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10850 Richmond Avenue
Suite 175
Houston, TX 77042

telephone 832-325-5700
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Risk Issues & the Proposed Pit Rule

Ben Thomas, Ph.D.

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OVERVIEW OF TESTIMONY

- Risk & Decision Process
- What is in the pits
- Risk evaluation of detected constituents
- OCD Proposal
- Alternative Impacts
- Conclusions

Thank you for the opportunity to speak before the Oil Conservation Commission. My name is Ben Thomas. As has been stated, I am an expert in a field called Risk-Based Decision Making (RBDM). I was retained by the oil and gas industry here in New Mexico to evaluate the Pit Rule being proposed by the staff of the Oil Conservation Division (OCD) with regard to the potential health and environmental risks posed by the constituents in closed drilling pits.

Value of Risk Evaluation

Risk is defined as the probability that an adverse effect or hazard will occur. The evaluation of risk has increasingly become an integral part of the regulatory decision process by agencies worldwide. The reasons for this are many:

1. Of importance to these proceedings, it is my understanding that the New Mexico Oil and Gas Act requires that risk be considered in the regulatory process.
2. The risk evaluation process is transparent and makes explicit to all parties the agency's objective in proposing regulatory action.
3. It provides an understanding of the supporting technical basis and rationale of the proposed standards and regulatory requirements.
4. A formal evaluation of risk minimizes unnecessary expenditure of financial and technical resources due to unclear regulatory policy. By "resources", I mean the resources of the regulated community who must comply with the proposed regulations, and the resources of the agency who must enforce them.

As I will discuss in my testimony today, I believe that the Pit Rule would benefit from a formal evaluation of risk issues.

What is in the Drilling/Reserve Pits?

As discussed by others, drilling pits are lined temporary pits that are used to store and recycle drilling mud during the drilling process. For that reason, a Drilling/Reserve pits is expected to contain...

- Formulated drilling mud (water-based);
- Rocks and debris created as the drill bit cuts through subsurface layers of mineral deposits and soils;
- Hydrocarbons as the drilling encounters pockets of oil and gas; and
- Salts derived from natural deposits and from brine drilling fluids.

Central Risk Questions

A formal risk evaluation process would ask two basic questions:

1. Will any of the constituents in a closed drilling pit pose an unreasonable risk to the public health, environment, or natural resources of the State of New Mexico?
2. If so, what is the most effective way to mitigate that risk?

The Industry Sampling Program -- What's in the Pits and How Much?

To confirm and characterize what is in Drilling/Reserve Pits, the industry conducted a detailed sampling and analysis of pit contents:

- A third party collected samples of the contents of temporary pits (after fluids removed; just prior to closure).
- The samples were analyzed for a full range of constituents using standard EPA methods for metals, volatile and semivolatile organic compounds, anions, cations, TPH, PCBs, radium isotopes, and other analytes.
- Where the EPA methods allow, a TCLP leachate of each sample was prepared and analyzed (selected metals and volatile organics).

The Sampling Program

Because of differences in geology and operating practices, the Industry chose...

- Three drilling/reserve pits in NW New Mexico (San Juan Basin; generally gas production at depths of 600–9000 ft), and
- Three pits in SE New Mexico (Lea County in the Permian Basin; generally oil production at 7000+ ft).

- Twelve samples of pit contents were collected at depth by auger at 11 locations in each pit...11 samples + 1 duplicate from each pit.
- Laboratory results were subjected to an independent quality assurance audit, then evaluated by my staff.
- Any constituents having at least one of the 12 samples exhibiting a concentration above the detection limit (including estimated concentrations) was included in the analysis of each pit

What was found? – TPH

- TPH was evaluated by EPA Method 8015, which separates petroleum hydrocarbons into gasoline-range (GRO) and diesel-range (DRO) fractions.

- Most of the hydrocarbons in both the northwest and southeast pits were in the DRO-size fraction.
  - SE NM average Total TPH (GRO+DRO) was 7700 mg/kg
  - NW NM average Total TPH (GRO+DRO) was 1800 mg/kg
  - OCD's proposed criterion is 2500 mg/kg.

QUESTION: Is Total TPH a risk issue?

What was found? -- Chloride

The average concentrations of Chloride anion were found to be:

- SE NM was 126,000 mg/kg
- NW NM was 3,900 mg/kg

QUESTION: Does chloride at these levels present a risk?

What was found? – Arsenic

- Arsenic is not a component of commercial drilling muds, and its presence is likely due to natural subsurface minerals being brought up during drilling.
  - Average NW was 4.1 mg/kg
  - Average SE was 2.3 mg/kg
  - NMED's Tier 1 Residential Soil Screening Level = 3.9 mg/kg (version 4)

- Arsenic levels in TCLP leachates were not detectable, indicating that the natural arsenic-containing minerals will not dissolve in water, are not environmentally mobile, and are not bioavailable.

CONCLUSION: Arsenic exists in New Mexico drilling/recycle pits in a chemical form that does not pose health or environmental risks.

What was found? -- Barium

- Barium (in the form of barium sulfate) is a common component of drilling muds.
  - Average SE was 1763 mg/kg
  - Average NW was 10,000 mg/kg
  - NMED SSL of 5450 mg/kg
- Barium levels in the TCLP leachates were low (estimated to be less than 3% of total; and were less than the WQCC 3103 criterion of 1 mg/L).
- Low water solubility indicates that barium in the pits is not environmentally mobile, and not bioavailable.

CONCLUSION: Barium is in a form that is generally not soluble in water, and therefore does not pose a health or environmental risk.

What was found? -- Benzene

- Benzene is a natural constituent of petroleum and natural gas, and is not considered to be a component of water-based drilling mud formulations. It is a recognized carcinogen.
  - Average SE NM was 8.17 mg/kg
  - Average NW NM was 0.12 mg/kg
  - NMED SSL is 10.3 mg/kg
- All soil samples exhibiting benzene concentrations above SSL were from Pit LC-1 (in SE NM) and were highly diluted (1000X vs. 5-100X due to other

analytes). High dilution ratios magnify analytical variability, and greatly complicate interpretation of such data.

- Benzene was found in all LC-1 leachate samples at concentrations above the WQCC 3103 criterion (0.01 mg/L).

QUESTION: Although complicated by high dilution ratios, should benzene be considered a possible regulatory issue?

What was found? – Halogenated Compounds

Several unusual halogenated compounds were reported by the laboratory at detectable levels. Subsequent lab discussions revealed that these were "QC surrogates" purposely added to the sample to evaluate analytical recoveries

2,3,4-TRIFLUOROTOLUENE -- Method 8015 (TPH)
o-TERPHENYL -- Method 8015 (TPH)
DECACHLOROBIPHENYL -- Method 8082 (PEST/PCB)
TETRACHLORO-m-XYLENE -- Method 8082 (PEST/PCB)
4-BROMOFLUOROBENZENE -- Method 8260 (VOC)
DIBROMOFLUOROMETHANE -- Method 8260 (VOC)
2-FLUOROBIPHENYL -- Method 8270 (SVOC)
2-FLUOROPHENOL -- Method 8270 (SVOC)
2,4,6-TRIBROMOPHENOL -- Method 8270 (SVOC)

What was found? -- Other Compounds

- The average soil concentrations of other detected Metal, VOC, SVOC, PCB analytes were below available NMED SSLs or SSL surrogate criteria.

- The average leachate concentrations of all other analytes were below available

WQCC 3103 criteria or drinking water surrogate criteria.

CONCLUSION: Other compounds detected do not to pose significant risk to public health and the environment.

The OCD Sampling Program -- What's in the Pits and How Much?

- It appears that OCD collected samples of solids from the surface at the four corners of each pit and mixed them to create a composite sample for analysis.
- OCD also collected water samples, suggesting that the fluids in the sampled pits had not yet been removed for closure.
- OCD tested each sample for VOCs, SVOCs, Total Metals; Anions; Cations; TPH, and other metrics (pH, etc.)

SE Pits: Of 20 detected analytes having SSLs:

- Only arsenic (average of all pits) exceeded its NMED criterion.
- Arsenic is present in a form that is not water soluble, therefore not environmentally mobile and not bioavailable.

NW Pits: Of 23 detected analytes having SSLs:

- None exceeded its NMED criterion.

Conclusions from Industry & OCD Findings

Analytes of possible regulatory concern:

- TPH
- Chloride
- Benzene

Thoughts from a Risk Perspective

Total Petroleum Hydrocarbon (TPH)

TPH Method

OCD has suggested use of EPA Method 418.1 as a simple and inexpensive test for TPH.

- The Method 418.1 procedure is no longer part of the EPA method series because it specifies that an ozone-depleting solvent (banned in the US) be used to extract the hydrocarbons.
- Laboratories running 418.1 assays are either using an alternative extraction solvent (unspecified), or are breaking the law.

Solvent extraction methods for TPH are non-specific in that biological fats and waxes are extracted along with petroleum hydrocarbons.

- It is possible for a soil sample to be reported as having a high level of "TPH" due to extraction of the waxy coating and essential oils of leaves and other plant debris, even though no petroleum is actually present in the sample.

RECOMMEND: If TPH is an issue, use EPA Method 8015m (GRO+DRO) or EPA Method 9071 (Oil & Grease).

TPH Standard

- NMED developed a risk-based SSL of 2500 mg/kg for "waste oil", based on…
  - the size classes of hydrocarbons that "waste oil" is assumed to

comprise, and

- the pathways of exposure relevant to the health risks to a hypothetical resident who directly contacts that material.

- It appears that OCD has simply adopted NMED's "waste oil" criterion.

QUESTION: Has OCD considered whether "waste oil" SSL is appropriate for petroleum crude oil and natural gas hydrocarbons?

- OCD has not specifically stated the nature of their concern(s) about TPH:
  - Cancer?
  - Suppression of immune function?
  - Unpleasant taste in well water?
- OCD has not given the members of the OCC the technical information they need to judge whether the OCD-proposed regulation of TPH is appropriate.

TPH Standard – Risk Critique

OCD has not given a technical rationale for proposed a 2500 mg/kg standard.

- Not clear why NMED's number applicable to pit materials
- If OCD's 2500 mg/kg criterion is "safe", it is not clear to me why current closure practices need to change.

A better rationale would look at the risks presented:

- Direct contact – but under 4' cover; construction and residential and primary exposure scenarios.
- Groundwater – leaching risk, but low solubility, volatilization and biodegradation makes significant exposure unlikely.

Primary toxicants of TPH are BTEX in the GRO fraction, and PAHs in the DRO fraction. Better to regulate specific toxicant, than nebulous mixture like TPH. It should be noted that the available data indicate that of the BTEX compounds, only benzene is of possible concern...and that is uncertain because of the high dilution of the affected samples.

Question: Why does OCD want to regulate a complex and highly variable mixture like TPH, rather than the toxic constituents of that mixture?

Chloride Anion

Chloride anion is highly water-soluble

The proposed rule does not state the nature of OCD's concern, although protection of ground water is suggested by their analytical approach.

- While salt (sodium chloride) can be toxic to plants, it is not the chloride anion that is primarily responsible. Rather, it is the sodium cation, which attracts a large shell of water molecules, that competes with plant roots for available moisture, causing dehydration of plant tissues.
- A similar mechanism is at play in animal tissues -- excess sodium pulls water out of the cells, disrupting biological functions.

Chloride is therefore a poor predictor of the risks associated with sodium chloride. Direct measurement of sodium or one of its surrogate metrics (e.g., electroconductivity, etc.) is better.

Chloride Anion: Risk Analysis

Potential pathways:

- Direct exposure is primarily salt driven; but no direct contact (under 4' cover)'
- Groundwater is other potential route

If chloride is of concern, recommended level:

- Direct exposure is addressed by cover

- Groundwater should be based on protection of groundwater use. Therefore, a leachable standard of 3500 mg/l is protective.
- A non-leachable field test may simplify field administration of the standard.
- Measurement of sodium is a better metric for risk evaluation.

Benzene

Benzene may or may not be an issue—analytical results were highly diluted

Benzene has a short half life, and will volatilize during evaporation and mixing prior to closure

The pathways of potential concern:

- Direct contact (but under liner and 4' cover)
- Groundwater use

Pathway analysis:

- Direct contact exposures would be short-term...limited to construction or other physical disturbance—a process that will further reduce concentrations
- Groundwater is unlikely to be of concern given the long time required to reach water versus benzene's half life and on-going evapotranspiration processes.

> Recommendation: Tier 1 Screening Level for benzene in soil to minimize risk to a construction worker is 174 mg/kg (i.e., NMED's SSL for a construction worker).

3103 Analytes

Based on the Industry and OCD sampling programs, most of these compounds are not present in New Mexico's drilling/recycle pits.

The 3103 constituents that were detected may or may not be an issue

The pathways of potential concern:

- Direct contact (but under liner and 4' cover)
- Groundwater use

Pathway analysis:

- Direct contact is limited to construction or residential exposures.
  - Organic 3103 compounds detected in pits tend to be volatile (i.e., VOCs), suggesting direct exposures would be short-term.
  - Metallic 3103 compounds shown by comparison to SSLs not to be of concern from direct exposures.
- Groundwater is unlikely to be of concern given dilution and attenuation processes (DAF >100)

Conclusion: The risks posed by the 3103 constituents by these routes are *de minimis* .

What OCD has Proposed

Proposed OCD Pit Rule – Temporary Pits

- Proposes treatment and release standards.
- Existing industry data would suggest pits will not meet these standards.
- In essence, all drilling materials will have to be hauled and disposed of at a commercial OCD-approved landfill.

Alternative Risk/Consequence

- All decisions have consequences.
- OCD rule addresses
  - Direct exposure risk
  - Groundwater risk, both by removing pit contents
- The Industry sponsored a study evaluating the likely consequences of OCD's proposal to transport, and dispose of pit material to an OCD-approved commercial landfill:
  - Economic Impact
  - Vehicular Accidents, Injuries, and Fatalities
  - Environmental Consequences

Economic Impacts

– It is estimated that the proposed Pit Rule will add more than $50 million per year in compliance costs of finding and producing oil and gas in New Mexico.

- It is estimated that the Industry will drill approximately 1400 wells per year in the State.

- There are only four OCD-approved landfills in New Mexico...all in the southeastern part of the State. New landfill capacity may need to be developed.

- Increases in heavy truck traffic will accelerate deterioration and repair of New Mexico roads, especially near the four existing landfills.

Vehicular Accidents, Injuries, and Fatalities

- Assumes the proposed pit rule will result in heavy trucks traveling a minimum of 27.4 up to 81.2 additional million vehicle miles (mvm) per year...80% on rural highways and 20% on urban highways.

- Based in statistics from the Federal Motor Carrier Safety Administration, an additional 0.85 – 2.53 fatalities, 14 – 41 injuries, and 71 – 142 property damage only (PDO) crashes can be expected on an annual basis.

- Data from the Industry and OCD sampling programs suggest that no fatalities or injuries are expected from exposures to the constituents of drilling/recycle pits in New Mexico.

• Environmental Consequences

- The proposed Pit Rule will result in estimated truck and dust emissions equivalent to twice the emissions from currently permitted stationary sources.
  - Drilling material hauled – ↑ 1.5MM to 2.7MM yd^3

- VOC emissions – ↑ 660 tons to 1900 tons/year
- Dust emissions – ↑ 13,000 to 41,000 tons/year
- CO_2 emissions – ↑ 50,000 to 149,000 tons/year

– Increased CO_2 emissions will put the Governor's GHG emission reduction goals in NW New Mexico at risk.

Conclusions

What are the Risks from Drilling/Recycle Pits?

- Based on the data from the Industry and OCD's sampling programs, it seems clear that only a few of the constituents found in the drilling/recycle pits may be of regulatory concern (TPH, chloride, and benzene).

- These constituents pose little risk to public health and the environment by the expected pathways of exposure.

- Based on OCD's proposed language, it appears that OCD's primary concern is odor and taste impacts on ground water.

- For evaluating risk...
  - BTEX and PAHs are better metrics than TPH
  - Sodium is a better metric than chloride

Does the proposed Pit Rule reduce actual risk?

- No, it mostly transfers the risk.
  - Transfers direct exposure risk to landfill
  - Transfers ground water impact to landfills

At what cost?

- In lives (0.85 – 2.53 fatalities/year)
- In injuries (14 – 41 injuries/year)
- In emissions (greenhouse gas emissions increased by up to 149,000 tons/year; airborne dust up to 41,000 tons/year)
- To ground water (low total mass of wastes in pits to high mass in landfills

yielding greater potential impact if released)
- In $ (more than $500,000,000 additional drilling costs over 10 years)
- In State revenue (unknown)

For what benefits?

- Speculative decrease in direct exposure

- Fewer pits with ground water impacts, by concentrating impacts at landfill locations

Based on my evaluation of the risk issues, I believe that the proposed Industry approach provides similar benefits at less cost:

- Small onsite pit closures (small mass of toxicant) present less overall risk to ground water than large concentrated landfills (large mass of toxicant)

  - If liners do not fail, both onsite pit closure and landfills are equally protective

  - If liners do fail, onsite pit closures are more protective than landfills

- Direct exposure risks (residential and construction) are *de minimis* for onsite pit closure

- Other cumulative impacts are minimized (e.g., lives, injuries, emissions, etc.)

Conclusions

If both OCD and Industry approaches achieve similar results, but Industry achieves same results at a lower cost, then:

- OCD is not making a risk judgment

- OCD is making a value judgment that the mere presence of "waste" justifies the costs in lives, injuries, emissions, etc., regardless of the risk that the "waste" objectively presents.

I hope that OCC will give consideration to the questions that I have raised, will consider the recommendations that I have made, and will render an appropriate judgment based on risk and benefit. I believe that such a judgment best serves the interests of the people of the State of New Mexico. Thank you.

Respectfully Submitted,

Ben Thomas

Ben Thomas, Ph.D.

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Anions & Cations

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ATTACHMENTS TO REPORT

A Corrected Summary Table (comparison to NMED SSLs version 4; deletion of halogenated surrogate compounds)

B Daniel B. Stephens & Associates, Inc. (2007). Effects of NMOCD Proposed Rule 53: Reserve Pits Removal.

ALL COMPOUNDS FOR WHICH AT LEAST ONE SAMPLE EXHIBITED A DETECTABLE CONCENTRATION (INCLUDING ESTIMATED VALUES = "J" CODE FOR ORGANICS or "B" CODE FOR METALS) -- COMPARISON WITH NMED SSLs (VERSION 4) [Revised 10/18/07]

Constituent	Form	Units	NMED SSL4[1]	SJC Avg	SJC Range	LC Avg	LC Range
METALS							
ARSENIC	Solid	mg/kg	3.9	4.1	ND - 6.6	2.3	1.4 - 4.7
	Leachate	mg/L		ND		ND	
BARIUM	Solid	mg/kg	15600	10001	910 - 27000	1763.4	19 - 7500
	Leachate	mg/L		0.69	0.31 - 1.4	0.298	ND - 0.57
CADMIUM	Solid	mg/kg	39	0.29	ND - 0.63	0.153	ND - 0.35
	Leachate	mg/L		0.0003	ND - 0.001	0.0022	ND - 0.0067
CHROMIUM	Solid	mg/kg	234	15.7	5.8 - 33	18.4	4.4 - 32
	Leachate	mg/L		0.007	ND - 0.028	0.011	ND - 0.042
COPPER	Solid	mg/kg	3130	36.7	18 - 120	15.2	ND - 130
	Leachate	mg/L		NM		NM	
IRON	Solid	mg/kg	23500	15356	9800 - 25000	8525.1	4400 - 26000
	Leachate	mg/L		NM		NM	
LEAD	Solid	mg/kg	400	46.1	32 - 210	9.2	1.4 - 24
	Leachate	mg/L		0.043	ND - 0.72	0.002	ND - 0.021
MANGANESE	Solid	mg/kg	3590	319.3	180 - 460	162.6	72 - 530
	Leachate	mg/L		NM		NM	
MERCURY	Solid	mg/kg	100000	0.294	0.0093-0.056	0.0211	0.0018-0.13
	Leachate	mg/L		0.000098	ND - 0.00024	0.00005	ND-0.0003
SELENIUM	Solid	mg/kg	391	0.436	ND - 2.4	0.36	ND - 2
	Leachate	mg/L		0.0077	ND - 0.062	0.0013	ND - 0.047
SILVER	Solid	mg/kg	391	0.045	ND - 0.28	0.3075	ND - 0.25
	Leachate	mg/L		ND		ND(2)NM(1)	

ATTACHMENT
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URANIUM	Solid	mg/kg	—	1.1	0.43 - 1.7	3.17	0.46-10
	Leachate	mg/L		NM		NM	
ZINC	Solid	mg/kg	23500	68	26 - 120	128.8	ND - 290
	Leachate	mg/L		NM		NM	
ANIONS							
CHLORIDE	Solid	mg/kg	—	3926	280-15,000	126278	ND - 420000
FLUORIDE	Solid	mg/kg	3670	1.7	ND-11	7.8	ND-77
NITRATE, AS NITROGEN	Solid	mg/kg	100000	22	ND-230	75	ND - 690
SULFATE	Solid	mg/kg	—	3324	ND-11,000	33056	ND - 72000
CYANIDE, TOTAL	Solid	mg/kg	1220	NM		0.1	ND-0.16
CATIONS							
CALCIUM	Solid	mg/kg	—	2814	140-15,000	14903	ND-31000
MAGNESIUM	Solid	mg/kg	10200	125	ND-850	313	ND-2100
POTASSIUM	Solid	mg/kg	—	2156	380-5,200	6409	ND-38000
SODIUM	Solid	mg/kg	—	5717	1,900-11,000	75928	6400-250000
VOLATILE ORGANIC COMPOUNDS							
ACETONE	Solid	mg/kg	28100	3.06	ND-21	1.043	ND-5.7
	Leachate	mg/L		NM		NM	
BENZENE	Solid	mg/kg	10.3	0.123	ND-0.59	8.17	ND-140
	Leachate	mg/L		0.00067	ND-0.01	0.118	ND-4.6
2-BUTANONE	Solid	mg/kg	31800	0.025	ND-0.36	NM	
	Leachate	mg/L		ND		NM	
N-BUTYLBENZENE	Solid	mg/kg	62.1	0.653	ND-1.7	4.7	0.07-39
	Leachate	mg/L		NM		NM	
SEC-BUTYLBENZENE	Solid	mg/kg	60.6	0.43	ND-1.2	2.2	ND-21
	Leachate	mg/L		NM		NM	
TERT-BUTYLBENZNE	Solid	mg/kg	106	0.09	ND-1.1	NM	
	Leachate	mg/L		NM		NM	

CARBON DISULFIDE	Solid	mg/kg	460	0.021	ND-0.044	0.001	ND-27
	Leachate	mg/L		NM		NM	
ETHYLBENZENE	Solid	mg/kg	128	0.516	ND-1.8	1.05	ND-3.7
	Leachate	mg/L		NM		NM	
ISOPROPYLBENZENE	Solid	mg/kg	—	0.187	ND-0.82	1.3	ND-15
	Leachate	mg/L		NM		NM	
P-ISOPROPYLTOLUENE	Solid	mg/kg	—	0.47	ND-0.80	2.05	ND-21
	Leachate	mg/L		NM		NM	
METHYLENE CHLORIDE	Solid	mg/kg	182	0.01	ND-0.05	NM	
	Leachate	mg/L		NM		NM	
3,4-METHYLPHENOL	Solid	mg/kg	—	0.08	ND-0.56	NM	
	Leachate	mg/L		ND		NM	
PHENOL	Solid	mg/kg	18300	2.04	ND-4.1	0.5	ND-5.8
	Leachate	mg/L		NM		NM	
N-PROPYLBENZENE	Solid	mg/kg	62.1	0.43	ND-1.4	7.6	ND-96
	Leachate	mg/L		NM		NM	
TETRACHLOROETHENE [3]	Solid	mg/kg	12.5	0.01	ND-0.17	NM	
	Leachate	mg/L		ND		NM	
TOLUENE	Solid	mg/kg	252	0.0813	ND-1.5	18.8	ND-280
	Leachate	mg/L		NM		NM	
1,2,4-TRIMETHYLBENZENE	Solid	mg/kg	58	3	ND-11	35.77	ND-540
	Leachate	mg/L		NM		NM	
1,3,5-TRIMETHYLBENZENE	Solid	mg/kg	24.8	1.1	ND-2.8	15	0.43-130
	Leachate	mg/L		NM		NM	
O-XYLENE	Solid	mg/kg	99.5	0.87	ND-2.9	1.9	ND-13
	Leachate	mg/L		NM		NM	
M+P-XYLENE	Solid	mg/kg	82	2.47	ND-6.1	3.6	ND-16
	Leachate	mg/L		NM		NM	

SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)							
BENZO(A)PYRENE	Solid	mg/kg	0.6	0.03	ND-0.25	NM	
	Leachate	mg/L		NM		NM	
1-METHYLNAPHTHALENE	Solid	mg/kg	—	4.8	ND-26	9.75	0.3-45
	Leachate	mg/L		NM		NM	
2-METHYLNAPHTHALENE	Solid	mg/kg	—	8.07	ND-260	11.15	ND-76
	Leachate	mg/L		NM		NM	
NAPHTHALENE	Solid	mg/kg	79.5	1.93	ND-8	11.95	ND-120
	Leachate	mg/L		NM		NM	
PETROLEUM HYDROCARBONS							
GASOLINE RANGE ORGANICS	Solid	mg/kg	—	44.7	ND-160	476.7	0.67-2500
	Leachate	mg/L		NM		NM	
DIESEL RANGE ORGANICS	Solid	mg/kg	—	1727	110-8000	7218	17-26000
	Leachate	mg/L		NM		NM	
OIL AND GREASE	Solid	mg/kg	—	2673.3	ND-26000	4991.7	240-19000
	Leachate	mg/L		NM		NM	
RADIUM							
Ra-226	Solid	pCi/g	—	1.45	0.93-1.97	1.01	ND-1.51
	Leachate	mg/L		NM		NM	
Ra-228	Solid	pCi/g	—	1.25	ND-1.8	0.175	ND-1.02
	Leachate	mg/L		NM		NM	
OTHER							
PH		pH	—	11	6.76-13.1	9.77	7.4-11.95
SPECIFIC CONDUCTIVITY		uMho/cm	—	1925	672-6900	22571.35	6670-65200

[1] New Mexico Environment Department (2006). Soil Screening Levels (SSLs), Revision 4.

[2] After issuing the report to the Governor's Task Force, discussion with the analytical laboratory revealed that several halogenated compounds initially identified as detected in the JDA pits were actually QC surrogates added by the laboratory to look at analyte recoveries. These compounds included 2,3,4-Trifluorotoluene and o-Terphenyl (used as surrogates for Method 8015 - TPH); Decachlorobiphenyl and Tetrachloro-m-xylene (used as surrogates for Method 8082 - PEST/PCB); 4-Bromofluorobenzene and Dibromofluoromethane (used as surrogates for Method 8260 - VOCs); 2-Fluorobiphenyl, 2-Fluorophenol, and 2,4,6-Tribromophenol (used as surrogates for Method 8270 - SVOCs). These compounds have therefore been deleted from this table.

[3] Tetrachloroethene was reported to be detected (170 mg/kg; no QC flag) in a single sample collected from Pit SJC-1 and analyzed at 5X dilution, but was not detected at 50X dilution. All other samples were non-detect for this compound.

[4] The analytical laboratory informed us that the 0.042 mg/kg value reported to us for Pentachlorophenol is not correct. It should have been reported as non-detect ("U" code). All analyzed samples were therefore found to be non-detect for this compound, and Pentachlorophenol has therefore been removed from this table.