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First Annual Report
RCRA Post-Closure Monitoring
and Inspections for the
U-3fi Waste Unit
for the Period
July 1995 - October 1996

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January 1997

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Environmental Restoration
Division

U.S. Department of Energy
Nevada Operations Office

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**FIRST ANNUAL REPORT
RCRA POST-CLOSURE MONITORING
AND INSPECTIONS FOR THE
U-3f1 WASTE UNIT**

**FOR THE PERIOD
JULY 1995 - OCTOBER 1996**

**Prepared For
U.S. Department of Energy
Nevada Operations
Environmental Restoration Division**

**Prepared By
Bechtel Nevada
Remediation Projects**

January 1997

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List of Abbreviations And Acronyms

bgs	Below Ground Surface
BN	Bechtel Nevada
cm	Centimeter(s)
COCs	Contaminants of Concern
DOE	U.S. Department of Energy
DOE/ERD	DOE Nevada Operations Office/Environmental Restoration Division
EPA	Environmental Protection Agency
ET _{POT}	Potential Evapotranspiration
ft	foot (feet)
gal	gallon
in	inch(es)
km	kilometer
l	liter
m	meter(s)
mCi	millicurie
mi	mile
NDEP	Nevada Division of Environmental Protection
NTS	Nevada Test Site
RCRA	Resource Conservation and Recovery Act
REEC	Reynolds Electrical and Engineering Company
RVMC	Residual Volumetric Moisture Content
sec	seconds
VMC	Volumetric Moisture Content
WMP	Waste Management Program
yr	year

EXECUTIVE SUMMARY

INTRODUCTION

This annual Neutron Soil Moisture Monitoring report provides an analysis and summary for site inspections, meteorological information, and neutron soil moisture monitoring data obtained at the U-3fi RCRA Unit, located in Area 3 of the Nevada Site (NTS), Nye County, Nevada during the July 1995 to October 1996 period.

Inspections of the U-3fi RCRA Unit are conducted to determine and document the physical condition of the covers, facilities, and any unusual conditions that could impact the proper operation of the waste unit closure.

The objective of the neutron logging is to monitor the soil moisture conditions along the 420 ft ER3-3 borehole and detect changes that may be indicative of moisture movement in the regulated interval.

This is the first annual report on the U-3fi closure and includes the first year baseline monitoring data as well as one quarter of compliance monitoring data.

REGULATORY CRITERIA

The following changes, in *Section 4.1.2* and *Section 4.1.3* of the Resource Conservation and Recovery Act Industrial Sites Environmental Restoration Post Closure Plan, Area 3 U-3fi Waste Unit; August 1995, were approved by Nevada Division of Environmental Protection (NDEP) in December 1996 (NDEP, 1996) and are in use as the reporting compliance criteria:

Replace Section 4.1.2 with:

“4.1.2 Unsaturated-Zone Monitoring Method (Title 40 CFR §265.278(a))

Unsaturated-zone monitoring will be conducted by the NTS Management Contractor's Environmental Management Division, with monitoring results reported to the DOE/NV Environmental Restoration Division for analysis and reporting to NDEP in accordance with regulatory requirements. The monitoring method will use a time series analysis that monitors and reports relative changes (wetting or drying) from baseline conditions using raw neutron probe results. The observation of a progressive wetting front (i.e., one that exceeds the specified Action Level for two or more consecutive monitoring periods) will constitute the

basis for evaluating the cause of the increased readings and reporting the findings to the NDEP as specified in *Section 4.1.3*.

The unsaturated-zone monitoring well, ER3-3, will be initially monitored on a monthly basis for up to one year to determine a representative baseline data set against which all subsequent monitoring will be compared. The post closure monitoring will be conducted on a quarterly basis once the baseline data set has been obtained. Quarterly monitoring will be conducted in January, April, July, and October with quarterly summaries provided in one annual monitoring report issued by January of each year.

The monitoring criteria for the determination of changes in soil moisture content requiring reporting to NDEP, will be to monitor for statistically significant changes in raw neutron counts exceeding a 200 count Action Level. Actions will be triggered, as specified in *Section 4.1.3*, if the residual raw neutron counts (Observed Raw Counts minus Baseline Raw Counts) exceeds the 200 count Action Level in the regulated interval extending between 240 to 270 ft for two or more consecutive quarterly monitoring periods."

Change Section 4.1.3, in the first paragraph. "... (e.g. observance of a five percent increase in VMC)" to read:

"...(e.g. if the residual raw neutron counts exceeds the 200 count Action Level in the regulated interval extending between 240 to 270 ft for two or more consecutive quarterly monitoring periods)."

RESULTS OF INSPECTIONS AND THE MONITORING PROGRAM

Inspections

The unit was inspected at the same frequency as was done for soil moisture monitoring. No significant concerns were observed.

Subsidence Survey

The baseline elevation control survey for the subsidence markers was conducted in September 1995. This survey did not close as is required to determine survey error and as a result this survey cannot be used for reference purposes. The subsidence survey, conducted in September 1996, will be substituted for the control survey. The first subsidence data will be obtained in September 1997 and reported in the annual report.

A visual inspection of the cover indicates no evidence of subsidence.

Precipitation

Precipitation data was collected from the National Weather Service Nuclear Support Office's meteorological station Buster Jangle Y (BJY) 37° 03' 46' ' N, 116° 03' 09" W, Area 3 , Nevada Test Site, Nevada. This station is located approximately three miles Northwest of ER3-3.

Total yearly precipitation for the period January 1995 through December 1995 was 21.95 cm (8.64 in), while the rainfall between the reporting period January 1996 through October 1996 was 6.02 cm (2.37 in).

Soil Moisture Monitoring

The *Cumulative Residual Neutron Counts* graph (Figures ES-1) tracks changes over time from baseline conditions relative to the regulatory level of concern. The *Residual Raw Counts* are calculated by subtracting the raw neutron count from each monitoring period from the first year average neutron count (Baseline). While the data are collected on a 0.3m (1 ft) interval, the Cumulative Residual Neutron Count graph only presents the residual count every 1.5 m (5 ft) in the regulated interval between 73 to 82 m (240 to 270 ft). This interval corresponds to the point closest to the bottom of the U-3fi emplacement casing. The residual values are plotted as *Residual Raw Counts* vs *Date* for each 1.5 m (5 ft) depth.

The level of regulatory concern is indicated as a heavy line at the 200 count Action Level. Values exceeding this limit for two consecutive monitoring periods require notifying the NDEP as specified in the revised Post-Closure Plan.

A second graph *Baseline Difference* (Figure ES-2) shows the changes occurring for one specific monitoring period along the entire length of a neutron access tube relative to baseline conditions. It is calculated by subtracting the current raw neutron count from the Baseline (first year average) raw neutron count on a depth basis. The result of this subtraction is referred to as the *Residual Raw Count*. The *Residual Raw Count* is plotted along with the actual *Raw Neutron Counts* of both the current and baseline data vs Depth from the top of the casing. A positive residual neutron count indicates conditions at that depth and point in time that are wetter than baseline conditions, while negative values indicate dryer conditions.

The *Baseline Difference* graph provides detailed information on the overall performance of the entire unit.

The *Cumulative Residual* graph focuses only on cumulative trends relative to the regulatory level of concern within the regulated interval and is used to determine regulatory compliance.

FINDINGS

- Neutron soil moisture data indicate the closed unit is performing as designed. It is in regulatory compliance with dry, stable conditions within both the regulated interval and along the length of the access tube.
- No indications are observed in the visual inspections or neutron data set that are indicative of subsidence.

SUMMARY AND CONCLUSIONS

- No significant concerns were observed during the site inspections over the period July 1995 through October 1996.
- The subsidence survey has been delayed one year due to failure in the original control survey to perform a proper elevation closure.
- The soils surrounding the ER3-3 access tube remain dry, stable and within the compliance criteria of less than 200 Residual Raw Counts.
- The closure is in compliance and performing as designed and expected.
- See page 21

RECOMMENDATIONS

The baseline subsidence survey is recommended to be moved from 1995 to 1996 due to a problem with the original survey.

ER3-3 Soil Moisture Monitoring Cumulative Residual Neutron Counts July 1995 through October 1996

FIGURE ES-1 ER3-3 CUMULATIVE RESIDUAL NEUTRON COUNTS

ER3-3 Soil Moisture Monitoring

Baseline Difference

October 1996 4th Quarter

FIGURE ES-2 ER3-3 BASELINE DIFFERENCE

1.0 INTRODUCTION

1.1 SCOPE AND OBJECTIVE

This annual neutron soil moisture monitoring report provides an analysis and summary for site inspections, meteorological information, and neutron soil moisture monitoring data obtained at the U-3fi RCRA Unit, located in Area 3 of the Nevada Site (NTS), Nye County, Nevada during the July 1995 to October 1996 period.

Inspections of the U-3fi RCRA Unit are conducted to determine and document the physical condition of the covers, facilities, and any unusual conditions that could impact the proper operation of the waste unit closure.

The objective of the neutron logging is to monitor the stability in soil moisture conditions along the 420 ft ER3-3 borehole and detect changes that may be indicative of moisture movement in the regulated interval.

This is the first annual report on the U-3fi Closure and includes the first year baseline monitoring data including one quarter of compliance monitoring data.

1.2 SITE HISTORY

The U-3fi Waste Unit is located in Area 3 at the NTS, a DOE research and development facility in Nye County, Nevada. The NTS is approximately 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas, Nevada (Figure 1).

The U-3fi Waste Unit is an abandoned Los Alamos National Laboratory (LANL) emplacement hole (Figure 2). It was drilled by Reynolds Electrical & Engineering Company, Inc. (REECo), between the dates of March 27, 1967 and April 24, 1967, for emplacement of a nuclear explosive device. A detailed history of the emplacement hole drilling program is found in the U-3fi Waste Unit Closure Plan (DOE, 1995b). On April 11, 1967, the hole reached a depth of 256 m (841 ft) below the surface. Due to formation conditions a thicker drilling foam was introduced to the hole. Unfortunately this did not work and the hole started caving in and the drill bit was trapped at a depth of 254.8 m (836 ft). There were a number of attempts to retrieve the drill bit but all attempts failed. The top of the collapsed emplacement hole was found at 73.2 m (240 ft) below ground surface. The hole was abandoned on April 24, 1967.

The U-3fi Waste Unit was established in 1970 as a disposal site for radiologically-contaminated waste primarily for postshot "high-grading" wash water, which was solidified with cement and drill cores (Tattro, 1989).

Bechtel Nevada

FIGURE 1
SITE LOCATION MAP U3-fi

Source: DOE, 1995b

Bechtel Nevada

**FIGURE 2
CROSS SECTION U3-fi WASTE UNIT**

The U-3fi Waste unit primarily received core samples and solidified decontamination wastes. Core samples consisted of mixed fission and activation products from the solidification detonation debris/melt during postshot drilling (DOE, 1988). While under LANL control, only LANL solid drillback waste was disposed in the U-3fi Waste Unit. Control of the U-3fi Waste Unit was assumed in 1977 by the Atomic Energy Commission, later renamed the Energy Research and Development Administration, now the DOE. At this time, four additional waste generators, Lawrence Livermore National Laboratory (LLNL), Area 6 Decontamination Pad, Area 12 Tunnels, and LRY3 (an unspecified generator of weapons test program waste), began disposing their waste in the U-3fi Waste Unit.

Waste-disposal record keeping for the U-3fi Waste Unit began in 1977. The data base, established and maintained by REEC Co Defense Waste Management Department, currently the Bechtel Nevada Waste Management Program (WMP), has 102 entries between January 11, 1977 and November 28, 1988. Access to the U-3fi Waste Unit from 1977 to 1989 was gained through both REEC Co Radiation Safety and Wackenhut Services, Inc.. Copies of the waste disposal documents are presented in Appendix C of the U-3fi Waste Unit Closure Plan (DOE, 1995b).

According to waste disposal records, it is estimated that 86.34 curies (3,181 GBq) (1.7 kg [3.7 lb]) of fission products from drilling activities were placed within the waste unit. Chromium from drilling mud and lead from pipe-lubricant, stemming, and shielding materials may also be present. Waste was placed from 55 m (180 ft) to approximately 73 m (240 ft) below ground surface (bgs).

Subsurface characterization activities began in November, 1994 with the installation of the ODEX borehole ER3-3. The objectives of this study were to determine if constituents of concern (COCs) were present in the subsurface and to assess the potential for migration of these COCs from the waste zone to the surrounding formations.

The ER3-3 borehole was located 18.3 m (60 ft) south of the U-3fi and drilled at a design angle of 6 degrees from the vertical in order to intercept the U-3fi emplacement borehole at approximately 183 m (600 ft) bgs. In practice, the emplacement borehole was intercepted at a depth of 125 m (410 ft) bgs due to drilling conditions increasing the borehole angle. The borehole reached a total depth of 130 m (425 ft) in February, 1995.

Cuttings and core samples were recovered during drilling operations that were used to help understand the geologic, lithologic and hydrologic soil properties surrounding the U-3fi waste unit. The results of these studies are discussed in the U-3fi Post-Closure Plan (DOE, 1995c).

The ER3-3 borehole was completed as a neutron-probe soil moisture monitoring well by removing the ODEX casing and stemming a single wall steel casing in place with a sand backfill. The monitoring well is located entirely within the vadose zone and extends from the surface to a

depth of 128 m (420 ft). Its purpose is to provide post-closure monitoring for changes in soil moisture content that would indicate moisture migration in the vicinity of the waste and to detect subsidence of material in the U-3fi borehole.

The Area 3 U-3fi Waste Unit Closure Plan (DOE, 1995b) was approved by the NDEP on August 28, 1995. The DOE Project Manager authorized closure of the waste unit at that time.

On September 6, 1995, the stemming activities in U-3fi began with the placement of approximately 2.13 m (7 ft) of 20/40 sand and an expanding cement grout plug 4.6 m (15 ft) thick. Once this plug was allowed to set, the U-3fi casing was then filled with 32.6 m (107 ft) of NTS fine stemming sand and grouted with an expanding cement plug 13.7 m (45 ft) thick.

On September 28, 1995 U-3fi unit was declared closed.

Post closure monitoring activities, detailed in the Post-Closure Plan (DOE, 1995c), specified a neutron monitoring program that was to be based upon monitoring and reporting changes in absolute moisture content. The Action Level criteria for tracking and reporting to the NDEP was specified as the observance of a five percent relative increase in volumetric moisture content for two or more consecutive monitoring periods. As originally designed, the ER3-3 well was to be used for obtaining raw neutron counts. This new specification would require a complicated and expensive compound calibration for determining absolute soil moisture content in the telescoping sand-packed borehole. In December 1995, representatives of DOE, NDEP, and Bechtel Nevada (BN) agreed that considering the 73 m (240 ft) depth of the regulated interval and the dry climatic conditions, no changes in moisture content would be expected. Therefore, the high cost of calibrating for the ER3-3 borehole geometry was not justified and a relatively simple program of monitoring for changes in raw counts would be sufficient as long as the alternative proposal was more conservative than the absolute Action Levels presented in the unapproved Closure Plan.

In September 1996 DOE formally petitioned NDEP to change the Action Level to a 200 count change from baseline conditions in the 73 to 82 m (240 to 270 ft) regulated interval. This request was based on a statistical analysis of the expected rate of occurrence of false positives and false negatives in a 20 year period.

The first neutron log from ER3-3 was obtained in July 1995, with base line conditions being recorded for the first year. The first quarterly monitoring was conducted in October 1996.

1.3 SITE GEOLOGY AND HYDROLOGY

The U-3fi Waste Unit is located in the west central portion of Yucca Flat in Area 3 of the Nevada

Test Site, Nye County, Nevada (834004 N, 692900 E).

Yucca Flat is located within the Ash Meadows groundwater subbasin (Waddel, 1982). Regional ground water flow is assumed to be south-southwest. Discharge occurs primarily in Ash Meadows, located approximately 80 km (50 miles) to the south-southwest.

The U-3fi emplacement hole extends to approximately 256 m (841 ft) and is hosted in Quaternary and Tertiary alluvial deposits which extend locally to about 274 m (900 ft). These deposits are variably cemented, moderately sorted sand and gravel derived from local hills. Beneath the alluvium a Tertiary volcanic sequence extends from about 274 m (900 ft) to about 671 m (2200 ft). These rocks form two hydrogeologic units; the welded tuff aquifer and the tuff confining unit (Winograd and Thordarson, 1975). The water table beneath U-3fi occurs within the tuff confining unit at approximately 488 m (1,600 ft). Underlying the volcanic sequence is the Lower Carbonate Aquifer, which is comprised of Paleozoic limestones and dolomites. These rocks are complexly faulted and form the primary groundwater transport path towards the Ash Meadows discharge point. The lower carbonate aquifer is estimated to be approximately 1,000 m (3,300 ft) thick beneath the U-3fi unit. Vertical migration of groundwater beneath U-3fi is controlled by the tuff-confining unit. Lateral (regional) migration is controlled by the lower carbonate aquifer.

Annual precipitation at Well ER6-1, located approximately 10 km (6.2 mi) south of U-3fi, is 12.52 cm (4.93 in). Estimates of Potential Evapotranspiration (ET_{POT}) obtained from characterization studies in Area 5 indicate an ET_{POT} of about 157.5 centimeters/year (62 in/yr), which is significantly higher than the mean annual precipitation (DOE, 1995a). Recharge to the subsurface is believed to be nonexistent.

2.0 REGULATORY CRITERIA

2.1 BACKGROUND

The Resource Conservation and Recovery Act Industrial Sites Environmental Restoration Post Closure Plan, Area 3 U-3fi Waste Unit, Section 4.0, August 1995; DOE/NV-405 UC-700, specified a neutron monitoring program that was to be based upon monitoring and reporting changes in absolute volumetric soil moisture content. An action criteria for tracking and reporting to the NDEP was specified (*Section 4.1.2*) as the observance of a five percent relative increase in volumetric moisture content for more than two consecutive monitoring periods. Because the well was designed for obtaining raw neutron counts, this specification would have required a complicated and expensive compound calibration for determining absolute soil moisture content in the telescoping, sand-packed borehole. Implementation of this strategy would be both costly and problematic.

In a meeting with representatives from DOE, NDEP, and BN in December, 1995 it was requested that the monitoring strategy be changed for two reasons. The first was that the benefits of obtaining a compound calibration for absolute moisture content are offset by the high cost of calibrating for the ER3-3 hole geometry. The second, considering the depth of the regulated interval and dry climatic conditions at the Nevada Test Site, was that no changes in moisture content are to be expected. Therefore, a relatively simple program of monitoring for changes in raw neutron counts would be both conservative and sufficient. It was agreed that it did not make sense to calibrate the neutron probe for the ER3-3 geometry, but that any alternative proposal must be more conservative than the absolute volumetric moisture content Action Levels presented in the unapproved Post-Closure Plan. In addition, it was agreed to obtain up to 12 months of baseline neutron data and then propose an alternative monitoring plan to NDEP.

The proposed alternative to an absolute calibration was to use "statistically significant" changes in raw counts from the neutron tool to determine when an increase in moisture content occurred in the regulated interval.

The philosophy in using this approach is guided by two criteria:

- 1). Considering both the depth to the regulated interval and the arid site conditions, no change was expected due to surface rainfall events and infiltration. Therefore, any changes above the system noise level could be considered significant regardless of the change in absolute moisture content. Consequentially, calibration of the neutron gauge to local geometries and soil conditions would not be required.

- 2). Because the proposed monitoring is based on changes in raw counts, and not on the absolute moisture content, the criteria for setting an Action Level should be more conservative than what would be set when using an absolute soil moisture content.

Considering the above stated criteria, a conservative choice for the Action Level would be "any statistically significant changes greater than some small multiple of the system noise level." In practice, the actual determination of the Action Level would need to be balanced between an acceptable occurrence of false positives and false negatives. By using the 12 month baseline data set and a statistical method called the Bootstrap (Efron Bradley and Robert Tibshirani, 1993) these occurrence rates can be simulated by generating 2,000 years of quarterly monitoring and observing the expectancy rate in 20 years of monitoring. An acceptable rate of false positives and false negatives can be selected by considering various Levels of Concern.

The Bootstrap was run using the one year baseline data set to provide the statistical character of the system noise and a 20 year acceptance rate of about two percent for both false positives and false negatives. The simulation was carried out to 2000 years of quarterly monitoring (8,000 observations) in the 73 to 82 m (240 to 270 ft) regulated interval. For an acceptance rate of two percent, an Action Level of 200 counts change from baseline conditions was found to meet the design criteria.

In October, 1996, a formal proposal (DOE, 1996) from DOE was submitted to NDEP requesting that the Post-Closure Monitoring Activities of Section 4.1 be modified to monitor for "statistically significant changes in raw neutron counts occurring in the regulated interval extending between 240 to 270 ft". This action will be triggered as specified in Sec. 4.1.3 if "The residual raw neutron counts (Observed Raw Counts minus Baseline Raw Counts) exceeds the 200 count Action Level, for two consecutive monitoring periods in the regulated interval of 240 to 270 ft".

NDEP approved this request on December 9, 1996 (NDEP, 1996).

2.2 SITE INSPECTION COMPLIANCE CRITERIA

Prior to conducting a Post-Closure inspection, design drawings, aerial photographs, and site maintenance records are reviewed to provide a basis for evaluating changing conditions. The site inspection includes a walking inspection of the entire site within 304 m (1,000 ft) of U-3fi, and photo documentation. The Post-Closure Inspection Checklist details items of concern under the following topics:

- Adjacent off-site features within the watershed areas up-slope of the U-3fi Waste unit, such as new roads, and erosional channels;
- Access roads, fences, gates, and signs;
- Monuments and other permanent features;
- U-3fi waste cover;
- Site drainage features; and
- Monitoring well ER3-3.

2.3 SOIL MOISTURE MONITORING COMPLIANCE CRITERIA

The following changes, in *Section 4.1.2* and *Section 4.1.3* of the Resource Conservation and Recovery Act Industrial Sites Environmental Restoration Post Closure Plan, Area 3 U-3fi Waste Unit; August 1995, were approved by NDEP in December 1996 (NDEP, 1996) and are in use as the reporting compliance criteria:

Section 4.1.2 Replaced with:

“4.1.2 Unsaturated-Zone Monitoring Method (Title 40 CFR §265.278(a))
Unsaturated-zone monitoring will be conducted by the NTS Management Contractor’s Environmental Management Division, with monitoring results reported to the DOE/NV Environmental Restoration Division for analysis and reporting to NDEP in accordance with regulatory requirements. The monitoring method will use a time series analysis that monitors and reports relative changes (wetting or drying) from baseline conditions using raw neutron probe results. The observation of a progressive wetting front (i.e., one that exceeds the specified Action Level for two or more consecutive monitoring periods) will constitute the basis for evaluating the cause of the increased readings and reporting the findings to the NDEP as specified in *Section 4.1.3*.

The unsaturated-zone monitoring well, ER3-3, will be initially monitored on a monthly basis for up to one year to determine a representative baseline data set against which all subsequent monitoring will be compared. The post closure monitoring will be conducted on a quarterly basis once the baseline data set has been obtained. Quarterly monitoring will be conducted in January, April, July, and October with quarterly summaries provided in one annual monitoring report

issued by January of each year.

The monitoring criteria for the determination of changes in soil moisture content requiring reporting to NDEP, will be to monitor for statistically significant changes in raw neutron counts exceeding a 200 count Action Level. Actions will be triggered, as specified in *Section 4.1.3*, if the residual raw neutron counts (Observed Raw Counts minus Baseline Raw Counts) exceeds the 200 count Action Level in the regulated interval extending between 240 to 270 ft for two or more consecutive quarterly monitoring periods.”

Section 4.1.3. Changed in the first paragraph. “...(e.g. observance of a five percent increase in VMC)” to read:

“...(e.g. if the residual raw neutron counts exceeds the 200 count Action Level in the regulated interval extending between 240 to 270 ft for two or more consecutive quarterly monitoring periods).”

3.0 SITE INSPECTIONS AND ANNUAL SUBSIDENCE SURVEY

3.1 INTRODUCTION

To comply with the Post-Closure Care requirements, formal site inspections have been done twice a year since the official closure of the unit in September, 1995. The inspections were completed to evaluate the performance and maintenance needs of the unit in accordance with the requirements of Title 40 CFR §265.15 and the RCRA Part B Permit. A complete inspection package includes copies of the inspection checklist, field logbook notes, site photographs, and the inspector's current resume. Copies of the Post-Closure Care inspection checklist and associated field notes for March, 1996 and September, 1996 are included in Appendix A.

3.2 FINDINGS FROM THE MONTHLY INSPECTIONS

No significant findings were observed in either the March, 1996 or September, 1996 inspections.

3.3 ANNUAL SUBSIDENCE SURVEY

A subsidence monument was installed in the cement plug on the U-3fi cover and surveyed on September 18, 1995. This monument provides elevation control to determine if subsidence of the cement plug or soils surrounding the U-3fi borehole is occurring. The Subsidence Survey Plat can be found in Appendix B.

On September 5, 1996, the first year subsidence survey was conducted and determined that the original survey was invalid because the survey had been run without a proper closure. The original survey resulted in an elevation of 4,038.1 ft (to preserve the survey precision these data are reported only in the original English survey units), but failed to close to a known vertical benchmark. A review of the survey field notes shows the elevation was established from the northwest corner monument to the U-3fi brass monument. However, the reciprocal angle from the U-3fi monument back to the northwest corner starting point was not recorded and therefore the vertical measurement cannot be proven or closed. The 1995 survey should not be used and the September 5, 1996 survey 4,038.18 ft will be substituted for the baseline elevation control, with subsequent surveys recording subsidence relative to this datum.

TABLE 1—SUBSIDENCE MONUMENT U-3*fi* COORDINATES AND ELEVATIONS

SURVEY DATE	COORDINATES		ELEVATION TOP OF MONUMENT	SUBSIDENCE (FEET)
	NORTHING	EASTING		
September 18, 1995	N 834004.0	E 692900.3	(4038.1) ³	
September 5, 1996	N 834004.00	E 692900.35	4038.18	-

1 - All coordinates based on the Nevada State Plane Grid, Central Zone - North American Datum of 1983 in feet.

2 - All elevations based on the North American Vertical Datum of 1929 in feet.

3 - Elevation cannot be proven due to failure to perform a proper closure on the original survey.

September 5, 1996 survey will be used for the elevation control datum.

4.0 SOIL MOISTURE MONITORING

4.1 INTRODUCTION

The objective of the ER3-3 vadose zone monitoring system is to monitor the soil moisture condition in the 73 to 82 m (240 to 270 ft) regulated interval to provide an early warning of the potential for leachate migration from the U-3fi borehole and casing into the subsurface. In addition, the monitoring system is used to monitor changes indicative of subsurface subsidence within the U-3fi borehole.

The ER3-3 monitoring system uses a portable neutron moisture logging tool to determine changes in the moisture content in soils surrounding neutron access tube which intercepts the U-3fi emplacement borehole. By monitoring changes in soil moisture content, it is possible to detect the movement of wetting fronts in the soils surrounding the bottom of the U-3fi casing. The detection of changes in soil moisture content in this area provides an early warning of the potential movement of leachate from the U-3fi casing to the surrounding environment, indicating possible failure of the grout plug.

The ER3-3 borehole was located 18.3 m (60 ft) south of the U-3fi borehole and drilled at a design angle of six degrees from the vertical. The U-3fi emplacement borehole was intercepted at a depth of 125 m (410 ft) bgs, with a total depth of 129.5 m (425 ft). Logging is conducted from the surface to 128 m (420 ft) to avoid the possibility of getting the neutron probe stuck at the bottom of the access tube.

A Campbell Pacific Nuclear Hydroprobe (Model 503DR) containing a 50 mCi (1.85 GBq) ²⁴¹Americium/Beryllium neutron source is used to obtain moisture logs in the access tube. The tool is operated with a soil moisture calibration, recording raw neutron counts within a 16 second window.

4.2 OPERATING PROCEDURES

Neutron logging operations follow Standard Operating Procedure AADzD.D.03.00 (REECo, 1990). The procedure was modified to operate without a centralizer on the downhole tool as the neutron access tube is inclined at a six degree angle. Field quality control operations require a daily standard count test to be run at the start and end of the day. Failure to pass this statistical test, which is detailed in the Standard Operating Procedure, requires stopping operations, notifying the supervisor, and determining the cause.

Using this procedure, neutron logs are obtained by lowering the neutron tool to within 1.5 m (5

ft) of the bottom of the access tube. The raw neutron count is obtained using a 16-second count time at 0.3 m (1 ft) intervals along the length of the access tube. The data is recorded on field log sheets and stored in the data logger of the neutron probe as raw counts. The data logger is then downloaded to an office personnel computer on a daily basis. Once the data have been reviewed, they are presented as two graphs: *Cumulative Residual Neutron Counts* and *Baseline Difference*. These graphs are discussed section 4.4.1, Data Presentation.

4.3 PRECIPITATION DATA

Precipitation data was collected from the National Weather Service Nuclear Support Office's CLINET station Buster Jangle Y (BJY) 37° 03' 46' ' N, 116° 03' 09" W, Area 3 at the NTS . This station is located approximately 3 miles Northwest of ER3-3. Precipitation records for this station for the period January 1995 through October 1996 are found in Appendix C and are summarized in Table 2 and Figure 3. Due to budget constraints and personnel loss at the National Weather Service, precipitation records have not been reviewed and qualified by a climatologist. Precipitation records dating from November 1994 to the present have been released and classified as "preliminary" until they can be reviewed by the weather service climatologist or staff.

Total yearly precipitation for the period January 1995 through December 1995 was 21.95 cm (8.64 in), while the rainfall between the reporting period January 1996 through October 1996 was 6.02 cm (2.37 in).

**TABLE 2 – PRECIPITATION DATA FOR THE BUSTER JANGLE Y,
METEOROLOGICAL STATION BJY, AREA 3, NTS.**

DATE	MONTHLY CUMULATIVE inches ¹	YEARLY CUMULATIVE inches
January 1995	3.09	3.09
February 1995	1.25	4.34
March 1995	2.55	6.89
April 1995	0.56	7.45
May 1995	0.71	8.16
June 1995	0.16	8.32
July 1995	0.13	8.45
August 1995	0.16	8.61
September 1995	0	8.61
October 1995	0.03	8.64
November 1995	0	8.64
December 1995	0	8.64
January 1996	0.11	0.11
February 1996	0.38	0.49
March 1996	0.21	0.70
April 1996	0	0.70
May 1996	0.26	0.96
June 1996	0.33	1.29
July 1996	0.36	1.65
August 1996	0.05	1.70
September 1996	0	1.70
October 1996	0.67	2.37

¹ Precipitation data are preliminary. Source National Weather Service
Nuclear Support Office.

4.4 SOIL MOISTURE MONITORING RESULTS

4.4.1 DATA PRESENTATION

The *Cumulative Residual Neutron Counts* graph (Figure 4) tracks changes over time from baseline conditions relative to the regulatory level of concern. The *Residual Raw Counts* are calculated by subtracting the raw neutron count from each monitoring period from the first year average neutron count (baseline). While the data are collected on a 0.3 m (1 ft) interval, the Cumulative Residual Neutron Count graph only displays the residual count every 1.5 m (5 ft) in the regulated interval between 73 to 82 m (240 to 270 ft). This corresponds to the point closest to the bottom of the U-3fi emplacement casing. The residual values are plotted as *Residual Raw Counts vs Date* for each 1.5 m (five ft) depth (Figure 4). The level of regulatory concern is indicated as a heavy line at the 200 count Action Level. Values exceeding this limit for two consecutive monitoring periods require notifying the NDEP as specified in the Post-Closure Plan.

A second graph, *Baseline Difference* (Figure 5), shows the changes occurring for one specific monitoring period along the entire length of a neutron access tube relative to baseline conditions. It is calculated by subtracting the current raw neutron count from the Baseline (first year average) raw neutron count on a depth basis. The result of this subtraction is referred to as the *Residual Raw Count*. The *Residual Raw Count* is plotted along with the actual *Raw Neutron Counts* of both the current and baseline data vs *Depth* from the top of the casing. A positive residual neutron count indicates conditions at that depth and point in time that are wetter than baseline conditions, while negative values indicate dryer conditions. Repeatability and instrumentation noise is approximately ± 100 counts and as a result the residual graph has a noisy chaotic character due to the absence of any signal. The *Baseline Difference* graph provides detailed information on the overall performance of the entire unit, while the *Cumulative Residual* graph focuses only on cumulative trends relative to the regulatory level of concern at a specific depth and is used to make compliance decisions.

4.4.2 DISCUSSION OF ANALYTICAL DATA TRENDS

The *Cumulative Residual Neutron Counts* Graph, Figure 4, provides summary monitoring information over time with respect to the level of regulatory concern. The baseline data set, as indicated on the graph, was derived from the first 10 months of data. The first quarterly monitoring session occurred in October 1996, the fourth quarter monitoring period. Below the Cumulative Residual plot is the monthly cumulative precipitation obtained from the Buster Jangle Y (BJY) weather station.

ER3-3 Soil Moisture Monitoring Cumulative Residual Neutron Counts July 1995 through October 1996

FIGURE 4 ER3-3 CUMULATIVE RESIDUAL NEUTRON COUNTS

ER3-3 Soil Moisture Monitoring Baseline Difference

October 1996 4th Quarter

FIGURE 5 ER3-3 BASELINE DIFFERENCE

The *Cumulative Residual Neutron Counts* are plotted on a 0.3 m (5 ft) interval, by date and indicate dry, steady state conditions with no trends evident since the inception of the monitoring program. The noisy character of the residuals indicates any changes in soil moisture content are well below the detection level of the system.

The moisture content of the regulated interval between 73 to 82 m (240 to 270 ft) remains dry, stable, and is below the compliance Action Level of 200 counts.

Performance along the entire neutron access tube is presented in the *Baseline Difference* graph (Figure 5). This graph shows the raw neutron counts obtained from both the baseline data set and the current quarterly monitoring period as well as the residual counts (Quarter - Baseline) on a one foot interval. This presentation is useful to determine moisture changes occurring outside of the regulated interval as well as monitoring for subsidence. The 200 count Action Level and the extent of the regulated interval are labeled for reference.

The residual raw count data indicate only small changes in moisture content occurring at the surface along the upper portion of the well head protection cement plug. Below this point, borehole conditions are dry and stable, with no trends or indications of subsidence evident in the data.

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 SUMMARY

- Inspections of the cover were done to identify any significant changes to the unit requiring action. No significant concerns were noted.
- A subsidence survey was conducted in September of 1995 and 1996. The baseline control survey, performed in September 1995, was found to be invalid due to the failure to close the survey. The survey conducted in September 1996 is suggested to be used as the control survey. The first subsidence determination will therefore be delayed until September 1997. Visual inspection of the cover reveals no evidence of subsidence.
- The ER3-3 neutron moisture data are below the Action Level of 200 residual raw counts within the regulated interval. Soil conditions remain dry and stable with no indications of subsidence or changes in moisture content.

5.2 CONCLUSIONS

- No significant concerns were observed during the site inspections over the period September 1994 through October 1996.
- Although the subsidence survey results have been delayed for one year due to problems with the initial survey, a visual inspection of the cover indicates no evidence of subsidence is apparent.
- Both the Baseline Difference and Cumulative Residual data indicate dry stable conditions along the length of the ER3-3 neutron access tube. The Residual Raw Neutron Counts remain below the compliance Action Level of 200 counts in the period from July 1995 through October 1996.
- The closure is in compliance and performing as designed and expected.

5.3 RECOMMENDATIONS

- The baseline subsidence survey is recommended to be moved from 1995 to 1996 due to the problem with the original survey.

6.0 REFERENCES

CPN, 1984, 503DR Hydroprobe Operating Manual, CPN Corporation.

Efron Bradley and Robert Tibshirani, 1993, An Introduction to the Bootstrap; Chapman & Hall.

Nevada Division of Environmental Protection, 1996, letter from P.J. Liebendorfer to S. A. Mellington, Review of Revised Technical Basis for Setting the Action Level for Subsurface Monitoring of ER3-3 (U-3fi Waste Disposal Site CAU #91 {Site}); December 9, 1996.

REECO, 1990, Standard Operating Procedure AADzD.D.03.00 Neutron Logging, the Vadose Zone Monitoring System, January 31, 1990.

Tattro, L.D., Los Alamos National Laboratory, August 4, 1989, Correspondence to Mr. Darrell M. Warren, Las Vegas, NV.

U.S. Department of Energy, 1988, Environmental Survey Preliminary Report. Nevada Test Site. Mercury. Nevada, DOE/EH/OEU-ISP, Washington, DC.

U. S. Department of Energy, 1995a, Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada, DOE/NV/11432-196.

U. S. Department of Energy, 1995b, Resource Conservation and Recovery Act Industrial Site Environmental Restoration Closure Plan. Area 3 U-3fi Waste Unit, DOE/NV, Las Vegas, NV.

U. S. Department of Energy, 1995c, Resource Conservation and Recovery Act Industrial Sites Environmental Restoration Post Closure Plan. Area 3 U-3fi Waste Unit; August 1995; DOE/NV-405, UC-700.

U.S. Department of Energy, 1996, letter from S.A. Mellington, DOE to P.J. Liebendorfer, NDEP, Submittal of the Technical Basis for Setting the Action Level Criteria for Neutron Access Tube ER3-3. ER3-3 Baseline Data Set and Hydrologic Properties Report (CAU 91); October 22, 1996.

U. S. National Weather Service Nuclear Support Office, 1995, Meteorological Data for The BJY Station.

Waddell, R.K., 1982, Two-dimensional Steady-state Model of Groundwater Flow, Nevada Test Site and Vicinity, Nevada-California, U.S. Geologic Survey Water-Resources Investigations 82-4085, 72p.

Winograd, I.J., W. Thordarson, R.A. Young, 1975, Hydrology of the Nevada Test Site and Vicinity, South Eastern Nevada, United States Department of the Interior, Geological Survey.

APPENDIX A

POST-CLOSURE CARE INSPECTION CHECKLISTS

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST

PAGE 1 OF 4

Date of Last Inspection: February 22, 1996 Reason for Last Inspection: Monthly routine inspection

Responsible Agency: Bechtel Nevada Remediation Projects

Address: Nevada Test Site, Mercury, Nevada

Responsible Agency Official: Robert Dodge, Project Manager

Inspection Start Date and Time: March 19, 1996 @ 1030 AM

Chief Inspector: Angela L. Olson, Geologist/Hydrologist, Bechtel Nevada

Name	Title	Organization
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Assistant Inspector: Not Applicable

Name	Title	Organization
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A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
2. Inspectors are to provide an up-to-date resume or vitae for inclusion in the inspection report.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site (i.e., the area within 1,000 feet of U-3fi and ER-3-3), including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Every monument, site marker, sign, monitoring well access, and erosion control marker will be inspected.
5. A standard set of color 35mm photographs is required. For this site, the standard set consists of 10 photographs (see instructions in Section D.6 of this checklist). In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.

B. PREPARATION (To be completed prior to site visit)

YES	NO	EXPLANATION
-----	----	-------------

1. Post-Closure Permit reviewed.

✓

See Explanation #1

2. Design basis documents reviewed.

✓

3. Site as-built plans and site base map reviewed.

✓

4. Previous inspection reports reviewed.

✓

a. Were anomalies or trends detected on previous inspections?

✓

b. Was maintenance performed?

✓

5. Site maintenance and repair records reviewed.

✓

a. Has site repair resulted in a change from as-built conditions?

✓

b. Are revised as-builts available that reflect repair changes?

✓

No modifications have been made.

6. Aerial photos, if taken since last inspection, reviewed. For each set, enter the date, scale, and if interpreted

✓

a. Date: Aug/Sept 1994

b. Scale: 1" = 2000'

✓

a. Date.

b. Scale.

✓

United States Department of Energy
Nevada Test Site Grid Map, Roll 7874,
Frame 155

7. Were any of the following suggested by examination of the aerial photographs? (If yes, give photo set date).

a. Intrusion by man?

✓

b. Intrusion by animals?

✓

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST (cont.)	YES	NO	EXPLANATION	PAGE 2 OF 4
c. Channelized erosion in area of cover?		✓		
d. Changes in washes in the drainage areas?		✓		
e. Faults?		✓		
f. Obstruction of diversion channel(s)?		✓		
g. Bank erosion of diversion channel(s)?		✓		
h. Change in surrounding vegetation?		✓		
i. Displacement of fences, site markers, boundary markers, or monuments?		✓		
j. Change in adjacent land use?		✓		
C. SITE INSPECTION PREPARATION				
Assemble the following equipment, as needed, to conduct inspections a. Camera and film b. Binoculars c. Tape measure d. Optical ranging device e. Brunton compass f. Photo scales g. Erasable board h. Keys to locks i. Hand lens j. Clipboard k. Other miscellaneous support equipment				
D. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION	
1. Adjacent off-site features within watershed areas upslope of U-3fi Waste Unit.				
a. Have there been any changes in use of adjacent area?		✓		
b. Are there any new roads or trails?		✓		
c. Has there been a change in the position of nearby washes?		✓		
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓		
e. Are there new drainage channels?		✓		
f. Other?		✓		
2. Access roads, fences, gates, and signs.				
a. Is there a break in the fence?		✓		
b. Have any posts been damaged or their anchoring weakened?		✓		
c. Is there evidence of erosion or digging beneath the fence?		✓		
d. Does the gate show evidence of tampering or damage?		✓		
e. Is there any evidence of human intrusion?		✓		
f. Is there any evidence of large animal intrusion?		✓		
g. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓		
h. Are access roads passable?	✓			
i. Other?		✓		

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST (cont.)	YES	NO	EXPLANATION	PAGE 3 OF 4
3. Monuments and other permanent features				
a. Have the survey or boundary monuments been defaced or disturbed?		✓		
b. Have the site markers been disturbed by man or natural processes?		✓		
c. Do natural processes threaten to integrity of any monument or site marker?		✓		
d. Other?		✓		
4. U-3fi Waste Unit cover				
a. Is there evidence of settling?		✓		
b. Is there cracking?		✓		
c. Is there evidence of erosion around the cap (wind or water)?		✓		
d. Is there evidence of animal burrowing?		✓		
e. Other?		✓		
5. Site drainage features (within 1,000 feet of U-3fi).				
a. Is the drainage as describe in the site plans?	✓			
b. Is there evidence of bank erosion?		✓		
c. Is there evidence of channel erosion?		✓		
d. Is there evidence of sedimentation?		✓		
e. Is there channel obstruction?		✓		
f. Is there any evidence that diversion channels (if present) are not performing their function?		✓		
g. Other?		✓		
6. Photo Instructions				
A total of 10 photographs are required to be taken during each inspection of the Area 3 U-3fi Waste Unit. Additional photos may also be taken. The required photographs shall be taken as follows:				
<ul style="list-style-type: none"> • Four (4) from the center of the U-3fi Waste Unit cap, one <u>in</u> each compass direction (i.e., N, S, E, W). • Four (4) of the U-3fi Waste Unit cap, one <u>from</u> each compass direction, • Two (2) of the ER-3-3 monitoring well surface completion with compass directions noted on the photo log. 				
7. Photo Documentation				
a. Have all photos required by the photo instructions been taken? (see last page of checklist)	✓			
b. Has a photo log been prepared for each roll of film exposed?	✓			
c. Number of rolls exposed (<u>18 photos taken</u>)				
d. Other?		✓		
8. Monitoring well ER-3-3 access				
a. Has the monitoring well access been disturbed by man or natural processes?		✓		
b. Does any natural process threaten the integrity of the monitoring well access?		✓		
c. Is the monitoring well access label plate intact and legible?	✓			
d. Is the monitoring well access capped and properly secured?	✓			
e. Other?		✓		

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST (cont.)		YES	NO	EXPLANATION	PAGE 4 OF 4
E. FIELD CONCLUSIONS					
1. Is there an imminent hazard to the integrity of the U-3fi Waste Unit? (Immediate report required)			✓		
Person/Agency to whom report made:					
2. Are more frequent inspections required?			✓		
3. Are existing maintenance/repair actions satisfactory?		✓		No repairs have taken place since closure	
4. Is other maintenance/repair necessary?			✓		
5. Rationale for field conclusions:					
Explanation #1 - No Post-Closure Permit has been issued					
Inspector's Conclusions:					
No significant problems or concerns were identified during the preparatory research or during the site inspection. The site is in excellent condition. There were no signs of disturbance, damage, erosion to the unit and/or the area surrounding the unit. No maintenance or repair has been required in the past nor should any be required in the foreseeable future.					
E. CERTIFICATION					
I have conducted an inspection of the Area 3 U-3fi Waste Unit at the NTS in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.					
Chief Inspector's Signature		Printed Name			
Title		Date			

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST

PAGE 1 OF 4

Date of Last Inspection: August 28, 1996 Reason for Last Inspection: Monthly routine inspection

Responsible Agency: Bechtel Nevada Remediation Projects

Address: Nevada Test Site, Mercury, Nevada

Responsible Agency Official: Robert Dodge, Project Manager

Inspection Start Date and Time: September 30, 1996 @ 1430

Chief Inspector: Angela L. Olson, Geologist/Hydrologist, Bechtel Nevada

Name	Title	Organization
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Assistant Inspector: Not Applicable

Name	Title	Organization
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A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
2. Inspectors are to provide an up-to-date resume or vitae for inclusion in the inspection report.
3. Any checklist line-item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site (i.e., the area within 1,000 feet of U-3fi and ER-3-3), including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Every monument, site marker, sign, monitoring well access, and erosion control marker will be inspected.
5. A standard set of color 35mm photographs is required. For this site, the standard set consists of 10 photographs (see instructions in Section D.6 of this checklist). In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.

B. PREPARATION (To be completed prior to site visit)

YES	NO	EXPLANATION
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1. Post-Closure Permit reviewed.		✓	No Post-Closure Permit has been issued.
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2. Design basis documents reviewed.	✓		
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3. Site as-built plans and site base map reviewed.	✓		
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4. Previous inspection reports reviewed.	✓		
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a. Were anomalies or trends detected on previous inspections?		✓	
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b. Was maintenance performed?		✓	
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5. Site maintenance and repair records reviewed.	✓		
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a. Has site repair resulted in a change from as-built conditions?		✓	
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b. Are revised as-builts available that reflect repair changes?		✓	No modifications have been made.
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6. Aerial photos, if taken since last inspection, reviewed. For each set, enter the date, scale, and if interpreted.	✓		
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a. Date: Aug/Sept 1994	b. Scale: 1" = 2000'	✓		United States Department of Energy Nevada Test Site Grid Map, Roll 7874, Frame 155
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a. Date:	b. Scale:	✓	
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7. Were any of the following suggested by examination of the aerial photographs? (If yes, give photo set date)			
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a. Intrusion by man?		✓	
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b. Intrusion by animals?		✓	
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AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST (cont.)	YES	NO	EXPLANATION	PAGE 2 OF 4
c. Channelized erosion in area of cover?		✓		
d. Changes in washes in the drainage areas?		✓		
e. Faults?		✓		
f. Obstruction of diversion channel(s)?		✓		
g. Bank erosion of diversion channel(s)?		✓		
h. Change in surrounding vegetation?		✓		
i. Displacement of fences, site markers, boundary markers, or monuments?		✓		
j. Change in adjacent land use?		✓		

C. SITE INSPECTION PREPARATION

Assemble the following equipment, as needed, to conduct inspections

- a. Camera and film
- b. Binoculars
- c. Tape measure
- d. Optical ranging device
- e. Brunton compass
- f. Photo scales
- g. Erasable board
- h. Keys to locks
- i. Hand lens
- j. Clipboard
- k. Other miscellaneous support equipment

D. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas upslope of U-3fi Waste Unit.			
a. Have there been any changes in use of adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Other?		✓	
2. Access roads, fences, gates, and signs.			
a. Is there a break in the fence?		✓	
b. Have any posts been damaged or their anchoring weakened?		✓	
c. Is there evidence of erosion or digging beneath the fence?		✓	
d. Does the gate show evidence of tampering or damage?		✓	
e. Is there any evidence of human intrusion?		✓	
f. Is there any evidence of large animal intrusion?		✓	
g. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
h. Are access roads passable?	✓		
i. Other?		✓	

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST (cont.)	YES	NO	EXPLANATION	PAGE 3 OF 4
3. Monuments and other permanent features				
a. Have the survey or boundary monuments been defaced or disturbed?		✓		
b. Have the site markers been disturbed by man or natural processes?		✓		
c. Do natural processes threaten to integrity of any monument or site marker?		✓		
d. Other?		✓		
4. U-3fi Waste Unit cover				
a. Is there evidence of settling?		✓		
b. Is there cracking?		✓		
c. Is there evidence of erosion around the cap (wind or water)?		✓		
d. Is there evidence of animal burrowing?		✓		
e. Other?		✓		
5. Site drainage features (within 1,000 feet of U-3fi).				
a. Is the drainage as describe in the site plans?	✓			
b. Is there evidence of bank erosion?		✓		
c. Is there evidence of channel erosion?		✓		
d. Is there evidence of sedimentation?		✓		
e. Is there channel obstruction?		✓		
f. Is there any evidence that diversion channels (if present) are not performing their function?		✓		
g. Other?		✓		
6. Photo Instructions				
A total of 10 photographs are required to be taken during each inspection of the Area 3 U-3fi Waste Unit. Additional photos may also be taken. The required photographs shall be taken as follows:				
<ul style="list-style-type: none"> • Four (4) from the center of the U-3fi Waste Unit cap, one <u>in</u> each compass direction (i.e., N, S, E, W). • Four (4) of the U-3fi Waste Unit cap, one <u>from</u> each compass direction, • Two (2) of the ER-3-3 monitoring well surface completion with compass directions noted on the photo log. 				
7. Photo Documentation				
a. Have all photos required by the photo instructions been taken? (see last page of checklist)	✓			
b. Has a photo log been prepared for each roll of film exposed?	✓			
c. Number of rolls exposed (<u>10 photos taken</u>)				
d. Other?		✓		
8. Monitoring well ER-3-3 access				
a. Has the monitoring well access been disturbed by man or natural processes?		✓		
b. Does any natural process threaten the integrity of the monitoring well access?		✓		
c. Is the monitoring well access label plate intact and legible?	✓			
d. Is the monitoring well access capped and properly secured?	✓			
e. Other?		✓		

AREA 3, U-3fi POST-CLOSURE INSPECTION CHECKLIST (cont.)	YES	NO	EXPLANATION	PAGE 4 OF 4
E. FIELD CONCLUSIONS				
1. Is there an imminent hazard to the integrity of the U-3fi Waste Unit? (Immediate report required)		✓		
Person/Agency to whom report made:				
2. Are more frequent inspections required?		✓		
3. Are existing maintenance/repair actions satisfactory?	✓		No repairs have taken place since closure	
4. Is other maintenance/repair necessary?		✓		
5. Rationale for field conclusions:				
Explanation #1 - No Post-Closure Permit has been issued				
Inspector's Conclusions:				
No significant problems or concerns were identified during the preparatory research or during the site inspection. The site is in excellent condition. There were no signs of disturbance, damage, erosion to the unit and/or the area surrounding the unit. No maintenance or repair has been required in the past nor should any be required in the foreseeable future.				
E. CERTIFICATION				
I have conducted an inspection of the Area 3 U-3fi Waste Unit at the NTS in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.				
Chief Inspector's Signature		Printed Name		
Title		Date		

ATTACHMENT A

FIELD NOTES

Tuesday, 3-19-96

0730 Kick-off meeting for surveying activities at the Area 3 Decon Pond at Wet-n-Wild.

Conduct monthly RCLA inspections. Will conduct the biannual Post Closure Site inspection for the Area 3 U3fi Waste Unit concurrently with the monthly inspection.

0800 Weather - Unseasonably warm, slight breeze
Inspect Area 2 Bitcutter/Postshot Injection Well & U2bu Subsidence Crater. Nothing unusual.

1030 Arrive Area 3 U3fi Waste Unit. Complete monthly inspection form.

Conduct visual survey / walking inspection of the area within 1,000 feet of U3fi + EL-3-3.

No evidence of changes of use in the adjacent area, no new roads/trails, no change in position of washes and/or lateral extension, changes, etc.

Photos:

#1 U3fi ~~Waste~~ Waste Unit looking west - note buried cable sign in foreground

#2 U3fi Waste Unit looking north

#3 U3fi Waste Unit looking east

#4 U3fi Waste Unit looking south

Conduct inspection of roads, fences, gates & signs.

No breaks, damage, tampering, erosion or digging were noted. No evidence of human or animal intrusion. Signs in excellent condition. Roads good.

Engelberson

WORK CONTINUED

3-19-96

2/12/96

Inspect monuments. No detachment or disturbance noted. No threats to the integrity of either U3fi or ER-3-3. U3fi Waste Cover shows no evidence of settling, cracking and no erosion or burrowing has occurred around the concrete pad. The ER-3-3 monitoring well was locked and secure with name plate intact & legible. No disturbances were noted.

General observations:

No evidence of erosion, sedimentation or changes to the site's drainage features were observed. The unit is in excellent conditions. No overall changes have taken place, with respect to topography, in the last year I have conducted inspections.

Photos:

#5 From the U3fi Waste Unit looking north

#6 From the U3fi Waste Unit looking south

#7 From the U3fi Waste Unit looking east

#8 From the U3fi Waste Unit looking west

#9 U3fi monument marker

#10 ER-3-3 Monitoring Well looking south

#11 ER-3-3 Monitoring Well looking north

#12 ER-3-3 looking cap

#13 Unit looking north

#14 Unit looking east

#15 Unit looking south

Angelika

DATE

3-19-96

DATE

3/20/96

Work continued from Page 163

#16 Unit looking west

#17 Typical interior of sign

#18 Typical exterior of sign

5 Prior to site inspection the Post-Closure Permit was reviewed, along with Design basis documents as built plans & base maps. I reviewed my past monthly inspection reports. Aerial photos were also inspected. No significant changes have occurred at the site other than addition of items used during the characterization & closure activities.

10 Completion of site inspection

15

20

25

Angela Bon

SUBMIT

Angela Bon

DISCLOSED TO AND BY RESTORATION

DATE

3-19-96

DATE

3/20/96

98

the gate to prevent it from blowing open. Other than that the site is in excellent condition. No problems noted - No concerns or recommendations. Site will continue to be inspected informally on a monthly basis.

End of Day

5 Arrive Area 3 U3f Waste Unit
 Day's Activity: Conduct biannual Post-Closure inspection. Inspection will consist of photographing site + physically walking line area within a 1,000 foot radius to identify changes in drainage, erosion, etc. The unit itself will be inspected for possible damage or deterioration of fencing, signs, monuments, etc.

Photo Log

1.	U3f.	from South (looking north)
2.	U3f.	from west
3.	U3f.	from north
4.	U3f.	from east
5.	From U3f.	looking south
6.	"	west
7.	"	north
8.	"	east
9.	From ER3-3	looking west
10.	From ER3-3	looking east

Inspect area. No erosion or drainage changes. Looks unchanged from last biannual inspection. Fenced rubble reads from inside fence. Gate has been to sign. A chain + lock was installed on 99

11/11

ATTACHMENT B
PHOTOGRAPHS

**RESOURCE CONSERVATION & RECOVERY ACT
AREA 3 U3fi WASTE UNIT
POST-CLOSURE SITE INSPECTION
PHOTOGRAPH LOG**

PHOTO NUMBER	DATE	DESCRIPTION
1	3/19/96	U3fi Waste Unit looking west, note "Buried Cable" sign in foreground
2	3/19/96	U3fi Waste Unit looking north
3	3/19/96	U3fi Waste Unit looking east
4	3/19/96	U3fi Waste Unit looking south
5	3/19/96	From the U3fi Waste Unit looking north
6	3/19/96	From the U3fi Waste Unit looking south
7	3/19/96	From the U3fi Waste Unit looking east
8	3/19/96	From the U3fi Waste Unit looking west
9	3/19/96	U3fi monument marker
10	3/19/96	ER-3-3 Monitoring Well looking south
11	3/19/96	ER-3-3 Monitoring Well looking north
12	3/19/96	ER-3-3 Monitoring Well locking cap
13	3/19/96	U3fi Waste Unit looking north
14	3/19/96	U3fi Waste Unit looking east
15	3/19/96	U3fi Waste Unit looking south
16	3/19/96	U3fi Waste Unit looking west
17	3/19/96	Typical interior of sign
18	3/19/96	Typical exterior of sign

RESOURCE CONSERVATION & RECOVERY ACT
AREA 3 U3fi WASTE UNIT
POST-CLOSURE SITE INSPECTION
PHOTOGRAPH LOG

PHOTO NUMBER	DATE	DESCRIPTION
1	9/30/96	U3fi Waste Unit looking west
2	9/30/96	U3fi Waste Unit looking north
3	9/30/96	U3fi Waste Unit looking east
4	9/30/96	U3fi Waste Unit looking south
5	9/30/96	From the U3fi Waste Unit looking north
6	9/30/96	From the U3fi Waste Unit looking south
7	9/30/96	From the U3fi Waste Unit looking east
8	9/30/96	From the U3fi Waste Unit looking west
9	9/30/96	ER-3-3 Monitoring Well looking south
10	9/30/96	ER-3-3 Monitoring Well looking north

ATTACHMENT C
INSPECTOR'S RESUME

Angela L. Olson
4584 East Armel Court
Las Vegas, Nevada 89115
Home: (702) 437-2573
Work: (702) 295-7276

Professional Qualifications

Ms. Olson is a geological engineer with over six years of experience in projects related to environmental restoration. She is familiar with site characterization and remediation techniques including RCRA closure activities and inspections, underground storage tank removal, facility Decontamination & Decommissioning, monitoring well installation and development, core logging, geotechnical testing, instrumentation, and slug testing. She has authored a variety of technical reports ranging from Health and Safety Plans to Closure Reports. In addition, her experience extends to all aspects of groundwater, soil, tank, and drum sampling, which encompasses sample collection, shipment, tracking, and data validation. She has been involved in slope stability analysis, and the design of surface water retention ponds and diversion ditches.

Education

B.S., Geological Engineering, S. D. School of Mines & Technology, Rapid City, SD, 1989

Additional Training:

OSHA Health & Safety Training, 40-hour
OSHA Supervisor's Health & Safety Training, 8-hour
USDOE Core Radiological Training (Rad Worker II)
Supervised Field Training, 24-hour
First Aid and CPR Training

Experience and Training

- 1996- **Geologist/Hydrogeologist , Bechtel Nevada, Nevada Test Site, Nevada**
Bechtel Nevada awarded O&M contractor for the Nevada Test Site. Including previous responsibilities, her additional duties include Property Management and Procurement.
- 1994- **Waste Management Specialist, Reynolds Electrical & Engineering Company, Inc.,**
1995 **Nevada Test Site, Nevada**
For the USDOE Nevada Test Site, Mercury, Nevada, she participated in several environmental Remediation projects including the Demolition and Decontamination Program, the Underground Storage Tank Program, the Abandoned Septic Tank Program, and Resource Conservation and Recovery Act site closures and monthly inspections.
- Supervised and responsible for all field operations and health & safety issues related to the Demolition and Decontamination of the Junior Hot Cell located at the Reactor Maintenance Assembly, and Disassembly Facility. Sole author of the Closure Report.
 - Supervised the demolition and removal of underground storage tanks and all related aspects such as verification sampling and closure report writing.

- Field manager for the clean closure of a RCRA site that involved preparation the Site Specific Health & Safety Plan, excavation of lead and hydrocarbon impacted soils, verification sampling, and preparation of the closure report that was submitted to the USDOE and Nevada Department of Environmental Protection.

1991- **Geological Engineer, IT Corporation, Englewood, CO**

- 1993 Involved in surface water flow and retention design projects including diversion ditch design and slope stability analysis. Computer skills include groundwater and PCSTABL5M slope stability modeling, STRATIFACT, Fortran and numerous PC applications.

- For the USDOE Nevada Test Site ; Las Vegas, Nevada, she participated in the Environmental Restoration (ER) Site Inventory Program. Her responsibilities included:

- Field verification and assessment of ER site
- Development and implementation of a database utilizing dBase IV to organize sitewide historical information and identify potential new sites.

- For the USDOE Rocky Flats Nuclear Facility, Golden , Colorado, she played a key role in the research and development of the Historical Release Report. Her duties included:

- Detailed review of Rocky Flats Plant documents
- Extensive technical writing and organizational skills
- Database management
- Interpretation of aerial photographs
- In-depth interviews with past and present employees with historical knowledge.

- Participate in Hazardous Waste Remediation Program for the Hardage Superfund Site which included:

- Design of recovery trench utilizing slope stability and grain size analysis
- Supervision of drilling crew
- Installation of groundwater monitoring wells
- Implementation of well development, sampling and slug testing plans
- Core logging, geotechnical testing, and sampling
- Cost estimation of trench construction efforts
- Data validation.

1990- **Technical Support/Sampler, ERM Rocky Mountain, Englewood, CO**

- 1991 Participated in the environmental restoration program at the USDOE Rocky Flats Nuclear Facility. Experience included:

- Quarterly sampling of groundwater monitoring wells and sample tracking
- Calibration and maintenance of HNu, pH meter and spectrophotometer
- Utilization of radiation screening devices
- Development of Lotus Spreadsheets to coordinate field generated data
- Scheduling of sampling teams
- Quality Assurance/Quality control of field data and spread sheets

APPENDIX B

SUBSIDENCE SURVEY PLAT

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APPENDIX C
PRECIPITATION RECORDS

JUL 1995

[illegible]

OCT 1995

TOTAL	.02	.02	.02	T	.01	T	.02	T	.03	.02	.03	.07	.03	.07	.03
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PRELIMINARY

NTS PRECIPITATION

Nov 1995

[illegible]

PRELIMINARY
NTS PRECIPITATION

MONTH/YEAR Dec 1995

	BJY	CS	DRA	4JA	40MIN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13	T	T	T	.01	T	T	T	.02	T	T	.01	.01	.01	T
14	T	.04		.01	.08	.05	T	T	.02	.05	.01	.05	.02	.05
15									.07					
16	T	T	T	T	T	T	T	T	.02	.02	T	T	T	T
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29									.03	.02				
30														
31														
TOTAL	T	.04	T	.02	.08	.05	T	.02	.14	.09	.02	.06	.03	.05

PRELIMINARY

PRELIMINARY
NTS PRECIPITATION

MONTH/YEAR JAN 1996

	BJY	CS	DRA	4JA	40MN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19	T		.01	T	T	T	T	T	.05		.02	T	T	.03
20	.03				.02	.01				.10				
21	.02		.02	.02	.02	.02	.02	.05			.02	.01	T	.07
22												.01		
23														
24														
25														
26														
27														
28														
29														
30						.02								
31	.06	.05	.27	.05	.15	.08	.20	.15	.05	.02	.05	.15	.12	.05
TOTAL	.11	.052	.30	.07	.19	.13	.22	.202	.05	.12	.09	.17	.12	.15

PRELIMINARY

PRELIMINARY NTS PRECIPITATION

MONTH/YEAR FEB -- 1996

	BJY	CS	DRA	4JA	40MN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1	.04							.03				.02		.07
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19						.05								
20	.05	.60	.42	.07	.15	.22	.38	.56	.40	.24	.25	.10	.10	.17
21				.05	.10	.23			.02	.07		.18	.15	
22	.03		.02	.03	.02	.02		.03			.30			
23						.02								
24														
25		.12	.27	.25	.03	.03	.17	.37	.13			.17	.03	
26	.02			.02	.02	.03				.05			.07	
27	.09	.15	.05	.09	.02	.02		.05	.02	.02		.08	.01	.05
28	.15	.10	.05	.08	.05	.06	.12		.06	.20		.14	.01	.05
29														
30														
31														
TOTAL	.38	.97	.81	.59	.39	.68	.67	.64	.63	.58	.55?	.69	.37	.34

PRELIMINARY

PRELIMINARY NTS PRECIPITATION

MONTH/YEAR MAR - - 1996

	BJY	CS	DRA	4JA	40MN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12	.14	.15	.17	.27	.37	.34	.19	.06			.20	.17		.09
13	.05		.06		.17	.35	.10	.10				.21		.10
14	.02		.11		.14	.05	.02	.07				.03		.03
15														
16														
17														
18														
19														
20														
21														
22														
23			T											
24														
25														
26														
27														
28														
29														
30														
31														
TOTAL	.21	.15	.34	.27	.68	.74	.31	.23	.60	.53	.20	.41	2	.22

PRELIMINARY

PRELIMINARY NTS PRECIPITATION

MONTH/YEAR APR -- 1996

	BJY	CS	DRA	4JA	4QMN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1					.09			.27	.40			.10	.04	
2									.06					
3														
4														
5														
6														
7														
8														
9														
10														
11														
12		.07			.04		.02						.06	
13														
14														
15														
16			T											
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
TOTAL	Ø	.07	T	Ø	.13	Ø	.02	.27	.16	Ø	Ø	.10	.10	Ø

PRELIMINARY

PRELIMINARY
NTS PRECIPITATION

MONTH/YEAR MAY -- 1996

	BJY	CS	DRA	4JA	40MN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10			...											
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22			T											
23														
24	.06	.05	.08	.08	.14	.08		.03	.03	.10	.07			
25	.16	.30	.02	.10		.02	.05	.25	.03	.56	.10	.12		.03
26					.10	.09			.10		.03	.05	.07	.10
27	.04		T					.05	.02	.07		.04		
28									.16					
29												.03		
30														
31														
TOTAL	.26	.35	.10	.18	.24	.19	.05	.33	.34	.73	.20	.24	.07	.13

PRELIMINARY

PRELIMINARY
NTS PRECIPITATION

MONTH/YEAR JUN - - 1996

	BJY	CS	DRA	4JA	40MN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25		.05												
26	.33	.05	.05		.10	.09	.11	.17	.07	.23	.04	.24	.12	.35
27														
28														
29														
30														
31														
TOTAL	.33	.10	.05	0	.10	.09	.11	.17	.07	.23	.04	.24	.12	.35

NTS PRECIPITATION

MONTH/YEAR JUL -- 1996

	BJY	CS	DRA	4JA	40MN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11					2.30	.03		.17	.07	.03		.16		.03
12	.14												.04	
13					.18	.03		.06				.10		
14	.22	.29	.13		.07	.02			.02			.20		.02
15														
16	*				*				*	*				
17						*		*				*	*	*
18		*		*			*				*			
19														
20														
21														
22														
23														
24														
25														
26														
27						.03		.02	.02					
28					.07			.05				.06		
29		.25			.03				.07				.03	
30														
31														
TOTAL	.36	.54	.13		2.60	.11		.25	.18	.03		.52	.07	.05

Data Tablated By 8/2/96 BTF

Data Quality Control RJA

* CAL. ON RAIN GAGE
16 - 17 - 18

MONTH/YEAR **AUG -- 1996** NTS PRECIPITATION

	BJY	CS	DRA	4JA	4QMN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12						.06								
13														
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16	.05		.16				.03	.20	.22				.10	.10
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23														.07
24								.16						
25														
26														
27														
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29														
30														
31														
TOTAL	.05	.00	.16	.00	.00	.06	.03	.20	.38	.00	.00	.00	.10	.17

Data Tablated By BF

Data Quality Control

NTS PRECIPITATION

MONTH/YEAR **SEP -- 1996**

	BJY	CS	DRA	4JA	4QMN	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1														
2														
3														
4														
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21														
22														
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28														
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31														
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Data Tablated By ATF

Data Qualtiy Contol _____

NO PRECIP FOR THE MONTH OF SEPT. 1996

MONTH/YEAR OCT -- 1996 NTS PRECIPITATION

	BJY	CS	DRA	4JA	4OMN	LF2	MER	MV	PM1	PHS	RV	TS2	V5B	UCC
1														
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18														
19														
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21														
22														
23														
24														
25			T											
26								.30						
27		.20								.02				
28	.22	.05	.02		.08	.20	.09	.40		.00		.31	.26	.45
29										.07			.03	
30	.45	.72	.30	.21	.53	.58	.25	.24		.05		.38	.31	.50
31										.01		.17		.05
TOTAL	0.67	0.97	0.32	0.21	0.61	0.78	0.34	0.96	0.00	.25	0.00	0.92	0.60	1.00

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