



OXY USA WTP LP
A subsidiary of Occidental Petroleum Corporation

760 Horizon Drive, Suite 101
Grand Junction, CO 81506

OXY USA WTP LP

DRILL CUTTINGS MATERIALS MANAGEMENT PLAN

**TEMPORARY STAGING AND DISPOSAL
OF DRILL CUTTINGS GENERATED FROM
OXY'S SHELL 797-03A PAD ON OXY'S
SHELL 797-03A (Location ID #427315) AND
SHELL 797-03B (Location ID #335482) PADS**

May 2012

TABLE OF CONTENTS

Section	Page Number
Introduction	2
Materials Management Plan (MMP)	2
Drill Cuttings Generation	2
Reserve Pit Closure Activities	3
Drill Cuttings Sampling Procedure	3
Cuttings Storage and Disposal Plan	5
Transportation of Cuttings to Disposal Areas	5
Cuttings Disposal Areas	6
Spill Response and Cleanup Procedures	6
Surface Water Monitoring	7
Proposed Facility Modifications	7
Facility Closure	7

Appendices

Appendix A – Sample chain-of-custody procedures

Attachments:

Shell Frontier Oil and Gas Approval Letter (3/29/2012)
Figure 1 – Temporary Storage and Disposal Locations Aerial Map
Figure 2 – Temporary Storage and Disposal Locations Topo Map
Oxy's Emergency Response Plan
Laboratory Analytical Data
Hydrogeologic Reports (Prepared by WALSH)

Operator contact information

OXY USA WTP LP (Operator #66571)
760 Horizon Drive, Suite 101
Grand Junction, CO 81506
(970) 263-3600 – Office
(970) 263-3694 – Fax

Designated contact person

Daniel Padilla
Regulatory Advisor
(970) 263-3637 – Office

Introduction

OXY USA WTP LP (Oxy) is submitting this Materials Management Plan (MMP) to the Colorado Oil and Gas Conservation Commission (COGCC), under a Form 4 Sundry, requesting review and approval of Oxy's Shell 797-03A MMP for storage and disposal of drill cuttings. The MMP will be used to manage drill cuttings transported to and disposed of at two locations, the Shell 797-03A and Shell 797-03B pads located on Shell Frontier Oil and Gas (Shell) lands situated in the Grand Valley field, Garfield County Colorado. The MMP covers cuttings generation, temporary storage and final disposal of cuttings located on Shell property. Oxy consulted with Shell and obtained approval of the MMP plan by the surface owner, see attached.

The proposed disposal locations in this plan, will be prepared for use prior to drilling and completion activities scheduled in 2012.

Materials Management Plan (MMP)

Oxy is proposing to drill mineral lease agreements located on Shell lands (see Figure 1, Location Map). Oxy's proposed drilling and completions operations on the proposed Shell 797-03A pad will occur in 2012, with activities being completed by October 2012. Due to the proposed constructed pad size, Oxy is proposing to temporarily store and dispose of drill cuttings generated from the Shell 797-03A pad on the Shell 797-03B and Shell 797-03A pads.

The proposed cuttings disposal area and temporary storage area are located within Oxy's Cascade Creek operational area, specifically:

Drill cuttings generation location and backup disposal location

- Shell 797-03A (Location ID # 427315): Tract 71, Section 3, Township 7 South, Range 97 West, 6th PM, Garfield County, Colorado.

Temporary storage and primary disposal location

- Shell 797-03B (Location ID # 335482): NWNE, Section 3, Township 7 South, Range 97 West, 6th PM, Garfield County, Colorado.

Oxy acquired the services of Walsh Environmental Scientists and Engineers, LLC to prepare a Hydrogeologic Report for the proposed disposal locations. The report discusses local geology and potential surface and ground water features.

Drill Cuttings Generation

Oxy proposes drilling 13 wells on the Shell 797-03A well pad. Oxy will begin drilling on the Shell 797-03A in July 2012 followed by completions operations beginning in September 2012. After processing, the cuttings will be blended with absorbent material such as sawdust to absorb *de minimis* amounts of liquid. On average, the drill cuttings will expand to approximately 330 cubic yards per well, using a conservative 50 percent swelling factor.

Oxy employs a skidable rig capable of drilling up to 24 wells from a single pad. Oxy's drilling rig utilizes a semi-closed loop system for mud cycling and reuse. The rig air drills the surface hole and then air is injected with mud for the production hole. As drill cuttings are returned to the surface they are deposited into a de-gasser. The de-gassing process allows the cuttings and mud to better separate in the next phase. The cuttings and mud are then sent to four rig shakers, which drain out fluids and mud from the cuttings. The

cuttings separated in this phase consist of a larger aggregate size and constitute the bulk of the cuttings to be stored off site. In addition to the rig shakers, the cuttings are also sent to four additional drying shakers, which removes another 20 percent of fluids from the cuttings. The separated fluids and mud collected are reused in the drilling process. Finer aggregate cuttings are then separated by sending the cuttings/mud mixture to a settling tank (mud trap), from which the cuttings are then sent to two centrifuges to remove low gravity solids (cuttings). These low gravity solids will also be hauled off site for storage and disposal. Any low gravity solids containing cement will be diverted to the above-mentioned pad reserve pit.

Reserve Pit Closure Activities

Prior to disposal of drill cuttings at the above-mentioned disposal location, Oxy will reclaim the Shell 03A pad reserve pit. Oxy will reclaim the reserve pit by removing liquids from the pit to *de minimis* levels. Any remaining reserve pit contents (solids) will be temporarily side cast immediately adjacent to the pit and the pit liner will be removed for off-site disposal. The pit contents will be returned to the pit for mixing and stabilization of the reserve pit contents for sampling and onsite disposal. Oxy will collect below liner grab samples from the pit bottom to be analyzed for COGCC Table 910-1 to ensure environmental impacts were not encountered during the reserve pit activity. Once confirmation samples have verified no issues, Oxy will collect composite samples of the stabilized reserve pit contents to be analyzed for COGCC Table 910-1. After the composite pit contents sample results confirm compliance with applicable COGCC Table 910-1 regulated levels, Oxy will backfill the pit with the stabilized material and begin additional disposal of drill cuttings within the reserve pit and cut slope of the pad location. Oxy will follow applicable COGCC guidance regarding constituents that don't commonly meet Table 910-1 concentration levels, such as Arsenic, pH, SAR, EC, and TPH and file the necessary sundries to document Oxy's disposal methods. Reserve pit closure activities will be documented as part of the cuttings disposal area closure activities.

Drill Cuttings Sampling Procedures

In accordance with COGCC regulations for storage and permanent disposal, samples shall be collected throughout the drilling process to document that the cuttings meet the standards which have been established by COGCC. To accomplish this, Oxy will:

- **Background Samples:** Initially, background samples will be collected from undisturbed locations around the Shell 797-03A pad. All background samples will be analyzed for COGCC Table 910-1 constituents excluding Hot Water Soluble Boron, and Barium will be analyzed via method SW-846.
- **Cuttings Samples:** In an effort to define the concentrations of Table 910-1 constituents which may be encountered on each pad, samples will be collected to determine the geologic source. On each of the drilling pads, beginning with the first well drilled, Oxy will collect multiple composite samples from both the surface and production strings by collecting samples of each major formation. The cuttings samples generated from the first well will be analyzed for the above mentioned analysis. Following the initial well, Oxy will collect cuttings samples from every 4th well (the 4th, 8th, 12th, 16th, and 20th) wells (based on a 22 well pad), targeting composites of surface and production string formations. Oxy will continue to use this numbered well sampling strategy for well pads which have fewer than 22 wells. In general, the samples will be collected in the following manner:
 - Initial well (well 1): Collect three to four composite samples from the surface string; targeting the Uinta, Green River, and Wasatch formations. Then collect six to seven samples from the production string; targeting the Fort Union, Williams Fork (four to five zones), and the Illes formations.
 - Additional wells (wells 4, 8, 12, 16, and 20 for a multi-well pad): Collect one composite sample from the surface string and three composite samples from the production string.
 - These composite samples will be collected from the cuttings storage bin which will consist of cuttings that have been processed and mixed with sawdust, used to absorb *de minimus* amounts of water present in the cuttings, and are ready for storage and disposal.
 - Oxy employs a drilling technique commonly referred to as "batch drilling", where the surface string is drilled for the first 6, 8 or 10 wells, prior to returning to the initial well to drill the production

string, where the production string of the 6, 8 or 10 wells will be drilled out. Batch drilling increases Oxy's efficiency by not having to switch out surface and production section tools between each well. Oxy typically batch drills every six wells. Batch drilling will stagger when surface and production string cuttings samples are collected for each well. Oxy will take this staggering into consideration when reviewing and tabulating the analytical data.

- Cuttings will be sampled and analyzed at the disposal location for COGCC table 910-1 to ensure proper mixing prior to disposal.

- **Analysis of Samples:** The samples collected from the initial well of each pad will be tabulated to characterize cuttings generated from the specific formations and/or combined formations within Oxy's Cascade Creek operating area. Oxy will be looking for any variations or leading indicators in the cuttings to allow Oxy to make recommendations on the sampling frequency of future wells or pads. The samples collected from the additional wells, will also be tabulated to characterize cuttings generated from combined formations within Oxy's Cascade Creek operating area to determine if statistical trends can be identified from the cuttings samples. All samples analyzed will be used to determine if more or less sampling should be required for future wells or pads.

Cuttings samples shall be collected directly from the blended cuttings storage bin. At a minimum, three composite samples will be collected from cuttings generated by the drilling of each well. This composite sample will represent concentrations found in the processed cuttings for each well.

The composite sample will consist of cuttings samples taken from at least five random locations on the blended cuttings bin pile and placed in the stainless steel bowl for blending. The blended composite cuttings sample found in the stainless steel bowl will then be packaged in laboratory provided glass jars for sample shipment and analysis. After filling of the appropriate number of jars, sample labels will be prepared and placed over the lid to provide a permanent seal to take the sample through chain-of-custody to the specified laboratory.

The individual collecting the sample should wear a new pair of disposable nitrile gloves for each sample collected to prevent cross-contamination of the samples. The samples should be collected using a stainless steel spoon, trowel or other appropriate equipment. The sampling equipment used will need to be thoroughly cleaned and rinsed with distilled water between each discrete sample. Appropriate sampling containers should be used for each sample. Each discrete sample should be placed into the specified container, and a log generated to identify the date, time, and identification of the person collecting the samples. The containers must be stored in a temperature controlled area which will maintain at or near 40 degrees F. (i.e. a refrigerator).

Each composite sample will be sent to a laboratory for analysis, samples should be given a distinct identification number (for example: 01 cuttings), labeled with the date and time of the sample collection, and the initials of the sampler, placed in a cooler with ice or back into the refrigerator under chain of custody protocol. The samples must be kept on ice and cool, during transportation from the field to the laboratory.

After the lab has analyzed the samples, the lab will provide Oxy with the results in a written report per the specified turn-around time. Oxy will tabulate the results for statistical analysis and trending.

Cuttings Storage and Disposal Plan

Dry drill cuttings generated from the above-mentioned drilling location will be managed as follows:

1. Drill cuttings will be stabilized with an absorbent material such as sawdust for transport to the temporary storage location at the Shell 797-03B pad.
2. Cuttings will be mixed and further stabilized with native material to satisfy Table 910-1 values and for disposal at the Shell 797-03B well pad.
3. Once the disposal area at the Shell 797-03B pad has reached capacity, any remaining drill cuttings that require disposal will remain at the Shell 797-03A pad for final disposal.

4. Each cuttings delivery will be offloaded into the 50' by 50' receiving/mixing area located immediately adjacent to the permanent disposal area.
 - The permanent disposal area will be approximately:
 - Primary – 27,534 square feet on the Shell 797-03B pad
 - Backup – 50,084 square feet on the Shell 797-03A pad
 - The above-mentioned cuttings disposal areas will be surrounded by an earthen berm when not in use.
 - After cuttings have been mixed with native material for additional stabilization (as needed), they will be carried over to the permanent disposal areas and will be stacked until approximately:
 - Primary – 3,365 cubic yards of cuttings are disposed at the Shell 797-03B pad
 - Backup – 17,752 cubic yards of cuttings are disposed at the Shell 797-03A pad
 - The cuttings will be set back so that they do not over-run the earthen berm serving as containment for the each permanent disposal area.

A final three foot cap consisting of native material will be placed on top of the cuttings disposal areas. The caps will be contoured to manage stormwater run on and run off then prepared for reclamation (seeding).

Transportation of Cuttings to Disposal Areas

Dry cuttings will be placed onto transport trucks (16 cubic yard dump trucks) and hauled to the primary temporary storage and disposal location (Shell 797-03B pad). The trucks will deliver the cuttings at the designated off-loading area where mixing and final disposal will occur. The transport trucks will travel approximately 1,500 feet on Oxy maintained roads between the temporary storage and disposal location. The access road does not cross any drainages.

The transport trucks will offload the dry cuttings initially at the staging areas for the above-mentioned cuttings disposal location. Oxy will track the volume of dry cuttings hauled for temporary storage and final disposal at each location.

In the event that a transport truck over turns along the transport routes identified, Oxy will implement spill response and cleanup procedures outlined further below.

When the disposal area at the Shell 797-03B pad has reached capacity, cuttings disposal and associated transport will be limited to drilling location, specifically the Shell 797-03A pad.

Cuttings Disposal Areas

The cuttings disposal areas will be managed in accordance with COGCC regulations and comply with applicable COGCC Table 910-1 standards. Oxy will follow applicable COGCC guidance regarding constituents that don't commonly meet Table 910-1 concentration levels, such as Arsenic, pH, SAR, and EC and file the necessary sundries to document Oxy's disposal methods. Oxy cuttings samples from the shaker tables on active drilling locations generally characterizes the cuttings which can be expected from the cuttings generated from this plan. Current drill cuttings samples identified elevated concentrations of sodium adsorption ratio (SAR), pH, arsenic, some PAH's, and TPH (see attached analytical results).

Due to sample collection from the shaker table on the drilling rig, Oxy believes the exceedances in some PAH's and TPH are due to improper mixing and stabilization, as well as insufficient time to allow for aeration. To address the elevated concentrations of some PAH's and TPH, Oxy will sufficiently mix the cuttings with an absorbent material such as sawdust to absorb *de minimis* amounts of liquids in the cuttings. To allow for sufficient aeration, these cuttings will then be transported to the temporary storage location for storage, then loaded and transported to the disposal location and off-loaded for disposal. These cuttings will be sufficiently mixed with native material to ensure stabilized cuttings satisfy COGCC Table 910-1 concentration values prior to disposal at the disposal location.

To address the elevated concentrations of SAR and pH, the cuttings will be buried and capped below at least three feet of native soil. Oxy believes the elevated arsenic concentrations found in the cuttings samples are due to documented naturally occurring arsenic known to be in the native sub-surface formations. Oxy will

ensure that As levels will be below COGCC Table 910-1 or naturally occurring background concentrations. Although natural variability is known to occur within the region, Oxy will default to naturally occurring background sample concentrations known to exist within the area. Prior to being capped, a sufficient number of samples will be collected to ensure compliance with applicable COGCC Table 910-1 standards. Oxy will follow applicable COGCC guidance regarding constituents that don't commonly meet Table 910-1 concentration levels, such as Arsenic, pH, SAR, and EC and file the necessary sundries to document Oxy's disposal methods. The final disposal locations shall be documented to include the final volume of cuttings disposed.

After the disposal areas have been capped with 3 feet of native fill material; the areas will be prepared for seeding. The disposal areas will be contoured to manage stormwater run-on and run-off and to provide for a surface that will encourage reseeding. Reseeding will generally occur in the early spring or fall which ever comes first to ensure seed germination. Oxy will monitor the reclaimed disposal location to ensure compliance Oxy's stormwater management plan. The disposal location will monitored revegetation effort at the next growing season and make necessary adjustments to ensure reclamation is complete.

Spill Response and Cleanup Procedures

In the event that a transport truck overturns and discharges cuttings materials, the site will be secured and Oxy will employ the response and reporting procedures identified in Oxy's Emergency Response Plan (ERP), see attached.

The ERP provides Oxy's emergency response and reporting procedures that will be followed in the event of an incident. Oxy emergency response personnel will ensure that the area is safe and that no fuel or hydraulic fluid has been released. If fuel, hydraulic fluid or other refined chemical has released, then the release will be contained, cleaned up, and if applicable reported to the necessary agencies. Please refer to the Oxy's ERP to identify individual roles and responsibilities.

Any cuttings that have discharged from the truck will be contained, collected, and taken to the disposal area. The cuttings shall be transported in a dry state and therefore will not run-off or generate an impact beyond the release area. Following control and removal of the release, Oxy will ensure that any and all required governmental and non-governmental agencies will be contacted. Please refer to Table 1 of the ERP for Agency emergency contact information.

Surface Water Monitoring

Water quality sampling will be conducted for the cuttings temporary storage location and the disposal location prior to the operation of these facilities. For the two locations, surface water sampling will occur from one sampling point approximately 1,600 feet west of the well pads (see Figures 1 and 2). Collection of samples will be based on the availability of flows, since the drainage (East Fork) where the sampling point is located, is an intermittent drainage.

If water is available, Oxy will collect one sample from the above-mentioned sampling point prior to commencing disposal operations to serve as a background assessment of water quality parameters in the area. Oxy will not collect a sample, immediately after a storm event. If water is available, quarterly water samples will be collected during disposal operations, peak flow when achievable, and will continue for an additional four quarters following capping and completion of the disposal operations. If water is available, quarterly sampling will continue except when difficulty of reaching the site due to inclement weather. Water samples will be collected and analyzed for COGCC Table 910-1 water standards to include; benzene, toluene, ethylbenzene, and total xylenes (BTEX), total dissolved solids, chlorides, sulfates, and dissolved metals. Water sample analytical results and tabulated data will be provided to the COGCC as part of the Form 27 closure documentation.

The individual collecting the sample will wear a new pair of disposable nitrile gloves for each sample collected to prevent cross-contamination of the samples. The individual collecting the surface water sample will fill, cap, and seal all laboratory provided containers using laboratory provided labels. The individual collecting the

samples will follow all storage, shipment, and chain-of-custody procedures implemented by Oxy in this MMP and outlined in Appendix A.

Proposed Facility Modifications

Oxy will notify the COGCC in writing (sundry) if proposed modifications to the facility design, operating plan, permit data, or permit conditions change following applicable COGCC rules.

Facility Closure

Oxy will comply with established COGCC rules by submitting a detailed Site Investigation and Remediation Workplan, Form 27, prior to facility closure to the Director for approval. Outlined below are operations and activities which Oxy assumes could be associated with the preliminary and final closure of the locations:

- Collection of processed cuttings samples to ensure compliance with COGCC Table 910-1 values;
- Stacking of the processed cuttings within the disposal location;
- Capping the cuttings with at least 3 feet of native fill material, if pH, SAR, and or EC values are identified as higher than COGCC Table 910-1 values;
- Collection of a sufficient number of compliance cap samples to ensure compliance with COGCC Table 910-1 values;
- Final contour and seed bed preparation, followed by seeding during the appropriate season; and
- Monitor seeding efforts and stormwater best management practices on the cuttings disposal area.

Closure documentation will be provided to the COGCC (form 27 or form 4 as needed) as necessary. All closure records will be kept on file at Oxy's Grand Junction office.

Appendix A

Sample chain-of-custody procedures