INDEPENDENT PETROLEUM
ASSOCIATION OF NEW MEXICO

OCD CASE NOS. 14784 AND 14785

IPANM Petition to amend Title 19, Chapter 15, part 17 (The PIT Rule)

May 14 – 18, 2012

IPANM exhibit 6
Slide presentation by Mullins
- Ten (10) pages -

Pit Release Modeling

Temporary Drilling Reserve Pit Risk Assessment Modeling for
New Mexico Rule 17 Modifications

Case # 14784 (NMOGA)
Case # 14785 (IPANM)

Prepared by Thomas E. Mullins, P.E.
May 2, 2012

Prepared for the Independent Petroleum Association of New Mexico

Risk Assessment

Saturated Flow of water is different from Unsaturated Flow. Focus is on diffuse natural recharge.

Utilized similar assumptions and conservative modeling parameters used by the NMOCD during the 2007 and 2009 Pit Rule Hearings

Existing presence of "Salt Bulge" in current soil profile verifies little salt migration through the Vadose zone over the past 10,000 to 16,000 years.

Infiltration rates can be as low as 0.03 mm/yr to 0.1 mm/yr (Walvoord and Scanlon, 2004)

Modeling includes horizontal transport (100 feet) in the aquifer.

Model drives flux down, does not support negative flux.

Predictive Models

Hydrologic Evaluation of Landfill Performance (HELP) Model

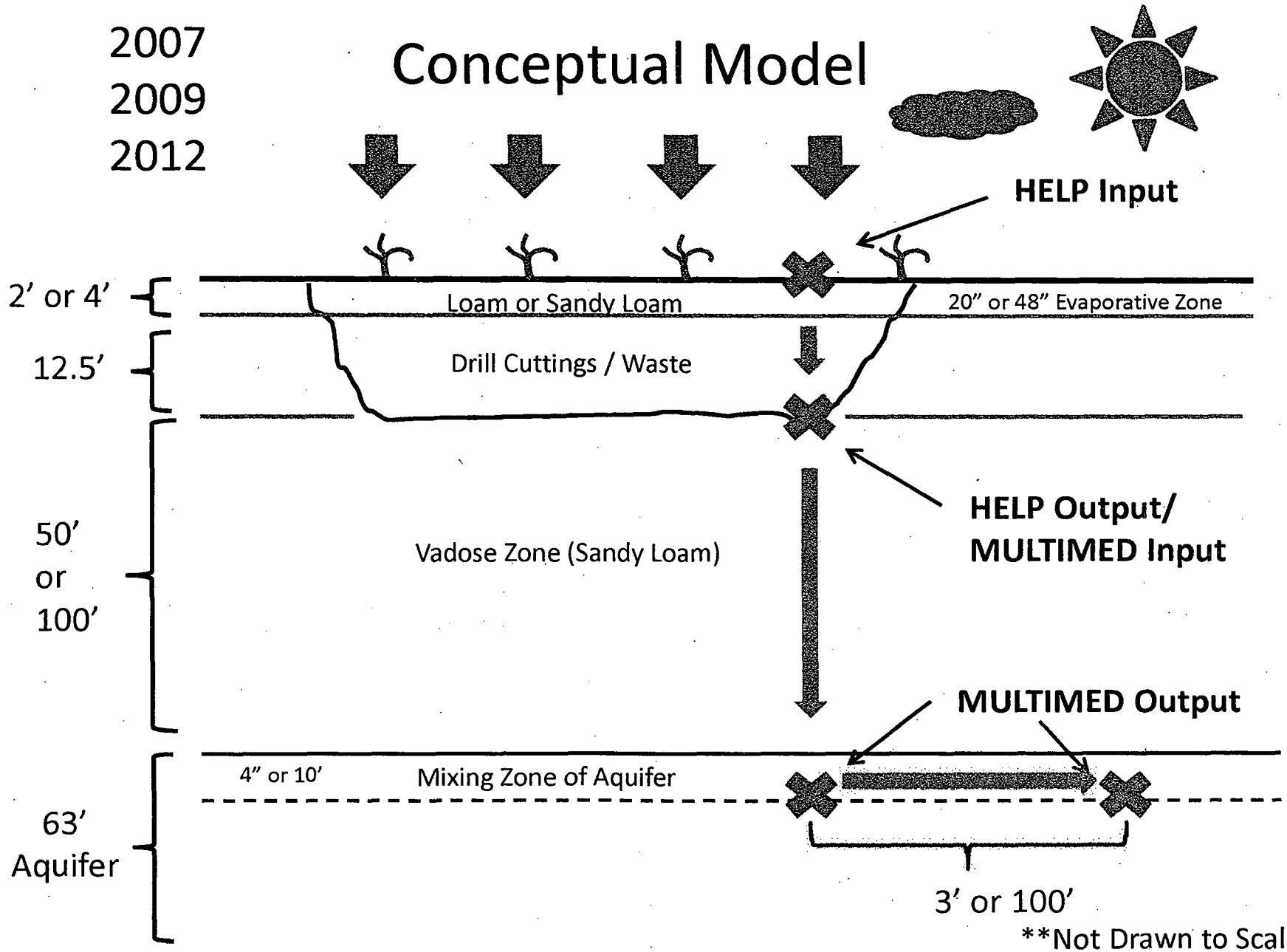
- US Army Corp of Engineers for the EPA
- Water balance model that includes:
Surface Storage, Snowmelt, Runoff, infiltration, Evapotranspiration, Vegetative Growth, Soil Moisture Storage, Lateral Subsurface Drainage, Unsaturated Vertical Drainage, Leakage through Soil, Geo-membrane or Composite Liners
- Used by many States and within Industry

Multimedia Exposure Assessment (MULTIMED) Model

- 2-Dimensional EPA Model
- Vadose Zone and Aquifer Transport
- Determines release concentrations over time at bottom of Vadose Zone and in the Aquifer

2007
2009
2012

Conceptual Model



HELP Model

Model Input Parameters

Weather Data

- Daily Precipitation & Wind Speed
- Daily Temperature & Humidity
- Daily Solar Radiation Indexes
- Daily Evaporation Indexes

Soils Data

- Number of Layers
- Layer Thickness
- Soil Porosity
- Soil Wilting Point
- Hydraulic Conductivity
- Type of Cover Material
- Evaporative Zone Depth
- Type of Layer
- Soil Types
- Soil Field Capacity
- Initial Soil Moisture
- Quality of Liner Installation
- Slope of Cover Material

MULTIMED Model

Model Input Parameters

Vadose Zone Variable

Thickness	Saturated hydraulic conductivity
Effective porosity	Residual Water Content
Long. Dispersivity	Percent Organic Matter
Bulk Density of Soil	Biological Decay coefficient

Source specific variables

Infiltration Rate (HELP)	Area of waste disposal
Duration of Pulse	Initial Concentration (100,000 mg/l)

Aquifer specific variables

Effective Porosity	Bulk Density
Thickness	Conductivity
Gradient	Dispersivities
Well Distance from site	

HELP Conceptual Model

Model Input Parameters

- Evaporative Zone Depth limited to top (48 inches) – IPANM

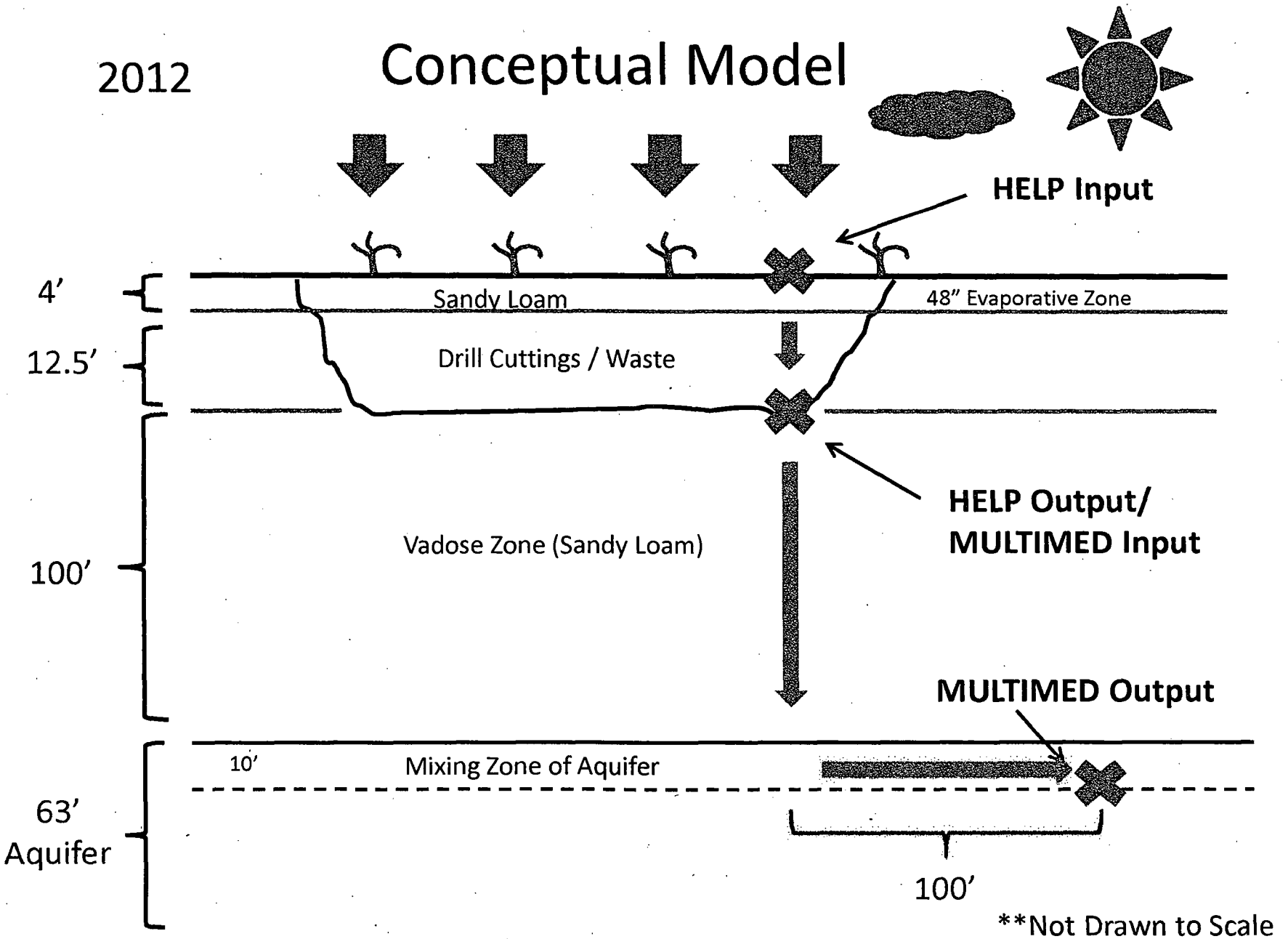
- Precipitation Values utilized for Hobbs, Maljamar, Roswell, Carlsbad, & Artesia.

- NMOCD utilized 50 years of data from Hobbs, NM & Dulce, NM in prior Hearings (1951 to 2000) to create synthetic forecasts.

- IPANM utilized 50 year synthetic models based upon Roswell, NM temperature and solar profile with actual monthly average precipitation for multiple locations in Southeast New Mexico, adjusted solar effect for Latitude.

- Utilized 4' of Soil Cover in all instances, with Liner on bottom of Pit.

2012 Conceptual Model



Southeast New Mexico Focus

48" Evaporative Depth	Carlsbad	Roswell	Artesia	Maljamar	Hobbs
Annual Average Precipitation:	14.1"	13.4"	13.4"	16.1"	18.2"
Elevation (m):	950	1,106	1,035	1,266	1,115
HELP Model Infiltration Rates Liner (mm/yr):	1.53	1.17	1.06	0.51	1.42
Years until reaching 100' Lateral @ 100' depth:	3,100	4,050	4,400	9,200	3,300
Years until max Cl:	4,500	5,750	6,200	12,800	4,800
Max Cl (mg/l) @ 100' lateral distance:	68	40	33	8	58

Conclusions

4' of Soil Cover protective in all instances.

No liner necessary on top of pit.

100' Siting Requirement is protective of public health & environment

Precipitation and Evaporative zone depths drive Infiltration Rates

Based upon HELP modeling and MULTIMED modeling of Chloride most mobile source, there is negligible risk to human health, the environment, the public, or accessible groundwater from 10 percent chloride leachate.

No testing of pit contents is necessary where GW is greater than 100'.