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Title: Confirmation of Non-Impacted Status (TA16-280 Complex)

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Confirmation of Non-Impacted Status (TA16-280 Complex)

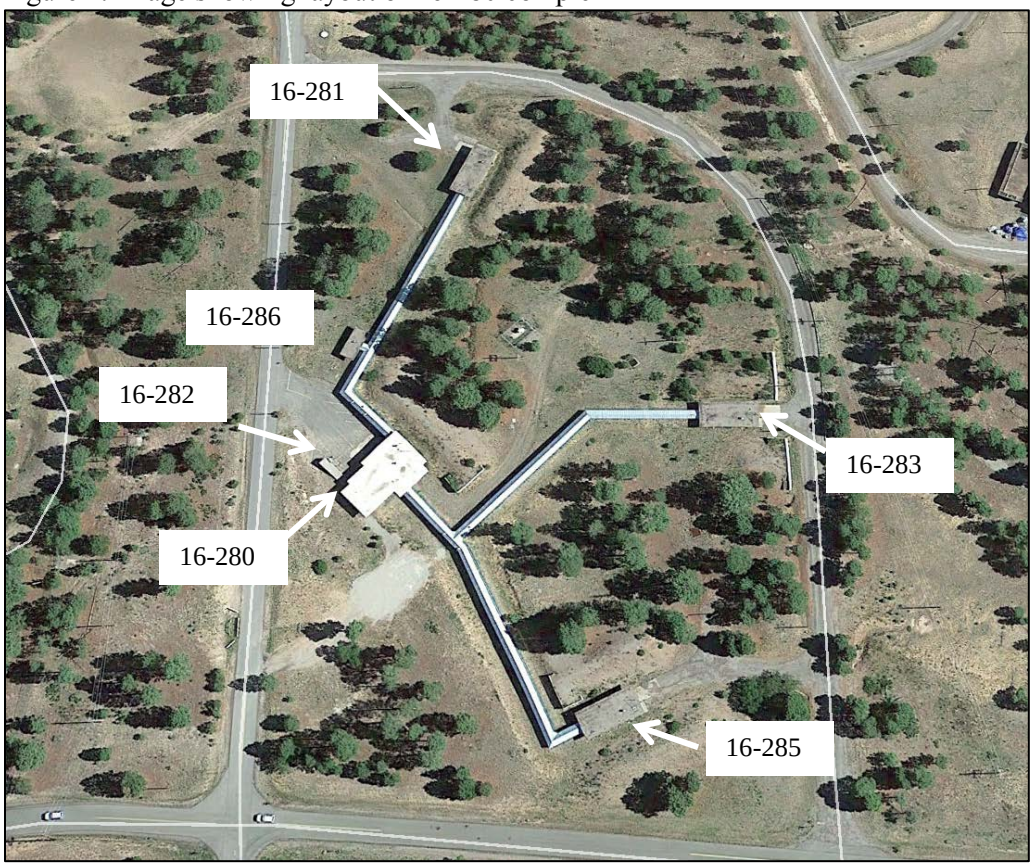
Summary

EPC-ES finds that the materials associated with TA16-280 complex (see Figure 1) are candidates for release to the public for recycle or as sanitary/commercial waste. This finding is consistent with the requirements of DOE Order 458.1 *Radiation Protection of the Public and the Environment* and LANL Policy 412 *Environmental Radiation Protection*.

Introduction

The TA-16 280 Complex (Figure 1) was used for high explosives (HE) processing (LANL 2001). Building 16-280 is the largest building in the complex and was used for HE receiving and inspection. Buildings 16-281, 283 and 285 were used as "rest houses" for HE shipping and staging and for storing bulk HE and a limited number of HE components. There is no specific historical information on Buildings 282 and 286. Interviews with radiation protection staff suggest that buildings 281, 283, and 285 were used in the past for storage of depleted uranium metal parts; however, these parts were not in a dispersible form. All material was removed from these three buildings in late 2008 and they are currently not controlled or posted for radiological conditions.

Figure 1. Image showing layout of 16-280 complex



Survey overview

Sentinel surveys were conducted to confirm the non-impacted status in this building. Potential disposition pathways for the material include disposition as Low Level Waste, release of concrete and metal for recycling, and/or release of debris for disposal at commercial/municipal landfills. Data quality objectives for transfer of items into the public domain are described in ENV-ES-TPP-001, R1 (2015a).

Direct measurements were made using a SHP380AB probe coupled with an Eberline E600 instrument. NUCON smears were used to collect removable samples and were counted using a Berthold 2010/143. Surveyor instructions are given in Table 1. The Sample Analysis Plan for the 16-280 complex is included as Appendix A to this report. Because the building was being evaluated for non-impacted status, it was required to meet the indistinguishable from background (IFB) criteria.

LANL has previous documented (LANL 2015b) the radiological characteristics of comparable reference materials for evaluating survey results and demonstrating IFB for personal property.

Table 1: Surveyor instructions for sampling at 16-280 complex.

Building	Smear surveys	Direct (α, β)	Scan (α, β)
16-280	Basement: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
	First floor (rooms 1-8, dock): 25 quasi-systematic grid per room (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
16-281	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	5-10% surface area, biased locations
16-283	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	5-10% surface area, biased locations
16-285	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	5-10% surface area, biased locations
16-282	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
16-286	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
Walkways	25 quasi-systematic grid samples (5 each long wall and 15 on floor)	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
Exterior for structures	12 quasi-systematic grid samples per structure (3 each wall, no roof samples required)	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations

Results

The 16-280 complex is a radiologically complex environment. In total, 30 structures/rooms were evaluated for release. An individual room typically contained between three and six building material types (e.g., painted concrete, painted metal, tile, wood, etc). In the initial evaluation of survey data, 11 of the 30 rooms failed to meet IFB by a Wilcoxon rank-sum (WRS) test for at least one building material type. Survey results indicate that the failing material types (across the eleven rooms) were: bare concrete, painted metal, tile, galvanized metal and rusted metal. Crucially, the IFB failures occurred only for direct measurements of building surfaces. Smear surveys indicated that there is no removable radioactive material present throughout the complex. The lack of any removable radioactive material implies that it is unlikely that LANL-derived radionuclides spread throughout the building. And as there is no history of criticality or other experiments which could cause widespread activation of building materials, it seemed initially unlikely that the elevated direct-count results were the result of LANL operations.

Follow-up surveys by radiation control technicians (RCTs) confirmed elevated measurements throughout the building, but revealed one important fact: many of the surfaces reported as bare concrete in the initial survey were actually ceramic tiles. This tile is a specialized material unique to LANL HE buildings of a certain age – it is intended to be blast-proof, and also to dampen the shock wave following an explosion to help preserve building integrity. It is extremely thick, and is more similar to a concrete cinderblock than a traditional ceramic tile. Because so many measurements taken on the blast tiles failed to pass IFB, RCTs removed a sample of the tile and sent it to LANL's Health Physics Analytic Lab (HPAL) for gamma spectroscopy. HPAL results indicated elevated natural thorium in the glaze of the 280-complex blast tiles. This explained the IFB failure for all measurements made on the blast tiles. However, numerous rooms still failed to pass the IFB criteria using a WRS test.

Figure 2. Blast tiles in building 16-280.

Because the failing units were so widely distributed, health physics follow-up included monitoring for radon gas over the weekend (c.a. 48 hours) with a Correntium handheld radon monitor. After deploying the radon monitors, health physics staff also walked the building looking for patterns in the elevated measurements, and also taking exposure readings and gamma spectra with an Exploranium GR-130 miniSPEC sodium iodide spectrometer. The rate meter measurements indicated that exposure rates were 3-4 times higher (compared to a reference office building) inside the portions of the 280 complex with either poured cement walls or blast tile on/in the walls. The portable gamma spectrometer confirmed the presence of natural thorium in the complex's blast tiles and in the poured concrete walls of the rest houses, e.g., 16-283. Radon monitoring did not detect elevated concentrations in the complex; readings were around 2 pCi/L, which is well-below the Environmental Protection Agency's residential screening level of 4 pCi/L.

Figure 3. Poured concrete walls in the 16-281 rest house. Note also the specialized metal ceiling lamps.

Despite these measurements, eight rooms were still failing to meet IFB for at least one material type. These materials consisting of painted, galvanized, and rusted metal. From building walk-downs and a careful review of the survey results, it was evident that the painted metal units (which were six of the remaining eight failures) were failing only due to measurements made on specialized blast-proof lamps which were scattered throughout the complex. Other types of painted metal (e.g., building ventilation systems directly adjacent to the lamps) passed as IFB under a WRS test. To evaluate the metal lamps for natural radioactivity, health physics staff made further detailed measurements of these items with a SHP380 a/b coupled to an Eberline E600 and an Exploranium GR-130 miniSPEC. The porcelain-enameled metal shade of the lamp was significantly elevated compared to a reference enameled metal surface. Other parts of the lamp (e.g., the glass shade protecting the bulb) were not elevated. A gamma spectrum acquired via an Exploranium GR-130 miniSPEC indicated the presence of both natural thorium and uranium in the metal lampshade.

Despite these investigations, two rooms had survey units that were still failing to meet IFB: in 16-283 a piece of galvanized metal attached to the ceiling, and in 16-285 a piece of rusted metal used as part of a hoist system. Given the failure to detect LANL-derived radionuclides elsewhere in the building, and the fact that no removable radioactive material was detected, and that metal – particularly rusted metal – is known to have unusual radiological properties (and may not match well to reference measurements even when only natural radioactivity is present) we believe these two readings are anomalies, and that the 16-280 complex meets the IFB criteria. As such, it may be free-released to the public under DOE Order 458.1.

Regulatory Status of Radioactive Material in the 16-280 Complex

Naturally occurring radioactive materials (NORM) are not regulated under the *Atomic Energy Act of 1954* (AEA), as amended. Whether a particular item meets the definition of NORM is a definition of exclusion (i.e., the item is not source material, not byproduct material, etc.)

Several DOE Orders, including Order 458.1, do regulate "byproduct material" as defined in the AEA sections 11e.(1) to 11e.(4). Some byproduct material is also NORM. The thorium and uranium present in the 16-280 complex do not meet the definition of AEA byproduct material and it would be inappropriate to regulate them as such.

DOE Order 435.1, chg 2, *Radioactive Waste Management Manual*, specifically defines NORM as "Naturally occurring materials not regulated under the *Atomic Energy Act of* 1954, as amended, whose composition, radionuclide concentrations, availability, or proximity to man have been increased by or as a result of human practices." Order 435.1 specifically excludes NORM from its definition of low-level waste.

Thorium has never been used by LANL as part of its operations. Most commonly, uranium used at LANL is depleted. These historical facts, combined with a complete lack of removable radioactive material throughout the 280 complex, indicate that the radioactive material embedded in building materials is naturally occurring and was a part of the building materials / items at the time that they were sourced. Since NORM is specifically excluded from regulation by the AEA and by DOE, these items and materials outside of LANL's radiological regulatory scope.

Despite the fact that naturally occurring thorium is outside of LANL's regulatory scope, its presence in building materials should be properly documented and disclosed to the waste receiving facility. All building debris to be disposed must meet the receiving facility's waste acceptance criteria, which may or may not include restrictions on NORM. EPC-ES recommends that the project work with its Waste Management Coordinator to ensure proper waste characterization and disclosure in support of final material disposition decisions. Proper characterization and disclosure will build trust with the receiving facility and avoid a costly investigation in the event that the facility's radiation monitors alarm during delivery.

Conclusions

Given the results of the survey described above, EPC-ES recommends no restriction on disposition of building materials. Under DOE O 458.1, the structures and materials associated with the 16-280 complex contain only NORM and are candidates for free release to the public without additional surveys.

References

LANL. 2001 May 16. "*ESH-20 NEPA Determination Document 9: High Explosives Research and Development and Processing Facilities*" LA-UR-01-3040.

LANL 2014. Policy 412 *Environmental Radiation Protection, Revision 1.* 24 November 2014. LA-UR-14-28987.

LANL 2015a. Technical Project Plan 001 *Data Quality Objectives for Measurement of Radioactivity in or on Items for Transfer Into the Public Domain*, Revision 1. 11 November 2015.

LANL 2015b. *Measurements of alpha and beta radiation from uncontaminated surface of common building materials.* LA-UR-15-28370.

U.S. Congress. Public Law 87-703. *Atomic Energy Act of 1954, as Amended*, 2013.

U.S. Department of Energy (DOE) 2011. Order 435.1 *Radioactive Waste Management Manual*, Change 2. 8 June 2011.

U.S. Department of Energy (DOE) 2013. Order 458.1 *Radiation Protection of the Public and the Environment.* Administrative, Change 3. 15 January 2013.

Attachments & Appendices

Appendix A: *TA 16 D&D MARSSIM Characterization Plan. Structures: TA16-430 Complex and TA16-280 Complex*

Appendix A

TA 16 D&D MARSSIM Characterization Plan. Structures: TA16-430 Complex and TA16-280 Complex

TA-16 D&D MARSSIM Characterization Plan

Structures: TA 16-430 Complex and TA 16-280 Complex

Rev. 0, Dated 8/12/2015

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1. Purpose and Scope of the TA-16 D&D MARSSIM Characterization Plan

There are three TA-16 structures in the 430 complex (structures 16-430, 16-435, and 16-437 and connecting covered walkways) and six structures in the 280 complex (structures 16-280, 16-281, 16-282, 16-283, 16-285, and 16-286, and the connecting covered walkways) that need to be characterized to support future Decontamination & Demolition (D&D) of these structures (Figures 1 and 2). There are several structures within this Plan with potential for radiological impact based on historical knowledge of operations in these buildings and the rest are likely non-impacted.

Since the structures are still standing, the MARSSIM survey approach will be utilized to perform the characterization surveys of these structures for residual radioactive contamination. However, since these structures will eventually be demolished and the waste and any recyclable materials will be sent offsite for disposal, the MARSAME requirements will be utilized to evaluate the resulting characterization data for waste debris and recyclable material disposal path decisions, as appropriate.

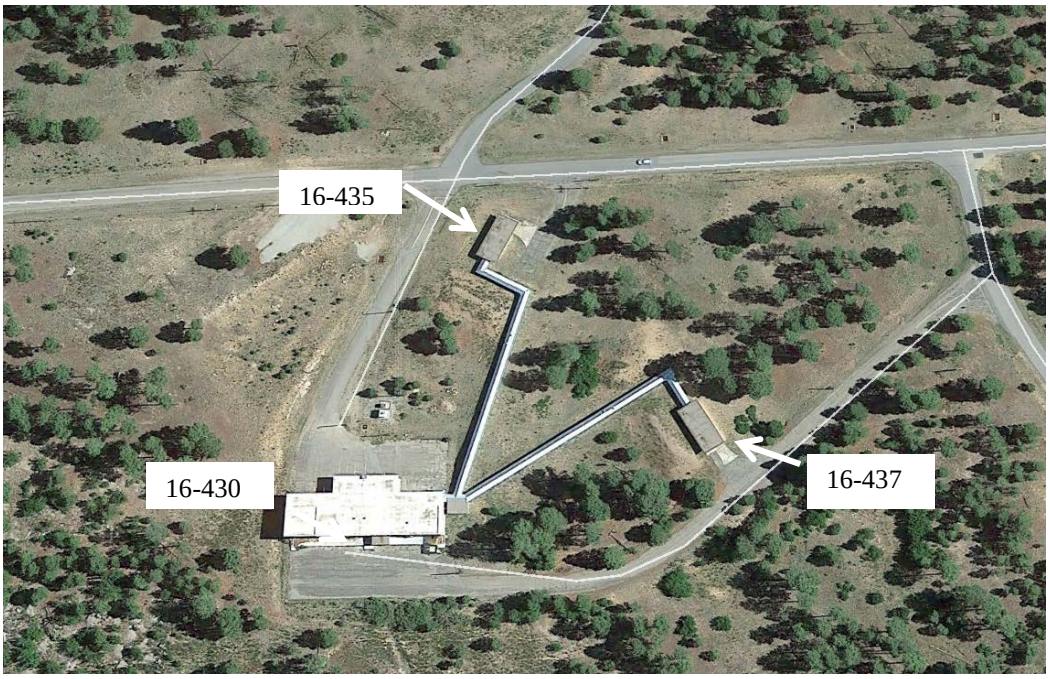

Figure 1. Overhead view of the 430 complex and the buildings and walkways slated for D&D.

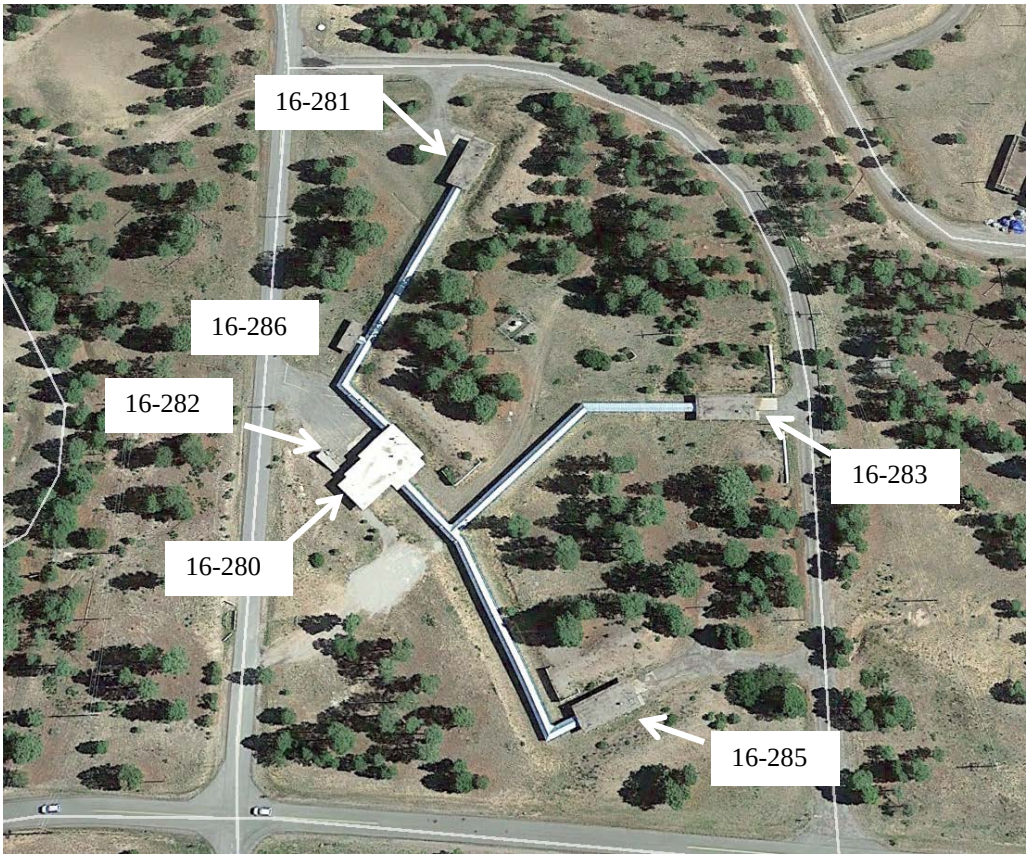

Figure 2. Overhead view of the 280 complex and the buildings and walkways slated for D&D.

1.1. Per MARSSIM Section 2.4, there are six principal steps in the MARSSIM Radiation Survey and Site Investigation Process:

- Site Identification
- Historical Site Assessment (HSA)
- Scoping Survey
- Characterization Survey
- Remedial Action Support Survey
- Final Status Survey

1.2. All six of these principal steps could be used in the D&D process for the TA-16 structures. The first two principal steps (i.e., site identification and HSA) have already been completed and the results are detailed in this document. The purpose of this Plan is to satisfy the 3rd and 4th principal steps (scoping and characterization) to assess for radiological impact in these structures, and, if impacted, to characterize the potential contamination. These two MARSSIM survey types have been combined in this plan and will only be referred to as characterization surveys.

1.3. The MARSSIM HSA information for these structures is contained is Section 2 below. Prior operational, surveillance, and maintenance information suggests these buildings do not contain radiological contamination. Exceptions could include buildings 281, 283 and 285, where there is some suspicion that depleted uranium was stored at some point in time. The MARSSIM surveys will be used to assess for the possibility of residual contamination. The survey results will be evaluated for radioactive contamination against MARSAME release requirements, and if release requirements are met, the debris from the buildings are candidates for unrestricted release under DOE Order 458.1.

1.4. If surveys measure radioactive contamination, per MARSSIM Chapter 2, Section 2.4.4., "If an area could be classified as Class 1 or Class 2 for the final status survey, based on the HSA and scoping survey results, a characterization survey is warranted. This type of survey is a detailed radiological environmental characterization of the area." Based on the HSA of the TA-16 structures, Class 1 and/or Class 2 final status survey units are unlikely. While the less rigorous elements of a scoping survey may be sufficient in most decision units in this Plan, a characterization survey structure was used as described in sections 1.5 through 1.8:

1.5. Per MARSSIM Chapter 2, Section 2.4.4., the primary objectives of a characterization survey are to:

- Determine the nature and extent of the contamination.
- Collect data to support evaluation of remedial alternatives and technologies.
- Evaluate whether the survey plan can be optimized for use in the final status survey.

- Provide input to the final status survey design.

1.6. Per MARSSIM Chapter 2, Section 2.4.4., "The characterization survey is the most comprehensive of all the survey types and generates the most data. This includes preparing a reference grid, systematic as well as judgment measurements, and surveys of different media (*e.g.*, surface soils, interior and exterior surfaces of buildings). The decision as to which media will be surveyed is a site-specific decision addressed throughout the Radiation Survey and Site Investigation Process."

1.7. Once the characterization survey has been completed per this Plan, the characterization data will be analyzed using the MARSAME statistical methods. The MARSAME statistical method results will be used to plan for the remedial action support surveys and/or final status surveys, as appropriate.

1.8. Notes and Assumptions:

1.8.1. This Characterization Plan was prepared in accordance with P412, Environmental Radiation Protection, and developed using P412 Data Quality Objectives.

1.8.2. The results of this survey are to be used for D&D planning purposes. Per MARSSIM Section 2.4.6, "data from other surveys conducted during the Radiation Survey and Site Investigation Process – such as scoping, characterization, and remedial action support surveys – can provide valuable information for planning a final status survey provided they are of sufficient quality." Release of building materials is contingent upon clean surfaces passing a final status survey, as appropriate.

1.8.3. The nominal release criteria for this D&D project are from Table 10-2 of P412 for surface contamination (see Section 4 of this Plan). Further restrictions may be imposed by the Waste Management Coordinator.

1.8.4. Waste disposition pathways for material from D&D projects are as follows:

1.8.4.1. Contaminated material that is known or suspected to exceed regulatory limits is to be disposed of as Low Level Waste (LLW).

1.8.4.2. Radiologically encumbered metal items (items within areas posted as radiological areas) fall under the metals moratorium and may not be released.

1.8.4.3. Unencumbered metals may be released for *reuse* within the DOE complex using the Table 10-2 criteria pending an ALARA evaluation.

1.8.4.4. Unencumbered metals may be released to the public for *recycle* or *disposal* using indistinguishable from background criteria.

1.8.4.5. Clean concrete may be released for recycle using the Table 10-2 criteria pending an ALARA evaluation.

1.8.4.6. Other D&D debris may be released to landfill under NMED regulations using indistinguishable from background criteria.

2. Historical Site Assessment Information

2.1. The TA-16 430 Complex (Figure 1) was used for high explosive (HE) processing and was part of High-Explosives Fabrication and Inspection Facility[1]. A Waste Characterization Strategy Form indicates that radioactive materials were never stored in these buildings, though other non-radioactive hazards are enumerated[2]. Building 16-430 is a high explosives processing building built in 1953 and operated until 2007. Buildings 435 and 437 were "rest houses" used for intermediate storage of containerized raw explosives, for storage of finished products ready for transport, and for scrap being removed for disposal. These structures and the associated walkways are not posted for radiological control and interviews with radiation protection staff suggest no evidence that radiological operations were ever performed in these buildings. There is also no evidence of legacy contamination in the immediate environment surrounding these structures.

2.2. The TA-16 280 Complex (Figure 2) was also used for HE processing.[1] Building 16-280 is the largest building in the complex and was used for HE receiving and inspection. Buildings 16-281, 283 and 285 were used as "rest houses" for HE shipping and staging and for storing bulk HE and a limited number of HE components. There is no specific historical information on Buildings 282 and 286[3]. Interviews with radiation protection staff suggest that buildings 281, 283, and 285 were used in the past for storage of depleted uranium metal parts; however, these parts were not in a dispersible form that could have caused contamination. All material was removed from these three buildings in the late 2008 time frame and they are currently not controlled or posted for radiological conditions.

3. Survey Units and Data Analysis

3.1. This Characterization Plan is designed to provide sufficient information for D&D planning and execution. If surveyors encounter contamination or unexplained increases in standard deviation or measured concentrations, further mitigation, sampling, and data analysis may be required.

3.2. Building and room maps are to be used as rough estimates of the spatial layout of the buildings. Adjustments to the survey units and/or maps may be required based on building specifics for this characterization survey and any additional surveys.

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[1] LANL. 2001 May 16. "ESH-20 NEPA Determination Document 9: High Explosives Research and Development and Processing Facilities" LA-UR-01-3040.

[2] LANL. 2010 May 14. "Waste Characterization Strategy Form for TA-16-430 435 437 and 1461. ERID-109430

[3] (LANL 2001) Section 4.3.1.3 states that "Radioactive materials are not used in the HE synthesis, production and characterization facilities although some analytical chemistry instruments generate very low levels of radiation for diagnostic purposes." Additionally, Section 4.3.7.3 makes a similar claim for receiving/transport/storage.

3.3. To better manage and coordinate the characterization survey process and data, survey units will be assigned as specified in Section 9. Based on the survey results, the survey units specified in Section 9.1 may be adequate for analysis for release. Alternatively, final status survey units may need to be revised or re-developed.

4. Nominal Release Criteria

4.1. Characterization data obtained from this survey may be used to supplement the MARSSIM final status survey if the characterization data meets final status survey Data Quality Objectives. MARSSIM Sections 2.3, 2.4.6, 2.6, 5.1, 5.2.4, 5.3.3.1 discusses the use of characterization surveys (and other MARSSIM surveys) to supplement and augment the final status survey requirements.

4.2. In some cases, additional surveys or sampling may be required to meet all final status survey requirements (e.g., QA measurements).

4.3. Table 1. Nominal release criteria for surface contamination.

Table 1: Values from P412 Section 1021 Table 2-2		
U-natural, U-235, U-238 and associated decay products (Removable)	1,000	dpm/100cm^2
U-natural, U-235, U-238 and associated decay products (Total)	5,000	dpm/100cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 (Removable)	20	dpm/100cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 (Total)	100	dpm/100cm^2
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 (Removable)	200	dpm/100cm^2
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 (Total)	1,000	dpm/100cm^2
β/γ emitters (Removable)	1,000	dpm/100cm^2
β/γ emitters (Total)	5,000	dpm/100cm^2
Tritium and Special Tritium Compounds	10,000	dpm/100cm^2

4.3 Sampling and data analysis for volumetric contamination is not required based on the history and potential for activation of building materials.

5. General Survey Instructions

5.1 Verify characterization activities are on the applicable Plan-of-the-Day, as appropriate.

5.2 Perform a Pre-Evaluation Brief and/or Job Task Brief in accordance with P300.

5.3 Verify personnel have appropriate training for the tasks they will be performing.

5.4 Comply with applicable Radiological Work Permit (RWP) requirements, if RWP is required.

5.5 Follow applicable IWD(s), as necessary.

6. Survey-Specific Instructions

6.1 Follow P121, RP-1-DP-37 "Surveying for Fixed and Removable Contamination", and other applicable characterization and sampling procedures. Document all survey results on the appropriate survey form(s) and the survey map(s). All direct and removable measurement results are to be reported as dpm/100cm^2. Do not use "NDA."

6.2 The number of direct and removable measurements is specified in the following survey unit and survey requirement tables for each survey unit. Survey point locations (both direct counts and smears) will be a combination of "uniformly distributed" and "biased" locations determined by the surveyors. Uniformly distributed points shall be spread across all survey unit surfaces in a uniform, even, systematic pattern (similar to a grid pattern). Survey point locations may be changed based on accessibility issues via consultation with the Project Manager and the Environmental Stewardship staff responsible for compliance with DOE Order 458.1.

6.3 Collect and record direct measurement instrument background readings periodically during surveys (approximately 5 background measurements per survey unit). Identify and document background measurements on the survey form and maps with the survey unit number, "-BKG," and sequential background number (e.g. 1-BKG1, 1-BKG2, etc.). Collect background measurements on direct reading probes by pointing the probe into the air and away from any nearby surfaces.

6.4 Required Characterization Surveys include:

6.4.1 Surface scan surveys using a SHP380AB (α / β) detector, listening for increased count rate areas.

6.4.2 60 second scalar direct surveys using an SHP380AB (α / β).

6.4.3 NUCON smears (counted for α and β/γ).

6.5 QA survey measurements are not required for MARSSIM scoping or characterization surveys.

6.6 Scan percentages are specified in the survey unit and survey requirement tables for each survey unit (Section 9). For any areas of noticeably elevated count rate, a biased measurement (direct and smear) shall be collected and documented. When biased surveying is required, scan surveys should be used to decide locations of biased survey points, or the biased locations can be selected based on process knowledge. Denote biased surveys sequentially after the last systematic survey location. Biased measurement locations may include: high traffic areas such as room entrances, HVAC intakes and exhaust ducts, storage areas, areas of frequent personnel contact such as doors and door frames, horizontal surfaces such as lab counter tops and shelves, sinks, the openings to sink and floor drains; the tops of lights, beams, crane rails, structural beams, etc.

6.7 On the survey forms, denote surface material (e.g., "concrete," "metal," etc.), as well as locations of biased surveys.

6.8 Use provided survey maps, or create scaled maps as necessary, to document the survey locations and results.

6.9 Smear survey results are to be reported in the form consistent with the results from HPAL. HPAL should be requested to report results as dpm/100cm^2 (not NDA). In consultation with HPAL, isotopic analysis can be performed on smears with high gross alpha/beta results if the radioisotope (or mixture) is unknown. Save all smears for possible future HPAL analysis.

6.10 Collect and maintain all characterization paperwork. Number each page of the survey unit packages using the format "XX of XX". Survey Unit packages should include survey forms, maps, HPAL smear results, and HPAL isotopic analysis (if required). Provide all completed paperwork to the Project Manager and the Environmental Stewardship staff.

7. Surface Labeling Requirements

7.1 Denote survey unit location numbers on structure surfaces where measurements are obtained. Mark locations on using the survey unit designation plus the next sequential survey point location number. For example, for survey unit 16-5-2, location survey point number 5, mark the structure surface with the number 16-5-2-5.

7.2 The direct reading probe outline shall be drawn on the surface with a marker and a template to identify the exact surveyed location in the event a re-survey is necessary.

7.3 Denote on the survey map where the scan, direct, and smear surveys were performed. Scan area may be approximated by a highlighted/circled area in survey units that require less than 100% scanning. Record the general scan findings on the survey forms and/or maps.

8.0 Special Support and Safety Requirements

8.1 Upper walls and ceilings/roofs require access via ladders, scaffolding, man-lifts, etc.

8.2 Survey technicians shall be trained for elevated work.

8.3 Pest control may be required in and around all structures.

9.0 Sampling and Analysis Plans for Characterization Surveys

9.1 The following table outlines the requirements for the characterization surveys in the TA-16 430 Complex buildings. Gamma and neutron measurements are not required.

Building	Smear surveys	Direct (α, β)	Scan (α, β)
16-430 (see Map 1)	Basement: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
	First floor (rooms 101-105, equipment room, hallway, lavatory): 25 quasi-systematic grid per room (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
	Second floor (rooms and utility room): 25 quasi- systematic grid per room (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
16-435 (see Map 2)	Each room: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
16-437 (see Map 3)	Each room: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
Walkways (see Map 4)	25 quasi-systematic grid samples (5 each long wall and 15 on floor)	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
Exterior for structures	12 quasi-systematic grid samples per building (3 each wall, no roof samples required)	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations

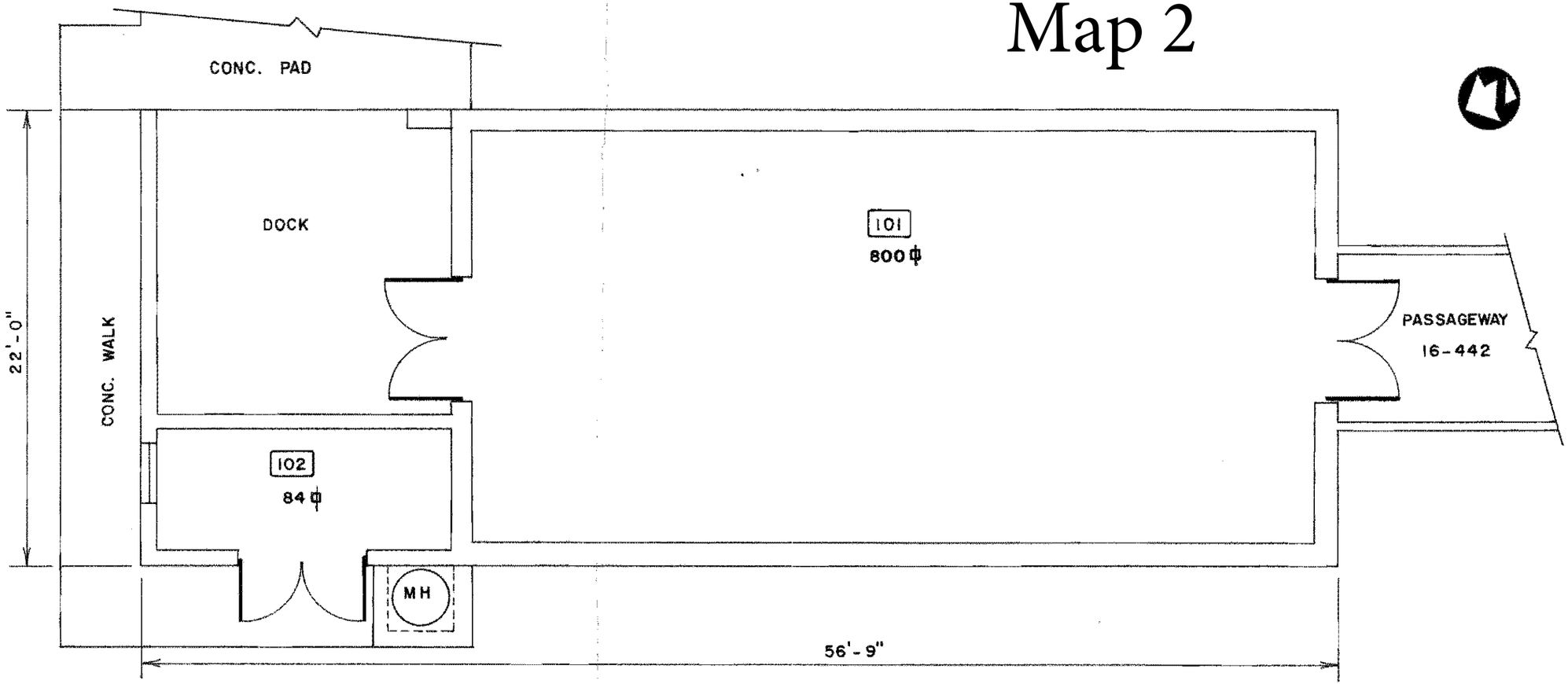
9.2 The following table outlines the requirements for the characterization surveys in the TA-16 280 Complex buildings. Gamma and neutron measurements are not required.

Building	Smear surveys	Direct (α, β)	Scan (α, β)
16-280 (see Maps 5-6)	Basement: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
	First floor (rooms 1-8, dock): 25 quasi-systematic grid per room (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
16-281	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	5-10% surface area, biased locations
16-283	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	5-10% surface area, biased locations
16-285	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	5-10% surface area, biased locations
16-282	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
16-286	Each room/area: 25 quasi-systematic grid samples (5 each wall and 5 on floor) plus 10 bias locations	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
Walkways	25 quasi-systematic grid samples (5 each long wall and 15 on floor)	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations
Exterior for structures	12 quasi-systematic grid samples per structure (3 each wall, no roof samples required)	Perform direct surveys next to each location smears were taken.	< 5% surface area, biased locations

MAP 1


UTILITY ROOM
201
131.9m²
(1420ft²)
218.6m²
(2353ft²)
15.1m²
(162ft²)
SECOND FLOOR
55.58m
(182'-0")
21.91m
(72'-0")
6.35m
(20'-10")
109
13.0m²
(140ft²)
3.3m²
(36ft²)
8.3m²
(89ft²)
BATTERY ROOM
110-A
14.9m²
(160ft²)
EQUIPMENT ROOM
110
78.0m²
(840ft²)
UP
DN
107-A
5.9m²
(64ft²)
107
2.8m²
(30ft²)
108
9.1m²
(98ft²)
MEN
WOMEN
106
21.7m²
(234ft²)
105CR
2.8m²
(30ft²)
104CR
2.8m²
(30ft²)
103 CR
2.8m²
(30ft²)
183.1m²
(1971ft²)
102 CR
2.8m²
(30ft²)
101 CR
2.8m²
(30ft²)
PASSAGEWAY
16-443
LADDER DN
14.76m
(48'-5")
105
104.3m²
(1123ft²)
104
92.4m²
(995ft²)
103
70.6m²
(760ft²)
102
92.4m²
(995ft²)
101
92.4m²
(995ft²)
DOCK
103-A
19.3m²
(208ft²)
FIRST FLOOR
LADDER UP
5.6m²
(60ft²)
B-1
77.6m²
(837ft²)
WALL ABOVE
BASEMENT
3.2mm=.30m
(1/8"=1'-0")
GRAPHIC SCALE
ROOM NO. SYMBOL
DOOR NO. SYMBOL
REVIEWER
CLASS
DATE
BASEMENT TOTAL 83.3 (897)
FIRST FLOOR TOTAL 870.9 (9374)
SECOND FLOOR TOTAL 395.7 (4259)
BLDG. TOTAL. 1349.9 (14530)
2 9-2-83 REVISED TO STATUS OF 9-2-83 H&N
REV. DATE REVISION BY CKD. APP.
UNIVERSITY OF CALIFORNIA
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545
FACILITIES ENGINEERING DIVISION
SEC. CLASSIFICATION
PROCESSING BLDG.
BSM'T., FIRST, & SECOND FLOOR PLANS
BLDG 430
TA-16
SUBMITTED
RECOMMENDED
APPROVED
DRAWN LEMON
CHECKED H&N
DATE 4-24-63
SHEET NO. 1 OF 1
DRAWING NO.
ENG-R2873

Map 2



(3/16" = 1'-0")

0 1 2 3 4 5 10

GRAPHIC SCALE

TOTAL $\frac{ft^2}{884}$

REV.	DATE	REVISION	BY	CKD.	APP.
2	8-22-83	REDRAWN & REVISED TO STATUS OF 8-22-83	H&N	H&N	

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Los Alamos, New Mexico 87545

FACILITIES ENGINEERING DIVISION

FLOOR PLAN

SEC. CLASSIFICATION: CLASS. U; REVIEWER Unrestricted; DATE 9-29-83

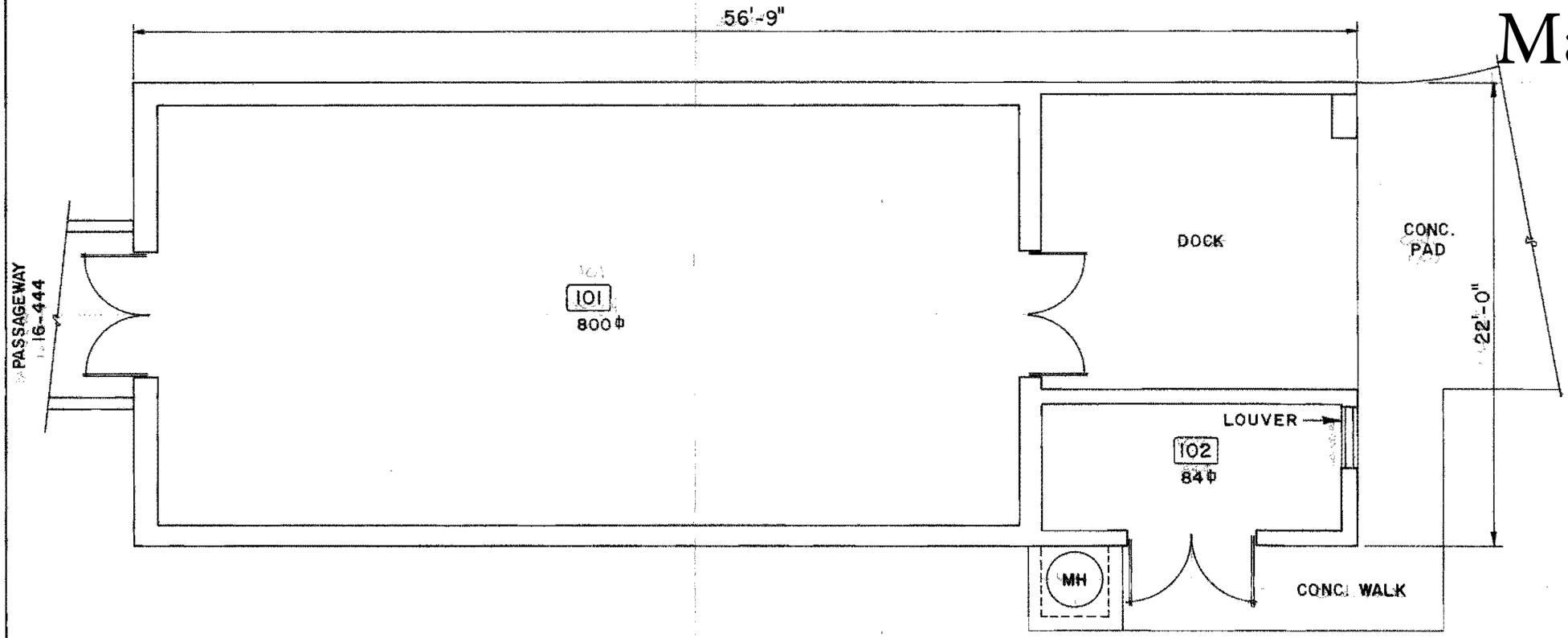
BLDG. 435 TA-16

SUBMITTED	RECOMMENDED	APPROVED
E. Trujillo	Dave Rabb	E. Hoffman

DRAWN	CHECKED	DATE	SHEET NO.	DRAWING NO.
MARSH H&N	Humble H&N	8-22-83	1 OF 1	ENG-R 2874

REC'D ___ LOGGED ✓ TO VAULT 11-22-83

Map 3



REV.	DATE	REVISION	BY	CKD.	APP.
2	9-1-83	REDRAWN & REVISED TO STATUS OF 9-1-83	H&N	H&N	

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FACILITIES ENGINEERING DIVISION

FLOOR PLAN

BLDG. 437 TA-16

SEC. CLASSIFICATION
CLASS. U
REVIEWER Madrid
DATE 9-29-83

SUBMITTED	RECOMMENDED	APPROVED
E. Tafoya	Dave Ross	Ernest Jones

DRAWN	CHECKED	DATE	SHEET NO.	DRAWING NO.
H&N	H&N	9-1-83	1 OF 1	ENG-R2875

TOTAL 884 ft²

(3/16"=1'-0")

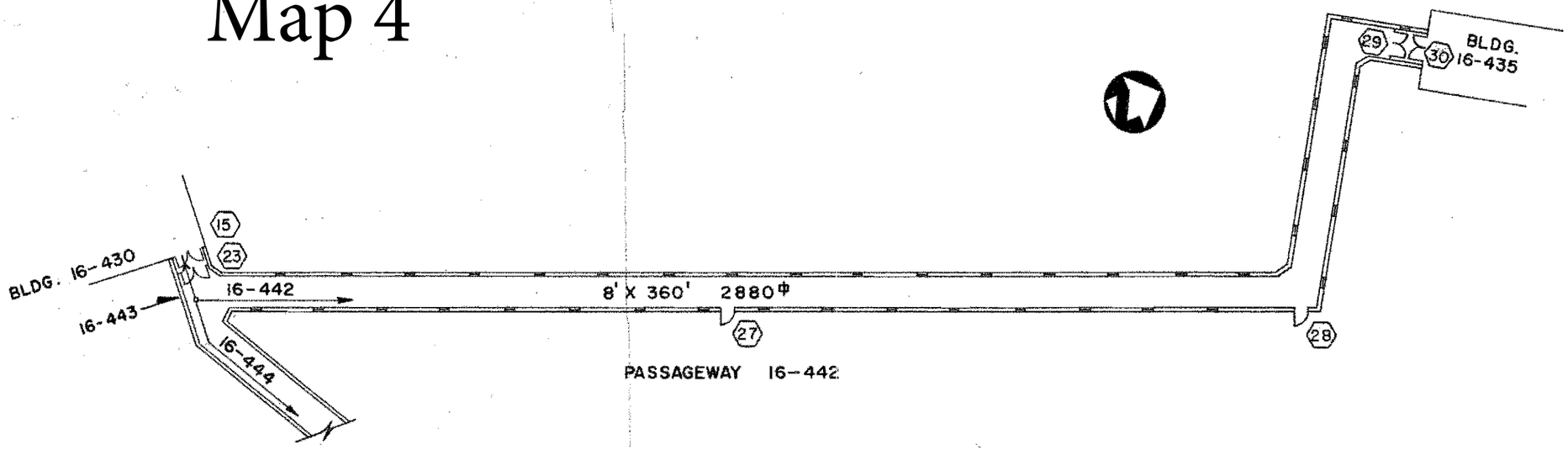
0' 5' 10'

GRAPHIC SCALE

REC'D ___ LOGGED ✓ TO VAULT 11-22-83

Map 4

NO.	DATE	REVISIONS	BY	CHKD	GRP. LDR.	ENG. D. O.
1	8-31-65	REVISED TO STATUS OF 8-23-65	DRK.	HB	SEE 2	



TOTAL SQ. FT. 3056

MF

REV.	DATE	REVISION	BY	CHKD.	APP.
2	9-2-83	REVISED TO STATUS OF 9-2-83	H&N	H&N	DP

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FACILITIES ENGINEERING DIVISION

FLOOR PLANS

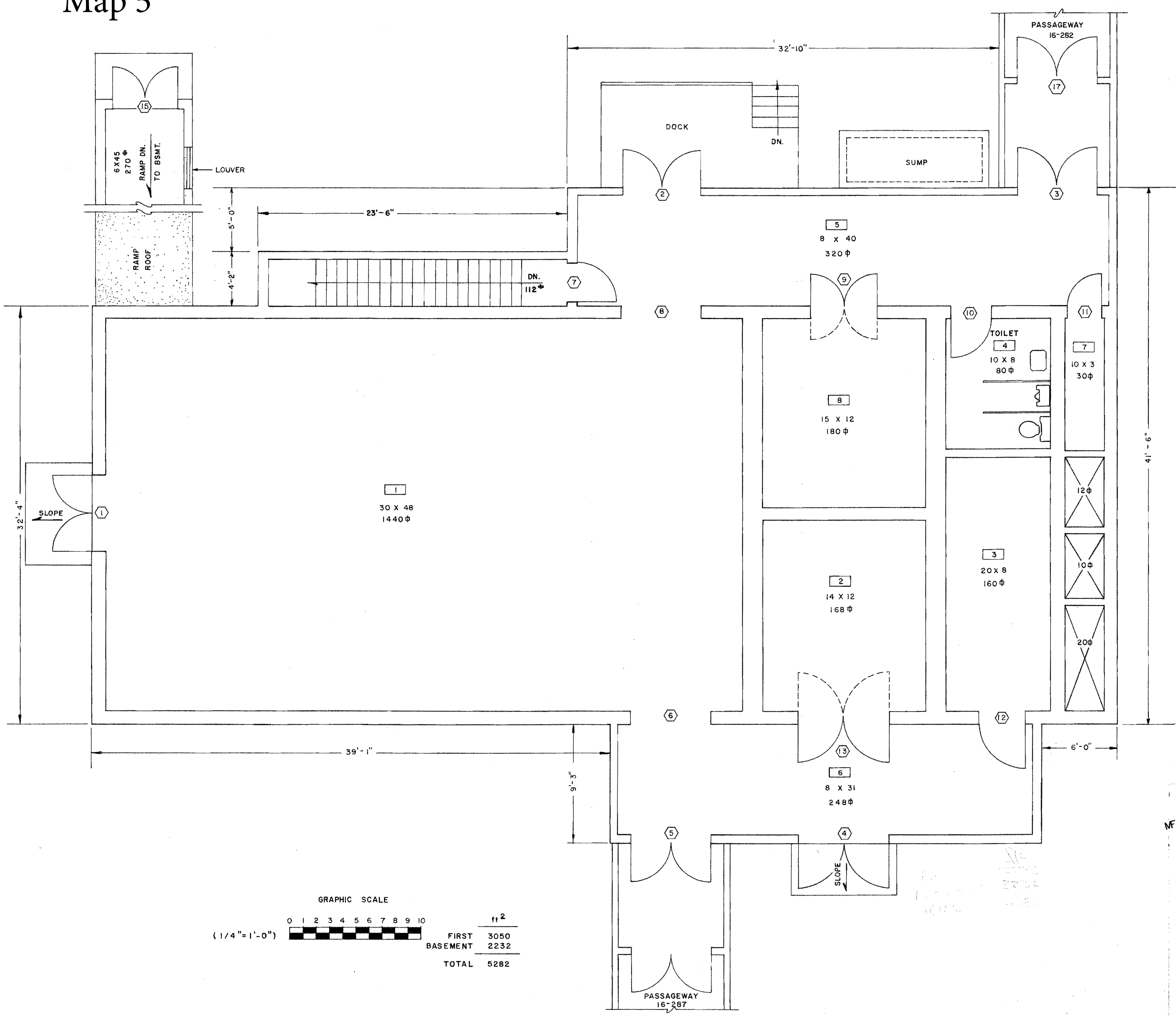
PASSAGEWAYS 419 & 442 TA-16

SEC. CLASSIFICATION: CLASS. U; REVIEWER Goudreau; DATE 9-14-83

SUBMITTED	RECOMMENDED	APPROVED
E. Trujillo	Dennis Ross	Ernest Stratton

DRAWN	CHECKED	DATE	SHEET NO.	DRAWING NO.
BREMER	Humble H&N	8-19-64	1 OF 1	ENG-R/2872

Map 5



	ft²
FIRST	3050
BASEMENT	2232
TOTAL	5282

REV.	DATE	REVISION	BY	CKD.	APP.
2	9-1-83	REVISED TO STATUS OF 9-1-83	H&N		

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FACILITIES ENGINEERING DIVISION

INSPECTION BUILDING
FIRST FLOOR PLAN

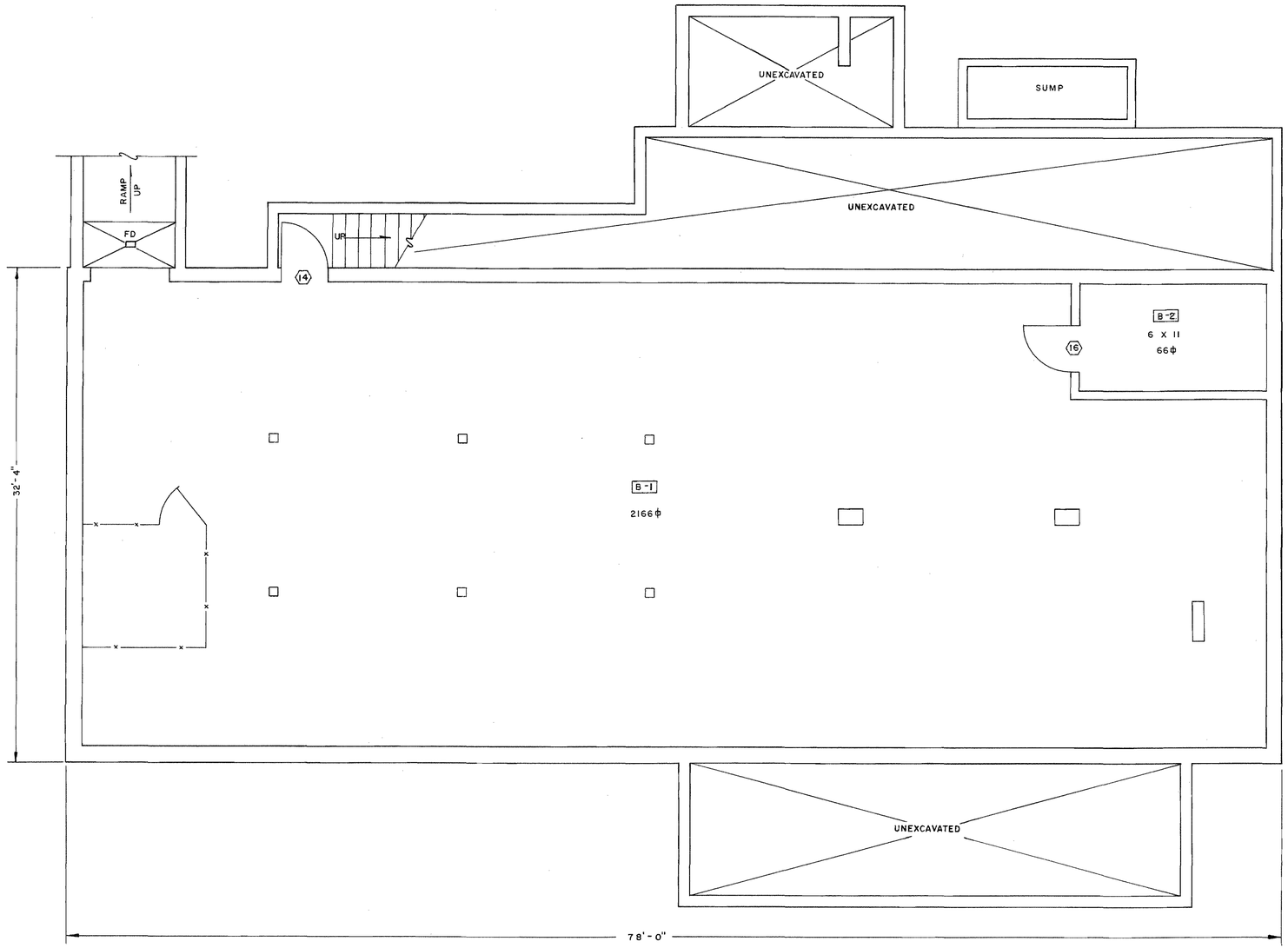
BLDG. 280 TA-16

SEC. CLASSIFICATION — CLASS. U — REVIEWER — DATE 11-28-83

SUBMITTED — RECOMMENDED — APPROVED

DRAWN GLASS — CHECKED H&N — DATE 1-3-64 — SHEET NO. 2 OF 2 — DRAWING NO. ENG-R 2818

Map 6



ROOM NO. SYMBOL

DOOR NO. SYMBOL

(1/4"=1'-0") 0 1 2 3 4 5 6 7 8 9 10

GRAPHIC SCALE

TOTAL SQ. FT. 2232

REV.	DATE	REVISION	BY	CKD.	APP.
2	9-1-83	REVISED TO STATUS OF 9-1-83	H&N		

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FACILITIES ENGINEERING DIVISION

INSPECTION BLDG.
BASEMENT FLOOR PLAN

SEC. CLASSIFICATION
CLASS. U
REVIEWER Bradsie
DATE 11-28-83

BLDG.280 TA-16

SUBMITTED	RECOMMENDED	APPROVED
E. Trujillo	Dawn Ryo	W. T. Love

DRAWN	GLASS	DATE	SHEET NO.	DRAWING NO.
CHECKED	Humble H&N	1-3-64	1 OF 2	ENG-R 2817

166-G4 CLOTH—K. & E. CO., N. Y.—REG. U.S. PAT. OFF.