DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: NASA White Sands Test Facility
Facility Address: P.O. Box 20, Las Cruces, NM 88004-0020
Facility EPA ID #: NM8800019434

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   __X__ If yes - check here and continue with #2 below. .

   _____ If no - re-evaluate existing data, or

   _____ if data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	X			NDMA (main contaminant)
Air (indoors)[2]		X		Not reasonably suspected to be contaminated
Surface Soil (e.g., <2 ft	X			NDMA and DMN(suspected)
Surface Water		X		No permanent sources of surface water exist
Sediment		X		Release(s) occurred to deeper unsaturated zone(s)
Subsurf. Soil (e.g., >2 ft)	X			NDMA and DMN at 500 Area Fuel Storage Area
Air (outdoors)		X		Volatiles Determined Below EPA Air Criteria

____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

X If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):_____

Groundwater

Groundwater sampling at the WSTF has been ongoing since 1983. Over 200 monitoring wells/zones are now currently being sampled at regularly scheduled intervals. The installation of additional wells is in progress. The contaminants of concern in WSTF groundwater and range of concentrations are shown in Table 1. As of August 2000, the NDMA and TCE plumes are approximately 4 miles long and 2 miles wide and confined entirely within NASA WSTF property or land controlled by NASA under joint use agreements with the Bureau of Land Management (BLM) and the State of New Mexico.

Soils

Subsurface soils (> 2ft) beneath the 300 and 400 Area Hazardous Waste Management Unit (HWMU) closures are reasonably suspected to be contaminated with NDMA. Although no analytical data are available for validation, hydrazine fuels were known to be used in the past within these areas. NASA submitted Certificates of Closure for these HWMUs in May and August of 1989. NMED subsequently approved the Certificates of Closure in November of 1989. Additionally, subsurface soil beneath the 500 Area Fuel Storage Area AOC has been recently discovered to contain NDMA above the EPA Region 9 Preliminary Remediation Goal (PRG) of 8.7 PPB (Table 2). Additional soil borings and sampling of the unsaturated zone beneath the 500 Area Fuel Storage Area was completed on December 12th, 2000. Preliminary analytical results indicate the presence of NDMA and DMN in subsurface soils. More investigation is anticipated in the 500 Area Fuel Storage Area to delineate the extent of contamination. Surface soils (< 2 ft) beneath the 300 and 400 Area HWMU closures are reasonably suspected to be contaminated with NDMA. Although no analytical data is available, hydrazine fuels were known to be used in the past within these areas. Closure of these HWMUs was approved in November of 1989.

Air

As outlined in the Phase 1 RFI, HWMUs that pose a threat to air quality by the spreading of particulates from soils have been covered or capped, isolating them from the air medium. Therefor, particulate transport of hazardous constituents is not considered to be of concern.

As outlined in the Phase 1 RFI Baseline Human Health Risk Assessment, off-gassing of volatile compounds to outdoor air from soil or groundwater was determined not to reasonably pose a health threat to WSTF employees. All volatile constituents were determined within the EPA's air target criteria. Additionally, because of the low volatility of the contaminant NDMA, threat of air dispersion via volatilization from the soil or groundwater medium does not pose a reasonable threat. Although limited data is currently available, the threat of human exposure to volatile compounds via indoor air is not reasonably suspected to be of concern.

Table 1. Contaminants of Concern in WSTF Groundwater

Parameter	Current Maximum Concentration (since 1/1/99)	MCL (EPA)	EPA Lifetime Health Advisory[a]	NM Groundwater Standards (WQCC)
N-Nitrosodimethylamine (NDMA)	41 ug/L [b]	-	-	tox
N-Nitrodimethylamine (DMN)	53 ug/L	-	-	-
Trichloroethene (TCE)	660 ug/L	5 ug/L	-	100
Tetrachloroethene (PCE)	39 ug/L	5 ug/L	-	20
Trichlorofluoromethane (Freon 11)	1400 ug/L	-	2 ug/L	tox
Chromium	0.68 mg/L	0.1 mg/L	-	0.05 mg/L
Lead	0.03 mg/L	0.015 mg/L (al)	-	0.05 mg/L

a Health Advisory: An estimate of acceptable drinking water levels for a chemical substance based on health effects information; a Health Advisory is not a legally enforceable Federal standard, but serves as technical guidance to assist Federal, state, and local officials.
Lifetime Health Advisory: The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure.

b Corrected for extraction efficiency

tox A numerical standard has not been established, but the contaminant is listed in a narrative standard of "toxic pollutant" defined in WQCC regulations.

al Action Level that, if exceeded, requires water treatment.

\- No current standard

Table 2. Constituents of Concern in WSTF Subsurface Soils (> 2 ft)

Chemical	Concentration (PPB)	PRG (PPB)*
DMN**	1.3	No Standard
NDMA**	25.3	400

*NMED Soil Screenig Level (Industrial Occupation Soil)
** Method 607

References

1. Draft RCRA Facility Investigation (RFI) Report, Vol. 1, NASA Johnson Space Center, March 1996.
2. Draft RCRA Facility Investigation (RFI) Report, Vol. 3, NASA Johnson Space Center, March 1996.
3. Draft RCRA Facility Investigation (RFI) Report, Vol. 4, NASA Johnson Space Center, March 1996.
4. Draft Corrective Measures Study (CMS) Report, Vol. 1, NASA Johnson Space Center, March 1996.
5. Draft RCRA Facility Investigation (RFI) Report, Vol. 6, NASA Johnson Space Center, March 1996.
6. Plume Front Stabilization Plan, NASA Johnson Space Center, January 1999.
7. Post Closure Care Report, NASA Johnson Space Center, April 2000.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	NO	NO	NO	NO	NO	NO	NO
~~Air (indoors)~~	___	___	___				
Soil (surface, e.g., <2 ft)	NO	NO	NO	NO	NO	NO	NO
~~Surface Water~~	___	___			___	___	___
~~Sediment~~	___	___			___	___	___
Soil (subsurface e.g., >2 ft)				NO			NO
~~Air (outdoors)~~	___	___	___	___	___		

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

__X__ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_____ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale for pathways not complete: **NASA is a remotely located, limited access test facility with 24 hour-armed security. Access is limited to NASA employees and contractors of NASA only. Non-NASA employees and contractors are allowed limited access to the site only after receiving a security clearance and safety briefing(s). Most non-NASA personnel require a full escort while on site. Additionally, all pertinent NASA employees and contractors are made fully aware of hazards associated with site contamination through extensive training. Both NASA and non-NASA personnel dealing directly with contaminants are thoroughly trained, briefed, and use appropriate personal protective equipment (PPE) when necessary. Non-NASA personnel are monitored continuously during operations occurring at NASA WSTF.**

Only groundwater contamination extends offsite. Where groundwater contamination extends offsite, NASA has interagency agreements with the Bureau of Land Management (BLM) and the State of New Mexico to limit the concentration of human population and allow NASA WSTF exclusive access to groundwater.

There are no permanent residents or day care facilities currently at the site. NASA WSTF is a limited access facility and recreational activity is not permitted. Food is trucked in offsite and prepared at the cafeteria within the 100 area, well away from any potential source of contamination.

All HWMUs are fully placarded and contain engineering controls limiting unauthorized access. Monitoring wells are kept locked at all times and access to the well head is restricted to qualified NASA and contractor personnel. Drinking water is provided to the site via two water wells. Samples from drinking water wells and distribution systems are analyzed regularly.

NASA WSTF conducts public meetings regarding its hazardous waste operations and management as needed for anyone interested in the surrounding community. Additionally, NASA is in the process of creating an Environmental Information Management System (EIMS) which will be accessible over the Internet to anyone with a web browser.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):_____

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):_____

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

__X__ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the **NASA White Sands Test** facility, EPA ID #**NM8800019434**, located at **P.O Box 20, Las Cruces, NM** under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) [illegible] Date 6-13-01
(print)
(title)

Supervisor (signature) [illegible] Date 6/8/01
(print) Stephen Rice
(title) WRPS I
(EPA Region or State) New Mexico

Locations where References may be found:

NASA White Sands Test Facility, P.O. Box 20, Las Cruces, NM 88004-0020
New Mexico Environment Department (NMED)

Contact telephone and e-mail numbers

(name)_____
(phone #)_____
(e-mail)_____

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.