Data for air quality, surface water, groundwater, soils, and geology are being validated in accordance with sections 3.4 and 3.7 of the QAPjP for data validation guidelines and data usability criteria respectively. Some of the data are validated and accepted, some are validated with qualifications, some have been rejected, and some have yet to go through the validation process. Appendices D, E, and F list the available analytical data and identify which samples have been validated. A summary evaluation of the data available for each IHSS located in OU 13 is given below.

North Chemical Storage Site (IHSS 117.1). This site was used to store non-radioactive construction debris, waste metal, and scrap metal. Existing data for this site are available from piezometers and groundwater monitor wells P114789, P214689, P115589, and P218089. The available data characterize the site's soils and geology. Limited surficial soils data was collected as part of a site-wide PCB investigation in 1991. This data shows no radionuclide contamination. The only data that shows contamination is the data from well P214689 which shows that radionuclides detected at levels exceeding background in samples of alluvium were plutonium-239/240, radium-226, radium-228, strontium-89/90, tritium, uranium-233/234, uranium-235, and uranium-238. Only plutonium-239/240 and radium-226 were detected at levels greater than the maximum concentration detected in background samples. No radionuclides were detected at levels exceeding background in bedrock samples.

Based upon the information currently available, it is not possible to relate the contaminants detected in Well P214689 to IHSS 117.1. Since there is no documented evidence of the storage or disposal of radioactively- or chemically-contaminated materials at IHSS 117.1, it is possible that the contaminants detected in alluvium and bedrock from Well P214689 may be related to a source upgradient of this IHSS.

Middle Chemical Storage Site (IHSS 117.2). This site was used as a non-radioactive chemical storage facility. Existing soils and geologic data for this are limited to piezometers located in the vicinity of the site. These piezometers are P115589, P213689, and P214089.

South Chemical Storage Site (IHSS 117.3). This site was used as a storage area for pallets, cargo containers and new drums, and in one instance it is believed the site was used for the storage of a contaminated glovebox. Existing data for this site characterize soils geology and groundwater in the vicinity. These data are available from piezometers and monitor wells P313489, P418289, 6186. A radiometric survey for gross contamination was conducted for this area.

Oil Burn Pit Number 1 Waste Leak (IHSS 128). Approximately 200 gallons of radioactively contaminated waste oil were burned in an open pit in 1956. Data for soils and geology are available from piezometer P114889. Air monitoring data collected at the time the oil was burned may also be available.

Lithium Metal Destruction Site (IHSS 134). This area contains the reaction products from oxidation of magnesium and lithium metal coated with machine oils that may have contained

Table 5.2
(sheet 2 of 2)

SAMPLING ACTIVITY OBJECTIVES FOR EACH STAGE OF PHASE I REMEDIAL INVESTIGATION

Groundwater	determine presence or absence of contamination in existing nearby wells and piezometers	supplement existing wells and piezometers with BAT Hydropunch to develop OU model for Transport and Fate of contaminants	provide additional information including complete deleniation of contaminated groundwater plumes, if present.
Surface Water and Sediments	establish presence or absence of contamination in the sump at IHSS 171 and at many locations through out the Industrial Area of the plant	provide additional information as deemed necessary from the Stage 1 results	provide additional information as deemed necessary from the Stage 2 results
Boreholes	determine the presence or absence of contamination resulting from subsurfaces releases at IHSSs 128&148	confirm anomalous findings from stage 1, begin to determine nature and extent of contamination in the subsurface	provide additional information as deemed necessary from the Stage 2 results

During all stages of the investigation, any anomalies detected will be investigated until the anomalies are completely mapped. For example, if soil gas anomalies continue beyond the present IHSS boundaries, additional soil gas samples will be collected and analyzed outside the IHSS boundaries until the anomalies are completely mapped or the boundary of a neighboring IHSS is encountered. If the adjoining IHSS is located in another operable unit, sampling within that IHSS will be coordinated with the appropriate Operable Unit Manager, to ensure that the anomalies are completely mapped.

The objectives for each of these activities are summarized in Section 5, Table 5.2.
The rationale for sampling groundwater from the existing wells and piezometers in the vicinity of OU 13 is based on the fact that the current quality of the groundwater beneath the operable unit is not known. Groundwater quality data is available for only one well located within OU 13. Sampling of the existing wells and piezometers provides a cost-effective means for better assessing groundwater conditions within the operable unit, and for analyzing the groundwater conditions that are being modeled site-wide. The data obtained from this activity will also enable a more complete evaluation of the analytical data that currently exists for these wells and piezometers in and around OU 13.

Upon completion of Stage 1, the data collected during Stage 1 screening activities will be evaluated so that subsequent stages of the investigation can be adequately planned. Results from applicable site-wide studies, Stage 1 data and recommendations for Stage 2 investigations will be summarized in a technical memorandum. Due to the turn-around times involved with obtaining laboratory results, this technical memorandum may not provide complete results of the laboratory analysis of borehole, surficial soil, and groundwater samples. A report of the complete laboratory results will be sent to the regulatory agencies within 45 working days of receipt of the last analysis.

Stage 2 sampling will be used to confirm the results of the Stage 1 surveys where no contamination was found and to provide additional information on those sites where contamination was found to be present. Activities to be conducted under Stage 2 include:

- Additional surficial soil sampling (if needed);

The surface radiological survey will be performed with an HPGe instrument. A sample of the soil present at the base of the artificial fill will be collected from within the boring drilled for the soil gas survey for analysis of radionuclides with a laboratory HPGe. The concentration of lithium and magnesium will also be measured. Subsequent to the HPGe survey, surficial soil samples will be collected from eleven locations in the combined IHSS 128, IHSS 134N and IHSS 171 area for analysis of lithium and TAL metals (Figure 6-6). At one of these sampling sites, a surficial soil sample will also be collected for analysis of radionuclides with a laboratory HPGe to confirm the results of the HPGe survey. This sample will be split and sent to a radiochemistry laboratory for analysis. Depending on the results of the HPGe survey, vertical profile samples may also be collected.

The soil gas survey will analyze for the following compounds and will note any other compounds which were detected but not calibrated for:

<u>IAG Required</u>

benzene toluene xylene perchloroethene

<u>Indicated by Available Data</u>

carbon disulfide acetone

Analyses of groundwater samples from existing piezometers P114989, P114889, and P114789 will provide data which may be useful in assessing potential contamination associated with IHSS 128 and the northern portion of IHSS 134 (Figure 6-2). Groundwater samples from these piezometers will be analyzed for the constituents indicated in Table 6.4.

6.3.1.5 Lithium Metal Destruction Site (IHSS 134)

As discussed in Section 6.3.1.4, the northern portion of IHSS 134 will be investigated with IHSS 128. Stage 1 sampling efforts for the southern portion of IHSS 134 will consist of a visual inspection, soil gas surveys, surficial soil sampling, and sampling of existing groundwater

6.3.1.6 Waste Spills (IHSS 148)

Stage 1 sampling efforts for IHSS 148 will consist of a visual inspection, surface radiological and soil gas surveys, one soil boring, and sampling of existing groundwater monitoring wells and piezometers (Figure 6-8 and Table 6.3). The Stage 1 surface radiological and soil gas surveys for this IHSS will be performed on initial grid spacings of 20 feet. It is believed that the releases that may have occurred within this IHSS occurred primarily beneath Building 123. The available information regarding releases at this IHSS also indicate that releases may have occurred around the building perimeter before and after the area south of the building was paved. Thus, the investigation in the paved areas surrounding the building to the north, east and south will focus on potential contamination of the asphalt as well as the soils beneath the asphalt. The surface radiological and soil gas surveys will be performed around the north, east and south perimeters to a line parallel with the eastern extension of the west wing of this building. The surveys will be performed between Building 123 and Fourth Street to the east, Central Avenue to the north, and Third Street to the west. The southern side of Building 123 will be surveyed within an area extending from the building to approximately 20 feet south of the eastern wing of the building. This area includes the alcove between the wings of the building (Figure 6-8). Much of this area is paved and will require that access holes be cut through the pavement prior to initiating the investigations of potential contamination in the soils beneath the pavement.

The surface radiological survey will initially be performed with a tripod-mounted HPGe instrument over the entire IHSS area. After the results of this survey have been evaluated, samples of asphalt will be collected at a maximum of four anomalous areas detected by this survey. These samples will be analyzed with a laboratory HPGe. At eleven locations surficial soil samples will also be collected for analysis of radionuclides and TAL metals (Figure 6-8). Two of these samples will be split and analyzed with a laboratory HPGe. Depending on the results of the HPGe survey, vertical profile samples may also be collected.

The IAG does not require the performance of a soil gas survey at IHSS 148. However, the available analytical data for well 4486, the nearest downgradient will to IHSS 148, indicate the presence of several VOCs in groundwater in the area. The source of these contaminants is not known, thus necessitating further investigation. The soil gas survey will analyze for the following compounds and will note any other compounds which were detected but not calibrated for:

1,1,1-trichloroethane	perchloroethene	trichloroethene chloroform
1,1-dichloroethane	acetone	

One soil boring will be drilled adjacent to the OPWL where it exits the south side of Building 123 (Figure 6-8). The invert elevation of the pipe at this point is approximately 2.5 feet below the ground surface. The location of the pipe will be determined by examining building engineering drawings, surface geophysics, or by hand trenching along the south edge of the building. The boring will be drilled to bedrock and discrete samples will be taken as shown in Figure 6-11 and analyzed for TAL metals, radionuclides, nitrate, chloride, and sulfate (Table 6.4).

Analyses of groundwater samples from existing well 4486 and piezometers P415989, P416189, P115589, and P115689 will provide data which may be useful in assessing potential contamination associated with IHSS 148 (Figure 6-2). Groundwater samples from these locations will be analyzed for the constituents indicated in Table 6.4.

6.3.1.7 Fuel Oil Tank (IHSS 152)

Stage 1 sampling efforts for IHSS 152 will consist of a visual inspection, a soil gas survey and sampling of existing groundwater monitoring wells and piezometers (Figure 6-5 and Table 6.3). Because the releases known to have occurred within this IHSS are relatively large (i.e., hundreds of gallons), the Stage 1 soil gas survey for this IHSS will be performed on a triangular grid spacing of 40 feet (Figure 6-5). This survey will be conducted over the entire area of the IHSS to the extent possible. The presence of Tank 221 and equipment associated with the tank may prevent the performance of this survey over a portion of the IHSS within the berm for that tank (Figure 6-5). IHSS 117.3 is located within the eastern portion of this IHSS, and the soil gas surveys for

TABLE 6.4 PHASE I, STAGE 1, ANALYTICAL PROGRAM

Parameters	IHSS										
	117 .1 & 197	117.2	117.3	128 & 134(N)	134(S)	148	152	157.1	158	171	186
Surficial Soil Analyses											
TAL Metals	X	X	X		X			X	X		
Lithium				X	X					X	
Radionuclides – Full Suite [c]	X	X	X	X	X	X		X	X	X	X
Laboratory HPGe [d]	X	X	X	X	X	X		X	X	X	X
Asphalt Analyses											
Laboratory HPGe [d]		X			X	X					
Borehole Samples											
TAL Metals						X					X
TCL Volatiles											X
TCL Demivolatiles											X
Laboratory HPGe [d]						X					X
Nitrate						X					X
Chloride						X					
Sulfate						X					
Groundwater Analyses											
TAL Metals	X	X	X	X	X	X	X	X	X	X	X
TCL Volatiles	X	X	X	X	X	X	X	X	X	X	X
TCL Semivolatiles	X	X	X	X	X	X	X	X	X	X	X
Radionuclides – Full Suite [c]	X	X	X	X	X	X	X	X	X	X	X
Anions [e]	X	X	X	X	X	X	X	X	X	X	X
Field Parameters [f]	X	X	X	X	X	X	X	X	X	X	X
Sump Liquids Analyses											
TAL Metals										X	
TCL Volatiles										X	
TCL Semivolatiles										X	
Radionuclides – Full Suite [c]										X	
Field Parameters [f]										X	

a Vertical Profile Samples Will Also Be Taken at Selected Locations for Analysis with a Laboratory HPGe
b All Soil Gas Samples Will Be Analyzed in the Field for the Constituents Listed in Section 6.3.1.1 to 6.3.1.11 for Each IHSS
c Analysis of the Following Radionuclides at a Radiochemistry Laboratory – Gross Alpha, Gross Beta, Amercium 241, Plutonium 239/240, Tritium, Uranium 233/234, Uranium 235, and Uranium 238
d Analysis of Samples for Gamma-Emitting Radionuclides with a Laboratory HPGe, or Appropriate Radiochemical Analysis
e Chloride, Fluoride, Nitrate, and Sulfate.
f Temperature, pH, and Specific Conductance

See Table 5.3 for a Complete List of Analytes, Detection Limits, and Analytical Methods

RESPONSE TO CDH COMMENTS RECEIVED ON MAY 4, 1993 PERTAINING TO THE PHASE I RFI/RI REVISED WORK PLAN FOR OPERABLE UNIT NO. 13 (OU 13) DATED MARCH 10, 1993

CDH General Comment 1

"The Division disagrees with the deposition of our comments regarding the number and location of surficial soil samples (Comment CDH #8, November 10, 1992). The statistical basis for the number of surficial soil samples, as presented in response to our comment, is not considered by the Division to be a valid approach to meeting any of the Stage 1 objectives. The Division does not believe that a sufficient number of surficial soil samples have been proposed to assure that the Stage 1 objectives will be attained. The statistical approach for the surficial soil field sampling plan should be consistent with Environmental Protection, EPA Guidance and approved RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plans for similar at the Rocky Flats Plant (RFP). This can be done by: 1) replacing Section 5.1.2.5.3 with the revised section contained in Attachment I; 2) modifying Table 6.2 and Figures 6-3 through 6-10 as shown in Attachment II; and 3) revising the text in section 6.3 as necessary to be consistent with items 1 and 2, above."

Response to Comment

First, refer to the statement "the statistical approach for the surficial soil field sampling plan should be consistent with EPA Guidance, and approved RFI/RI Workplans for similar OUs at the Rocky Flats Plant."

The problem with this statement is that OU 13 is not similar to any of the OUs that have already submitted RFI/RI Workplans. OU 13 is unique in the fact that no historical data exists within each of the Individual Hazardous Substance Sites (IHSS). The only information that exists is information about possible releases and land usages from the Historical Release Report. In addition, there is some data available from groundwater wells and piezometers which surround the OU 13 area. All the wells and piezometers, except one, are not within the IHSS areas. These wells and piezometers might be influenced by OU 13, but at this time not enough information is available from OU 13 to attribute the conditions at these wells and piezometers directly to OU 13.

CDH copied the text from the Field Sampling Plan (FSP) designed for the OU 10 RFI/RI Work Plan and would like it to replace portions of section 5.1.2.5.3. There are several technical issues that arise from doing this:

1. The assumption is made that the OU 10 IHSS areas are identical to the IHSS areas in OU 13. By reviewing the Historical Release Report, this assumption is invalid. The possible contaminants at the IHSS areas in OU 13 are different from the possible contaminants at the IHSS areas in OU 10.

2. CDH is also using the historical data in OU 10 to describe the conditions in OU 13 (largest CV=0.59). If the historical data in OU 10 can describe OU 13, then why can't the data currently being collected in OU 10 be used to describe the current conditions at OU 13? This is not sound statistical or technical practice, since the possible contaminants in OU 13 are different from those in OU 10.

3. CDH fails to understand the Stage 1 objective of the OU 13 FSP. CDH is trying to use EPA Guidance that is designed to meet Risk Assessment criteria for OU 13 Stage 1 objective. This guidance bases a FSP on historical data, which is not currently available for OU 13. The Stage 1 objective in OU 13 is to try and identify elevated concentrations of possible contaminants and to provide information to design a sampling plan that meets the Risk Assessment Criteria. The data collection for Risk Assessment is the Stage 2 objective and not the Stage 1 objective in OU 13.

4. The copied text from the FSP in OU 10 uses equations from Gilbert (Statistical Methods for Environmental Pollution Monitoring,1987). According to Gilbert (page 34), to use the equations specified in the copied text, one needs to have estimates of ∂ or the coefficient of variation. These parameters can be estimated by one of the following three ways (described by Gilbert):

   1. Collect preliminary data from the population to approximate ∂ or the coefficient of variation.
   2. Estimate 6 or the coefficient of variation from data collected at the same population at a prior time or on a population from a similar study site.
   3. Use best judgment when reliable data are not available.

   No historical data exists to estimate these parameters and we do not feel that OU 10 is a "similar study site", so suggestion 2 can not be used. That leaves us with collecting preliminary data from the population to approximate these parameters or using best judgment.

The OU 13 Stage 1 FSP is designed to collect preliminary data from the population to approximate these parameters and identify the possible contaminants. Best judgment was not used, since there is not enough information about these IHSS areas to determine a defensible sampling plan.

The statistical methods used to develop the OU 13 Stage 1 FSP are based on reconnaissance sampling and <u>not</u> baseline risk assessment sampling. The Division is familiar with sampling plans based on baseline risk assessment, since historical information has been available for the other OUs. When historical information is not available, one needs to explore the area to obtain information, hence reconnaissance sampling.

Reconnaissance sampling addresses the question of whether contamination is present at a specific IHSS. It is designed to bound the level of contamination at a IHSS, and detect contamination, if it is present. Two parameters are needed to determine the required number of samples: the fraction of the site affected by contamination and the probability of detecting elevated concentrations.

The fraction of the site contaminated was estimated to be at least 25% at each IHSS area based on the Historical Release Report. The fraction of the site contaminated should actually be much higher than 25% at most of the IHSS areas according to the Historical Release Report. The probability of detecting elevated concentrations was set at 95%. By biasing the samples to improve detection (i.e, stained soil and areas with elevated counts from field surveys), the actual probability of detection may significantly exceed 95%.

The information gleaned from reconnaissance sampling will help identify contaminants of concern and bound the level of contamination. It will also provide information to estimate the parameters needed i.e., coefficient of variation to develop a sampling plan for baseline risk assessment.

The approach submitted in the revised Work Plan dated March 10, 1993 is more efficient, accurate, and technically valid from the Division's proposed alternative.

CDH GENERAL COMMENT #2

DOE's response to the Division's comment (CDH 1) regarding HPGe SOP has not been fully implemented in the Work Plan. In the March 8, 1993 Response to Comments, DOE states "We have also revised Section 6 - Field Sampling and Analysis Plan to avoid the use of HPGe detectors for sampling beneath the pavement." However, section 6.3.1 of the Field Sampling Plan on page 6-38 indicates the HPGe survey is one of two methods to be used to characterize potential below pavement contamination. The second method is surficial soil samples. Neither the Field Sampling Plan or the Data Quality Objectives address how the HPGe survey would be conducted and results interpreted in paved IHSSs. The Division does not consider the HPGe survey to be capable of characterizing potential contamination located under pavement or other fill material. Therefore, the Data Quality Objectives (Section 5.1.2.5.1) and Field Sampling Plan (Section 6.3) for the Radionuclide Survey must be revised to clarify that the HPGe survey will not be used for characterization of potential contamination below pavement or other fill material. The surficial soil sampling program revisions proposed in General Comment 1 have been structured to begin radionuclide characterization under paved and fill covered IHSSs in OU 13. The Division still considers the HPGe survey appropriate for screening potential surface contamination of soil and asphalt.

Response to Comment

The HPGe will not be used to characterize radionuclides below the pavement. All that the text on page 6-38 says is that strong sources of radioactivity near the surface may produce anomalous readings which we would need to investigate further. We agree with the statement that the HPGe detector is the appropriate instrument to use for screening potential surface contamination of soil and asphalt. No revision of the text is warranted.

CDH General Comment #3

The Division disagrees with the deposition of our comments to the draft and final Work Plans regarding Section 5.1.2.5. As stated in CDH November 1992 comments to that section, when ground water contamination has been confirmed at an IHSS, plume delineation

will be necessary. One down-gradient well is not necessarily sufficient. The text must specifically acknowledge that complete plume delineation will occur. Plume delineation should be added to the Stage 3 objectives for ground water in Table 5.2.

Response to Comment

The data quality objective stated in Table 5.1 is clear—Characterize the nature and extent of contamination. This would normally include the delineation of any plume of contaminated groundwater. However, the text on page 6-72 (second to last paragraph in section 6.3.3) has been revised to include the following statement: The results of the samples will be incorporated into the Draft RFI/RI Report to ensure the complete delineation of any plume of contaminated groundwater that is encountered. In addition, Table 5.2 has been revised per comment.

CDH SPECIFIC COMMENT #1

In Section 5.1.1.2 for the North Chemical Site (IHSS 117.1) on page 5-4 the text states, "The data shows no radionuclide contamination.", which appears to be inconsistent with revised Section 6.3.1.1 where data from borehole P214689 at IHSS 117.1 is reported to contain above background concentrations of several radionuclides. Please clarify/correct this apparent discrepancy between these sections of the Work Plan.

Response to Comment

The referenced sentence in section 5.1.1.2 (page 5-4) refers to the collected PCB data. For clarification, the following sentence was added: "The only data that shows contamination is the data from well P214689 which shows that radionuclides detected at levels exceeding background in samples of alluvium were plutonium-239/240, radium-226, radium-228, strontium-89/90, tritium, uranium-233/234, uranium-235, and uranium-238. Only plutonium-239/240 and radium-226 were detected at levels greater than the maximum concentration detected in background samples. No radionuclides were detected at levels exceeding background in bedrock samples.

Based upon the information currently available, it is not possible to relate the contaminants detected in Well P214689 to IHSS 117.1. Since there is no documented evidence of the storage or disposal of radioactively- or chemically-contaminated materials at IHSS 117.1, it is possible that the contaminants detected in alluvium and bedrock from Well P214689 may be related to a source upgradient of this IHSS." This is consistent with the text on pages 2-86 and 2-87.

CDH SPECIFIC COMMENT #2

The Target Analyte List (TAL) metals includes magnesium and beryllium. In order for the text to be consistent, Table 6.4 has been revised. Magnesium was detected as a specific analyte. Similarly, the text on pages 6-47, 6-51, and 6-53 has been changed to reference only TAL metals.

Response to Comment

We agree with the comment. The text on page 6-44 has been modified to include magnesium. Table 6-4 will be modified to show beryllium as an analyte for IHSS 148.

CDH SPECIFIC COMMENT #3

In Section 6.2.2 (page 6-26); if, because of laboratory turnaround time, complete analytical results for Stage 1 sampling are not provided in Technical Memorandum 1, a target date for submittal of the remainder of the Stage 1 data needs to be specified. The Division agrees that Technical Memorandum 1 should not be delayed waiting for complete Stage 1 analytical results. However, it is not appropriate to defer reporting complete Stage 1 results until the Stage 2 Technical Memorandum is submitted. The Division recommends that complete Stage 1 results be reported in the Division within a reasonable time (i.e., 30 days) after EG&G/DOE receipt of complete Stage 1 analytical results.

Response to Comment

The text in section 6.2.2 (page 6-26) has been revised accordingly.