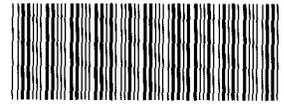


NOTICE

All drawings located at the end of the document.



000107685



CLOSE-OUT RADIOLOGICAL SURVEY REPORT

123 CLUSTER

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K.A. [Signature] (LNU)
 8/31/98

APPROVED

1/12

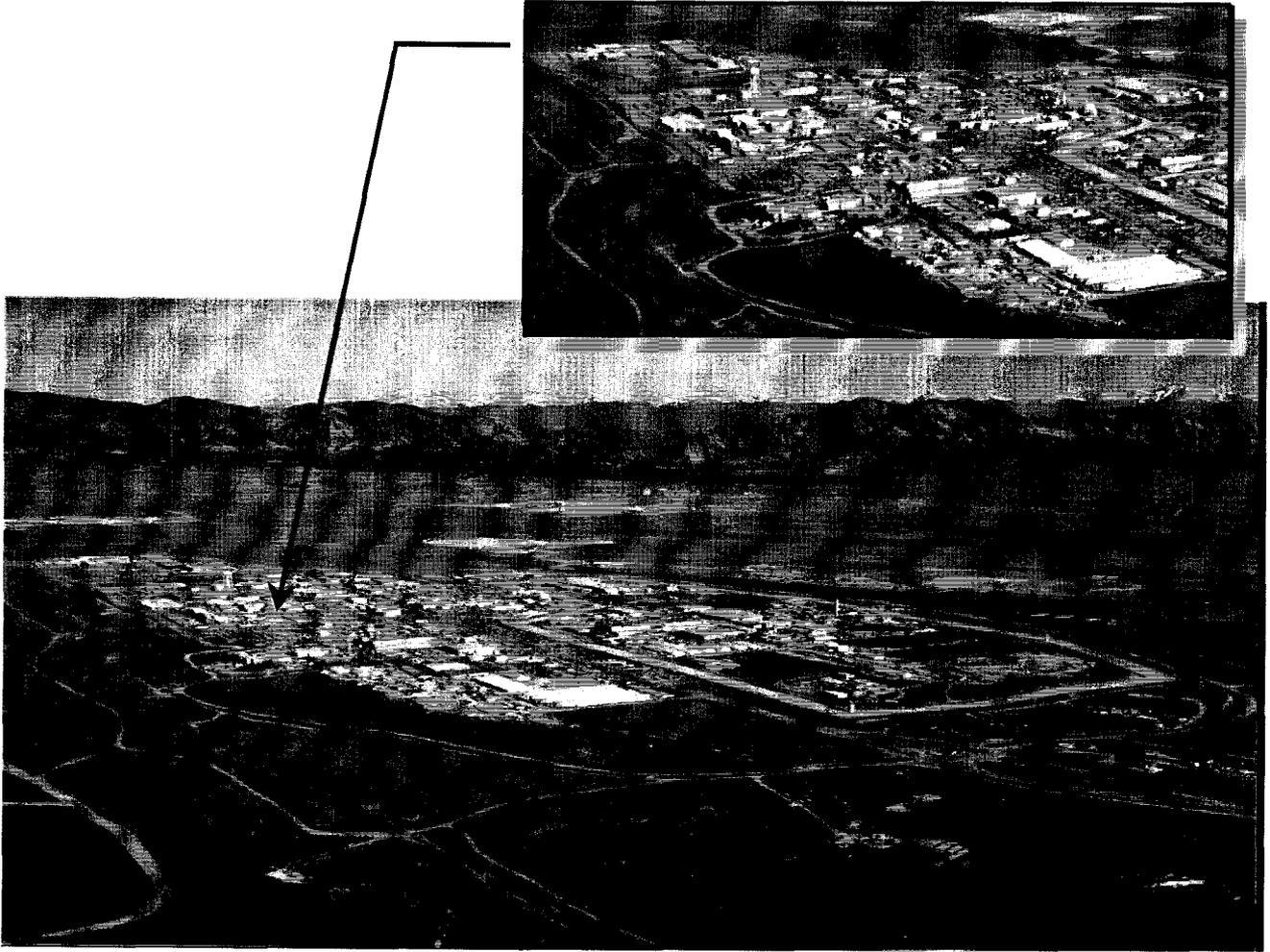
ABSTRACT

The 123 Cluster, consisting of Buildings 123, 123S, 113 and 114, was surveyed in accordance with the guidance provided by the Multi-Agency Radiation Survey and Site Investigation Manual (draft) and the Manual for Conducting Radiological Surveys in Support of License Termination, NUREG/CR-5849 (draft) as incorporated in the Close-Out Radiological Survey Plan For The 123 Cluster. Final disposition of building materials was determined following an analysis of the data obtained from the radiological surveys and samples performed during final surveys. When compared against the 123 Cluster Derived Concentration Guideline Levels and the Department of Energy's No-Rad-Added Program, survey and sample results indicated that all building materials, except for the Building 123 concrete slab, may be released in an unrestricted manner.

Residual radioactivity in excess of the release criteria remains within the Building 123 slab and is located in what was once Rooms 109, 123 and 124. Attempts to remediate these areas failed. In an effort to protect these areas from the weather and demolition activities, the areas have been sealed with a weather proof epoxy coating, when necessary, and covered with a steel plate bolted into the slab. In addition, abandoned source wells and process waste piping are located in the Building 123 slab which have yet to be characterized. Areas containing elevated levels of residual radioactivity and abandoned process waste piping and source wells will be addressed during the remediation of the Building 123 slab.

Rocky Flats Environmental Technology Site

Location of the Building 123 Cluster



Bldg. 123 Cluster:

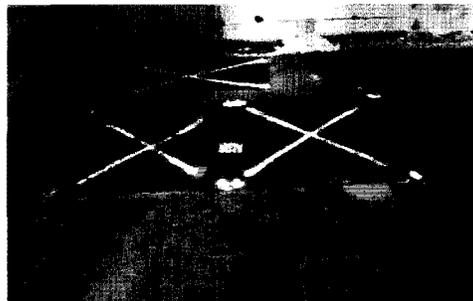
View of the North Wall
As Seen From The
Roof of Building 331

Executive Summary

The 123 Cluster consists of Building 123, Building 113, Building 114, and Building 123S. Building 123 was the main building of this cluster. Constructed in 1953, Building 123 was one of the first ten buildings constructed at Rocky Flats Environmental Technology Site. Analytical laboratory, dosimetry, and instrument calibration activities have been conducted in Building 123 since its construction. Building 123 also provided office space for radiation health specialists, storage for radiological health records, and storage for calibration and repair of criticality alarms. Medical research was also conducted in Building 123 until operations were relocated to Building 122. Additional details on operations at the 123 Cluster can be found in the *Close-Out Radiological Survey Plan For The 123 Cluster (CRSP)(#RF/RMRS-97-110)*, Revision 4, dated March, 1998.

In total, approximately 666 cubic yards of building debris were disposed of as Low Level Radioactive Waste (LLW), 4,734 cubic yards of building debris were disposed of as non-hazardous waste (i.e., "free released") in a local sanitary landfill and 491 cubic yards of metal were recycled. This report details the effort to achieve free release of the majority of building debris from the 123 Cluster.

This *Close-Out Radiological Survey Report (CORSR)* supports the final disposition of building materials in Buildings 123, 113 and 114. Specifically, this report delineates areas in these buildings that may be released in an unrestricted manner, in a restricted manner and/or as radioactive waste. These determinations were made after analyzing and comparing the results of the radiological surveys and samples obtained to support the



Room 109: Protective steel over Cs-137 embedded concrete.

CORSR with the requirements in the *Close-Out Radiological Survey Plan For The 123 Cluster (CRSP)(#RF/RMRS-97-110)*, Revision 4, dated March, 1998. Core samples of the Building 123 walls were not obtained to characterize the interior concrete or cinder block wall surfaces. It was appropriate to assume that if the radioactivity contained within the paint sample was indistinguishable from background, then the structural wall itself was free of DOE radioactive material. In the case of unpainted walls, release was determined solely on the radiological surveys performed directly on the wall surface. Based on the above logic, no additional sampling of the wall cores were needed to determine that the interior wall matrixes meet the release criteria. The results of this comparison show that all building materials, except for the Building 123 concrete slab, may be released in an unrestricted manner. This conclusion was reached since all survey and sample data are complete and meet the unrestricted release criteria.

Residual radioactivity in excess of the release criteria is contained within the Building 123 slab and is located in what was once Rooms 109, 123 and 124. Based on historical

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data and verified through in-situ gamma spectroscopy, the source of radioactivity in Room 109 is from a spill of Cs-137. Residual radioactivity identified in Rooms 123 and 124 appears to originate from process waste system piping abandoned within the slab. Attempts to remediate these areas failed. In an effort to protect these areas from the weather and demolition activities, the areas have been sealed with a weather-proof epoxy coating, when necessary, and covered with a steel plate bolted into the slab.



Room 157: Process waste sump with steel access plates.

In addition, abandoned source wells and process waste piping are located in the Building 123 slab which have yet to be characterized. An area of elevated activity has been identified in one process waste sump (Room 157). This sump is covered with steel access doors (as part of the original design) and is below grade. These two attributes provide adequate assurance that residual radioactivity will remain undisturbed during demolition. Following demolition, the sumps were filled with soil and capped with concrete to mitigate the personnel hazard associated with an open pit. This action will prevent the spread of residual radioactivity as a result of water intrusion into the sump. Areas containing elevated levels of residual radioactivity will be addressed during the Building 123 Slab Remediation Project.

It should be noted that three areas in the north wing, Room 111 south wall, the Room 105 slab surface and Room 123A cement transformer pad along the north wall were successfully decontaminated/remediated.

The standard radiological survey form used at Rocky Flats Environmental technology Site (RFETS) did not provide the required level of traceability for use in a Decontamination & Decommissioning (D&D) project. In an effort to provide data in the most traceable form, radiological survey data was recorded as gross instrument readings, net instrument readings and net survey results. Gross instrument readings were obtained from the raw data sheets that were completed by the Radiological Control Technicians (RCT) performing the surveys. Net survey results were calculated using the appropriate instrument background and efficiencies, as listed on the Survey Unit Specific Background Count Rate Calculation Sheets for the instrument(s) used to perform the surveys. In some instances, due to the multitude of RCTs and instruments used to perform a survey, raw data could not be tied to a specific instrument. In these cases, the most limiting instrument (lowest background and lowest efficiency) was used to calculate the most conservative net survey results. Net survey results calculated using this methodology are annotated as such on the Electra Background Log for the specific survey unit.

Independent radiological engineers were assigned to perform verifications of survey data gathered during final surveys. These verifications included a check of raw, hand-recorded data against the final computer generated reports. The first verification included a review of 125 of 1242 data points obtained during the first phase of final surveys. For the data reviewed, only one data transcription error and one instrument calibration date error were noted. See attached memo "Verification of B123 Contamination Survey Data - HBE-013-98" dated April 13, 1998. The second verification included a 100% review of the data points obtained during the second phase of final surveys. A total of 10 transcription errors were noted; this represents a small fraction of the total data population. Refer to Memo JMF-98-003, dated April 30, 1998, included in the Correspondence Section of this report. All discrepancies were corrected by RMRS Radiological Engineering personnel. These transcription error rates were deemed acceptable.

To account for naturally occurring radioactivity present in some building materials, (specifically concrete/cinder block surfaces) a reference area background has been added to the instrument background, when appropriate. "Instrument Only" and "Instrument + Reference Area" backgrounds are recorded on the Electra Background Log Sheet and on the Radioactive Contamination Data Form. The "Instrument + Reference Area" background was used most often during final surveys of Building 123. Survey points with instrument only background subtracted (non-concrete/cinder block surfaces) are annotated on the Radioactive Contamination Survey Form by **bolding** the survey point number.

The reported total activity values for some of the survey points are significantly below zero. This is attributed to the expected variance/fluctuation in local area background. This variability in background was also noted by the SRA/Millennium team during the acceptance testing and performance of radiological surveys in the north and west wings of Building 123. Dr. Shonka reports "background is spatially variable, and different areas of the same survey grid exhibit real differences in background levels". Figure 3.1, *Beta Background Distribution for Floor Survey Grids with Standard Deviations Less Than 300* from the *Executive Summary of Radiation Surveys Performed at Rocky Flats Environmental Technology Site* illustrates a beta background range between 2500 dpa (synonymous with 2500 dpm/100cm²) to 3800 dpa with an arithmetic mean of 3300 dpa, which is consistent, but somewhat higher than the beta background obtained by RFETS RCTs using conventional counting instrumentation. It has been hypothesized that the difference results from the edge (wall) effect associated with the conventional survey instrumentation used at RFETS.

The majority of the floor space and portions of the walls (up to six feet) were surveyed by the Shonka Research Associates, Inc. (SRA) and Millennium Services Inc.(MSI) team who were subcontracted to perform portions of the final contamination surveys in the north and west wings of Building 123. The surface contamination surveys portion of the north and west wings of Building 123 performed by this team are acceptable for use in final release survey documentation. The information content, detection limits, and

accuracy of the survey report meets or exceeds conventional survey technology. Refer to the *Executive Summary of Radiation Surveys Performed at Rocky Flats Environmental Technology Site*, prepared by: Shonka Research Associates, Inc. and the associated *Final Survey Data Set North & West Wings Building 123* for SRA/MSI survey results. Refer to Safe Sites of Colorado Interoffice Memorandum, RLM-004-98, *Qualification of SRA/Millennium Services, Inc. Data for Use in Building 123 Final Surveys*, for acceptance criteria and survey methodology clarification.

Site RCTs performed one minute direct contamination surveys and swipe surveys in all grids scanned by SRA/MSI; however, some overlap exists between the scan surveys performed by SRA/MSI and Site RCTs. Grids scanned primarily by SRA/MSI are annotated as "See Millennium Data" on the radiological survey data forms. Grids that were not completely scanned by SRA/MSI and annotated as "See Millennium Data" have a corresponding hand scan located at the end of the associated survey unit section of the final survey report. In most cases, the radiological survey maps of the associated survey unit are overlaid with the SRA/MSI scan grids which are included, along with the associated data table(s), in the corresponding survey unit section of the SRA report. Three areas, the south wall of Survey Unit 9 between the men's and lady's locker rooms (SRA/MSI survey area RF12310), the lady's locker room floor (SRA/MSI survey area RF12313) and the floor of Survey Unit 9 (SRA/MSI survey area RF12306) were not overlaid onto the corresponding survey unit maps. SRA/MSI survey area RF12306 was overlaid onto the corresponding survey unit map by RMRS Radiological Engineering.

An RCT accompanying the SRA/MSI team during their performance of surveys recorded areas that could not be scanned using the SRA/MSI equipment. These areas were scanned by an RCT. Although it could be justified to utilize the SRA/MSI survey data to satisfy the scan and direct survey requirements of the CRSP, the data obtained by SRA/MSI will only be used (along with the Site RCT scan surveys) to fulfill the 100% scan survey requirement for Survey Units 6, 7, 9 and 10.

In order to achieve the required minimum detectable activity (MDA), swipes obtained during final surveys were counted using a Tennelec Low Background Counting system. Some swipe surveys, were counted with the Trench 1 Tennelec, Serial Number 38922, using a counting application with a 1 minute count time (vice 2 minutes) which did not subtract background. In all cases, the MDA of the instrument is very close to or meets the goal of 50% of the DCGL. Additionally, the background subtract error is a conservative error which would result in a higher calculated activity. Neither of these errors invalidate the release for unrestricted use determinations. Nearly all Tennelec survey results show swipes 55 and 56 reversed. This is due to an equipment manufacturer error on the numbering of carriers 55 and 56 which causes them to be displayed in reversed order. In the statistical analysis section the data is entered as if the swipes had been counted in the correct order. Since no activity above limits was noted on any of these surveys, it does not affect the validity of the results.

Final surveys were performed following the removal of the interior walls that defined rooms and hallways. Refer to the attached Building 123 Floor Plan and Survey Unit Maps to correlate room numbers with survey units. To the greatest extent possible, final surveys were performed in accordance with the *Close-Out Radiological Survey Plan For The 123 Cluster (CRSP)*, Revision 4, dated March, 1998. In some instances, deviations from the CRSP were identified during the performance of final surveys or following the review of final survey data. These deviations, listed below, are primarily administrative and did not affect the decision to release the 123 Cluster.

1. The CRSP, Appendix B, Survey Units 14, 15, 18, 19 and 20, Note (3), specifies a DCGL of 100 dpm/100cm² alpha and 750 dpm/100cm² beta, based on the more restrictive isotopes used within Building 123; however, a DCGL of 5,000 dpm/100cm² beta was used for these survey units, as specified in early revisions. This was an administrative error in the CRSP. It is assumed that if residual radioactivity exists in these survey units, it would have been deposited as a result of a release from a process facility. The basis for the 100 dpm/100cm² alpha and 5,000 dpm/100cm² beta DCGLs is the source terms, transuranics and uranium respectively, which would be associated with an airborne radiological release from a process facility.
2. Appendix C of the CRSP states that a Reference Area Background will be determined daily in Building 551 until an adequate number of data points have been obtained and analyzed by Radiological Engineering. Concern was raised regarding the adequacy of Building 551 for use as a reference area for material background determination. A new reference area background was determined and applied to all the necessary survey data. Refer to RMRS Interoffice Memorandum JBB-002-98, *Survey Unit Specific Background Count Rate (SUSBCR) Determination for Building 123 Final Surveys*. This memo supersedes J.J. Miller memo, JJM-11-98, dated March 24, 1998.
3. Rooms 137 and 138, part of Survey Unit 9 were surveyed independently. This deviation from the CRSP is conservative in that the statistical analysis was performed using a smaller sample size and the results of the analysis indicate the sample size was adequate.
4. As stated in Section 6.0, Step 3 of the CRSP, the maximum background of 700 cpm (beta) for the NE Electra was recorded in error. The maximum allowable background count rate is 1000 cpm (beta). Refer to Appendix 2 of 4-K62-ROI-03.01, *Performance of Surface Contamination Surveys*, for the corrected values.
5. The CRSP initially identified the south end of the west wing as Survey Unit 7 and the north end of the west wing as Survey Unit 6. During the physical process of gridding the floors and walls; however, the RCTs labeled the South end of the West wing as Survey Unit 6 and the north end of the west wing as Survey Unit 7. The attached B123 Final Survey Units Diagram reflects this labeling change. All radiological survey maps coincide with Survey Units 6 and 7 as shown on the attached B123 Final Survey Units Diagram.

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The following describes the radiological surveys performed along with a comparison of those surveys with the unrestricted release criteria.

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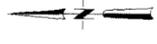
Location Map of Building 123

EXPLANATION

Standard Map Features

-  Buildings and other structures
-  Solar evaporation ponds
-  Lakes and ponds
-  Streams, ditches, or other drainage features
-  Fences and other barriers
-  Contour (5-Foot)
-  Paved roads
-  Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data acquired by EG&G ISC, Las Vegas, NV. Topography (contours) were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and TIGER to process the DEM data to create 5-foot contours. The DEM was processed by MK, Las Vegas, NV, 1994. Aerial Flyover at 10 meter resolution. The DEM post-processing performed by MK, Winter 1997.



Scale = 1 : 1940
1 inch represents approximately 162 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

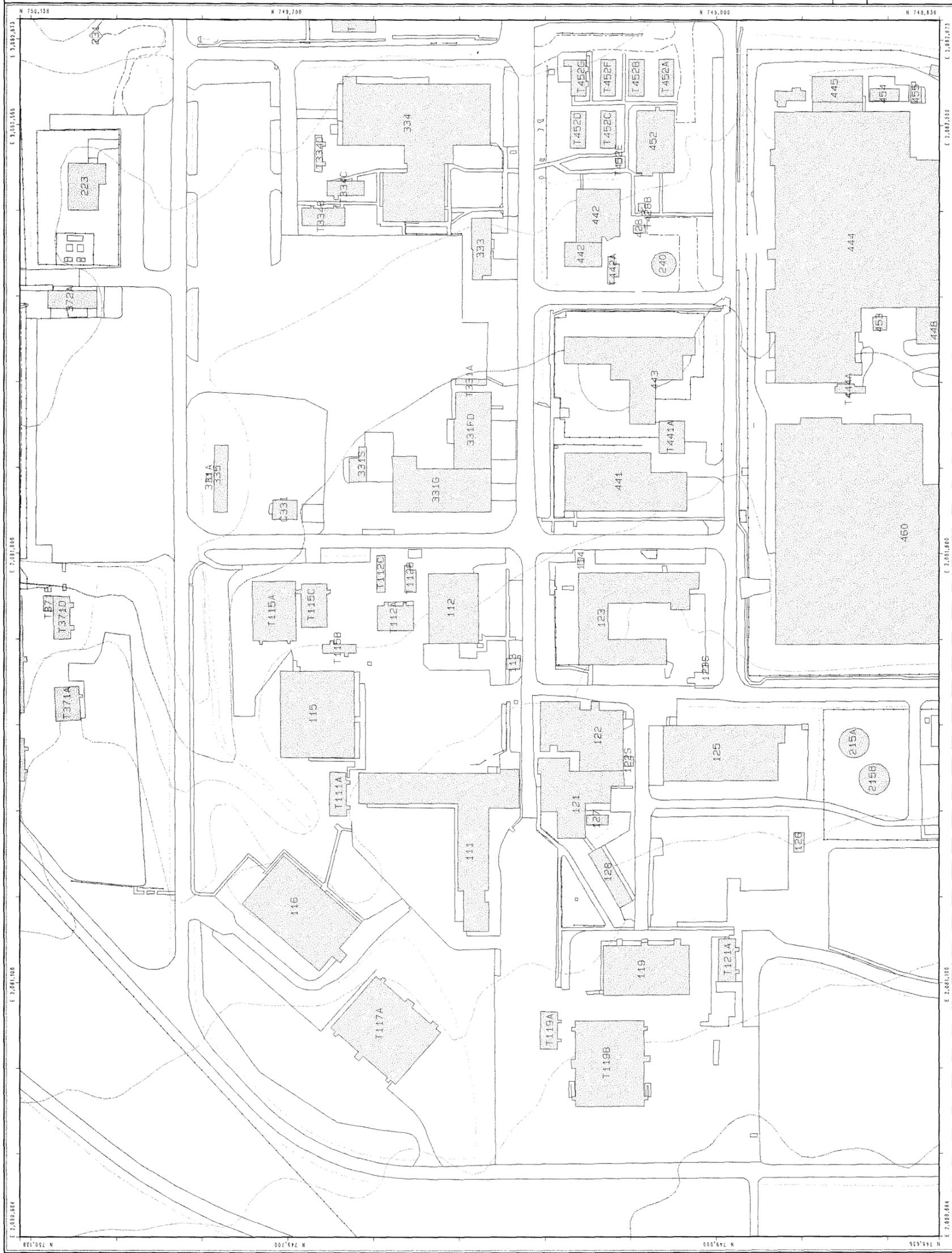
Prepared by:
U.S. Department of Energy
Rocky Flats Environmental Technology Site



Rocky Mountain
Remediation Services, L.L.C.
Geographic Information Systems Group
P.O. Box 464
Golden, CO 80402-0464

MAP ID: 98-0183

May 14, 1998





- NOTES:
1. SYMBOL LOCATIONS ARE APPROXIMATE
 2. SYMBOLS ARE NOT TO SCALE
 3. DWG. MODIFICATIONS ARE IN RED
 4. ROOMS NOT COMPLETED ARE IN GREEN
 5. RCA OUTLINED IN MAGENTA



02-14-95	REP	CLASSIFICATION	JOB I.D.	D. I. S.
DATE	U. S. DEPARTMENT OF ENERGY	ROCKY FLATS OFFICE	GOLDEN, COLORADO	
	ROCKY FLATS PLANT			
	GOLDEN, COLORADO			
	SURFACE WATER DIVISION DEPT. DMG.			
FLOOR PLAN				
SIZE	DRAWING NUMBER	ISSUE	SHEET	
D	123/123S-1	A	1	OF 1

BLDG 123 FLOOR PLAN
DRAIN IDENTIFICATION STUDY

12/12