0016

C/041/002 Incoming

Canyon Fuel Company, LLC.
Sufco Mine
A Subsidiary of Arch Western Bituminous Group, LLC.

Ken May, General Manager
597 South SR 24
Salina, UT 84654
(435) 286-4400 - Office
(435) 286-4499- Fax

#3308

May 28, 2009

Mr. Daron Haddock
Permit Supervisor
Utah Coal Regulatory Program
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P. O. Box 145801
Salt Lake City, Utah 84114-5801

Re: Proposed 2009 Mitigation Activities for the North Water Spring Area, Canyon Fuel Company, LLC, SUFCO Mine C/041/0002

Dear Mr. Haddock:

Copies of the attached plan and Division forms C-1 and C-2 are being submitted for the Proposed 2009 Mitigation Activities for the North Water Spring Area for the Sufco Mine.

This additional proposed plan for bedrock drilling required to locate a suitable source of ground water is included at the end of the 'Pines 105, Joes Mill Pond, Pines 310 and Pines 311 Investigation' section located on pages 7-51F and 7-51G of the M&RP.

If you have any questions or need additional information, please contact Mike Davis at (435) 286-4421 or Leland Roberts at (435) 286-4483.

Sincerely,
CANYON FUEL COMPANY, LLC
SUFCO Mine

Kenneth E. May
General Manager

Encl.

KEM/MLD:kb

cc: DOGM Correspondence File

RECEIVED
JUN 08 2009
DIV. OF OIL, GAS & MINING

sufpub\govt2009\dogmmrp\MRP North Water Springs ltr.doc

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: CANYON FUEL COMPANY, LLC
Mine: SUFCO MINE **Permit Number:** C/041/002
Title: 2009 Mitigation Activities for the North Water Spring Area
Description, Include reason for application and timing required to implement:

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☒ Yes ☐ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes ☒ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

KENNETH E. MAY, MINE MANAGER — Kenneth E May — 6/1/09
Print Name — Sign Name, Position, Date

Subscribed and sworn to before me this 1st day of June, 2009

Jill White
Notary Public

NOTARY PUBLIC
JILL WHITE
70 W 300 S
Gunnison, UT 84634
My Commission Expires
March 28, 2012
STATE OF UTAH

My commission Expires: _____, 20___}
Attest: State of _____} } ss:
County of _____

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
		RECEIVED JUN 08 2009 DIV. OF OIL, GAS & MINING

Form DOGM- C1 (Revised March 12, 2002)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: CANYON FUEL COMPANY, LLC
Mine: SUFCO MINE **Permit Number:** C/041/002
Title: 2009 Mitigation Activities for the North Water Spring Area

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☒ Add	☐ Replace	☐ Remove	Add proposed 2009 mitigation activities for the north water spring area to Appendix 7-22 in Volume 8 of MRP.
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	Received by Oil, Gas & Mining
	RECEIVED JUN 08 2009 DIV. OF OIL, GAS & MINING

Form DOGM - C2 (Revised March 12, 2002)

Canyon Fuel
Company, LLC.
Sufco Mine
A Subsidiary of Arch Western Bituminous Group, LLC.

Michael L. Davis
Environmental Engineer
597 South SR 24
Salina, UT 84654
(435) 286-4421 - Office
(435) 286-4499 - Fax

May 5, 2009

Coal Regulatory Program
Attn.: Daron Haddock
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

RE: Proposed 2009 Mitigation Activities for the North Water Spring Area, Canyon Fuel Company, LLC, SUFCO Mine, C/041/0002

Dear Mr. Haddock:

Sufco respectfully submits to the Division of Oil, Gas and Mining (Division) this letter outlining the investigation and mitigation activities the mine plans for the North Water Spring area for 2009. Earlier in the year the mine had nearly finalized plans that included additional drilling and completion of piezometers and wells within the alluvium in the North Water Spring and Joes Mill Pond areas. This work was to be done to further determine the feasibility for horizontal drilling and completion of in-place ground water drainage systems upgradient of subsided areas. However, questions arose regarding the feasibility of completing this type of system in the alluvium and the actual volume of water that could be produced. Prior to submitting a 2009 work plan to the Division the mine sought to answer these and other questions this spring by conducting a well test, reviewing past well/slug tests, and reviewing drill hole data from the wells and piezometers that have already been installed in the area. Following is a description of the testing performed earlier this spring and the results that have made the mine change its potential mitigation plans.

Past Proposed Mitigation

Sufco has been evaluating data collected from the piezometers installed in the North Water Spring area and in the Joes Mill Pond area since late 2007. Additionally, small scale slug tests and pumping tests have been attempted in a few of the piezometers and 4-inch wells which were installed in those areas in August 2006. Test results have caused the mine to re-evaluate the potential mitigation measures that were previously proposed for the spring sites. At one time it was envisioned that horizontal collection systems might be constructed in the alluvium upstream of Pines 105 (North Water Spring) and Pines 310 springs through trenching or horizontal drilling. The mine also investigated the possibility of producing water from the 4-inch diameter wells installed in the alluvium in August 2006. The mine was preparing a proposal to the Utah Division of Oil, Gas and Mining (UDOGM) that included drilling and installing additional piezometers and 4-inch diameter wells in the side canyon south of Pines 105 and in the Joes Mill Pond area. The wells and piezometers were to be used to test the permeability and productivity of the water-bearing alluvium in these areas. Previous slug tests performed in existing piezometers to determine the hydraulic conductivity of the alluvium had raised some

questions regarding the ability of the alluvium to support wells or drainage systems that could produce more than a few gallons per minute. The installation of the proposed wells and piezometers and subsequent pumping tests were to take place in the summer of 2009.

Recent Activities

In an effort to prepare a more focused work proposal for submittal to the Division and to better understand the hydrologic characteristics of the alluvium in the North Water drainage, Erik Petersen of Petersen Hydrologic, Inc., with the help of mine personnel, performed a slug test on the 4-inch well, NWP 33 (also known as Well #33), located adjacent to the Pines 310 lower spring on April 7, 2009. The results of that slug test are contained in a brief report prepared by Petersen and included to this letter as Attachment A. The test results indicate the permeability of the alluvium in the Pines 310 area is very low, approximately 6×10^{-5} cm/sec. The slug tests results from this well suggest the alluvium is unlikely to provide water either from wells or spring collections systems that would sustain ground water discharges of more that one gallon per minute.

Petersen and mine personnel reviewed drill hole logs made during the installation of the piezometers and 4-inch wells. Coupling the alluvial lithology with results of the slug tests solved several problems encountered when comparing pre-mining and post-mining water level data obtained from the piezometers. One perplexing issue that has arisen from evaluating the data is that piezometers located within a few tens of feet of each other have dramatically different water levels. This issue led to speculation about the proximity of fractures in the bedrock underlying the alluvium to the piezometers and how proficiently the piezometers and wells were completed.

Initially it was supposed the sand layers within the alluvium were continuous, interconnected, and widespread and that interbedded organic rich layers were more discontinuous and of limited extent. Further we assumed that, over the past several thousand years, significant storm events within the drainage deposited sheets of sand that would cover the canyon floor. The deposition of the sand was followed by the slow formation of an organic layer as annually vegetation would grow and die.

Based on the slug test results, the re-evaluation of the alluvial lithology, and field observations, we believe highly permeable sand deposits are limited in areal extent and thickness. Furthermore, we believe the alluvium may consist of pods of sands, not sheets of sand, which are poorly interconnected and separated both vertically and horizontally by organic material. Through time, the depositional cycle that produced the alluvial fill created deposits where the majority of the alluvial material has low hydraulic conductivity values versus the higher values found in the limited and isolated clean sand beds. This scenario would explain why the alluvium is saturated in some areas but completed wells in these locations produce water in very small volumes (See Petersen's attached report). Based on these new findings, Sufco's original proposals for mitigation seem less likely to succeed. Therefore, Sufco proposes additional drilling in the North Water and Joe's Mill Pond spring areas to determine the occurrence of ground water and elevations of potential aquitards within and immediately underlying the Castlegate Sandstone.

Future Proposed Activities

During the summer of 2009, Sufco proposes to drill up to five core holes using a helicopter supported drilling rig (Figures 1 and 2). The holes will be drilled on or near the rim of the

canyon above the North Water spring drainage and would be approximately 250 to 350 feet deep. The purpose of these core holes is to establish the nature of the Castlegate Sandstone in this area and determine where the existing and potential aquitards are located within the formation. These core holes may also allow the mine to determine the depth of the first occurrence of ground water within the Castlegate Sandstone. The proposed holes are also located near known subsidence cracks. The mine believes by locating the holes adjacent to cracks it may ascertain whether or not the cracks contain water. Data collected from these holes will allow the mine to determine if additional drilling and well completions, including both vertical and angled holes, will provide sufficient water volume for mitigation purposes. If possible, one or more of these holes will be completed as piezometers to monitor ground water levels in the Castlegate Sandstone.

Drilling these core holes will be accomplished utilizing a helicopter transportable core drilling rig, a freshwater tank, piping or tubing to transport water from the East Fork of Box Canyon to the freshwater tank, and piping to transport water from the tanks to the rig. Drill pads will not require significant disturbance and minimal impact to vegetation and soils is anticipated. This project would be done in conjunction with the Ark Land exploration drilling program planned at Sufco for the summer of 2009. Portions of an Ark Land drilling Notice of Intent for drilling activities submitted to the Division in 2008 what generally describes and illustrates helicopter supported drilling and projected disturbance is included with this letter as Attachment B.

The core hole project proposed herein is not a coal exploration project. It is part of the on going mitigation investigation project for the North Water Spring area and lies within Sufco's existing lease and permitted area. The intent of the project is to help develop the most efficient and successful mitigation plan for the spring area. Appropriate clearances for vegetation, cultural sites, wildlife and water use will be obtained before commencement of the project. The coring project will be performed either immediately before or after Ark Land's 2009 coal exploration project in the Sufco Mine area.

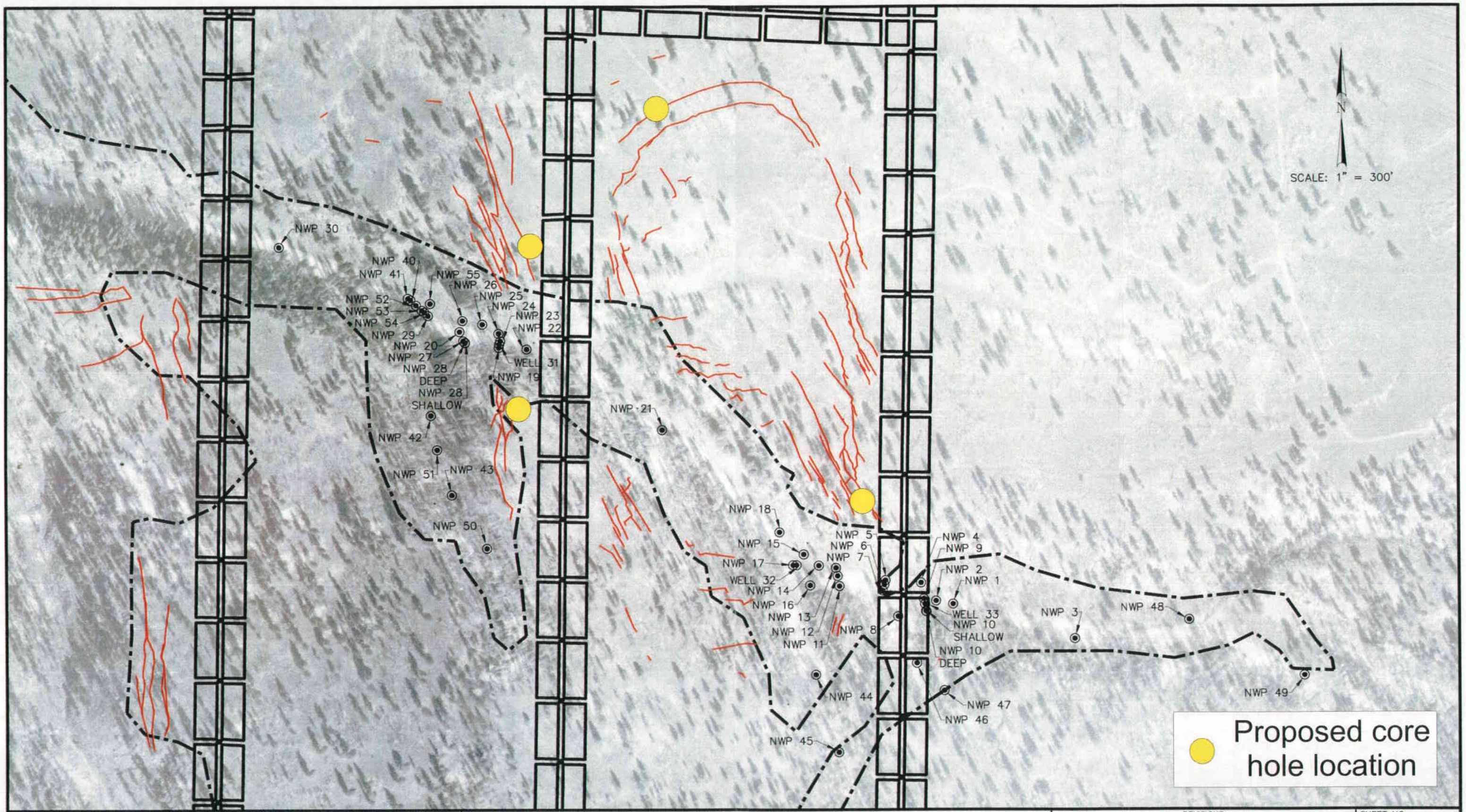
If you have any questions regarding this proposal, please contact me at (435) 286-4421 or Leland Roberts at (435) 286-4483.

Sincerely,
CANYON FUEL COMPANY, LLC
SUFCO Mine

Michael L. Davis,
Environmental Engineer

ec: John Byars, Sufco Mine
Chris Hansen, Arch Western Bituminous Group
Leland Roberts, Sufco Mine
Tom Lloyd, Manti LaSal National Forest
Steve Rigby, USBLM/Manti LaSal National Forest
Jeff McKenzie, USBLM

Attach.



Canyon Fuel Company, LLC
SUFCO Mine
397 South 800 West - Salina, UT 84654
(435) 286-4880 Phone
(435) 286-4499 Fax

North Water Area

Subsidence Crack & Monitoring Well Locations

SCALE: 1" = 300'	DATE: Oct. 2007	DRAWN BY: K.B.B.	ENGINEER: M.L.D.	CHECKED BY: M.L.D.
FILE NAME: H:\				

REVISIONS					SHEET NO.
NO.	DATE	REQ. BY	DWG. BY	REMARKS	1

Figure 1 Proposed Castlegate Sandstone core hole location in the North Water Canyon area.

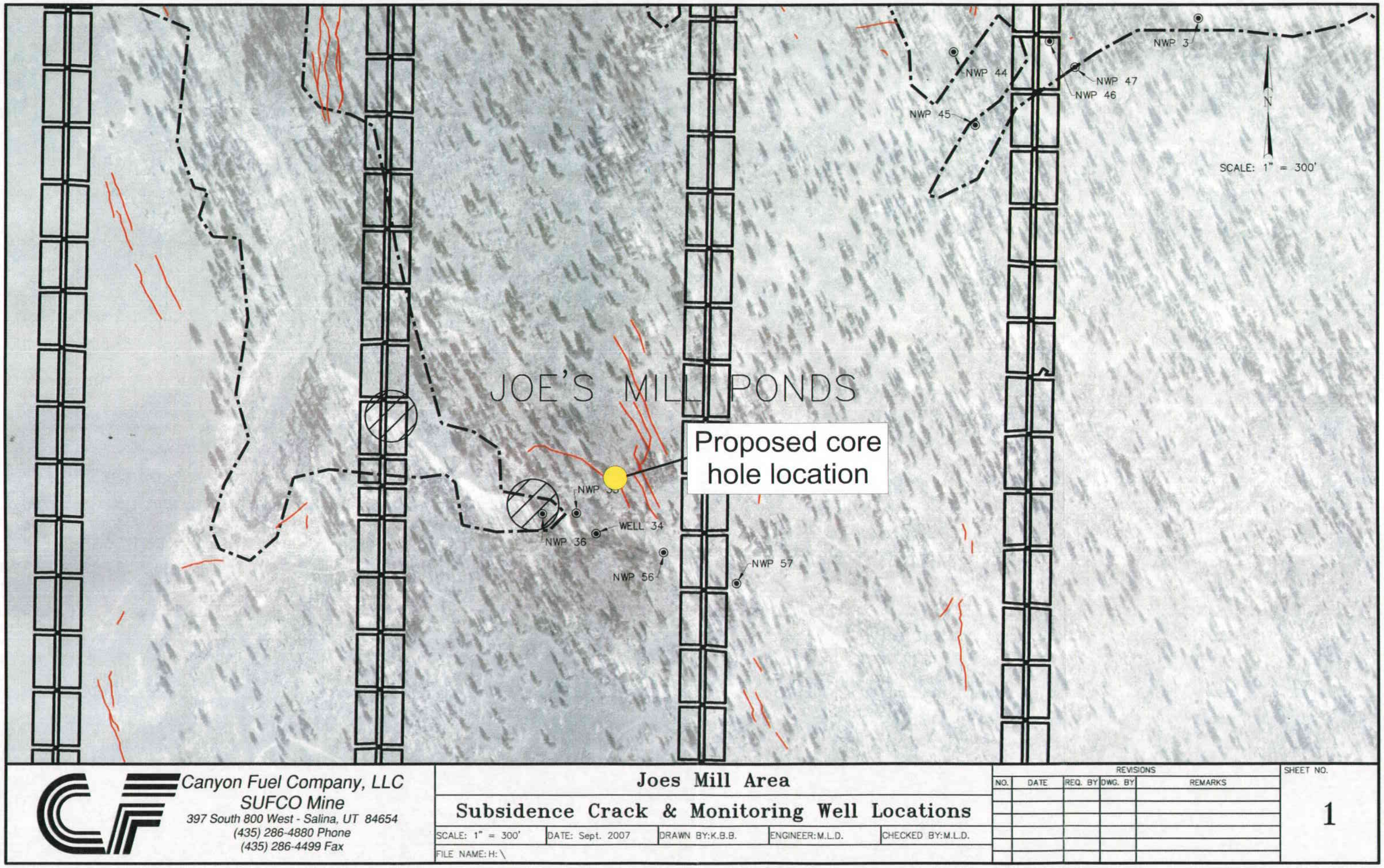


Figure 2 Proposed Castlegate Sandstone core hole location in the Joes Mill area.

ATTACHMENT A

PETERSEN HYDROLOGIC, INC.,

MAY 1, 2009 REPORT

PETERSEN HYDROLOGIC

1 May 2009

Mr. Mike Davis
Canyon Fuel Company, LLC
Sufco Mine
397 South 800 West
Salina, Utah 84526

Mike,

At your request we have performed an investigation of the potential for production of alluvial groundwater from well NWP-33 in North Water Canyon, a tributary of the East Fork of Box Canyon Creek in the Sufco Mine permit area. This letter report presents the findings of this investigation.

Overview

Well NWP-33 is a 4-inch diameter well that is screened in alluvial sediments in North Water Canyon. (Additional well and piezometer construction details and subsurface geologic conditions in the North Water Canyon area are available in the Petersen Hydrologic, LLC (2007a) report). The alluvial sediments in the canyon consist of fine-grained sands derived from the erosion of Castlegate Sandstone bedrock interbedded with silty, clayey, organic-rich sediments. It is anticipated that the hydraulic conductivity of the fine-grained sands greatly exceeds the hydraulic conductivity of the silty organic sediments. Well NWP-33 was drilled using an 8-inch diameter hollow-stem auger. The well is 19 feet deep and is open to the adjacent alluvial sediments from 3 to 19 feet depth. When the well was being constructed, flowing sands rapidly entered the borehole to a depth of 8.5 feet below the ground surface before the sand pack could be emplaced. Subsequently, a sand pack zone could only be installed from a depth of 3 to 8.5 feet. A bentonite hydraulic seal was installed from the surface to a depth of three feet. A concrete surface seal was constructed at the ground surface.

The well was designed to potentially produce modest amounts of groundwater from the shallow alluvial groundwater system in North Water Canyon. The purpose of this investigation is to evaluate the production capacity of this well and to determine its suitability for providing water for groundwater mitigation in North Water Canyon.

2695 N. 600 E. LEHI, UTAH 84043 (801) 766-4006

Methods of Study

On 7 April 2009 the North Water Canyon area was visited and an aquifer pumping and recovery test of well NWP-33 was performed. A Geotech brand dual stage geosquirt centrifugal pump and portable electrical generator were obtained to facilitate pumping of groundwater from the well during the test. As part of the testing procedure, automated pressure transducer/data logger units were also configured and installed in nearby 1-inch piezometers to monitor the aquifer response in the surrounding areas during the pumping and recovery test. At the time of the commencement of the pumping test, there was a height of approximately 4.5 feet of water standing in the well casing. Prior to the installation of the test pump into the well, the well was bailed using a 3.5 inch plastic bailer to clean out sediment potentially present in the well. After bailing approximately 3 gallons of water from the well, the well was bailed dry. It became apparent that recharge to the well was occurring very slowly and consequently, the test pump was not installed in the well and further pump testing was not performed. After the well was bailed, a pressure transducer/data logger unit was rapidly installed in the well to monitor the water level recovery.

Results and Conclusions

A plot of the NWP-33 water level recovery following pumping is presented in Attachment 1. It is apparent in Attachment 1 that the water level recovery occurred slowly, with a 90 percent recovery occurring only after about 180 minutes (3 hours) after the cessation of pumping (bailing).

Using these recovery data, an approximation of the hydraulic conductivity of the alluvial sediments in which the well is screened has been performed. It should be acknowledged that a technically valid slug test cannot be performed using these data because the water levels were below the top of the well screen during the pumping and recovery. However, using the Hvorslev (1951) slug test analysis method for these data, a general approximation on the order of 6×10^{-5} cm/s is obtained. This is typical of hydraulic conductivity values for silts (or the low end of the range of silty sands) presented in published literature (Freeze and Cherry, 1979). It is noteworthy that the hydraulic conductivity value approximated here is appreciably lower than that measured previously in nearby well NWP-10 deep (2×10^{-3} cm/s; Petersen Hydrologic, 2007b). The disparate hydraulic conductivities of sediments in these two nearby wells are reflective of the marked heterogeneity of the alluvial sediments in the North Water Canyon alluvial groundwater system. This heterogeneity (see also the vertically and horizontally variable geologic conditions noted in the geologic logs of boreholes in the canyon (Petersen Hydrologic, 2007a)) suggests an aquifer skeleton consisting of lenticular, discontinuous strata and partitioned groundwater conditions (i.e. more permeable sands interbedded with much less permeable organic silts). Such conditions are generally not favorable for the long-term production of groundwater from an aquifer.

Given the slow water level recovery rate and the low hydraulic conductivity value measured at well NWP-33, it is readily apparent that it will not be possible to pump useful quantities of groundwater from well NWP-33.

Referenced Cited

Freeze, R.A., and Cherry, J.C., 1979, Groundwater, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 604 p.

Hvorslev, M.J, 1951, Time lag and soil permeability in ground water observations, U.S. Army Corps of Engineers Waterways Experimental Station, Buletin 36, 50 p.

Petersen Hydrologic, LLC, 2007a, Report of 2007 Hydrogeologic Field Investigations: Supplemental information for the report: Investigation of subsidence-related impacts to groundwater systems in the North Water and Joes Mill Pond areas and proposed groundwater mitigation activities, Sufco Mine, Unpublished consulting report for Canyon Fuel Company, LLC, Salina, Utah.

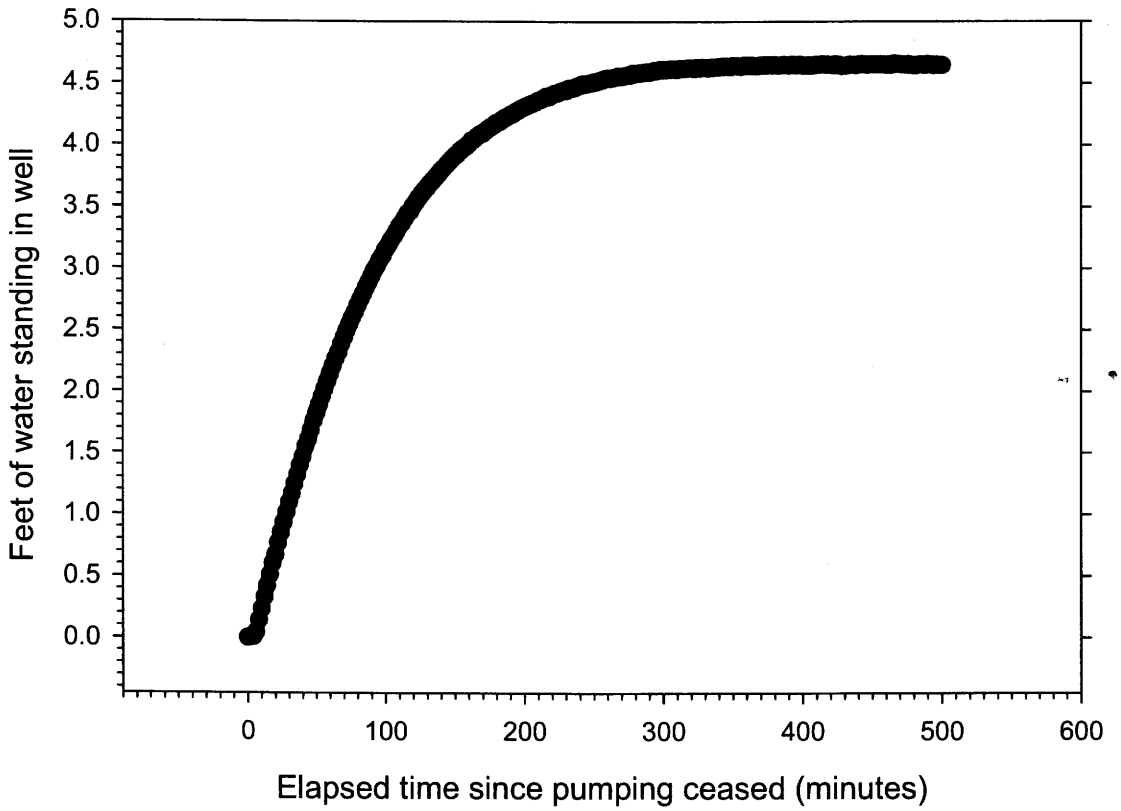
Petersen Hydrologic, LLC, 2007b, Investigation of subsidence-related impacts to groundwater systems in the North Water and Joes Mill Pond areas and proposed groundwater mitigation activities, Sufco Mine, Unpublished consulting report for Canyon Fuel Company, LLC, Salina, Utah.

Please feel free to contact me should you have any questions in this regard.

Sincerely,

Erik C. Petersen, P.G.
Principal Hydrogeologist
Utah PG #5373615-2250

NWP-33 water level recovery



Attachment A NWP-33 water level recovery

ATTACHMENT B

PORTION OF MODIFIED ARK LAND DRILLING NOI

(MODIFIED FOR INCLUSION IN NORTHWATER MITIGATION COREHOLE DRILLING, MAY 2009)

NOTICE OF INTENT TO CONDUCT MINOR COAL EXPLORATION

CANYON FUEL FEE COAL LEASE
WINTER QUARTERS CANYON
2008

ARK LAND COMPANY
A Subsidiary of Arch Coal Inc.

JULY 2008

EVENT	WEEK1	WEEK 2	WEEK 3	WEEK 4
Set pump, frac tank and run water line to site				
Move drill equipment to site and drilling				
Reclaim any disturbance, remove frac tank, water line				

The general method to be followed during drill hole exploration, reclamation, and abandonment is: 1) fly drilling equipment to drill sites, 2) prepare drill sites as shown on Fig. 1, 3) set temporary water tanks, pumps, and water lines, 4) drill and log holes, and 5) reclaim drill sites and remove waterlines, tanks, and pumps. No road building will occur and no blasting will be done for road building or repair. Access to the drillsite will be accomplished along the existing road in Winter Quarters Canyon and on foot, horseback, or via helicopter.

Drilling will be accomplished utilizing continuous core drilling techniques. Drilling will involve two heliportable core rigs capable of drilling 2000 ft. with necessary support equipment such as rod trays, supply trailers, portable water tanks, fuel tanks, etc. The drilling procedure will be to be to plug drill to core depth or continuously core to total depth utilizing water, foam, polymer, and/or mud as drilling medium.

To eliminate the need for road and drillpad construction, the planned drilling method is helicopter-supported continuous wireline core drilling. Exploration equipment for the drilling phase will include 2 heli-portable skid-mounted core drilling rigs together with all necessary heli-portable equipment such as drill rod trays, mud tanks, water tanks, water pumps, etc.

Core drilling will involve two skid-mounted 1800 ft rated core drills, one or two 1000 gal. poly water tanks at each drill rig, two water trough-type mudtanks, and 4 to 6 drill rod trays. Other support equipment will include two to three supply trailers parked at the Winter Quarters Canyon staging area, up to 6 pick-up trucks, and a geophysical logging truck. The drilling procedure for the exploration hole will be to plug drill to core depth or continuously core to total depth. One hundred to 200 ft. of surface casing will be set in each hole depending on the hole conditions. Water will be pumped from Winter Quarters Creek to the water tanks at each drill rig. Fifth-wheel supply trailers or transport trailers will carry the heli-portable equipment, including drills, drill steels, coring equipment, drilling additives, cutting and welding equipment, and other supplies to the staging area. One pick-up truck will be used for each drill rig by the drillers to carry personnel, fuel,

and supplies and two to three pickup trucks will be used by the dirt contractor. The logging contractor will use a single axle 1 ton rated truck. The company representative and geological consultant will also use pick-up trucks for transportation.

No temporary road construction is planned for this project

No road construction is planned. Disturbance to wildlife will be minimized by utilizing the existing roads and trails and eliminating the need to build roads with heavy equipment. No wetlands or riparian are known along the proposed routes. No utility or support facilities are present in the area.

Reclamation will occur as soon as possible upon completion of drilling operations. Reclamation will include filling in any hand excavations and reseeding the disturbed surface with the approved seed mix. No damage to public or private property will occur.

The drill location will be setup approximately as shown on Figure 1. Earth excavation for the drill site will be minimal using hand tools only. Some minor leveling for placement of wood crib blocking for leveling of drill may be required. Minor amounts of topsoil that may be removed will be stored and replaced upon completion of drilling. No mud pits will be excavated. Portable mudtanks will be utilized. Cuttings will be stored and hauled away to the Skyline Mine waste rock site by helicopter or truck upon completion of drilling.

Reclamation is an integral part of the exploration activities and will progress as contemporaneously as practical with the other exploration activities. Upon completion of the hole, all hand excavations will be filled in to original contour, topsoil replaced, all equipment will be removed, and all trash will be hauled away. An approved seed mix will then be applied to the drill area.

There will be no diversion of overland flows.

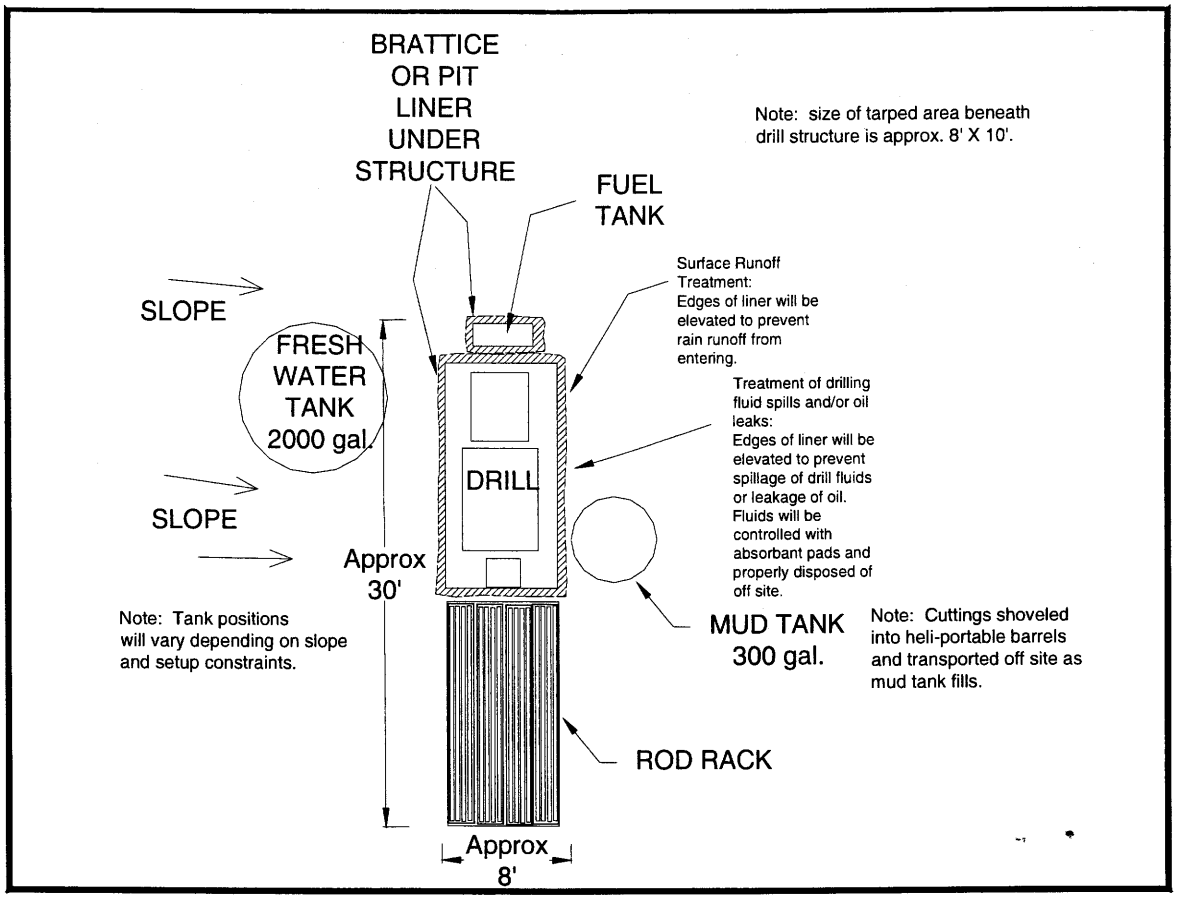


Figure 1. Typical heli-portable drillsite setup.

Upon completion of drilling, the holes will be plugged and abandoned with a cement, bentonite, or cement/bentonite slurry to full depth. A brass tag will be placed at the top of the drill hole stating the operator's name, drill hole number, and legal description. The tag will be placed in cement at ground level.

The main drill hole diameter will be nominally 2.4 inch diameter. Approximately 100 to 200 ft. of surface casing (3 inch) will be set. Estimated depth and other drill hole information is given in the following table. Disturbed area will include minor hand excavation on the drillsite. Total disturbed area acreage is estimated at 0.003 acres (10' X 12', hand excavation only)

Geologic logs of drilling will be kept. Any appreciable water encountered during drilling will be logged, noting depth, geology, and estimated flow. Any such zones will be evaluated for potential water monitoring.

Figure 1 shows a drawing of the approximate drillsite setup.

If the drill hole begins to make excess water, such water will be pumped to a tank at the staging area. From there it will be hauled to an approved waste water disposal site. At no time will excess drill water generated in the drill hole be allowed to run on topsoil on the surface.