Seagull Environmental Technologies, Inc.

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March 13, 2017

Ms. Kristin Allan Tipton
Development Director
Environmental Improvement and Energy Resources Authority
425 Madison Street
Jefferson City, Missouri 65102

Subject: **Analysis of Brownfields Cleanup Alternatives**
Kemper Military School – K Barracks Site, Boonville, Missouri
Missouri Brownfields Revolving Loan Fund Support Contract

Dear Ms. Allan Tipton:

Seagull Environmental Technologies, Inc. (Seagull) is submitting the attached Analysis of Brownfields Cleanup Alternatives (ABCA) report for the Kemper Military School – K Barracks site in Boonville, Missouri. If you have any questions or comments, please contact the project manager at (720) 666-3803.

Sincerely,

Ryan M Lunt

Ryan M. Lunt, CHMM
Environmental Scientist

Enclosures

ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES

KEMPER MILITARY SCHOOL – K BARRACKS SITE, BOONVILLE, MISSOURI

Missouri Brownfields Revolving Loan Fund Support Contract

Prepared For:

Environmental Improvement and Energy Resources Authority
P.O. Box 744
Jefferson City, Missouri 65102

March 13, 2017

Prepared By:

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1.0 INTRODUCTION

Seagull Environmental Technologies, Inc. (Seagull) was tasked by the Environmental Improvement and Energy Resources Authority (EIERA), under the Missouri Brownfields Revolving Loan Support Contract, to complete an Analysis of Brownfields Cleanup Alternatives (ABCA) report for the Kemper Military School – K BARRACKS site in Boonville, Missouri. This ABCA report examines alternatives for cleanup of asbestos-containing materials (ACM), including preliminary cost estimates.

2.0 SITE LOCATION AND DESCRIPTION

The site is a three-story, approximately 42,000-square-foot (ft^2) building at the former Kemper Military School. The physical address for the property is 701 3rd Street, Boonville, Missouri (see Appendix A Figure 1). The Kemper Military School-K Barracks is located in Section 35, Township 49 North, and Range 17 West. The coordinates for the approximate center of the subject property are 38.971389 degrees north latitude and 92.747185 degrees west longitude (see Appendix A Figure 1). The K Barracks consists of a boiler room and storage rooms that housed paints, trash bins, benches, and various building materials for the City of Boonville.

Historical information obtained for the site indicates that the original K Barracks building has been on-site since at least 1947. Since development of the K Barracks, the boiler room in the basement supplied heat to half the Kemper Military campus. In 2003, the City of Boonville acquired the subject property through an auction. Future plans are to demolish the building.

3.0 POTENTIAL CLEANUP ALTERNATIVES

The overall goal of any Brownfields cleanup action is to address any environmental conditions preventing or impeding the preferred type of site redevelopment, and to do so in a manner protective of human health and the environment. Future plans are to demolish the building.

Brownfields cleanup alternatives were evaluated for the site to address ACM identified in past environmental assessments/inspections. SCI Engineering, Inc. (SCI) completed a Phase I Environmental Site Assessment (ESA) for the site in July 2016 (SCI 2016). As part of that Phase I ESA, SCI completed an asbestos inspection for the site, which involved visually confirming the presence/quantity of previously identified ACM, as well as sampling other materials suspected to contain asbestos.

The purpose of the ABCA is to present viable cleanup alternatives based on site-specific conditions, technical feasibility, and preliminary cost evaluations. The following sections describe Brownfields cleanup alternatives

for addressing the ACM, including a "No Action" alternative. Following the description, each alternative is evaluated in terms of its effectiveness, implementability, and cost.

The effectiveness of an alternative refers to its ability to meet the objectives of the Brownfields cleanup. Specific criteria used to assess the effectiveness of an alternative include the following:

- Overall protection of public health and the environment;
- Compliance with applicable or relevant and appropriate requirements (ARAR) and other criteria, advisories, and guidance;
- Long-term effectiveness (includes resilience to impacts associated with natural disasters, climate change, etc.); specific effects of climate change evaluated for the site were for increased/decreased temperatures and precipitation, as well as extreme weather events (e.g., storms of unusual intensity, increased frequency and intensity of localized flooding events);
- Reduction of toxicity, mobility, or volume through treatment/removal;
- Short-term effectiveness.

The implementability criteria address the technical and administrative feasibility of implementing an alternative, and the availability of various services and materials required during its implementation. Specific criteria used to assess implementability of an alternative include:

- Technical feasibility;
- Administrative feasibility;
- Availability of services and materials;
- State acceptance;
- Community acceptance.

Each alternative is evaluated to determine its estimated cost. The evaluations compare each alternative's direct capital costs, which include equipment, services, and contingency allowances. The purpose of evaluating each alternative is to determine its advantages and disadvantages relative to the other alternatives in order to identify key tradeoffs that would affect selection of the preferred alternative.

3.1 EVALUATED CONTAMINATION

Contaminants and environmental issues evaluated as part of this ABCA include ACM. The sections below discuss contaminants/materials identified in the 2016 Phase I ESA and asbestos inspection completed for the site. Site photographs are included as Appendix B.

3.1.1 Asbestos-Containing Materials

During the 2016 asbestos inspection, 85 bulk samples of building materials were collected for laboratory analysis of asbestos. In addition, Seagull conducted a site visit on January 31, 2017, to confirm quantities of ACM. Based on that site visit, some of the quantities of ACM were revised from totals listed in previous site reports. In all, 17 materials associated with the site have been determined to contain asbestos. Those materials are ceiling texture, mudded fittings, vibration dampener, insulation around the water tanks, mud around the boiler openings, magblock duct insulation, boiler tanks insulation, spray-on fireproofing, 12" x 12" brown floor tile and associated mastic (basement, 1st, 2nd , and 3rd floors), 12" x 12" white with tan streaks floor tile and associated mastic (basement), 12" x 12" white floor tile (Room 339), 12" x 12" gray floor tile (3rd Floor), and drywall joint compound (basement only). Those materials contained asbestos (chrysotile) at concentrations ranging from 2 to 60 percent (%). The U.S. Environmental Protection Agency (EPA) defines ACM as any material containing asbestos at a concentration above 1%. It should be noted the drywall as a composite material (drywall and joint compound) was less than 1 %; however, since the K Barracks are being demolished, the Occupational Safety and Health Administration (OSHA) would consider the material to be ACM (due to the 2% chrysotile in the joint compound) and therefore abatement would be required. Table 1 summarizes the materials determined to contain asbestos during the inspection, as well as materials identified as ACM during previous assessments. Figures 3A through 3D in Appendix A show the locations of ACM.

TABLE 1

ASBESTOS-CONTAINING MATERIALS
KEMPER MILITARY SCHOOL – K BARRACKS BUILDING SITE
BOONVILLE, MISSOURI

Material	Location*	Estimated Quantity	Asbestos Result (%)
12"x 12" Floor Tile (on concrete) – Brown	3rd Floor- All Rooms -	9,350 ft^2	Tile – 2% Chrysotile Mastic – 3% Chrysotile
12"x 12" Floor Tile (on concrete) – Brown	1st Floor	11,000 ft^2	Tile – 3% Chrysotile Mastic – 5% Chrysotile
12"x 12" Floor Tile (on concrete) – Brown	2nd Floor-	11,000 ft^2	Tile – 3% Chrysotile Mastic – 5% Chrysotile
12"x 12" Floor Tile (on concrete) – Brown	Basement	3,500 ft^2	Tile – 3% Chrysotile Mastic – 4% Chrysotile
12"x 12" Floor Tile (on concrete) – White with Tan Streaks	Basement	3,500 ft^2	Tile – 3% Chrysotile Mastic – 4% Chrysotile
12"x 12" Floor Tile (on concrete) – Gray	3rd Floor - Hallway	1,650 ft^2	Tile – No Asbestos Present Mastic – 4% Chrysotile
12"x 12" Floor Tile (on concrete) – White	Room 339	35 ft^2	Tile – No Asbestos Present Mastic – 3% Chrysotile
Ceiling Texture	1st, 2nd, and 3rd Floor Rooms	28,000 ft^2	3% Chrysotile
Vibration Dampener**	Storage Room	2 Each	60% Chrysotile
Mudded Fittings	Boiler Room	250 Fittings	20% Chrysotile
Magblock Duct Insulation	Boiler Room	800 ft^2	60% Chrysotile
Boiler Opening Mud	Boiler Room	15 lf	10% Chrysotile
Large Sideways Water Tank Insulation	Boiler Room	175 ft^2	20% Chrysotile
Small Upright Water Tank Insulation	Boiler Room	150 ft^2	20% Chrysotile
Boiler Tanks Insulation	Boiler Room	500 ft^2	20% Chrysotile
Spray-On Fireproofing	Boiler Room-Ceiling	2,400 ft^2	20% Chrysotile
Drywall with Joint Compound	Basement	650 ft^2	Drywall – No Asbestos Present Joint Compound – 2% Chrysotile

Notes:

* Locations of ACM are depicted on Figures 3A through 3D in Appendix A of this report.
**During the site reconnaissance to verify the quantity of asbestos-containing material, Seagull did not locate the vibration dampeners.

" Inch
% Percent
ACM Asbestos-containing material
ft^2 Square feet
lf Linear feet

3.1.2 Lead-Based Paint

A Lead-Based Paint (LBP) inspection was not conducted as part of the 2016 Phase I ESA; however, since future plans for the K Barracks involve its demolition, no LBP inspection, remediation or special handling is required.

3.2 EVALUATION OF CLEANUP ALTERNATIVES

Evaluation of cleanup alternatives includes two options for ACM. Evaluations have been developed with specific consideration to the Missouri Department of Natural Resources (MDNR) Brownfields/Voluntary Cleanup Program (BVCP) procedural requirements and Missouri Risk-Based Corrective Action (MRBCA) technical guidance. This consideration was made because cleanup projects implemented with EPA Brownfields Cleanup funding generally require participation in a state voluntary cleanup program (or equivalent). For reference, fees associated with enrollment into the MDNR BVCP include a $200 application fee and refundable oversight deposit of $5,000.

3.2.1 Asbestos-Containing Materials

For ACM, two options were evaluated: (1) no action, and (2) proper abatement.

Alternative 1: No Action

Alternative 1 (no action) would consist of leaving ACM in place at the site.

Effectiveness

This alternative would not be effective regarding demolition of the site building that contains ACM. In accordance with National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations, demolition of the K Barracks building cannot be conducted prior to proper abatement; therefore, site redevelopment could not occur. This alternative would also be ineffective in achieving the goal of reduction of health risks.

Implementation

Implementation of this alternative is straightforward ─ the ACM is left in place. Demolition of the K Barracks Building could not be conducted prior to abatement.

Cost

This alternative would not involve any direct costs.

Alternative 2: Abatement of Asbestos-Containing Material

Alternative 2 would involve proper abatement of the ACM identified at the site, which includes ceiling texture, mudded fittings, vibration dampener, insulation around the water tanks, mud around the boiler openings, magblock duct insulation, boiler tans insulation, spray-on fireproofing, 12" x 12" brown floor tile and associated mastic (basement, 1st, 2nd ,and 3rd floors), 12" x 12" white with tan streaks floor tile and associated mastic (basement), 12" x 12" white floor tile (Room 339), 12" x 12" gray floor tile (3rd Floor), and drywall joint compound. Abatement would be conducted in accordance with applicable local, state, and federal regulations by a registered asbestos abatement contractor. Regulatory clearance would be obtained through successful implementation of a pre-approved Remedial Action Plan (RAP) and pre/post-abatement inspections. The collection of indoor air samples for clearance purposes will not be required, because the building will not be reoccupied.

Effectiveness

If all of the identified ACM was removed, then Alternative 2 would be most effective in removing the risk to human health posed by the ACM. In addition, full abatement would allow for the demolishing of the K Barracks building without restrictions concerning disturbance of ACM.

Implementation

Abatement would be conducted in accordance with applicable local, state, and federal regulations by a registered asbestos abatement contractor. ACM identified at the site includes approximately 38,350 ft^2 of 12" X 12" floor tile/mastic, 1,650 ft^2 of tile mastic, 28,000 ft^2 of ceiling texture, 2 vibration dampeners, 250 thermal system insulation (TSI) mudded joints, 800 ft^2 of duct insulation, 15 linear feet of mudding, 825 ft^2 of tank insulation, 2,400 ft^2 of spray-on fire proofing, and 650 ft^2 of drywall compound. Full abatement would include complete removal of those materials.

Cost

Estimated abatement costs were gathered from local vendors. Costs per linear foot and ft^2 are provided and include removal and disposal costs. Table 2 below summarizes the abatement costs.

TABLE 2

ACM ABATEMENT COSTS
KEMPER MILITARY SCHOOL – K BARRACKS BUILDING SITE
BOONVILLE, MISSOURI

Material	Location	Estimated Quantity	Cost/Unit	Total Cost
12" X 12" Floor Tile/Mastic	Throughout Building	38,350 ft^2	\$2.00/ft^2	\$76,700.00
12" X 12" Floor Tile Mastic	3rd Floor	1,650 ft^2	\$2.00/ft^2	\$3,300.00
Ceiling Texture	1st, 2nd, and 3rd Floor Rooms	28,000 ft^2	\$6.00/ft^2	\$168,000.00
*Vibration Dampeners	Storage Room	2 Each	\$375.00/each	\$750.00
TSI Mudded Joints	Boiler Room	250	\$20.00/each	\$5,000.00
Magblock Duct Insulations	Boiler Room	800 ft^2	\$20.00/ft^2	\$16,000.00
Boiler Opening Mud	Boiler Room	15 lf	\$20.00 /lf	\$300.00
Tank Insulations	Boiler Room	825 ft^2	\$20.00/ft^2	\$16,500.00
Spray-on Fireproofing	Boiler Room-Ceiling	2,400 ft^2	\$20.00/ft^2	\$48,000.00
Drywall with Joint Compound	Basement	650 ft^2	\$7.50/ft^2	\$4,875.00
			Total ACM Abatement Cost	****\$339,425**

Notes:

*During the site reconnaissance to verify the quantity of asbestos-containing material, Seagull did not locate the vibration dampeners.
**If Davis Beacon Prevailing Wages are used for the abatement of ACM, a 25 percent (%) increase could potentially occur to the total cost.

ACM Asbestos-containing material
ft^2 Square feet
lf Linear feet
TSI Thermal system insulation

Total abatement cost for all of the ACM is estimated at \$339,425.00. Additional costs to be considered include preparation of a Final Cleanup Report. Estimated cost for the Final Cleanup Report is \$3,500.

3.3 RECOMMENDED CLEANUP ALTERNATIVES

Asbestos-Containing Material

Alternative 2 – abatement of ACM – is the recommended cleanup alternative for ACM identified at the site. Future plans at the site include demolition of the site building. Therefore, removal of all of the identified ACM would be required prior to demolition.

3.3.1 Total Cleanup Cost

Based on the recommended cleanup alternatives for ACM, the estimated total cleanup cost is $348,125.00, which includes costs for site enrollment in the MDNR BVCP and preparation of a Final Cleanup Report. Specifically, full abatement of the ACM is estimated at $339,425.00. Site enrollment fees into the MDNR BVCP program are $5,200, while cost for preparation of a Final Cleanup Report is $3,500. Table 3 summarizes the discussed costs.

TABLE 3

SUMMARY OF COSTS
KEMPER MILITARY SCHOOL – K BARRACKS BUILDING SITE
BOONVILLE, MISSOURI

Contaminant/Material	Recommended Alternative	Action – Cost	Total Cost
ACM	Alternative 2 – Abatement	Abatement – $339,425.00	$339,425.00
MDNR Brownfields/Voluntary Cleanup Program Fees			$5,200.00
Final Cleanup Report			$3,500.00
			TOTAL CLEANUP COST - $348,125.00

Notes:

ACM Asbestos-containing materials
MDNR Missouri Department of Natural Resources

4.0 REFERENCES

SCI Engineering, Inc (SCI). 2016. Phase I Environmental Site Assessment and Asbestos Inspection Report of the Kemper Military School K Barracks Building Site. July.

APPENDIX A

FIGURES

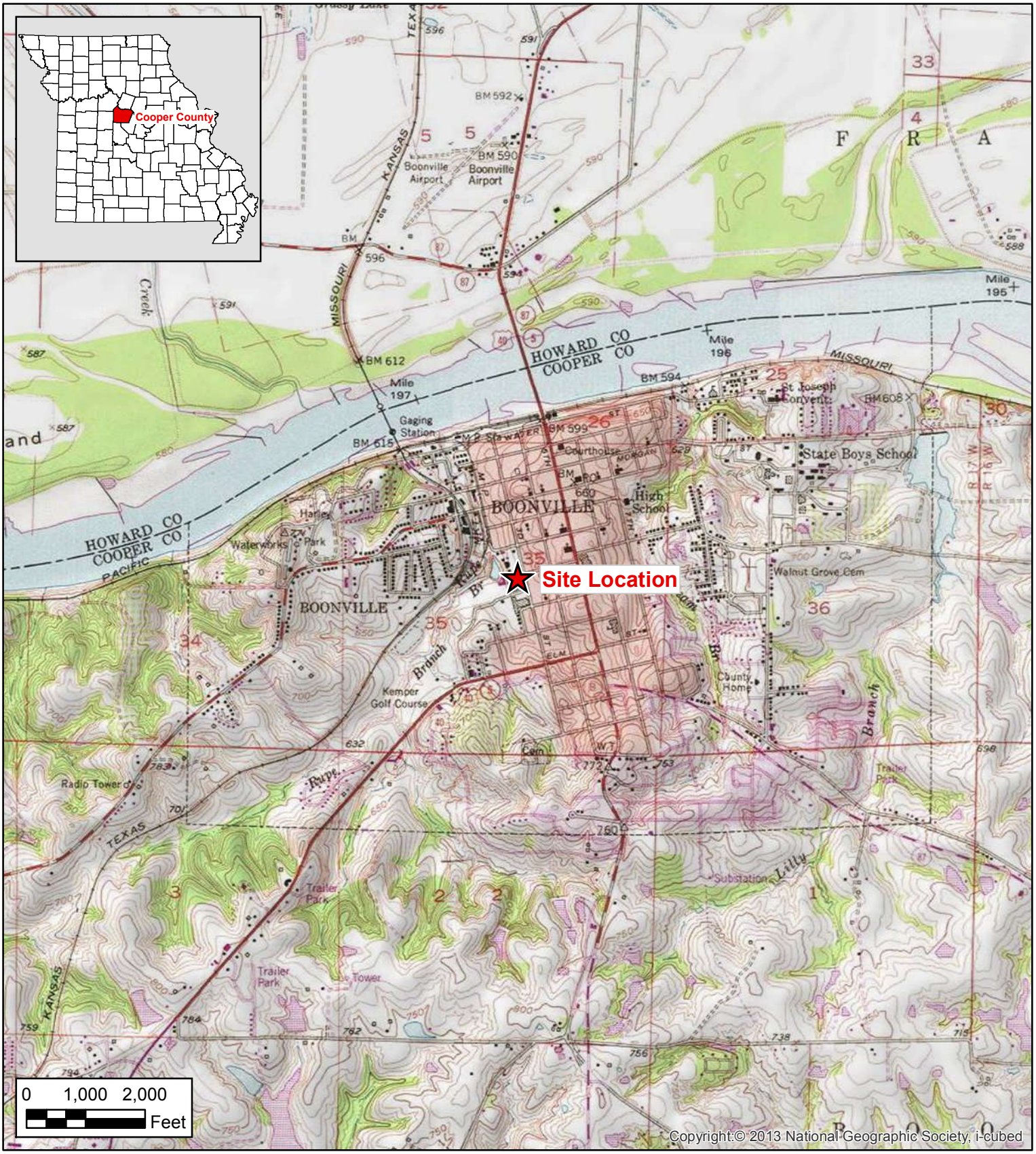

Figure 1
Site Location Map
Kemper Military School- K Barracks
Boonville, Missouri

N
W E
S

Seagull Environmental Technologies, Inc.

Source: USGS Boonville, MO 7.5 Minute Topo Quad, 1979

Date: February 2017

Project No: EIERA0012TA

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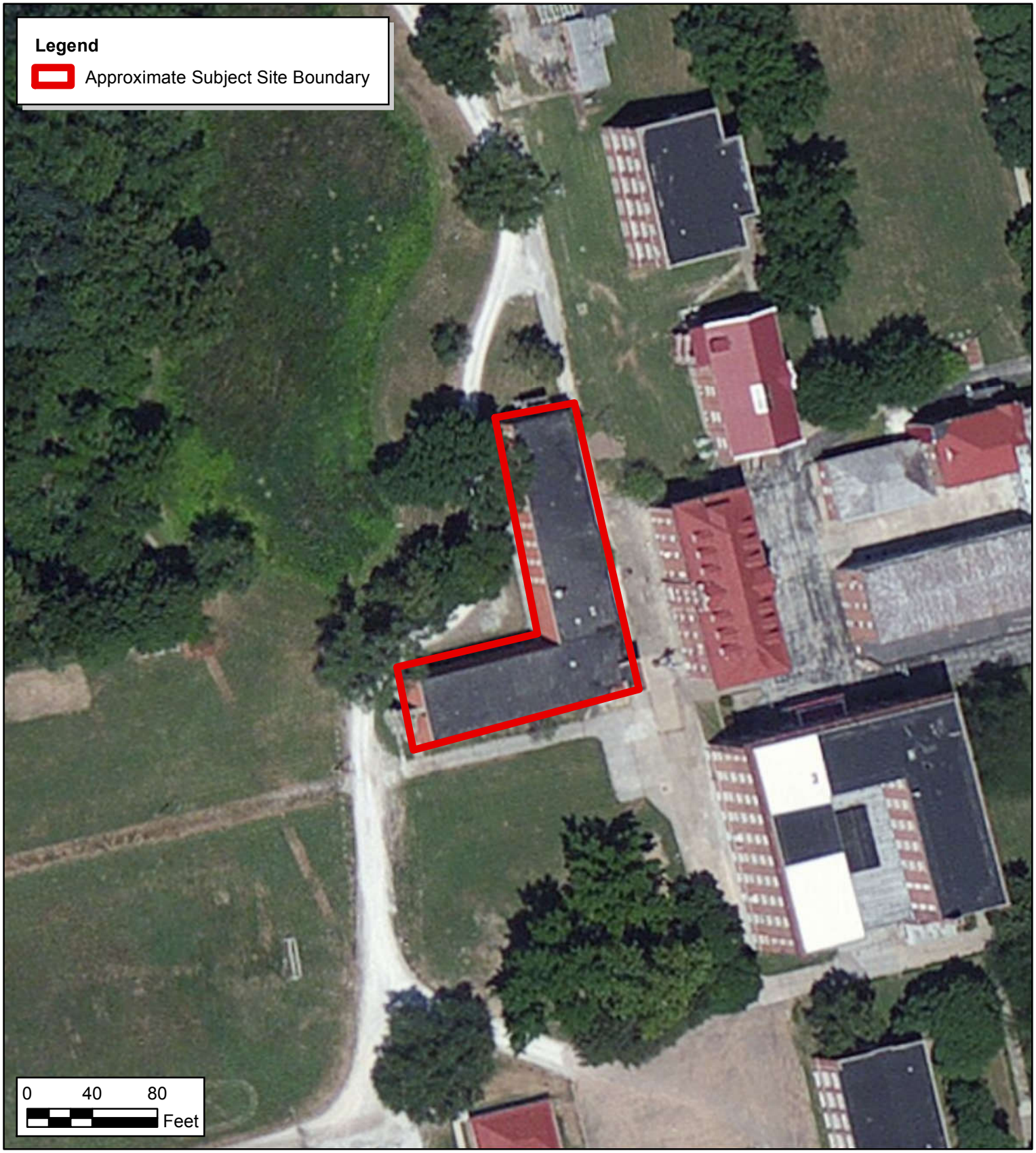

Figure 2
Site Layout Map

Kemper Military School- K Barracks
Boonville, Missouri

N
W
E
S

Seagull Environmental Technologies, Inc.

Source: ArcGIS Online Aerial Imagery, 2012

Date: February 2017

Project No: EIERA0012TA

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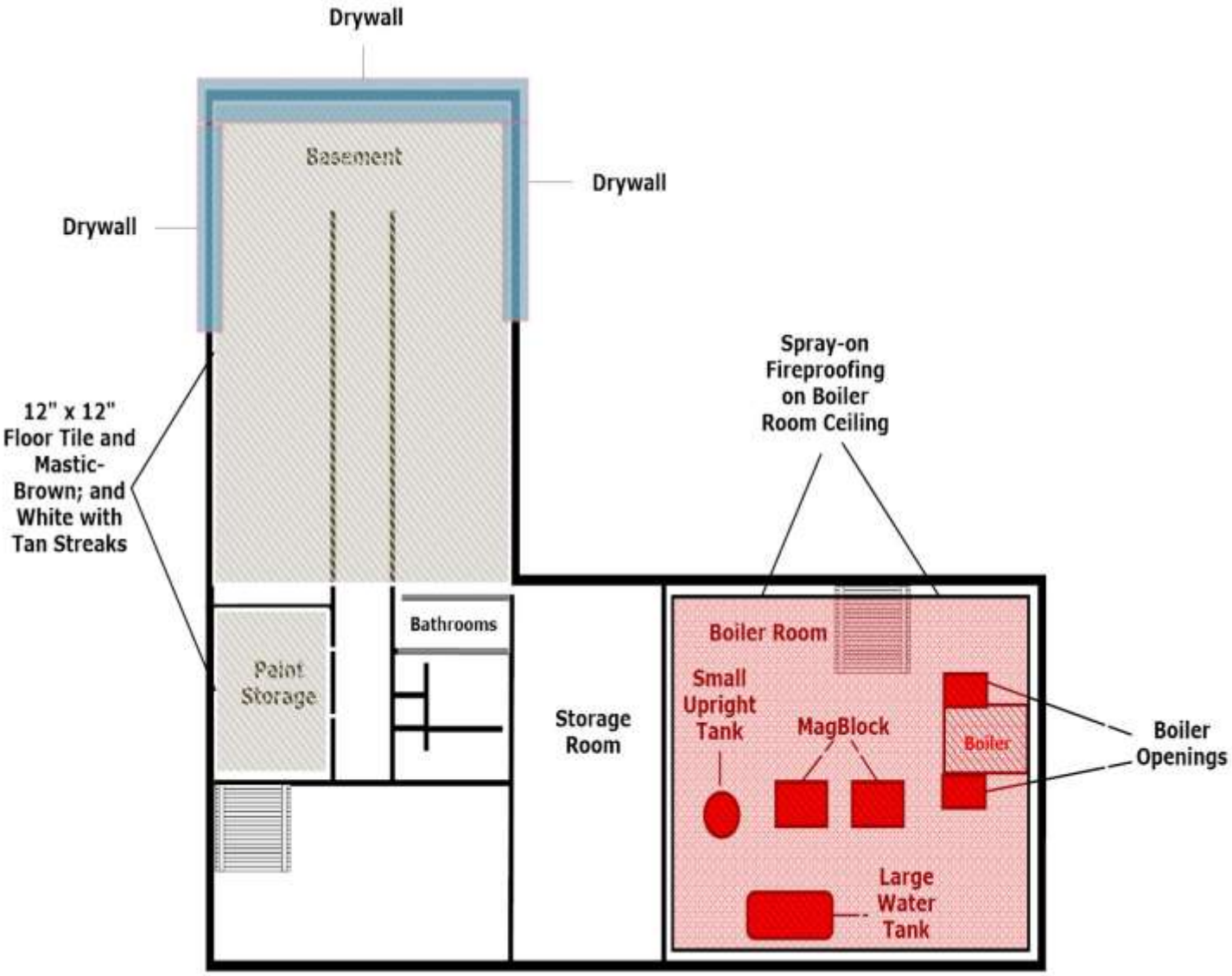


Figure 3A – Basement

Asbestos Containing Materials Location Map
Kemper Military K Barracks ABCA/RAP
701 3rd Street
Booneville, Missouri

Seagull Environmental Technologies, Inc.

Date: February 2017 Project No: EIERA0012TA

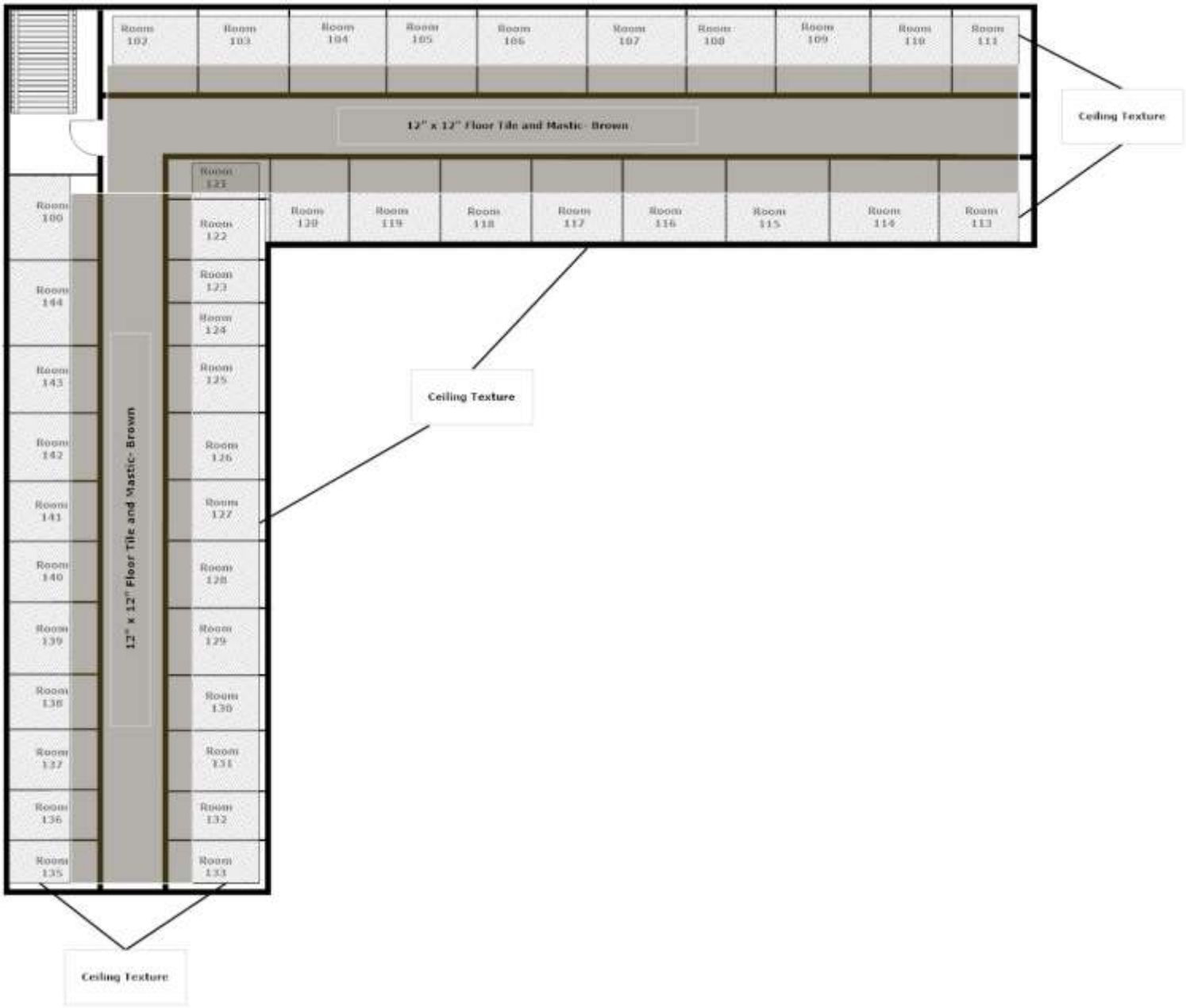


Figure 3B – 1st Floor

Asbestos Containing Materials Location Map
Kemper Military K Barracks ABCA/RAP
701 3rd Street
Booneville, Missouri

Seagull Environmental Technologies, Inc.

Date: February 2017 Project No: EIERA0012TA

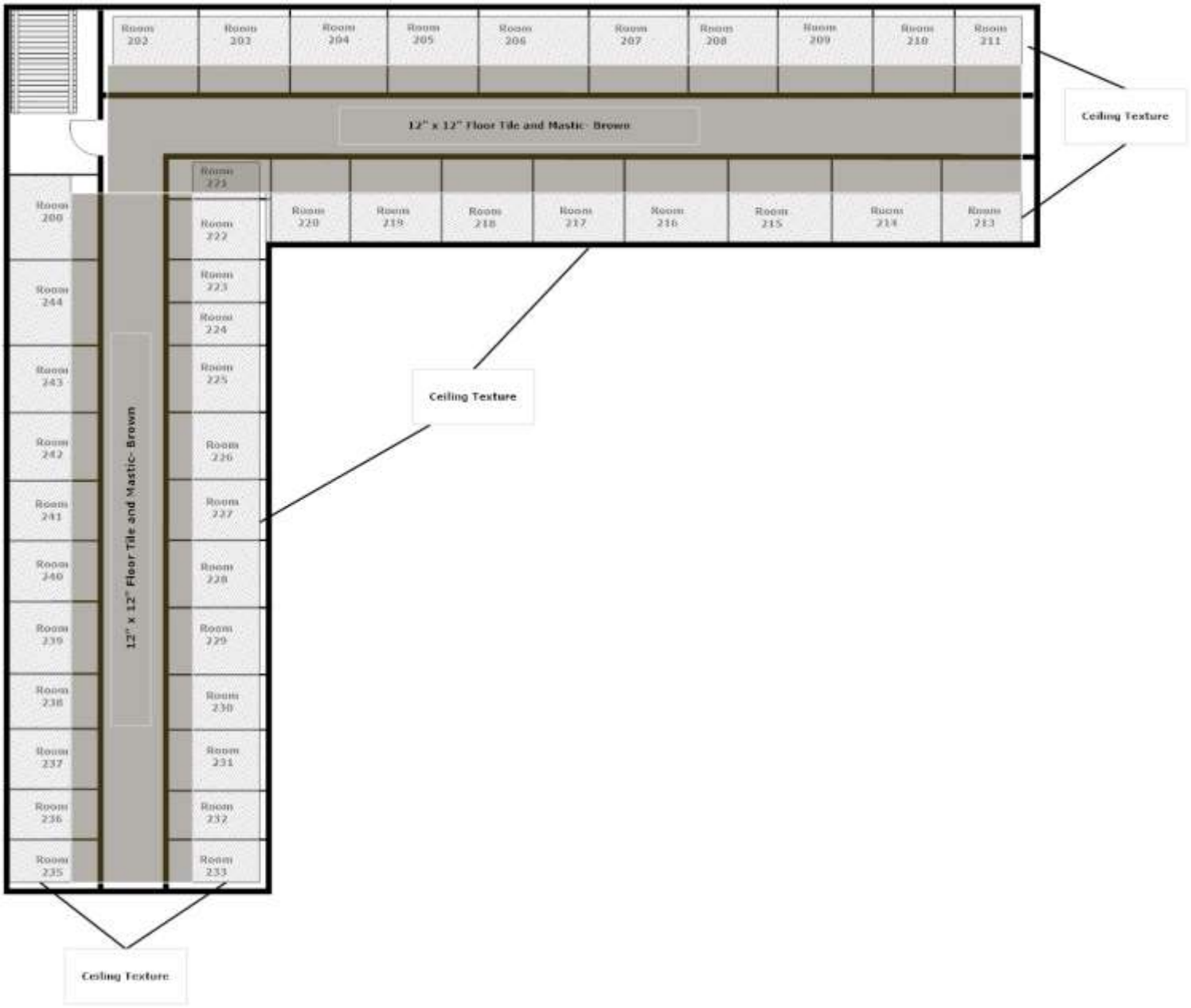


Figure 3C – 2nd Floor

Asbestos Containing Materials Location Map
Kemper Military K Barracks ABCA/RAP
701 3rd Street
Booneville, Missouri

Seagull Environmental Technologies, Inc.

Date: February 2017 Project No: EIERA0012TA

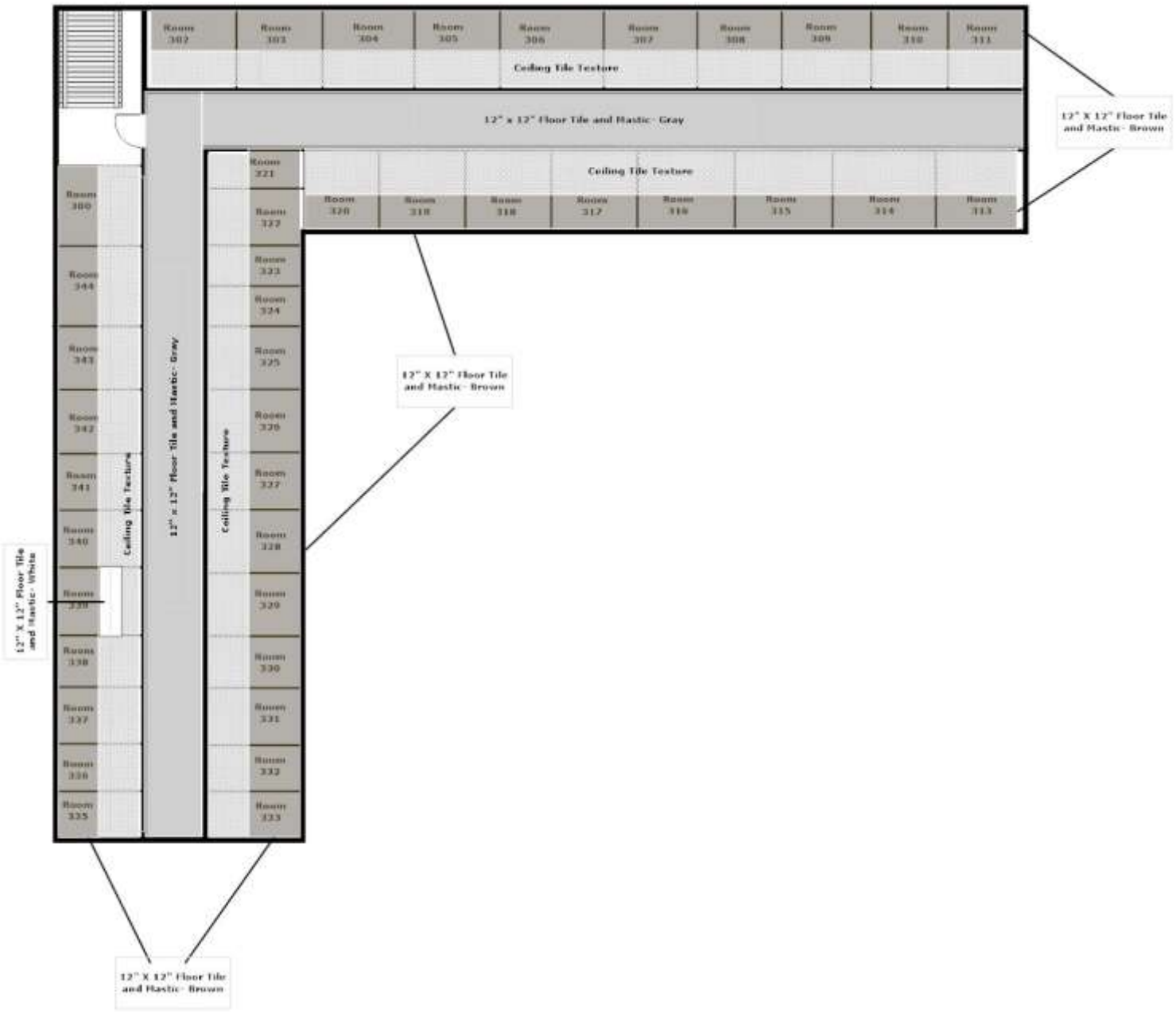


Figure 3D – 3rd Floor

Asbestos Containing Materials Location Map
Kemper Military K Barracks ABCA/RAP
701 3rd Street
Booneville, Missouri

Seagull Environmental Technologies, Inc.

Date: February 2017 Project No: EIERA0012TA

APPENDIX B

PHOTOGRAPHIC DOCUMENTATION

Client: EIERA	Description: Photograph of the front of the Kemper Military School – K Barracks Building Site.	Photograph Number: 1
Direction: West	Photographer: Brandon Jones	Date: 1/31/2017

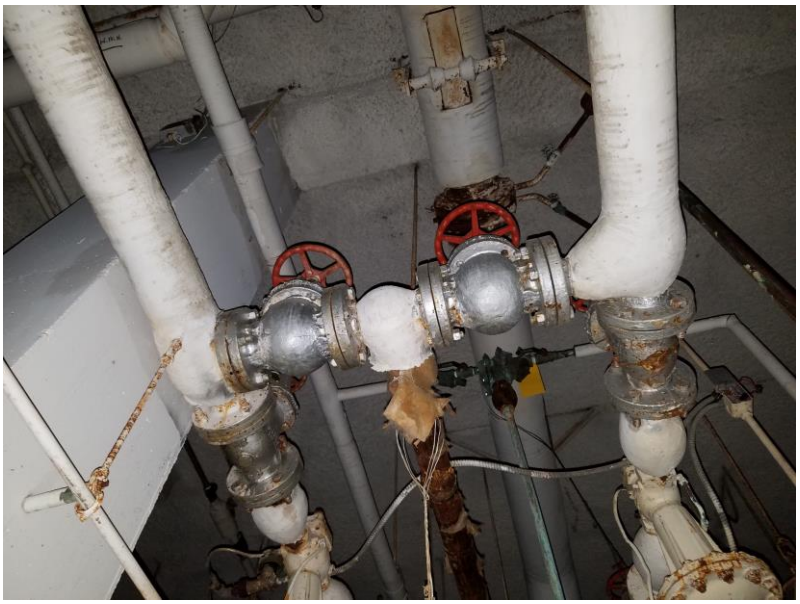
Client: EIERA	Description: Photograph of 12” x 12” Brown floor tile and associated mastic containing asbestos-containing (ACM) materials are present in the 1st, 2nd, 3rd, and basement.	Photograph Number: 2
Direction: N/A	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of 12” x 12” White with Tan streaks floor tile and associated mastic containing ACM materials are present in the basement. Additionally, the 12” x 12” Brown floor tile and associated mastic containing ACM materials are present.	Photograph Number: 3
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of 12” x 12” Gray floor tile on the 3rd floor hallway. The associated mastic contains asbestos.	Photograph Number: 4
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of 12” x 12” white floor tile in Room 339 on the 3rd floor hallway. The associated mastic contains ACM materials.	Photograph Number: 5
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing ceiling texture on the 1st, 2nd, 3rd floor rooms.	Photograph Number: 6
Direction: East	Photographer: Brandon Jones	Date: 1/31/2017



Client: EIERA	Description: Photograph of mudded joint ACM in the boiler room.	Photograph Number: 7
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing pipe magblock duct insulation.	Photograph Number: 8
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing mud on the boiler opening.	Photograph Number: 9
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing insulation on the large sideways water tank.	Photograph Number: 10
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing insulation on the small upright water tank.	Photograph Number: 11
Direction: North	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing insulation on the boiler tanks.	Photograph Number: 12
Direction: West	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of asbestos-containing spray-on fireproofing on the ceiling in the boiler room.	Photograph Number: 13
Direction: NA	Photographer: Brandon Jones	Date: 1/31/2017

Client: EIERA	Description: Photograph of drywall in the basement The joint compound in the drywall contains asbestos	Photograph Number: 14
Direction: North	Photographer: Brandon Jones	Date: 1/31/2017