the Tables section of the reports. At a minimum, the following subsections shall be included, where appropriate.

E.3.g.i Surface Conditions

This subsection shall provide a description of current site topography, features and structures including a description of drainages, vegetation, erosional features and current site uses. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff or contaminant transport shall be included in this subsection.

E.3.g.ii Exploratory Drilling or Excavation Investigations

This subsection shall describe the locations, methods and depths of subsurface explorations including the types of equipment used, the logging procedures and the soil or rock classification system used to describe the observed materials, exploration equipment decontamination procedures and conditions encountered that may have affected or limited the investigation.

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A description of the site conditions observed during subsurface investigation activities shall be included in this section including soil horizon and stratigraphic information. Site plans showing the locations of all borings and excavations shall be included in the Figures section of the report. Boring, test pit and excavation logs for all exploratory borings and excavations shall be presented in an Appendix or Attachment to the report.

E.3.g.iii Subsurface Conditions

This subsection shall provide a description of known subsurface lithology and structures based on observations made during the current and previous subsurface investigations and including interpretation of geophysical logs and as-built drawings of man-made structures, if applicable. A description of the known locations of pipelines and utility lines and observed geologic structures shall also be included in this subsection. A site plan showing boring and/or excavation locations and the locations of site above- and below-ground structures shall be included in the Figures section of the report. In addition, cross sections shall be constructed, if appropriate, to provide additional visual presentation of site or regional subsurface conditions.

E.3.g.iv Monitoring Well Construction, Exploratory Boring or Excavation Abandonment

The methods and details of monitoring well construction and the methods used to abandon or backfill exploratory borings and excavations shall be described in this section. The description shall include the dates of well construction, boring abandonment or excavation backfilling. In addition, well construction diagrams shall be included in the Appendix or Attachment with the associated boring logs for monitoring well borings.

E.3.g.v Groundwater Conditions

This subsection shall describe groundwater conditions observed beneath the subject site and relate subsurface groundwater conditions to regional groundwater conditions. A description of the depths to water, aquifer thickness and groundwater flow directions shall be included in this section for each water bearing zone as appropriate to the investigation. Figures showing well locations and the appropriate site, surrounding area and regional groundwater elevations and flow directions for each hydrologic zone shall be included in the Figures section of the report.

E.3.g.vi Surface Water Conditions

This subsection shall describe surface water runoff, drainage, surface water sediment transport and contaminant transport in surface water as suspended load and/or as dissolved phase in surface water via natural and man-made drainages, if applicable. A description of contaminant fate and transport shall be included, if appropriate.

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E.3.g.vii Surface Air and Subsurface Vapor Conditions

This subsection shall provide a description of air and vapor monitoring and sampling methods used during the site investigation, if conducted, and provide a description of observations made during the site investigation regarding subsurface flow pathways and the subsurface air flow regime.

E.3.g.viii Materials Testing Results

Materials testing results such as core permeability testing, grain size analysis or other materials testing results shall be reported in this subsection. Sample collection methods, locations and depths also shall be included. Corresponding summary tables shall be included in the Tables section of the report.

E.3.g.ix Pilot Testing Results

Pilot testing is typically conducted after initial subsurface investigations are completed and the need for additional investigation or remediation has been evaluated. Pilot testing, including aquifer testing and remediation system pilot testing shall be addressed through separate work plans and pilot test reports. The format for pilot test work plans and reports shall be approved by the Secretary prior to submittal.

E.3.h REGULATORY CRITERIA

This section shall provide information regarding applicable cleanup standards, screening levels and/or risk-based cleanup goals for each pertinent media at the subject unit. The appropriate cleanup levels for each unit within the subject site shall be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the data tables shall be included in the Tables section of the document. Risk-based evaluation procedures, if used to calculate cleanup levels, shall be presented in a separate document. If cleanup levels calculated in a risk evaluation are employed, the risk evaluation document shall be referenced including pertinent page numbers for referenced information.

E.3.i SITE CONTAMINATION

This section shall provide a description of sampling intervals and methods for detection of surface and subsurface contamination in soils, sediments, groundwater , surface water and vapor-phase contamination as appropriate to the scope of the investigation. Factual information only shall be included in this Section. Interpretation of the data shall be reserved for the Summary and Conclusions Section of the reports.

E.3.i.i Soil and Sediment Sampling

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This subsection shall briefly describe the dates, locations and methods of sample collection, sampling intervals, methods for sample logging, screening and laboratory sample selection methods including the sample depths for samples submitted for laboratory analyses. A site plan showing the sample locations shall be included in the Figures section of the report.

E.3.i.ii Soil Sample Field Screening Results

This subsection shall describe the field screening methods used during the investigation and the field screening results. Field screening results also shall be presented in summary tables in the Tables section of the document. The limitations of field screening instrumentation and any conditions that influenced the results of field screening shall be discussed in this subsection.

E.3.i.iii Soil Sampling Chemical Analytical Results

This subsection shall briefly summarize the laboratory analyses conducted, the analytical methods and the analytical results and provide a comparison of the data to cleanup standards or established cleanup levels for the site. The laboratory results also shall be presented in summary tables in the Tables section of the document. Field conditions and sample collection methods that could potentially affect the analytical results shall be described in this section. If appropriate, soil analytical data shall be presented with sample locations on a site plan and included in the Figures section of the report.

E.3.i.iv Groundwater Sampling

This subsection shall briefly describe the dates, locations, depths and methods of sample collection and methods for sample logging, screening and laboratory sample selection methods. A map showing the locations of all site and surrounding area well locations shall be included in the Figures section of the report.

E.3.i.v Groundwater General Chemistry

This subsection shall describe the results of measurement of field purging parameters and field analytical measurements. Field parameter measurements and field analytical results also shall be presented in summary tables in the Tables section of the document. The limitations of field measurement instrumentation and any conditions that may have influenced the results of the field measurements shall be discussed in this subsection. If appropriate, relevant water chemistry concentrations shall be presented in data tables or as isoconcentration contours on a site plan included in the Figures section of the report.

E.3.i.vi Groundwater Chemical Analytical Results

This section shall summarize groundwater chemical analytical methods and analytical results, and provide a comparison of the data to the cleanup standards or established cleanup levels for the site. The rational or purpose for altering or modifying the groundwater sampling program

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outlined in the site investigation work plan also shall be provided in this section. Field conditions that may have affected the analytical results during sample collection shall be described in this section. Tables summarizing the groundwater laboratory, field and QA/QC chemical analytical data, applicable cleanup levels and modifications to the groundwater sampling program shall be provided in the Tables section of the report. If appropriate, relevant analytical data concentrations shall be presented in data tables or as isoconcentration contours on a site plan included in the Figures section of the report.

E.3.i.vii Air and/or Subsurface Vapor Sampling

This subsection shall briefly describe the dates, locations, depths and methods of sample collection and methods for sample logging and laboratory sample selection methods. A site plan showing the locations of all air sampling locations shall be provided in the Figures section of the report.

E.3.i.viii Air and/or Subsurface Vapor Field Screening Results

This subsection shall describe the field screening methods used for ambient air and/or subsurface vapors during the investigation and the field screening results. Field screening results also shall be presented in summary tables in the Tables section of the document. The locations of ambient air and/or subsurface vapor screening sample collection shall be presented on a site plan included in the Figures section of the report. The limitations of field screening instrumentation and any conditions that influenced the results of field screening shall be discussed in this subsection.

E.3.i.ix Air and/or Subsurface Vapor Laboratory Analytical Results

This section shall list air sampling laboratory analytical methods and analytical results and provide a comparison of the data to emissions standards or established cleanup or emissions levels for the site, if applicable. The rational or purpose for altering or modifying the air monitoring or sampling program outlined in the site investigation work plan also shall be provided in this section. Field conditions that may have affected the analytical results during sample collection shall be described in this section. Tables summarizing the air sample laboratory, field and QA/QC chemical analytical data, applicable cleanup levels or emissions standards and modifications to the air sampling program shall be provided in the Tables section of the report. If appropriate, relevant concentrations shall be presented in data tables or as isoconcentration contours on a map included in the Figures section of the report.

E.3.j CONCLUSIONS

This section shall provide a brief summary of the investigation activities and a discussion and conclusions with regard to the results of the investigation conducted at the site. In addition, this section shall provide a comparison of the results to applicable cleanup levels and relevant historical investigation results and chemical analytical data. Potential receptors, including groundwater, shall be identified and discussed and the need for further investigation, corrective

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measures and/or a risk analyses shall be included in this section. An explanation shall be provided with regard to data gaps. If appropriate, a risk analysis may be included as an Appendix in an investigation report; however, the risk analysis shall be presented in the Risk Analysis format included in Appendix E, Section E.5 of this Permit. References to the risk analysis shall be presented only in the Summary and Conclusions section of the Investigation Report.

E.3.k RECOMMENDATIONS

Recommendations and explanations regarding future investigation, monitoring, corrective measures, risk analyses or site closure shall be included in this section. A corresponding schedule for further action regarding the unit also shall be provided.

E.3.l TABLES

The following summary tables shall be included in each investigation report as appropriate. Data presented in the tables shall include the current data including information on dates of data collection, analytical methods, detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections.

1. Summaries of regulatory criteria, background and/or the applicable cleanup levels (this information may be included in the analytical data tables instead of as separate tables).
2. Summaries of field survey location data. Separate tables shall be prepared for well locations and individual media sampling locations except where the locations are the same for more than one media.
3. Summaries of field screening and field parameter measurements of soil, sediments, groundwater, surface water and/or air quality data.
4. Summaries of soil laboratory analytical data shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
5. Summaries of groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
6. Summary of groundwater laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
7. Summary of surface water laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
8. Summary of air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
9. Summary of pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements.
10. Summary of materials testing data, if applicable.

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E.3.m FIGURES

The following figures shall be included with each investigation report as appropriate. All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers.

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figure(s) showing boring or excavation locations and sampling locations.
4. Figure(s) presenting soil sample field screening and laboratory analytical data.
5. Figure(s) displaying the locations of all newly installed and existing wells and borings.
6. Figure(s) presenting monitoring well and piezometer locations, groundwater elevation data and indicating groundwater flow direction(s).
7. Figure(s) presenting groundwater laboratory analytical data including past data, if applicable. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
8. Figure(s) displaying surface water sample locations and field measurement data including past data, if applicable.
9. Figure(s) presenting surface water laboratory analytical data including past data, if applicable. The laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure.
10. Figure(s) showing air or subsurface vapor sampling locations and presenting air quality data. The field screening or laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
11. Figure(s) presenting geologic cross-sections based on outcrop and borehole data.
12. Figure(s) presenting pilot testing locations and data, where applicable, including site plans or graphic data presentation.

E.3.n APPENDICES

Investigation reports shall include the following appendices. Additional appendices may be necessary to present data or documentation not listed below.

E.3.n.i FIELD METHODS

Detailed descriptions of the methods used to acquire field measurements of each media that was surveyed or tested during the investigation shall be included in this section. Methods include, but are not limited to, exploratory drilling or excavation methods, the methods and types of instruments used to obtain field screening, field analytical or field parameter measurements, instrument calibration procedures, sampling methods for each media investigated,

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decontamination procedures, sample handling procedures, geophysical methods, documentation procedures and field conditions that affected procedural or sample testing results. Methods of measuring and sampling during pilot testing shall be reported in this section, if applicable. Investigation derived waste storage and disposal methods also shall be presented as a subsection of this appendix. Copies of IDW disposal documentation shall be provided in a separate appendix.

E.3.n.ii BORING/TEST PIT LOGS AND WELL CONSTRUCTION DIAGRAMS

Boring logs, test pit or other excavation logs and well construction details shall be presented in this appendix. In addition, a key(s) to symbols and soil or rock classification system shall be included in this section.

E.3.n.iii CHEMICAL ANALYTICAL PROGRAM

Chemical analytical methods, a summary of data quality objectives and data quality review procedures shall be reported in this appendix. A summary of data quality exceptions and their effect on the acceptability of the field and laboratory analytical data with regard to the investigation and the site status shall be included in this appendix along with references to case narratives provided in the laboratory reports.

E.3.n.iv CHEMICAL ANALYTICAL REPORTS

This section shall include all laboratory chemical analytical data generated for the reporting period. The reports must include all chain-of-custody records and QA/QC results provided by the laboratory. The laboratory reports may be provided electronically in a format approved by the Secretary and shall be in the form of a final laboratory report. Laboratory report data tables may be submitted in Microsoft Excel format. Hard (paper) copies of the chain-of-custody forms shall be submitted with the reports regardless of whether the final laboratory report is submitted electronically or in hard copy.

E.3.n.v OTHER APPENDICES

Other appendices containing additional information shall be added as appropriate.

E.4 PERIODIC MONITORING REPORT

The format listed below fulfills the requirements acceptable to the Secretary for the reporting of periodic groundwater, vapor and/or remediation system monitoring at the Facility. This document provides a general outline for monitoring reports and also lists the minimum requirements for reporting within each subsection when preparing routine monitoring reports for specific units and for Facility-wide monitoring. All data, collected during each monitoring and sampling event in the reporting period, shall be included in the reports. In general, interpretation of data shall be presented only in the Background, Conclusions and Recommendations sections

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of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications. The general report outline is provided below.

E.4.a TITLE PAGE

The title page shall include type of document, the Facility name and SWMU, AOC, site and/or unit name(s) (if the report is for unit specific monitoring) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.4.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose, scope and results of the monitoring conducted at the subject site during the reporting period. The Facility, SWMU, AOC and/or unit name(s) and location shall be included in the executive summary. In addition, the Executive Summary shall include a brief summary of conclusions based on the monitoring data collected.

E.4.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the report. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.4.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the site usage and status shall be included in this section. A brief description of the purpose of the monitoring, type of monitoring conducted and the type of results presented in the report also shall be provided in this section.

E.4.e SCOPE OF SERVICES

This section shall provide a summary of all activities actually performed during the monitoring event or reporting period including field data collection, chemical testing, remediation system monitoring, if applicable, and purge/decontamination water storage and/or disposal.

E.4.f REGULATORY CRITERIA

This section shall provide information regarding applicable cleanup standards, screening levels and/or risk-based cleanup goals for the subject facility. The appropriate cleanup levels for each unit within the subject facility shall be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the data tables may be substituted for this section. Risk-based

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evaluation procedures, if used to calculate cleanup levels, must either be included as an attachment or referenced. The specific document and page numbers must be included for all referenced materials.

E.4.g MONITORING RESULTS

This section shall provide a summary of the results of monitoring conducted at the site including, but not limited to, the dates that monitoring was conducted, the measured depths to groundwater, direction(s) of groundwater flow, field air and/or water quality measurements, static pressures, field measurements and a comparison to previous monitoring results. Field observations or conditions that may influence the results of monitoring shall be reported in this section. Tables summarizing vapor monitoring parameters, groundwater elevation/depth to groundwater measurements and other field measurements may be substituted for this section. The tables shall include all information required in section E.4.k below.

E.4.h CHEMICAL ANALYTICAL DATA

This section shall summarize the dates of vapor and/or groundwater sampling, chemical analytical methods and analytical results, and provide a comparison of the data to previous results and the cleanup standards or established cleanup levels for the site. The rational or purpose for altering or modifying the sampling program shall be provided in this section. A table summarizing the laboratory and QA/QC analytical data, applicable cleanup levels and modifications to the vapor and/or groundwater sampling program may be substituted for this section. The tables shall include all information required in section E.4.k below.

E.4.i REMEDIATION SYSTEM MONITORING

This section shall summarize remediation system capabilities, performance data, monitoring data, treatment system discharge sampling requirements and system influent and effluent sample chemical analytical results. The dates of operation, system failures and modifications made to the remediation system during the reporting period shall be included in this section. A summary table may be substituted for this section. The tables shall include all information required in section E.4.k below.

E.4.j SUMMARY

This section shall provide a discussion and conclusions with regard to the results of the monitoring conducted at the site. In addition, this section shall provide a comparison of the results to applicable cleanup levels and relevant historical monitoring and chemical analytical data. An explanation shall be provided with regard to data gaps. A discussion of remediation system performance, monitoring results, modifications, if applicable, and compliance with discharge requirements shall be provided in this section. Recommendations and explanations regarding future monitoring, remedial action or site closure also shall be included in this section.

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E.4.k TABLES

The following summary tables shall be included in each monitoring report. Data presented in the tables shall include the current data plus data from the three previous monitoring events or, if data from less than three monitoring events is available, data acquired during previous subsurface investigations and vapor, groundwater and/or remediation system monitoring. The dates of data collection shall be included in the tables. Summary tables may be substituted for portions of the text. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections.

1. Summary of regulatory criteria (a Regulatory Criteria text section can be substituted for this table or the applicable cleanup levels can be included in the analytical data tables).
2. Summary of groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
3. Summary of field measurements of surface water quality data, if applicable.
4. Summary of field measurements of field vapor monitoring data (must include historical vapor monitoring data as described above), if applicable.
5. Summary of field measurements of groundwater quality data (must include historical water quality data as described above).
6. Summary of vapor sample chemical analytical data, if applicable (must include historical vapor sample chemical analytical data as described above).
7. Summary of surface water chemical analytical data, if applicable (must include historical surface water chemical analytical data as described above).
8. Summary of groundwater chemical analytical data (must include historical groundwater chemical analytical data as described above).
9. Summary of remediation system monitoring data, if applicable (must include historical remediation system monitoring data as described above).

E.4.l FIGURES

All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers. The following figures shall be included with each monitoring report where applicable:

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Facility site plan that presents pertinent site features and structures, well and piezometer locations and remediation system location(s) and features. Off-site well locations and pertinent features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figure presenting the locations of, piezometer, monitoring and other well locations, groundwater elevation data and indicating groundwater flow direction(s).

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4. Figure(s) presenting groundwater chemical analytical data for the current monitoring event. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
5. Figure(s) presenting surface water sampling locations and chemical analytical data for the current monitoring period.
6. Figure(s) presenting vapor sampling locations and chemical analytical data for the current monitoring event. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
7. Figures presenting geologic cross-sections based on outcrop and borehole data, if applicable.

E.4.m APPENDICES

Monitoring reports shall include the appendices listed in this section (E.4.m) below. Additional appendices may be necessary to present data or documentation not listed below.

E.4.m.i FIELD METHODS

The methods used to acquire field measurements, groundwater elevations, vapor and water quality data, vapor and water samples, and remediation system data shall be included in this section. Methods include, but are not limited to, the methods and types of instruments used to measure depths to water, air or headspace parameters, and water quality parameters. In addition, decontamination, well purging and well sampling techniques and sample handling procedures shall be provided in this Appendix. Methods of measuring and sampling remediation systems shall be reported in this section, if applicable. Purge and decontamination water storage and disposal methods also shall be presented in this appendix. Copies of purge and decontamination water disposal documentation shall be provided in a separate appendix.

E.4.m.ii CHEMICAL ANALYTICAL PROGRAM

Chemical analytical methods, a summary of data quality objectives and data quality review procedures shall be reported in this Appendix. A summary of data quality exceptions and their effect on the acceptability of the chemical analytical data with regard to the monitoring event and the site status shall be included in this appendix along with references to case narratives provided in the laboratory reports.

E.4.m.iii CHEMICAL ANALYTICAL REPORTS

This appendix shall include all laboratory chemical analytical data generated for the reporting period. The data may be submitted electronically on a compact disc in Microsoft Excel format. The reports shall include all chain-of-custody records and QA/QC results provided by the laboratory. Hard (paper) copies of all chain-of-custody records shall be submitted as part of this appendix.

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E.5 RISK ANALYSIS REPORT

The format listed below fulfills the requirements acceptable to the Secretary for the preparation of a risk assessment report for sites requiring corrective action at the Facility. This section provides a general outline for risk assessments and also lists the minimum requirements for describing risk assessment elements within each subsection when preparing these documents for Facility sites. In general, interpretation of data shall be presented only in the Background, Site Conceptual Model and Conclusions and Recommendations sections of the reports. The other text sections of the Risk Analysis document shall be reserved for presentation of sampling results from all investigations, conceptual and mathematical elements of the risk assessment, and presentations of toxicity information and screening values used in the risk assessment. Sections E.5.h and subsequent sections should be presented in separate sections for the human health and ecological risk assessments, but the general risk assessment outline applicable to both sections is provided below.

E.5.a TITLE PAGE

The title page shall include the type of document, Facility name and SWMU, AOC, site and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.5.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose and scope of the risk assessment for the subject site. The Executive Summary also shall briefly summarize the conclusions of the risk assessment. The Facility name and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary.

E.5.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the risk assessment. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.5.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the current site usage and status shall be included in this section.

E.5.e BACKGROUND

Relevant background information shall be provided in this section. This section shall briefly

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summarize historical site uses including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features.

E.5.e.i Site Description

This subsection shall provide a description of current site topography, features and structures including a description of drainages, erosional features, current site uses and other data relevant to assessing risk at the site. Depth to groundwater and direction of groundwater flow shall be included in this section. The presence and location of surface water bodies such as springs or wetlands shall be noted in this section. Photos of the site may be incorporated into this section if desired. Ecological features of the site should be described here, including type and amount of vegetative cover, observed and expected wildlife receptors, and level of disturbance of the site. A topographical map of the site and vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features shall be included in the Figures section of the document.

E.5.e.ii Sampling Results

This section shall include a summary of the release history, known and possible sources of contamination, and the vertical and lateral extent of contamination present in each media. This section shall include summaries of sampling results of all investigations including site plans (included in the Figures section of the document) showing locations of detected contaminants. This section shall reference pertinent figures, data summary tables and references in previous reports. References to previous reports shall include page, table and figure numbers for referenced information. Summaries of sampling data for each constituent shall include the maximum value detected, the detection limit, the 95% UCL of the mean value detected (if applicable to the data set) and whether that 95% UCL of the mean was calculated based on a normal or lognormal distribution. Background values used for comparison to inorganic constituents at the site shall be presented in this subsection. The table of background values should appear in the Tables section of the document and include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, UTL). This section shall also include a discussion of how "non-detect" sample results were handled in the averaging of data.

E.5.f SITE CONCEPTUAL MODEL

This section shall include information on the expected fate and transport of contaminants detected at the site and shall provide a list of all sources of contamination at the unit. Sources that are no longer considered to be ongoing but represent the point of origination for contaminants transported to other locations shall be included. The discussion of fate and transport shall address potential migration of each contaminant in each media, potential degradation products and their migration, and anticipated pathways of exposure for human or ecological receptors. Diagrammatic representations of the site conceptual model shall appear in the Figures section of the document.

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For human health risk assessments, the conceptual site model shall include residential land use as the future land use for all risk assessments. In addition, site specific future land use may be included provided that written approval to consider a site-specific future land use has been obtained from NMED prior to inclusion of the anticipated land use in the risk assessment. If a site-specific future land use scenario appears in the risk assessment, all values for exposure parameters and the source of those values shall be included in table format and presented in the Tables section of the document.

Conceptual site models presented for ecological risk assessments shall identify assessment endpoints and measurement receptors for the site. The discussion of the model shall explain how the measurement receptors for the site are protective of the wildlife receptors identified in section E.5.e.h.i.

E.5.g RISK SCREENING LEVELS

This section shall present the actual screening values used for each contaminant for comparison to all human health and ecological risk screening levels. NMED soil screening levels for residential soil shall be used to screen soil for human health. For those contaminants not appearing on the NMED SSL table, the EPA Region 6 soil screening value adjusted to meet the NMED risk goal of 10^{-5} for total risk for carcinogens shall be used to screen the site for human health risks. If the NMED database does not contain a screening value for the receptor or contaminant of concern, the Facility shall use USEPA ECO-SSLs or derive a screening level using the methodology in the NMED *Guidance for Assessing Ecological Risks Posed by Chemicals: Screening –Level Ecological Risk Assessment*. If no valid toxicological studies exist for the receptor or contaminant of concern, the contaminant/receptor combination shall be addressed using qualitative methods. If an approved site-specific risk scenario is used for the human health risk assessment, this section shall include all toxicity information and exposure assessment equations used for the site-specific scenario as well as the sources for that information. Other regulatory levels applicable to screening the site, such as drinking water MCLs, shall also be included in this section.

E.5.h RISK ASSESSMENT RESULTS

All risk values, HQs, and HIs for human health under projected future residential scenario and site-specific scenario, if applicable, shall be presented in this section. For ecological receptors, the HQ for each contaminant for each receptor, as well as the HI for each receptor shall be presented in this section.

E.5.h.i Uncertainty Analysis

This section shall include discussion of both qualitative and quantitative uncertainty in the risk assessment and estimate the potential impact of the various uncertainties.

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E.5.i CONCLUSIONS AND RECOMMENDATIONS

This section shall include the interpretation of the results of the risk assessment and any recommendations for future disposition of the site. This section may include additional information and considerations that the facility believes are relevant to the analysis of the site.

E.5.j TABLES

Data presented in the summary tables shall include information on detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. The following summary tables shall be included in the risk assessment, as appropriate:

1. Background values used for comparison to inorganic constituents at the site. Table shall include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, UTL, or max).
2. Summaries of sampling data shall include, for each constituent: the maximum value detected, the 95% UCL of the mean value detected (if applicable to the data set) and whether the 95% UCL of the mean was calculated based on a normal or lognormal distribution.
3. Table of all screening values used and the sources of those values.
4. For human health, all risk values, hazard quotients (HQs), and hazard indices (HIs) under projected future residential scenario.
5. For human health, all risk values, HQs, HIs under approved additional site-specific future land use scenario.
6. For ecological receptors, the HQ for each contaminant for each receptor, as well as the HI for each receptor.

E.5.k FIGURES

All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers. The following figures shall be included with the risk assessment for each unit, as appropriate:

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. For human health risk assessments, unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. For ecological risk assessments, a topographical map of the site and vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features.
4. Conceptual site model diagrams for both human health and ecological risk assessments

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E.5.l APPENDICES

Appendices may be included to present additional relevant information for the risk analysis such as the results of statistical analyses of data sets and comparisons of data, ecological checklists for the site, full sets of results of all sampling investigations at the site or other data as appropriate.

E.6 CORRECTIVE MEASURES EVALUATION

The format listed below fulfills the requirements acceptable to the Secretary for the preparation of a corrective measures evaluation for sites requiring corrective action. This section provides a general outline for corrective measures evaluations and also lists the minimum requirements for describing corrective measures evaluations within each subsection when preparing these documents for Facility sites. All investigation summaries, site condition descriptions, corrective action goals, corrective action options, remedial options selection criteria and schedules shall be included in the corrective measures evaluations. In general, interpretation of historical investigation data shall be presented only in the Background sections of the corrective measures evaluations; however, at a minimum, detections of contaminants encountered during previous site investigations shall be presented in the corrective measures evaluations in table format with an accompanying site plan showing sample locations. The other text sections of the corrective measures evaluations shall be reserved for presentation of corrective action-related information regarding anticipated or potential site-specific corrective action options and methods relevant to the project. The general corrective measures evaluation outline is provided below.

E.6.a TITLE PAGE

The title page shall include the type of document, Facility name and SWMU, AOC, site and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.6.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose and scope of the corrective measures evaluation to be conducted at the subject site. The Executive Summary also shall briefly summarize the conclusions of the evaluation. The Facility and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary.

E.6.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the corrective measures evaluation. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

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E.6.d INTRODUCTION

This section shall include the Facility name, unit location and unit status (active operations, closed, corrective action, etc.). General information on the current site usage and status shall be included in this section. A brief description of the purpose of the corrective measures evaluation and the corrective action objectives for the project also shall be provided in this section.

E.6.e BACKGROUND

Pertinent background information shall be provided in this section. This section shall briefly summarize historical site including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features. The locations of subsurface features such as pipelines, underground tanks, utility lines and other subsurface structures shall be included in the background summary and labeled on the site plan.

This section shall include contaminant and/or waste characteristics and a brief summary of the release history, known and possible sources of contamination and the vertical and lateral extent of contamination present in each media. This section shall include brief summaries of results of previous investigations including references to pertinent figures, data summary tables and text in previous reports. References to previous reports shall include page, table and figure numbers for referenced information. Summary tables and site plans showing relevant investigation locations shall be referenced and included in the Tables and Figures sections of the document, respectively.

E.6.f SITE CONDITIONS

E.6.f.i Surface Conditions

This subsection shall provide a description of current and historic site topography, features and structures including a description of drainages, vegetation, erosional features and current site uses. This subsection also shall include a description of those features that could potentially influence corrective action option selection or implementation such as structures, wetlands or other features that may affect remedial activities. In addition, descriptions of features located in surrounding sites that may have an effect on the subject site regarding sediment transport, surface water runoff or contaminant transport shall be included in this subsection. A site plan displaying the locations of all pertinent surface features and structures shall be included in the Figures section of the corrective measures evaluation.

E.6.f.ii Subsurface Conditions

A description of the site conditions observed during previous subsurface investigations shall be included in this section including but not limited to, relevant soil horizon and stratigraphic information, groundwater conditions, fracture data and subsurface vapor information. A site

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plan displaying the locations of all borings and excavations drilled or excavated during previous investigations shall be included in the Figures section of the corrective measures evaluation.

E.6.g POTENTIAL RECEPTORS

E.6.g.i Sources

This subsection shall provide a list of all sources of contamination at the subject site where corrective measures are to be considered or required. Sources that are no longer considered to be ongoing but represent the point of origination for contaminants transported to other locations shall be included in this subsection.

E.6.g.ii Pathways

This subsection shall provide a description of potential migration pathways that could result in either acute or chronic exposures to contaminants such as utility trenches, paleochannels, surface exposures, surface drainages, stratigraphic units, fractures, structures and other features. The migration pathways for each contaminant and each media shall be tied to the potential receptors for each pathway. A discussion of contaminant characteristics relating to fate and transport of regulated substances through each pathway also shall be included in this subsection.

E.6.g.iii Receptors

This subsection shall provide a listing and description of all anticipated potential receptors that could possibly be affected by the contamination present at the site. Potential receptors shall include human and ecological receptors, groundwater and also features such as pathways that could divert or accelerate the transport of contamination to human receptors, ecological receptors and/or groundwater.

E.6.h REGULATORY CRITERIA

This section shall provide information regarding applicable cleanup standards, risk-based screening levels and/or risk-based cleanup goals for each media at the subject site. The appropriate cleanup levels for each unit within the subject site shall be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the summary data tables providing the results of previous investigations shall be included in the Tables section of the document. Risk-based evaluation procedures, if used to calculate cleanup levels, shall be presented in a separate document. If cleanup levels, calculated in a risk evaluation are employed, the risk evaluation document shall be referenced including pertinent page numbers for referenced information.

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E.6.i IDENTIFICATION OF CORRECTIVE MEASURES OPTIONS

This section shall identify and describe potential corrective measures for source control, pathway control and receptor control. Corrective action options shall include the range of available options including but not limited to, no action alternative, institutional controls, engineering controls, in situ and/or on-site remediation alternatives, complete removal and any other combination of alternatives that would potentially achieve cleanup goals.

E.6.j EVALUATION OF CORRECTIVE MEASURES OPTIONS

This section shall provide an evaluation of the corrective measures options identified in Section E.6.i above. The evaluation shall be based on the applicability, technical feasibility, effectiveness, implementability, impacts to human health and the environment, and cost of each option. A table summarizing the corrective measures alternatives and the criteria listed below shall be included in the Tables section of this document. The general basis for evaluation of corrective measures options is defined below.

E.6.j.i Applicability

Applicability addresses the overall suitability for the corrective action option for containment or remediation of the contaminant(s) in the subject media(s) with regard to protection of human health and the environment.

E.6.j.ii Technical Feasibility

Technical Feasibility describes the reliability/uncertainty in designing, constructing and operating a specific remedial alternative. The description shall include an evaluation of historical application of the remedial alternative including performance, reliability and minimization of hazards.

E.6.j.iii Effectiveness

Effectiveness assesses the ability of the corrective measure to mitigate the measured or potential impact of contamination in a media under the current and projected site conditions. The assessment also shall include the anticipated duration for the technology to attain regulatory compliance. In general, all corrective measures described in Section E.6.i above will have the ability to mitigate the impacts of contamination at the site or unit but not all remedial options will be equally effective at achieving the desired cleanup goals to the degree and within the same time frame as other options.

E.6.j.iv Implementability

Implementability characterizes the degree of difficulty involved during the installation,

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construction and operation of the corrective measure. Operation and maintenance of the alternative shall be addressed in this subsection.

E.6.j.v Human Health and Ecological Protectiveness

This category evaluates the short-term (remedy installation-related) and long-term (remedy operation-related) hazards to human health and the environment of implementing the corrective measure. The assessment shall include whether the technology will create a hazard or increase existing hazards and the possible methods of hazard reduction.

E.6.j.vi Cost

This subsection shall discuss the anticipated cost of implementing the corrective measure. The costs shall be divided into (1) capital costs involved with construction, installation, pilot testing, evaluation, permitting and reporting of the effectiveness of the alternative and (2) continuing costs associated with operating, maintaining, monitoring, testing and reporting on the use and effectiveness of the technology.

E.6.k SELECTION OF CORRECTIVE MEASURES

The Permittee shall provide a justification in this section for the recommendation of the preferred corrective measure(s) at the site or unit. The recommendation shall be based upon the ability of the remedial alternative to: (1) achieve cleanup objectives in a timely manner, (2) protect human and ecological receptors, (3) control or eliminate the source(s) of contamination, (4) control migration of released contaminants and (5) manage remediation waste in accordance with State and Federal regulations. The justification shall include the supporting rational for the remedy selection based on the factors listed in Section E.6.j and a discussion of short- and long-term objectives for the site or unit. The benefits and possible hazards of each preferred potential corrective measure alternative shall be included in this section.

E.6.l DESIGN CRITERIA TO MEET CLEANUP OBJECTIVES

The Permittee shall present descriptions of the preliminary design for the recommended corrective measures alternatives in this section. The description shall include appropriate preliminary plans and specifications to effectively illustrate the technology and the anticipated implementation of the remedial option at the subject area. The preliminary design shall discuss the design life of the alternative and provide engineering calculations for proposed remediation systems.

E.6.m SCHEDULE

This section shall provide a proposed schedule for completion of remedy-related activities such as bench tests, pilot testing, construction, installation, remedial excavation, cap construction, installation of monitoring points and other remedial actions. The anticipated duration of

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corrective action operations and the schedule for conducting monitoring and sampling activities also shall be presented. In addition this section shall provide a schedule for submittal of reports and data to the Secretary including a schedule for submitting all status reports and preliminary data.

E.6.n TABLES

Data presented in the summary tables shall include information on dates of sample collection, analytical methods, detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. The following summary tables shall be included in the corrective measures evaluations, as appropriate:

1. Summaries of regulatory criteria, background and/or the applicable cleanup standards.
2. Summaries of historical field survey location data.
3. Summaries of historical field screening and field parameter measurements for individual media.
4. Summaries of historical soil, sediment, groundwater and/or surface water laboratory analytical data. The summary tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
5. Summaries of historical groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
6. Summary of historical air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits and significant data quality exceptions that would influence interpretation of the data.
7. Summary of historical pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements.
8. Summary of the corrective measures alternatives and evaluation criteria.
9. Schedule for installation, construction, implementation and reporting of selected corrective measures.

E.6.o FIGURES

All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers. The following figures shall be included with each corrective measures evaluation for each unit, as appropriate:

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figures showing historical soil boring or excavation locations and sampling locations.

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4. Figures presenting historical soil sample field screening and laboratory analytical data, if appropriate.
5. Figures showing all existing wells including vapor monitoring wells and piezometers, presenting historical groundwater elevation data and indicating groundwater flow direction(s).
6. Figure(s) presenting historical groundwater laboratory analytical data including past data, if applicable. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
7. Figures presenting historical surface water sample locations and analytical data including past data, if applicable. The laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure.
8. Figures showing historical air sampling locations and presenting air quality data. The field screening or laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
9. Figures presenting historical pilot testing locations and data, where applicable, including site plans or graphic data presentation.
10. Figures presenting geologic cross-sections based on outcrop and borehole data if applicable.
11. Figures presenting the locations of existing and proposed remediation systems.
12. Figures presenting existing remedial system design and construction details.
13. Figures presenting preliminary design and construction details for preferred corrective measures.

E.6.p APPENDICES

The management plan for waste generated as a result of construction, installation or operation of remedial systems or activities plan shall be included as an appendix to the corrective measures evaluation. Corrective measures evaluations shall include additional appendices presenting relevant additional data such as pilot testing or investigation data, remediation system design specifications, system performance data or cost analyses as necessary.

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ATTACHMENT 1

NAVAJO REFINING COMPANY ARTESIA REFINERY
RCRA PART B POST-CLOSURE PERMIT APPLICATION
SECTIONS 4.0 THROUGH 9.0, APPENDIX 2 AND APPENDIX 3

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ATTACHMENT 2

RCRA PART B POST-CLOSURE PERMIT APPLICATION
NAVAJO REFINING COMPANY ARTESIA REFINERY
RCRA PART B POST-CLOSURE PERMIT APPLICATION
SECTIONS 13.0, 15.0, 16.0, ATTACHMENTS B-4 THROUGH B-6 AND B-8