NASA White Sands Test Facility

Environmental Program

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List of Permits

- 12 Permits (8 specifically support test operations)
  - NM8800019434-1: RCRA permit for 200 Area evaporation tanks
  - NM8800019434-1: RCRA permit for 500 Area hydrazine storage tanks
  - NM8800019434-2: RCRA post-closure care permit for 5 closed units
  - DP-392: Wastewater discharge permit for 6 site-wide operating sewage lagoons
  - DP-584: Wastewater discharge permit for STGT operating sewage lagoon
  - DP-697: Wastewater discharge permit for Test Stand 302 cooling pond
  - DP-1170: Wastewater discharge permit for 400 Area pond system
List of Permits

- DP-1255: Discharge permit for injection of treated groundwater
- 629-M-3(a): Air permit for Test Stand 302 cooling tower
- 629-M-3(b): Air permit for Test Stand 302 boiler system
- 629 Area 400-M-1(a): Air permit for 400 Area boiler system
- 629 Area 400-M-1(b): Module minute limitations for chemical steam generator
- 629 Area 800: Air permit for Test Cell 844 emissions
- Area 700-HEBF: Air permit for 700 Area explosion testing operations
- 700-PCC: Post-closure care permit for closed solid waste landfill
Environmental Compliance Program

• Six WSTF Core Capabilities:
  – Remote Hazardous Testing of Reactive, Explosive, and Toxic Materials and Fluids
  – Hypergolic Fluids Materials and Systems Testing
  – Oxygen Materials and System Testing
  – Hypervelocity Impact Testing
  – Flight Hardware Processing
  – Propulsion Testing
Remote Hazardous Testing of Reactive, Explosive, and Toxic Materials and Fluids

Enabling:
• Toxic and Criteria Emissions Permit (Area 700-HEBF)
• Hazardous Waste Operating Permit (NM8800019434-1)
Hypergolic Fluids Materials and Systems Testing

Enabling:
• Toxic and Criteria Emission Permit (629 Area 800)
• Hazardous Waste Operating Permit (NM8800019434-1)
• Grandfathered Status for Historical Emissions
Hypergolic Fluids Materials and Systems Testing (cont’d)

Enabling:
- Hazardous Waste Operating Permit (NM8800019434-1)
- Grandfathered Status for Historical Emissions

Evaporation Tank Unit

Ignition Test
300 Propulsion Testing

Enabling:
- Toxic and Criteria Emission Permit (629-M-3)
- Discharge Permit (DP 697)
- Hazardous Waste Operating Permit (NM8800019434-1)
- Grandfathered Status for Historical Emissions
400 Propulsion Testing

Enabling:

- Toxic and Criteria Emission Permit (629 Area 400-M-1)
- Discharge Permit (DP 1170)
- Hazardous Waste Operating Permit (NM8800019434-1)
- Grandfathered Status for Historical Emissions

Static firing of DC-X with 4 LOX/Hydrogen RL10-A5 engines

500 Fuel Treatment Unit

Cassini - Saturn orbit insertion engine glows during 3 h 20 min continuous firing
Flight Hardware Processing

Enabling:

- Currently: Hazardous Waste Operating Permit (NM8800019434-1)
- Waste Management Generator

Requirements could be accomplished without an operating permit
Oxygen Materials and System Testing

Enabling:

- Currently: Hazardous Waste Operating Permit (NM8800019434-1)
- Waste Management Generator Requirements could be accomplished without an operating permit
Hypervelocity Impact Testing 270/272

Enabling:

• Currently: Hazardous Waste Operating Permit (NM8800019434-1)
• Waste Management Generator Requirements could be accomplished without an operating permit
Permit/Grandfathered Status & Challenges

• Hazardous Waste Operating Permit
  – Application fee: ~$75K/10yr
  – Operational costs: ~$0.5-1M/yr
  – Current risks:
    • NMED’s Draft Permit contained significant operational changes that if implemented, could result in cost increases up to several million dollars (One-time costs + procedural changes)
    • Prepared for negotiations – waiting on NMED to set dates

• Air Permits
  – Requires: Valid testing using system every 5 years
Permit/Grandfathered Status

- Discharge Plans
  - Renewed every 5 years, not dependent on testing
  - Operational costs: ~$25K/yr
- Grandfathered Status
  - Priceless
  - Requirement: perform valid test within area every 5 years to maintain status
  - Loss of status is permanent
Environmental Program

- Restoration Program
  - Background
  - Plume Front Treatment System
    - Renewable energy
  - Mid-Plume Interception Treatment System
    - Innovative treatability studies
  - Other Clean-up Activities
  - Challenges
Restoration Program

• Historic operations and practices beginning in the 1960s (through the early 1980s) resulted in contamination of WSTF’s groundwater.
  – Propulsion system testing programs:
    • N-Nitrosodimethylamine (NDMA)
    • Dimethylnitramine (DMN)
  – Component servicing and cleaning operations:
    • Trichloroethene (TCE)
    • Tetrachloroethene (PCE)
    • Freons (11, 21, and 113)

• WSTF contaminated ground water is NASA HQ’s greatest liability (estimated at $350M)
Environmental Restoration

• Priority: Protect the public’s health and the health of our workforce
  – Stop Unhealthy Practices
    • Proper hazardous materials and waste processes
  – Determine Nature & Extent
    • Measure, Model, and Monitor (over 106 records)
  – Containment
    • Stop the migration of contaminated groundwater
    • Greatest health-risk liability pursued initially
      – Plume Front
      – Mid-Plume
      – Source Areas
  – Restoration
    • Clean-up the environment to preexisting conditions
Closed Source Areas (Stop Unhealthy Practices)

- Three underground storage tanks in 200 area (2 closures)
- Ponds and mixing tank in 300 area
- Ponds and mixing tank in 400 area
- Two connected ponds in 600 area
- Old Landfill
Determine Nature & Extent (150/220 locations, TCE plume)
TCE Concentration in ppb (Using Surfer 8.0)

Determine Nature & Extent
Public and Employee Assessment

• No impact to any drinking water well
  – Includes public wells and the NASA supply well

• No public exposure
  – Groundwater is several hundred feet below ground
  – No air or surface water exposure
  – Plume is moving very slowly to the west
    • Plume Front Treatment System will stop this westward movement

• NASA performs on-going monitoring
  – More than 200 wells and zones are routinely sampled
  – ~850 samples are obtained monthly and analyzed for over 300 different hazardous chemicals
Containment and Restoration

- A Staged Approach over ~60 years:
  - Attack the greatest risk to public health first
    • Stabilize the plume front (in progress)
  - Stop migration of contaminant into the front
    • Extraction and treatment at the Mid-Plume Constriction Area (~2009)
  - Stop migration into the Mid-Plume Constriction Area
    • Clean up the source areas (~2012-2015)
**Plume Front Treatment System**

- **Containment & Partial Restoration:**
  - Stop westward movement of the plume to protect drinking water and irrigation wells
    - Extract the contaminated water from the aquifer
    - Remove chemicals using best available technology
    - Return (inject) the treated water back to the aquifer

- The Plume Front Treatment System is operational
Contaminated water containing nitrosamines and VOCs

Extraction Wells

1
2
3
4A
5
7

VOCs Removed

Air Strippers

Water Filters

UV Tower

Particulate filtration

Plume Front Treatment System

UV-Photolysis of Nitrosamines

Treated water Injected back into aquifer

Injection Wells

1
2
3
4
North East Environmental Products (NEEP) Air Strippers in Bldg. 650
Calgon Rayox® Tower UV Reactor in Bldg. 650
Renewable Energy

- PFTS electrical costs ~ $300-500K/yr for ~1MW
- Energy Storage Unit – FY08
- Concentrated solar collection system – FY10
- Wind - TBD
  - Initial investment of $6M
Mid-Plume Interception Treatment System

• Containment & Partial Restoration:
  – Stop migration of contaminant into the front using best available technology
  – Evaluate new technology such as bioremediation
    • Potential to accelerate cleanup
    • Peer review panel of recognized experts in these fields

• Design Process
  – Completed December 2008
NDMA Concentration in ppt (Using Surfer 8.0)

Containment & Partial Restoration
Remediate Source Areas

- Post Closure Care Permit No. NM8800019434-2
- Application fee: ~$470K/10yr
- Operational costs: ~$4M/yr
- Remediation costs: ~$2M+
- Work plans: ~2009-2012
- Challenge: Treatment levels
Questions?

Night Blooming Cereus