Environmental Assessment
Repair, Replacement, and Renovation of
Hammond Bay Biological Station

Prepared for:

United States Geological Survey
Hammond Bay Biological Station
Millersburg, Michigan

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LIST OF ACRONYMS AND GLOSSARY

BMPs Best Management Practices – Methods that have been determined to be the most effective and practical means of preventing or reducing pollution. (http://www.epa.gov/ebtpages/envibestmanagementpractices.html)

CEQ Council on Environmental Quality – coordinates Federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives. (http://www.whitehouse.gov/administration/eop/ceq/about/)

CFR Code of Federal Regulations – the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government. (http://www.gpoaccess.gov/cfr/)

DM Departmental Manual – Department of the Interior manual. (http://elips.doi.gov/app_dm/index.cfm?fuseaction=home)

DOI Department of the Interior - http://www.doi.gov/index.cfm

EA Environmental Assessment – A concise public document for which a Federal agency is responsible that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with the Act when no environmental impact statement is necessary; and (3) facilitate preparation of a statement when one is necessary. An EA shall include brief discussions of the need for the proposal, of alternatives to the proposed action, of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted. (http://ceq.hss.doe.gov/nepa/regs/ceq/1508.htm#1508.9)

EIS Environmental Impact Statement – detailed document required by the National Environmental Policy Act for Federal Agency actions "significantly affecting the quality of the human environment." A tool for decision-making, an EIS describes the positive and negative environmental effects of proposed actions, evaluates potential alternatives to the proposed action, and mitigation of potential adverse impacts. (http://ceq.hss.doe.gov/nepa/regs/ceq/1508.htm#1508.9)

EPA US Environmental Protection Agency (http://www.epa.gov/)

F Fahrenheit

FEMA Federal Emergency Management Administration (http://www.fema.gov/)

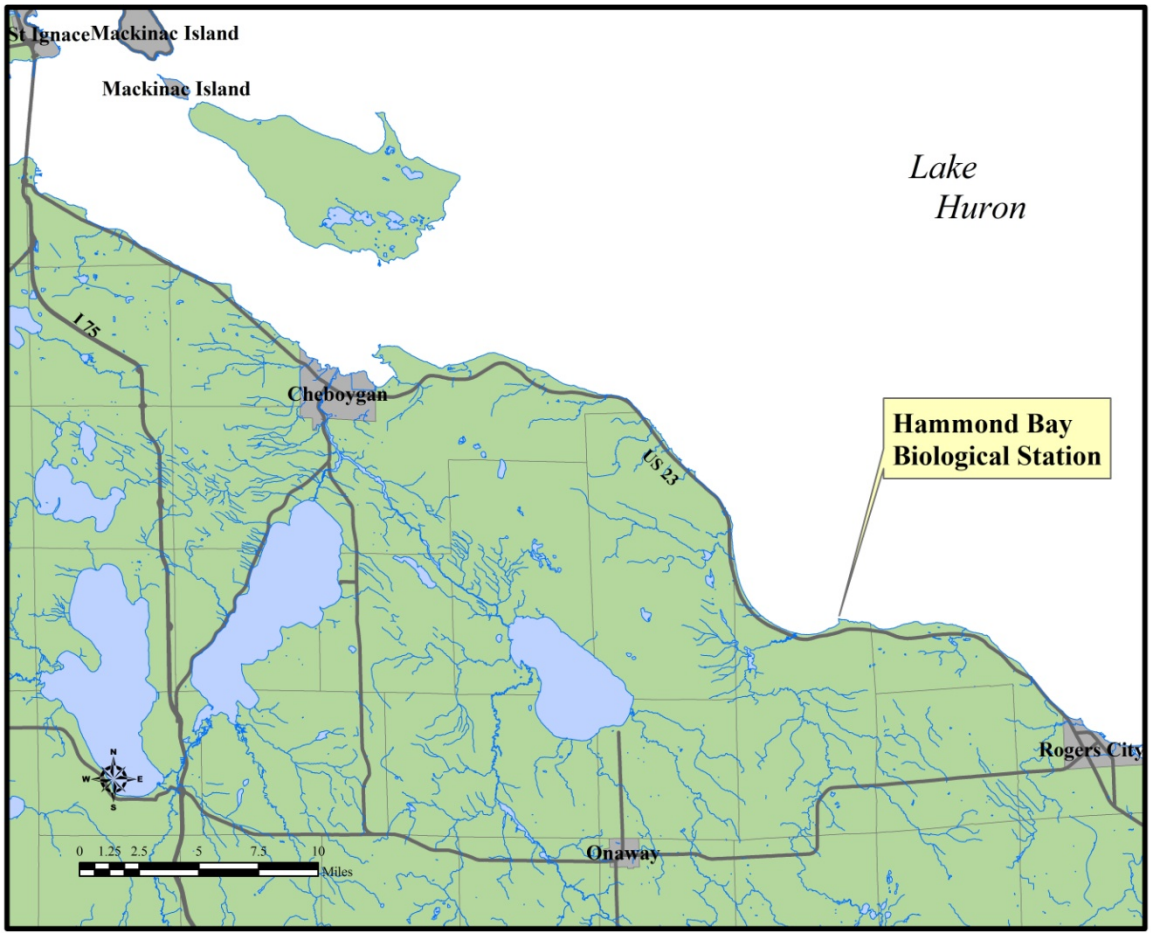
FONSI	Finding of No Significant Impact – a document by a Federal Agency briefly presenting the reasons why an action will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared. (http://ceq.hss.doe.gov/nepa/regs/ceq/1508.htm - 1508.13)
ft^2	Square feet
GLEAM	Great Lakes Environmental Assessments and Mapping (http://www.greatlakesmapping.org/)
GLFC	Great Lakes Fishery Commission (http://www.glfc.org/).
GLSC	Great Lakes Science Center (http://www.glsc.org/)
HBBS	Hammond Bay Biological Station (http://www.glsc.usgs.gov/main.php?content=aboutus_theglsc_stations&title=The%20GLSC0&menu=aboutus)
IGLD	International Great Lakes Datum (http://www.lre.usace.army.mil/greatlakes/hh/newsandinformation/iglddatum1985/)
MDEQ	Michigan Department of Environmental Quality (http://www.michigan.gov/deq)
MDEQ WRD	Michigan Department of Environmental Quality Water Resources Division
MDNR	Michigan Department of Natural Resources
MI	Michigan
MNFI	Michigan Natural Features Inventory (http://mnfi.anr.msu.edu/)
NAAQS	National Ambient Air Quality Standards – standards which the Clean Air Act requires the Environmental Protection Agency to set (40 CFR part 50) for pollutants considered harmful to public health and the environment. (http://www.epa.gov/air/criteria.html)
NEPA	National Environmental Policy Act of 1969, as amended – Law that requires Federal Agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. (http://ceq.hss.doe.gov/nepa/regs/nepa/nepaeqia.htm)
NPDES	National Pollutant Discharge Elimination System – permit program that controls water pollution by regulating point sources that discharge pollutants into waters of

	the United States. (http://cfpub.epa.gov/npdes/)
NRCS	US Department of Agriculture Natural Resource Conservation Service (http://www.nrcs.usda.gov/)
NWI	National Wetlands Inventory
RCRA	Resource Conservation and Recovery Act - enacted by Congress in 1976. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner (http://www.epa.gov/region2/waste/what.htm)
SHPO	State Historical Preservation Office (http://history.nd.gov/)
US	United States
US ACE	US Army Corps of Engineers (http://www.mvd.usace.army.mil/)
USC	US Code (http://www.gpoaccess.gov/uscode/)
USCG	US Coast Guard
USCB	US Census Bureau (http://www.census.gov/)
USFWS	US Fish and Wildlife Service (http://www.fws.gov/)
USGS	US Geological Survey (http://www.usgs.gov/)
WRD	Water Resources Division

1.0 INTRODUCTION

The United States Geological Survey (USGS) proposes to repair, replace and completely renovate the laboratory facilities at the USGS Hammond Bay Biological Station (HBBS) in Millersburg, Michigan (MI). Figure 1 shows the project location and vicinity of the facility. The HBBS is located at 11188 Ray Road, along the southern shore of Lake Huron, approximately twenty-four miles southeast of Cheboygan, MI, and approximately twelve miles northwest of Rogers City, MI.

Figure 1. Project Location



The HBBS research laboratory lies within a 59.5-acre campus consisting of 13 buildings used for offices, laboratories, shops, garages and storage. The majority of the property is not developed and remains a natural wooded parcel along the shore line of Lake Huron (Figure 2).

Figure 2. Aerial View of Facility

The HBBS is a unit of the Great Lakes Science Center (GLSC) of the USGS (http://www.glsc.usgs.gov/main.php?content=aboutus_theglsc&title=The%20GLSC0&menu=aboutus), operated in accordance with a Memorandum of Understanding with the Great Lakes Fishery Commission (GLFC). The GLFC presently funds HBBS research (salaries, fringe benefits, travel, utilities, supplies, equipment and other costs) through annual Memoranda of Agreements with GLSC. HBBS conducts integrated research to fulfill the Department of the Interior's (DOI's) responsibilities to the nation's natural resources. The GLSC is located throughout the Great Lakes basin with the purpose of meeting the nation's need for scientific information for protecting, restoring, enhancing and managing living resources and their habitats in the Great Lakes basin ecosystem.

The HBBS has been a center for research and development on the parasitic sea lamprey, the most deleterious invasive species in the history of the Great Lakes and perhaps the nation. HBBS's success in providing research support for control of sea lampreys uniquely positions the station for future work on other aquatic invasive species, a rapidly increasing environmental problem. Additional information concerning the mission and research of HBBS may be found on the HBBS web site at http://www.glsc.usgs.gov/_files/factsheets/Stations%202002-2%20Hammond.pdf

The general proposed project scope of work includes:

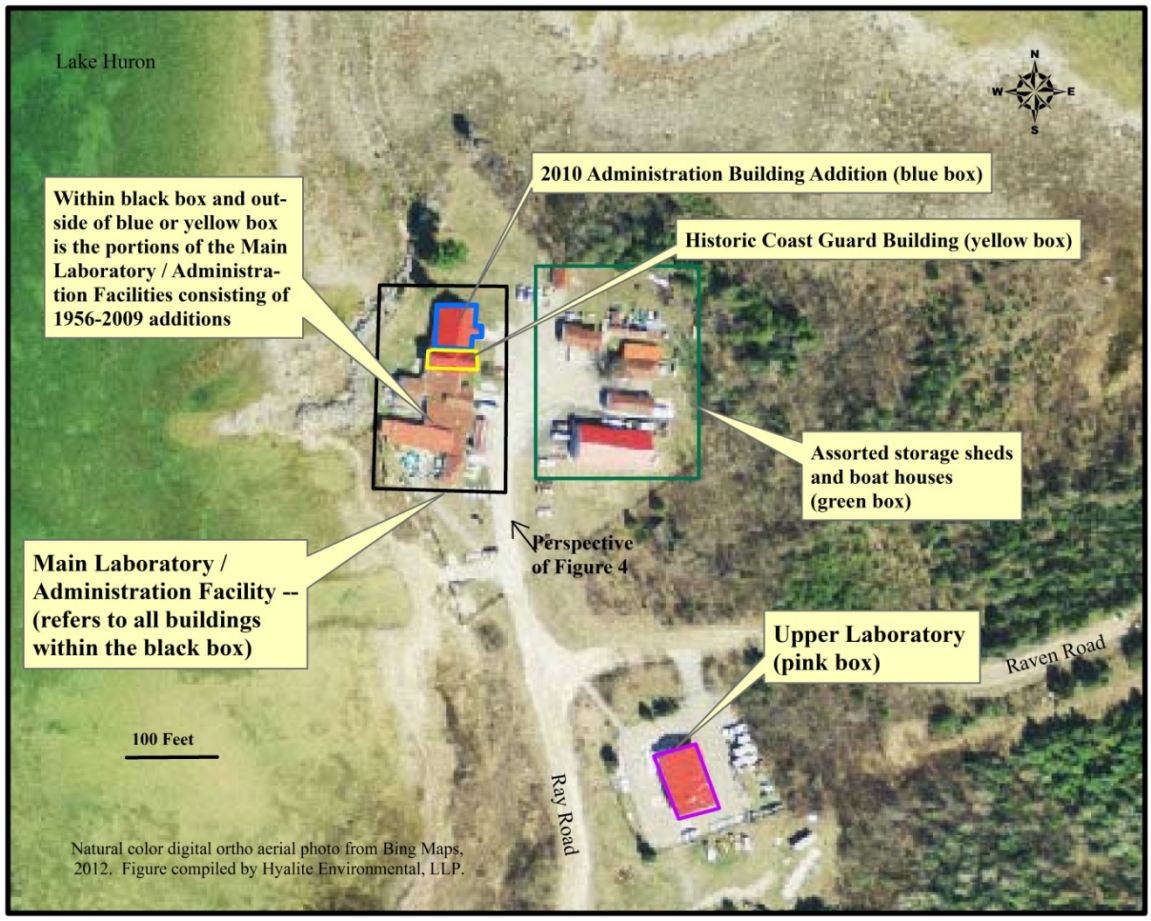
1. Repair, renovate, and/or replace portions of the Main Laboratory;

2. New water intake line and tank; and

3. Renovation of the Upper Laboratory.

The primary buildings to be addressed, the Main Laboratory and the Upper Laboratory, are noted in the aerial photo of the HBBS shown in Figure 3. More detail is provided concerning each of these scope of work tasks in Section 2.0, Purpose and Need. The manner in which each of these tasks may potentially be addressed is described in the descriptions of the proposed alternatives in Section 4.0.

Figure 3. Aerial View of HBBS Buildings

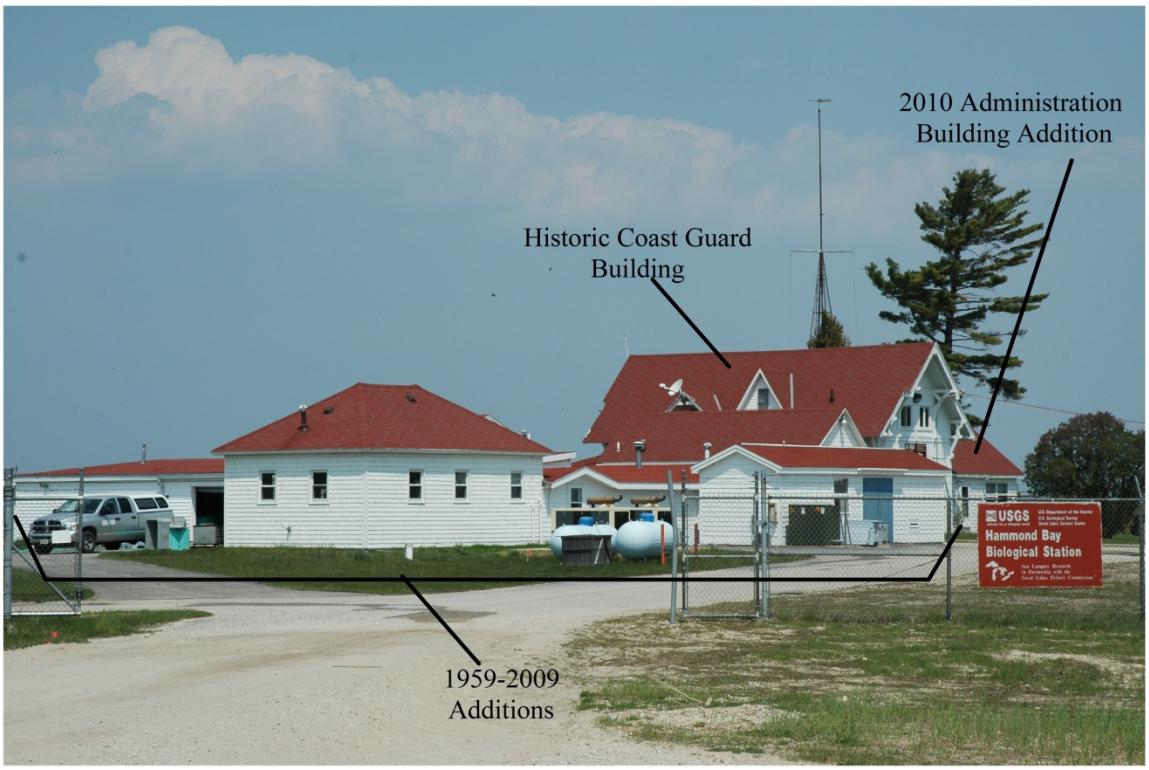


Laboratory research began at HBBS during 1953-1956 within the original buildings obtained from the U.S. Coast Guard (USCG). Additions to the facility during 1950-1984 led to the present 10,325-square-foot (ft^2) footprint, encompassing an interconnected maze of offices, labs, and utility rooms that have no central plan, flow or coherence that

would facilitate operations. Surrounding buildings include garages, shops, storage sheds, and a pump-electrical shed. Office spaces within the original laboratory / administration facility were expanded through reconstruction in 2010 (1,900 ft^2) and offices in the upstairs of the Historic Coast Guard building were renovated in 2011 (975 ft^2).

Figure 4 shows the Main Laboratory / Administration Facility. The tall section with the large overhang situated in the center of the facility is the Historic Coast Guard structure. The 2010 administrative building addition is to the right (north) of the historic portion.

Figure 4. Main Laboratory and Administration Buildings



Sanderson Stewart, Bozeman, Montana, has been subcontracted by CTA Architects Engineers, the architectural and engineering firm contracted by the USGS, to prepare and submit an Environmental Assessment (EA) for the proposed project. This EA is prepared for the USGS to document compliance with:

- National Environmental Policy Act (NEPA) of 1969 (42 USC 4321);
- The Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1500-1508) and Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions (CEQ, 2010);
- The Council on Environmental Quality's Memorandum concerning the Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact (CEQ, 2011);
- The Council on Environmental Quality's Draft Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change (CEQ, 2014);

- The Department of Interior's regulations for implementing NEPA (43 CFR Part 46) and associated policies published in Part 516 of the Departmental Manual (DM) Chapter 1-4 and issued in the series of environmental statement, review, and compliance memoranda;
- USGS NEPA policy (516 DM 9); and
- USGS NEPA Handbook (USGS, 2014).

2.0 PURPOSE AND NEED FOR ACTION

The purpose of the proposed project is:

(1) To improve facility conditions by bringing the facility into compliance with current standards, increasing energy efficiency, and improving staff environment while minimizing any project implementation impacts to ongoing science research programs; and

(2) To update and expand the facility to accommodate the projected needs for research concerning aquatic invasive species.

The proposed project will allow USGS to safely and effectively fulfill its mission.

1. Main Laboratory

The history of ad hoc additions to the Main Laboratory have led to rambling interconnected series of spaces that have now aged beyond their useful lives and are lacking in functional utility. Facility assessments (Kling Stubbins, 2013; Faithful + Gold, 2008) found the Main Laboratory to be in "Poor" condition, with an assessment that the deferred maintenance required to bring the buildings to code is within at least 30% of their replacement value. The facility assessments found that the lab is in such disrepair and has so many code violations that it has reached the end of its useful life, is no longer sustainable through fix-on-failure maintenance, and needs to be replaced to continue the research mission. Time spent off-line for repairs limits cutting-edge research that is increasingly crucial to meeting performance metrics of the USGS Science Strategy, the GLFC mission, and management responsibilities of partners of the HBBS.

Employees need to work in safe conditions that meet the appropriate building codes. The projected needs for the research mission of the facility require updating and expansion of capacity. The need for this action (1) to create safe working conditions and (2) to update and expand the facility to provide for projected needs as a Center of Excellence for USGS invasive species research.

2. Water Intake, Storage, Use and Discharge Systems

Existing water systems at the HBBS provide the ability to pump Lake Huron water from two different depths at over one million gallons per day. Currently, water is being pumped into a concrete holding tank located inside the lab facility, and then distributed through a makeshift series of pipes and valves. Water flow and temperatures are increasingly not sufficient or reliable enough to support ongoing research requirements.

An additional water line is needed to approximately double the water intake from, and discharge to, Lake Huron. The need is for reliable and efficient system that will also have increased capacity to support the projected needs of the facility.

3. Upper Laboratory

The Upper Laboratory was recently used by the U.S. Fish and Wildlife Service (USFWS) as a lamprey sterilization facility. The facility is no longer used for that program and is available to serve as an additional general aquatic laboratory. However, the existing facility must be completely renovated to meet building and safety code requirements and changes in functional requirements, the need for this proposed action. Renovation that addresses environmental safety issues and workplace ergonomics would ensure a higher level of worker safety. The Upper Laboratory needs to (1) create safe working conditions and (2) reduce operating costs and produce a design that would more flexibly support the projected needs of the USGS scientific mission.

2.1. Decision to be Made

The USGS Responsible Official will make the final decision regarding which action to take on the basis of the agency mission, legal mandates, and public input on this EA.

In accordance with NEPA, the Responsible Official must determine if the preferred alternative will have a significant impact on the quality of the human environment. If there is no significant impact, the USGS will issue a Finding of No Significant Impact (FONSI). If there is a significant impact, additional analysis may be required in an Environmental Impact Statement (EIS), or the Responsible Official may choose to take No Further Action. If the FONSI and Decision Record are signed, the USGS will begin implementing the chosen alternative.

2.2. Legal Mandates

USGS projects are required to comply with Federal, State, and Local substantive and procedural requirements, and with any applicable Federal, State, and Local requirements or Executive Orders that are more stringent than those listed in the USGS Manual (USGS, 2002, Chapter 1, Section 1.A(2)). Representative Federal, State, and Local regulations that are pertinent to the proposed project are included in Appendix A.

2.3. List of Environmental Permits

The proposed project will require several environmental permits. Plans and construction will require conformance with Presque Isle County regulations for building. Utility work in Lake Huron will require permitting with the U.S. Army Corps of Engineers (US ACE) for impacts to Waters of the US. Wetland permitting is coordinated by the US ACE and Michigan Department of Environmental Quality Water Resources Division (MDEQ WRD). Any impacts to federally or state listed species will require permitting through the US Fish and Wildlife Service (USFWS) and Michigan Department of Natural Resources (MDNR). The change in withdrawal/discharge to Lake Huron will require changes to the

current National Pollution Discharge Elimination System (NPDES) permit. HBBS follows all protocols and appropriate licensing for biological and hazardous materials handling. All applicable Local and State regulations and permitting for construction activities, such as the development of a storm water pollution prevention plan and the use of Best Management Practices (BMPs) for control of erosion and protection of Lake Huron will need to be followed.

A list of laws and regulations that can trigger environmental permitting requirements is included in Appendix A.

3.0 SCOPING AND ISSUES

Internal and external input was solicited as part of the NEPA process for the proposed project. On-site NEPA work was performed October 9 through 11, 2012, and October 7 through 9, 2014. HBBS USGS staff was interviewed with respect to potential environmental effects and issues related to the proposed project.

External scoping included requests for input and information early in the project from agencies with potential interest or jurisdiction, and from local organizations with a potential interest in the proposed project (Appendix B, page B1). Responses from Agencies are included in Appendix B.

Public notice of the availability of the Public Draft EA was carried in local and community newspaper and local radio (Appendix C). Public notice was mailed directly to all adjacent landowners. No comments from the general public were received on the Public Draft EA.

No major issues or concerns have been raised by the public. Issues recognized during site investigations, interagency correspondence and conversations with people knowledgeable with HBBS operations and the HBBS site, or with jurisdiction / responsibilities related to actions at the site included:

1. Concerns that potential impacts to wetlands, riparian areas, and Lake Huron be minimized and / or mitigated;
2. Concerns about potential impacts to federally and state listed threatened Houghton's goldenrod; and
3. Concern that the visual / aesthetic potential impacts be minimized and / or mitigated.

The Public Draft EA that was made available in March 2014 gave rise to comments from several agencies, which were subsequently addressed as the proposed project design moved forward (Appendix B). There were no comments received on the Public Draft EA except those from regulatory agencies.

4.0 ALTERNATIVES

This section provides a description of reasonable alternatives that address the Purpose and Need for the proposed project actions to identify potential environmental impacts. The No-Action Alternative is included as a baseline in the list of alternatives and for comparison (40 CFR 1508.9(b)).

There are three actions that have been proposed for the Hammond Bay Biological Station. The alternatives developed and described for each of the actions are:

A. Main Laboratory Repair, Renovation, and/or Replacement;
   - A1. No-Action
   - A2. New Building in Portions of Existing Building Footprint
   - A3. New Building in Previously Disturbed Area
   - A4. New Building Primarily within Previously Disturbed Area (Preferred Alternative)
   - A5. New Building Outside of Previously Disturbed Area

B. Water Intake Line and Tank
   - B1. No-Action
   - B2. New Water Intake Line and Tank (Preferred Alternative)

C. Upper Laboratory Renovation
   - C1. No-Action
   - C2. Renovation to Meet Safety Code Requirements (Preferred Alternative)

4.1. Main Laboratory Repair, Renovation, and/or Replacement

4.1.1. Alternative A1: No-Action

The No-Action Alternative would include no changes to the existing Main Laboratory or administrative buildings. The No-Action Alternative would require continued repair and piecemeal replacement of the existing lab facility structure and systems. The operational and scientific limitations that currently exist would continue. Replace-on-failure would repeatedly interrupt research. This alternative would not meet the project purpose and need.

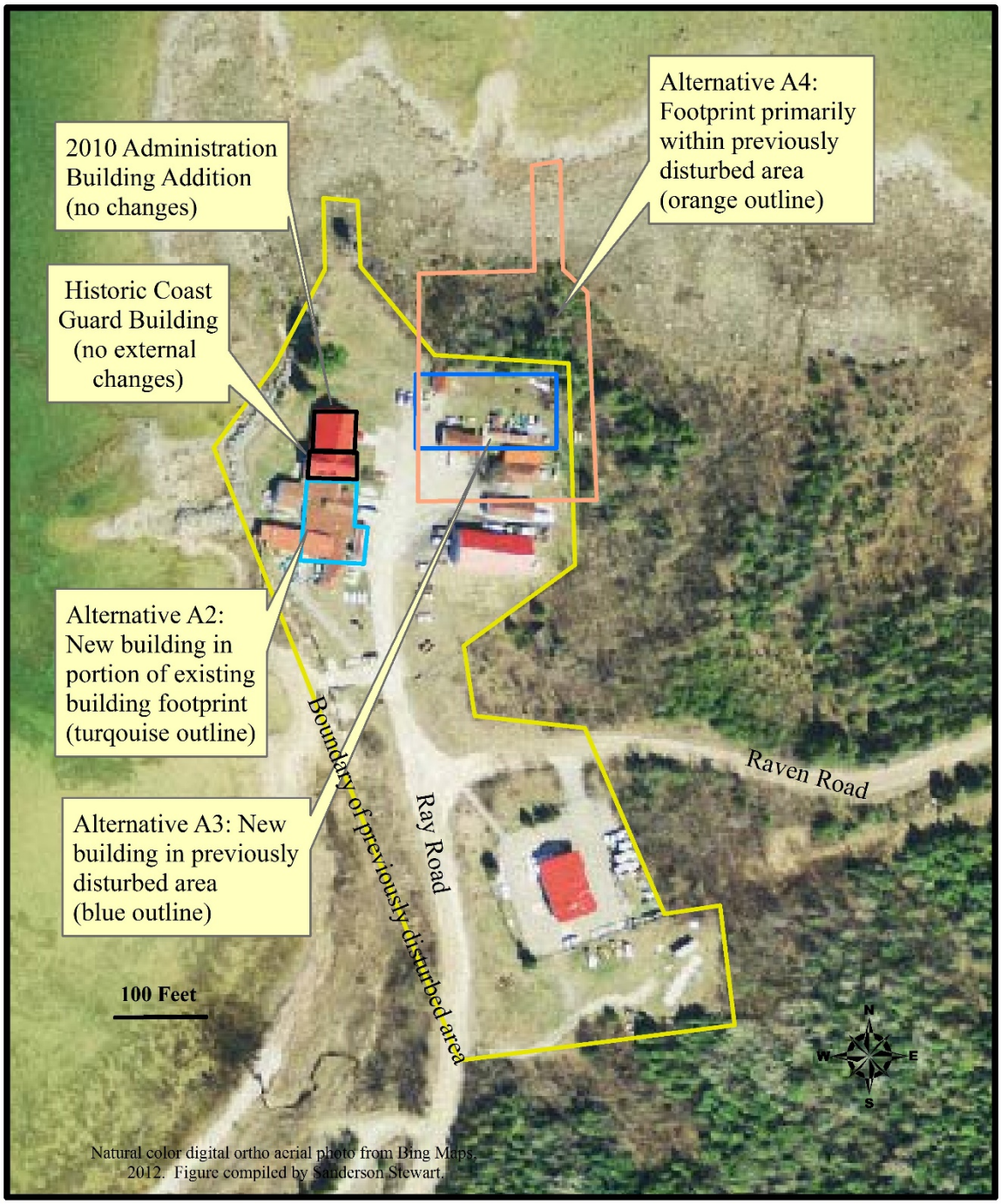
4.1.1. Alternative A2: New Building in Portions of Existing Building Footprint

This proposed alternative would involve the renovation / construction of a new building within the footprint of the existing Main Laboratory facility (Figure 5, within the turquoise outline). The existing laboratory would be renovated / replaced in phases in order to maintain ongoing operations. The administrative office addition would remain as it is. The Historic Coast Guard building would have internal renovations related to the lab and office facilities within that space, but the exterior would remain the same.

All staging and construction access disturbances would be within the previously disturbed area and previous fill at the site. BMPs will be employed to avoid incidental

impacts to areas adjacent to the previously disturbed area and historic fill. BMPs would also be employed to mitigate construction noise, dust, construction storm water runoff, and other potential impacts that may be mitigated by BMPs. Appropriate standard operating procedures, including handling and disposal of any demolition materials, would be followed. This alternative would meet the project purpose and need.

Figure 5. Alternative Locations for repair, renovate, replace Main Laboratory


2010 Administration Building Addition (no changes)
Historic Coast Guard Building (no external changes)
Alternative A2: New building in portion of existing building footprint (turqouise outline)
Alternative A3: New building in previously disturbed area (blue outline)
Alternative A4: Footprint primarily within previously disturbed area (orange outline)
Boundary of previously disturbed area
Ray Road
Raven Road
100 Feet
N
W
E
S
Natural color digital ortho acrial photo from Bing Maps, 2012. Figure compiled by Sanderson Stewart.

4.1.2. Alternative A3: New Building in Previously Disturbed Area

This proposed Alternative would construct a new, approximate 8000-square-foot laboratory facility within a new footprint that would be within the area of the property that has previously been disturbed / developed (only within the blue box in Figure 5). This previous disturbance and development has included historic placement of fill, removal of the existing woody vegetation, construction of building pads, storage sheds, gravel and paved parking, as well as lawn-style landscaping.

The existing Main Laboratory would remain in service during construction. After the new facility is operational, the old laboratory buildings would be torn down, leaving the Historic Coast Guard building and administrative offices intact. Some of the outbuildings and storage sheds would be moved or demolished if they impinge upon the new building footprint. Appropriate health, safety, and materials handling procedures would be followed for demolition, and materials would be recycled, as possible, or appropriately disposed.

The internal portion of the Historic Coast Guard building would be remodeled to accommodate a main entrance and to upgrade existing offices and restroom / breakroom facilities. A new mounded septic system and drainfield will be required for a new laboratory facility, constructed within the previously disturbed area. The existing drainfield, north of the 2010 Administration Building Addition, would continue to serve the Historic Coast Guard building and administrative offices.

All staging and construction access disturbances would be within the previously disturbed area and historic fill at the site. BMPs will be employed to avoid incidental impacts to areas adjacent to the previously disturbed area and historic fill. BMPs would also be employed to mitigate construction noise, dust, construction storm water runoff, and other potential impacts that may be mitigated by BMPs. Appropriate standard operating procedures, including handling and disposal of any demolition materials, would be followed. This alternative would meet the project purpose and need.

4.1.3. Alternative A4: New Building Primarily Within Previously Disturbed Area (Preferred Alternative)

The Preferred Alternative would construct a new, approximate 8000-square-foot laboratory facility within a new footprint that would primarily reside within the area of the property that has previously been disturbed / developed, but have minor excursions off the previously developed area (Figure 5). The area outside of the previously developed area that would be impacted by this alternative would be reduced as practicable. Areas outside of / adjacent to the previously disturbed area that would be impacted would include grading and minor utilities excursions north of the current landscaped lawn, requiring removal of woody vegetation, and minor removal of trees east of the current landscaped lawn for a new mounded septic system and drainfield.

The existing Main Laboratory would remain in service during construction. After the new facility is operational, the old laboratory buildings would be torn down, leaving the

Historic Coast Guard building and administrative offices intact. Some of the outbuildings and storage sheds would be moved or demolished if they impinge upon the new building footprint. Appropriate health, safety, and materials handling procedures would be followed for demolition, and materials would be recycled, as possible, or appropriately disposed.

The internal portion of the Historic Coast Guard building would be remodeled to accommodate a main entrance and to upgrade existing offices, restroom, and breakroom facilities. A new septic system and drainfield, designed to meet sanitary and environmental regulations, will be constructed for the new laboratory building. The existing drainfield, north of the 2010 Administration Building Addition, would continue to serve the Historic Coast Guard building and administrative offices.

Any staging and construction access disturbances outside of the previously disturbed area and historic fill at the site would be constrained to minimize impacts to the maximum extent practicable. BMPs will be employed to avoid incidental impacts to areas adjacent to the previously disturbed area and historic fill. BMPs would also be employed to mitigate construction noise, dust, construction storm water runoff, and other potential impacts that may be mitigated by BMPs. Appropriate standard operating procedures, including handling and disposal of any demolition materials, would be followed. This alternative would meet the project purpose and need.

4.1.4. Other Alternatives Considered

An alternative was considered that would include construction of a new, approximate 8000-square-foot laboratory facility within a new footprint as described for Alternatives A3 and A4; but would be entirely within an area of the property that has not been previously disturbed (outside the yellow "previously disturbed area" on Figure 5). The construction of the new laboratory facility outside of the previously disturbed area would involve removal of existing native vegetation, excavation and fill, etc. Although this alternative would meet the project purpose and need, it was discarded as not viable due to excessive expense and unwarranted environmental impacts.

4.2. Water Intake Line and Tank

4.2.1. Alternative B1: No-Action

The No-Action Alternative would include no changes to the water intake utilities. This alternative would not support proposed future facility needs. This alternative would not meet the project purpose and need.

4.2.2. Alternative B2: New Water Intake Line and Tank (Preferred Alternative)

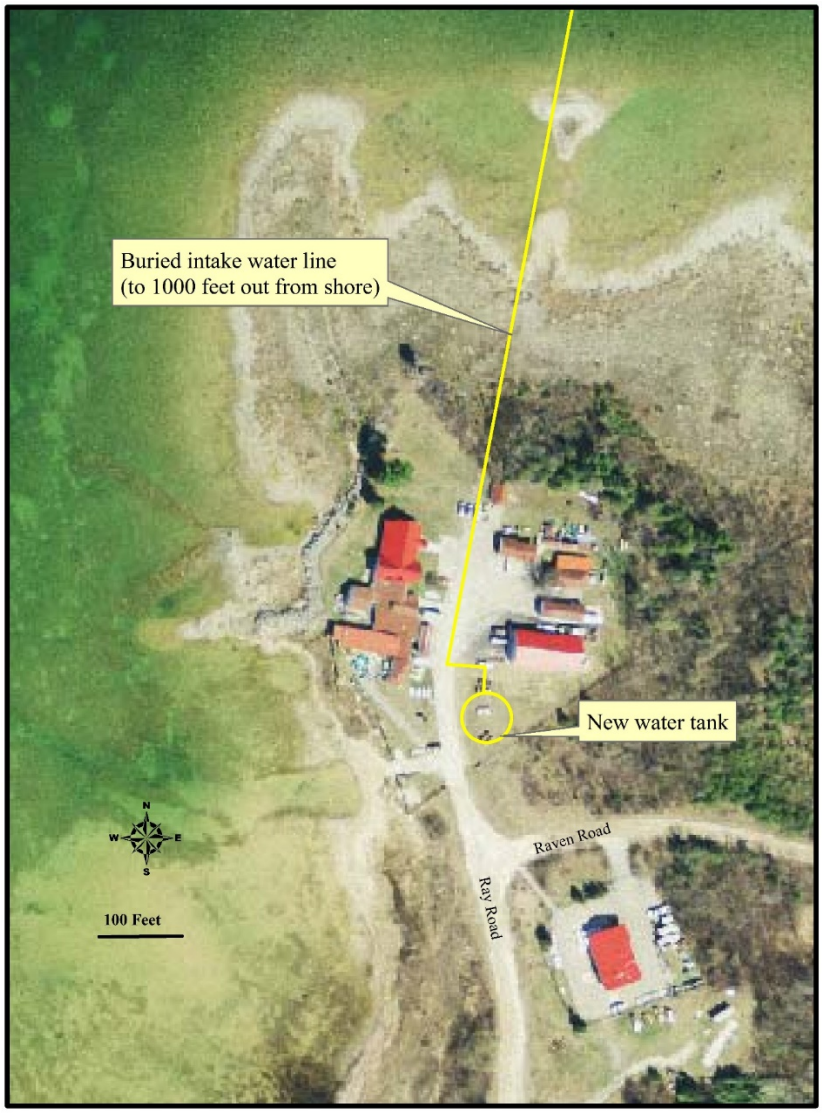
The Preferred Alternative for utility work includes the installation of a new 12-inch diameter water line that will adjacent and parallel to the existing 12-inch-diameter water line (Figure 6). The water intake and tank design is intended to maximize gravity feed and energy efficiency.

The new water line would extend off of USGS property into Lake Huron, to an approximate 80-foot depth. A new pump would be added to support the new water line. An aboveground water tank will be constructed to provide water storage and gravity-fed water flows (Figure 6). It is anticipated that the tank will be sixty feet in diameter and thirty-five feet tall. The addition of the new line will allow approximately twice the current water use in order to provide for projected future facility needs.

Any staging and construction access disturbances would be constrained to minimize impacts to the maximum extent practicable. BMPs would be employed to mitigate construction noise, dust, construction storm water runoff, and other potential impacts that may be mitigated by BMPs. Appropriate standard operating procedures, including handling and disposal of any demolition materials, would be followed.

This alternative would meet the project purpose and need.

Figure 6. New Intake Water Line and Tank location



4.3. Upper Laboratory Renovation

4.3.1. Alternative C1: No-Action

The No-Action Alternative would include no changes to the Upper Laboratory. This alternative would not meet the project purpose and need.

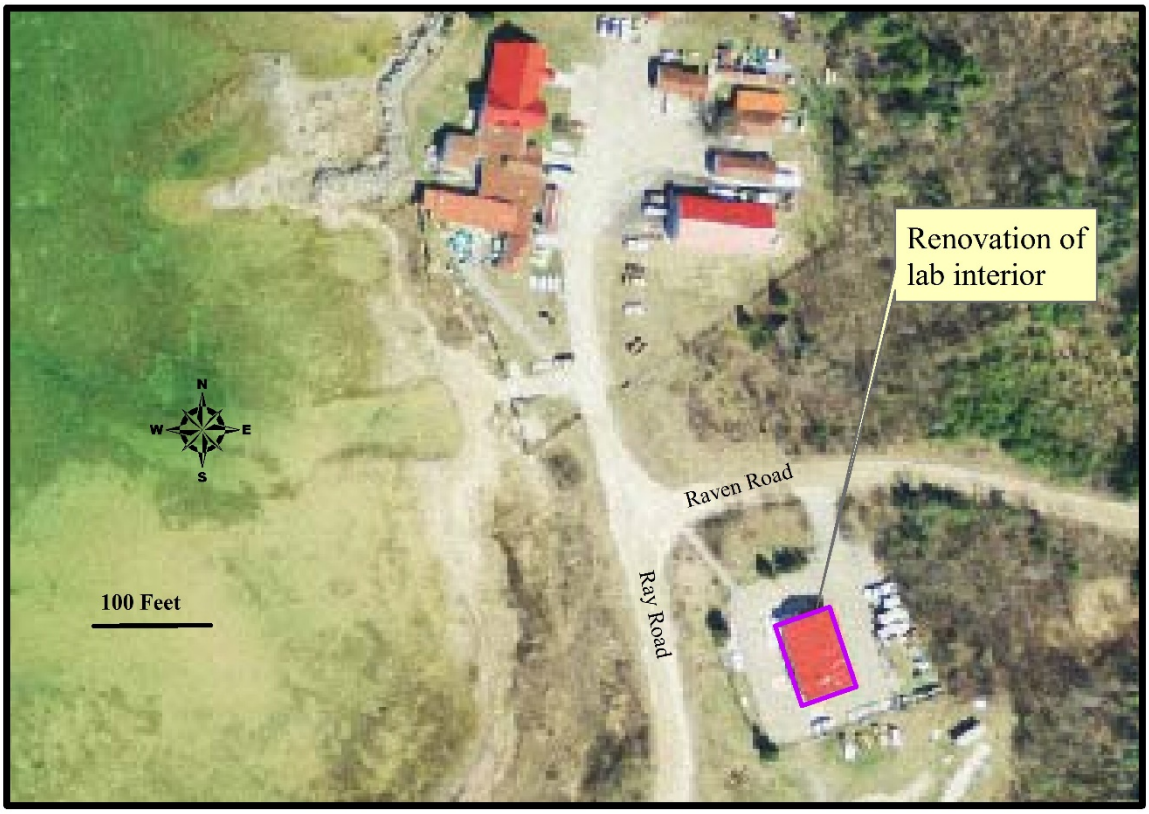
4.3.2. Alternative C2: Renovation of Upper Laboratory (Preferred Alternative)

The Preferred Alternative for the Upper Laboratory (Figure 7) would include renovations to the interior of the lab to create as much open general-aquatic lab space as possible. The open general lab space will allow for a variety of large or small experimental tank designs. Utility systems, including plumbing and electrical, will be brought up to code if currently not efficient or compliant.

Any staging and construction access disturbances would be constrained to minimize impacts to the maximum extent practicable. BMPs would be employed to mitigate potential impacts. Appropriate standard operating procedures, including handling and disposal of any demolition materials, would be followed.

This alternative would meet the project purpose and need.

Figure 7. Renovation of Upper Laboratory Interior



5.0 AFFECTED ENVIRONMENT

The following section provides a description of the current or historical environmental conditions of resources, which could potentially be affected by the proposed action alternative(s) under consideration. The current state of the potentially affected environment is investigated to provide a baseline against which potential impacts of proposed alternatives may be analyzed.

The description of the affected environment relies on information obtained from previous evaluations, published records, agency knowledge, and new field investigations. A NEPA-*Categorical Exclusion Review & Checklist* was completed in 2010 for the construction of the office / administrative space addition to the Main Laboratory / Administration Facility (USGS, 2010). There are no other available records of previous NEPA analyses performed by USGS for this facility. Pertinent USGS HBBS program documents, including Environmental Audit and Occupational Safety Inspections (USGS, 2012), current National Pollution Discharge Elimination System (NPDES) permits (EPA, 2013a), and Condition Assessment and Building Engineering Reports (Faithful + Gold, 2008; Kling Stubbins, 2013) provided additional information required for this NEPA analysis. A list of primary references used and cited is included in Section 9.

5.1. Earth Resources

5.1.1. Geology

The HBBS is located on the Huron Lake-Border Plain of the Cheboygon Lowland adjacent to the southern shore of Lake Huron (Schaetzl, 2012). Bedrock at the facility is the Middle Devonian Detroit River Group, a thick sequence of dolostones with minor limestone (Ehlers and Kesling, 1970; Milstein, 1987) deposited within the Michigan Basin. The bedrock is overlain by un-lithified lacustrine sand and gravel (Farrand, 1982). To the east and west of the rocky point upon which the HBBS facilities lie there are varying amounts of cobble shore, sandy shore and glacial sand and dune deposits.

The terrain in the vicinity of HBBS is the low-relief landscape and sandy lake plain associated with the floor of Glacial Lake Algonquin. The southern boundary of the sandy lake plain is present as an intermittent escarpment with approximately 100-meters of relief approximately 3 miles south of the current shoreline of Lake Huron (Schaetzl and Lusch, 2009). The buildings and facilities of the HBBS campus are located on the shore adjacent to Lake Huron at approximately 584 to 591 feet above mean sea level.

The area is typified by a series of beach ridges and adjacent wet depressions. Near the lake shore these depressions are typically poorly drained and are sometimes ponded. It is likely that the higher ground at the developed area of the HBBS facility is some combination of the rocky point, sandy soils and historic fill related to early construction of the facilities.

Geologic hazards in the vicinity of the HBBS site are generally confined to shoreline erosion and flooding. The developed facilities at the HBBS site are located on historic fill with riprap and retaining-wall shore protection in areas closest to the shoreline. The filled

area is slightly higher than the adjacent land and therefore less susceptible to flooding or ponding of surface water. There is potential for downslope movement of soils on the southern, undeveloped portion of the HBBS property along the steeper slope adjacent to Highway 23.

5.1.2. Soils

The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) soil survey of Presque Isle County, MI, has mapped the soil units in the vicinity of the HBBS (NRCS, 2012a; 2012b). A soil map of the HBBS is included in Appendix D (pages D1 – D3). The NRCS soil map does not reflect the previously placed fill surrounding the rocky point upon which the Main Laboratory/Administration Facility and assorted storage and boat sheds are located, only the surrounding regional soil units (the "previously disturbed area").

The vicinity of the buildings and facilities on the HBBS campus is characterized by:

- *Wheatley muck;*
- *Hessel mucky flaggy loam, bedrock substratum;* and
- *Alpena very gravelly sandy loam, 0-8% slopes.*

The second two units are on the topographically higher portions of the developed area of the HBBS campus, where the Upper Laboratory is located. All other buildings and development at the HBBS campus are surrounded by areas of the *Wheatley muck*, which consists of about 6 inches of muck over gravelly sand, formed from sandy and gravelly glaciofluvial deposits. The *Wheatley muck* and *Hessel mucky flaggy loam, bedrock substratum* are partially hydric soil units, considered to be poorly drained and frequently ponded, but with no flooding. The depth to water table for each of these units is noted as "about 0 inches." [Note: This is the historic soil survey. With the Lake Huron at previously low levels, the groundwater level is currently much lower.] The *Alpena very gravelly sandy loam, 0-8% slopes* soil unit is not hydric. None of the soil units in the developed area of the HBBS campus are considered areas of prime farmland.

Geotechnical investigations at the site (NDG, 2012a; Scott Associates, 1981) have confirmed the NRCS soil mapping outside of the previously disturbed area, and determined the engineering requirements within the previously disturbed area that would be needed to support the proposed foundations and drainage field. These investigations have found approximately 6 inches to 1 foot of topsoil overlying sand, silty sand, and clayey sand, with varying gravel content (NDG, 2012a) within the previously disturbed area.

5.2. Biological Resources

5.2.1. Vegetation and Habitat Types

The HBBS facility is located within the Cheboygon Subsection (Albert, 1995) of the Northern Lacustrine-Influenced Lower Michigan Section of the Laurentian Mixed Forest

Province Level III Ecoregion (Bailey, 2001). Moist air masses cross the Great Lakes before encountering this area, resulting in reduced continentality and lake effect precipitation. The Rogers City, MI, weather station (207094) has recorded the average annual total precipitation as 28.43 inches (Midwestern Regional Climate Center, 2012). The average maximum temperature is 78.0° Fahrenheit (F) in July and the average minimum temperature is 10.8° F in January. The average total annual snowfall is 72.3 inches. The growing season ranges from 130 to 140 days.

The developed area at the HBBS is landscaped with mowed lawns. Most of the developed area is slightly higher than the surrounding area, indicating that there was likely fill placed when the buildings were first constructed.

The surrounding majority of the campus is characterized by "Boreal Forest" community (MNFI, 2014a; Slaughter and Cuthrell, 2014; Kost and others, 2007; Albert and others, 1995). Boreal Forest is a conifer or conifer-hardwood forest type occurring on moist to dry sites characterized by species dominant in the Canadian boreal forest. It typically occupies upland sites along shores of the Great Lakes, on islands in the Great Lakes, and locally inland. The canopy of boreal forests is dominated by balsam fir *(Abies balsamea)*, white spruce *(Picea glauca)*, and northern white-cedar *(Thuja occidentalis)*. Understory and ground vegetation diversity and coverage in this community are relatively depauperate because of the dense canopy cover of the cedars. The conservation rank of the Boreal Forest community is considered to be "vulnerable" on a state basis and is "unrankable" on a global basis (NatureServe, 2013). The areas have likely all been previously logged, but forest has become re-established.

Several other vegetation communities lie in narrow bands parallel to Lake Huron between the forested portion of the site and Lake Huron (Slaughter and Cuthrell, 2014). The local distribution of these vegetation communities reflect the hydrology and climate (wind, wave action) of the lake. These include: Limestone Cobble Shore; Sand and Gravel Beach; Great Lakes Marsh; and Northern Shrub Thicket (MNFI, 2014b; 2014c; 2014d; 2014e).

The Northern Shrub Thicket (MNFI, 2014e) community is located in narrow band parallel to the Lake Huron shoreline, serving as the transition between the beach and shore communities and the Northern Boreal Forest. Northern Shrub Thicket is characterized by dominance of speckled alder (*Alnus incana*). Descriptions of this community point out that alder and associated shrubs form "seemingly impenetrable thickets and that the floristic diversity of these systems decreases with shrub canopy closure" (Kost and others, 2007). Alders are fast-growing and shade-intolerant. The conservation rank of the Northern Shrub Thicket community is "secure", both state-wide and globally (NatureServe, 2013).

The shore of Lake Huron within the facility grounds is a cobble and rock beach, characterized by hardy species that tolerate the calcium-rich soils and constant exposure to wind, ice, changing lake levels, and lapping waves (MNFI, 2014b). The conservation rank of this community (Great Lakes Limestone Cobble – Gravel Shore) ranges from "vulnerable" to "imperiled" (MNFI, 2014b; Kost and others, 2007), due to the very

restricted range/extent of the community. In local areas on the point of the HBBS shoreline and more commonly east and west of the rocky point upon which the HBBS facilities lie there are varying amounts of sandy shore and glacial sand deposits, supporting a shoreline vegetation community that is slightly less sparse.

Depending upon storm activity and lake water-level fluctuations, there may be a fringe of shallow water emergent wetlands along the beach. In fall of 2012, there had been sufficient storm and wave activity that there was no established emergent vegetation. During the field visit in the fall of 2014, emergent vegetation was present. The emergent vegetation consists primarily of bulrushes *(Schoenoplectus)*, sedges *(Carex)*, rushes *(Juncus)*, and blue-joint grass (*Calamagrostis canadensis*). This vegetation is typical of the Great Lakes Marsh vegetation community (MNFI, 2014d; Kost and others, 2007).

5.2.2. Wildlife Resources

The Boreal Forest provides habitat for a wide range of megafauna, including white-tailed deer, bobcat, raccoon, foxes, mice and rabbits (MNFI, 2014a). Birds use the forest canopy to feed, rest and nest. The lakeshore location of the Boreal Forest at the facility indicates that there are likely many waterfowl and gulls that also use the wooded areas adjacent to the cobbly beach strand. Wolves were confirmed on the Lower Peninsula in Presque Isle County in 2004, and by 2011 there was a breeding pack in Cheboygan County (McWhirter, 2011). Wolves are no longer listed as a Threatened or Endangered Species in Michigan.

Adjacent and nearby sections of State forest are considered to have high habitat potential for:

- "sharp-shinned hawk, northern goshawk, bald eagle, eastern newt, northern flicker, brown snakes, great-horned owl, bear, coyote, redbelly snake, bobcat, American toad and long-tailed weasels to name only a few species." (MDNR, 2007)

- "various waterfowl, reptiles, amphibians, and their predators, including raccoon, bobcat, mink and Great Blue Heron. Many bird species stand to benefit from the diverse forest types and juxtaposition of lowland and upland habitats present in the compartment. These include birds such as yellow-rumped warbler, black-throated green warbler, red-eyed vireo, white-throated sparrow, hermit thrush, red-breasted nuthatch, ruffed grouse, and American woodcock. Dune and swale complex is unique and provides habitat for amphibians, which in turn contribute to the prey base for many reptiles, birds, and mammals. Thus this habitat is an important component in the food web and is critical to maintaining a diverse community of species." (MDNR, 2011)

- "excellent habitat for black bear, white-tailed deer, snowshoe hare, ruffed grouse, American woodcock, and woodland raptors." (MDNR, 2013a)

5.2.3. Federal Threatened and Endangered Species and Critical Habitat

The following endangered, threatened, and candidate species may be present in Presque Isle County:

Species	***Status***	***Habitat***	***Possible Habitat In Action Area***
Kirtland's warbler *(Setophpaga kirtlandii)*	Endangered	Nests in young stands of jack pine	No
Piping plover *(Charadrius melodus)*	Endangered	Beaches along shorelines of the Great Lakes	**Yes**
Piping plover *(Charadrius melodus)*	Endangered	Critical habitat	**Yes**
Rufa red knot *(Calidris canutus rufa)*	Threatened	Uses coastal areas during the Red Knot migratory window of May 1 to September 30	**Yes**
Northern long-eared bat *(Myotis septentrionalis)*	Proposed as endangered	Hibernates in caves and mines, swarming in surrounding wooded areas in autumn. Roosts and forages in upland forests during spring and summer.	No
Eastern Massasauga *(Sisturus catenatus)*	Candidate	Wet areas adjacent to upland forested habitat	**Yes**
Hine's emerald dragonfly *(Somatochlora hineana)*	Endangered	Spring fed wetlands, wet meadows and marshes; calcareous streams and associated wetlands overlying dolomite bedrock	No
Hungerford's crawling water beetle *(Brychius hungerfordi)*	Endangered	Cool riffles of clean, slightly alkaline streams	No
Dwarf lake iris *(Iris lacustris)*	Threatened	Partially shaded sandy-gravelly soils on lakeshores	**Yes**
Houghton's goldenrod *(Solidago houghtonii)*	Threatened	Sandy flats along Great Lakes shores	**Yes**
Pitcher's thistle *(Cirsium pitcher)*	Threatened	Stabilized dunes and blowout areas	No

(USFWS, 2014a; 2014b)

Habitat requirements for the Kirtlands' warbler, the Northern long-eared bat, Hungerford's crawling water beetle, Hine's emerald dragonfly and Pitcher's thistle, include young jack pine stands, sand dunes, live streams, and wet meadows -- habitats

that are not found within the HBBS property -- so occurrence of these species on the site is very unlikely (USFWS, 2006; 2002; 2001; 1985).

The piping plover could use the lakeshore of the HBBS property as habitat, and Rufa red knots migrating to breeding grounds in the central Canadian arctic tundra could occasionally use the beach area as well. Dwarf lake iris and Houghton's goldenrod are characteristically found on sandy or gravelly lakeshore. The Eastern Massasauga rattlesnake lives in wetland areas with nearby upland woods, such as wet depressions within the boreal forest community. Therefore, these species could be encountered at the HBBS site.

The Michigan Natural Features Inventory performed a rare species review (flora and fauna) for Federal Threatened and Endangered Species pecies for the Action Area associated with the proposed alternatives (except Alternative A5) (Appendix D). They found that the only federally listed threatened and endangered species present within the Action Area was Houghton's goldenrod (*Solidago houghtonii*).

5.2.4. Michigan Species and Communities of Conservation Concern

The Michigan Natural Features Inventory (MNFI) program, Michigan State University Extension, reviewed the inventory for records of rare species occurring within 1.5 miles of the HBBS property. They found the potential for occurrence of four Michigan legally protected species within 1.5 miles of the HBBS property:

Species	***Michigan Status***	***Habitat***	***Possible Habitat In Action Area***
Lake Huron locust *(Trimerotropis huroniana)*	Threatened	Sparsely vegetated, high quality coastal sand dunes.	No
Houghton's goldenrod *(Solidago houghtonii)*	Threatened	Sandy flats along Great Lakes shores	**Yes**
Lake Huron tansy *(Tanacetum huonense)*	Threatened	Lake Huron tansy occur along the Great Lakes shorelines in open dunes and along shores and beaches in sandy to rocky areas.	**Yes**
Pitcher's thistle *(Cirsium pitcher)*	Threatened	Stabilized dunes and blowout areas	No

(MNFI, 2014f)

The Michigan Natural Features Inventory performed a rare species review (flora and fauna) for State Threatened and Endangered Species for the Action Area associated with the proposed alternatives (except Alternative A5) (Appendix D). They found that the only state listed threatened and endangered species present within the Action Area was Houghton's goldenrod (*Solidago houghtonii*).

5.3. Water Resources

5.3.1. Surface Water

There are no live surface water streams, intermittent, ephemeral, or perennial on the HBBS property. The HBBS property has approximately 0.57 miles (linear) of shoreline on Lake Huron. Lake Huron immediately adjacent to the HBBS site has not been assessed for water quality. The overall status of Lake Huron within Michigan jurisdiction is considered to be impaired, not meeting beneficial uses for aquatic life harvesting, because of pesticides, dioxins and polychlorinated biphenyls. A Total Maximum Daily Load is being developed by the states adjoining Lake Huron and local watershed groups for atmospheric deposition of dioxin and polychlorinated biphenyls and incorporation in fish tissue (EPA, 2013b).

The Great Lakes Environmental Assessment and Mapping project (GLEAM) has assessed the Great Lakes for a number of environmental stressors and human benefits (GLEAM, 2013). Lake Huron adjacent to the HBBS shoreline is considered to be subject to a relatively high level of cumulative environmental stress, based primarily upon water level change and impacts of non-native species. The public boat ramp and access directly adjacent (west) of the HBBS buildings is considered both a human benefit and a source of impact to the lake.

The HBBS facility holds an NPDES wastewater discharge permit, MI0005100 (EPA, 2013a), that was originally issued in 1986. The most current version of this permit includes a single outfall with two monitoring points, rated for a discharge of 2.2155 million gallons per day. When there is active discharge, the effluent is monitored daily for flow and specified constituents of concern, when those constituents are being used in the lab. None of the chemicals associated with Lake Huron's non-achievement of beneficial uses are employed or will be affected by the HBBS facility water use (current or proposed).

All active building alternatives would require permitting such as a General Construction Permit for Storm Water Discharge, and Erosion Control Plans. Mitigation of any impacts to surface water quality as a result of construction and post-construction activities would be included in a storm water pollution prevention plan and erosion control plan.

5.3.2. Floodplains

The floodplain of Lake Huron is not mapped by the Federal Emergency Management Administration (FEMA), the normal reference used for definition of flood levels on rivers and smaller lakes (FEMA, 2013). The U.S. ACE has developed levels that are comparable to the FEMA 100-year flood levels for regulation of the Great Lakes shorelines, called "open-coast 100-year flood levels". These levels are defined for specific shoreline reaches of the Great Lakes. The open-coast 100-year flood level for the reach of Lake Huron adjacent to the HBBS is 582.5 feet International Great Lakes Datum (IGLD) (US ACE, 1988) (http://www.in.gov/dnr/water/3659.htm).

Lake levels were at historic lows, 576.05 feet IGLD (Greenwood, 2012) in 2012. Although the lake has risen since 2012, lake levels are not projected to return to the higher levels recorded earlier in the 19th century. The all-time highest monthly average lake level was 582.42 IGLD in June 1886 (IDNR, 2013).

The Michigan Department of Environmental Quality (MDEQ) and the U.S. ACE have defined an "ordinary-high-water mark" for Lake Huron. The ordinary high water mark of Lake Huron is 579.82 feet according to the MDEQ and 580.82 feet according to the U.S. ACE (NDG, 2012b), in elevations converted to IGLD. None of the HBBS facility buildings are below any of the defined waterlines, although portions of the property along the lakeshore fall below these levels.

5.3.3. Groundwater

A geotechnical investigation performed during November of 2012 at the HBBS site found that groundwater depths in the vicinity of the facility ranged from 4.7 to 7.25 feet below the ground surface (NDG, 2012a). Two wells completed in the limestone aquifer (260 feet and 305 feet below ground surface) provide potable water at the facility (MDEQ, 2013a; 2013b).

HBBS has an independent septic system and drainfield for its facilities. The septic system is used for domestic wastewater from the facility. Storm water drains to a separate containment system and then to the drainfield. No chemicals, paints, or other toxic materials are disposed of in the septic system.

5.3.4. Wetlands

The National Wetlands Inventory (NWI) (USFWS, 2013) and Michigan Final Wetland Inventory (MDNR, 2013b) maps both show areas of wetlands within the boundaries of the HBBS property (Appendix D, pages D4 – D10). The NWI mapping effort has identified the wetlands as "Palustrine, Forested, needle-leaved evergreen, saturated." The area of wetlands identified by the Michigan inventory is slightly smaller than that identified by NWI. The areal extent of hydric soils is greater than the area of wetlands that have been mapped. In addition to the modern extent of wetlands, the Michigan Department of Natural Resources has mapped the likely historic extent of wetlands on the HBBS parcel. The wetland inventory maps identify hydric soils along the shoreline of Lake Huron, but no wetlands are identified within this area. (Appendix D, pages D4 – D10).

A wetland assessment was performed for the Action Area potentially impacted by any of the Active Alternatives (except for A5) (Appendix D). The assessment found wetlands that are likely jurisdictional along the shore of Lake Huron. There are small, potentially isolated pocket depressional wetlands in the forested uplands adjacent to the previously disturbed area, but none within the Action Area potentially impacted by any of the Active Alternatives (except for A5).

If the chosen alternative / implemented actions impact the wetland areas, a Clean Water Act Section 404 permit will be required. The Clean Water Act Section 404 permits are jointly overseen in Michigan by the U.S. ACE and the MDEQ-WRD. The U.S. ACE makes final determination of jurisdictional status of wetlands, and possible mitigation requirements to offset any adverse impacts to wetlands.

5.4. Air Resources

The HBBS site is in a non-classifiable / attainment air quality control area, in compliance with the Clean Air Act's National Ambient Air Quality Standards (NAAQS) for all NAAQS pollutants (EPA, 2013c). Laboratory fan emissions are exempt from permitting in Michigan (Michigan Administrative Code r. 336.1283). The fans and ventilation systems at the facility are maintained in compliance with relevant Occupational Safety and Health Administration standards.

5.5. Cultural Resources

The United States Treasury took original title (by deed) to property where HBBS is located on March 6, 1895 (USCG, no date). The original building, constructed in 1876 (USGS, 2013), was operated as a lifeboat rescue station by the United States Lifesaving Service until absorbed by the USCG. It was decommissioned in 1947, and in 1950 the station was granted by revocable permit to the United States Bureau of Commercial Fisheries (part of the USFWS). The property was declared excess by the USCG in 1968. Since 1971 the facility has been attached to the Fish Control Laboratory in La Crosse, WI (now the Upper Mississippi Environmental Science Center), and later, the Great Lakes Fisheries Laboratory in Ann Arbor, MI (now the GLSC). In 1979, the GLFC purchased 51.7 acres adjacent to the original acreage and transferred title to the USFWS. Through agency reorganization, the operations were transferred to the USGS in 1995.

An investigation of the historical authenticity and significance of the Hammond Bay property was conducted during the fall of 2012, as part of the USGS's effort to inventory and assess USGS historical properties. The Historic Coast Guard building (within the yellow box on Figure 3 or the southern black box on Figure 5), the boathouse (currently used as a storehouse), watchtower, and flagpole were considered for their potential qualification for the National Register of Historic Places. They were found to not currently retain integrity or otherwise meet criteria for listing on the National Register of Historic Places (USGS, 2013).

MI State Preservation Historical Office (SHPO) (Appendix B, page B5) found that "no historic properties are affected within the area of potential effects of the proposed actions."

5.6. Aesthetic Resources

5.6.1. Noise

There is no background ambient noise data for the HBBS. There have been no recorded noise complaints from the surrounding community. There are normal operational noises from pumps and equipment within the different buildings at the facility.

The facility is surrounded by rural residential, forest and recreational land uses. The only sensitive noise receptors in the vicinity of the HBBS are rural residences to the southeast. Forested portions of the HBBS property separate the developed facility area from those adjacent properties, and largely attenuate and buffer any noise from the facility.

5.6.2. Visual

The developed portion of the HBBS facility is visible from Lake Huron, a public boat ramp, and from Ray Road, a rural road with residences. None of the residences are within site of the developed facility area. Although additions and renovations have been made to the original historic USCG facility, much of the ornamentations of the west elevation of the original building have been maintained. The traditional red and white color scheme has also been maintained. The developed portion of the HBBS facility is fenced.

5.7. Socio-Economic Resources

Socio-economic resources that must be considered by NEPA include impacts to local infrastructure and services as well as any potential economic impacts. Consideration of potential impacts of any proposed action to the socio-economic environment includes consideration of any potential environmental justice issues.

HBBS is located in Ocqueoc Township, Presque Isle County. The township is 52.3 square miles, with a population of 655 in the 2010 national census (USCB, 2013). The township is entirely rural – no towns, villages or cities – with a population density of 12.5 people per square mile. Comparable 2010 national census population densities were 5.2 people per square mile for Presque Isle County, and 102.1 people per square mile for Michigan. The population density of Ocqueoc Township is likely twice that of the county as a whole because of development in the corridor along the coast of Lake Huron and U.S. Highway 23.

The population of Presque Isle County decreased by 7.2 percent between 2000 and 2010. The population of Michigan decreased by 7.8 percent over that same decade. The population of Presque Isle County is projected to grow 2.7 percent by 2020 (MDTMB, 2013; Michigan Sea Grant, 2009).

The primary industries providing employment in Ocqueoc Township are agriculture, forestry, fishing and hunting (City-Data, 2013a). In Presque Isle County as a whole, construction provides more employment; and mining, quarrying, and oil and gas extraction provide employment equal to that of the agriculture, forestry, fishing, and

hunting sector (City-Data, 2013b). The per capita income of the population in northeastern Michigan is significantly lower than the per capita incomes for Michigan and the United States (Michigan Sea Grant, 2009). The October 2011 – November 2012 unemployment rate in Presque Isle County was 12.6 percent, significantly higher than that of the United States over the same period, 8.1 percent (US BOL, 2013).

5.8. Hazardous Materials

Hazardous materials treatment, storage, disposal, permits, and spills were investigated in the area within one mile of the HBBS using the U.S. Environmental Protection Agency and Michigan databases, and a commercial environmental data service (EPA, 2013d; EDR, 2013; MDEQ, 2013c). There are no Superfund (Comprehensive Environmental Response, Compensation, and Liability Act) sites within one mile of the HBBS facility. There are no Resource Conservation and Recovery Act (RCRA) Treatment, Storage or Disposal facilities within one mile of the HBBS facility.

There are no active Leaking Underground Storage Tanks within one-half mile of the HBBS facility. Previous Underground Storage Tanks at the HBBS facility have been closed. There are no current registered Underground Storage Tanks adjacent to or on the HBBS facility. There are no solid waste landfills in the vicinity of the HBBS property. USGS conducts environmental audits to ensure that hazardous material, health and safety protocols are appropriately implemented (USGS, 2012).

Asbestos in the existing facilities has been inventoried, and any asbestos containing material has either been removed or mitigated (USGS, 2012). A lead paint inventory of the HBBS facilities is pending (USGS, 2012).

5.9. Other Environmental Concerns

With respect to climate change and greenhouse gas emissions, the important aspect of the existing affected environment at the HBBS and vicinity has to do with the reduction of energy use and the potential for carbon sequestration in preservation of ecosystems and habitat. Any action that increases / decreases energy consumption from sources that emit greenhouse gases will incrementally affect the global emissions of greenhouse gases. Resources produced and transported to implement any action will likewise incrementally increase net global greenhouse gas production if greenhouse gases are emitted in the production and transportation of those resources.

6.0 ENVIRONMENTAL EFFECTS

This section describes the environmental effects of the proposed alternatives as presented in Section 4, to the affected environment as described in Section 5. The terms “effect” and “impact” are synonymous as used in this EA and can be considered either beneficial or adverse. Table 1 provides a summary of potential environmental effects of the proposed alternatives to the environment. The terms direct, indirect, and cumulative are

used in the table to describe the environmental effects. The following definitions as defined in NEPA (40 CFR 1508) are:

- **Direct effects –** those effects which are caused by the action and occur at the same time and place as the action.
- **Indirect effects –** those effects which are caused by the action and occur later in time or further removed in distance, but are still reasonably foreseeable and causally linked to the action.
- **Cumulative effects –** impacts to the environment which result from incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions.

The effects / impacts are further characterized by their relative magnitude and for this EA are separated into three categories:

- Areas of No or Negligible Impacts
- Areas of Minor Impact
- Areas of Potentially Consequential Impact

The terms “negligible”, “minor” and “consequential” in this analysis refer to their standard American English definitions, and are qualitative. Table 1 lists the relative magnitude of potential impacts for each aspect of the affected environment.

Effects are also expressed in terms of duration. Definitions for short-term and long-term are:

- **Short-term –** used here to indicate the time interval during which construction is ongoing, until the proposed facility improvements have been implemented.
- **Long-term –** time interval after action has been implemented, following active construction, during which there are only normal operations and maintenance.

Table 1. Environmental Effects of Alternatives

Effects		Alternatives							
		Main Laboratory Renovation/Replacement				New Water Intake Line and Tank		Upper Lab Renovation	
		Alt. A1 No Action	Alt. A2 Existing Building Footprint	Alt. A3 Historically Developed Area	Alt. A4 Primarily Historically Developed Area	Alt. B1 No Action	Alt. B2 New Water Intake Line and Tank	Alt. C1 No Action	Alt. C2 Renovation
					✓		✓		✓
Earth Resources									
Short-term (1)		N	N	N	M	N	M	N	N
Long-term	Direct	N	N	N	M	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	N	N	N
Biological Resources									
Short-term (1)		N	N	N	M	N	M	N	N
Long-term	Direct	N	N	N	M	N	N	N	N
	Indirect	N	N	N	M	N	N	N	N
	Cumulative	N	N	N	M	N	N	N	N
Water Resources									
Short-term (1)		N	M	M	M	N	M	N	N
Long-term	Direct	N	N	N	M	N	M	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	M	N	N
Air Resources									
Short-term (1)		N	M	M	M	N	M	N	N
Long-term	Direct	N	N	N	N	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	N	N	N
Cultural Resources									
Short-term (1)		N	N	N	N	N	N	N	N
Long-term	Direct	N	N	N	N	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	N	N	N
Aesthetic Resources									
Short-term (1)		N	N	N	N	N	N	N	N
Long-term	Direct	N	N	N	N	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	N	N	N
Socio-Economic Resources									
Short-term (1)		N	M	M	M	N	M	N	M
Long-term	Direct	N	N	N	N	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	N	N	N
Hazardous Materials									
Short-term (1)		N	M+	M+	M+	N	N	N	M+
Long-term	Direct	N	N	N	N	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	N	N	N	N	N	N	N
Other Environmental Concerns									
Short-term (1)		N	N	N	N	N	N	N	N
Long-term	Direct	N	M	M	M	N	N	N	N
	Indirect	N	N	N	N	N	N	N	N
	Cumulative	N	M	M	M	N	N	N	N

Explanation

✓ Preferred Alternative

N Areas of Negligible or No Impact

M Areas of Minor Impact

C Areas of Potentially Consequential Impact

\+ Indicates Impact is Beneficial

Notes:

(1) For this table, the direct, indirect and cumulative short-term impacts are combined in a single "short term" category. This time period is approximately equivalent to duration of construction. Long-term impacts are divided into direct, indirect and cumulative. Long-term impacts occur after the project is implemented (post-construction).

6.1. Environmental Effects for Main Laboratory Renovation / Replacement

6.1.1. Alternative A1: No-Action

Alternative A1, No-action, would have negligible or no impacts on earth resources, biological resources, water resources, air resources, cultural resources, aesthetic resources, socio-economic resources, hazardous materials, and other environmental concerns. Because the No-action Alternative does not change the current utility operations or design, there would be no change to the surrounding human or natural environment. The No-Action alternative would not address the purpose and need for the project.

6.1.2. Alternative A2: New Laboratory in Existing Footprint

Alternative A2 would build a new laboratory within the approximate existing footprint of the current laboratory. Demolition of the existing laboratory would be completed in phases as the new facility is built. This alternative would not impact any area outside of the previously disturbed area within the property.

Alternative A2 would have no or negligible short-term and long-term impacts on earth resources, biological resources, cultural resources, and aesthetic resources. This alternative would also have no or negligible long-term impacts on water resources, air resources, socio-economic resources, and hazardous materials.

The new construction would likely have short-term minor impacts to water resources, air resources, and hazardous materials. There is potential for a short-term positive impact to the local economy through construction activities.

Alternative A2 could have long-term minor positive impacts to other environmental concerns, particularly energy consumption, sustainability, and the emission of greenhouse gases. The new laboratory design will increase the operational and energy efficiency of the new facility compared to that of the existing facility. However, depending on the final design, increased facility size, regardless of efficiency, may increase the overall energy demand.

Mitigation -- Short-term impacts to surface water would be minimized during construction with the use of appropriate BMPs to reduce erosion and sediment run-off. Appropriate setbacks as required by local, state, and/or federal agencies from established high water / floodplain boundary lines would be maintained, and will likely affect the new design since the current laboratory footprint falls within specified setbacks. Debris from the demolition of the existing laboratory would be handled and disposed according to appropriate regulations. Hazardous materials, such as asbestos, require special removal and disposal prior to demolition. Dust emissions during demolition and construction would be greatly reduced or mitigated by the use of BMPs.

6.1.3. Alternative A3: New Laboratory in Previously Disturbed Area

This alternative includes the construction of a new laboratory facility within a new footprint that is within the "previously disturbed area", i.e., the area that has already been filled, graded, and /or developed. The final design would include a new mounded drain field within the previously disturbed area.

Alternative A3 would have no or negligible short-term and long-term impacts on earth resources, biological resources, cultural resources, and aesthetic resources. The alternative would also have no or negligible long-term impacts on water resources, air resources, socio-economic resources, and hazardous materials.

The new construction would likely have short-term minor impacts to water resources, air resources, and hazardous materials. There is potential for a short-term positive impact to the local economy as a result of construction activities.

Alternative A3 could have long-term minor impacts to other environmental concerns. The new laboratory design will increase the operational and energy efficiency of the new facility compared to that of the existing facility. However, depending on the final design, increased facility size, regardless of efficiency, may increase the overall energy demand.

Mitigation -- Short-term impacts to surface water would be minimized during construction with the use of appropriate BMPs to reduce erosion and sediment run-off. Dust emissions during demolition and construction would be greatly reduced or mitigated by the use of BMPs. Impacts to land adjacent to the previously disturbed area, historic fill and landscaped lawn would be avoided by locating construction staging and access only within the disturbed area and implementing BMPs to protect the adjacent land. Debris from the demolition of the existing laboratory would be handled and disposed according to appropriate regulations. Hazardous materials, such as asbestos, would require special removal and disposal prior to demolition.

6.1.4. Alternative A4: New Laboratory Primarily in Previously Disturbed Area (Preferred Alternative)

Alternative A4, the Preferred Alternative, includes the construction of a new laboratory facility within a new footprint that is primarily within the "previously disturbed area", i.e., the area that has already been filled, graded, and /or developed. However, there are minor excursions off that area into the undeveloped natural areas of HBBS.

Alternative A4, the Preferred Alternative, would have no or negligible short-term and long-term impacts on cultural resources and aesthetic resources. The Preferred Alternative would also have no or negligible long-term impacts on air resources, socio-economic resources, and hazardous materials.

There is a potential for short-term and long-term minor impacts to earth resources. Impacts to soil resources would occur as a result of construction within an area where the ground has not been previously disturbed. It is likely that some fill or aggregate will need

to be imported for construction activities. Any construction outside of the previously disturbed portions of the property will disrupt the naturally occurring site soils, soil profiles, and natural soil-forming processes. Impacts to earth resources are minor since there is no shortage of import soil or aggregate in the vicinity, the site soils are not rare or unique, and the soils are not a type considered to be Prime Farmland.

There is a potential for short-term and long-term minor impacts to biological resources. Any construction that takes place within areas that have not been previously disturbed would impact the existing vegetation community, and would impact wildlife resources through reduction of habitat. The proposed design for this alternative includes the construction of a new discharge swale across the beach to the lake in an area in which an on-site rare species survey by MNFI identified a population of a federally and state listed threatened species, Houghton's goldenrod *(Solidago houghtonii).* The area of impact is small relative to the size of the population, approximately 0.046 acres of the population which is estimated to extend at least 1 mile to the west and similarly to the east of the area of impact (MNFI, 2014). Conservative estimates of potential impacts to Houghton's goldenrod for this alternative have been submitted to the USFWS in a Biological Assessment requesting formal Section 7 Endangered Species Act consultation (Sanderson Stewart, 2014). USFWS will form a biological opinion and determine mandatory mitigation efforts to minimize impacts to the population.

There is a potential for short-term and long-term minor impacts to water resources. The drainage discharge swale will traverse wetlands and require permitting.

The new construction would likely have short-term minor impacts to air resources and hazardous materials. There is potential for a short-term positive impact to the local economy as a result of construction activities.

Alternative A4 could have long-term minor impacts to other environmental concerns. The new laboratory building design will increase the operational and energy efficiency when compared to that of the existing facility. However, depending on the final design, an increase in energy use as a result of increased facility size and function may increase the overall energy demand. Any removal of existing vegetation as a result of the new footprint would reduce the biomass, reducing carbon sequestration by that increment of vegetation.

Mitigation -- Short-term impacts to surface water would be minimized during construction with the use of appropriate BMPs to reduce erosion and sediment run-off. Appropriate setbacks as required by local, state, and/or federal agencies from established high water / floodplain boundary lines would be maintained. Impacts to wetlands would be minimized by employing low-impact grading methods for the construction of the discharge drainage swale. Dust emissions during demolition and construction would be greatly reduced / mitigated by the use of BMPs.

Mandatory mitigation to minimize impacts to the threatened Houghton's goldenrod will be identified by USFWS. It is anticipated that short-term mitigation may include education of construction personnel and low-impact construction techniques. Salvage and

transplantation of plants excavated from the area of the discharge drainage swale may be possible. Long-term mitigation will likely include educational signage and maintenance of fencing to reduce pedestrian access to the Houghton's goldenrod population on the beach.

Impacts to land adjacent to the previously disturbed area, previous fill and landscaped lawn would be minimized by locating construction staging and access only within the previously disturbed area and implementing BMPs to protect the adjacent land. Debris from the demolition of the existing laboratory would be handled and disposed according to appropriate regulations. Hazardous materials, such as asbestos, would require special removal and disposal prior to demolition.

6.2. Environmental Effects of Water Line and Tank

6.2.1. Alternative B1: No-Action

Alternative B1: No-Action alternative would have negligible or no impacts on earth resources, biological resources, water resources, air resources, cultural resources, aesthetic resources, socio-economic resources, hazardous materials, and other environmental concerns. Because the No-Action Alternative does not change the current utility operations or design, there would be no change to the surrounding human or natural environment. The No-Action alternative would not address the purpose and need for the project.

6.2.2. Alternative B2: New Water Line and Tank (Preferred Alternative)

Alternative B2, the preferred alternative, would have no or negligible short-term and long-term impacts on cultural resources, aesthetic resources, hazardous materials, and other environmental concerns. This alternative would also have no or negligible long-term impacts on earth resources, biological resources, air resources, and socio-economic resources.

There is a potential for short-term and long-term minor impacts to water resources. There may be impacts to shoreline wetlands associated with Lake Huron. Any impacts will be temporary, since the intake line will be buried, and wetland permitting will be performed prior to construction. The installation of an additional water line will approximately double the water intake from, and discharge to, Lake Huron. Long-term impacts to water resources will be regulated through NPDES permitting and other appropriate regulatory agency oversight.

The new utility work would likely have short-term minor impacts to earth resources, biological resources, and air resources. Impacts to soil resources adjacent to the existing intake water line would occur within construction areas where the ground has not been previously disturbed as discussed in Section 6.1.4 and 6.1.5.

Any construction that takes place within areas that have not been previously disturbed would impact the vegetation, and wildlife resources as a result of disruption of existing habitat. These impacts would be considered temporary since the water line would be buried, allowing for natural conditions to re-establish after construction is completed.

There is potential for a short-term positive impact to the local economy as a result of construction activities.

Mitigation -- Short-term impacts to surface water would be minimized during construction with the use of appropriate BMPs to reduce erosion and sediment run-off. Dust emissions from construction activities would be greatly reduced / mitigated by the use of BMPs.

6.3. Environmental Effects of Upper Lab Renovation

6.3.1. Alternative C1: No-Action

Alternative C1: No-Action alternative would have negligible or no impacts on earth resources, biological resources, water resources, air resources, cultural resources, aesthetic resources, socio-economic resources, hazardous materials, and other environmental concerns. Because the No-Action Alternative does not change the current Upper Lab operations or design, there would be no change to the surrounding human or natural environment. The No-Action alternative would not address the purpose and need for the project.

6.3.2. Alternative C2: Upper Lab Renovation (Preferred Alternative)

Alternative C2, the Preferred Alternative, would have no or negligible short-term and long-term impacts on earth resources, biological resources, water resources, air resources, cultural resources, aesthetic resources, and other environmental concerns. The renovation of the upper lab would likely have short-term minor impacts to hazardous materials if any hazardous material, such as asbestos, is removed during renovation. Dust emissions during demolition and construction would be largely contained within the building. There is potential for a short-term positive impact to the local economy through construction activities.

The renovated Upper Lab design will increase the operational and energy efficiency when compared to that of the existing facility. However, depending on the final design, an increase in energy use as a result of increased facility function(s) may increase the overall energy demand.

Mitigation -- Any external dust emissions would be greatly reduced / mitigated by the use of BMPs. Debris from the demolition of the existing laboratory would be handled and disposed according to appropriate regulations. Hazardous materials, such as asbestos, would require special removal and disposal prior to demolition.

6.4. Environmental Effects of and Mitigation of Proposed Actions on Other Environmental Concerns

As discussed in Section 5.9, with respect to climate change and greenhouse gas emissions, the potential environmental effects of any of the alternatives relate to potential emissions of greenhouse gases or reduction of absorption of greenhouse gases.

There are two primary methods of mitigating potential adverse effects of any of the alternatives with respect to emissions of greenhouse gases. The most important of these is through preservation of vegetation and minimization of un-vegetated building and pavement footprints that may reduce the biomass of vegetation, directly impacting carbon sequestration. The second method for mitigating and reducing emissions of greenhouse gases related to any active alternatives at the HBBS involves maximizing use of energy and materials that reduce or have lower life-cycle greenhouse gas emissions in order to reduce the facility's contribution to net increase of global greenhouse gases.

The participation of HBBS in the DOI's Carbon Footprint Program (DOI, 2010) is important to address cumulative impacts of actions that, when addressed singly, may have no or negligible impact on climate change and the emission of greenhouse gases. None of the actions considered under this NEPA analysis would generate sufficient greenhouse gas emissions to require a quantitative study.

In order to minimize irreversible and irretrievable commitment of natural resources, any actions taken at the HBBS should maximize use of sustainable materials. Demolition and waste materials should be recycled to the maximum extent possible.

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