

**Rule 53.G Specific Requirements
Applicable To Landfills**

- (1) Waste acceptance criteria**
- (2) Background testing for WQCC 3103 constituents**
- (3) Operation and waste treatment**
- (4) Treatment zone monitoring**
- (5) Vadose zone monitoring**
- (6) Treatment zone closure performance standards**
- (7) Disposition of treated soils**
- (8) Environmentally acceptable bioremediation
endpoint approach**

**Rule 53.G Specific Requirements
Applicable To Landfills**

- (1) Waste acceptance criteria**
- **Soils and drill cuttings predominantly contaminated by PHC < 50,000 mg/kg**
 - **Chlorides < 1000 mg/kg**
 - **May accept tank bottoms on case-by-case basis**
 - **Must pass paint filter test**

**Rule 53.G Specific Requirements
Applicable To Landfarms**

(2) Background testing

- **Background for all WQCC 3103 constituents**

Rule 53.G Specific Requirements Applicable To Landfarms

(3) Operation and waste treatment

- Berms to control run-on and run-off of rainwater
- Boundary restriction (100 feet)
- Pipeline restriction (20 feet)
- Eight-inch lifts
- Disked within 72 hours of receipt and biweekly thereafter
- Application of moisture as required
- Application of microbes requires prior division approval
- Pooling of liquids prohibited - remove freestanding water within 24 hours
- Records maintenance

**Rule 53.G Specific Requirements
Applicable To Landfarms**

(4) Treatment zone monitoring

- Spread contaminated soil in eight-inch or less lifts
- Semi-annual treatment zone monitoring
- Prior to adding an additional lift
 - reduce TPH < 2500 mg/kg
 - restrict chloride < 1000 mg/kg
- Maximum thickness of two feet
- Treat to Rule 53.G(6) closure standards or remove contaminated soils

**Rule 53.G Specific Requirements
Applicable To Landfarms**

(5) Vadose zone monitoring

- Sampling program: samples taken from between three and four feet
- Semi-annual monitoring program: four samples for TPH, BTEX, and chlorides
- Annual monitoring program: four samples for TPH, BTEX and chlorides plus WQCC 3103 metals and inorganics
- Record keeping requirements
- Corrective action for releases

Rule 53.C Specific Requirements Applicable To Landfills

(6) Treatment zone closure performance standards

- After reaching the maximum thickness of two feet, continue treatment until remediated to either background or the following:

Benzene:

0.2 mg/kg

BTEX:

50 mg/kg

TPH - GRO plus DRO:

500 mg/kg

TPH - TEPH:

1000 mg/kg

Chlorides:

1000 mg/kg

WQCC 3103 constituents:

BG or landfill soil

closure standards

Rule 53.G Specific Requirements Applicable To Landfarms

(6) Treatment zone closure performance standards

How did OCD determine appropriate soil closure performance standards?

- Constituent list taken from WQCC 3103
- Closure to background concentrations always allowed
- Soil concentrations were borrowed from other agencies, primarily from NMED
- OCD calculated chlorides concentrations

Rule 53.G Specific Requirements Applicable To Landfills

Soil concentrations were borrowed from other agencies

Benzene: NMED PSTB 2000 GUIDANCE
BTEx: OCD 1993 Guidance and draft Rule 50
TPH: Total Petroleum Hydrocarbons (TPH) NMED
SWB Regulations (1000 TPH for disposal in
landfill) and NMED, 2005: Residential Soil:
Appendix A - State of New Mexico Soil
Screening Levels - Table A-1 (new lift based
on waste oil = 2500 mg/kg)
3103: NMED, 2005: Residential Soil: Appendix A -
New Mexico Soil Screening Levels - Table
A-1 and other sources

Rule 53.G Specific Requirements Applicable To Landfarms

How did OCD determine appropriate landfarm treatment zone soil closure performance standards for constituents or parameters other than TPH, BTEX, and chlorides given that landfarms may treat soils contaminated with a very large number of constituents?

Constituent list taken from WQCC 3103 (20:6.2.3103 NM/AC

- Standards For Ground Water of 10,000 mg/l TDS

Concentration or Less, Sections A & B)

- WQCC 3103 consists of approximately 42 constituents or parameters
- "Toxic Pollutants" (20:6.2.7.VV NM/AC) includes 93 constituents, or classes of constituents, or isomers

Rule 53.G Specific Requirements Applicable To Landfarms

How appropriate is WQCC 3103 for soil standards?

- 3103 specifies constituents for protection of ground water
 - a major responsibility for OCD.
- 3103 lists 42 constituents: 34 of 42 are known crude oil or produced water constituents and all or almost all are known waste constituents appropriate for contaminated soil taken from oil field services sites.

Rule 53.G Specific Requirements Applicable To Landfills

WQCC Section 3103	EPA 1995	EPA 2000	TPHCWG 1998	WQCC Section 3103	EPA 1995	EPA 2000	TPHCWG 1998
Arsenic (As)	✓			total xylenes	✓	✓	✓
Barium (Ba)	✓	✓	✓	methylene chloride			✓
Cadmium (Cd)	✓	✓	✓	chloroform	✓		
Chromium (Cr)	✓	✓	✓	1,1-dichloroethane			
Chromium III	✓		✓	ethylene dibromide (EDB);	✓		
Chromium VI				1,2-dibromoethane	✓		✓
Cyanide (CN)				1,1,1-trichloroethane	✓		
Fluoride (F)				1,1,2-trichloroethane	✓		
Lead (Pb)	✓	✓		1,1,2,2-tetrachloroethane			
Total Mercury (Hg)	✓		✓	vinyl chloride			
Nitrate (NO3 as N)	✓			PAHs: total naphthalene plus	✓	✓	
Selenium (Se)	✓		✓	mesomethylnaphthalenes			✓
Silver (Ag)	✓	✓		benzo-a-pyrene			
Uranium (U)	✓						
Radioactivity: Combined Radium-226 & Radium-228		✓		Chloride (Cl)		✓	
Benzene	✓	✓		Copper (Cu)	✓	✓	
Polychlorinated biphenyls (PCBs)			✓	Iron (Fe)		✓	
Toluene	✓	✓	✓	Manganese (Mn)	✓	✓	
Carbon Tetrachloride	✓	✓	✓	Phenols	✓	✓	
1,2-dichloroethane (EDC)	✓	✓	✓	Sulfate (SO4)			
1,1-dichloroethylene (1,1-DCE)				TDS		✓	
1,1,2,2-tetrachloroethylene (PCE)	✓			Zinc (Zn)			
1,1,2-trichloroethylene (TCE)				pH			
ethylbenzene	✓	✓	✓	Aluminum (Al)	✓	✓	
				Boron (B)		✓	
				Cobalt (Co)	✓	✓	
				Molybdenum (Mo)	✓	✓	
				Nickel (Ni)		✓	

**WQCC Section 3103
20.6.2.3103 NMAC
47 Constituents**

**EPA, 1995
159 Constituents**

**EPA, 2000
47 Constituents**

**TPHCWG, 1998
159 Constituents in one
table, 10 additional tables**

Arsenic (As)	✓		
Barium (Ba)	✓	✓	✓
Cadmium (Cd)	✓	✓	✓
Chromium (Cr)	✓	✓	✓
Chromium III	✓		✓
Chromium VI			
Cyanide (CN)			
Fluoride (F)			
Lead (Pb)	✓	✓	
Total Mercury (Hg)	✓		✓
Nitrate (NO3 as N)	✓		
Selenium (Se)	✓		✓
Silver (Ag)	✓	✓	
Uranium (U)		✓	
Radioactivity: Combined		✓	
Benzene	✓	✓	
Polychlorinated biphenyls			✓
Toluene	✓	✓	✓
Carbon Tetrachloride	✓		✓
1,2-dichloroethane	✓		
1,1-dichloroethylene			
1,1,2,2-tetrachloroethylene	✓		
1,1,2-trichloroethylene (TCE)			
ethylbenzene	✓	✓	✓
total xylenes	✓	✓	✓
methylene chloride			✓
chloroform	✓		
1,1-dichloroethane			
ethylene dibromide (EDB);	✓		
1,2-dibromoethane			
1,1,1-trichloroethane	✓		✓
1,1,2-trichloroethane	✓		
1,1,2,2-tetrachloroethane			
vinyl chloride			
PAHs: total naphthalene plus monomethylnaphthalenes benzo-a-pyrene	✓	✓	✓
Chloride (Cl)		✓	
Copper (Cu)	✓	✓	
Iron (Fe)		✓	
Manganese (Mn)	✓	✓	
Phenols	✓	✓	
Sulfate (SO4)			
TDS		✓	
Zinc (Zn)	✓		
pH			
Aluminum (Al)	✓	✓	
Boron (B)		✓	
Cobalt (Co)	✓	✓	
Molybdenum (Mo)	✓	✓	
Nickel (Ni)		✓	

Plus 62 other compounds Plus 24 other compounds

References:

EPA, 1995. Sector Notebook Project - Petroleum Refining Industry. Exhibit 17.

EPA, 2000. Sector Notebook Project - Oil and Gas Extraction Industry. Table 5: Produced Water Effluent Concentrations

TPHCWG, 1998. Total Petroleum Hydrocarbon Criteria Working Group Series Volume 2 - Composition of Petroleum Mixtures

*Hazardous
WASTE
Bureau
Soil to GW
Pathway*

20.6.2.3103 NMAC Standards for Ground Water of 10,000 mg/l TDS Concentration or Less:		Soil Standards						Ground Water Protection Standards		
A. Human Health Standards	OCD Landfarm Soil Closure Stds (mg/kg)	NMED 2005 Residential Soil Screening Levels (mg/kg)	NMED 2005 DAF 1 (mg/kg)	EPA R3 RBCs DAF 1 (mg/kg)	EPA R6 SSLs DAF 1 (mg/kg)	EPA R9 PRGs DAF 1 (mg/kg)	EPA Superfund Soil Screening Guidance For Chemicals (mg/kg)	WQCC Section 3103 (mg/l)	EPA MCLs (mg/l)	TCLP (mg/kg)
Arsenic (As)	0.0146	3.90	0.0146	0.0013	1	1		0.1	0.01	5
Barium (Ba)	106	545	106	300.76	82	82		1	2	100
Cadmium (Cd)	1.37	39	1.37	1.37	0.4	0.4		0.01	0.005	1
Chromium (Cr)	2.1	NL	NL	NL	NS	NS		0.05	0.1	5
Chromium III (NMED SSL)	100,000	100,000	98,600,000	98,550,010.95	NS	NS		NL	NL	NL
Chromium VI (NMED SSL)	2.1	234	2.1	2.1	2	2		NL	NL	NL
Cyanide (CN)	7.35	1560	7.35	7.38	2	NS		0.2	0.2	NL
Fluoride (F)	329	4680	329	NL	NS	NS		1.6	4	NL
Lead (Pb)	400	400 IEUBK	400	NL	NS	NS		0.05	0.015	5
Total Mercury (Hg)	334	100,000	334	NS	0.1	NS		0.002	0.002	0.2
Nitrate (NO3 as N)	17.1	100,000	17.1	NS	NS	NS		10	10	NL
Selenium (Se)	0.953	391	0.953	0.95	0.3	0.3		0.05	0.05	1
Silver (Ag)	1.57	391	1.57	1.55	2	2		0.05	0.1	5
Uranium (U)	16.0	NL	NL	NS	NL	16.0 Residential soil	0.018	0.03	0.03	NL
Radioactivity: Combined Radium-226 & Radium-228	30 pCi/g 20.3.14.1403 NMAC	NL	NL	NL	NL	NL	Ra-226 0.016 pCi/g Ra-228 0.059 pCi/g	30 pCi/L	5 pCi/L	NL
Benzene	0.2 NMED PSTB 2000	3.32	0.0010	0.00009	0.0020	0.0020		0.01	0.005	0.5
Polychlorinated biphenyls (PCBs)	0.0224	1.1200	0.0224	0.02070	NL	NL		0.0010	0.0005	NL
Toluene	0.3470	252.0000	0.3470	1.33614	0.6000	0.6000			1	NL
Carbon Tetrachloride	0.0010	0.9650	0.0010	0.00011	0.0030	0.0030			0.005	0.5
1,2-dichloroethane (EDC)	0.0002	1.8200	0.0002	0.00005	0.0010	0.0010			0.005	0.5
1,1-dichloroethylene (1,1-DCE)	0.1330	24.9000	0.0150	0.14609	0.0030	0.0030			0.007	0.7
1,1,2,2-tetrachloroethylene (PCE)	0.0022	3.5200	0.0022	0.00023	0.0002	0.0002			0.005	0.7
1,1,2-trichloroethylene (TCE)	0.0001	0.2260	0.0001	0.00001	0.0030	0.0030			0.005	0.5
ethylbenzene	1.0100	128.0000	1.0100	0.74880	0.7000	0.7000			0.700	NL
total xylenes	0.1670	101.0000	0.1660	0.74880	10.0000	10.0000			10.000	NL
methylene chloride	0.0085	64.7000	0.0085	0.00095	0.0010	0.0010			NL	NL
chloroform	0.0004	1.2100	0.0004	0.00005	0.0300	0.0300			NL	6
1,1-dichloroethane	0.2010	1.8200	0.0002	0.25513	1.0000	1.0000			NL	0.5
ethylene dibromide (EDB)	0.000029	0.1820	0.000013	0.000003	NL	NL	0.000029		0.00005	NL
1,1,1-trichloroethane	1.3400	563.0000	1.3400	1.61987	0.1000	0.1000			0.200	NL
1,1,2-trichloroethane	0.0005	3.9000	0.0005	0.00004	0.0009	0.0009			0.005	NL
1,1,2,2-tetrachloroethane	0.0002	2.0000	0.0034	0.00003	0.0002	0.0002			NL	NL
vinyl chloride	0.000143	1.04 Child	0.000143	0.00001	0.0007	0.0007			0.002	0.2
PAHs: total naphthalene plus monomethylnaphthalenes	0.0197	25.2000	0.0197	0.00769	4.0000	4.0000			NL	NL
benzo-a-pyrene	0.6210	0.6210	NS	0.01872	0.4000	0.4000			NL	NL
B. Other Standards for Domestic Water Supply										
Chloride (Cl)	1000 OCD 2006	NL	NL	NL	NL	NL			250	NL
Copper (Cu)	51.5	3130	51.5	525.89	NS	NS			1	NL
Iron (Fe)	277	23,500	277	NS	NS	NS			1	0.3
Manganese (Mn)	334	10,200	334	47.6	NS	NS			0.2	0.05
Phenols	2.3700	18,300	2.3700	3.3288	5.0000	5.0000			NL	NL
Sulfate (SO4)	Background	NL	NL	NL	NL	NL			600	250
TDS	DNA	NL	NL	NL	NL	NL			1000	500
Zinc (Zn)	682	23,500	682	681.09	620	620			10	5
pH	between 6 and 9	NL	NL	NL	NL	NS			between 6 and 9	NL
C. Standards for Irrigation Use										
Aluminum (Al)	54,800	77,800	54,800	NL	NS	NS			5	0.05 to 0.2
Boron (B)	24	12,200	24	NS	NS	NS			0.75	NS
Cobalt (Co)	33.1	1520	33.1	NL	NS	NS			0.05	NS
Molybdenum (Mo)	3.7	391	3.7	NL	NS	NS			1	NS
Nickel (Ni)	47.7	1560	47.7	NL	7	7			0.2	NS

Water Quality Control Commission Regulations - 20.6.2.3103 NMAC - Standards For Ground Water Of 10,000 mg/l TDS Concentration Or Less (Sections A & B)
OCD Landfarm Soil Closure Standard: Proposed at Paragraph 14 of Subsection G of 19.15.1.53 NMAC - Based on the more protective concentrations of either direct ingestion/dermal contact or the soil-to-ground water-pathway (DAF 1) using various sources.

NMED, 2005: Residential Soil (mg/kg): Appendix A - State of New Mexico Soil Screening Levels - Table A-1

NMED 2005 DAF 1 (mg/kg) - The DAF accounts for leachate mixing in the aquifer. A leachate concentration that is protective of ground water is back calculated by multiplying the ground water standard for a given constituent by the DAF. A DAF of 1 implies no reduction in contaminant concentration occurs.

NS - Not specified

NL - Not listed

IEUBK - Integrated Exposure Uptake Biokinetic Model for Lead in Children

*DAF = 1
Dilution Attenuation
Factor of 1*

NMED 2005 - TABLE 1
TPH COMPOSITIONAL ASSUMPTIONS IN SOIL

Petroleum Product	C11-C22 Aromatics (%)	C9-C18 Aliphatics (%)	C19-C36 Aliphatics (%)
Diesel #2/ new crankcase oil	60	40	0
#3 and #6 Fuel Oil	70	30	0
Kerosene and jet fuel	30	70	0
Mineral oil dielectric fluid	20	40	40
Unknown oil (a)	100	0	0
Waste Oil (b)	0	0	100

(a) Sites with oil from unknown sources must be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

(b) Compositional assumption for waste oil developed by NMED is based on review of chromatographs of several types of waste oil. Sites with waste oil must be tested for VOCs, SVOCs, metals, and PCBs to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

NMED (2005) Table 2a.
TPH Screening Guidelines for Potable Groundwater (GW-1)

Petroleum Product	TPH		Concentration in Groundwater (mg/L)
	Residential Direct Exposure (mg/kg)	Industrial Direct Exposure (mg/kg)	
Diesel #2/crankcase oil	520	1120	1.72
#3 and #6 Fuel Oil	440	890	1.34
Kerosene and jet fuel	760	1810	2.86
Mineral oil dielectric fluid	1440	3040	3.64
Unknown oil (a)	200	200	0.2
Waste Oil (b)	2500	5000	Petroleum-Related Contaminants
Gasoline	Not applicable	Not applicable	Petroleum-Related Contaminants

(a) Sites with oil from unknown sources must be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

(b) Compositional assumption for waste oil developed by NMED is based on review of chromatographs of several types of waste oil. Sites with waste oil must be tested for VOCs, SVOCs, metals, and PCBs to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

NMED (2005) Table 2a.			
TPH			Concentration in Groundwater (mg/L)
Petroleum Product	Residential Direct Exposure (mg/kg)	Industrial Direct Exposure (mg/kg)	
Diesel #2/crankcase oil	520	1120	1.72
#3 and #6 Fuel Oil	440	890	1.34
Kerosene and jet fuel	760	1810	2.86
Mineral oil dielectric fluid	1440	3040	3.64
Unknown oil (a)	200	200	0.2
Waste Oil (b)	2500	5000	Petroleum-Related Contaminants
Gasoline	Not applicable	Not applicable	Petroleum-Related Contaminants

(a) Sites with oil from unknown sources must be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

(b) Compositional assumption for waste oil developed by NMED is based on review of chromatographs of several types of waste oil. Sites with waste oil must be tested for VOCs, SVOCs, metals, and PCBs to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines

1000

Residential Direct Exposure (mg/kg)	
Mean	976.67
Standard Error	350.33
Median	640
Mode	#N/A
Standard Deviation	858.13
Sample Variance	7.36E+05
Kurtosis	1.40
Skewness	1.38
Range	2300
Minimum	200
Maximum	2500
Sum	5860
Count	6

GRO X
DRO

CANADA-WIDE STANDARDS FOR PETROLEUM HYDROCARBONS (PHC) IN SOIL (2001)					
Table 1. Summary of Tier 1 Levels (mg/kg) for surface soil.*					
Land Use	Soil Texture	Fraction 1 nC6 to nC10	Fraction 2 nC11 to nC16	Fraction 3 nC17 to nC34	Fraction 4 >nC35
Residential/Parkland	Coarse-grained soil	(c.) 30	(c.) 150	400	2800
	Fine-grained soil	260	900	800	5600
		(b) 180	(b) 250		
Agricultural	Coarse-grained soil	130	450	400	2800
	Fine-grained soil	260	900	800	5600
		(b) 180	(b) 250		
Commercial	Coarse-grained soil	310	760	1700	3300
	Fine-grained soil	(a) 230	(a) 150		
		660	1500	2500	6600
Industrial	Coarse-grained soil	310	760	1700	3300
	Fine-grained soil	(a) 230	(a) 150		
		660	1500	2500	6600
		(b) 180	(b) 250		
* Additional Tier 1 levels are presented in Technical Supplement.					
(a) Where applicable, for protection against contaminated groundwater discharge to an adjacent surface water body.					
(b) Where applicable, for protection of potable groundwater.					
(c.) Assumes contamination near residence with slab-on-grade construction.					

Descriptive Statistics

Fraction 1 + Fraction 2		Fraction 1 + Fraction 2		Fraction 3 + Fraction 4		Fraction 3 + Fraction 4	
Speciated for protection of surface water and ground water				For residential and agricultural use		For all land uses	
Mean	187.33	Mean	419.66	Mean	2400	Mean	2962.5
Standard Error	15.41	Standard Error	71.60	Standard Error	778.28	Standard Error	527.41
Median	180	Median	250	Median	1800	Median	2650
Mode	180	Mode	180	Mode	400	Mode	400
Standard Deviation	59.70	Standard Deviation	385.56	Standard Deviation	2201.30	Standard Deviation	2109.62
Sample Variance	3.56E+03	Sample Variance	1.49E+05	Sample Variance	4.85E+06	Sample Variance	4.45E+06
Kurtosis	2.19	Kurtosis	2.53	Kurtosis	-1.18	Kurtosis	-0.78
Skewness	-1.15	Skewness	1.73	Skewness	0.74	Skewness	0.61
Range	220	Range	1470	Range	5200	Range	6200
Minimum	30	Minimum	30	Minimum	400	Minimum	400
Maximum	250	Maximum	1500	Maximum	5600	Maximum	6600
Sum	2810	Sum	12170	Sum	19200	Sum	47400
Count	15	Count	29	Count	8	Count	16

Rule 53.G Specific Requirements Applicable To Landfarms

Alternative sources of crude oil, produced water, and TPH constituents (does not address oil field services waste).

EPA, 1995. Sector Notebook Project - Petroleum Refining Industry. Exhibit 17 (159 constituents)

EPA, 2000. Sector Notebook Project - Oil and Gas Extraction Industry. Table 5: Produced Water Effluent Concentrations (47 constituents)

TPHCWG, 1998. Total Petroleum Hydrocarbon Criteria Working Group Series Volume 2 - Composition of Petroleum Mixtures (159 constituents in Table 14 - CRUDE OIL n.b.; There are 10 other tables)

Rule 53.C Specific Requirements Applicable To Landfarms

Landfarm treatment zone soil closure performance standards

Industry has asserted that OCD's proposed standards were not based on "sound science" and recommended that OCD adopt NIMED's PSTB risk based decision making (RBDM) process. Industry was particularly concerned about two main issues:

1. TPH soil closure standards cannot be achieved
2. "Other" soil closure standards should be limited to BTTEX using a ten times the NIMED PSTB Tier 1 concentration, specifically recommending that OCD allow small amounts to migrate below the treatment zone.

Rule 53.G Specific Requirements Applicable To Landfarms

Landfarm treatment zone soil closure performance standards

Q: Why did OCD reject industry's recommendations to base all closure soil concentration standards on risk-based concentrations and to use the "Bioremediation Endpoint" approach for TPH?

A: OCD rejects Industry's concept that large landfarms (up to 500 acres in size) that handle large volumes of poorly characterized oil contaminated waste and that will be operational for years should be allowed to contaminate the environment, even in "small amounts." Rule 53 is designed to prevent releases, not to permit releases.

Rule 53.G Specific Requirements Applicable To Landfills

(Risk-based approach continued): As previously noted, OCD intentionally "borrowed" from other sister waste management agencies, such as NIMED's Solid Waste, Ground Water Quality, and Hazardous Waste Bureaus because of similar waste streams, technology, administrative issues such as permitting requirements, and environmental concerns such as protection of ground water. NIMED's PSTB Remedial Action Program is not a waste management program and deals primarily with small-scale UST/AST accidental spills, not large landfills at which Operators will intentionally apply large volumes of contaminated soil.

Rule 53.G Specific Requirements Applicable To Landfarms

(Risk-based approach continued): Industry's "risk based" approach would set oil field waste management standards to as low a standard as can be justified. (*"No pathway, no risk"*). OCD chose to propose waste management rules that are based on Best Management Practices (*"No release, no risk"*).

There is no logical reason to allow even "small amounts" of contamination to be released from any surface waste management facility, regardless of whether it is a landfarm, landfill, oil treatment plant, or evaporation pond. The requirements for large-scale treatment and disposal facilities should be much for stringent than those for a small-scale spill site.

Rule 53.C Specific Requirements Applicable To Landfarms

(Risk-based approach continued): OCD rejects Industry's proposed "risk-based" approach because of the size of the surface waste management facilities and the length of time that these facilities may be operational; therefore, OCD determined that a BMP standard is appropriate for surface waste management facilities.

Rule 53.G Specific Requirements Applicable To Landfarms

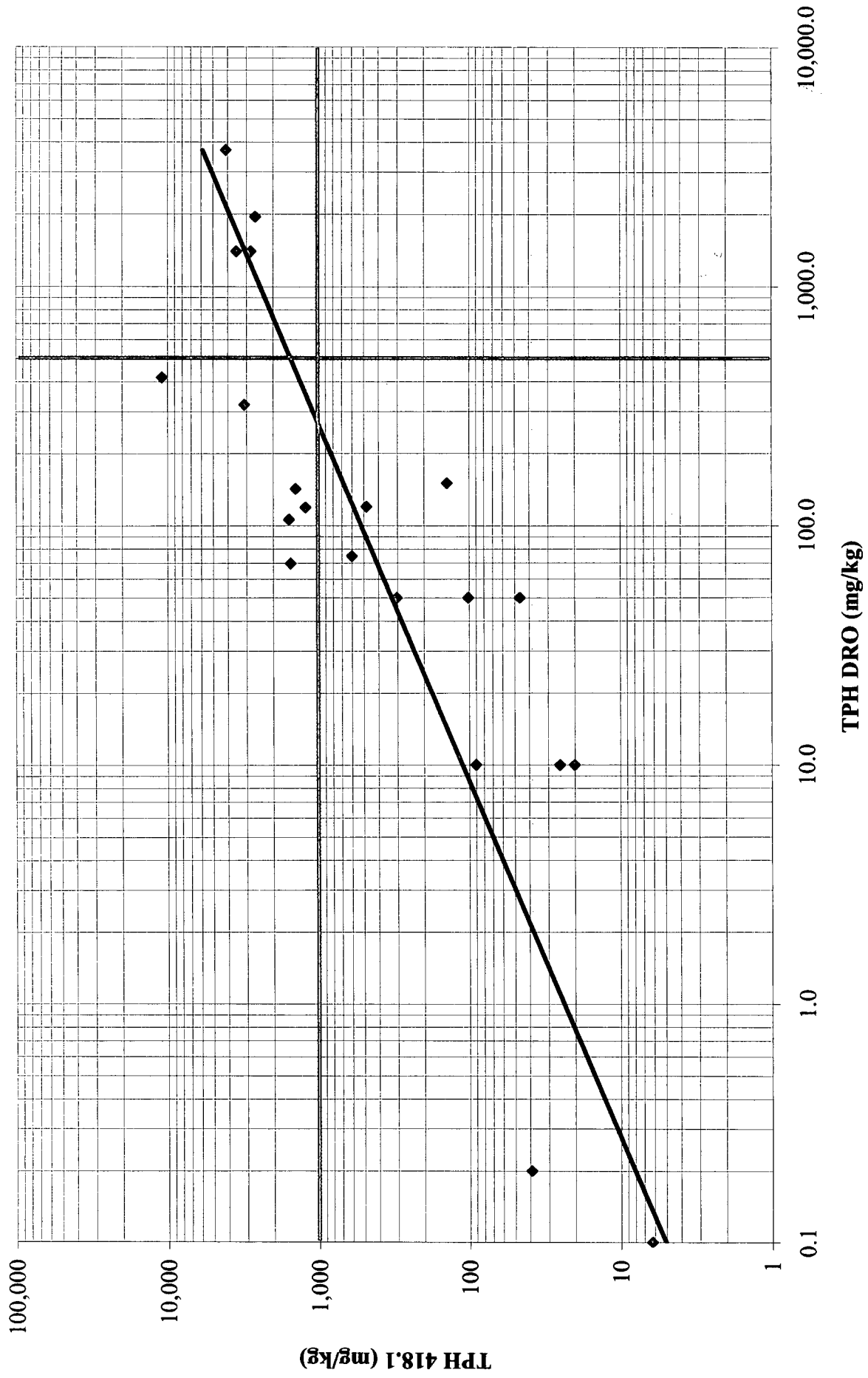
Landfarm treatment zone soil closure performance standards

Q: Why did OCD reject industry's recommendations to base all closure soil concentration standards on risk-based concentrations and to use the "Bioremediation Endpoint" approach for TPH?

A: OCD disagrees with Industry's assertion that landfarms simply cannot achieve the TPH GRO-DRO standard of 500 mg/kg based on its own experience with New Mexican landfarms. New Mexican Landfarm Operators commonly have been able to achieve TPH-DRO treatment zone concentrations that would meet the old standard of < 100 ppm.

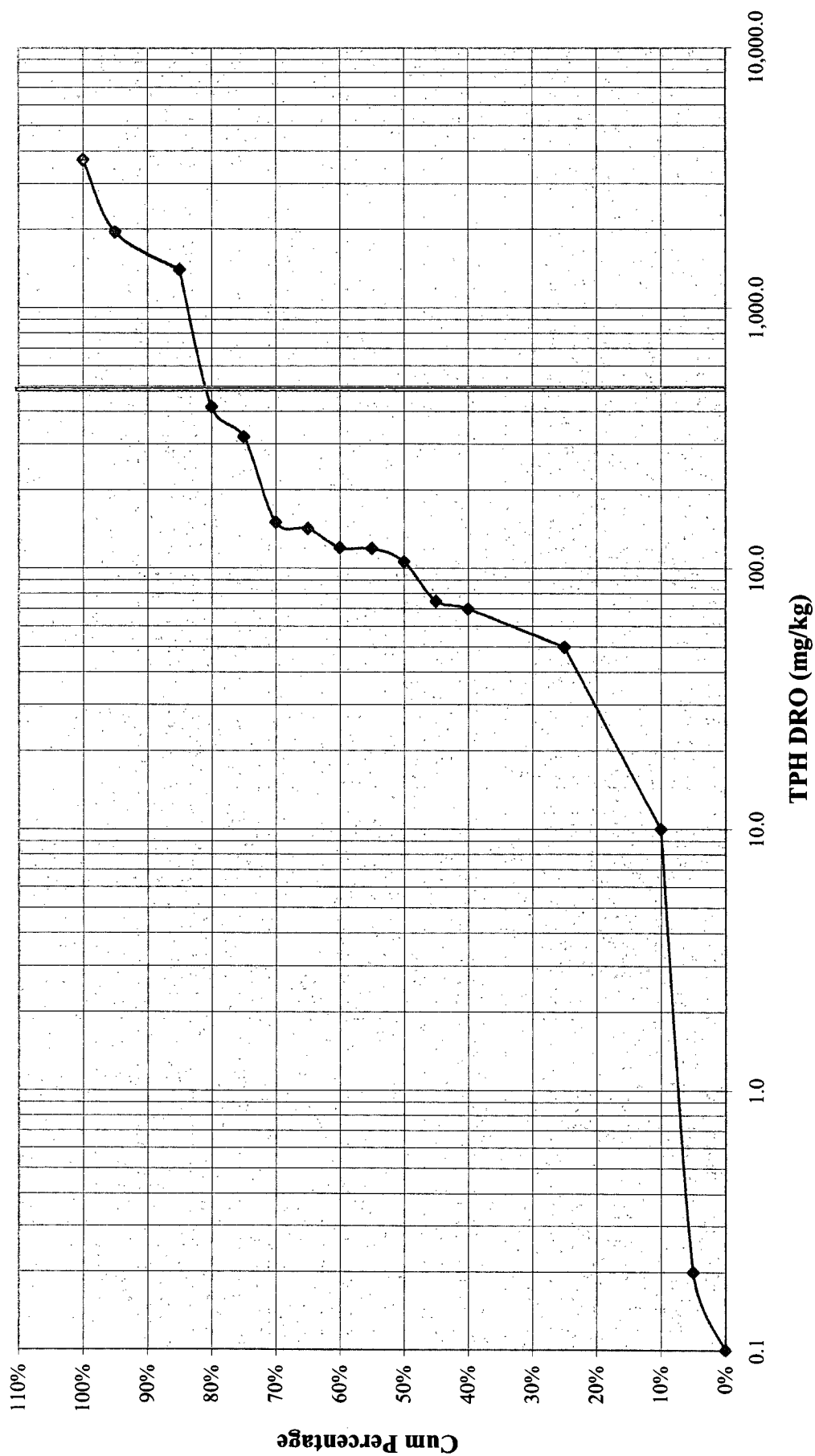
LEA COUNTY LANDFARMS (2006)

LEA AND SAN JUAN COUNTY LANDFARMS (2006)



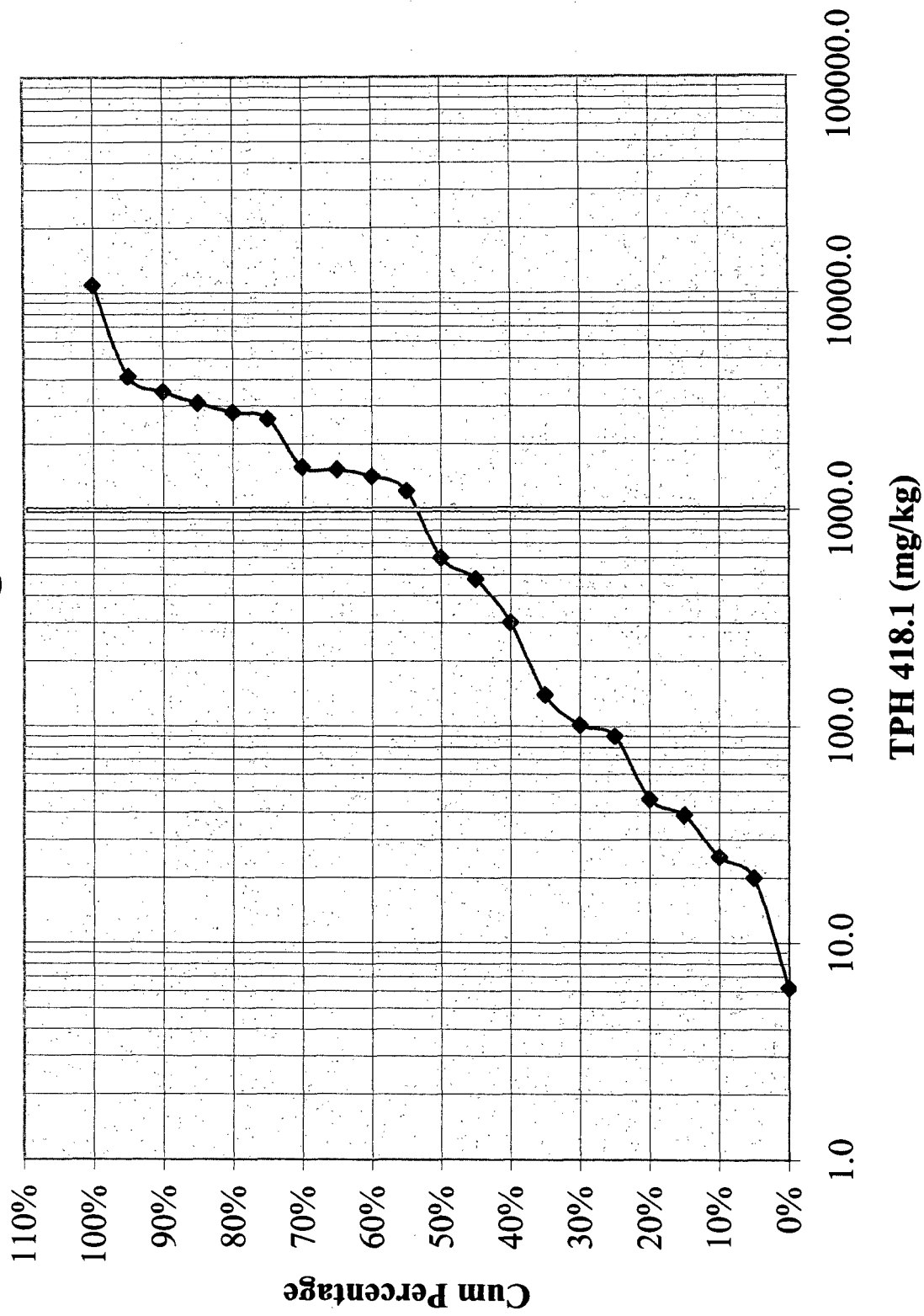
Q192A

Cum Percentage TPH DRO



0192B

Cum Percentage 418.1



01922

Rule 53.G Specific Requirements Applicable To Landfarms

Landfarm treatment zone soil closure performance standards

“Bioremediation Endpoint” approach for TPH continued:

A: After careful consideration of Industry’s proposed “Bioremediation Endpoint,” OCD determined that not all soils and drill cuttings predominantly contaminated by petroleum hydrocarbons are amenable to bioremediation in a landfarm. Therefore, OCD allowed Operators to follow an “Environmentally Acceptable Bioremediation Endpoint” approach that requires an 80% reduction in TPH.

Rule 53.G Specific Requirements Applicable To Landfarms

Landfarm treatment zone soil closure performance standards

OCD based the rest of the proposed soil concentrations standards for the WQCC 3103 constituents on the soil screening concentrations in the NMED 2005 *Technical Background Document For Development Of Soil Screening Levels*. For WQCC constituents not considered by NMED, OCD considered the various "soil cleanup lists" issued by EPA Regions 3, 6, and 9 and EPA Superfund. As previously noted, OCD determined that it should be consistent with other waste management programs such as NMED's Solid Waste, Hazardous Waste, and Ground Water Quality Bureaus.

“The goal of Rule 53 is to protect human health and the environment by ensuring through sensible waste management practices (i.e.; BMPs) that operators will prevent pollution by ensuring that no new releases of oil field waste occur as a result of the operations of surface waste management facilities.”

Rule 53.G Specific Requirements Applicable To Landfarms

Landfarm treatment zone soil closure performance standards

Q: What assumptions did OCD make?

A: OCD assumed unrestricted, residential land use during post-closure. Given the large size and large variety of contamination that may be handled at a landfarm, OCD chose conservative soil concentration standards. However, the most conservative standard would be to background. OCD chose the more protective concentration of either direct ingestion/dermal contact or the soil-to-ground water-pathway using the most conservative Dilution Attenuation Factor (DAF 1) taken from various sources.

**OCD DRAFT RULE 53.G
LANDFARM OPERATING STANDARDS**

CONSTITUENTS	WASTE ACCEPTANCE CRITERIA	NEW LIFT	CLOSURE
	may accept tank bottoms on case-by-case basis must pass Paint Filter Test		
Benzene	NS	NS	0.2 mg/kg (NMED PSTB 2000 GUIDANCE)
BTEX (8021B)	NS	NS	50 mg/kg (OCD 1993 Guidance and draft Rule 50)
TPH	50,000 mg/kg	2500 mg/kg (NMED 2005 Waste Oil)	1000 mg/kg {SWB Regulations)
GRO/DRO(8015M)	NS	NS	500 mg/kg (CWS 2001 for PHC In Soil)
TEPH (418.1)	NS	NS	1000 mg/kg (SWB Regulations)
TPH using Environmentally Acceptable Bioremediation Endpoint approach.	NS	NS	1) TPH reduced by 80% 2) rate of reduction in TPH concentration is essentially zero.
Chlorides (300.1)	1000 mg/kg OCD 2006	1000 mg/kg OCD 2006	1000 mg/kg OCD 2006

NMED'S SOLID WASTE MANAGEMENT REGULATIONS - 20.9.1.700 NMAC - SPECIAL WASTE REQUIREMENTS:
H. Petroleum Contaminated Soils: (5) Remediation shall be deemed adequate when the following conditions are met in a soil sample of what appears to be the most contaminated soil:
(b) the TPH concentration is less than 1,000 mg/Kg.

Rule 53.G Specific Requirements Applicable To Landfills

(7) Disposition of treated soils

- If the treatment zone closure standards are met:
 - leave the treated soil in place or
 - dispose or reuse the treated soil in an alternative manner
- If the treatment zone closure standards are not met:
 - dispose in a OCD landfill
 - reuse or recycle it in a manner approved by the division
- Alternative soil closure standards possible on case-by-case basis with public notice

Rule 53.G Specific Requirements Applicable To Landfarms

(8) Environmentally acceptable bioremediation endpoint approach

- In lieu of TPH requirements only
- Bioremediation endpoint
- Environmentally acceptable bioremediation endpoint
- Detailed landfarm operations plan required
- Dedicated landfarm cells required
- Detailed information required
- Additional operational requirements

**Rule 53.G Specific Requirements
Applicable To Landfarms**

**(8) Environmentally acceptable bioremediation endpoint
approach**

- In lieu of TPH requirements only

Rule 53.G Specific Requirements Applicable To Landfarms

(8) Environmentally acceptable bioremediation endpoint approach

- Bioremediation endpoint: TPH reduced to a minimal concentration and the rate of reduction is zero
- Environmentally acceptable bioremediation endpoint: TPH reduced by at least 80% and the rate of reduction is zero

**Rule 53.G Specific Requirements
Applicable To Landfarms**

**(8) Environmentally acceptable bioremediation endpoint
approach**

- Detailed landfarm operations plan required
 - o dedicated landfarm cells required

Rule 53.G Specific Requirements Applicable To Landfarms

(8) Environmentally acceptable bioremediation endpoint approach

- Additional operational requirements
- characterize native soil
 - characterize contaminated soil
 - operating procedures
 - management procedures

Rule 53.G Specific Requirements Applicable To Landfarms

- additional operational requirements
 - Characterize native soil
 - treatment cell size
 - soil porosity
 - soil bulk density
 - soil pH
 - moisture content
 - field capacity
 - organic matter concentration
 - soil structure
 - sodium adsorption ratio (SAR)
 - electrical conductivity (EC)
 - soil composition
 - soil temperature
 - soil nutrient (C:N:P) concentrations
 - oxygen content

Rule 53.G Specific Requirements Applicable To Landfills

- additional operational requirements
 - Characterize contaminated soil:
 - petroleum hydrocarbon loading factor
 - TPH
 - BTEX
 - chlorides
 - WQCC 3103 constituents
 - soil moisture
 - soil pH
 - ~~○ TCH~~
 - API gravity (if available)

Rule 53.G Specific Requirements Applicable To Landfills

- additional other operational requirements
 - Operating procedures:
 - tilling
 - petroleum hydrocarbon loading
 - pH maintenance
 - nutrients
 - moisture
 - TPH concentrations

Rule 53.G Specific Requirements Applicable To Landfills

- Additional operational requirements
 - Management procedures:
 - schedule operations
 - record keeping
 - sampling and analysis plan (SAP)
 - statistics
 - reporting
 - endpoint determination
 - closure and post-closure plans

API GRAVITY vs 2005 PRODUCTION

Mode: 38 API
Weighted Ave: 39.24 API

