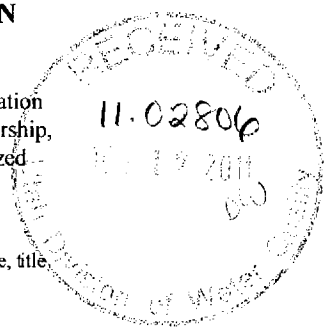
MAIL TO:
Division of Water Quality
Utah Department of Environmental Quality
Salt Lake City, Utah 84114-4870

Application No.:_____
Date Received:_____
(leave both lines blank)

UTAH GROUND WATER DISCHARGE PERMIT APPLICATION



Part A - General Facility Information Please read and follow carefully the instructions on this application form. Please type or print, except for signatures. This application is to be submitted by the owner or operator of a facility having one or more discharges to groundwater. The application must be signed by an official facility representative who is: the owner, sole proprietor for a sole proprietorship, a general partner, an executive officer of at least the level of vice president for a corporation, or an authorized representative of such executive officer having overall responsibility for the operation of the facility.

1. **Administrative Information.** Enter the information requested in the space provided below, including the name, title, and telephone number of an agent at the facility who can answer questions regarding this application.

Facility Name: MCW Energy Group
Mail Address: 344 Mira Loma Avenue
Glendale, California 91024

Facility Legal Location* Uinta County, West of Vernal in T. 4 S., R. 20 E., SLBM,
Section 23: N 1/2 NE 1/4, E 1/2 W 1/2, S 1/2 SE 1/4; Section 24: Lots 2-4, W 1/2 E 1/2, N 1/2 NW 1/4;
Section 26: E 1/2, E1/2 W1/2.
Containing 1,138.22 acres, more or less.
See Figure 1 for the location of the facility and other relevant features/objects. *Note: A topographic map or detailed aerial photograph should be used in conjunction with a written description

Contact's Name: Jon Schulman Phone No.:(801) 943-4144
Title: Environmental Engineer JBR Environmental Consultants, Inc.

2. **Owner/Operator Information.** Enter the information requested below, including the name, title, and phone number of the official representative signing the application.

Owner Name: Kevin Radzinsky, MCW Energy Group Phone No.:(800) 979-1897
Mail Address: 344 Mira Loma Avenue; Glendale, CA 91204

Operator Name: same as owner

Official Representative Name: Jon Schulman Phone No.:(801) 943-4144
Title: Environmental Engineer, JBR Environmental Consultants, Inc.

3. **Facility Classification** (check one)

[x] New Facility [ ] Existing Facility [ ]
Modification of Existing Facility

4. **Type of Facility** (check one)

[x] Industrial [ ] Mining [ ] Municipal [ ] Agricultural Operation [ ] Other, please describe:
Tar sands processing plant. Initially a pilot plant.

5. **SIC/NAICS Codes: NAICS 211 Oil and Gas Extraction [211111 Crude Petroleum & Natural Gas Extraction, Crude Petroleum from Oil Sands]**

Enter Principal 3 Digit Code Numbers Used in Census & Other Government Reports

6. **Projected Facility Life**: if pilot is successful, projected life is 10-20 years, otherwise < 1 year

7. **Identify principal processes used, or services performed by the facility. Include the principal products produced, and raw materials used by the facility:** see attached

8. **List all existing or pending Federal, State, and Local government environmental permits:**

	Permit Number
[ ] NPDES or UPDES (discharges to surface water)	
[ ] CAFO (concentrated animal feeding operation)	
[ ] UIC (underground injection of fluids)	
[ ] RCRA (hazardous waste)	
[x] PDS (air emissions from proposed sources)	Pending
[ ] Construction Permit (wastewater treatment)	
[ ] Solid Waste Permit (sanitary landfills, incinerators)	
[ ] Septic Tank/Drainfield	
[x] Other, specify:	Uintah County Conditional Use Permit, Pending DOGM Small Mining Permit, To be filed in the future for a different location

9. Name, location (Lat.____° _____' _____"N,Long._____° _____' _____"W) and description of: each well/spring (existing, abandoned, or proposed), water usage(past, present, or future); water bodies; drainages; well-head protection areas; drinking water source protection zones according to UAC 309600; topography; and man-made structures within one mile radius of the point(s) of discharge site. Provide existing well logs (include total depth and variations in water depths).

See Attached

Name	Location	Description	Status	Usage

The above information must be included on a plat map and attached to the application.

Part B - General Discharge Information

Complete the following information for each point of discharge to ground water. If more than one discharge point exists, photocopy and complete this Part B form for each discharge point.

1. Location (if different than Facility Location in Part A): County:_____
T._____, R._____, Sec._____, _____1/4 of _____1/4,
Lat._____° _____' _____"N.Long._____° _____' _____"W

2. Type of fluid to be Discharged or Potentially Discharged
(check as applicable)

Discharges (fluids discharged to the ground) **NONE**

[ ] Sanitary Wastewater: wastewater from restrooms, toilets, showers and the like
[ ] Cooling Water: non-contact cooling water, non contact of raw materials, intermediate, final, or waste products
[ ] Process Wastewater: wastewater used in or generated by an industrial process
[ ] Mine Water: water from dewatering operations at mines
[ ] Other, specify:_____

Potential Discharges (leachates or other fluids that may discharge to the ground) **NONE – tailings will be stored on an impermeable liner until they are adequately characterized, at which MCW will seek permit by rule or a groundwater discharge permit**

[ ] Solid Waste Leachates: leachates from solid waste impoundments or landfills
[ ] Milling/Mining Leachates: tailings impoundments, mine leaching operations, etc.
[ ] Storage Pile Leachates: leachates from storage piles of raw materials, product, or wastes
[ ] Potential Underground Tank Leakage: tanks not regulated by UST or RCRA only
[ ] Other, specify:_____

3. Discharge Volumes

For each type of discharge checked in #2 above, list the volumes of wastewater discharged to the ground or ground water. Volumes of wastewater should be measured or calculated from water usage. If it is necessary to estimate volumes, enclose the number in parentheses. Average daily volume means the average per operating day: ex. For a discharge of 1,000,000 gallons per year from a facility operating 200 days, the average daily volume is 5,000 gallons.

Discharge Type: Daily Discharge Volume all in units of (Average) (Maximum)

_____ _____ _____ _____

Not Applicable _____ _____ _____

4. Potential Discharge Volumes

For each type of potential discharge checked in #2 above, list the maximum volume of fluid that could be discharged to the ground considering such factors as: liner hydraulic conductivity and operating head conditions, leak detection system sensitivity, leachate collection system efficiency, etc. Attach calculation and raw data used to determine said potential discharge.

Discharge Type: Daily Discharge Volume all in units of (Average) (Maximum)

_____ _____ _____ _____

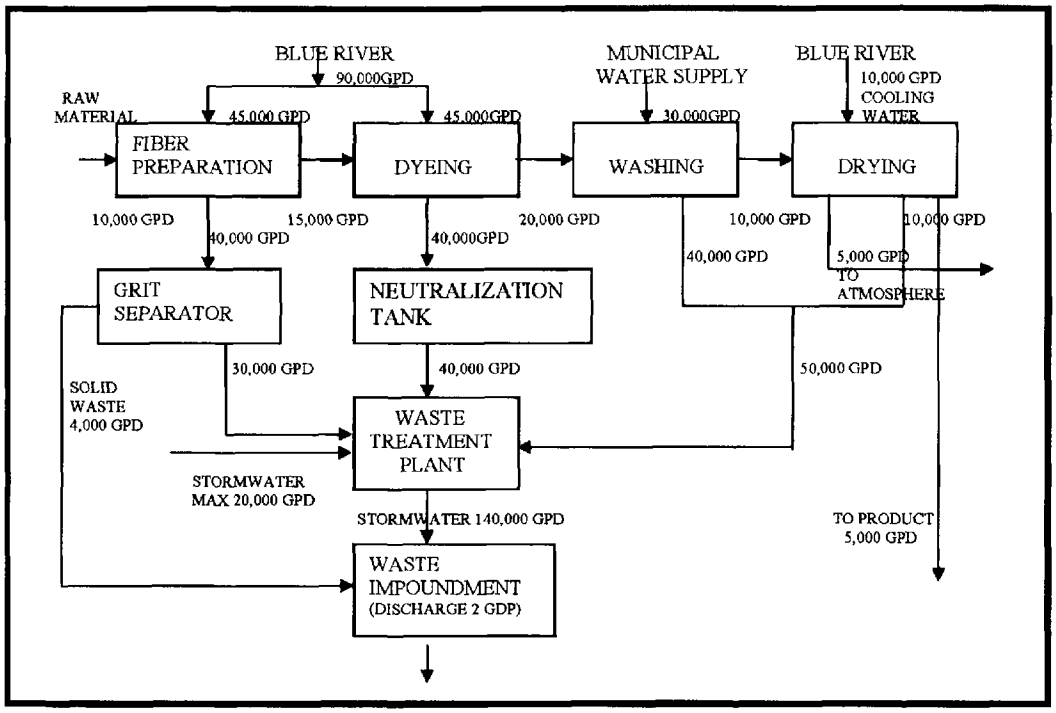
Not Applicable _____ _____ _____

5. **Means of Discharge or Potential Discharge** (check one or more as applicable)

[ ] lagoon, pit, or surface impoundment (fluids)
[ ] industrial drainfield
[ ] land application or land treatment
[ ] underground storage tank
[ ] discharge to an ephemeral drainage
[ ] percolation/infiltration basin (dry wash, etc.)
[ ] storage pile [ ] mine heap or dump leach [ ] landfill (industrial or solid wastes)
[ ] mine tailings pond [ ] other, specify_____

6. **Flows, Sources of Pollution, and Treatment Technologies**

Flows. Attach a line drawing showing: 1) water flow through the facility to the ground water discharge point, and 2) sources of fluids, wastes, or solids which accumulate at the potential ground water discharge point. Indicate sources of intake materials or water, operations contributing wastes or wastewater to the effluent, and wastewater treatment units. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and wastewater outfalls. If a water balance cannot be determined, provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures. See the following example. **See flow diagram in Appendix B of the Attached**



7. **Discharge Effluent Characteristics** Established and Proposed Ground Water Quality Standards - Identify wastewater or leachate characteristics by providing the type, source, chemical, physical, radiological, and toxic characteristics of wastewater or leachate to be discharged or potentially discharged to ground water (with lab analytical data if possible). This should include the discharge rate or combination of discharges, and the expected concentrations of any pollutant (mg/l). If more than one discharge point is used, information for each point must be provided. **Not Applicable**

Hazardous Substances - Review the present hazardous substances found in the Clean Water Act, if applicable. List those substances found or believed present in the discharge or potential discharge. **Not Applicable**

The following reports and plans should be prepared by or under the direction of a professional engineer or other ground water professional. Since ground water permits cover a large variety of discharge activities, the appropriate details and requirements of the following reports and plans will be covered in the pre-design meeting(s). For further instruction refer to the Ground Water Permit Application Guidance Document.

8. Hydrogeologic Report

Provide a Geologic Description, with references used, that includes as appropriate:

Structural Geology – regional and local, particularly faults, fractures, joints and bedding plane joints; **Stratigraphy** – geologic formations and thickness, soil types and thickness, depth to bedrock; **Topography** – provide a USGS MAP (7 ½ minute series) which clearly identifies legal site location boundaries, indicated 100 year flood plain area and applicable flood control or drainage barriers and surrounding land uses.

Provide a Hydrologic Description, with references used, that includes: Ground water – depths, flow directions and gradients. Well logs should be included if available. Include name of aquifer, saturated thickness, flow directions, porosity, hydraulic conductivity, and other flow characteristics, hydraulic connection with other aquifers or surface sources, recharge information, water in storage, usage, and the projected aerial extent of the aquifer. Should include projected ground water area of influence affected by the discharge. Provide hydraulic gradient map indicating equal potential head contours and ground water flow lines. Obtain water elevations of nearby wells at the time of the hydrologic investigation. Collect and analyze ground water samples from the uppermost aquifer which underlies the discharge point(s). Historic data can be used if the applicant can demonstrate it meets the requirements contained within this section. Collection points should be hydraulically up and downgradient and within a one-mile radius of the discharge point(s). Ground water analysis should include each element listed in Ground Water Discharge Permit Application, Part B7. **NOTE** Failure to analyze for background concentrations of any contaminant of concern in the discharge or potential
discharge may result in the Executive Secretary's presumptive determination that zero concentration exist in the background ground water quality. Sample Collection and Analysis Quality assurance – sample collection and Preservation must meet the requirements of the EPA RCRA Technical Enforcement Guidance Document, OSWER-9959.1, 1986 [UAC R317-6-6.3(I,6)]. Sample analysis must be performed by State of Utah certified laboratories and be certified for each of the parameters of concern. Analytical methods should be selected from the following sources [UAC R317-6-6.3L]: (Standard Methods for the Examination of Water and Wastewater, 20th Ed.,1998; EPA, Methods for Chemical Analysis of Water and Wastes, 1983; Techniques of Water Resources Investigation of the U.S. Geological Survey, 1998, Book 9; EPA Methods published pursuant to 40 CFR Parts 141, 142, 264 (including Appendix IX), and 270. Analytical methods selected should also include minimum detection limits below both the Ground Water Quality Standards and the anticipated ground water protection levels. Data shall be presented in accordance of accepted hydrogeolgic standards and practice.

Provide Agricultural Description, with references used, that includes: If agricultural crops are grown within legal boundaries of the site the discussion must include: types of crops produced; soil types present; irrigation system; location of livestock confinement areas (existing or abandoned).

Note on Protection Levels:

After the applicant has defined the quality of the fluid to be discharged (Ground Water Discharge Permit Application, Part B), characterized by the local hydrogeologic conditions and determined background ground water quality (Hydrogeologic Report), the Executive Secretary will determine the applicable ground water class, based on: 1) the location of the discharge point within an area of formally classified ground water, or the background value of total dissolved solids. Accordingly, the Executive Secretary will determine applicable protection levels for each pollutant of concern, based on background concentrations and in accordance with UAC R317-6-4.

9. Ground Water Discharge Control Plan:

Select a compliance monitoring method and demonstrate an adequate discharge control system. Listed are some of the Discharge Control Options available.

√ **No Discharge** – prevent any discharge of fluids to the ground water by lining the discharge point with multiple synthetic and clay liners. Such a system would be designed, constructed, and operated to prevent any release of fluids during both the active life and any post-closure period required.

Earthen Liner – control the volume and rate of effluent seepage by lining the discharge point with a low permeability earthen liner (e.g. clay). Then demonstrate that the receiving ground water, at a point as close as practical to the discharge point, does not or will not exceed the applicable class TDS limits and protection levels* set by the Executive Secretary. This demonstration should also be based on numerical or analytical saturated or unsaturated ground water flow and contaminant transport simulations.

Effluent Pretreatment – demonstrate that the quality of the raw or treated effluent at the point of discharge or potential discharge does not or will not exceed the applicable ground water class TDS limits and protection levels* set by the Executive Secretary.

Contaminant Transport/Attenuation – demonstrate that due to subsurface contaminant transport mechanisms at the site, raw or treated effluent does not or will not cause the receiving ground water, at a point as close as possible to the discharge point, to exceed the applicable class TDS limits and protection levels* set by the Executive Secretary.

Other Methods – demonstrate by some other method, acceptable to the Executive Secretary, that the ground water class TDS limits and protection levels* will be met by the receiving ground water at a point as close as practical to the discharge point.

*If the applicant has or will apply for an alternate concentation limit (ACL), the ACL may apply instead of the class TDS limits and protection levels.

Submit a complete set of engineering plans and specifications relating to the construction, modification, and operation of the discharge point or system. Construction Permits for the following types of facilities will satisfy these requirements. They include: municipal waste lagoons; municipal sludge storage and on-site sludge disposal; land application of wastewater effluent; heap leach facilities; other process wastewater treatment equipment or systems. **Woody Campbell has all pertinent information regarding the liner, which has been permitted and constructed.**

Facilities such as storage piles, surface impoundments and landfills must submit engineering plans and specifications for the initial construction or any modification of the facility. This will include the design data and description of the leachate detection, collection and removal system design and construction. Provide provisions for run on and run-off control. **See above**

10. **Compliance Monitoring Plan:** The applicant should demonstrate that the method of compliance monitoring selected meets the following requirements:

Ground Water Monitoring – that the monitoring wells, springs, drains, etc., meet all of the following criteria: is completed exclusively in the same uppermost aquifer that underlies the discharge point(s) and is intercepted by the upgradient background monitoring well; is located hydrologically downgradient of the discharge point(s); designed, constructed, and operated for optimal detection (this will require a hydrogeologic characterization of the area circumscribed by the background sampling point, discharge point and compliance monitoring points); is not located within the radius of influence of any beneficial use public or private water supply; sampling parameters, collection, preservation, and analysis should be the same as background sampling point; ground water flow direction and gradient, background quality at the site, and the quality of the ground water at the compliance monitoring point.

Source Monitoring – must provide early warning of a potential violation of ground water protection levels, and/or class TDS limits and be as or more reliable, effective, and determinate than a viable ground water monitoring network.

Vadose Zone Monitoring Requirements – Should be: used in conjunction with source monitoring; include sampling for all the parameters required for background ground water quality monitoring; the application, design, construction, operation, and maintainence of the monitoring system should conform with the guidelines found in: Vadose Zone Monitoring for Hazardous Waste Sites; June 1983, KT-82018(R).

Leak Detection Monitoring Requirements – Should not allow any leakage to escape undetected that may cause the receiving ground water the exceed applicable ground water protection levels during the active life and any required post-closure care period of the discharge point. This demonstration may be accomplished through the use of numeric or analytic, saturated or unsaturated, ground water flow or contaminant transport simulations, using actual filed data or conservative assumptions. Provide plans for daily observation or continuous monitoring of the observation sump or other monitoring point and for the reporting of any fluid detected and chemical analysis thereof.

Specific Requirements for Other Methods – Demonstrate that: the method is as or more reliable, effective, and determinate than a vable ground water monitoring well network at detecting any violation of ground water protection levels or class TDS limits, that may be caused by the discharge or potential discharge; the method will provide early warning of a potential violation of ground water protection levels or class TDS limits and meets or exceeds the requirements for vadose zone or leak detection monitoring.

Monitoring well construction and ground water sampling should conform to A Guide to the Selection of Materials for Monitoring Well Construction. Sample collection and preservation, should conform to the EPA RCRA Technical Enforcement Guidance Document, OSWER-9950.1, September, 1986. Sample analysis must be performed by State-certified laboratories by methods outlined in UAC R317-6-6.3L. Analytical methods used should have minimum detection levels which meet or are less than both the ground water quality standards and the anticipated protection levels.

11. Closure and Post Closure Plan: The purpose of this plan is to prevent ground water contamination after cessation of the discharge or potential discharge and to monitor the discharge or potential discharge point after closure, as necessary. This plan has to include discussion on: liquids or products, soils and sludges; remediation process; the monitoring of the discharge or potential discharge point(s) after closure of the activity.

12. Contingency and Corrective Action Plans: The purpose of this Contingency plan is to outline definitive actions to bring a discharge or potential discharge facility into compliance with the regulations or the permit, should a violation occur. This applies to both new and existing facilities. For existing facilities that may have caused any violations of the Ground Water Quality Standards or class TDS limits as a result of discharges prior to the issuance of the permit, a plan to correct or remedy any contaminated ground water must be included.

Contingency Plan – This plan should address: cessation of discharge until the cause of the violation can be repaired or corrected; facility remediation to correct the discharge or violation.

Corrective Action Plan – for existing facilities that have already violated Ground Water Quality Standards, this plan should include: a characterization of contaminated ground water; facility remediation proposed or ongoing including timetable for work completion; ground water remediation.

Certification

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

Jon Schulman, Environmental Engineer, JBR Environmental Consultants, Inc 801.943.4144

NAME & OFFICIAL TITLE (type or print) PHONE NO. (area code & no)

SIGNATURE DATE SIGNED

MCW Energy
Asphalt Ridge Project
Uintah County, Utah

Project Background, Geology, Hydrology, & Operations Description

Introduction

MCW Energy (MCW) has leased a Utah School and Institutional Trust Lands Administration (SITLA) tract west of Vernal, Utah (previously leased by Amerisands, LLC) (see Figure 1). The tract contains approximately 1,138.22 acres in the following areas:

Township 4 South (T4S), Range 20 East (R20E), Salt Lake Base & Meridian (SLB&M),
Section 23: N ½ NE ¼, E ½ W ½, S ½ SE ¼;
Section 24: Lots 2-4, W ½ E ½, N ½ NW ¼;
Section 26: E ½, E ½ W ½.

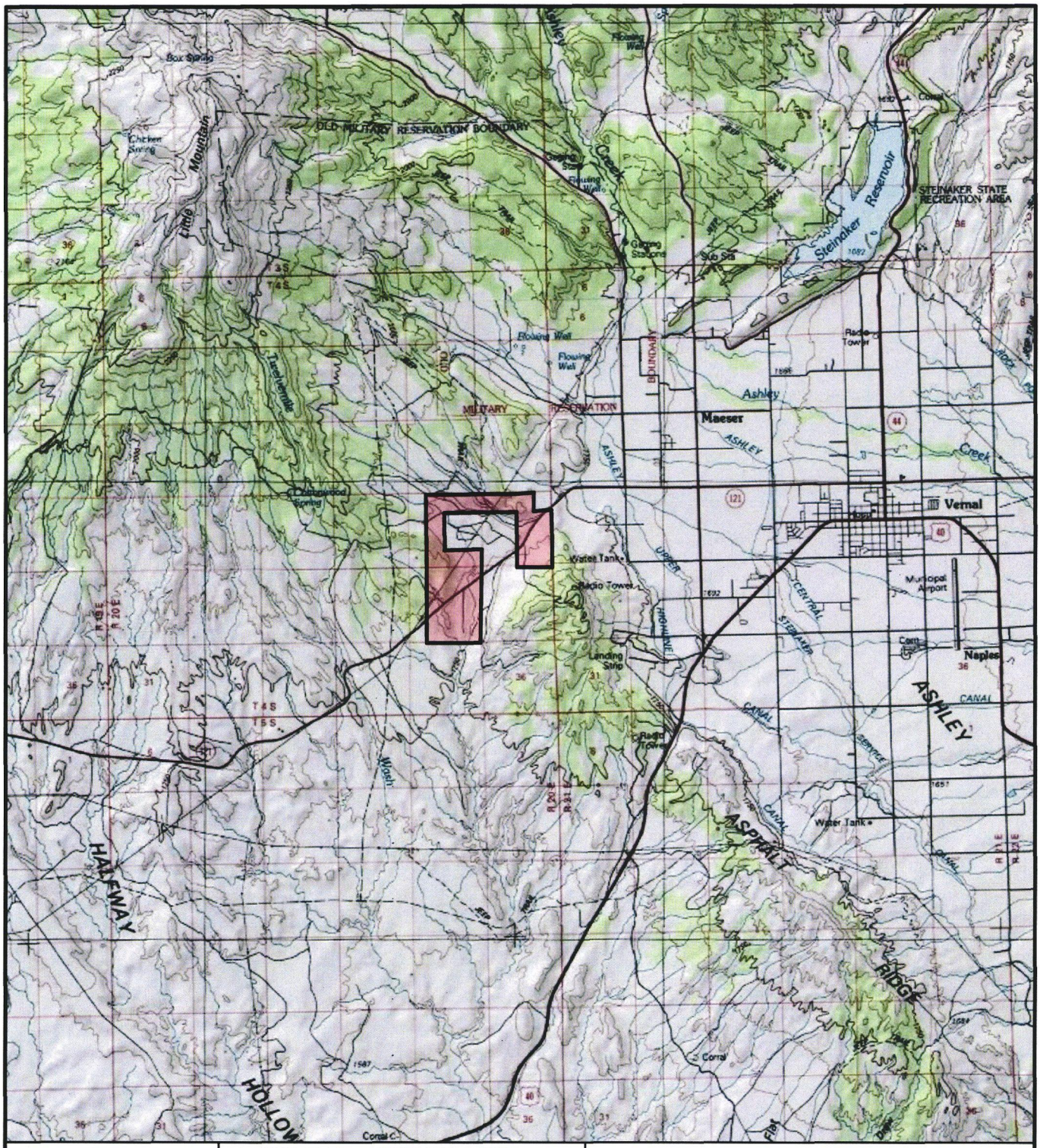
MCW plans to extract oil from Asphalt Ridge tar sands using a proprietary solvent process that was developed and is in use in the Ukraine. The process is designed to produce bitumen as its primary product, and clean, dry sand suitable for construction material as a secondary product. The modular processing plant will be delivered to the site and constructed in the SW¼ NE¼, Section 24, T4S, R20E, SLB&M in October 2011 (see Figure 2, below, and Site Plan in Appendix B). MCW has purchased tar sands from an existing mining operation to use for a pilot test of the process. MCW has no plans to mine tar sands on the tract now or in the future.

Once the process has been optimized through the pilot test, MCW will scale up into a production operation. During the production phase, tar sand will either be purchased from an existing operation or mined by MCW at a different (off lease) location. All ore storage, crushing, processing, and employee support facilities will be located off Highway 121 on the MCW plant site. During the pilot test the plant will employ up to 12 workers, and, during production, up to 18 workers. Other than a minor amount of additional traffic, there should be no impact to Highway 121 or its users.

The MCW process uses no process water, although the plant will require water for its boiler, dust control, and for employee sanitary purposes. Current plans are to bring fresh water to the site by truck and store it in a tank on site. Sanitary waste water will be collected in a tank and trucked to a licensed disposal facility. No water or waste water will contact tar sands or any process chemicals.

Tar sands, a proprietary tar sand processing solvent, and water will be delivered to the site by truck. A front end loader will be used on-site to move stockpiled tar sands to the crusher, and to load clean, dry sand onto trucks for use on other sites. Bitumen, sanitary waste water, and sand will be trucked out of the facility.

This report has been prepared to demonstrate that the design and location of the MCW facilities ensures a very low probability that any contaminants would impact soils or groundwater as a result of the MCW pilot test or operations.



BASE MAP: USGS 7.5 MINUTE QUADRANGLE

Legend

Property Boundary

N

1 0 1 Miles

MCW ENERGY GROUP
North Asphalt Ridge

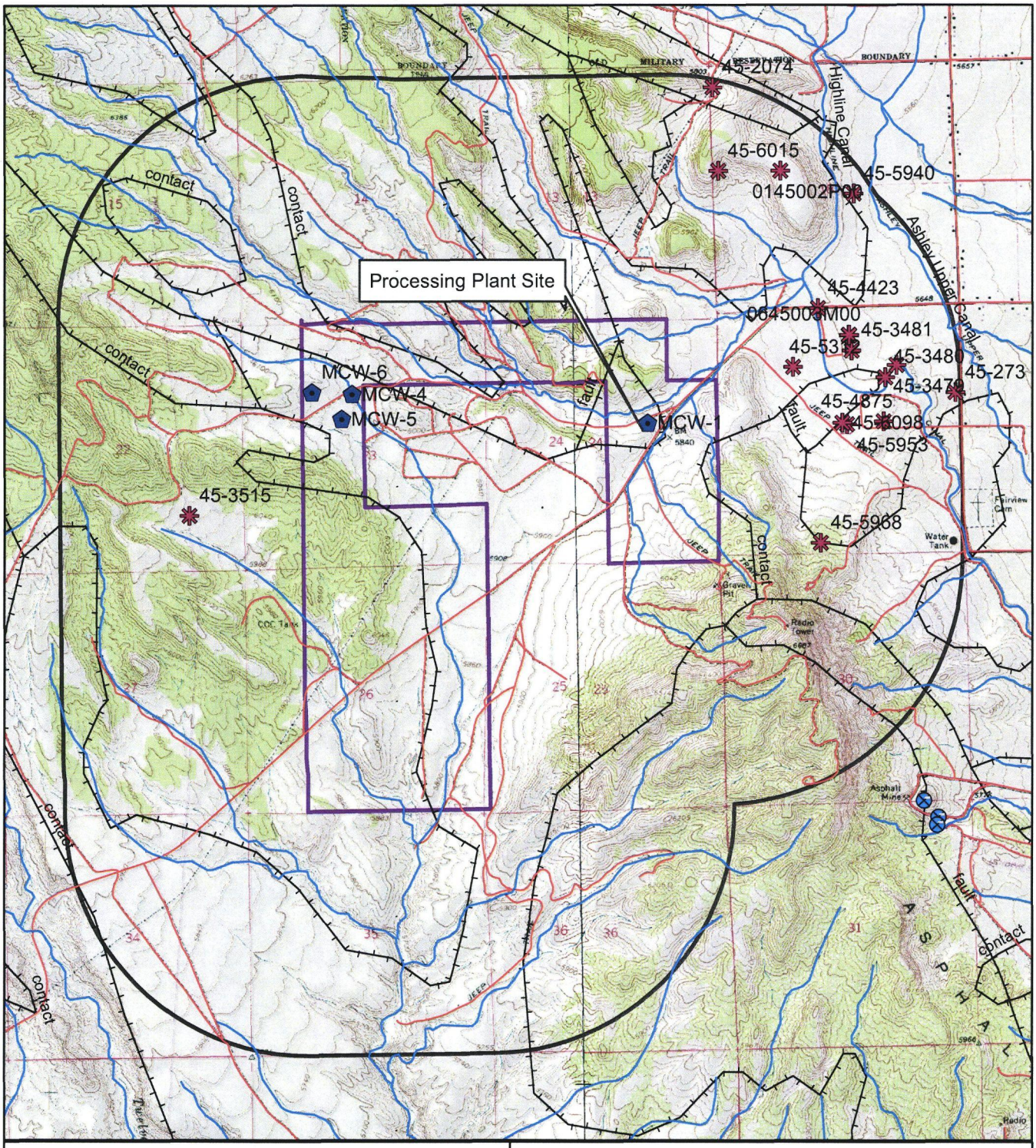
Figure 1
General Location Map

JBR

DRAWN BY	DATE DRAWN
CP	08/30/2011

SCALE 1:120,000

drawings\MCW Energy Group\Fig 2 Site Map.mxd



Legend

- Geologic Core
- Water wells w/in 1 mile
- Monitoring Wells
- Geologic Formations
- MCW Lease
- MCW Lease Buffer

N

0 0.4 0.8 1.6 Miles

MCW ENERGY GROUP
Asphalt Ridge Project

Figure 2
Geology & Wells

JBR

DRAWN BY	DATE DRAWN
	10/03/2011
SCALE	

Environmental Setting

The topography of the proposed plant site (see Figure 2) is relatively flat with rolling hills. There are no perennial surface water features on the site; an unnamed ephemeral drainage is approximately 116 feet north of the nearest site disturbance. The vegetation in the area surrounding the NW Asphalt Ridge site includes mixed shrub/grassland communities with junipers on slopes. Temperatures range from average highs of 32°C (89.8°F) in July to average lows of -15°C (4.9°F) in January. Precipitation averages 8.31 inches annually with 15.3 inches of snowfall.

The topographic setting of the leasehold is shown on Figure 2. The leasehold exhibits moderate relief with elevations ranging from 5,760 feet to over 6,200 feet on Asphalt Ridge in the southern portion of the tract. State Highway 121 between the small communities of Maeser and Lapoint traverses the tract, and most of the tract is accessible through numerous unimproved roads. A powerline also crosses through the center of the tract.

Geology and Landform

This section is taken largely from the "Draft Technical Report on NW Asphalt Ridge Tar Sand Deposit, Uintah County, Utah," by James F. Kohler, P.G., Utah Geosystems, dated June 12, 2011.

The NW Asphalt Ridge deposit is one of the tar sand deposits which occur in the Uinta Basin of northeastern Utah (Figure 3). Asphalt Ridge is a 15-mile-long northwest trending hogback, with the Tertiary Duchesne River Formation lying uncomformably on the Cretaceous Mesaverde Group (Figure 4). The NW Asphalt Ridge deposit is separated from the main Asphalt Ridge deposit by a series of major faults which lower the Mesaverde formation over 1,000 feet to the north.

Within the NW Asphalt Ridge deposit, Mesozoic and early Tertiary strata dip steeply to the south southwest. These strata are overlain unconformably by less steeply dipping formations of middle Tertiary age. This is shown on Figure 4 which shows a generalized cross section across north-central Asphalt Ridge (Kayser, 1966). A section showing the stratigraphy of the NW Asphalt Ridge area is shown on Figure 5.

Tar sand deposits in the NW Asphalt Ridge area are found in sandstone units in the Cretaceous Mesaverde group which intertongue with the Mancos Shale of marine origin. Two sandstone units have been identified with some level of bitumen saturation. These units have been designated from oldest to youngest as the Asphalt Ridge sandstone and the Rim Rock sandstone.

Within the NW Asphalt Ridge area, the upper Cretaceous Mancos Group immediately underlies and intertongues with the sandstones of the Mesaverde Group. which consists of two distinct sections, the lower marine sandstones and the upper brackish water sandstones, siltstones, carbonaceous shales and coals. At NW Asphalt Ridge this upper sequence has been eroded, and only the lower marine sandstones are present (Sinks, 1985). The Rim Rock Sandstone varies in thickness in the vicinity of the NW Asphalt Ridge deposit from 100 to 350 feet thick.

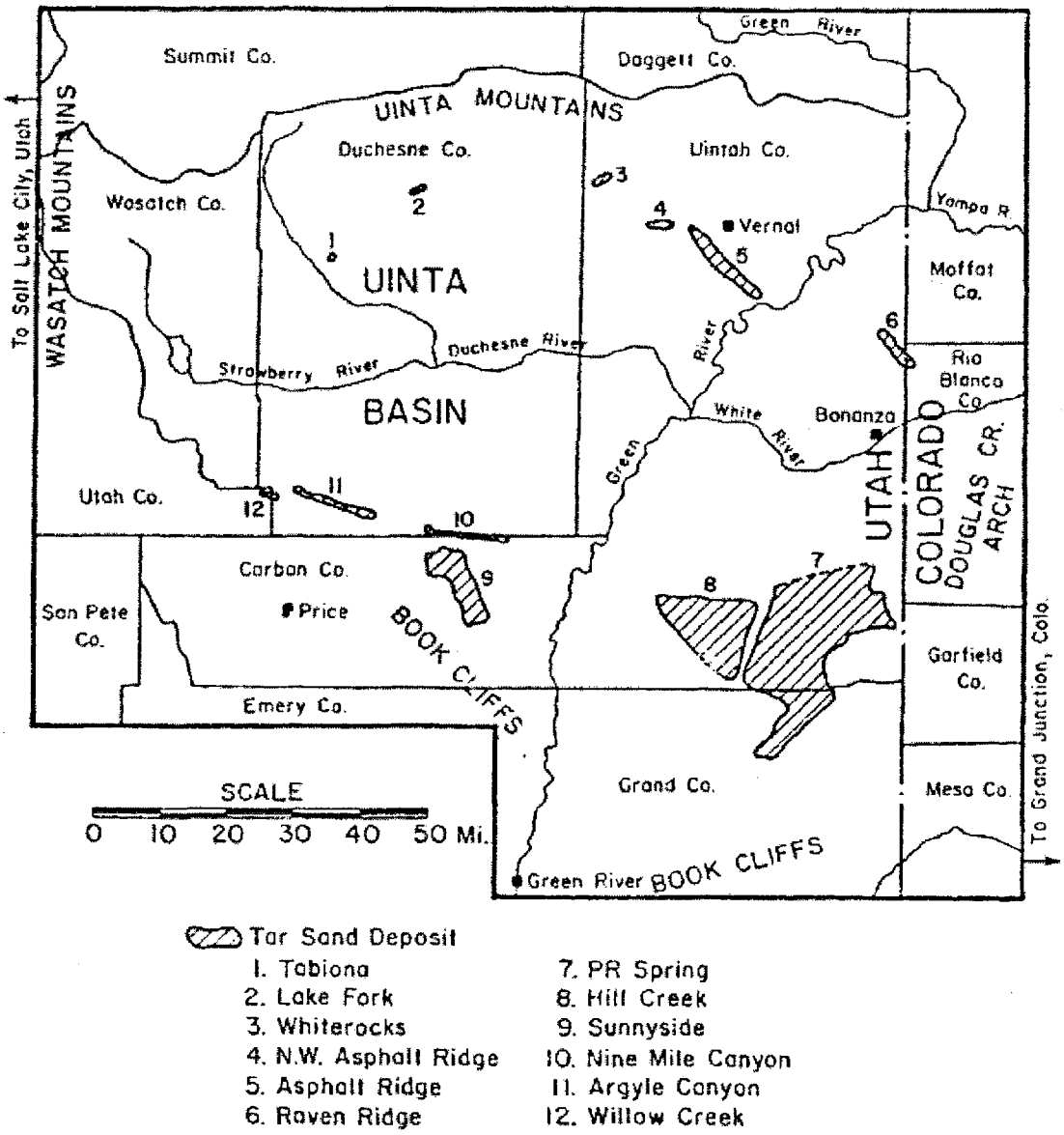


Figure 3. Uintah Basin Tar Sands Deposits

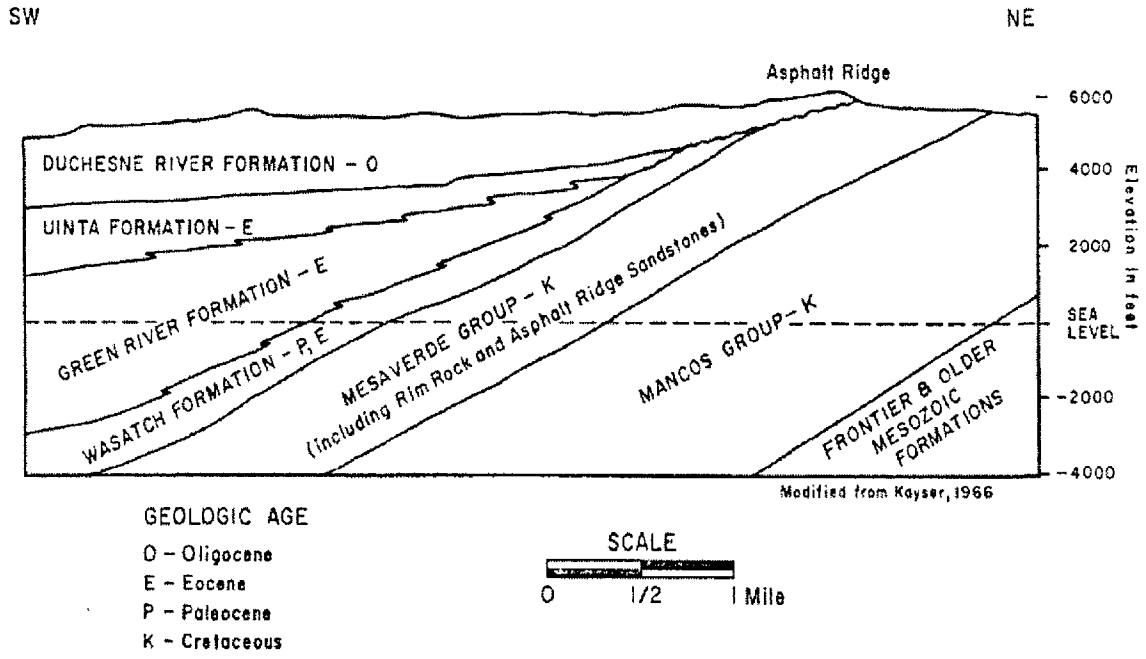


Figure 4. Generalized Cross Section Through Asphalt Ridge (from Kayser, 1966)

The middle zone of the Rim Rock Sandstone was the target reservoir for three in situ field tests conducted in August 2011 (see MCW-4, MCW-5, and MCW-6 on Figure 2; Core logs in Appendix A). An angular unconformity exists between the upper Rim Rock and the overlying Duchesne River Formation.

The third significant formation at the study area is the Oligocene Duchesne River Formation which unconformably overlies the Mesaverde Group at the NW Asphalt Ridge. This angular unconformity represents approximately 7,000 feet of missing strata (Walton, 1944). The Duchesne River formation is of fluvial origin and the lower portion formation may be saturated with bitumen in some areas (Covington, 1955a; Covington, 1963; Campbell and Ritzma, 1979). This formation, along with Quaternary alluvium, is exposed at the surface basinward from the NW Asphalt Ridge deposit.

Asphalt Ridge is separated from Northwest Asphalt Ridge by faulting at the north end of Asphalt Ridge. Covington (1957) has estimated its displacement to be about 1,200 feet, with the downthrown side to the northwest. The Mesaverde Group dips 12-34° south southwest, while the strata overlying the unconformity between the Mesaverde Group and the Duchesne River Formation are less steep, with dips ranging 5-20° southwest (Kayser, 1966). Drilling and seismic surveys indicate that the NW Asphalt Ridge deposit is structurally complex with a series of NW-SE trending normal faults (Sinks, 1985). The bedrock geology of the area is shown on Figure 6. Faults and contacts are shown on Figure 2.

MCW had four geologic cores drilled in August 2011 as shown on Figure 2. Logs of the cores are attached in Appendix A. Table 1 summarizes the logs. Groundwater was not found in any of the core holes.

Table 1 Summary of Rock Core Logs in Feet Below Ground Surface (BGS)

Feature	MCW-1 (feet bgs)	MCW-4 (feet bgs)	MCW-5 (feet bgs)	MCW-6 (feet bgs)
Alluvium (Duchesne River formation?)	0-25	0-45	0-30	0-20
Mesa Verde – alternating layers, primarily of shale & sandstone	25-60	45-180	30-280	20-180
Mancos Shale		180-220	280-300	
Bitumen		92-120	125; 245-270; 275-280	125-140

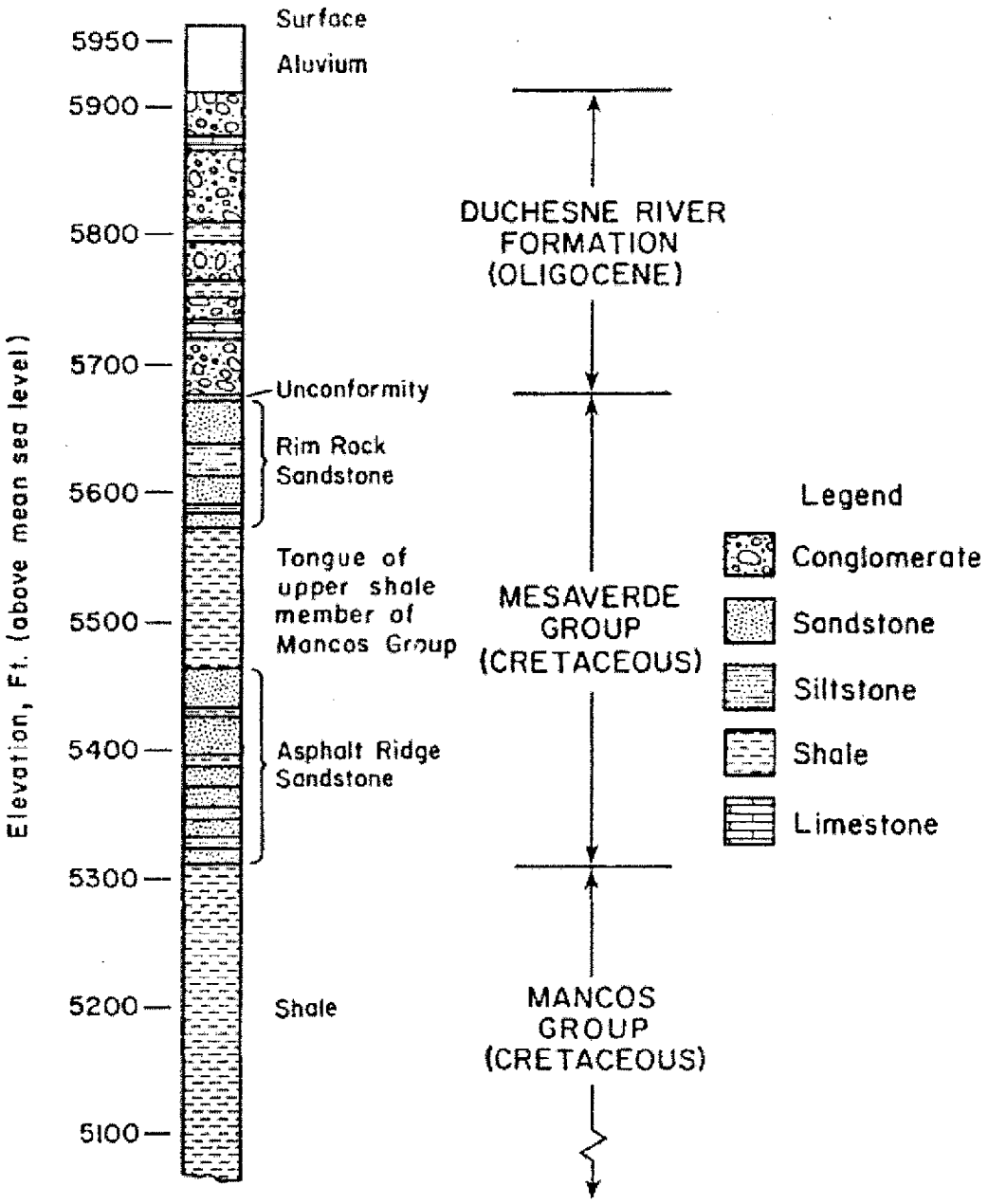
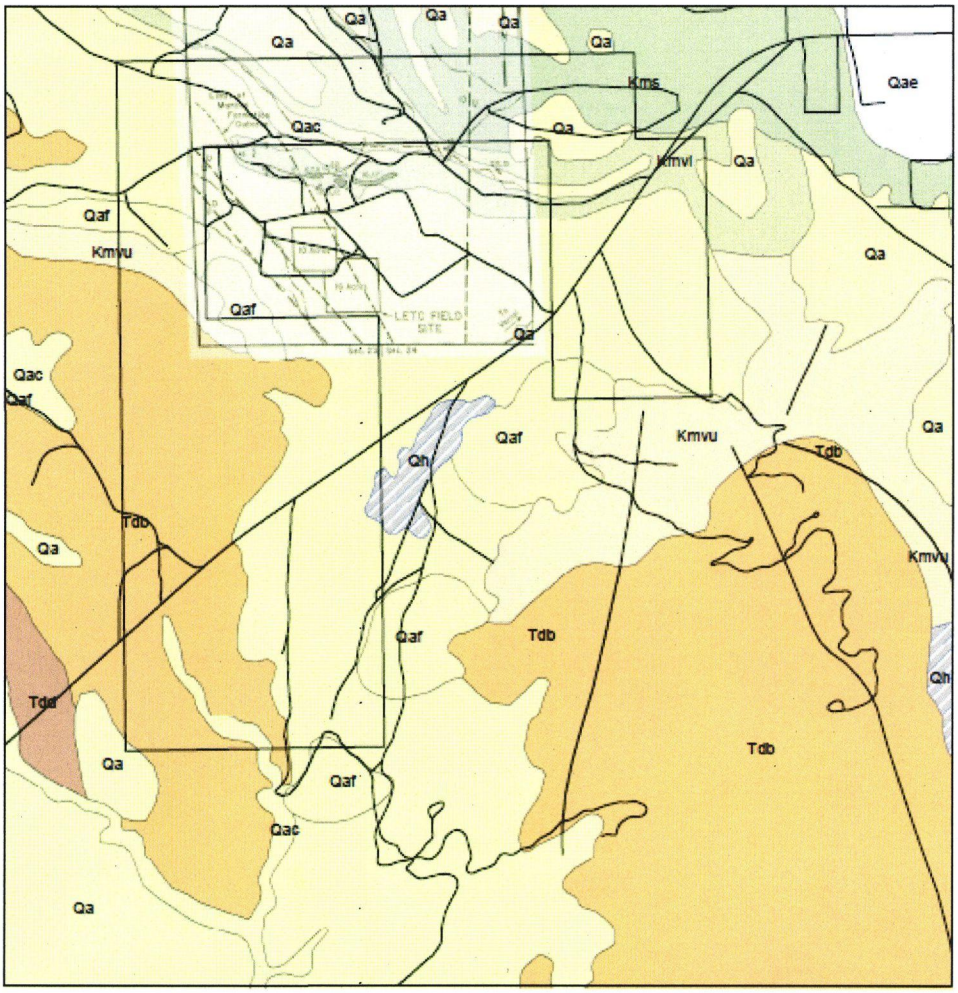


Figure 5. Stratigraphic Section of the NW Asphalt Ridge Area (from Sinks, 1985)

Figure 6: Bedrock Geology of the NW Asphalt Ridge Deposit



Surface Water

There are no perennial streams within the lease area or adjacent to it. Precipitation on the pilot plant site (see Figure 2) would drain to an unnamed ephemeral channel that may drain to the Highline Canal. Best management practices (BMPs) related to stormwater permitting and the Spill Prevention, Control, and Countermeasure (SPCC) plan will ensure that no sediment or contaminants reach the channel.

The project is in two watersheds. The eastern portion, where the processing plant will be located, is in the lower Ashley Creek watershed, while the western portion is in the Twelvemile Wash basin. Both are tributary to the Green River. At a HUC 12 level, the eastern portion is in the Coal Mine Basin-Ashley Creek watershed and the western portion is in the Middle Twelvemile Wash watershed.

The nearest gauging stations in the Ashley Creek drainage are Ashley Creek, Sign of the Maine, near Vernal, Utah (USGS 09271000) and Ashley Creek near Naples, Utah (USGS 09271400). Drainage from the processing plant area would not be measured by either station. There are no gauging stations in the Twelvemile Wash watershed. The gauging station on the Highline Canal Below Mantle Gulch near Jensen, Utah (USGS 09271070) may gauge water from the project site, but it is eight miles downstream and took discharge readings for 36 months between June 1969 and September 1972. During that period there was no flow December through March. The highest monthly average for a single month was 11.7 cfs in June 1971; the highest monthly average flow for the period of record was 8.1 cfs in June, based on four years (1969-1972).

Ashley Creek near Vernal, which would be upstream of the project site, operated from 1900 to 1965. During the period of 1939 through 1965, the average annual discharge was 121.5 cfs. Peak flow for 1900-1965 was 4,110 cfs on June 11, 1965. Water quality samples were taken at irregular intervals between 1949 and 1974; the average total dissolved solids (TDS) of all 42 samples taken during that period was 140.4 mg/L.

Ashley Creek near Naples, which would be downstream from the project area (but parallel to the Highline Canal), has only a three year record of operation. Average annual discharge for water years 2001, 2002, and 2003 was 62.1 cfs, 5.28 cfs, and 19.0 cfs, respectively. Average TDS for 50 water samples taken between January 2000 and November 2003 was 1,088 mg/L.

Hood and Fields (1978) say the following of Ashley Creek:

> In Ashley Valley, the stream is almost completely diverted and part of the water is impounded. The return flow from irrigation is a slightly saline water of the calcium magnesium sulfate type.

Groundwater

The State of Utah defines an aquifer as "a geologic formation, group of geologic formations or part of a geologic formation that contains sufficiently saturated permeable material to yield usable quantities of water to wells and springs" (R317-6-1).

Several publications describe the local area alluvial surface layer as a fresh water aquifer where present (BLM 2008; Hood 1976; UDWR 1999). In the local area of Maeser and Vernal there are wells completed in the alluvium, but it is a relatively thin layer. As shown in Table 1 (above) the alluvium in the four MCW geological cores varied from 20-45 feet. Figure 2 shows all water wells and monitoring wells within one mile of the MCW lease area that are in the Utah Division of Water

Rights (UDWRi) well database. Table 2 shows which five of those wells have well logs (those well logs and the geologic rock core logs are in Appendix A). Three of the five wells indicate surface layers of alluvium with the depth of the alluvium being 15, 21, and 36 feet. The two wells with deeper alluvium are the only two wells in use within the one mile buffer of the lease area, with their uses being irrigation and stock water (they are not used for domestic supply). The third well that showed an alluvial layer was drilled to 200 feet and abandoned as a dry hole. All four of the geologic core holes were dry as well, with total depths of 60, 220, 300, and 180 feet. The two water well logs that did record alluvium at the surface described the surface layer as clay.

Table 2 Water Wells Within One Mile of Leased Area (UDWRi 2011)

Water Right Number	Well Log	Summary Status[1]	Priority	Uses[2]	CFS	AC FT	Well Depth (ft)
45-3515	N	T	19740521	IS	1.000	0.000	
45-2074	Y	T	19490606	I	0.000	0.000	260*
45-6015	Y	P	20030314	I	0.000	0.880	28
45-5940	N	U	20020509	I	1.000	0.000	
45-4423	N	T	19781018	DIS	0.015	0.000	
45-3481	N	T	19740108	DIS	0.015	0.000	
45-5312	Y	T	19880524	I	0.015	0.000	70**
45-3479	N	T	19740107	DIS	0.015	0.000	
45-3480	N	T	19740107	DIS	0.015	0.000	
45-273	N	T	1900	DI	0.100	0.000	
45-6098	Y	T	20040720	DIS	0.000	4.730	200***
45-4875	N	T	19810811	DI	0.015	0.000	
45-5953	N	T	20020604	DIS	0.000	4.730	
45-5968	Y	P	20020625	IS	0.000	3.512	36
0145002P00	N	A		NP	0.000	0.000	
0645003M00	N	A	20060609	NP	0.000	0.000	
0645003M00	N	A	20060609	NP	0.000	0.000	
0645003M00	N	A	20060609	NP	0.000	0.000	
0645003M00	N	A	20060609	NP	0.000	0.000	
0645003M00	N	A	20060609	NP	0.000	0.000	

[1] T=Terminated; P=Perfected; U=Unapproved; A=Approved

[2] I=Irrigation; S=Stockwater: D=Domestic; NP=Non-Production Well for Heat Exchange

* Well abandoned

** "Water was unusable", well plugged

*** Dry Hole
Last six wells in the table are heat exchange wells and have no well logs or information.

The Duchesne River formation may be present below the alluvium as conglomerate. This formation is described as a key aquifer by the BLM (2008), and the Utah State Water Plan for the Uintah Basin (UDWR 1999) states the following:

> Due to the lack of unconsolidated aquifers in much of this basin, the only other groundwater source that can be developed is from consolidated or bedrock aquifers. While all geologic formations contain some water, those in the Uintah Basin which have been identified as being the best groundwater targets are the Browns Park, Duchesne River, Uinta, Current Creek and Morgan formations, Nugget/Navajo sandstone and Weber quartzite. These consolidated aquifers are considered the best for development.
>
> Groundwater in these consolidated formations is unconfined in locations nearest areas of recharge. Confined conditions, however, are the most common and occur in about 90 percent of the area within the basin underlain by sedimentary rocks.
>
> The circulation of groundwater in these consolidated aquifers is affected by folding and faulting, which locally will either enhance groundwater movement by fracturing or impair groundwater movement by offsetting aquifers. Local fracturing also enhances interformational leakage, which affects water quality.

The last paragraph is applicable to the MCW lease area, which contains a fault (see the geology section above and Figure 2). MCW-4 and MCW-5 (see Table 1) are approximately 680 feet horizontal distance apart and the core logs indicate the top of the Mancos Shale is 100 feet deeper at MCW-5 than it is at MCW-4. It is not clear from the rock core logs if the Duchesne River Formation is present on the MCW lease area as conglomerate graded into the alluvium or not present.

Below the alluvium at the project site is weathered shale which may be an interbed of the Mancos Shale within the Mesa Verde Formation (see rock core logs in Appendix A). The interlocking tongues of sandstone and shale vary in thickness from less than 10 feet to 30 feet, which is a fairly thin layer to sustain an aquifer, although the sandstone beds might be connect via fracturing within the shale layers. The Mesa Verde sandstone layers are the most likely reservoirs for bitumen, and where the sandstone is saturated with bitumen it does transmit water. In the areas of the Uinta Basin where the Mesa Verde does not interbed with the Mancos Shale it is considered a key aquifer.

Surface and Ground Water Quality

There is very little analytical data available for either surface water or groundwater in the project area locally or within the two surface water drainages (Ashley Creek and Twelvemile Wash). As described under Surface Water above, the U.S. Geological Survey (USGS) gauging station at Ashley Creek near Vernal, which would be upstream of the project site, had water quality samples taken at irregular intervals between 1949 and 1974; the average TDS of all 42 samples taken during that period was 140.4 mg/L. For Ashley Creek near Naples, which would be downstream from the project area (but parallel to the Highline Canal), average TDS for 50 water samples taken between January 2000 and November 2003 was 1,088 mg/L.

Hood and Fields (1978) describe the water quality in Ashley Creek as follows:

> Ashley Creek above the mouth of Ashley Creek canyon yields freshwater of the calcium bicarbonate type, which, during the spring freshet is very dilute. ...In Ashley Valley, the stream is almost completely diverted and part of the water impounded. The return flow from irrigation is a slightly saline water of the calcium magnesium sulfate type.

Analytical data on groundwater in the local area is also scarce. Two monitoring wells at the Crown Asphalt Ridge tar sand mine south of the MCW project site were sampled in 2005. Results of that sampling event are provided in Table 3. The results reflect the local geology in which layers saturated with bitumen were situated above the sampled aquifer.

Table 3 Analytical Results from Crown Asphalt Ridge Monitoring Wells

	Benzene (mg/L)	Toluene (mg/L)	E-Benzene (mg/L)	Xylenes (mg/L)	Naphthalene (mg/L)	TPH-GRO (mg/L)	TPH-DRO (mg/L)	Oil & Grease (mg/L)
Utah Tier 1 (2008) (mg/L)	0.30	3	4	10	0.7	10	10	10
MW-2								
5/1/2005	ND	ND	ND	ND	ND	ND	ND	**5.7**
MW-3								
5/1/2005	**0.003**	**0.008**	**0.006**	**0.055**	**0.048**	**0.6**	**4.5**	**32**

The Environmental Protection Agency (EPA) conducted a tar sands leachate study in 1984 (Grosse and McGowan). Processed tar sands were tested separately for leachate quality using the RCRA EP Toxicity Test; the ASTM (D-3987) Method A-1 Modification (8) shake extraction test; and one other protocol. EPA came to the following conclusion:

> The initial laboratory tests conducted under this study indicate that leachates from spent tar sand may not contain significant amounts of toxic pollutants but may contain substantial amounts of sulfate and total organic carbon (TOC). Only five constituents of the specific parameters analyzed were identified as priority pollutants (e.g., those elements posing the greatest risk to health and the environment). Of the five priority pollutants tested (cyanide, mercury, nickel, arsenic, and zinc), all exhibited low concentrations. However, concentrations of sulfate and TOC were fairly high and could impact surface and/or groundwater quality. Those trace elements which were present to any significant degree were not considered to be highly toxic or deleterious to the environment.

MCW Asphalt Ridge Tar Sands Project Specifics

As described above, MCW plans to extract oil from Asphalt Ridge tar sands using a proprietary process that was developed and is in use in the Ukraine. The process is designed to produce

bitumen as its primary product, and clean, dry sand suitable for construction material as a secondary product.

Two phases are planned for the project. The first phase will be a pilot test of the process and will also be used to characterize tailings produced by the plant to determine how they will be used or disposed during the second phase of the project. The second phase will be the production phase.

MCW has purchased tar sands locally to use during the pilot test the process. To ensure that there would be no risk of leachate from the ore contaminating either soil or groundwater, an impermeable liner was constructed. One thousand tons of purchased tar sands are currently stockpiled on the liner. Tailings produced during the pilot test will be placed back on the existing liner, but segregated from the unprocessed ore. JBR will sample fresh tailings as they come out of the plant for residual solvent, BTEXN, Oil and Grease, TPH-DRO and TPH-GRO.

Once the extraction process has been optimized through the pilot test, MCW will move into the production operation. During the production phase tar sand will either be purchased from an existing operation or mined by MCW at a near-by, off-lease location which has not yet been determined. By that time the tailings will been characterized and their future use or disposal will be known. This information and all analytical results will be shared with DWQ,

The MCW process uses no process water, although the plant will require water for its boiler and for employee sanitary purposes. Current plans are to bring fresh water to the site by truck. Sanitary waste water will be collected in a tank and trucked to a licensed disposal facility. No water or waste water will contact tar sands or any process chemicals. The plant is designed to produce bitumen as its primary product, and clean, dry sand suitable for construction material as a secondary product.

Tar sands, a proprietary tar sand processing solvent and water will be delivered to the site by truck. A front end loader will be used on-site to move stockpiled tar sands to the crusher, and to load clean, dry sand onto trucks for use on other sites. Bitumen, sanitary waste water, and sand will be trucked out of the facility.

Stormwater will be routed around the plant to prevent mobilization of sediment from disturbed areas. Silt fencing will be used during construction and operation to prevent sediment from reaching surface waters. Stored solvent, bitumen and other potential contaminants will be stored in containment per spill prevention, control, and countermeasure regulations. MCW is currently obtaining permits from the Utah Department of Environmental Quality, Uintah County, and other agencies as required. The company will abide by all permit conditions.

A process flow diagram and site plan are attached in Appendix B.

Summary

At the pilot plant site, no groundwater was found in the surface alluvium or the upper 30 feet of the weathered shale layer underlying the alluvium. Within a mile of the MCW lease no wells are being used for domestic supply. Where wells are in use they are drawing on the alluvial aquifer. All water well and geologic core logs that went below the alluvial layer were either dry (to as deep as 300 feet) or were abandaoned because the water was "unsable." This combined with the presence of multiple layers of low permeability shale indicates low vulnerability of any aquifer in the project area.

By design, the MCW bitumen extraction process uses no process water and a closed loop solvent system. Water will only be used in the boiler, for dust suppression (if needed), and for employee sanitary needs. All potential sources of soil or groundwater contamination will be contained and potential sources of leachate (ore stockpile and tailings) will be placed on impermeable liners.

In summary, MCW believes that its pilot test and subsequent tar sand production operation pose a very low to negligible risk of contaminating groundwater for the following reasons:

- Groundwater within the one-mile buffer area, including the MCW lease area, has very low vulnerability based on the underlying geology and the distance (depth) to groundwater.
- Leachate through bitumen has been shown to have low toxicity potential.
- The geology at the site (i.e., bitumen-saturated sandstone) has been present for millennia, as recent samples of groundwater have demonstrated; removing the bitumen may ultimately improve groundwater quality, assuming processing chemicals are prevented from reaching groundwater.
- MCW is taking all appropriate measures to protect the environment, including isolating tailings until they are demonstrated to pose no risk to groundwater; BMPs to manage stormwater from the site; and BMPs (i.e., containment) to control any potential risk from chemical spills.

Consequently, we believe MCW's proposed operations pose a very low to negligible probability that any contaminants will impact soils or groundwater as a result of the MCW pilot test or production operations.

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APPENDIX A

WATER WELL AND ROCK CORE LOGS

U-4-21 1000R-1

Report of Well and Tunnel Driller
STATE OF UTAH

(Separate report shall be filed for each well or tunnel)

ABANDONED

WR NUM 45-2074

GENERAL INFORMATION:

Report of well or tunnel driller is hereby made and filed with the State Engineer, in compliance with Sec. 100-3-22, Utah Code Annotated, 1943. (This report shall be filed with the State Engineer within 30 days after the completion or abandonment of well or tunnel. Failure to file such report constitutes a misdemeanor.)

1. Name and address of person, ~~company or corporation having charge of~~ drilling well ~~or tunnel~~.
(Strike words not needed)

J. C. Zimmerman, Roosevelt, Utah

2. Name and address of owner of well or ~~tunnel~~ Elmer Lind
(Strike Words not needed)

Vernal, Utah Uintah County

3. Source of supply is in Uintah County;

..... drainage area; ..... artesian basin
(Leave blank) (Leave blank)

4. The number of approved application to appropriate water is 21199

5. Location of well or ~~mouth of tunnel~~ is situated at a point

S. 500 ft. and E. 100 ft. from NW. Cor. Sec. 18, T4S, R21E, SLM.

(Describe by rectangular co-ordinates or by one course and distance with reference to U. S. Government Survey Corner — Copy description from well owner's approved application)

6. Date on which work on well ~~or tunnel~~ was begun 12/1/49
(Strike words not needed)

7. Date on which work on well ~~or tunnel was completed or~~ abandoned 12/7/49
(Strike words not needed)

8. Maximum quantity of water measured as flowing, pumped or ..... on completion of
(Strike words not needed)

well or ~~tunnel in sec. ft.~~; or in gals. per minute ..... Date .....

DETAIL OF COLLECTING WORKS:

9. **WELL:** It is drilled, ~~dug, flowing or pump~~ well. Temperature of water ..... °F.
(Strike words not needed)

(a) Total depth of well is 260 ft. below ground surface.

(b) If flowing well, give water pressure (hydrostatic head) above ground surface ..... ft.

(c) If pump well, give depth from ground surface to water surface before pumping .....

..... ; during pumping .....

(d) Size and kind of casing none
(If only partially cased, give details)

(e) Depth to water-bearing stratum .....
(If more than one stratum, give depth to each)

(f) If casing is perforated, give depth from ground surface to perforations .....

.....

(g) Log of well Well was abandoned until 7 inch casing can be obtained; well c caving in Farther drilling impossible.--0-35 yellow clay; 35-75 Black clay; 75-82 white talck; 82-85 dark shale; 85-105 Coal black shale; 105-115 grey shale; 115-155 Black clay; 155-165 black shale; 165-180 grey shale; 180-210 white clay; 210-230 Light grey shale, trace of water; 230-260 soft grey shale; 8¼ inch hole Bottom.

.....

(h) Well was equipped with cap, valve, or ..... to control flow.
(Strike words not needed)

(Over)

(c) Log of tunnel.....

11. **GENERAL REMARKS:** (Note any general or detailed information not covered above).

STATE OF UTAH,
COUNTY OF Salt Lake } ss.

I, J. C. Zimmerman, being first duly sworn, do hereby certify that I am the driller of the aforesaid well or tunnel who furnished the foregoing statement of facts; that I have read said statement and each and all of the items therein contained are true to the best of my knowledge and belief.

/s/ J. C. Zimmerman
Driller

Subscribed and sworn to before me this 10 day of December, 19 49.

(SEAL) (SEAL)

/s/ Laurence C. Monson
Notary Public

My Commission Expires:

GENERAL STATEMENT: Report of well driller is hereby made and filed with the State Engineer, in accordance with the laws of Utah. (This report shall be filed with the State Engineer within 30 days after the completion or abandonment of the well. Failure to file such reports constitutes a misdemeanor.)

WR Num 45-5312

(1) WELL OWNER:

Name Mr. Jones

Address Vernal Utah

(2) LOCATION OF WELL:

County Uintah Ground Water Basin (leave blank)

~~North~~ South 1,300 feet, ~~East~~ West 980 feet from NW¼ Corner of Section 19, T. 4 ~~N~~ S, R. 21 E SLBM ~~W USM~~ (strike out words not needed)

(3) NATURE OF WORK (check):

New Well ☑ Replacement Well ☐ Deepening ☐ Repair ☐ Abandon ☐

If abandonment, describe material and procedure:

(4) NATURE OF USE (check):

Domestic ☐ Industrial ☐ Municipal ☐ Stockwater ☐

Irrigation ☑ Mining ☐ Other ☐ Test Well ☐

(5) TYPE OF CONSTRUCTION (check):

Rotary ☐ Dug ☐ Jetted ☐

Cable ☐ Driven ☐ Bored ☐

(6) CASING SCHEDULE: Threaded ☐ Welded ☐

..... " Diam. from ..... feet to ..... feet Gage .....

..... " Diam. from ..... feet to ..... feet Gage .....

..... " Diam. from ..... feet to ..... feet Gage .....

New ☐ Reject ☐ Used ☐

(7) PERFORATIONS: Perforated? Yes ☐ No ☐

Type of perforator used .....

Size of perforations ..... inches by ..... inches

..... perforations from ..... feet to ..... feet

..... perforations from ..... feet to ..... feet

..... perforations from ..... feet to ..... feet

..... perforations from ..... feet to ..... feet

..... perforations from ..... feet to ..... feet

(8) SCREENS: Well screen installed? Yes ☐ No ☐

Manufacturer's Name .....

Type ..... Model No. .....

Diam. ..... Slot size ..... Set from ..... ft. to .....

Diam. ..... Slot size ..... Set from ..... ft. to .....

(9) CONSTRUCTION:

Was well gravel packed? Yes ☐ No ☐ Size of gravel: .....

Gravel placed from ..... feet to ..... feet

Was a surface seal provided? Yes ☐ No ☐

To what depth? ..... feet

Material used in seal: .....

Did any strata contain unusable water? Yes ☑ No ☐

Type of water: ..... Depth of strata .....

Method of sealing strata off: .....

Was surface casing used? Yes ☐ No ☐

Was it cemented in place? Yes ☐ No ☐

(10) WATER LEVELS:

Static level ..... feet below land surface Date .....

Artesian flow ..... feet above land surface Date .....

(12) WELL TESTS:

Drawdown is the distance in feet the water level is lowered below static level.

Was a pump test made? Yes ☐ No ☐ If so, by whom? .....

Yield: ..... gal./min. with ..... feet drawdown after ..... hours

" ..... " ..... " ..... "

" ..... " ..... " ..... "

Bailer test ..... gal./min. with ..... feet drawdown after ..... hours

Artesian flow ..... g.p.m. Date .....

Temperature of water ..... Was a chemical analysis made? No ☐ Yes ☐

(13) WELL LOG:

Diameter of well ..... inches

Depth drilled ..... feet. Depth of completed well ..... feet.

NOTE: Place an "X" in the space or combination of spaces needed to designate the material or combination of materials encountered in each depth interval. Under REMARKS make any desirable notes as to occurrence of water and the color, size, nature, etc., of material encountered in each depth interval. Use additional sheet if needed.

DEPTH From	DEPTH To	MATERIAL Clay	Silt	Sand	Gravel	Cobbles	Boulders	Hardpan	Conglomerate	Bedrock	Other	REMARKS
0	70	X										Blue

Water was unusable well casing was pulled well was filled with cement.

Work started June 1, 1958 Completed June 3, 1958

(14) PUMP:

Manufacturer's Name .....

Type: ..... H. P. .....

Depth to pump or bowles ..... feet

Well Driller's Statement:

This well was drilled under my supervision, and this report is true to

B.S.
12-30-04

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

Well Identification

Water Right: 45-5968 WIN: 31969

Owner *Note any changes*

Bruce L. Kendall
1905 East 500 South
Vernal UT 84078

Contact Person/Engineer: _____

Well Location *Note any changes*

N 200 W 450 from the S4 corner of section 19, Township 4S, Range 21E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 11-24-04 Completion Date: 12-09-04

Check all that apply: ☒ New ☐ Repair ☐ Deepen ☐ Clean ☐ Replace ☐ Public Nature of Use: _____

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	38	10"	AIR ROTARY	AIR + FOAM
38	60	6"	"	"

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, ordor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0	28				x			x			x	Topsoil	B1	
28	36	X						X					B2	

RECEIVED
DEC 30 2004
WATER RIGHTS
SALT LAKE

Static Water Level

Date 12-09-04 Water Level 11 feet Flowing? ☐ Yes ☐ No

Method of Water Level Measurement Air Sounder If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced Top of Casing Elevation _____

Height of Water Level reference point above ground surface 2' feet Temperature _____ degrees ☐ C ☐ F

Construction Information

DEPTH (feet) FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	☐SCREEN ☒PERFORATIONS ☒OPEN BOTTOM SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
+2	-38.	Steel	.25.	6"	30'	35'	3/8"	5"	3-...

Well Head Configuration: McNitor Cap. Access Port Provided? ☒Yes ☐No

Casing Joint Type: Welded. Perforator Used: Cutting Torch.

Was a Surface Seal Installed? ☒Yes ☐No Depth of Surface Seal: 28' feet Drive Shoe? ☒Yes ☐No

Surface Seal Material Placement Method: Poured

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	28'.	Cement + Bentonite Hole Plug.	11 Sacks.	5 gal

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One: GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
12-9-04	Air Lift.	20 +	X			1 Hr.

Pump (Permanent)

?

Pump Description: Horsepower: Pump Intake Depth: feet

Approximate Maximum Pumping Rate: Well Disinfected upon Completion? ☐Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

No casing failure - shell cut is intended for a place for sand to go. advised customer to keep pump above 30'

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name INTERSTATE WATER WELLS INC (Person, Firm, or Corporation - Print or Type) License No. 606

Signature Leroy E. Kuehler (Licensed Well Driller) Date 12-27-04

WELL DRILLER'S REPORT

State of Utah
Division of Water Rights
For additional space, use "Additional Well Data Form" and attach

RECEIVED
APR 04 2003
WATER RIGHTS
SALT LAKE

Well Identification PROVISIONAL WELL: 01-45-002-P-01 (45-6015)

Owner *Note any changes*
DAHMS, DALE M
1084 N 1500 E
VERNAL, UT 84078

Contact Person/Engineer:

Well Location *Note any changes*

NORTH 380 feet EAST 150 feet from the W4 Corner of
SECTION 18, TOWNSHIP 4S, RANGE 21E, SLB&M.

Location Description: (address, proximity to buildings, landmarks, ground elevation, local well #)

Drillers Activity Start Date: 3-21-03 Completion Date: 3-28-03

Check all that apply: ☒ New ☐ Repair ☐ Deepen ☐ Clean ☐ Replace ☐ Public Nature of Use:

If a replacement well, provide the location of the new well. ____ feet north/south and ____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	28'	18"	AUGER	NONE

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE high	PERMEABLE low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTIONS AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition, density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture, degree of weathering, hardness, water quality, etc.)
0	7						X							
7	21								X					
21	28											SHALE	BLUE	

Static Water Level

Date 3-27-03 Water Level 10' feet Flowing? ☐ Yes ☒ No

Method of Water Level Measurement ____ If Flowing, Capped Pressure ____ PSI

Point to Which Water Level Measurement was Referenced Ground Level Ground Elevation (If known) ____

Height of Water Level reference point above ground surface ____ feet Temperature ____ ☐ °C ☐ °F

Well Log

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	☐ SCREEN ☐ PERFORATIONS ☐ OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
0	28'	8" Plastic	200 PSI		20'	28'	1/8" Slots	6"	4

Well Head Configuration: CAP Access Port Provided? ☐ Yes ☒ No

Casing Joint Type: Glue Perforator Used: Saw

Was a Surface Seal installed? ☒ Yes ☐ No Depth of Surface Seal: 6 feet Drive Shoe? ☐ Yes ☒ No

Surface Seal Material Placement Method: Cement

Provide Seal Material description below:

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal.,# bag mix, gal./sack etc.)
8'	28'	GRAVEL	2 yds	
6'	8'	Quick Gel		
0'	6'	cement		5 Bag Mix

Well Development and Well Yield Test Information

Date	Method	Yield	Units Check One GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)

Pump (Permanent)

Pump Description: Horsepower: Pump Intake Depth: feet

Approximate maximum pumping rate: Well disinfected upon completion? ☐ Yes ☐ No

Comments Description of construction activity, additional materials used, problems encountered, extraordinary circumstances, abandonment procedures. *Use additional well data form for more space.*

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name Bill Jr's Rathole Drilling Inc. License No. 348
(Person, Firm, or Corporation - Print or Type)

Signature W.O. [signature] Date 3-28-03
(Licensed Well Driller)

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

Rec'd 9/21/04

For additional space, use "Additional Well Data Form" and attach

Well Identification

Water Right: 45-6098 WIN: 30414

Owner *Note any changes*

Anna K. Jenkins
809 North 3500 West
Vernal, UT 84078

Contact Person/Engineer: _____

Well Location *Note any changes*

S 2500 E 100 from the N4 corner of section 19, Township 4S, Range 21E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: Sept 9 2004 Completion Date: Sept 9 2004

Check all that apply: ☒ New ☐ Repair ☐ Deepen ☐ Clean ☐ Replace ☐ Public Nature of Use: _____

If a replacement well, provide location of new well, _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	30	12¼	Air Rotary	Air

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	CONSOLIDATED COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, ordor, fracturing, mineralogy, texture,degree of weathering, hardness, water quality, etc.)
0	~~15~~						X		XX				Red	
15	25				X							Clay	Brown	
25	32				X							Clay	Green	
32	56				X							Clay	Grey	
56	200										X	Shale	Blue	

Static Water Level

Date ~~Sept~~ Sept 9 2004 Water Level _____ feet Flowing? ☐ Yes ☒ No

Method of Water Level Measurement _____ If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced _____ Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature _____ degrees ☐ C ☐ F

Dry hole

Well Log

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	☐SCREEN ☐PERFORATIONS ☒OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per foot/interval)
0	30	Steel	250	8"		N/A			

Well Head Configuration: Well Casp — Access Port Provided? ☐Yes ☒No

Casing Joint Type: Welded — Perforator Used: N/A

Was a Surface Seal Installed? ☒Yes ☐No — Depth of Surface Seal: 30 feet — Drive Shoe? ☐Yes ☒No

Surface Seal Material Placement Method: Cement

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	30	Cement	13 SACKS	6 GAL WATER PER SACK

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
	Dry Hole					

Pump (Permanent)

Pump Description: _____ Horsepower: _____ Pump Intake Depth: _____ feet

Approximate Maximum Pumping Rate: _____ Well Disinfected upon Completion? ☐Yes ☐No

Comments Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

Dry Hole

Well Driller Statement This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name ROSS DRILLING & CONSTRUCTION INC (Person, Firm, or Corporation - Please Type) — License No. 346

Signature N/A (Licensed Well Driller) — Date Sept-18, 2004

PROJECT: MCW Energy, NW Asphalt Ridge

ROCK CORE LOG

BORING NO. MCW-6	PROJECT NO.	LOCATION E: 614790 N: 4479484 El.: 6041	SHEET 1 OF 1
TIME START 1230	DRILLING CONTRACTOR Envirotech	DRILLING EQUIPMENT	DATE 8/17/2011
TIME STOP 1530	DRILLER Warren	DRILLING METHOD Rotary / Air	SAMPLING METHOD Cuttings @ 5 ft.
TOTAL DEPTH 180	BACKFILL MATERIAL Cuttings w/ cement	WATER FIRST ENCOUNTERD None	FINAL DEPTH TO WATER Dry Hole

DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	RQD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
0										0 to 20 ft. Alluvium
10										
20										20 to 35 ft. Sandstone, silty with mudstone
30										
40										35 to 45 ft. Mudstone, broun
50										45 to 70 ft. Shale with sandstone interbeds
60										
70										70 to 75 ft. Sandstone, very fine grained, oil smell
80										75 to 80 ft. Shale, dark gry., some pyrite
90										80 to 100 ft. Sandstone, very fine grained, some clay
100										100 to 105 ft. Sandstone with shale, gry.
110										105 tp 115 ft. Shale, dark gry.
120										115 to 120 ft. Sandstone, very fine grained, brown, oil smell
130										120 to 125 ft. Shale, sandy, gry.
140										125 to 140 ft. Sandstone, very fine grained, light brown, minor bitumen
150										140 to 145 ft. Shale, sandy
160										145 to 165 ft. Sandstone with Shale Interbeds, minor oil smell
170										165 to 180 ft. Shale, dark gry.
180										
190										

LOGGED BY: James Kohler OFFICE: DATE: 8/17/2011

PROJECT: MCW Energy, NW Asphalt Ridge

ROCK CORE LOG

BORING NO. MCW-5	PROJECT NO.	LOCATION E: 614962 N: 4479302 Elev.: 6016	SHEET 1 OF 2
TIME START 1345	DRILLING CONTRACTOR Envirotech	DRILLING EQUIPMENT	DATE 8/16/2011
TIME STOP 8/17 1130	DRILLER	DRILLING METHOD Rotary / Air	SAMPLING METHOD Cuttings @ 5 ft.
TOTAL DEPTH 300 ft.	BACKFILL MATERIAL Cuttings, cement plug	WATER FIRST ENCOUNTERD None	FINAL DEPTH TO WATER Dry HOle

DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	RQD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
0										0 to 30 ft. Alluvium light tan, very fine grained with gravel
10										
20										
30										30 to 35 ft. Siltstone, brown
40										35 to 45 ft. Sandstone, very fine grained, lt. yellow
50										45 to 68 ft. Mudstone, medium brown
60										
70										68 to 72 ft. Sandstone, very fine grained, silty, light tan
80										72 to 80 ft. Mudstone, brown
90										80 to 85 ft. Shale, gry. to light gry.
100										85 to 92 ft. Sandstone, very fine grained, some oil smell
110										92 ft. to 100 ft. Sandstone, light gry, silty
120										100 to 125 ft. Shale (tar @ 125 ft., contamination?)
130										125 to 130 ft. Sandstone, very fine grained, crystalline, hard
140										130 to 140 ft. Mudstone, green, sandy at bottom
150										140 to 155 ft. Sandstone. gry to greenish gry, some mudstone
160										155 to 165 ft. Mudstone, red
170										165 to 175 ft. Sandstone, very fine grained, greenish gry.
180										175 to 188 ft. Mudstone, red
190										188 to 200 ft. Sandstone, gry, mudstone @ 195
200										

LOGGED BY: _____ OFFICE: _____ DATE: _____

PROJECT: MCW Energy, NW Asphalt Ridge

ROCK CORE LOG

BORING NO. MCW-5	PROJECT NO.	LOCATION E: 614962 N: 4479302 Elev.: 6016	SHEET 2 OF 2
TIME START 1345	DRILLING CONTRACTOR Envirotech	DRILLING EQUIPMENT	DATE
TIME STOP 8/17 1130	DRILLER	DRILLING METHOD Rotary / Air	SAMPLING METHOD Cuttings @ 5 ft.
TOTAL DEPTH 300 ft.	BACKFILL MATERIAL Cuttings, cement plug	WATER FIRST ENCOUNTERD None	FINAL DEPTH TO WATER Dry Hole

DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	RQD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
200										200 to 215 ft. Mudstone, dark gry to red
210										
220										215 to 225 ft. Sandstone, very fine grained, some oil smell
230										225 to 230 ft. Mudstone, red
240										230 to 245 ft. Sandstone, shaley, minor oil smell?
250										245 to 250 ft. Sandstone, very fine grained brown, with bitumen
260										250 to 260 ft. Sandstone with shale, minor bitumen
270										260 to 270 ft. Sandstone, very fine grained, brown, with bitumen
280										270 to 275 ft. Shale, sandy
290										275 to 280 ft. Sandstone, lt. brown, some bitumen
300										280 to 300 ft. Shale, Dark gry, (Mancos?)
310										
2										
3										
4										
5										
6										
7										
8										
9										

LOGGED BY: _____ OFFICE: _____ DATE: _____

PROJECT: MCW Energy, NW Asphalt Ridge

ROCK CORE LOG

BORING NO.	PROJECT NO.	LOCATION	SHEET
MCW-4		E: 615044 N: 4479474 Elev.: 6124	1 OF 2
TIME START 0900	DRILLING CONTRACTOR Envirotech	DRILLING EQUIPMENT	DATE 8/16/2011
TIME STOP 1300	DRILLER Warren	DRILLING METHOD Rotary/Air	SAMPLING METHOD Cuttings @ 5 ft.
TOTAL DEPTH 220	BACKFILL MATERIAL Cuttings and Cement	WATER FIRST ENCOUNTERD None	FINAL DEPTH TO WATER None

DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	RQD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
0										0 to 45 ft. Alluvium, light tan: clay with gravel
10										
20										
30										
40										
50										45 to 55 ft. Sandstone, gray with some gravel
60										55 to 70 ft. Shale, sandy, gray
70										75 to 92 ft. Sandstone, very fine grained, light brown with strong oil smell
80										
90										92 to 100 ft. Sandstone, very fine grained, black, well saturated with bitumen
100										100 to 110 ft. Shale, dark gry, minor bitumen in sample
110										110 to 120 ft. Shale, dark gry, with sandstone, minor bitumen
120										120 to 128 ft. Shale, gray
130										128 to 140 ft. Sandstone, very fine grained, trace bitumen
140										140 to 150 ft. Shale, gray
150										150 to 180 ft. Sandstone, very fine grained, silty, dark brown with oil smell
160										
170										
180										180 to 220 ft. Shale, gray (Mancos Shale?)
190										

LOGGED BY: James Kohler OFFICE: DATE: 8/16/2011

PROJECT: ROCK CORE LOG

BORING NO. MCW-4	PROJECT NO.	LOCATION	SHEET 2 OF 2
TIME START	DRILLING CONTRACTOR	DRILLING EQUIPMENT	DATE
TIME STOP	DRILLER	DRILLING METHOD	SAMPLING METHOD
TOTAL DEPTH 220	BACKFILL MATERIAL	WATER FIRST ENCOUNTERD	FINAL DEPTH TO WATER

DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	RQD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
~~200~~										
~~210~~										
~~220~~										
3										
4										
5										
6										
7										
8										
9										
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

LOGGED BY: James Kohler OFFICE: DATE: 8/16/2011

PROJECT: MCW Energy NW Asphalt Ridge

ROCK CORE LOG

BORING NO. MCW-1	PROJECT NO.	LOCATION E: 617035 N: 4479286 EL: 5837	SHEET 1 OF 1
TIME START 1615	DRILLING CONTRACTOR Envirotech	DRILLING EQUIPMENT	DATE 8/17/2011
TIME STOP 1730	DRILLER Warren	DRILLING METHOD rotary / air	SAMPLING METHOD cuttings @ 5 ft.
TOTAL DEPTH 60	BACKFILL MATERIAL Cuttings, cement surf.	WATER FIRST ENCOUNTERD No Water	FINAL DEPTH TO WATER Dry Hole

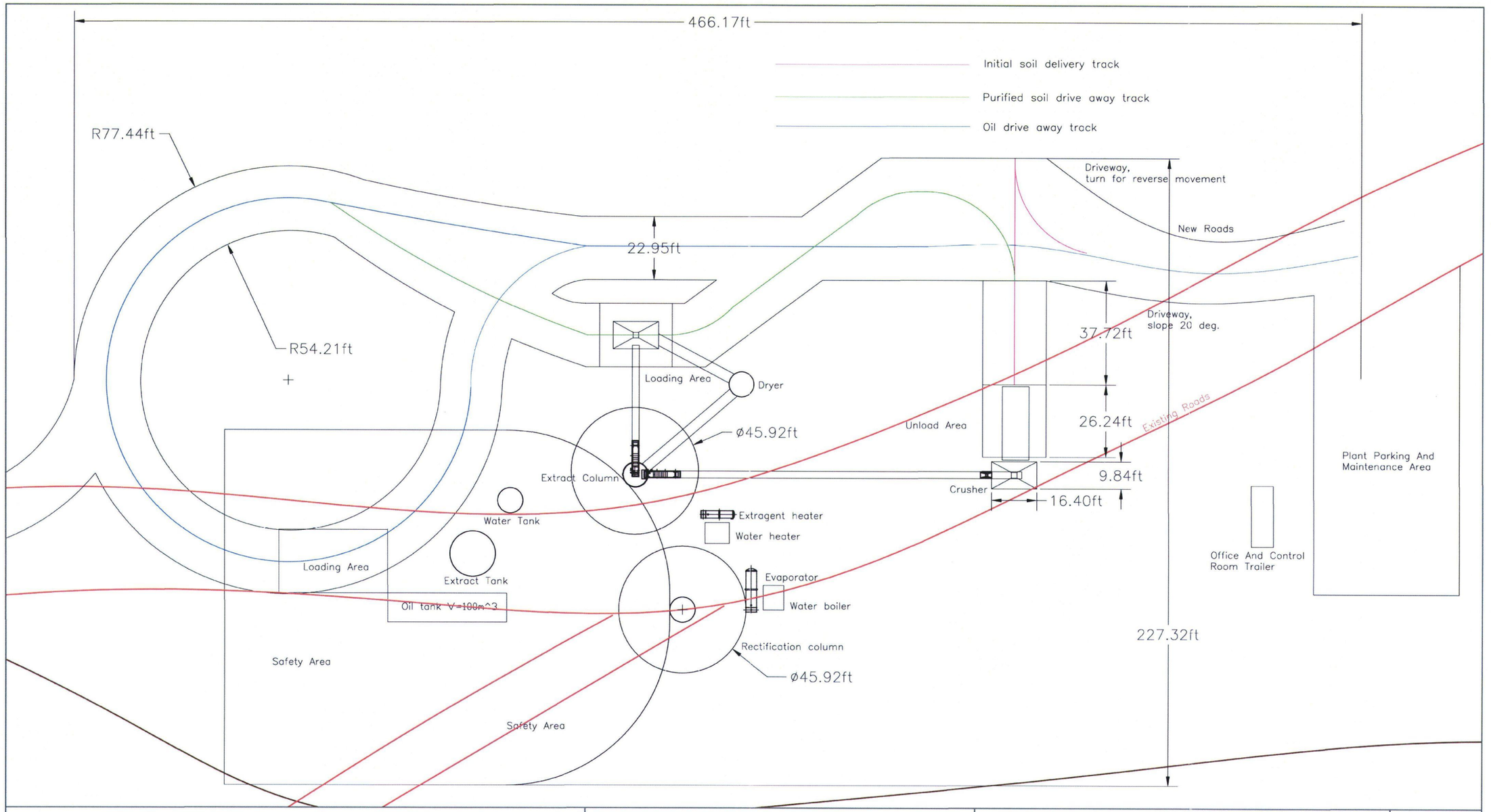
DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	RQD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
0										0 to 25 ft. Alluvium, vfg sand, cly, gravel
1										cuttings damp 15 ft. to 20 ft.
2										
3										25 to 60 ft. Shale, weathered, lt. gry to brown
4										
5										
6										
7										
8										
9										
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

LOGGED BY: James Kohler OFFICE: DATE: 8/17/2011

APPENDIX B

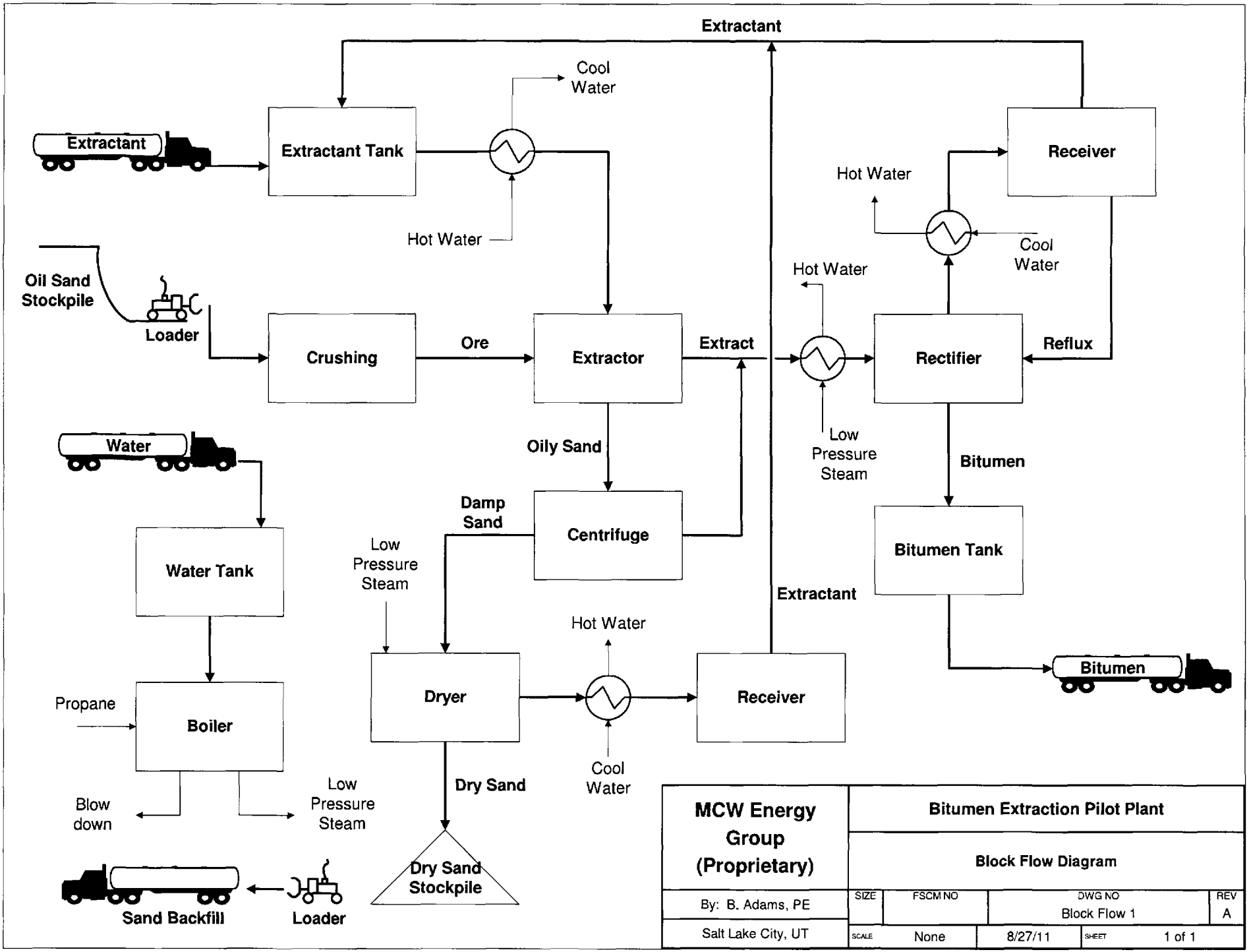
SITE PLANS

FLOW DIAGRAMS



Initial soil delivery track
Purified soil drive away track
Oil drive away track
Lease Boundry
Existing Roads
Grid Sections
Topo Lines
Creek/Creek Bed

PROJECT: MCW Energy Pilot Plant	TITLE: Plot Plan		SHEET: 3
LOCATION: Vernal, Utah	DATE: 8/26/2011	REVISIONS: 1	
DRAWN BY: Mac Johnson	SCALE: 1"=33'4"		
Proprietary Information			


Extractant
Cool Water
Extractant
Extractant Tank
Hot Water
Receiver
Hot Water
Cool Water
Oil Sand Stockpile
Loader
Crushing
Ore
Extractor
Extract
Hot Water
Rectifier
Reflux
Low Pressure Steam
Bitumen
Water
Oily Sand
Damp Sand
Centrifuge
Bitumen Tank
Water Tank
Low Pressure Steam
Extractant
Hot Water
Bitumen
Propane
Boiler
Dryer
Receiver
Blow down
Low Pressure Steam
Dry Sand
Cool Water
Dry Sand Stockpile
Sand Backfill
Loader
MCW Energy Group (Proprietary)
Bitumen Extraction Pilot Plant
Block Flow Diagram
By: B. Adams, PE
Salt Lake City, UT
SIZE
FSCM NO
DWG NO
Block Flow 1
REV
A
SCALE
None
8/27/11
SHEET
1 of 1