

UNIVERSITY *of* MISSOURI

ENVIRONMENTAL HEALTH AND SAFETY

Mr. Mike Lafranzo
Senior Health Physicist
Region III - Division of Nuclear Materials and Safety
U.S. Nuclear Regulatory Commission
2443 Warrenville Road
Lisle, Illinois 60532-4352

May 10, 2013

Re: SOP - "Pickard Hall Radiological Operations and Restrictions" submitted to address deferred RAI's from U.S. NRC letter dated November 6th, 2012 (ML12312A095)

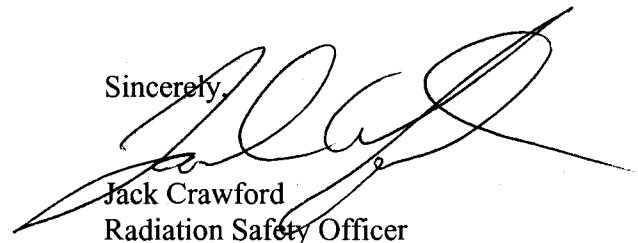
Dear Mr. Lafranzo:

Enclosed is the University of Missouri, Environmental Health and Safety, Radiation Safety Programs (RSP's) internal Standard Operating Procedure (SOP) titled "Pickard Hall Radiological Operations and Restrictions". This SOP has been drafted to expand on the already existing special conditions and radiological controls that we have implemented at Pickard Hall and to also address some of the deferred Requests for Additional Information from our responses submitted in February 6, 2013 (ML13126A170) for U.S. NRC letter dated November 6th, 2012 (ML12312A095).

We will review this SOP as part of our RSP's annual audit or at anytime conditions would change at Pickard Hall that would require a revision to the SOP.

If you have any questions or concerns please contact me at (573)-882-0931 or crawfordw@missouri.edu.

Sincerely,



Jack Crawford
Radiation Safety Officer

Attachments

cc: J. Jones
S. Jurisson
M. Kotlas
S. Engelhardt
RSO File

RECEIVED MAY 15 2013





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Pickard Hall
Radiological Operations and Restrictions

RSIP-DC-01

Prepared by:

A handwritten signature in black ink, written over a horizontal line.

Date: 5/10/13

Name

Reviewed by:

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Date: 5/10/13

Name

Approved by:

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Date: 5/10/13

RSO

Pickard Hall

Radiological Operations and Restrictions

1) Purpose

The purpose of this SOP is to proceduralize the numerous operational guidelines and restrictions associated with Pickard Hall due to the presence of legacy contamination and associated decommissioning requirement.

2) Scope

This procedure will provide guidance for the restrictions and control of the legacy radium contamination in Picard Hall as it relates to decommissioning activities.

This procedure will also be used to track additional guidance associated with our responses to the Request for Additional Information letter sent to us from the NRC in November of 2012 NRC reference No. ML12312A095.

3) Procedure Notes

The following assumptions and current restrictions and special conditions apply to the Pickard Hall administrative authorization (AU# 55555).

4) Assumptions, Current Restrictions, and Special Conditions for Pickard Hall

A. Assumptions

1. Pickard Hall is currently listed as an administrative authorization under our Radiation Safety Program. The RSO is the functioning primary Authorized User and Dr. Alex Barker (director of the Museum) is a Co-Authorized User. All correspondence and changes to the radiological management of Pickard shall be made available for review by Dr. Barker as well as the RSO.
2. This administrative authorization is only for decommissioning purposes due to the suspected legacy contamination from radioactive material separation activities which began in the early 1900's and ceased in this facility in the 1930's.
3. Pickard Hall Faculty and Staff (PHF&S) have been trained as Radiation Workers. Selected staff have been provided dosimetry for exposure monitoring - the ALARA/alert level for this exposure monitoring has been set to 25 mrem/quarter.

4. Areas with residual contamination are controlled and access to these areas is not permitted without escort by a PHF&S who are trained as Radiation Workers (RW's) or Environmental Health and Safety (EHS) Radiation Safety (RS) personnel.
5. EHS RS will monitor for Radon in Pickard Hall no less than annually.
6. Pickard Hall's radiological status will be reviewed annually as part of RS Offices annual audit.
7. A copy of periodic radiation surveys are provided to Pickard Halls building coordinator, Chair of Art History and Archaeology, and the Director of the Museum for their review and dissemination.

B. Current Restrictions

1. The RS Office needs to be consulted if any outside grounds near Pickard Hall (see attachment 3 – Potentially impacted soils near Pickard Hall) are to be disturbed past basic shallow core aerating, minor thatching, or mowing of grass, etc. There is to be no digging or disturbance of *sub* surface soils (e.g. greater than a couple of inches) without coordination through EHS RS.
2. Visitor access to rooms 12, 13, 13A, and 15 requires escort by trained PHF&S radiation workers or EHS.
3. Access to the attic and the feeder tunnel requires approval and escort by EHS.
4. Any currently inaccessible areas of legacy contamination that may be made subsequently accessible due to maintenance reasons and removal of current flooring or plaster wall coverings, etc requires coordination with EHS RS. Refer to 5A for detail.

C. Locations

The following rooms (see attachment 1 for Pickard Hall floor maps) have areas of potential fixed legacy contamination from radium separation experiments from the early 1900's in the original flooring/ceiling structures and have been posted with "Caution Radioactive Material" signs. Access to these areas of fixed contamination are "restricted" and require EHS RS health physics coverage prior to ANY work being performed on or near them (above, below, in front of, or next to the area of fixed contamination).

Basement Level:

○ 17, 17A:

- Rooms 17 and 17A have some areas of suspected legacy contamination behind the current walls and/or under the current

flooring surfaces. These rooms have been posted and are considered radiological restricted areas. The impacted areas have been identified with postings.

- 1B, and corridor C000C:

- The upper south west corner of room 1B has contamination present in a structural beam which runs along the west wall and above the drop ceiling. The ceiling area below this normally inaccessible structural beam has been posted.
- The hallway (C000C) has an area of elevated readings that indicate there is presence of contamination under the floorings likely in the old piping of the original building structure from the 1900's. The lower wall nearest the impacted area has been posted as no access or disturbance of floorings is permitted without EHS RS support.
- The main entrance to the offices of 1/1A as well as the locked doors of room 12 serve as controlled access points for both alcove room 1B and the hallway C000C when the area is not being monitored by PHF&S RW's who normally occupy their offices in this space during normal working hours.

- 12, 13, 13A, 15:

- Room 12, also has elevated readings that indicate there maybe suspected contamination present behind walls and/or under floorings. Unescorted access to these areas is restricted to trained PHF&S RW's with assigned dosimetry or EHS RS staff. The access points are posted and the room secured when unattended.
- Room 13, 13A and 15 have areas of fixed contamination present on floors and walls beneath an encapsulant. Unescorted access to these areas is restricted to trained PHF&S RW's with assigned dosimetry or EHS RS staff. The access points are posted and the room is secured when unattended.
- Access to these rooms is restricted; non-RW access is permitted only by escort of PHF&S RW's or EHS RS.

- Feeder tunnel:

- The feeder tunnel connects room 15 with the steam tunnel and associated services. There is contamination present in the dirt floor of the feeder tunnel. The area is secured by a locked door leading from Pickard Hall room 15 and by a secured entry to

the main steam tunnel.

- Both sides of the feeder tunnel are also posted as restricted areas and access to the feeder tunnel requires approval, preplanning and escort by EHS. See additional discussion below on feeder and steam tunnels 5I.
- 27:
 - Room 27 has elevated readings that indicate that there is likely contamination present underneath the current flooring structure and according to historical documentation reviews the readings are likely confined to a contaminated drain pipe. Access to these subsurface areas is restricted. The door to room 27 is locked when unattended. Access to this suspected drain pipe and the exposure rates from it have been much reduced by the placement of several hundred pounds of lead sheeting. Additionally this area has been posted and the room secured when unattended.
 - See additional discussions on drain lines 5H below.
- 23 (janitor closet), 25 (mechanical room):
 - Room 23 has fixed alpha and beta contamination present on limited areas of the concrete floor.
 - Room 25 has fixed alpha and beta contamination present on an upper wall.
 - These areas are posted and the rooms are locked when unattended.

First Floor -

- C101; C101 is the corridor outside rooms 111 and 112:
 - Contamination may be present in the ceiling structural members of this first floor area because elevated radiation levels were identified in the flooring of the second floor directly above. The three ceiling access panels in the 1st floor corridor near room 111 that would allow access to the unoccupied space between the 2nd floor flooring and the drop ceiling of the 1st floor office are posted.
 - The reception desk in front of rooms 111 and 112 is manned when staff are present during business hours and the door the office area is locked when no staff are present.

○ 106:

- Room 106 contains a beam running under the west wall with known contamination. Access to the beam requires removal of the stage floor. The west wall near the floor is posted behind a white wooden box (the box allows projection onto the wall for lectures) and the base of the speaker's podium is posted as well. The area under the stage is the restricted area and no one is to gain access to this space from either room 106 stage removal or from the ceiling of room 1/1A without coordination with EHS RS.

Second Floor -

○ 213:

- Room 213 contains an area of known contamination behind an existing wall and likely near an exterior (now obscured) window. The west wall near the areas is posted. The room secured when unattended.

○ 205/206:

- Rooms 205 and 206 are public exhibition galleries. There is suspected contamination present in the flooring beneath the current floor coverings. These galleries are posted. Museum guards are present during normal hours of public access.
- A camera is also present in the hallway and can monitor the entrance to both rooms.

○ Attic:

- All areas of the attic are restricted and the posting is present on the ladder prior to accessing the attic entrance. Access to the attic is via a hidden ladder behind a cosmetic cover in the museum gift shop. The ladder cover is locked in place.
- The museum shop is manned when in operation and the guard desk is in direct line of sight of the shop and hence access to the attic.
- Access to the attic access requires approval, preplanning and escort by EHS RS only.

5) Specific Procedures or Guides for Specific Areas of Pickard

A. Authorization to access potential radiological contamination within Pickard

MU currently has interim controls in place to control access to the impacted areas of Pickard Hall.

These controls are reflected in the special conditions of the administrative authorization and the additional restrictions included in this SOP and will be included in ongoing training of PHF&S, Campus Facilities, and others as needed.

MU presumes that all building original interior sub-surface structures may have the potential for contamination and therefore have established comprehensive administrative controls by working with Campus Facilities to place work restrictions for Pickard Hall into CF's maintenance work order software system "Maximo" so when CF prints out work orders for Pickard Hall they get the following message: "CONTACT EHS RADIATION SAFETY AT 882-5024 BEFORE WORKING ON ANY BLDG COMPONENTS TO INCLUDE CEILINGS, WALLS, FLOORS, DRAINS, HVAC, FURNITURE MOVING, ETC."

Ref: RAI-02e, Ref: RAI-02b, Ref: RAI-02g

B. Access to potential radiological contamination under basement floor of Pickard

Access to the areas beneath the basement floor are controlled as outlined in 5.A.

At this time access to the suspected radiological contamination under the basement floor is restricted as the rooms or locations where radiological contamination has been identified by surveys are specifically posted to contact EHS RS prior to access or any work is to be performed on those areas.

EHS RS will restrict any Member of the Public (MOP) from having access to the contaminated soils underneath Pickard's basement without prior authorization from our RS program. However at this time there are no *known* accessible points to sub surface soils under the interior basement floor coverings and concrete floors in Pickard Hall at this time.

Ref: RAI-02e

C. Access to hidden or enclosed original ductwork within the walls

Access to the HVAC system is controlled as outlined in 5.A.

No work is to be performed on any HVAC system or associated ducting (new or the original ducting that is enclosed behind current walls) within Pickard Hall without first contacting EHS RS to determine if any health physics coverage is needed and if a radiological assessment is needed.

Most if not all of the current HVAC system components including associated ducting (not enclosed brick ducts that run from basement to attic) was replaced several years ago in a 1970 reconstruction project that modified the building to its current use as a Museum.

Ref: RAI-02b

D. No Invasive Work on structures of Pickard Hall

Repairs, construction, reconstruction etc., are controlled as outlined in 5.A.

As identified above in the assumptions and precautions no new construction, reconstruction or similar repair work will be conducted in Pickard Hall on any surface of the building structures that may have been impacted by legacy contamination without first being reviewed and approved by EHS RS.

Ref: RAI-02g

E. Encapsulant Inspection Schedule

Routine inspections assess the location of encapsulated areas.

MU uses an administrative authorization, identified internally as #55555, to conduct monthly radiological surveys and surveillances of Pickard Hall. During those surveillances we inspect the physical condition of any encapsulant and perform surveys for fixed and removable contamination in numerous areas of the building.

Ref: RAI-02h

F. Actions for Compromised Encapsulations

Routine inspections assess the integrity of the encapsulated areas.

In the event of suspected encapsulant degradation, EHS will control and manage the area and evaluate and:

- perform nonaggressive decontamination and apply a new coating of encapsulant, or

- apply a secondary encapsulant over the first without decontamination, or
- should the activity require aggressive decontamination prior to re-application of encapsulant we will control and manage the affected area until we can retain appropriate consultant services that have been licensed to perform this type of work as we (EHS RS) are currently not licensed to perform aggressive radiological decontamination.

Ref: RAI-02i, RAI-03h

G. Water intrusion and contingency plans for water intrusion

Pickard Hall's building coordinator and CF have been advised to contact EHS RS immediately concerning any water intrusions.

Different types of construction methods have been used in the renovations of Pickard Hall over the years that have reduced the likelihood of water intrusion into the building.

Should there be an occasion or incident where there is evidence of water intrusion into Pickard the building coordinator of Pickard and CF have been advised that they must contact EHS RS so we can respond and assess the impact.

Should there be a condition that has already resulted in a discharge of water from suspect contaminated areas due to unforeseen water intrusion RS will coordinate an assessment of the potential impact and need for additional support (e.g. hiring of consultants, to conduct additional monitoring, and remediation as necessary).

Ref: RAI-03j, Ref: RAI-03k

H. Access to potentially contaminated storm and sewer drain lines

Access to storm and sanitary sewer drain lines in the vicinity of Pickard (both interior and exterior) will be coordinated with EHS RS first so as to assess any potential of legacy contaminated piping being present and determine if any health physics coverage is needed.

History /detail:

MU is currently only aware of one sanitary sewer (SS) line (shown in yellow on Attachment 2) that originates from inside Pickard Hall and is suspected to be contaminated. This is based on earlier radiological surveys and review of documentation that identified elevated readings near the drain. It is our understanding that this sanitary sewer line in room 27 started from a drain in that room near the north wall and ran north under the building to tie into an east to west run of main sanitary sewer line transit.

This drain line and a small run of piping under the flooring to the exterior wall of north side of Pickard was indicated to be filled in with concrete as part of an earlier construction project in the 1990's that rendered this line dormant as part of an earlier water intrusion mitigation activity.

The original northern sanitary sewer lines that ran from Pickard Hall to the first maintenance utility hole in the Francis Quadrangle were also dug up and replaced in a large construction project in the 1990's that replaced nearly all of the old sewer piping around Pickard Hall including most of the storm sewer lines.

These new sanitary sewer lines that run from Pickard to the Francis Quadrangle continue on to discharge into the city of Columbia's water processing plant.

The storm sewer lines (shown in green on the map) drains water from the gutters and similar run offs exterior to the building and then ties into an underground line that also runs out into the quadrangle and connects up with other storm lines that drain away from that part of campus.

As above with the sanitary sewer lines large portions if not all of the original storm sewer lines were replaced as part of the large Francis Quadrangle subsurface sewer piping replacement project in the 1990's.

RAI-03n

I. Feeder Tunnel to main Steam Tunnel access restrictions and Surveillances

The Feeder and Steam Tunnels are already restricted and under surveillance.

All sidewalk level grated entrances and other door-like entrances that have access to the Francis Quadrangle steam (services) tunnel are securely locked and the keys are secured by the Campus Facilities (CF) Energy Management (EM) group and only used as needed for access to steam tunnel services for maintenance or similar.

The steam tunnel system is equipped with security monitoring devices, which are remotely monitored by CF/EM. CF/EM notifies the MU Police Department (MUPD) for any unauthorized intrusions. MUPD would then respond to the location of the nearest sensor and take appropriate action. CF/EM has been advised and understand that they are to notify EHS RS should persons acquire unescorted access to the area of the subsurface steam tunnels west of Pickard Hall. See Attachment 3 for map of area of the steam and feeder tunnel that would require EHS RS notification as that area of the steam tunnels may have potential impacted sub surface soils near it.

As part of future characterizations of Pickard Hall following the moving of PHF&S and the priceless museum artifacts, MU plans to conduct additional assessments of the sub-surfaces soils near Pickard and near the feeder/steam tunnel as discussed in our response

to Request for Additional Information letter, dated November of 2012 NRC reference No. ML12312A095

Ref: RAI-03o

J. Furniture, Mechanical Equipment Movement Restrictions

Repairs, construction, reconstruction, etc (moving of equipment or furniture) are controlled as outlined in 5.A.

Work restrictions for Pickard Hall have been programmed into the MU CF maintenance work order software system "Maximo" to print out a message on top of all work orders impacting Pickard Hall as another reminder of the restrictions associated with Pickard Hall. That message reads "CONTACT EHS RADIATION SAFETY AT 882-5024 BEFORE WORKING ON ANY BLDG COMPONENTS TO INCLUDE CEILINGS, WALLS, FLOORS, DRAINS, HVAC, FURNITURE MOVING, ETC." Note that this truncated message has been developed to accommodate the character limit that is available in the system.

Ref: RAI-05b

K. Controlling radiation exposure and contamination control for MOP from Pickard Hall

MU maintains and controls radiation exposure and contamination for MOP through a variety of redundant methods.

Those methods are:

1. PHF&S are trained radiation workers. They are tasked with keeping MOP out of restricted areas unless escorted appropriately.
2. EHS/RS routinely inspects and surveys Pickard Hall to evaluate control measures for controlling access and to assess exposure and verify contamination remains in place and does not migrate.
3. "Maximo" work order software program has been utilized to direct all CF maintenance work for Pickard Hall to consult EHS RS for review and approval.
4. Exposure levels in publicly accessible areas are within limits for MOP as evidenced by the dosimetry records of tracked PHF&S, dose rate measurements taken by EHS and by area monitors placed in public galleries.
5. All areas of known contamination are secured by physical means or surveillance to prevent unauthorized intrusion.

Ref: RAI-05c

References

1. Radioactive Material License 24-00513-32 Amendment #110
2. RML RAM permit authorization "55555"
3. ML13126A170 - University of Missouri's response to U.S. NRC letter dated November 6, 2012 concerning Pickard Hall Alternate Decommissioning Schedule, 02/06/2013.
4. ML13014A739 - Telephone Conversation Record: the Curators of the University of Missouri. 01/14/2013.
5. ML12354A550 - IR 03002278-12-001, on 11/26-30/2012, Curators of the University of Missouri, 591M Part 1 & 3.
6. ML12312A095 - LTR-Curators of the University of Missouri, Pickard Hall - NRC Alternate Schedule Request Response, 11/06/2012.
7. ML12296A135 - The Curators of the University of Missouri - Trip Report, 09/27/2012.
8. ML12292A248 - IR 03002278-12-001, on 09/19/12, The Curators of the University of Missouri - Pickard Hall, 591M Parts 1, 2 & 3.
9. ML12040A125 - LTR-EA-11-281 Revised Notice of Violation-The Curators of the University of Missouri, 02/03/2012.
10. ML113640256 - The Curators of the University of Missouri Response to Notice of Violation Dated September 16, 2011, 12/23/2011.
11. ML11304A043 - LTR-University of Missouri-Columbia IR-030-02278/2011-002 Response to Licensee Request for NOV Time Extension, 10/28/2011.
12. ML112800138 - University of Missouri - Columbia, Request for Extension of Response Time for Reply to Notice of Violation Letter dated September 16, 2011, Docket No. 03002278, License No. 24-00513-32, 10/03/2011.
13. ML112720592 - IR 03002278-11-002; 8/26-25/2011; The Curators of the University of Missouri; Inspection Record, 09/13/2011.
14. ML11200A193 - Letter to University of Missouri re; Change of U.S. Nuclear Regulatory Commission Project Manager for Curators of University of Missouri, Pickard Hall Decommissioning Project, 07/18/2011.
15. ML11194A073 - 06/23/2011 Summary of Public Meeting Regarding the University of Missouri, Columbia's Request for Alternative Schedule for Decommissioning, 07/11/2011.
16. ML11081A022 - LTR - Acceptance Review Letter University of Missouri's Alternative Schedule Request for Submittal of a Decommissioning Plan, 03/21/2011
17. ML103050161 - University of Missouri's Request for Submittal of Pickard Hall Decommissioning Plan, Oct 25 2010.
18. ML100600810 - IR 03002278-10-01 (DNMS), on 01/26/10 and 01/27/10, University of Missouri, NRC Reactive Inspection Report, 02/24/2010.
19. ML093570579 - 12/22/2009 Telephone Conversation Record of Discussion of Licensee Actions Taken Relating to Characterization Survey Results of Pickard Hall, 12/22/2009.
20. ML093560017 - Telephone Conversation Record University of Missouri Letter Dated November 17, 2009 - Decommission Pickard Hall, 12/04/2009

List of Attachments

Attachment 1 – Drawings of Pickard Hall Floors

Attachment 1A – Basement Floor

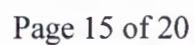
Attachment 1B – First Floor

Attachment 1C – Second Floor

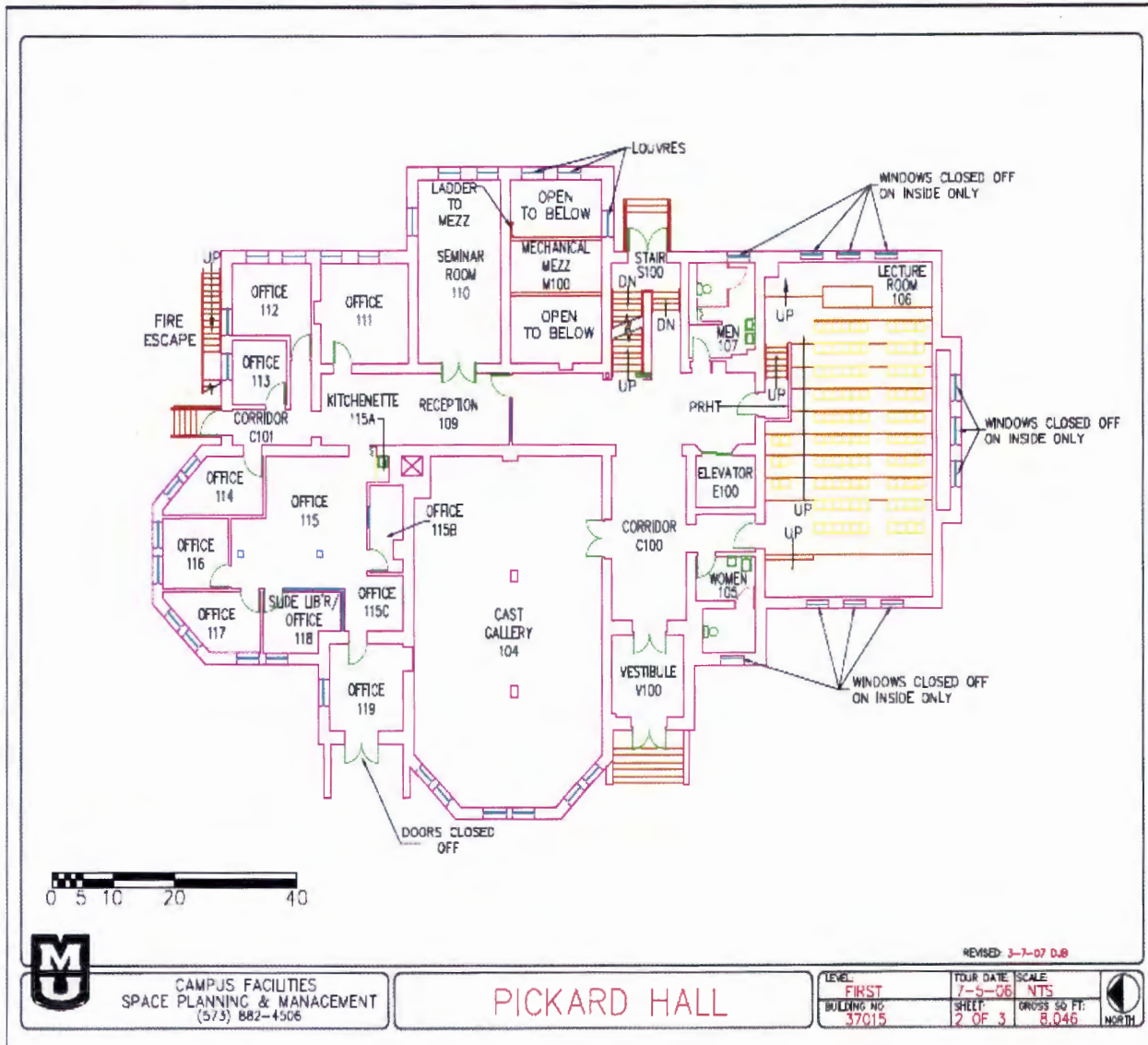
Attachment 2 – Sanitary and Storm Sewer line GIS Map for servicing Pickard Hall

Attachment 3 – Potentially Impacted Soils near Pickard Hall

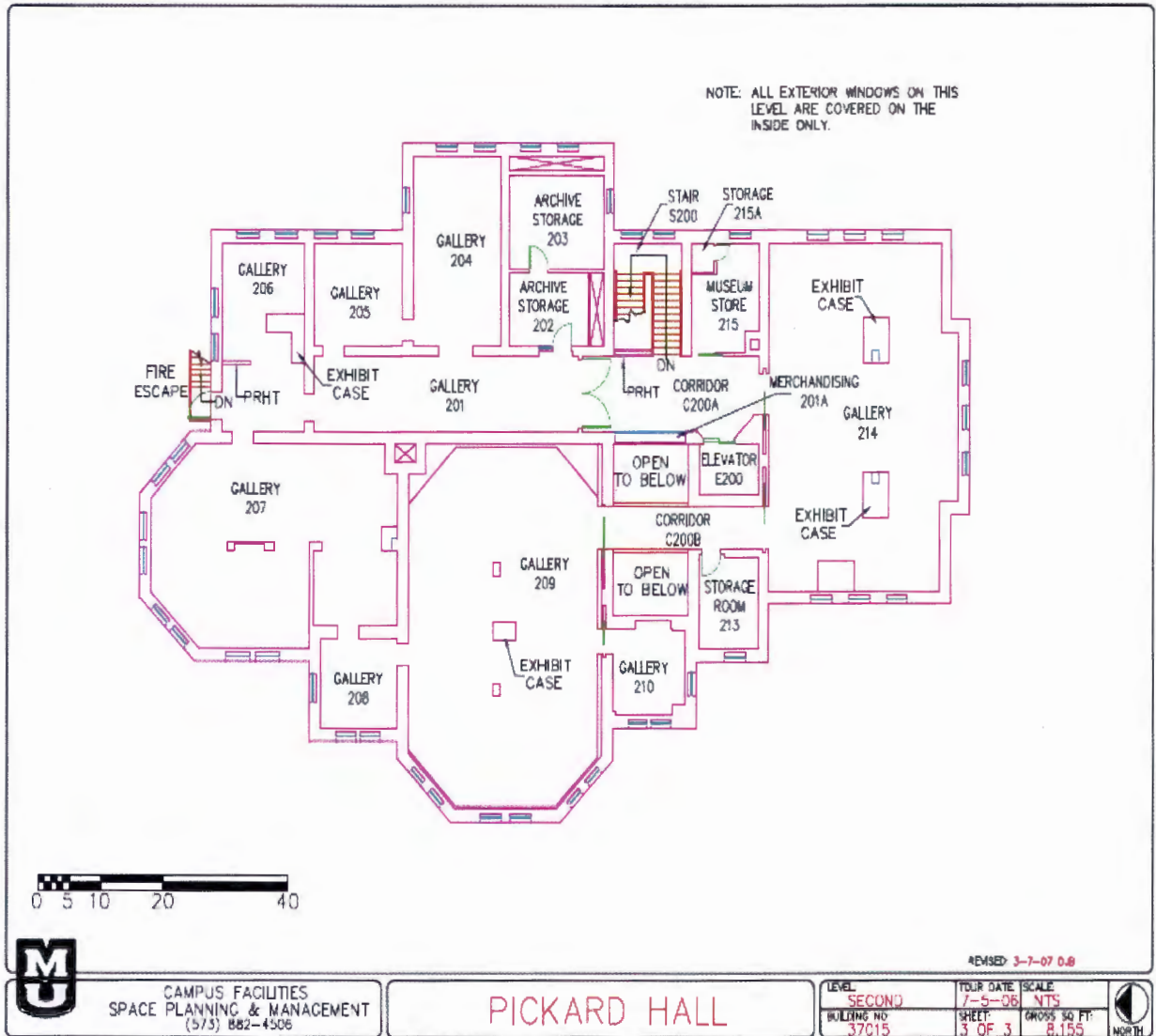
Attachment 1A. Basement Floor



Attachment 1B. First Floor



Attachment 1C. Second Floor



Attachment 2 – Sanitary and Storm Sewer line GIS Map for servicing Pickard Hall

Green = Storm Sewer

Yellow = Sanitary Sewer

Blue = Potable

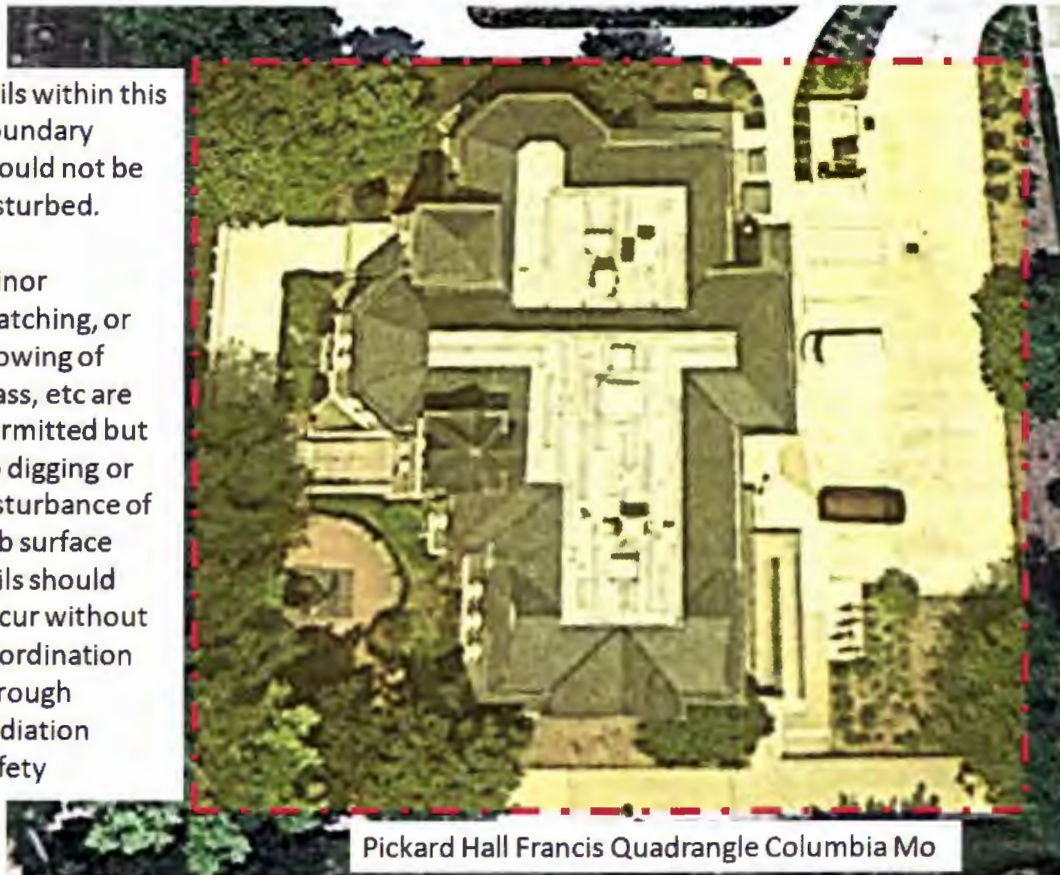
Green Circles = Utility Holes (some not connected are abandoned)



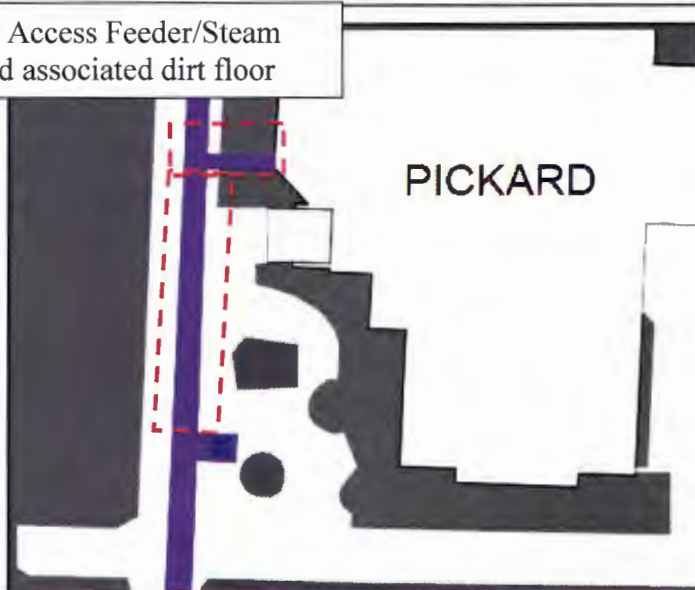
Attachment 3 – Potentially Impacted Soils near Pickard Hall

Soils within this boundary should not be disturbed.

Minor thatching, or mowing of grass, etc are permitted but no digging or disturbance of sub surface soils should occur without coordination through Radiation Safety



Restricted Access Feeder/Steam Tunnel and associated dirt floor



Contact Information

EHS Office Contact Information

Environmental Health and Safety - Radiation Safety

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For emergency service at night, weekends or holidays, call MU Police (573) 882-7201

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