DRAFT Analysis of Brownfields Cleanup Alternatives and Remedial Action Plan

Building 487
Polk Street
Bangor, Maine

Prepared for:

City of Bangor
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Bangor, Maine 04401

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1. INTRODUCTION

Credere Associates, LLC (Credere) has prepared this Analysis of Brownfields Cleanup Alternatives and Remedial Action Plan (ABCA/RAP) for Building 487 located off Polk Street in the City of Bangor, Maine (the Site). This document was prepared for Eastern Maine Development Corporation (EMDC) on behalf of the City of Bangor using funding from EMDC's Brownfields Cleanup grant (BF-96177401). The following report provides a technical evaluation of remedial alternatives for addressing the identified environmental conditions at the Site and presents a work plan for the selected remedial alternative.

1.1 PURPOSE AND SCOPE

The purpose of this report is to evaluate Brownfields cleanup alternatives to mitigate identified environmental conditions at the Site. Please note that this ABCA only addresses environmental conditions associated with hazardous building materials in/on the Site building. Soil and groundwater conditions at the Site have not been assessed, but should be assessed as part of a future Phase II Environmental Site Assessment (ESA). As such, soil and groundwater are not addressed in this ABCA/RAP. Information on known Site conditions is based on the results of the following environmental investigations which were completed for the Site:

- February 13, 1998, Phase I Environmental Site Assessment (ESA) by S.W. Cole Engineering, Inc. (SWC)
- July 2, 2014, Phase I ESA by Credere
- October 30, 2014, Hazardous Building Materials Survey (HBMS) by Credere

Consistent with the findings of these environmental investigations, environmental conditions that need to be addressed at the Site include the following:

- Asbestos-containing materials (ACM) in the Site building
- Polychlorinated biphenyl (PCB)-containing building materials in the Site building
- Lead-based paint (LBP) on the Site building
- Universal, Hazardous, and Miscellaneous Waste in the Site building,
- A room with lead-sheeting lined walls
- One 1,000-gallon No. 2 fuel oil aboveground storage tank (AST)

1.2 SITE DESCRIPTION

The Site is a 2.8-acre parcel located at the intersection of Polk Street and Nevada Avenue to the east of Bangor International Airport's (BIA's) runway. The Site contains a one story slab-on-grade building that was constructed in approximately 1957, which has an addition on its northwest side that was constructed in approximately 1961. Due to a leaking roof and lack of

maintenance throughout the building, the building is in severe disrepair and has experienced considerable water damage and mold growth. Areas of the Site not occupied by the Site building include paved parking and driveways and landscaped areas.

This Site is identified by the City of Bangor Assessors Office as tax map 001, lot 487 and is currently owned by the City of Bangor.

Figure 1 locates the Site on the Bangor, Maine, quadrangle prepared by the United States Geological Survey (USGS). A plan of the Site depicting pertinent features is presented as **Figure 2**.

1.3 SITE HISTORY

The Site was first developed in 1927 as part of Godfrey Field, a civilian airport, until it became part of the Dow Army Airfield in 1942 and the Dow Air Force Base in 1947. Based on the previous Phase I Environmental Site Assessment (ESA), the Site was originally in the vicinity of several runways, helicopter pads, and hangars until the current Site building was constructed in 1957.

According to plans obtained from the City of Bangor Planning Department, the original portion of the Site building contained squadron operations and target intelligence office space associated with the Dow Air Force Base. The new addition on the northwest side of the building contained a trainer room and simulator room in 1961. According to the 1982 Site plans, the addition was used as a Non Destructive Inspection (NDI) Laboratory. The addition contained a garage bay, lead-lined X-ray room, and small X-ray processing rooms. The original portion of the building was occupied by administrative office space. The building was abandoned in 1996 and has remained vacant since that time.

1.4 PROPOSED REUSE

The City of Bangor plans to demolish the Site building. Future redevelopment plans have not been finalized but may include leasing land to an adjacent business to allow it to expand its operations.

2. SUMMARY OF PREVIOUS INVESTIGATIONS

The following subsections are provided to summarize the previous environmental investigations completed at the Site.

Phase I ESA, S.W. Cole Engineering, Inc. (SWC), February 13, 1998

In February 1998, SWC performed a Phase I ESA on behalf of the City of Bangor to provide an indication of the potential for environmental contamination of the property by petroleum and hazardous substances from previous uses of the Site and adjoining properties. The Phase I ESA was performed on the Site, which was listed as 487 Nevada Avenue in the report, as well as three other properties located on Griffin Road and Maine Avenue. The report indicated that the Site was privately owned prior to the early 1940s, that the U.S. government acquired the Site from the City of Bangor in 1940, and that the Site became part of the Dow Air Force Base in 1942. The Site building was reportedly constructed in the late 1950s and at the time of the 1998 Phase I ESA was used as office space; however, SWC did not enter the Site building.

From the 1940s through the 1950s, the Site and surrounding area were occupied by Building 487 (the Site), aircraft hangar 478 (northeast of the Site), helicopters pads (north of the Site), a wash rack for cleaning and degreasing equipment, and a 6-inch diameter aviation fuel line. The U.S. government declared Dow Air Force Base excess property in 1964, and military operations on the Site ceased in 1968.

In the late 1980s and early 1990s, at least 7,100 cubic yards (cy) of petroleum contaminated soil from the Bangor waterfront and airport areas were reportedly land spread on adjoining properties including on the abandoned helicopter pad (north of the Site), portions of the abandoned runway (north and east of the Site), and on the concrete hangar 478 slab (northeast of the Site). At the time of the 1998 Phase I ESA, some of those soils were reported to remain on or in the vicinity of the Site.

Adjoining properties were reported to be in use by Irving Oil for oil storage; General Electric (GE) and M/A-Com ANZAC Electronics, Inc. for electronics or other manufacturing; and Bass Shoe Company and Timberland as shoe factories.

SWC reportedly also reviewed four reports that described incidents in the vicinity of the Site that included a 3,000-gallon spill of phosphoric acid, the detection of trichloroacetic acid (TCA) and trichloroethylene (TCE) in groundwater in the vicinity of the Site, or other large petroleum incidents.

SWC's Phase I ESA referenced a 1992 Phase I ESA conducted by GE that indicated a 6,000-gallon fuel oil underground storage tank (UST) was removed from the northwest corner of the Site building in 1992 by Apex, who at the time, noted the presence of contaminated soil but did not indicate the location of the soil or if the soil was removed.

Additionally, the 1992 Phase I ESA reported that wastes generated at the Site included penetrants, cleaners, fixers, developers, and solvents in use by a NDI laboratory that may have been discharged to the floor drains and oil/water separator (OWS) that existed at the Site. Waste from the separator and drains reportedly discharged into storm drains that empty into a drainage swale located adjacent to the parking lot.

SWC reviewed letters dated 1993 and 1994, from Wehran Engineering Corporation to GE indicating geotechnical and environmental screening was conducted prior to the expansion of GE's adjoining Building 30. The letters indicated 26 soil borings were advanced on the adjoining property northwest of the Site and were field screened with a photoionization detector (PID) for total volatile organic compounds (VOCs). Reportedly, 25 of 91 soil samples screened with the PID tested positive for VOCs. Based on the PID results, seven soil samples were submitted for laboratory analysis of total petroleum hydrocarbons (TPH). Results indicated TPH present in soil at concentrations ranging from 5 to 520 milligrams per kilogram (mg/kg). As part of the GE facility expansion, approximately 1,300 cubic yards of TPH impacted soil were excavated and stockpiled for future reuse. Two soil samples collected from the stockpile were analyzed for TPH and the results indicated TPH concentrations of 72 and 100 mg/kg. Additionally, a water sample collected from the drainage outfall in the vicinity of the excavation was analyzed and contained TPH at a concentration of 660 microgram per liter (µg/L).

Numerous other spill files and other documents reporting spills or releases of petroleum and/or hazardous materials in the vicinity of the Site were summarized in the SWC Phase I ESA report. While some documents indicate remedial actions were performed, most indicate that environmental media in the vicinity of the Site has been impacted by multiple releases.

Based on this information, SWC concluded that the previous use of the Site as a military base suggested that various fuels, lubricants, solvents, and similar chemicals may have been used at the Site. In addition, evidence of potential onsite and offsite sources of contamination had been documented, and SWC recommended that a subsurface exploration be conducted.

Phase I ESA, Credere, March 27, 2014

Credere performed a Phase I ESA for the Site in March 2014 on behalf of EMDC and the City of Bangor. Based on records review, Site reconnaissance, and interviews, Credere identified the following 6 recognized environmental conditions (RECs) for the Site:

- REC-1 – The historical uses of the Site as an airport, Air National Guard facility, and U.S. Air Force base.
- REC-2 – Land spreading of contaminated dredge sediment on or in the vicinity of the Site on former impervious surfaces with runoff that may have impacted the Site.
- REC-3 – Documented releases to the Site from a former 6,000-gallon fuel oil UST.
- REC-4 – Potential releases to the environment at the Site from a floor drain and OWS separator system.

- REC-5 – Observed suspected ACM in waste form throughout the Site building.
- REC-6 – Potential Site contamination from offsite sources.

The following 4 *de minimis* environmental conditions (DMECs) were identified during the Phase I ESA:

- DMEC 1 – Historical presence or likely PCB-containing transformers on the Site building.
- DMEC 2 – Lead-lined room within the Site building.
- DMEC 3 – Containers of hazardous materials within the Site building.
- DMEC 4 – Onsite 1,000-gallon aboveground storage tank (AST) possibly containing fuel oil.

Lastly, the following two additional environmental findings, which do not meet the definitions of a REC, historical REC, controlled REC or DMEC according to the ASTM E 1527-13 standard; however, warrant the environmental professional's opinion, were identified during the Phase I ESA:

- Environmental Finding 1 – Possible hazardous building materials throughout the Site building
- Environmental Finding 2 – Likely presence of mold throughout the Site building

Based on the above list of RECs, DMECs, and other environmental findings, Credere recommended the following:

- A Phase II ESA should be completed to assess the potential for soil and groundwater impacts at the Site. Please note that at the time of this ABCA/RAP, a Phase II ESA has not been performed at the Site, and soil and groundwater at the Site have not been adequately assessed. As such, soil and groundwater conditions are not addressed in this ABCA/RAP.
- A HBMS should be conducted prior to renovation or demolition of the Site building assessing the presence of LBP, ACM, PCB-containing materials and/or miscellaneous small containers of hazardous materials.
- A mold survey should be conducted within the Site building to determine if future Site renovation workers would be exposed to hazardous mold spores during redevelopment and if protective measures are necessary to protect worker health.

Please note that DMEC-2 concerning the lead-lined room does not require further assessment where the lead is affixed to the interior walls.

HBMS, Credere, October 30, 2014

Credere performed a HBMS for the Site in October 2014 on behalf of EMDC and the City of Bangor. During this investigation, Credere identified the following hazardous building materials.

- ACM was identified at the Site in the form of all floor tiles, including the black mastic beneath them; ceiling tiles; the cementitious wall board in the Dynamics Corps. Area; and the black felt paper on the roof. Additionally, materials in the Boiler Room, including mud fittings, tube insulation, formed/molded pipe wrap, transite ceiling tiles, gray painted tank insulation, and the tan painted duct wrap. All identified ACM was observed to be or should be presumed to be in a heavily damaged condition (in waste form).
- White over green paint, white over tan paint, and brown over green paint in the East Office Area were identified as non-Toxic Substances Control Act (non-TSCA) regulated PCB-containing materials. Additionally, gray floor paint, and red paint on the boiler in the Boiler Room, as well as the black mastic throughout the Site building were identified as non-TSCA regulated PCB-containing materials.
- LBP was identified in the brown paint on the soffit and fascia around the entire exterior of the building. Please note that this LBP and the underlying substrate have not been characterized for disposal.
- Approximately 780-square feet of ¼-inch thick lead was observed lining the X-ray room.
- Universal, hazardous, and other miscellaneous waste was identified in the Site building.

Based on the results of this investigation, Credere made the following recommendations for the Site:

- Prior to or concurrent with building demolition activities, Credere recommends that all identified ACMs be properly abated by a licensed asbestos abatement professional in accordance with all applicable state and federal regulations.
- Prior to or concurrent with building demolition activities, Credere recommends that the lead lining in the X-ray room be removed and properly recycled at an appropriate recycling facility.
- Concurrent with building demolition activities, Credere recommends that all LBP be properly managed in accordance with the Occupational Health & Safety Administration (OSHA) Lead in Construction Standard.
- Prior to or during building renovation or demolition activities, Credere recommends that all demolition waste that may contain LBP and/or non-TSCA regulated concentrations of PCBs be properly characterized and disposed at an appropriately licensed facility.
- All universal, hazardous, and/or miscellaneous wastes should be properly consolidated and disposed or recycled as appropriate prior to or concurrent with building demolition.

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3. UPDATED CONCEPTUAL SITE MODEL

An updated conceptual site model (CSM) was developed using the findings of the previous investigations and will be updated in subsequent reports as new information becomes available. This CSM includes a description of the physical setting of the Site, contaminants of concern (COCs), extent of contamination, exposure pathways, and potential human and environmental receptors.

3.1 PHYSICAL SETTING

Topography

According to the United States Geological Survey (USGS) Topographic Map of the Bangor Quadrangle, Maine, dated 2011, topography at and in the vicinity of the Site is generally flat. An excerpt from this map has been included as **Figure 1**.

Geology

Surficial Geology

According to the Maine Geological Survey (MGS) Surficial Geology of the Bangor Quadrangle, Maine, map, the Site is underlain by till, a loose to very compact, poorly sorted, massive to weakly stratified mixture of sand, silt, and gravel-size rock debris deposited by glacial ice.

Bedrock Geology

According to the MGS Bedrock Geology of the Bangor Quadrangle, Maine, map, bedrock beneath the Site consists of the Brewer Formation, which is a Silurian dominantly dark gray to black siltstone and claystone slate. No bedrock outcrops were observed during Credere's Phase I ESA Site reconnaissance or HBMS. According to boring data presented on the MGS Significant Sand and Gravel Aquifer map for the Bangor Quadrangle, Maine, bedrock is approximately 50 feet below ground surface (bgs) in the vicinity of the Site.

Hydrology

The nearest surface water body to the Site is the urban impaired Birch Stream, which is located approximately 1,600 feet to the east. No storm drains were observed on the Site during Credere's Phase I ESA Site reconnaissance or HBMS. Grassed areas of the Site are graded toward gently sloped swales such that surface water runs away from the building. Drainage is therefore likely directed toward offsite storm drains or the detention areas located across Polk Ave to the east that allows for infiltration.

Review of the MGS Significant Sand and Gravel Aquifer map for the Bangor Quadrangle, Maine, indicates the Site does not fall within a mapped significant sand and gravel aquifer.

Based on observed grades, mapped topography, and the location of the nearest surface water body, groundwater at the Site is presumed to flow east.

Changing Climate Concerns

The Site is approximately 20-miles north of the Atlantic Ocean and approximately 155-feet above mean sea level (MSL); therefore, sea level rise associated with climate change is not expected to impact the Site. Based on the unassessed RECs associated with subsurface materials at the Site, climatic changes that might affect environmental conditions at the Site might include changing dates of ground thaw/freezing and changing groundwater table. As this ABCA only relates to the Site building and associated hazardous building materials, effects of climate change on the subsurface was not considered. Changing temperature, extreme weather, wildfires, changing ecological zone and saltwater intrusion are not likely to affect the Site.

3.2 CURRENT CONTAMINANTS OF CONCERN

Based on the results of the 2014 HBMS, current COCs addressed in this ABCA/RAP include the following:

- ACM in the Site building
- Non-TSCA regulated PCB-containing building materials in the Site building
- LBP on the Site building
- Universal, hazardous and other miscellaneous waste in the Site building including a lead-lined room

This ABCA/RAP is intended only for addressing cleanup alternatives for hazardous building materials in/on the Site building. Soil and groundwater conditions associated with the RECs identified in Credere's 2014 Phase I ESA have not been adequately assessed and may still pose additional environmental risks.

3.3 EXTENT OF CONTAMINATION

Contamination associated with hazardous building materials is considered to be confined to the Site building.

3.4 EXPOSURE PATHWAYS AND POTENTIAL RECEPTORS

Exposure pathways describe how a human or environmental receptor comes into contact with contaminants that may be present at the Site. Exposure pathways presented in the CSM which are present at the Site include the following:

Dermal Absorption:	Exposure via dermal absorption occurs when receptors are exposed to chemical concentrations present in soil, groundwater, surface water, or hazardous building materials through direct contact with the skin.
Active Ingestion:	The active ingestion pathway represents exposure which may occur through the active ingestion of contaminant concentrations via a

	drinking water supply well, through agricultural products, or through direct consumption of soil (e.g., typically by children).
Incidental Uptake:	This pathway is applicable when receptors may incidentally inhale or ingest impacted media in the form of contaminated dust, chips, or airborne asbestos fibers.

Potential Receptors are categorized by duration of exposure and intensity of use at the Site. The receptor categories described in the CSM which are present at the Site include the following:

Outdoor Commercial Worker:	Outdoor commercial receptors are those which are present at the Site for long durations but with low intensity exposure such as groundskeepers, parking lot attendants, and mechanics. This category is also conservatively applied for indoor office workers at the Site.
Recreational or Park User:	Park users (including trespassers) are characterized by low duration, i.e. less than two hours per day, and low intensity usage such as that which would occur during activities such as walking, shopping, and bird watching.
Excavation or Construction Worker:	Excavation or construction workers are present at the Site for short durations though intensity of use is high, such as during non-routine activities including construction or utility work. Examples include utility and construction contractors and landscapers.

3.5 CONCEPTUAL SITE MODEL SUMMARY

Based on the proposed demolition or renovation of the Site building, the identified potential receptors include outdoor commercial workers, visitors (including trespassers), and excavation and construction workers. Exposure pathways for these potential receptors include dermal absorption, active ingestion, and incidental uptake. These exposure pathways are associated with asbestos, PCB, and lead dust, as well as exposure to universal, hazardous, and/or miscellaneous waste.

4. CLEANUP GOALS AND APPLICABLE GUIDELINES

To determine the most appropriate cleanup method for the Site, the volume of impacted media must first be determined and then the cleanup goals for the Site must be analyzed considering the future reuse of the Site.

4.1 ESTIMATE OF IMPACTED MEDIA

ACM

The following estimated quantities of ACM have been identified in the Site building:

Table 1 – Approximate Quantities of Asbestos Containing Materials

Material Description	Quantity
Floor Tiles	18,200 ft^2
Black Tile Mastic	18,200 ft^2
Black Felt Paper/Roof	18,200 ft^2
Cementitious Wall Board	Up to 1,650 ft^2
Assumed Transite Ceiling Tile	2,200 ft^2
Cementitious Ceiling Tile	Up to 2,200 ft^2
Metal Fire Doors	Approximately 20 doors
Boiler Room/Large Mud Fittings	Approximately 100 fittings
Boiler Room/Tube Insulation	8 linear feet of 10 inch diameter
Boiler Room/Formed/Molded Pipe Wrap	10 linear feet
Boiler Room/Gray Painted Tank Insulation	1 water tank of 4 foot diameter
Boiler Room/Tan Painted Duct Wrap	50 linear feet of 18-inch by 18-inch duct

PCBs

Non-TSCA regulated PCBs were determined to be contained in white over green paint, white over tan paint, and brown over green paint in the East Office area. Additionally, gray floor paint, and red paint on the boiler in the Boiler Room, as well as the black mastic throughout the Site building were identified as non-TSCA regulated PCB-containing materials.

Please note that the black mastic located throughout the Site building is ACM comingled with non-TSCA regulated concentrations of PCBs. Asbestos-containing floor tiles would also require appropriate management as a non-TSCA regulated PCB-containing material due to contact with the comingled PCB-containing ACM mastic.

LBP

LBP was identified in the brown paint on the soffit and fascia around the entire exterior of the building. No other LBP was identified. Please note that this LBP and the underlying substrate have not been characterized for disposal.

Universal, Hazardous, and/or Miscellaneous Waste

The following table summarizes universal and/or hazardous wastes that were identified at the Site:

Table 2 – Universal, Hazardous, and Miscellaneous Waste Inventory

Type of Material	Quantity	Waste Disposal Classification
Fluorescent light fixtures	Approx. 260	Universal Waste
Mercury thermostats	22	Universal Waste
Emergency lights	10	Universal Waste
Smoke detectors	7	Universal Waste
Large halide lights	2	Universal Waste
5-gallon bucket of roof sealer	1	Assume Non-Hazardous Waste
5-gallon bucket of magnetic testing compound	2	Assume Hazardous Waste
5-gallon bucket of dry cleaning solvent	1	Hazardous Waste
1-gallon can of paint	2	Assume Hazardous Waste
Projectors	4	Universal Waste
Air conditioner units	2	Universal Waste
Water chiller/fountain	1	Universal Waste
Lead lined walls in the X-ray room	Approx. 780-square feet	Recyclable as scrap metal
1,000-gallon No. 2 fuel oil AST (tank contents assumed to contain specification waste oil)	1 (AST contains approximately 700 gallons of oil/sludge)	Recycle Steel After Pump-Clean, Oil/Sludge is State Regulated Waste

4.2 CLEANUP GOALS

ACM

Any ACM to be impacted by renovation or demolition activities will be properly removed prior to these activities. All asbestos removal, handling and oversight will be conducted according to Maine DEP Chapter 425, and by appropriately trained and certified personnel. Confirmatory air sampling will be conducted by third party Maine DEP certified asbestos air monitor.

PCBs

Paints in the Site building contain non-TSCA-regulated concentrations of PCBs, as defined by 40 CFR 761.3, which must be properly disposed when no longer in use. Additionally, handling of

non-TSCA-regulated PCBs should be conducted in a manner that protects the safety of cleanup workers and other future human receptors.

LBP

Construction work involving exposure or potential exposure to any concentration of lead is regulated by OSHA's Lead in Construction Standard 29 CFR 1926.62. Cleanup goals will be that LBP is removed and properly disposed of; or is repaired and managed to be maintained in "Good Condition" as defined in Maine DEP Chapter 424: Lead Management Regulations (Chapter 424); and that post renovation conditions in the Site building are safe for reoccupancy as defined in Chapter 424. Please note that this LBP and the underlying substrate have not been characterized for disposal. Any generated waste that may contain LBP should be properly characterized and disposed at an appropriately licensed facility.

Universal, Hazardous, and Miscellaneous Waste

Materials that would be characterized as universal, hazardous, and/or miscellaneous waste materials may be removed from service during the proposed redevelopment activities. As such, the goal of the remediation is to properly manage and dispose of universal, hazardous, and/or miscellaneous waste materials in such a way as to prevent a release. Universal, hazardous, and/or miscellaneous waste will be identified and managed in accordance with Maine Hazardous Waste Management Regulations - Chapters 850 through 857, 49 CFR 100-199 - Transportation of Hazardous Materials, and 40 CFR 256 – Guidelines for Development and Implementation of State Solid Waste Management Plans. These wastes should be recycled as appropriate whenever possible.

5. DESCRIPTION OF REMEDIAL ALTERNATIVES

Based on the potential remaining exposure pathways to future receptors at the Site, the remedial actions selected for the Site should accomplish the following objective:

- Minimize the potential for exposure of hazardous building materials to excavation and construction workers at the Site during demolition
- Minimize improper disposal of hazardous building materials

Multiple remedial alternatives are available to address the COCs in the Site building. However, based on our past experience at sites with similar contaminants and conditions, we have pre-screened general advantages and disadvantages of various options and have selected three (3) remedial alternatives for further evaluation and comparison:

Alternatives for Hazardous Building Material Management

1. Alternative #1 – No Action
2. Alternative #2 – Hazardous Building Material Abatement and Control
3. Alternative #3 – Hazardous Building Material Abatement and Building Demolition

These remedial alternatives were evaluated for implementation at the Site and are further discussed in the following sections.

"No Action" Alternative

A "No Action" alternative signifies that no remediation activities would be implemented at the Site. The "No Action" alternative does not include a means for mitigating or eliminating potential exposure to hazardous building materials during and following redevelopment. Therefore, the potential for human exposure continues to exist for potential future building occupants, trespassers, or excavation or construction workers. This alternative is presented and discussed throughout the subsequent portions of this report as a baseline comparison and represents the existing conditions at the Site.

Alternative #2 - Hazardous Building Material Abatement and Control

This alternative would involve the removal of hazardous materials that are in waste form; and the control and management of hazardous materials that can be returned to usable condition. The structure of the building would remain in place for possible future redevelopment. This alternative would involve the abatement and disposal of all ACM, which are currently in waste form. Loose and flaking LBP and non-TSCA regulated PCB paint would be removed and these surfaces would be stabilized to restore the surfaces to good condition. All debris containing LBP and non-TSCA regulated PCB paint would be properly removed and disposed. Damaged universal, hazardous, and/or miscellaneous waste would be properly disposed of. A Hazardous Building Material Management Plan (HBMMP) would be implemented to manage remaining hazardous materials.

Alternative #3 - Hazardous Building Material Abatement and Building Demolition

This alternative would involve the complete abatement by removal of all ACM and all universal, hazardous, and/or miscellaneous waste, followed by the complete demolition of the Site building and proper removal, characterization, and disposal of all demolition waste containing LBP and non-TSCA regulated PCB paint.

6. COMPARISON OF ALTERNATIVES

As discussed in the previous section, three remedial alternatives were developed to address the COCs at the Site. The comparison and evaluation of the remedial alternatives has been conducted using the five criteria listed below:

1. risk reduction and effectiveness
2. feasibility and ease of implementation
3. sustainability, reliability and resiliency
4. cost effectiveness
5. estimated time to reach "No Further Action"

A brief summary of these five criteria and a discussion as to how they pertain to the three remedial alternatives is presented below and summarized on **Table 3** at the end of this Section.

6.1 DESCRIPTION OF EVALUATION CRITERIA

Risk Reduction and Effectiveness

Since the primary objective of any remedial action is to reduce or eliminate exposure of humans and the environment to COCs, risk reduction and effectiveness is considered the primary threshold criterion. Alternatives must pass this criterion to be considered for implementation as the recommended alternative. It addresses whether or not a remedy provides adequate protection and describes how the risks posed by the Site are eliminated, reduced, or controlled. Protection of human health is assessed by evaluating how risk from each exposure route is eliminated, reduced, or controlled through each specific alternative. This criterion also addresses the ability of the alternative to achieve the cleanup goal and applicable guidelines.

Feasibility and Ease of Implementation

This criterion analyzes technical feasibility and the availability of services and materials. Availability of services and materials evaluates the need for off-site treatment, storage, or disposal services and the availability of such services. Necessary equipment, specialists, and additional resources are also evaluated.

Sustainability, Reliability, and Resiliency *(as related to climate change)*

This criterion evaluates the long term reliability of the alternative with respect to reasonable costs associated with upkeep, level of effort associated with upkeep, and the resilience of the alternative with respect to reasonably foreseeable changing climate conditions. This includes potential impacts to proposed remedial actions that may be impacted or affected by future Site impact due to climate change. This criterion also evaluates the extent of green remediation techniques that can be employed as part of the project and their associated benefits relative to other alternatives. This criterion will also evaluate each alternative's consistency with EPA's *Principle for Greener Cleanup* policy.

Cost Effectiveness

Cost information presented for the alternatives evaluates the estimated capital, operational and maintenance costs of each alternative. Capital costs include direct capital costs such as materials and equipment. Costs are presented as a balancing criterion such that if a number of remedial alternatives are comparable for the previously discussed criteria, cost may be used as a distinguishing factor in the selection of the remedial action. Estimated costs were developed based on prior project and contractor experience, and current estimates received from contractors. Remediation is scheduled to take place in 2014, and as such, costs presented are in year 2014 dollars.

Estimated Time to Reach "No Further Action"

This criterion is defined as the time it will take to achieve "No Further Action" in accordance with Maine 38 M.R.S.A. 343-E as well as to meet the requirements of the Maine DEP Voluntary Response Action Program (VRAP) and receive a Certificate of Completion from VRAP. Please note this criterion does not take into account redevelopment and other time for non-environmental tasks.

6.2 EVALUATION OF ALTERNATIVES

Alternative #1 - "No Action" Alternative

The "No Action" alternative involves no abatement or disposal of hazardous building materials and would not include a means for eliminating potential exposure to these COCs during future reuse or demolition. Therefore, the potential for human exposure through direct contact, active ingestion and incidental uptake continues to exist for future excavation or construction workers. As such, the "No Action" response is not wholly protective of human health and the environment. Additionally, without action, the toxicity, and volume of contaminants will not be reduced. Therefore, this alternative is ineffective as a permanent remedial solution. As a result, this alternative cannot be considered as a final alternative for the Site.

Alternative #2 – Hazardous Building Material Abatement and Control

Risk Reduction and Effectiveness

This alternative fulfills the overall protection of human health and the environmental requirement by reducing, but not permanently eliminating, the risks posed by human and environmental exposure to the identified contaminants. This alternative is effective and is also reliable, provided that the HBMMP is followed, because when completed, would prevent current and future receptor exposure to COCs at the Site. **Therefore, this alternative is effective.**

Feasibility and Ease of Implementation

This method would use standard and proven construction, remedial, abatement, and institutional control techniques to remove hazardous materials that are in waste form, and manage remaining hazardous building materials in-place. Numerous contractors in the northeast are versed in the

necessary abatement techniques; therefore, this alternative is technically feasible and is easily implementable. However, the Site owner plans to demolish the Site building. **Therefore, this alternative is easily implementable and technically feasible, but is not practically feasible because it conflicts with the future plans for the Site**.

Sustainability, Reliability, and Resiliency (as related to climate change)

This alternative is reliable because it would employ proven techniques, but does ensure long-term maintenance and implementation of the HBMMP.

Since this alternative involves the removal of some, but not all, hazardous building materials, and the building is to be left intact, transportation and fuel consumption, as well as the amount of material that would be disposed of at a landfill would be minimal compared to the demolition of the entire building. It is possible to further reduce the transportation impacts by using local contractors, local disposal facilities, and a local source of clean fill. Additionally, subcontractors with green business practices (i.e. biofuel converted utility trucks, renewable/sustainable heating and electricity at their office/yard, etc.) can be given precedence in the bidding process.

There are no perceived future impacts from climate change to this alternative.

Therefore, this alternative has the potential for sustainable green remediation practices, but requires long-term maintenance and implementation of the HBMMP to be reliable.

Cost Effectiveness

Under this alternative, the removal of hazardous materials in waste form, as well as the management and control of residual affected surfaces is required. Based on prior project and contractor experience, the estimated cost to execute this remedial alternative is as follows:

Remedial Planning/Engineering	$ 10,000
Abatement of all interior ACM, Removal of all debris, including ACM comingled with PCBs	$ 90,000
Abatement of ACM Roof, Replace roof	$ 260,000
Stabilization of remaining LBP/PCB paint	$ 75,000
Universal, hazardous, and/or miscellaneous waste removal	$ 20,000
Prepare and implement HBMMP	$ 6,000
Construction Oversight/Reporting	$ 15,000
10 % Contingency	$ 47,600
Total	$ 523,600

Estimated Time to Reach "No Further Action"

Following the installation of controls and repair of hazardous building materials, and the implementation of the HBMMP, the Site would meet the requirements for "No Further Action"

and could attain a Certificate of Completion from the Maine DEP VRAP. **Using this alternative, "No Further Action" could be attained within six months of implementation.**

Alternative #3 - Hazardous Building Material Abatement and Building Demolition

Risk Reduction and Effectiveness

This alternative fulfills the overall protection of human health and the environmental requirement by permanently eliminating the risk of exposure to hazardous building materials. This alternative relies on proper engineering controls and best management practices to effectively and reliably minimize exposure potential during abatement and demolition. Once the remediation and building demolition is complete, this method would eliminate the toxicity, mobility, and volume of COCs at the Site, and permanently prevent exposure to hazardous building materials to future receptors. **Therefore, this alternative is highly effective.**

Feasibility and Ease of Implementation

This method would use standard and proven construction, remedial and abatement techniques to remove hazardous building materials and demolish the Site building. Numerous contractors in the Northeast are versed in the necessary abatement techniques. This alternative aligns with owner's plans to demolish the building, and is therefore practically feasible. **Therefore, this alternative is feasible and is easily implementable.**

Sustainability, Reliability, and Resiliency (as related to climate change)

Since this alternative involves the removal of all hazardous building materials, and the demolition of the building, transportation and fuel consumption, as well as the amount of material that would be disposed of at a landfill would be increased compared to alternative #2. It is possible to further reduce the transportation impacts by using local contractors, local disposal facilities, and a local source of clean fill. Additionally, subcontractors with green business practices (i.e. biofuel converted utility trucks, renewable/sustainable heating and electricity at their office/yard, etc.) can be given precedence in the bidding process. This alternative would use recycling of materials instead of disposal whenever appropriate and practicable. This alternative is reliable because it would employ proven techniques, and no residual contamination will be present that may become a risk in the future. There are no perceived future impacts from climate change to this alternative. **Therefore, this alternative has the potential for green remediation practices and is sustainable and reliable.**

Cost Effectiveness

Based on prior project and contractor experience, the estimated cost to execute this remedial alternative is as follows:

Remedial Planning/Engineering	$ 10,000
Abatement of all interior ACM, Removal of all debris, including ACM comingled with PCBs	$ 90,000
Universal, hazardous, and/or miscellaneous waste removal	$ 20,000
Building Demo w/ LBP and non-TSCA PCBs, ACM Roofing removed	$100,000
Engineering/Construction Oversight/Reporting	$ 15,000
10% contingency	$ 23,500
Total	$258,500

Estimated Time to Reach "No Further Action"

Following the removal of hazardous building materials, and the demolition of the building, the Site would meet the requirements for "No Further Action" and could attain a Certificate of Completion from the Maine DEP VRAP. **Using this alternative, "No Further Action" could be attained within four months of implementation.**

6.3 JUSTIFICATION FOR THE SELECTED REMEDIAL ALTERNATIVE

Each of the alternatives and the comparison criteria are summarized below in **Table 3**. Based on the evaluation of the remedial alternatives presented above, the recommended alternative is Alternative #3 – Hazardous Building Material Abatement and Building Demolition. This alternative most effectively meets each of the comparison criteria evaluated in this report, and is the best alternative considering the comparison of costs versus benefit for the Site.

Table 3
Summary of Remedial Alternatives

Evaluation Criteria	Alternative #1 – No Action	Alternative #2 – Hazardous Building Material Abatement and Control	Alternative #3 – Hazardous Building Material Abatement and Building Demolition
Risk Reduction and Effectiveness	Not Effective	Risk to human health by exposure to hazardous building materials is reduced, but not permanently eliminated. Reductions in contaminant mobility but not toxicity. Management of hazardous building materials in-place has been proven to be an effective and reliable form of remediation.	**Risk to human health via exposure to hazardous building materials is eliminated by removing the contaminant source. Abatement and/or removal of hazardous building materials eliminate the exposure pathways and have been proven to be an effective and reliable form of remediation.**
Feasibility & Ease of Implementation	Not feasible but easily implementable.	Utilizes standard construction, remedial, abatement, and institutional control techniques. Owner plans to demolish the building. Therefore easily implementable and technically feasible but not practically feasible.	**Utilizes standard construction, remedial and abatement techniques. Owner plans to demolish the building. Therefore easily implementable, and technically and practically feasible.**
Sustainability, Reliability, and Resiliency (as related to climate change)	Not sustainable in a changing climate as mobility of contaminates could be increased by increased stormwater discharge through the roof and further deterioration of hazardous building materials.	Has the advantage of less fuel consumption and material waste that must enter a landfill. The HBMMP must be maintained to control human exposure. There are no perceived future impacts from climate change to this alternative.	**Requires the most fuel consumption and material waste that must enter a landfill. Is the most reliable and sustainable as all hazards will be permanently removed. There are no perceived future impacts from climate change to this alternative.**
Year 2014 Costs	No Cost	$523,600	**$**258,500
Time to Reach "No Further Action"	Will not be achieved.	Six months.	**Four months.**
Summary	Does not address risk to human health, the environment, or regulatory obligations and will therefore hinder redevelopment.	Partially eliminates risk and has continued need for management. Easy to implement, green remediation potential, but does not align with the owners plans for demolition.	**Entirely eliminates risk and has no continued need for management. Easy to implement, some green remediation potential, aligns with the owners plans for demolition.**

Bold – Selected alternative

7. PROPOSED REMEDIAL ACTION PLAN

Hazardous Building Material Abatement and Building Demolition has been selected as the recommended alternative to address the COCs at the Site. This section describes activities that will be completed as part of the cleanup of hazardous building materials at the Site. The activities described below will also be presented for review and approval by the Maine DEP VRAP prior to initiating this project.

7.1 ACM ABATEMENT

Prior to the demolition of the Site building, an Asbestos Abatement Contractor licensed by Maine DEP will remove and dispose of identified ACM pursuant to Maine DEP Chapter 425: Asbestos Management Regulations (Chapter 425). This does not included asbestos comingled with non-TSCA regulated PCBs discussed in the following paragraph and in **Section 7.3**.

All ACM floor tile and mastic and all debris on all floors within the Site building shall be considered comingled asbestos and non-TSCA regulated PCB waste and will be removed and disposed of at a facility licensed to accept asbestos comingled with non-TSCA regulated PCBs at the at-found concentrations identified at the Site (non-detect to 41 mg/kg). As the floor tiles are in a significant degraded condition, it is not practicable to remove them intact; the removal of these floor tiles will be conducted as *Alternative Work Practice Requirements for Demolition Activities* as defined in and subject to Chapter 425.

Following the completion of asbestos abatement activities, and once successful clearance results are obtained, all documentation required by Chapter 425 will be submitted to the Maine DEP.

7.2 UNIVERSAL, HAZARDOUS, AND/OR MISCELLANEOUS WASTE REMOVAL AND DISPOSAL

All identified universal, hazardous, and/or miscellaneous wastes in the Site building will be removed and properly disposed by qualified personnel in accordance with the Maine DEP Hazardous Waste Management Rules (Chapters 850 through 857). These activities will be completed prior to the demolition of the Site building.

7.3 BUILDING DEMOLITION WITH LBP AND NON-TSCA REGULATED PCB PAINT

After the removal of all asbestos (including the comingled ACM and non-TSCA regulated PCBs) and universal, hazardous, and/or miscellaneous wastes, the Site building will be demolished

Demolition waste including portions of the building containing LBP and/or non-TSCA regulated concentrations of PCBs will be disposed of as Special Waste containing lead and/or non-TSCA regulated concentrations of PCBs up to 41 mg/kg at a facility that can accept these wastes. Where unpainted materials can be segregated from the waste stream for recycling or disposal as

construction/demo debris, this will be conducted as practicable. Demolition wastes will be properly characterized as appropriate prior to off-site disposal.

Please note, soil at the Site has not been adequately assessed yet, therefore during demolition the soil will be conservatively considered to be contaminated with various fuels, lubricants, solvents, and similar chemicals. All work at the Site, including demolition, waste storage, loading, trucking, etc. will be conducted in a manner that minimizes disturbance of soil. The building slab foundation will be left intact and in-place to prevent disturbing of potentially contaminated soil beneath.

Haul truck cargo areas will be securely and completely covered during material transport on public roadways. Vehicles leaving the Site shall have no mud or dirt on the vehicle body or wheels. Any foreign matter on the vehicle body or wheels will be physically removed prior to vehicle's entering of a public roadway using dry brushing and rinsing (if necessary). Vehicles will not be permitted to leave the Site with exterior mud or dirt that has the potential to be deposited on public roadways. If mud or dirt is tracked onto the public roadway it must be immediately collected and brought back to the Site using hand tools or a street sweeper, etc.

During the demolition of the Site building and during all handling of demolition waste, the contractor will use dust control measures and demolition best management practices to prevent migration of any dust potentially containing PCBs or lead. No visible emissions of dust will be allowed. Wet suppression will be applied on a routine basis as necessary to control dust. Several applications per day may be necessary to control dust depending upon weather conditions and work activity, and continuous wet suppression will be applied during particular dusty activities. At a minimum, wet suppression will be applied to the work area, haul roads, and exposed soils once a day during dry conditions. Water runoff generated by dust control will be retained on-site.

Any and all floor drains in the slab foundation of the Site building (to remain) will be sealed with a temporary bung to prevent infiltration into the subsurface and to allow future assessment of these drain systems.

7.4 STATE AND FEDERAL PERMITS REQUIRED

Proper asbestos project notification and a building permit will be required prior to any asbestos abatement at the Site. No other permits are anticipated to be required as a part of this remediation project.

7.5 REMEDIAL ACTION REPORTING

Following the initiation of remediation activities at the Site, status update reports will be submitted by email to the Maine DEP on a monthly basis. Once these cleanup activities are complete, a Remedial Action Completion Report will be submitted to the Maine DEP summarizing the field activities conducted as part of the remediation effort including all applicable clearance documentation, disposal documentation, photographs, and Davis-Bacon

compliance (if applicable). This report will be prepared and submitted to the Maine DEP within 60 days following the completion of building demolition activities.

8. CONCLUSIONS

Credere developed this ABCA/RAP for Building 487 located Polk Street in the City of Bangor, Maine. The purpose of this study is to evaluate potential remedial action alternatives to mitigate identified environmental conditions at the Site. Based on the findings of this study, a summary of our conclusions and recommendations are presented below:

- Remedial action is necessary to address hazardous building materials located at the Site. In consideration of the Conceptual Site Model, applicable guidelines, and the nature of the specific contaminants detected, Credere evaluated three alternatives to identify the most appropriate cleanup technique. The three evaluated remedial alternatives were compared for risk reduction and effectiveness; feasibility and ease of implementation; sustainability, reliability and resiliency; cost effectiveness; and estimated time to reach "No Further Action".
- Alternative #3 Hazardous Building Material Abatement and Building Demolition was selected as the recommended alternative because it meets all of the evaluation criteria and is the best alternative considering the proposed redevelopment of the Site. The developed remedial action plan details the execution of this alternative.

FIGURES

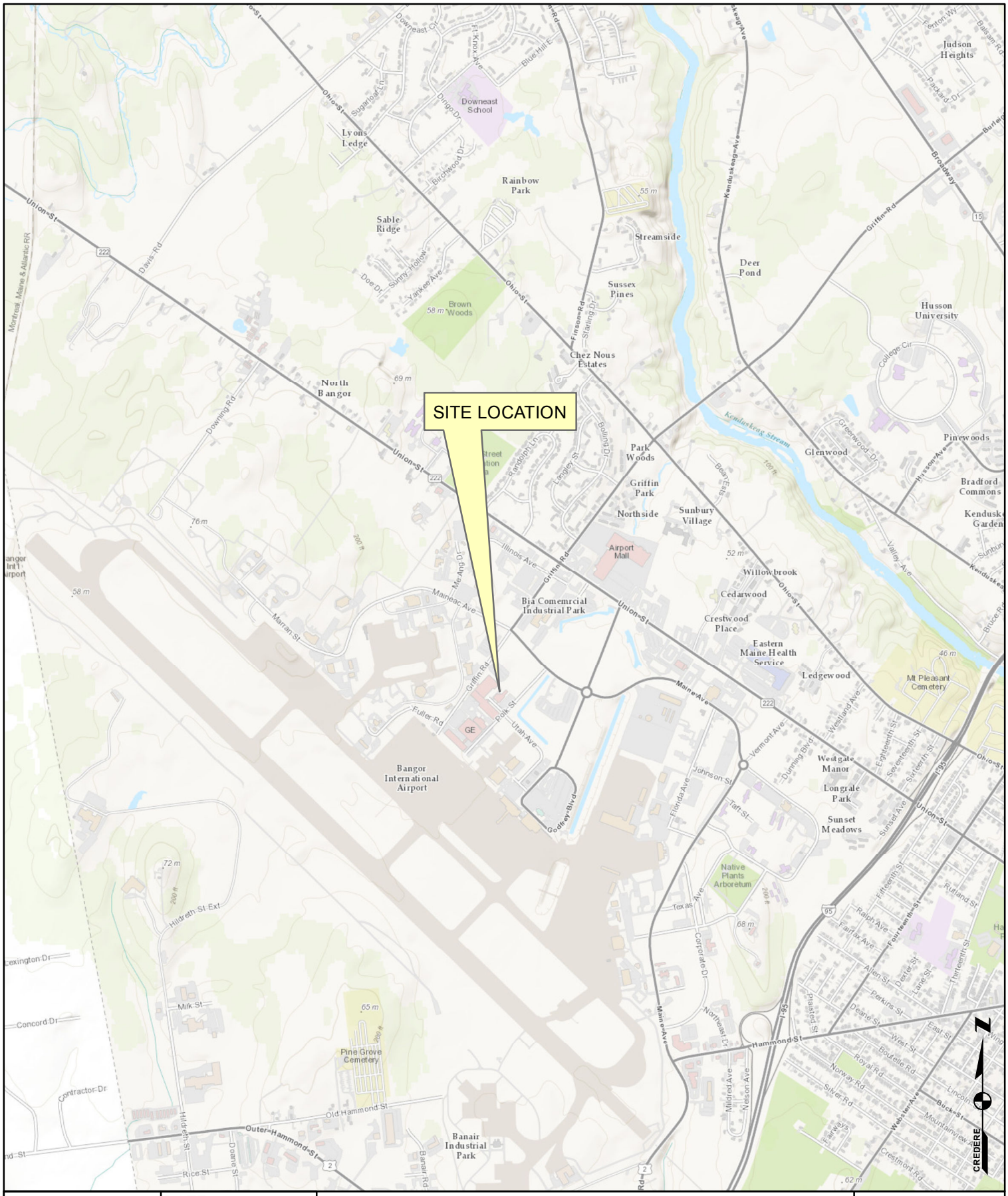

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FIGURE 1
SITE LOCATION PLAN

BUILDING 487
POLK STREET
BANGOR, MAINE

1,000 0 2,000 Feet
1 INCH = 2,000 FEET

Topographic Map Data Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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DRAWN BY: **SWM**	DATE: **11/07/2014**
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FIGURE 2
DETAILED SITE PLAN

BUILDING 487
POLK STREET
BANGOR, MAINE

AREA OF COMMINGLED ACM AND NON-TSCA REGULATED PCB WASTE FLOOR TILES AND MASTIC

AREA OF DAMAGED NON-TSCA REGULATED PCB WALL AND FLOOR PAINT

EXPECTED OIL-WATER SEPARATOR

FLOOR DRAIN

SITE BOUNDARY

PARCEL BOUNDARY

BUILDING WALLS

NOTES:
1. EXISTING CONDITIONS FEATURES SHOWN ON THIS PLAN ARE APPROXIMATE AND ARE BASED ON INFORMATION OBTAINED FROM THE CITY OF BANGOR GIS DATA, ESRI ORTHO IMAGES AND THE SITE RECONNAISSANCE PERFORMED ON SEPTEMBER 12, SEPTEMBER 22, AND OCTOBER 6, 2014.
2. FLOOR PLAN FEATURES ARE BASED ON ALLIED ENGINEERING, INC. PLANS DATED SEPTEMBER 16, 1982

Ortho Image Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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