Official Draft Public Notice Version December 2016.
The findings, determinations, and assertions contained in this document are not final and subject to change following the public comment period.

Donald Clark, PhD
Chief Geologist
MCW Energy Group
18653 Ventura Blvd
Tarzana, CA 91356

Dear Mr. Clark:

Subject: **Construction Permit** for the MCW Energy Group at both the Maeser Facility and the Temple Mountain Mine Site

In May 2015, the Division of Water Quality (DWQ) started receiving various documents from the MCW Energy Group for both the Maeser Facility and the Temple Mountain Mine Site. There have been numerous meetings and iterations and the final documents were received on a flash drive on March 30, 2016. The engineering plans and specifications were prepared by CIVCO Engineering, Inc. and stamped by Troy D. Ostler, P.E. a Utah Certified Professional Engineer.

The following is a summary of the proposed major construction projects:

Maeser Facility

- Construction of two separate pads. An Ore Stockpile Pad and a Tailings Holding Pad for the processed tar sands will be constructed with a liner that is 1 foot of clay with a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec and six inches of native asphalt over the compacted clay. These pads will be constructed using the same design and construction specifications. The pads are 65'x65' and are designed for temporary storage. The ore will be transported from the mine to the Ore Stockpile Pad. The ore is then processed and the sands placed onto the Tailings Holding Pad. The processed sands will then be hauled back to the mine site for permanent storage and mine reclamation.

Temple Mountain Mine Site

- Berm just west of the stream. Construction of a berm between the mine and the stream that is to the east of the mine. On the northern portion of the property the stream is at a higher elevation than the mine so in this area the berm will protect the mine from receiving water from the stream during major storm events. In the southern portion of the property where the stream is at a lower elevation than the mine, the berm will protect the stream from receiving any sediment that may be washed in that direction.
- Construction of a Staging Area Pad. This is the same design as the Stock Pile Retention Pad at the Maeser Facility. This pad is located at the top of the hill just directly east of the mine and the processed tar sands will then be pushed into the mine for reclamation.
- Additional processed sands storage. There is a flat area directly north of the Former Work Facility that may be used for temporary storage of processed sands. This area currently has approximately 15 feet of oil sands ore. The processed sands will ultimately be placed back into the mine for reclamation and the underlying ore will be processed.
- Collection Lysimeter. Before placement of the reclamation liner a concrete collection lysimeter will be constructed for long term water/leachate monitoring.
- Reclamation Liner. Before placement of processed sands a reclamation liner shall be constructed

identical to the liner constructed over the lysimeter. This includes a 1 foot clay liner with a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec and six inches of native asphalt over the compacted clay.

- Reclamation Cap. An evapotranspiration cap will be placed over the processed sands during mine reclamation. This cap is designed with various layers including a gas vent layer, an hydraulic barrier layer with a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec, a 40 mil HDPE flexible membrane liner, and a vegetative soil layer. The gas vent layer will have horizontal perforated pipe placed into the aggregate that will collect any volatile hydrocarbons and conduct that to a vertical pipe that carries the gas through the other layers for venting of the waste sands.

The plans and specifications, as submitted, comply with *the Utah Water Quality Rules, (R317, Utah Administrative Code).* A **Construction Permit** is hereby issued as constituted by this letter, subject to the following conditions:

1. *Any revisions or modifications to the approved plans and specifications must be submitted to DWQ for review and approval, before construction or implementation thereof. Please submit any changes for review and approval directly to Woodrow Campbell, P.E., of the DWQ Ground Water Protection Section.*

2. *A written operations and maintenance manual, containing a description of the functioning of the facilities, an outline of routine maintenance procedures, and all checklists and maintenance logs needed for proper operation of the system, must be submitted and approved before the final inspection and operation of the system.*

3. *The approved facilities must not be placed in service unless DWQ has conducted a final inspection, reviewed and approved the As-Built Construction Certification Report, and provided written authorization to place the constructed facilities in service.*

4. *Construction activities that disturb one acre or more are required to obtain coverage under the Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permit for Construction Activities. The permit requires the development of a storm water pollution prevention plan (SWPPP) to be implemented and updated from the commencement of any soil disturbing activities at the site until final stabilization of the project. For more information, or to obtain permit coverage on-line, please go to: http://www. waterquality. utah.gov/UPDES/stormwater. htm*

The plans and specifications for this project have been stamped and signed by a Professional Engineer currently licensed to practice in the state of Utah. The construction design, inspection supervision, and written construction certification of all work associated with this Construction Permit must be performed by a Professional Engineer licensed to practice in the state of Utah.
This Construction Permit will expire one year from the date of its issuance, as evidenced by the date of this letter, unless substantial progress is made in constructing the approved facilities or the plans and specifications have been resubmitted and the construction permit is reissued. This permit does not relieve you, in any way, of your obligations to comply with other applicable local requirements. You may contact Tri-County Health Department (435-247-1163) or Scott Hacking Tri-County District Engineer (435-559-3825) for further assistance regarding local matters.

Please contact Mr. Campbell at the beginning of construction for each of the various projects to allow periodic inspections to be scheduled. Upon completion of the project, a final inspection and approval of the As-Built Construction Certification Report is required before the approval to operate the completed facilities can be issued. Please remain in contact with Mr. Campbell to schedule each final inspection. The Construction Certification Report with final as-built drawings must include test results for the following construction quality assurance and quality control (CQA/QC) elements:

<u>Soil</u>

- Proctor Curves,
- Soil Classification,
- Field Compaction Testing,
- Hydraulic Conductivity and
- Subgrade Acceptance Certification.

<u>Concrete</u>

- Concrete Mix Verification,
- Concrete ASTM Testing Method, Frequency, and Results,
- Concrete Testing Pass/Fail Criteria, and
- Crack Inspection and Repair.

<u>Flexible Membrane Liner</u>

- Panel Placement Log,
- Trial Seam Test Log,
- Seaming Record,
- Seam Test Record,
- Repair Log,
- As-Built Drawing,
- Manufactures Certification including QA/QC Testing of the Rolls, and
- Professional Engineer Certification.

If we can be of further assistance, please contact Mr. Woodrow Campbell at wwcampbell@utah.gov or (801) 536-4353.

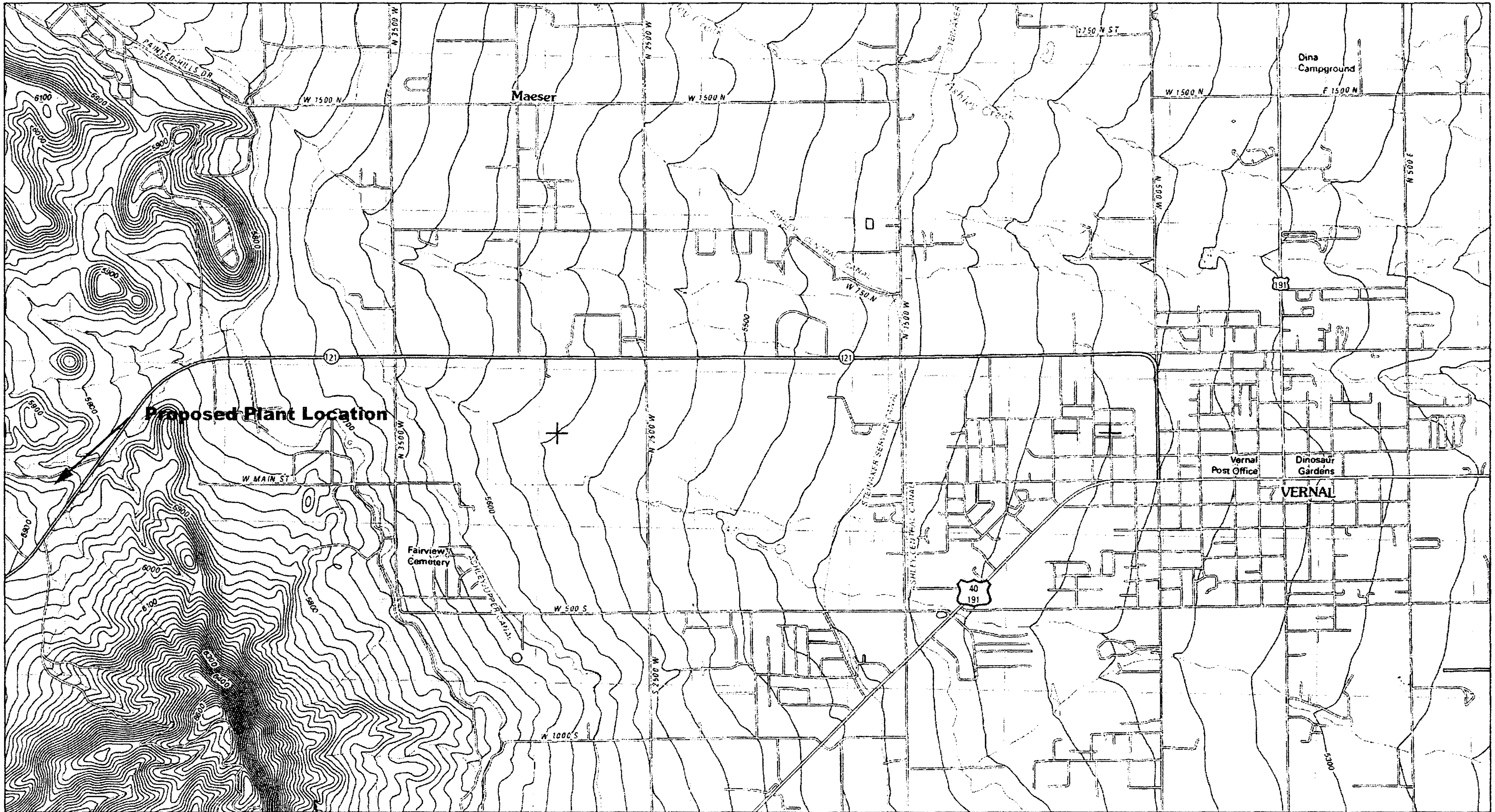
Sincerely,

Walter L. Baker, P.E.
Director

WLB/WWC/DJH:ag

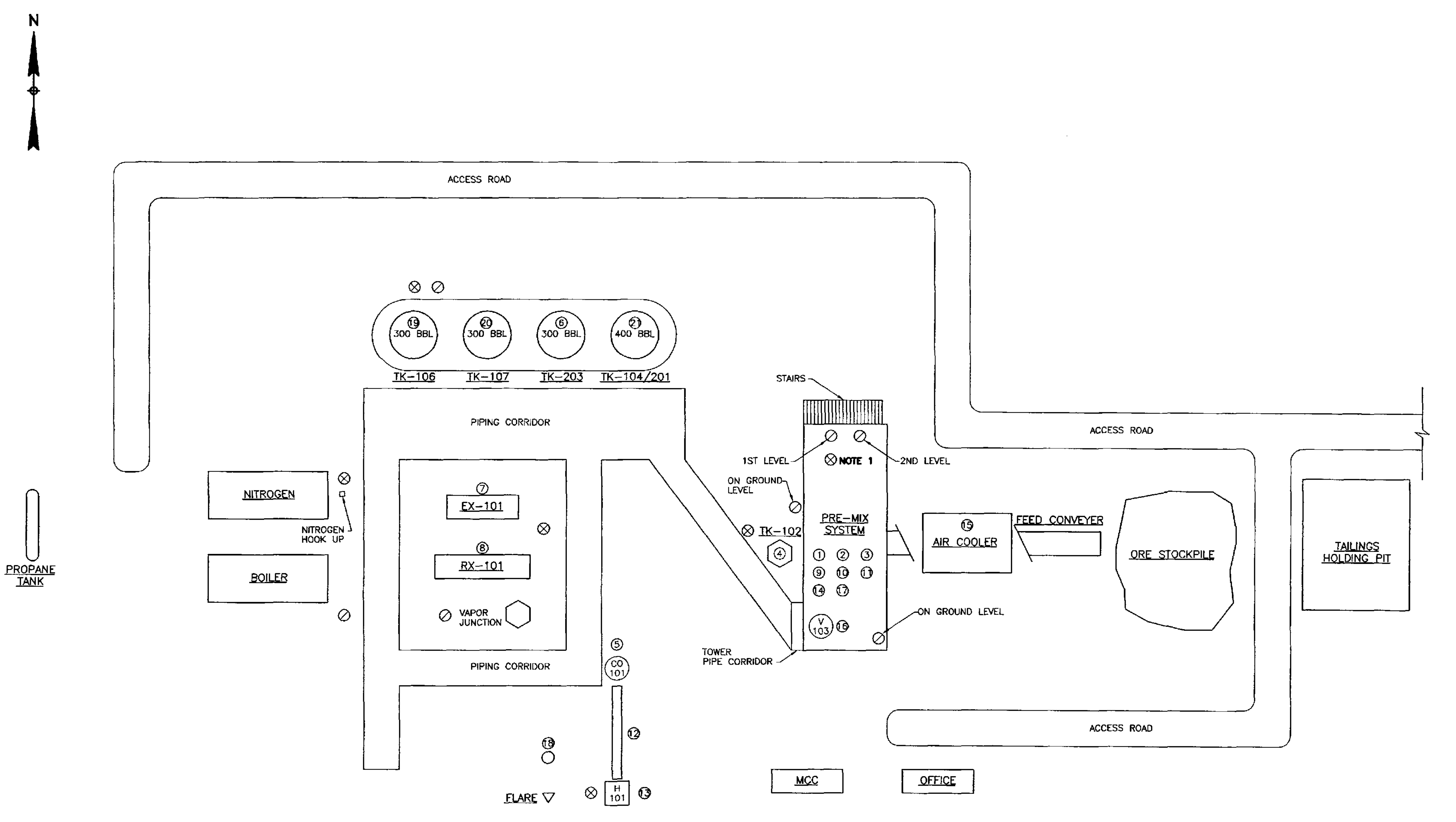
cc: Scott Hacking (via email w/o attachments)
Tri-County Health Department (via email w/o attachments)
Donald Clark (dclark@mcwenergygroup.com via email w/o attachments

DWQ-2016-009304.doc



PROJECT: MCW Energy Pilot Plant	TITLE: Plot Plan	SHEET: 1
LOCATION: Vernal, Utah	DATE: 8/26/2011	REVISIONS: 1
DRAWN BY: Mac Johnson	SCALE: 1"=2000'	
Proprietary Information		

DWQ-2016-009203



BUILDING/EQUIPMENT LIST

–	EQUIPMENT
⊗	FIRE EXTINGUISHER
⊘	EYE WASH
1	TK-101A FEED BIN
2	C-102A METERED AUGERS
3	C-103 PUG MILL
4	TR-102 PRE-MIX VESSEL
5	CO-101 EXTRACTION COLUMN
6	TK-203 EXTRACTOR SURGE TANK
7	EX-101 EVAPORATOR
8	RX-101 RECTIFICATION COLUMN/REBOILER
9	EX-102 CONDENSER
10	EX-103 DEFLAGMATER
11	EX-104 CHILLER
12	C-104A/B UNDERFLOW CONVEYOR
13	H-101 – DESOLVENTIZER DRYER
14	EX-105 DRYER CONDENSER
15	EX-851 AERIAL CONDENSER
16	V-103 SOLVENT CONDENSER SURGE DRUM
17	K-107 SOLVENT CONDENSER VACUUM PUMP
18	FLARE K.O. DRUM
19	TK-106 BITUMEN PRODUCT TANK
20	TK-107 FRESH SOLVENT TANK
21	TK-104/201 FRESH WATER TANKS

NOTE:
1. FIRE EXTINGUISHERS TO BE INSTALLED AT EACH OF THREE PLATFORMS.

DRAWING NUMBER	DRAWING TITLE
REFERENCE DRAWINGS	

TG JOB # 214025

REV.	DESCRIPTION OF CHANGE	DATE	BY	CHK	ENG.
A	ISSUED FOR REVIEW	15.03.30	RD		

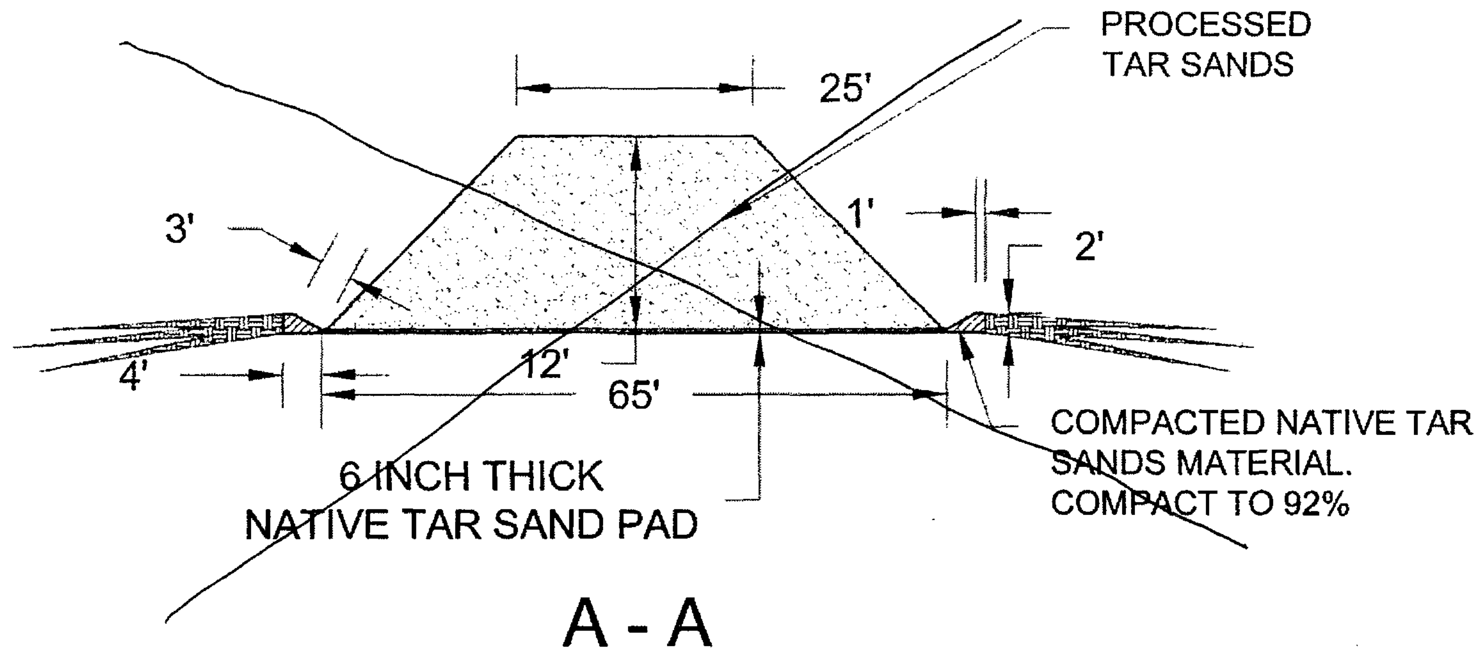
MCW ENERGY GROUP

VERNAL, UT
SITE PLAN

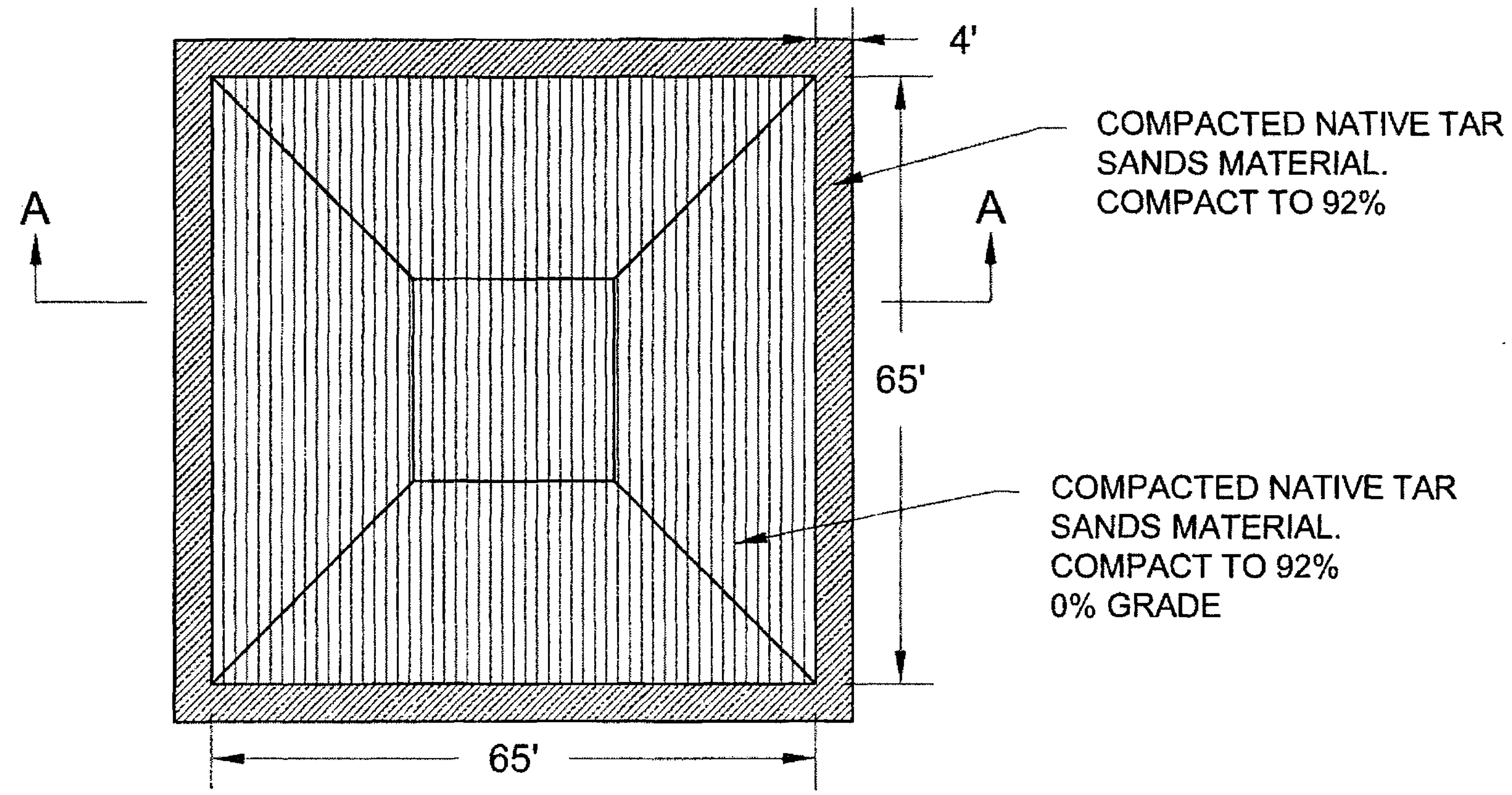
T/G ENGINEERING INC

SCALE(11"x17"): –
SCALE(D-SIZE): –
CAD No.: –
DRAWING NUMBER: SITE PLAN
REV. A

Revised



A - A



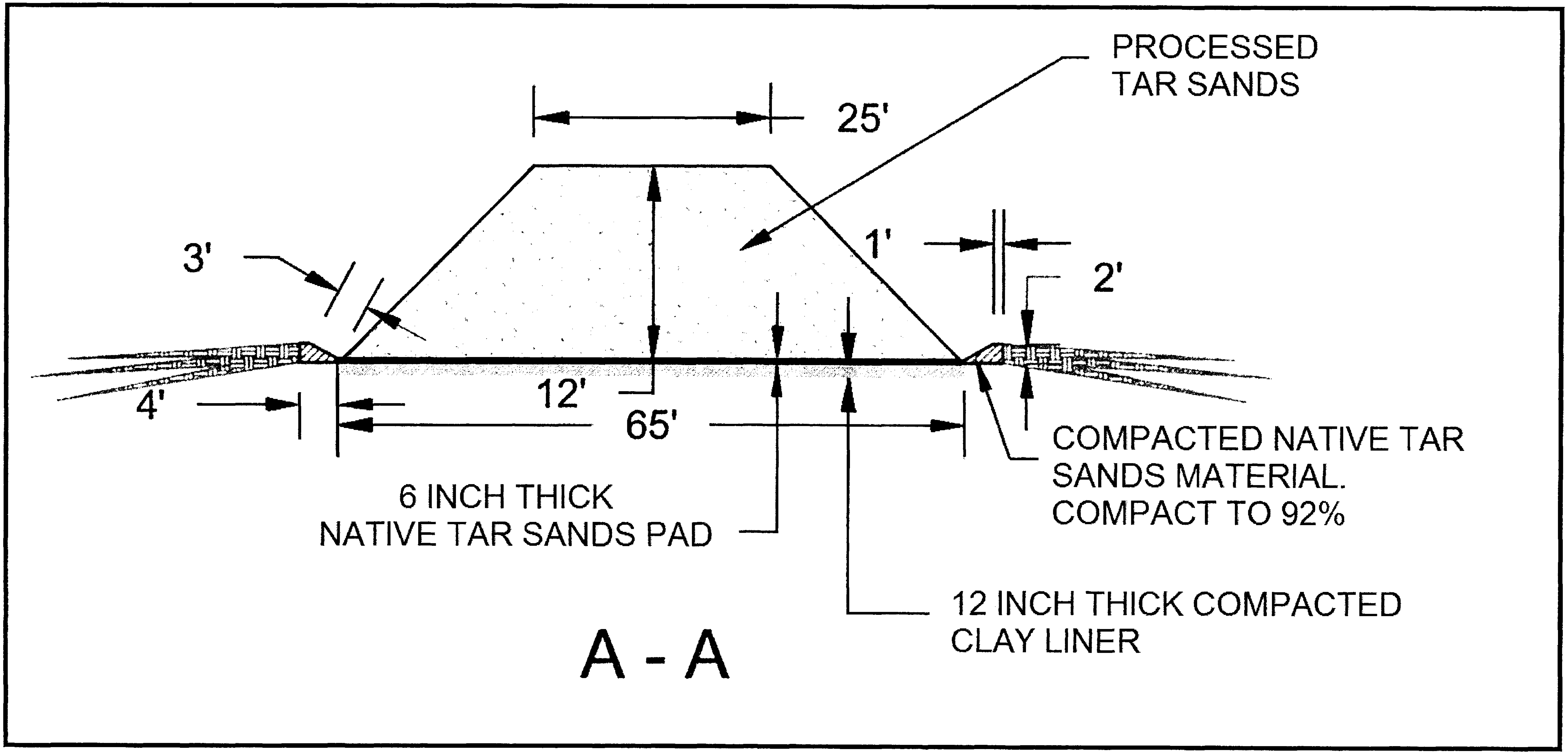
STOCK PILE
RETENTION AREA

REGISTERED STRUCTURAL ENGINEER
167895
TROY D.
OSTLER
6-9-15
STATE OF UTAH

PROJECT	MCW Energy Group Maeser Facility	UTAH DEPARTMENT OF TRANSPORTATION ROADWAY DESIGN	
PROJECT NUMBER	Processed Tar Sands / PIN Temp Storage Area	APPROVED PROFESSIONAL ENGINEER / DATE	DRAWN BY #### / QC CHECKED BY ####

No.	DATE	BY	REMARKS
			REVISIONS

SHEET No. DT-5


PROCESSED
TAR SANDS
25'
3'
1'
2'
4'
12'
65'
6 INCH THICK
NATIVE TAR SANDS PAD
COMPACTED NATIVE TAR
SANDS MATERIAL.
COMPACT TO 92%
12 INCH THICK COMPACTED
CLAY LINER
A - A

New temporary pad dimensions and storm water catchment solution

At full production the plant will process 7 to 10 cubic yards an hour.

9 yd^3 x 24 hours x 27 ft^3/yd^3 = 5,832 ft^3 per day x 7 days = **40,824 ft^3 per week**

The current temporary tailing pad was designed for **17,460 ft^3**, just over 2 days of tailings at full production. If we take the tailings back to the mine site after each load of ore is delivered, this should not be a problem, but since we are resubmitting the application, we should enlarge the pad to accommodate some additional material so that we are not on such a tight schedule taking tailings back to the mine site.

If we increase the dimensions of the temporary tailings pile to the following…

Perimeter Length (**b1**) - 65 ft (assume a square base)

Height - **h1** - 32.5 ft

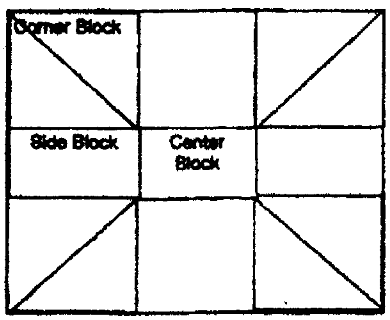
Volume V1 = $b1^2$ (h1/3) = 65^2 (32.5/3) = **45,771 ft^3**

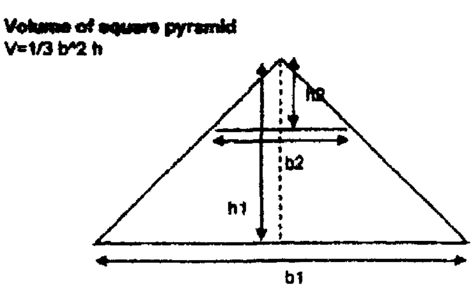
Width of flat top (**b2**) - 25 ft

Height - **h2** - 12.5 ft.

Volume V2 = $b2^2$ (h2/3) = 25^2 (12.5/3) = **2,604 ft^3**

Volume of stockpile = V1 – V2 = 45,771 ft^3 - 2,604 ft^3 = **43,167 ft^3**, which is a full week's storage at 9 cubic yards per hour.





Source: Permit presently on file with DWQ

Bulk Density - 125 lbs/ft3

Tailings in Stockpile - 43,167 ft^3 x 125 lbs/ft^3 = 5,395,875 lbs = **2,698 tons**

Stockpile Height - 20 ft

Ideally, two trips per week would prevent the tailings pile from reaching maximum capacity, but if one trip per week was done, there would be enough storage capacity.

Concerning storm water capacity - the original temporary tailings holding pad had the capacity to hold 480 ft^3 of water in the base 10 inches of clean sand with 25% porosity.

48 ft x 48 ft x (10/12) x 0.25 = **480 ft^3 of pore space**.

A 100-year 24-hour rain event in eastern Utah will yield 2.3 inches of rain.

48 x 48 x (2.3/12) = **441.6 ft^3 of storm water**.

The new dimensions will also accommodate a 100-year 24-hour rain event…

65 ft x 65 ft x (10/12) x 0.25 = **880 ft^3 of pore space**.

A 100-year 24-hour rain event in eastern Utah will yield 2.3 inches of rain.

65 x 65 x (2.3/12) = **809 ft^3 of storm water**.

We can cheaply and easily modify the design of the base of the pad to accommodate even more water. If the berm surrounding the pad is 2 feet high, we get a total of **2,112 ft^3** of storm water storage capacity with a flat bottom. With an asphalt base, this should be more than adequate to prevent any storm water from contaminating the ground water with leachate.

Total volume = 65 x 65 x 2 x 0.25 = **2,112 ft^3** of total storm water storage space.

http://www.wrcc.dri.edu/pcpnfreq/ut100y24.gif

We can have two 100-year 24-hour rain events in the same week and still have the capacity to store all the storm water within the temporary tailings holding pad without any storm water runoff.

It should be noted that the tailings themselves have the capacity to hold even more water since they will be coming out of the dryer virtually free of any moisture. The capillary forces within the tailings after a rain storm will be quite strong and hold a significant amount of water. This was not considered in the original application since the saturated storage was adequate to hold a

100-year 24-hour rain event. It may be beneficial for us to include this information in the new application.

If we use a water holding capacity chart as a measure of the storage capacity of the tailings and use fine sand as the category of soil that the tailings are equivalent to, then each vertical foot of tailings should be able to hold 1.8 inches of rainwater via capillary forces (Table 1). Two feet of tailings will hold 3.6 inches of rain, this is more than the 100-year 24-hour rain event <u>without</u> taking into consideration the saturated storage capacity of the sand.

Table 1. Water holding capacity measured in inches of water per foot of soil.

Soil Type	Total Available Water, in/ft
coarse sand	0.6
fine sand	1.8
loamy sand	2.0
sandy loam	2.4
sandy clay loam	1.9
loam	3.8
silt loam	4.2
silty clay loam	2.4
clay loam	2.2
silty clay	2.6
clay	2.4
peat	6.0

Source: http://nrcca.cals.cornell.edu/soil/CA2/CA0212.1-3.php

Lastly, we should also include the fact that the temporary storage pad will also be temporary since we will be going to a system of having the dry tailings loaded directly onto trailers right from the conveyor belt in the short term future.

June 1, 2015

SPECIAL PROVISION

SECTION 02744S

OIL SAND ASPHALT (OSA)

Add Section 02744:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products and procedures for mixing, laying, and compacting a surface course of one or more layers of oil sand asphalt comprised of raw oil sands.

1.2 REFERENCES

A. ASTM D 2950: Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

B. ASTM E 178: Practice for Dealing with Outlying Observations

1.3 DEFINITIONS

A. Oil Sands
   1. A mined material comprised of natural asphalt and sand.

1.4 ACCEPTANCE

A. A lot equals the number of tons of OSA placed during each production day. The Engineer may:
   1. Conduct the following tests on the placed OSA for acceptance:
      a. Obtain samples for density and thickness.
         1. Obtain one core per 250 tons, randomly as instructed, and in the presence of the Engineer within two days after the pavement is placed.(UDOT Materials Manual of Instruction Part 8-981: Random Sampling, UDOT Materials Manual of Instruction Part 8-984: Sampling Methods)
         2. Move transversely to a point one foot from the edge of the pavement if the random location for cores falls within one foot of the edge of the overall pavement section (outer part of shoulders).

3. Fill core holes with OSA or high AC content cold mix and compact.
4. Obtain one nuclear density test for each 2500 Sq. Ft. of placed OSA.

PART 2 PRODUCTS

2.1 OIL SAND

A. Use Oil Sand supplied by the owner. Load and haul oil sands from source identified by owner.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Locate, reference, and protect all utility covers, monuments, and other components affected by the paving operations.

B. Remove all moisture, dirt, sand, leaves, and other objectionable material from the prepared surface before placing the OSA.

3.2 COMPACTION

A. Use a small compactor or vibratory roller in addition to normal rolling at structures.

B. Operate in a transverse direction next to the back wall and approach slab.

C. Use aggressive rolling techniques to minimize risk of under-compacted OSA courses.

D. Roll surface immediately after placement.

3.3 LIMITATIONS

A. Do not place OSA on frozen base or subbase.

B. Do not place OSA during adverse climatic conditions, such as precipitation, or when surface is icy or wet.

C. Place OSA from when the air temperature in the shade and the surface temperature are above 70 degrees F.
   1. The Engineer determines if it is feasible to place OSA outside the above limits. Obtain written approval from the Engineer prior to paving.

END OF SECTION

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter, Method C (ASTM D5084)

IGES

Project: **American West Analytical Laboratories**
No: **M00754-051 (PO# 1509565)**
Location: Maiser Tailings
Date: 10/7/2015
By: JDF

Boring No.:
Sample: **TMM Clay**
Depth:
Sample Description: Grey clay
Sample Type: Remolded
Compaction Specifications: 114.2 pcf
at 12.6 (%) w

	Initial (o)	Final (f)
Sample Height, H (in)	3.016	3.028
Sample Diameter, D (in)	2.409	2.43
Sample Length, L (cm)	7.661	7.692
Sample Area, A (cm^2)	29.406	30.012
Sample Volume, V (cm^3)	225.27	230.86
Wt. Rings + Wet Soil (g)	463.96	493.37
Wt. Rings (g)	0	0
Wet Unit Wt., γ_m (pcf)	128.6	133.4
Wet Soil + Tare (g)	309.96	621.69
Dry Soil + Tare (g)	290.97	540.45
Tare (g)	139.84	128.09
Weight of solids, Ws (g)	412.17	412.17
Water Content, w (%)	12.57	19.70
Dry Unit Wt, γ_d (pcf)	114.2	111.5
Void ratio, e, for assumed Gs	0.48	0.53
Saturation (%), for assumed Gs	71.3	100 [a]
Average K[b] (cm/sec)	**4.2E-07**	

[a] Saturation set to 100% for phase calculations
[b] K corrected to 20°C

Gs	2.7	Assumed
Cell No.	1	
Station No.	1	
Permeant liquid used	De-aired tap water	
Total backpressure (psi)	35	
Effective horiz. consolidation stress (psi)	5	
Effective vert. consolidation stress (psi)	5	

	Initial (o)	Final (f)
B value	0.88	0.96
External Burette (cm^3)	21.60	22.00
Cell Pressure (psi)	0.0	40.0
Backpressure bottom (psi)	35.0	
Backpressure top (psi)	35.0	
System volume coefficient (cm^3/psi)	0.150	
System volume change (cm^3)	5.99	
Net sample volume change (cm^3)	5.59	
Bottom burette ground length, l_b (cm)	82.00	
Top burette ground length, l_t (cm)	82.1	
Burette area, a (cm^2)	0.197	
Conversion, reading to cm head (cm/rd)	5.076	

Start Date and Time: 10/6/15 9:34

Elapsed time (sec)	Bottom Burette (cm^3)	Top Burette (cm^3)	h_1 (cm)	h_2 (cm)	K (cm/sec)	Temp (°C)	Visc. Ratio R_T	K[b] (cm/sec)
1020.0	0.18 0.30	9.98 9.92	49.65	48.73	4.6E-07	21.3 21.6	0.97	4.4E-07
600.0	0.30 0.38	9.92 9.88	48.73	48.12	5.3E-07	21.6 21.2	0.97	5.1E-07
600.0	0.38 0.44	9.88 9.86	48.12	47.72	3.6E-07	21.2 20.9	0.98	3.5E-07
600.0	0.44 0.48	9.86 9.82	47.72	47.31	3.6E-07	20.9 21.0	0.98	3.5E-07
600.0	0.48 0.54	9.82 9.78	47.31	46.80	4.5E-07	21.0 20.6	0.98	4.5E-07

Entered by:____________
Reviewed:____________

2.2 Processed sands liner design: The liner shall be constructed of compacted clay and asphalt. The fine grained native clay found at the mine site has previously been tested and has a permeability of less than 10^{-7} cm/sec and is an excellent material for use as the main component of the compacted clay liner (Appendix I). The compacted clay liner shall include the following features based on the recommendations of US EPA (1989) and USDA/NRCS/Wisconsin, 2015.

- a minimum thickness of one foot.
- a maximum hydraulic conductivity of 1×10^{-7} cm/sec.
- soil plasticity indices ranging from 10% to 30%.
- shall containing at least 30 percent fines and up to 50 percent gravel, by weight.
- the moisture content shall be above the optimum moisture as determined by the standard proctor test or modified proctor test.
- loose lift (layer) thicknesses shall be 6 inches.
- compactors, weighing 25,000 or more pounds, with feet long enough to penetrate a loose lift of soil will be used to compact each lift.
- 5 to 20 passes will be made to ensure that clods are broken up (less than ½ inch in diameter) and that the clay is compacted properly.
- the clay liner shall be compacted to a minimum of 95% of standard proctor dry density or to a minimum of 90% of modified proctor dry density.
- Foundation surfaces shall be graded to remove surface irregularities and shall be scarified or otherwise acceptably scored or loosened to a minimum depth of 2 inches.

Six inches of compacted native asphalt will be used to cover the compacted clay. Although the compacted asphalt will provide a high degree of impermeability on its own, as indicated above, the main purpose of the asphalt will be to protect the integrity of the clay liner during remediation activities and to protect it from desiccation. It should be noted that the rock formations below the floor of the mine are composed of interbedded shale and oil sands, which naturally form a very impermeable barrier to water flow. It should also be noted that no aquifers were identified beneath the mine floor, or in the vicinity of this mine.

2.3. Quality control during the installation of the compacted clay low permeability layer: Quality control during the installation of the compacted clay layer are based on the guidelines of the US EPA (1989) and USDA/NRCS/Wisconsin, 2015 (Table 8). Clay liner construction shall be tested and documented by a third party engineering or testing firm at the specified minimum frequency shown in Table 8.

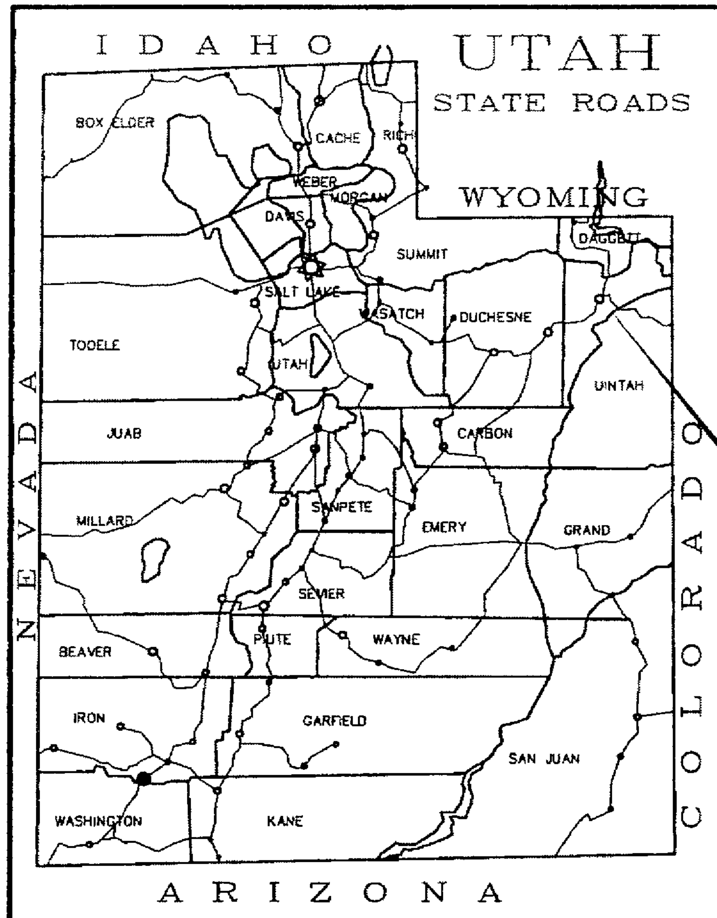
Table 8: Quality control testing performed during compacted clay installation.

Test	Frequency
Standard proctor test (ASTM D-698), or Modified Proctor Test (ASTM D-1557)	1 per 5,000 cubic yards of clay liner
Field density tests (ASTM D-2922, or D-2937, or D-2167, or D-1556)	1 test per 100 foot grid per1 foot thickness of clay liner
Atterberg Limit tests (ASTM D-4318)	1 per 5,000 cubic yards of clay liner
Grain size distribution (ASTM-D422)	1 per 5,000 cubic yards of clay liner
Permeability (ASTM D-5084)	1 per 5,000 cubic yards of clay liner

Source: USDA/NRCS/Wisconsin, 2015 Section IV, Technical Guide 300. Clay liner
US EPA, 1989.

2.4 Potential groundwater monitoring well location: Historical records indicate that 17 wells were drilled in this area as exploration wells for oil sands within the Duchesne River Formation (Fig. 1) (Stantec 2015). Well logs indicated that only four of these wells encountered intervals that were described as "water wet" (Table 1). Wells CG-1 and F-4 had thin intervals described as "water wet", but these wells are east of the mine site, so are not appropriate locations for a monitoring well since ground water will tend to travel in the down dip direction, which is 9° to 20° to the SSW in this area (Blackett, 1996). Well F-1 also had a very thin interval described as "water wet", but this core was taken from within the proposed open pit area, so is not an appropriate monitoring well location (Figs. 1). Well CF-1 is both down dip of the mine site (and therefore the processed sands that will be used for mine remediation) and also had the most intervals described as "water wet", so appears to be the most appropriate location for a monitoring well based upon currently available information and understanding of the geology of the area (Fig.1, Appendix C).

Stantec (2015) indicated that the interval described as "water wet" in well CF-1, at a depth of 58.1 - 60.7 feet, is likely an isolated sand lens as opposed to an aquifer of any areal extent. Drilling the proposed monitoring well, slightly offset to the original CF-1, will help to establish whether this shallow sandstone body extends over a larger area than just the immediate area where the original well was drilled. The intervals between 215 and 285 feet below ground surface that were described in the well log as "water wet" were also described as having light to fair oil saturation (SOHIO Petroleum Company, 1957 – Appendix C). This description suggests that the

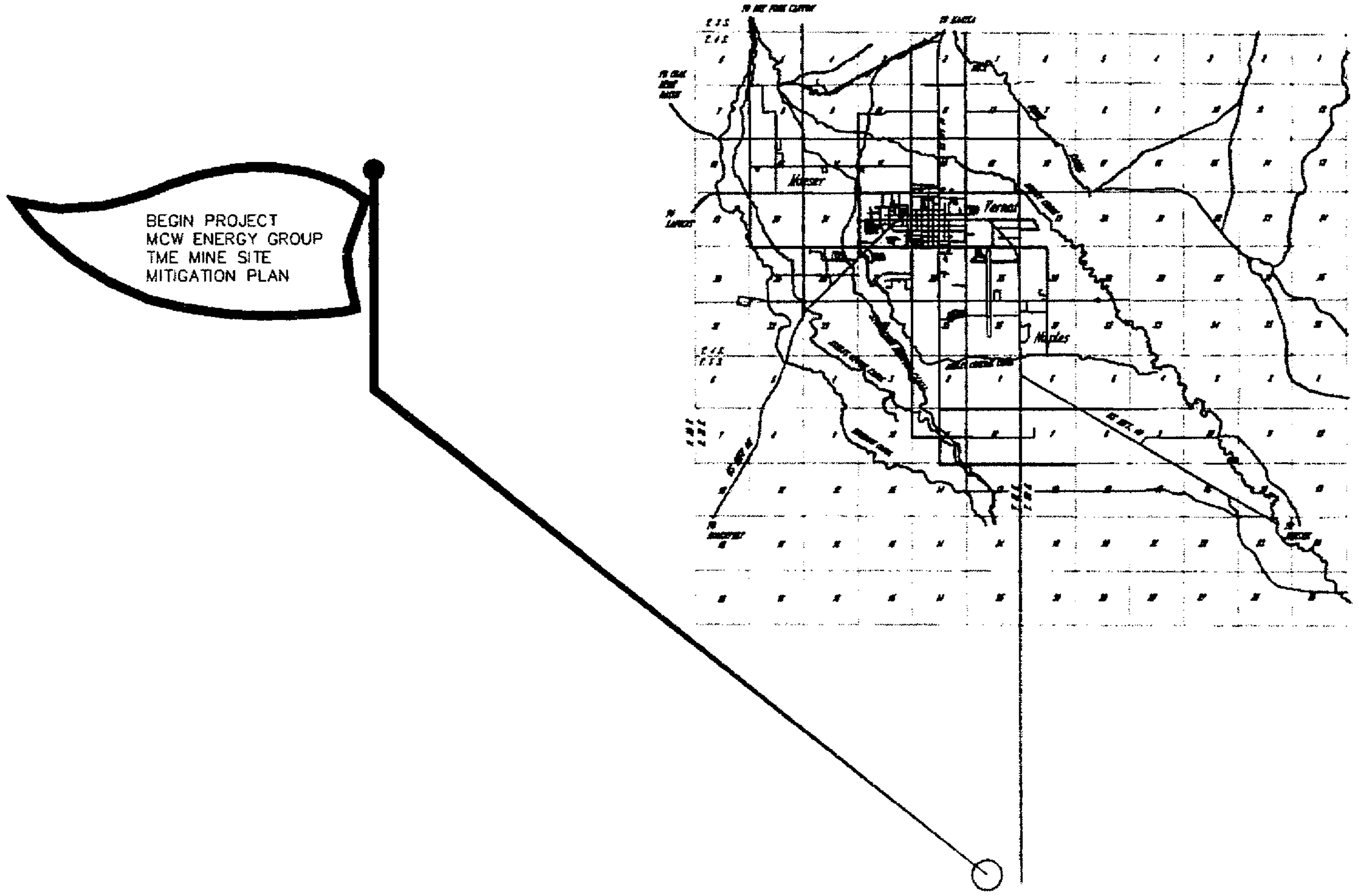


MCW ENERGY GROUP

TME MINE SITE MITIGATION PLAN

UINTAH COUNTY

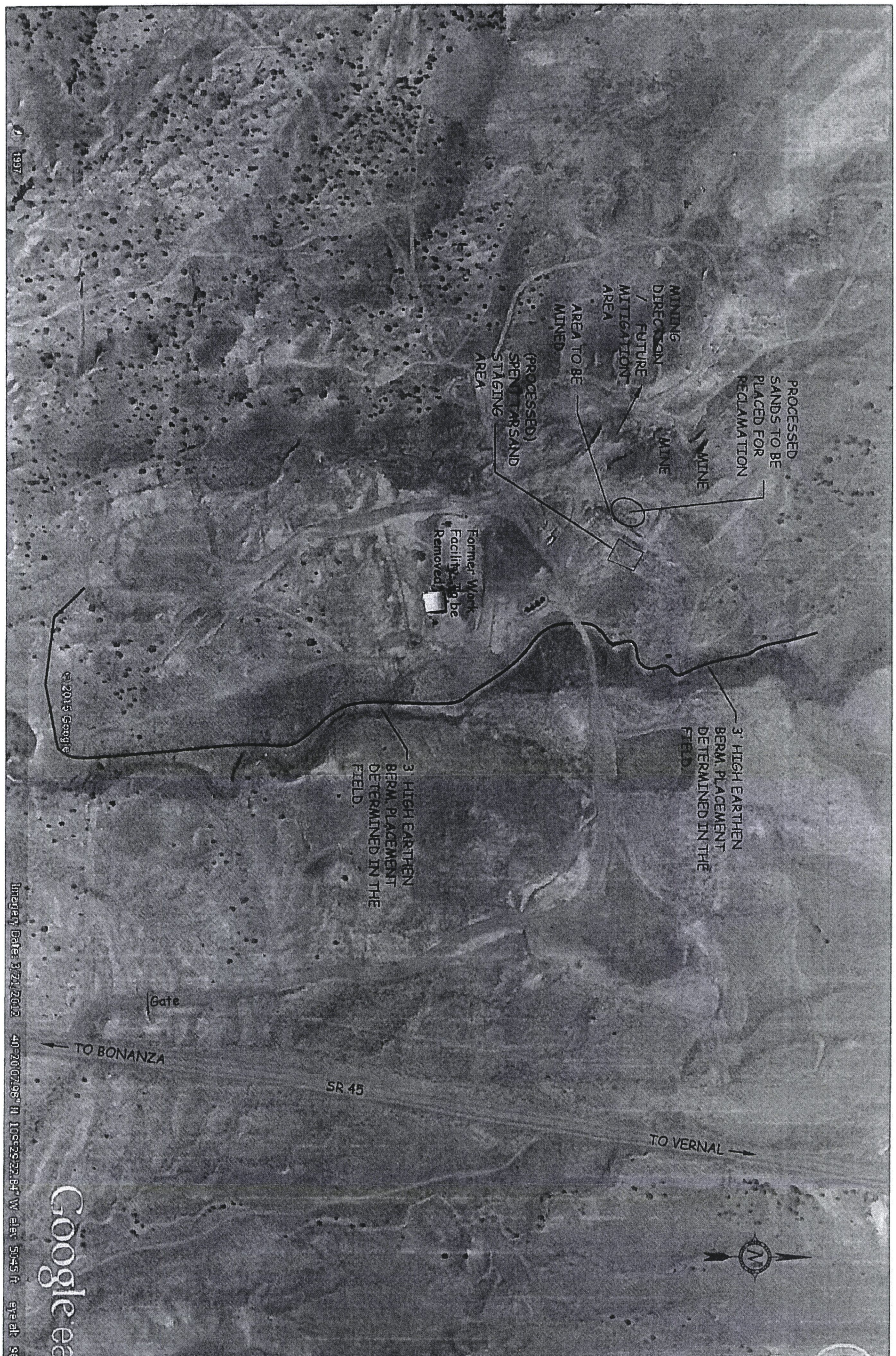
UINTAH TRANSPORTATION
SPECIAL SERVICE DISTRICT
500 SOUTH DRAINAGE PROJECT



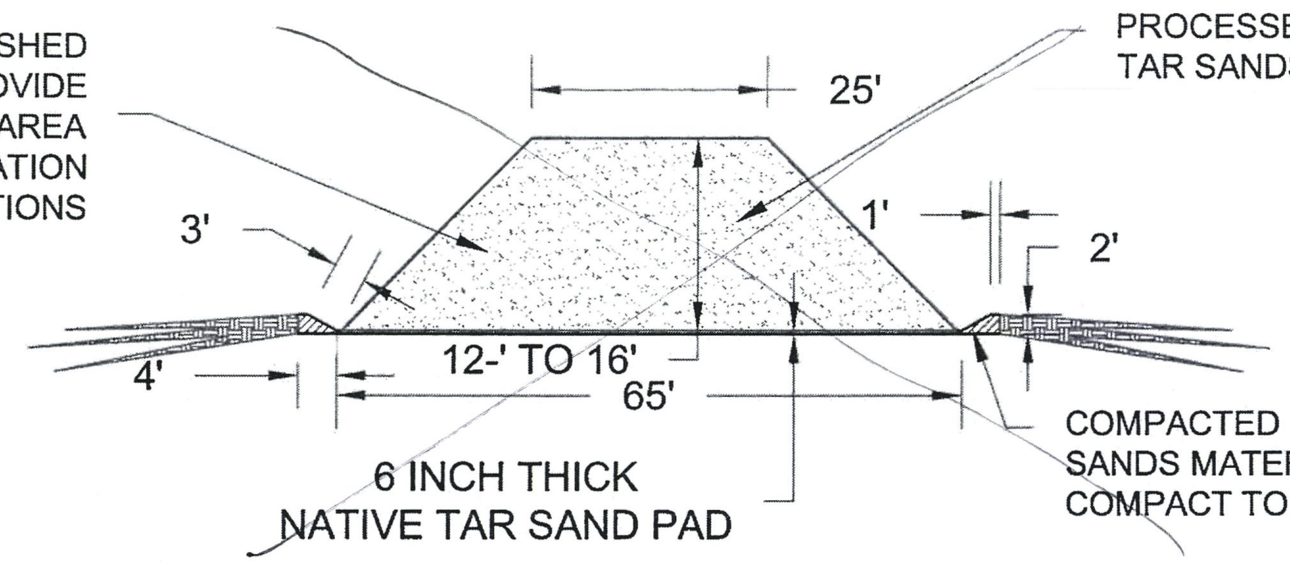
THIS SEAL APPLIES TO ALL SHEETS
CONTAINING THIS SIGNATURE

REGISTERED STRUCTURAL ENGINEER
167895
TROY D. OSTLER
11-05-15
STATE OF UTAH

RECOMMENDED FOR APPROVAL: ______ DATE
TROY D. OSTLER, P.E.
CIVCO Engineering, Inc.



SHEET No. 1	PROJECT	MCW ENERGY GROUP	CIVCO Engineering, Inc. 1256 W 400 S STE 1, P.O. Box 1758, Vernal, Utah 84078 Telephone (435) 789-5448 Fax (435) 789-4485					
		TEMPLE MOUNTAIN SITE						
	PROJECT NUMBER	PROCESSED TARSANDS	APPROVED	DRAWN BY	GLK			
		MITIGATION LAYOUT	PROFESSIONAL ENGINEER 11-5-15 DATE	QC CHECKED BY	TDO	No.	DATE	BY	REMARKS
						REVISIONS			



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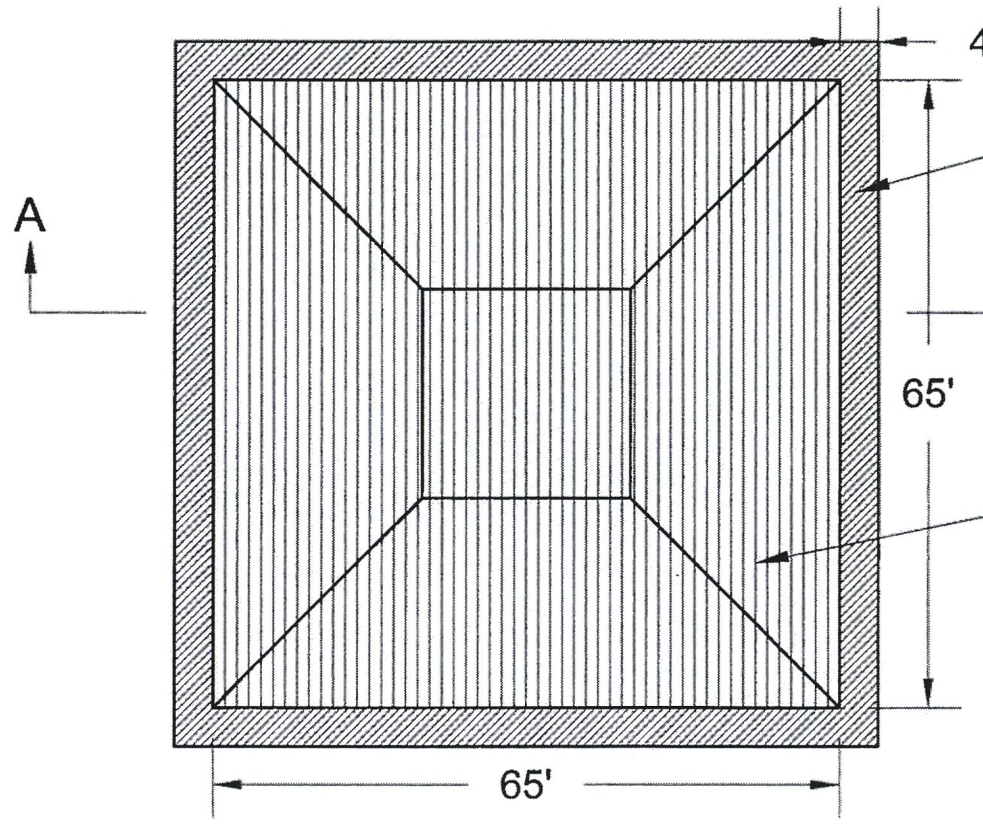

MINE SITE
STOCK PILE RETENTION AREA

REGISTERED STRUCTURAL ENGINEER
167895
TROY D.
OSTLER
6-9-15
STATE OF UTAH

PROJECT	Temple Mountain Energy		
	Mine Site		
PROJECT NUMBER	Processed Tar Sands	PIN	
	Retention Area		

UTAH DEPARTMENT OF TRANSPORTATION
ROADWAY DESIGN

APPROVED

PROFESSIONAL ENGINEER | DATE

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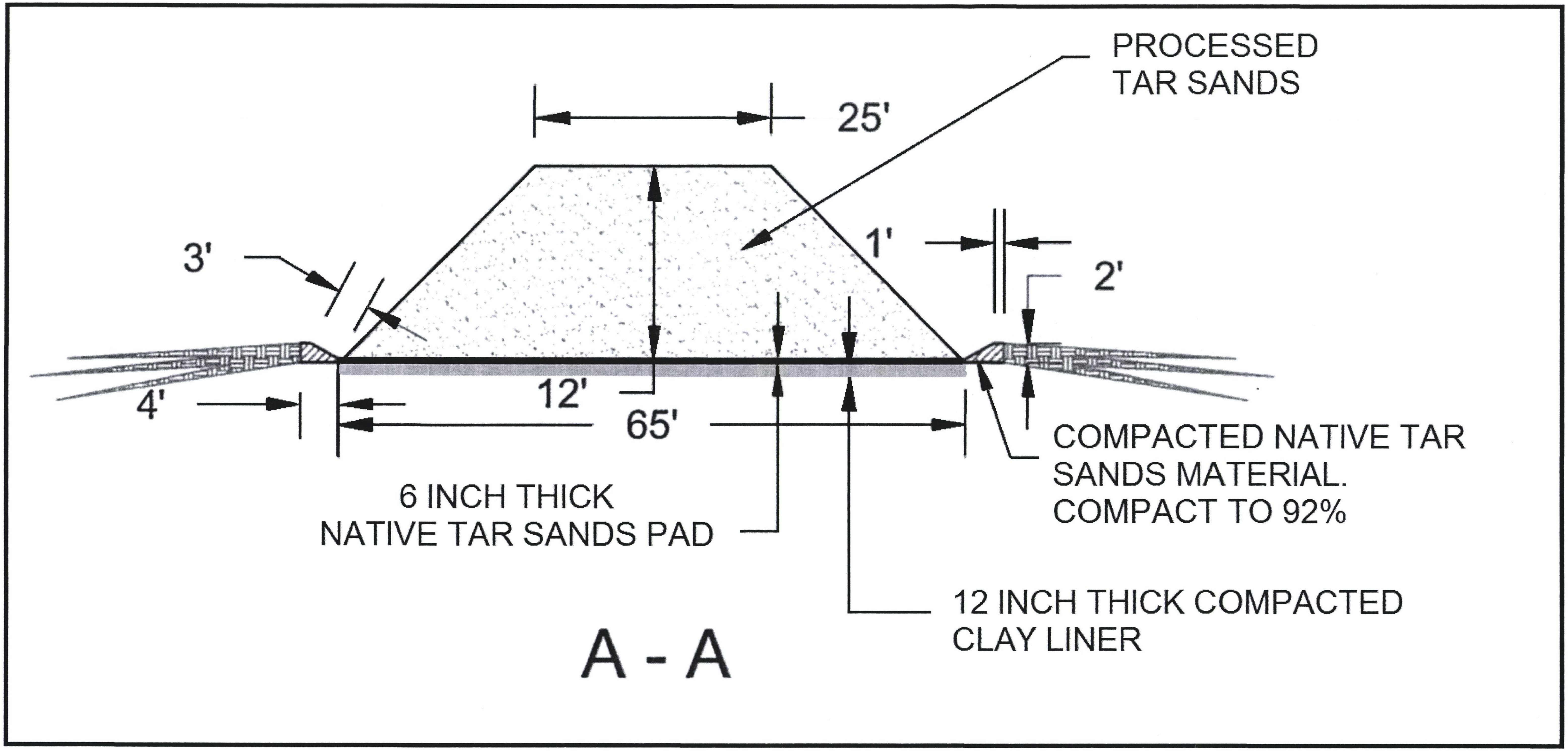
No.	DATE	BY	REMARKS

REVISIONS

SHEET No. DT-6


PROCESSED
TAR SANDS
25'
3'
1'
2'
4'
12'
65'
COMPACTED NATIVE TAR
SANDS MATERIAL.
COMPACT TO 92%
6 INCH THICK
NATIVE TAR SANDS PAD
12 INCH THICK COMPACTED
CLAY LINER
A - A

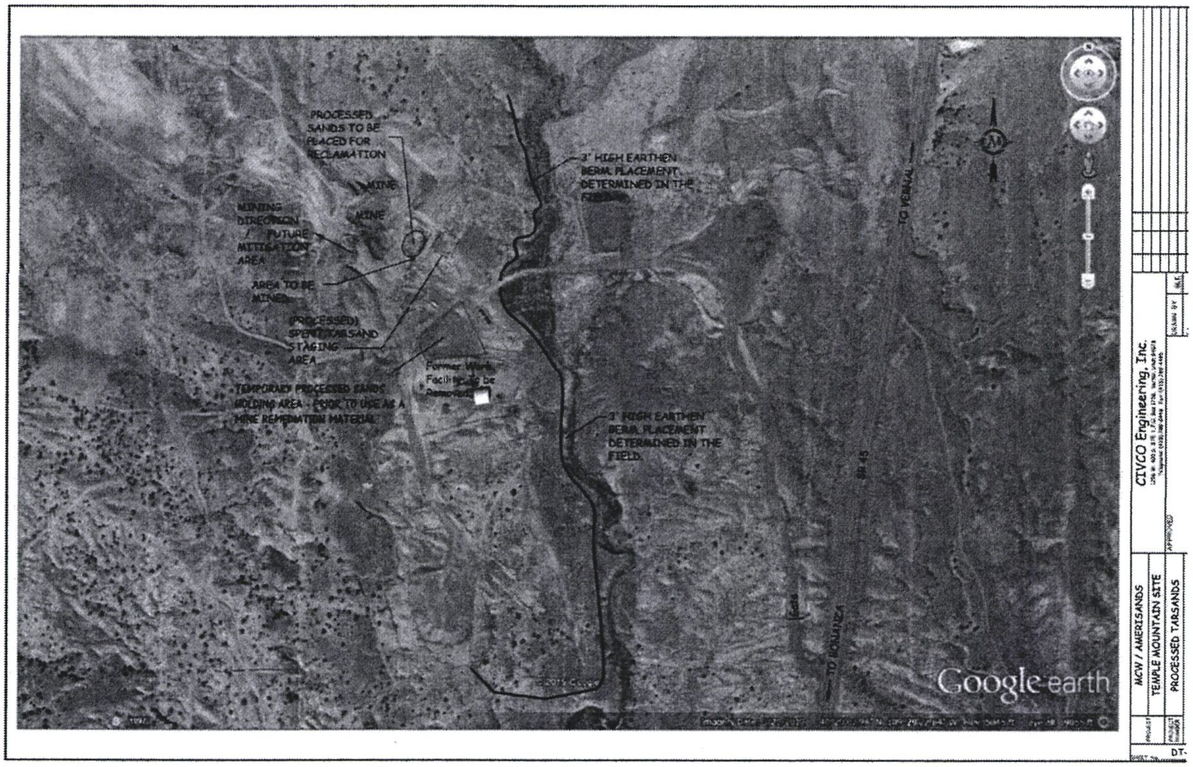


Figure 2. Aerial view of the active open pit and processed sand staging area (square box) and area where processed sands will start to be used for mine remediation (oval). Temporary storage of processed sands will be on a large flat topped oil sands stockpile (red box). A raised berm surrounds the perimeter of the temporary storage pad. The temporary storage area will be used until mine remediation activity starts.

2.1 Processed sands cap design: Despite the fact that the dry analysis of the processed oil sands indicated extremely low levels of remaining hydrocarbons, as an addition level of environmental protection the design of the cap will be based upon the recommendations of the EPA for covering hazardous waste landfills (Fig. 4) (EPA, 1989). This design includes the following features…

- A 30 cm (12 in.) minimum thickness gas vent layer composed of a coarse-grained, porous material (sand or gravel) located between the low-permeability soil liner and the underlying waste layer. Horizontal, perforated pipes will be connected to vertical risers located at high points to minimize water infiltration. The standpipes will be 30 cm (12 in.) or more in diameter.
- A 60 cm (24 in.) minimum thickness compacted soil component with a maximum in-place saturated hydraulic conductivity of 1 x 10^{-7} cm/ sec. The natural clays found at the mine site will be used for this layer. As expanded upon below, native oil sands may be used for this layer as well.

CIVCO Engineering, Inc.
Civil Engineering Consultants
PO Box 1758 * 1256 W 400 S, Suite 1
Vernal, Utah 84078

October 21, 2015

MCW Energy Group Mitigation Plan

MCW Energy Group (MCW) has leased a Utah School and Institutional Trust Land Administration tract of land west of Vernal, Utah in Maeser for their processing facility. MCW plans to extract bitumen from tar sands acquired from the Temple Mountain mine site South of Vernal, using a process that produces enhanced bitumen as its primary product and clean, dry sand suitable for construction material as a second product. Tar sand will be hauled by truck from the extraction site south of vernal, to the MCW processing site in Maeser. The tar sand will then be crushed and sent thru the processing plant. The processed tar sand produces Bitumen and sand, the sand that is not sold as a construction product, will be transported by truck to the extraction site and placed on a 65 foot x 65 foot temporary storage area (as shown in the drawing), before being placed in the permanent storage area(as shown in the drawing). The engineering plans for the 65' x 65' temporary storage area are attached as a separate document.

The permanent storage area will have an impermeable base layer (<= 10^{-7} cm/sec) consisting of either clay or native tar sand asphalt. The processed sands will be placed directly on this impermeable base, see attached diagram. When the sands are placed on the storage area, they will be capped with a non-permeable layer of clay or tar sands to prevent precipitation from running on or being allowed to leach thru the sands. As per the recommendations of the DWQ, a plan to monitor the processed sand quality throughout the life of the project will be adhered to. This plan shall include conducting semiannual to annual dry analyses on the sand material (reported in mg/kg) for Total Organic Carbon and the petroleum parameters which were detected in the SPLP analysis, the sands will then be used for remediation of the mine site.

A silt fence will be installed along the southern boundary of the area generating the over burden, to control the silts migration from the regrading of the surfaces. The area to the east of the current mine pit will be graded to create a -2% slope to the west, the over burden will be used to create a barrier to make sure the precipitation flows to the west and south. There is a non-perennial stream on the east side of the storage area and test base lines have been taken and are on file to show the lack of quality water in the

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Email: civco@civcoengineering.com

stream. The over burden that is not used for a berm will be stock piled to help in the remediation of the mine site.

The area noted on the drawing has a shelf of tar sand material to be mined; when the tar sand material has been mined, it will provide an area to place the produced sand so as to not handle the sands twice. As the mine progresses to the northwest the processed sands will be used to reclaim the area of the mine just mined and the remaining over burden will be placed back on top to produce the rolling hills matching the surrounding area. MCW will use best management practices in the operation of the mining facility, extraction process, and the processing plant. The area around the mine, when the mining is completed, will be contoured and regraded to match the surrounding rolling hills and revegetated with the natural vegetation type of the area.

If you have any questions concerning this matter, please feel free to contact me. I look forward to working with you in the future.

Sincerely,

Troy D. Ostler, SE
CIVCO Engineering, Inc.

STATE OF UTAH
TROY D. OSTLER
10167895
11-5-15
PROFESSIONAL STRUCTURAL ENGINEER

cc: Project File

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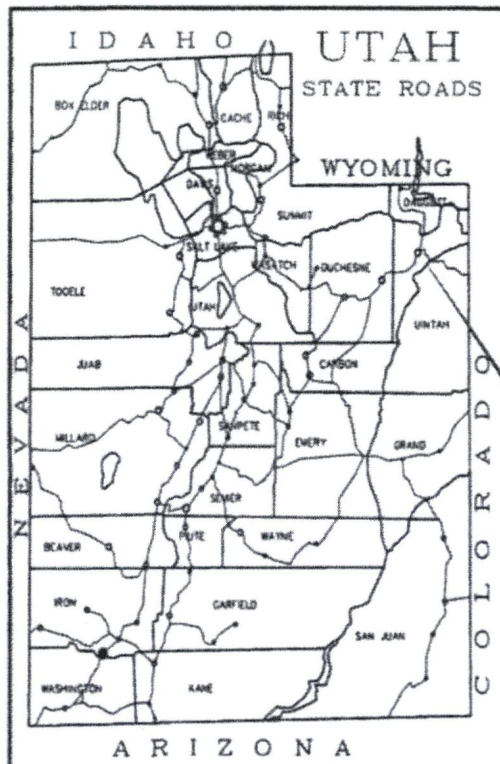
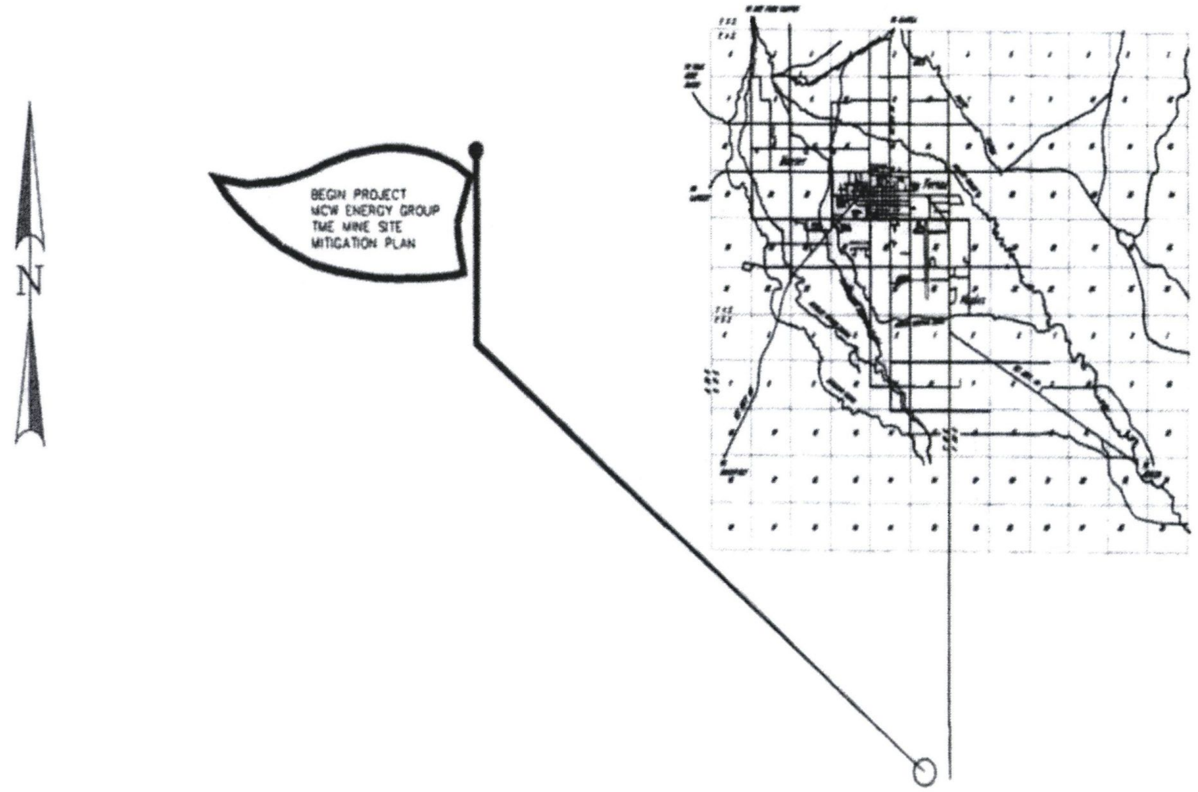


MCW ENERGY GROUP

TME MINE SITE MITIGATION PLAN

UINTAH COUNTY

UINTAH TRANSPORTATION
SPECIAL SERVICE DISTRICT
500 SOUTH DRAINAGE PROJECT



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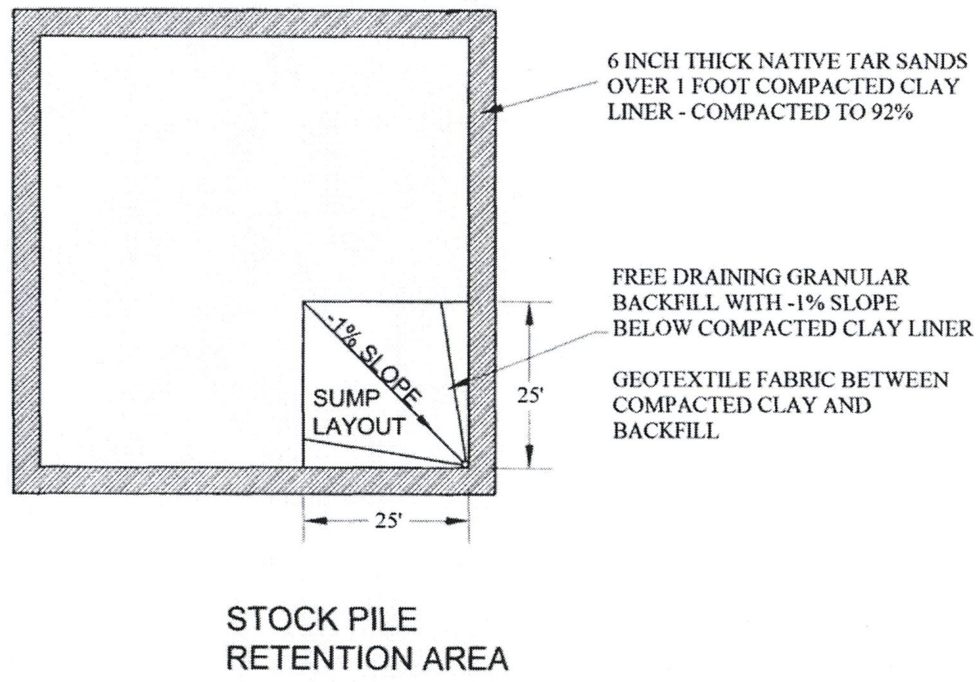
CONTAINING THIS SIGNATURE

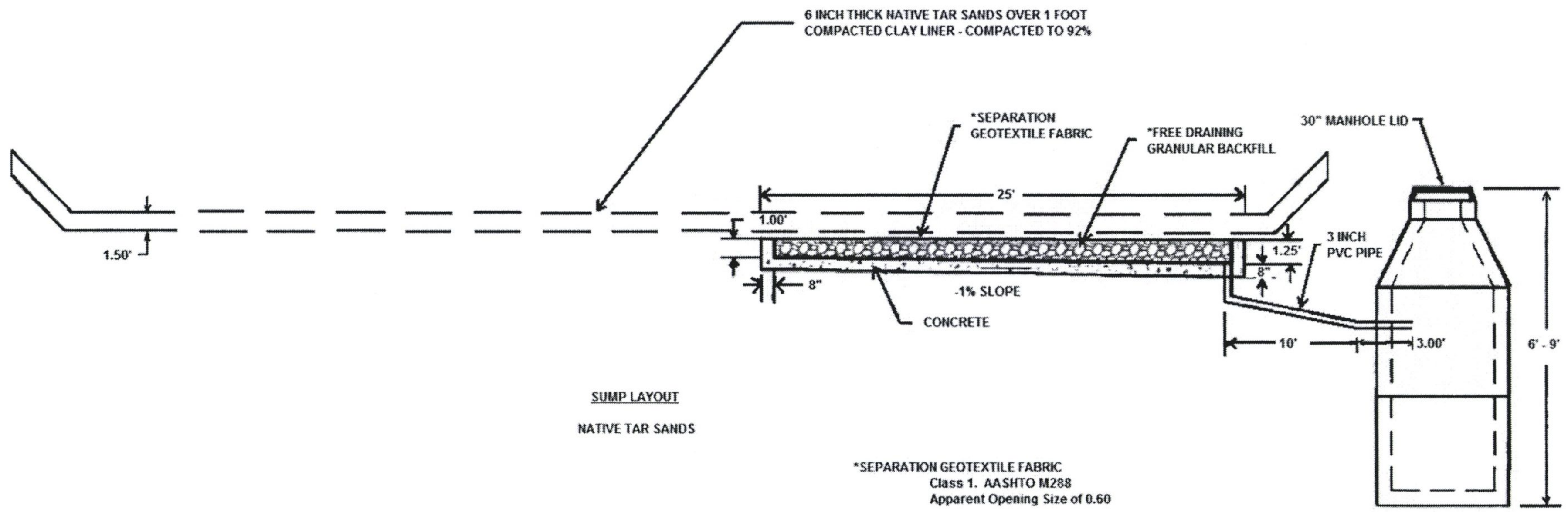
RECOMMENDED FOR APPROVAL
TROY D. OSTLER, P.E.
CIVCO Engineering, Inc.

DATE



PROJECT	MCW ENERGY GROUP	CIVCO Engineering, Inc. 1256 W 400 S. STE 1, P.O. Box 1758, Vernal, Utah 84078 Telephone (435) 789-5448 Fax (435) 789-4485	
	TEMPLE MOUNTAIN SITE		
PROJECT NUMBER	PROCESSED TARSANDS PAD	APPROVED	DRAWN BY
SHEET No. 2	MITIGATION LAYOUT	PROFESSIONAL ENGINEER 11-5-15 DATE	QC CHECKED BY

No.	DATE	BY	REMARKS
			REVISIONS



SUMP LAYOUT

NATIVE TAR SANDS

*SEPARATION GEOTEXTILE FABRIC
Class 1. AASHTO M288
Apparent Opening Size of 0.60

* Free Draining Granular Backfill

Sieve Size	% Passing
1 1/2 inch	100.00
1 inch	95.00
1/2 inch	25.00
No. 4	0 - 10
No. 200	0 - 5

PROJECT: MCW ENERGY GROUP
TEMPLE MOUNTAIN SITE
PROJECT NUMBER: LYSIMETER LAYOUT
MITIGATION LAYOUT

CIVCO Engineering, Inc.
1256 W. 400 S. STE. 1, P.O. Box 1756, Vernal, Utah 84078
Telephone: (435) 789-5448 Fax: (435) 789-4485

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PROFESSIONAL ENGINEER
11-5-15
DATE

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No.	DATE	BY	REMARKS

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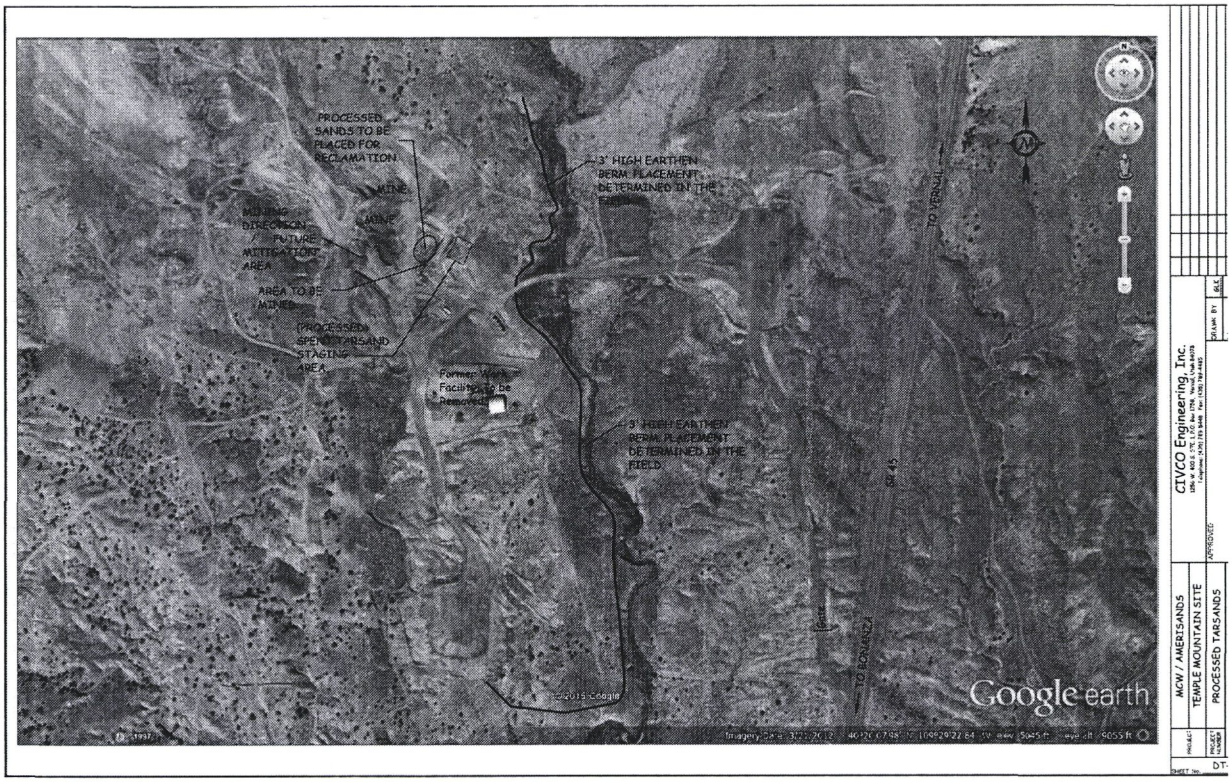

Figure 2. Aerial view of the active open pit and processed sand staging area (square box) and area where processed sands will start to be used for mine remediation (oval).

2.1 Processed sands cap design: Despite the fact that the dry analysis of the processed oil sands indicated extremely low levels of remaining hydrocarbons, as an addition level of environmental protection the design of the cap will be based upon the recommendations of the EPA for covering hazardous waste landfills (Fig. 4) (EPA, 1989). This design includes the following features…

- A 30 cm (12 in.) minimum thickness gas vent layer composed of a coarse-grained, porous material (sand or gravel) located between the low-permeability soil liner and the underlying waste layer. Horizontal, perforated pipes will be connected to vertical risers located at high points to minimize water infiltration. The standpipes will be 30 cm (12 in.) or more in diameter.
- A 60 cm (24 in.) minimum thickness compacted soil component with a maximum in-place saturated hydraulic conductivity of 1 x 10^{-7} cm/ sec. The natural clays found at the mine site will be used for this layer. As expanded upon below, native oil sands may be used for this layer as well.
- A 20 mil (0.5 mm) minimum thickness flexible membrane liner [FML] component installed directly over the compacted soil component.

- A 30 cm (12 in.) minimum thickness soil drainage (and FML protective bedding) layer with a minimum hydraulic conductivity of 1×10^{-2} cm/sec. The EPA indicated that this layer may not be necessary in arid regions, so this layer may not be used at this location.
- A 60 cm (24 in.) minimum thickness fill soil component above the drainage layer. Stockpiled original overburden and interburden material from the mining operation will be used for this layer. This fill layer shall be covered by a top layer composed of either a vegetated, or armored surface component to minimize erosion and, to the extent possible, promote drainage off the cover. Stockpiled top soil and gravel will be used for this layer. The top surface shall have a slope of at least 3 percent, but not more than 5 percent, to promote runoff while reducing erosion.
- Overburden material and surface soils will be temporarily stored to the south of the active mining area, or on the other side of Route 45 (in the area designated as Pit 3) before being used to cover the capped processed sands during mine remediation activities (Fig. 3a).

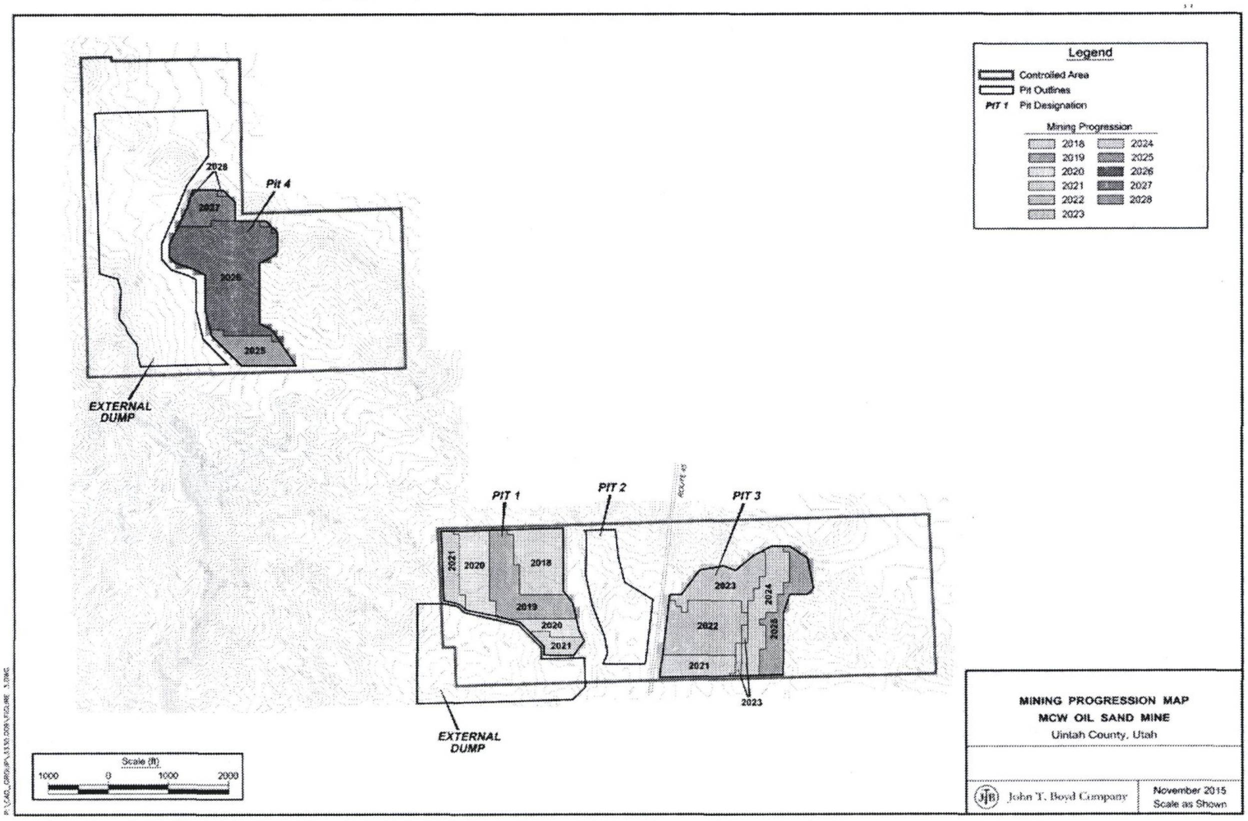

Figure 3a. Schematic of anticipated mining activity for the first four to eight years of operations. The oil sands processing facility will be constructed in the northern portion of the area designated as Pit 2. Overburden material and surface soils will be stockpiled in the area marked external dump before being used to cover the processed sands. If additional room is needed to stockpile the overburden material, the area designated as Pit 3, across Route 45, will be used.

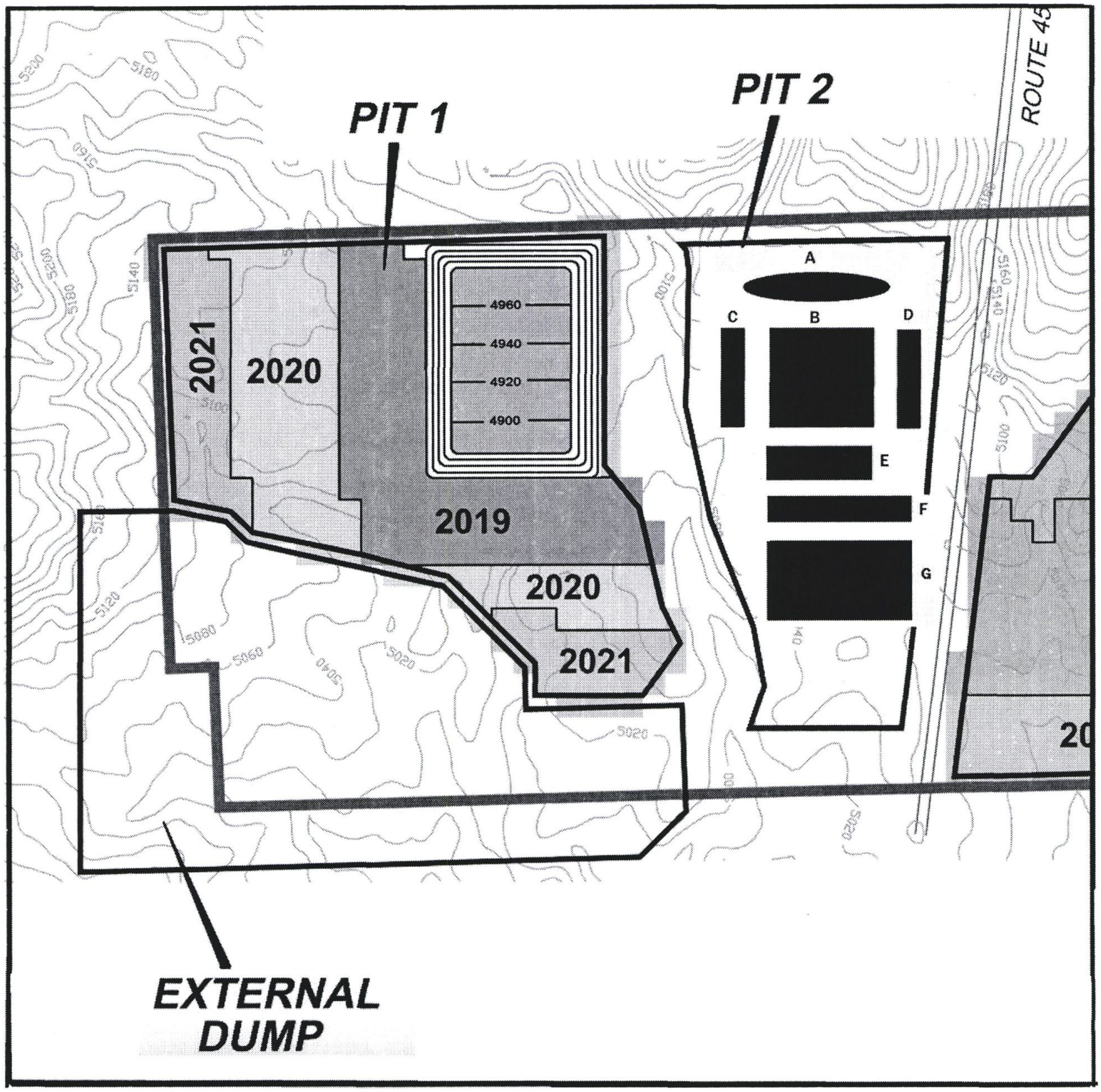

Fig. 3b. Anticipated open pit mining activity during 2018 (5000 barrel per day operation). Contour lines are estimates for the floor of the active mining area.

A – Raw oil sands ore stockpile
B – Oil sands processing facility
C – Solvent storage tanks
D – Solvent storage tanks
E – Bitumen storage tanks
F – Tanker truck loading area
G – Parking area, offices, work shop

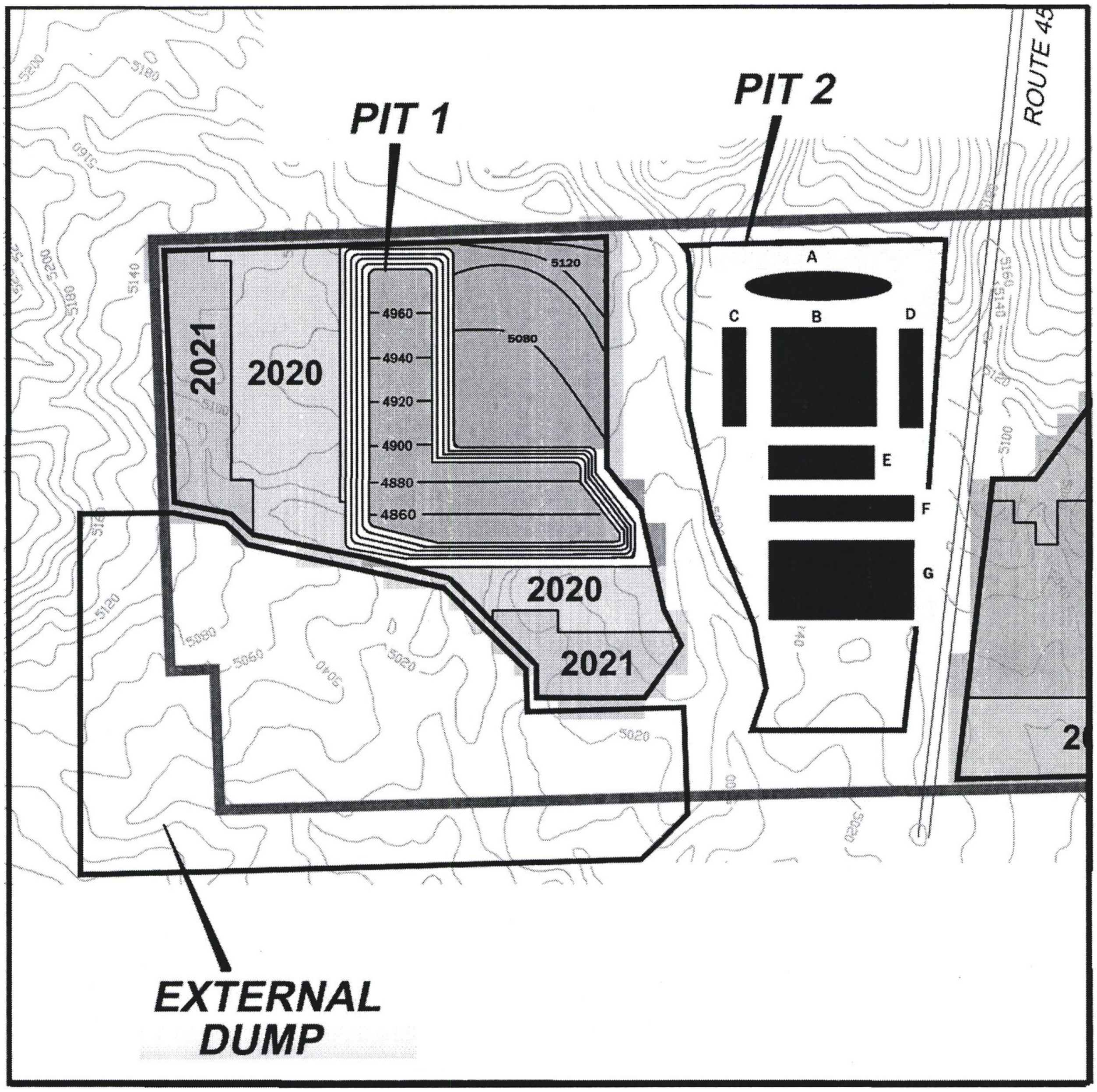

Fig. 3c. Anticipated open pit mining activity during 2019 (5000 barrel per day operation). Contour lines are estimates for the floor of the active mining area. Contour lines over the 2018 mining area are surface estimates after mine remediation activities are completed.

A – Raw oil sands ore stockpile
B – Oil sands processing facility
C – Solvent storage tanks
D – Solvent storage tanks
E – Bitumen storage tanks
F – Tanker truck loading area
G – Parking area, offices, work shop

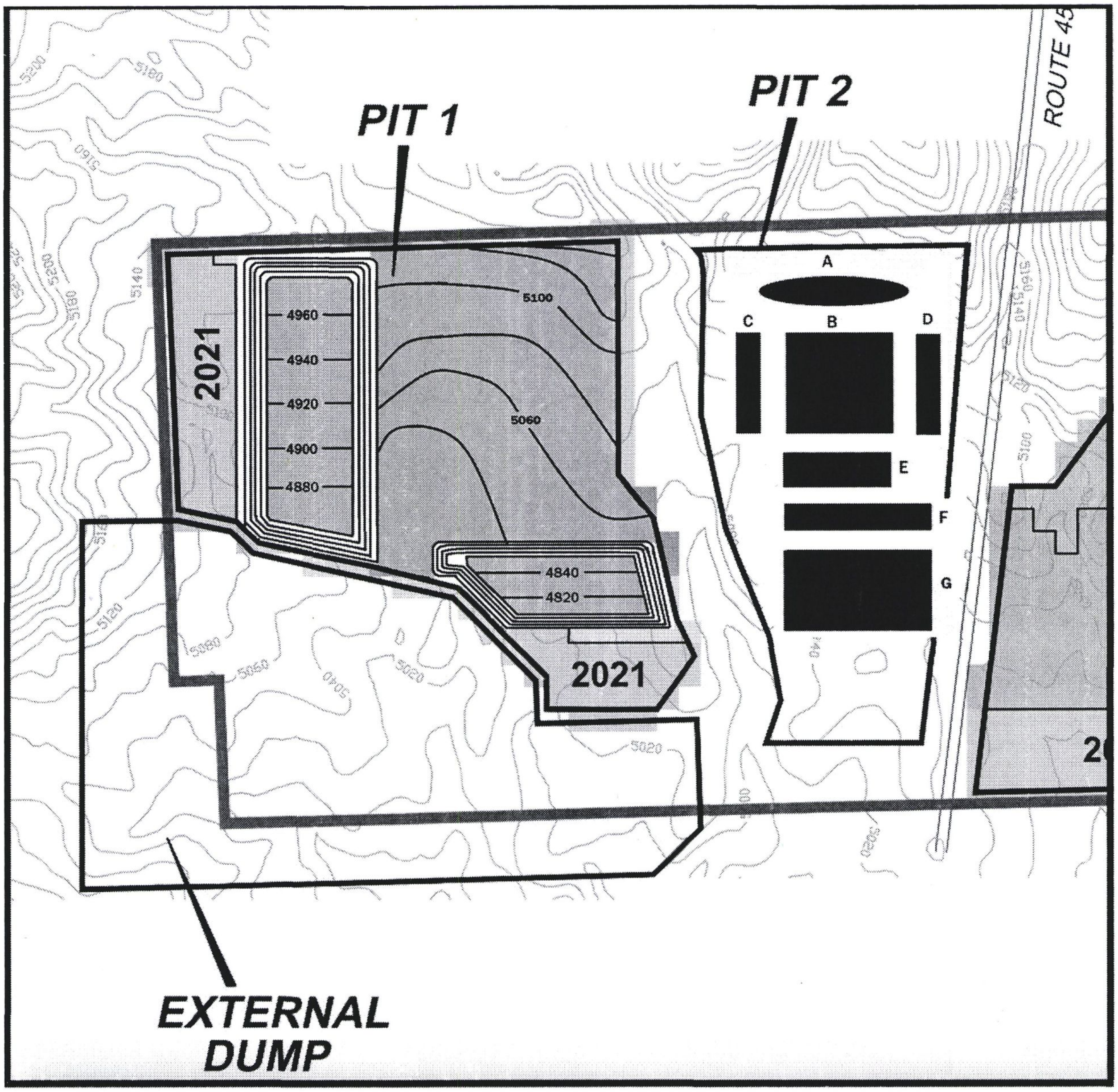

Fig. 3d. Anticipated open pit mining activity during 2020 (5000 barrel per day operation). Contour lines are estimates for the floor of the active mining area. Contour lines over the 2018 - 2019 mining area are surface estimates after mine remediation activities are completed.

A – Raw oil sands ore stockpile
B – Oil sands processing facility
C – Solvent storage tanks
D – Solvent storage tanks
E – Bitumen storage tanks
F – Tanker truck loading area
G – Parking area, offices, work shop

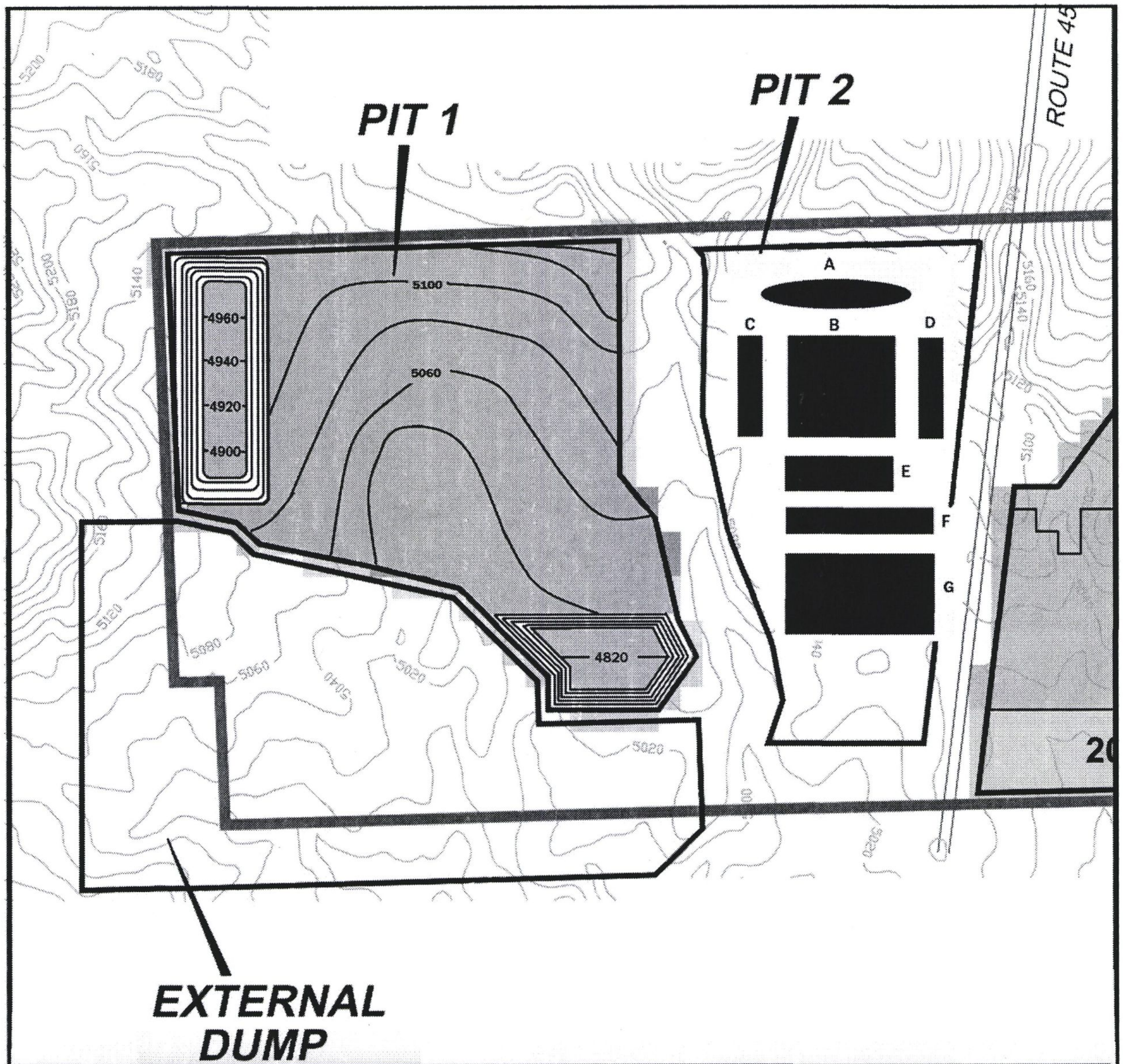

Fig. 3e. Anticipated open pit mining activity during 2021 (5000 barrel per day operation). Contour lines are estimates for the floor of the active mining area. Contour lines over the 2018 - 2020 mining area are surface estimates after mine remediation activities are completed.

A – Raw oil sands ore stockpile
B – Oil sands processing facility
C – Solvent storage tanks
D – Solvent storage tanks
E – Bitumen storage tanks
F – Tanker truck loading area
G – Parking area, offices, work shop

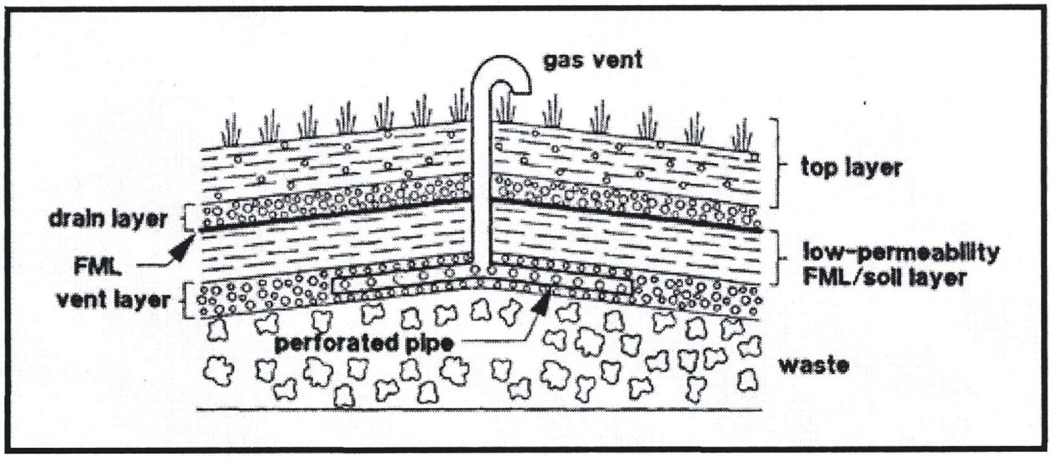

Fig 4. Schematic of the cap design for hazardous waste landfills. See body of text for detailed description of each layer.

Source: EPA, 1989.

As stated above, in addition to the natural clays found at the mine site, the oil sands mined at Temple Mountain can be used as a component of both the cap and the base.

Bowders, et al (2000) reviewed the benefits of using an asphalt barrier as a hydraulic barrier/cap for both hazardous waste and municipal landfills (Appendix H). Several of the benefits include very long life (>1,000 years), especially when buried with cover soils, and extremely low hydraulic conductivities when the proper weight percent of bitumen is used. Recommendations for using asphalt as a hydraulic cap include the following...

- bitumen weight percent of 7% or higher should be used to achieve a hydraulic conductivity of 10^{-7} cm/s or lower.
- the use of two layers of asphalt with a minimum thickness of 5 cm (~2 inches) each.
- an asphalt cement tack coat should be sprayed between the layers.
- the seams of the layers should be staggered.
- the fines content should be between 8% and 15% to ensure a dense graded mixture.
- the asphalt should be compacted so that the percentage of air is below 4%.

The presence of multiple shale and oil sands layers, recorded in SOHIO well logs below the proposed 200 foot maximum depth of the open pit, will act as a very effective seal below the processed sands (Temple Mountain Energy, 2013). Impermeable oil sands and shales extend downward for several thousand feet below the mine site.

2.2 Processed sands liner design: The liner shall be constructed of either compacted clay or asphalt. The native clay found at the mine site has previously been tested and has a permeability of less than 10^{-7} cm/sec and is an excellent material for use as the main component of the compacted clay liner (Appendix I).

As per US EPA recommendations, the compacted clay liner shall include the following features (US EPA, 2016).

- a minimum thickness of two feet.
- a maximum hydraulic conductivity of 1×10^{-7} cm/sec.
- soil plasticity indices ranging from 10% to 30%.
- shall containing at least 30 percent fines and up to 50 percent gravel, by weight.
- water content shall be between 10% and 28%.
- loose lift (layer) thicknesses shall range between 13 and 25 cm (5 and 10 in.)
- heavy compactors, weighing more than 50,000 pounds and with feet long enough to penetrate a loose lift of soil will be used to compact each lift.

If an asphalt liner is used, the criteria listed above shall be used in order to form an impermeable barrier between the processed sands and the rock formations below. It should be noted that the rock formations below the floor of the mine are composed of interbedded shale and oil sands, which naturally form a very impermeable barrier to water flow.

2.3 Potential groundwater monitoring well location: Historical records indicate that 17 wells were drilled in this area as exploration wells for oil sands within the Duchesne River Formation (Fig. 1) (Stantec 2015). Well logs indicated that only four of these wells encountered intervals that were described as "water wet" (Table 1). Wells CG-1 and F-4 had thin intervals described as "water wet", but these wells are east of the mine site, so are not appropriate locations for a monitoring well since ground water will tend to travel in the down dip direction, which is 9° to 20° to the SSW in this area (Blackett, 1996). Well F-1 also had a very thin interval described as "water wet", but this core was taken from within the proposed open pit area, so is not an appropriate monitoring well location (Figs. 1). Well CF-1 is both down dip of the mine site (and therefore the processed sands that will be used for mine remediation) and also had the most