Appendix A

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

PUBLIC INVOLVEMENT

I. AVAILABILITY OF THE DRAFT EA

The Draft EA is available for public review and comment at the KCAB Administrative Offices located at the CVG Centre, 77 Comair Blvd, Erlanger, KY 41018 from June 23, 2016 through July 22, 2016. The KCAB has provided an opportunity for a public hearing as outlined in FAA Order 5050.4B, Section 404. NOTICE OF OPPORTUNITY FOR A PUBLIC HEARING. The notice, containing all required information, was published in The Cincinnati Enquirer on June 23, 2016. A copy of the Draft EA was also made available to regulatory agencies. Copies of newspaper notices and distribution letters will be included in this appendix. If any comments are received or a request for a public hearing is made, that information will also be included in this appendix.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix B

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B

AIR QUALITY

I. INTRODUCTION

The Proposed Project at the Cincinnati/Northern Kentucky International Airport (CVG or Airport) includes the following:

- Site preparation of Site 3C which measures approximately 25 acres in size and is located on the northeast corner of the intersection of Donaldson Highway and Point Pleasant Road;
- Construction and operation of a 264,000 square foot commercial warehouse/distribution structure;
- Construction of parking and circulation areas to support operations for the commercial building;
- Grading of land to facilitate stormwater flow, including the creation of stormwater detention facilities;
- Construction of utilities to support the development.

The Proposed Project would not increase aircraft operations, change the aircraft fleet mix, or change runway use. Therefore, the potential impacts to air quality associated with the Proposed Project include an increase in surface traffic and temporary emissions from the use of construction equipment.

II. BOONE COUNTY AIR QUALITY STATUS

The airport is located within Boone County, Kentucky, which is included in the Metropolitan Cincinnati Interstate Air Quality Region.[1] The U.S. Environmental Protection Agency (USEPA) has determined that levels of the eight-hour concentration of ozone exceed the Federal standards defining healthful air quality within this area. In the past, Boone County was designated as nonattainment for 24-hour concentrations of fine particulate matter ($PM_{2.5}$); however, on December 15, 2011, the USEPA determined the area had attained the $PM_{2.5}$ standard and the region was redesignated to attainment for $PM_{2.5}$. The area now operates under a maintenance plan for $PM_{2.5}$.

The use of construction equipment and vehicles for the Proposed Project will cause emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOC), the precursors to ozone development; and will also emit fine particulate matter ($PM_{2.5}$). As such, the Proposed Project at CVG would be subject to the General Conformity provisions under the Clean Air Act (CAA, including the 1990 Amendments), which are required to ensure compliance with the Kentucky State Implementation Plan

---

[1] USEPA, 40 CFR Part 81.20.

(SIP).[2] In addition to the CAA, the impacts of the Proposed Project would require assessment under the provisions of the National Environmental Policy Act (NEPA) to determine compliance to the Federal air quality standards, referred to as the National Ambient Air Quality Standards (NAAQS). The analyses required under the CAA and NEPA are separate and distinct. However, the analyses may be combined where overlaps exist, and the results may be reported in a common document.

III. REGULATORY SETTING

NATIONAL AMBIENT AIR QUALITY STANDARDS

The Clean Air Act, including the 1990 Amendments, (CAA) provides for the establishment of standards and programs to evaluate, achieve, and maintain acceptable air quality in the U.S. Under the CAA, the USEPA established a set of standards, or criteria, for six pollutants determined to be potentially harmful to human health and welfare.[3] The USEPA considers the presence of the following six criteria pollutants to be indicators of air quality:

- Ozone (O_3);
- Carbon monoxide (CO);
- Nitrogen dioxide (NO_2);
- Particulate matter (PM_{10} and $PM_{2.5}$);[4]
- Sulfur dioxide (SO_2); and,
- Lead (Pb).[5]

The National Ambient Air Quality Standards for the criteria pollutants, known as the NAAQS, are summarized in **Table B-1**. For each of the criteria pollutants, the USEPA established primary standards intended to protect public health, and secondary standards for the protection of other aspects of public welfare, such as preventing materials damage, preventing crop and vegetation damage, and assuring good visibility. Areas of the country where air pollution levels consistently exceed these standards may be designated nonattainment by the USEPA.

---

[2] The State Implementation Plan (SIP) is the State air agency document that sets forth the strategy intended to reduce air emissions in an area of poor air quality and maintain the quality of the air relevant to the Federal air quality standards.

[3] USEPA, Code of Federal Regulations, Title 40, Part 50 (40 CFR Part 50) *National Primary and Secondary Ambient Air Quality Standards (*NAAQS), July 2011.

[4] PM_{10} and $PM_{2.5}$ are airborne inhalable particles that are less than ten micrometers (coarse particles) and less than 2.5 micrometers (fine particles) in diameter, respectively.

[5] Airborne lead in urban areas is primarily emitted by vehicles using leaded fuels. The chief source of lead emissions at airports would be the combustion of leaded aviation gasoline in small piston-engine general aviation aircraft.

Table B-1
NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant		Primary / Secondary	Averaging Time	Level	Form
Carbon Monoxide(1)		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead(2)		primary and secondary	Rolling 3 month average	0.15 µg/m3 (3)	Not to be exceeded
Nitrogen Dioxide(4)		primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	Annual	53 ppb(5)	Annual Mean
Ozone(6)		primary and secondary	8-hour	0.075 ppm (7)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter	PM2.5	primary	Annual	12 µg/m^3	annual mean, averaged over 3 years
		secondary	Annual	15 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM10	primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide(8)		primary	1-hour	75 ppb (9)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Note: ppm is parts per million; ppb is parts per billion, and µg/m^3 is micrograms per cubic meter.

Sources: USEPA, 40 CFR Part 50.4 through Part 50.13 and http://www3.epa.gov/ttn/naaqs/criteria.html.

(1) 76 FR 54294, Aug 31, 2011

(2) 73 FR 66964, Nov 12, 2008

(3) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(4) 75 FR 6474, Feb 9, 2010 and 61 FR 52852, Oct 8, 1996

(5) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(6) 73 FR 16436, Mar 27, 2008

(7) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(8) 75 FR 35520, Jun 22, 2010 and 38 FR 25678, Sept 14, 1973.

(9) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

A nonattainment area is a homogeneous geographical area[6] (usually referred to as an air quality control region) that is in violation of one or more NAAQS and has been designated as nonattainment by the USEPA as provided for under the CAA. Some regulatory provisions, for instance the CAA conformity regulations, apply only to areas designated as nonattainment or maintenance.

A maintenance area describes the air quality designation of an area previously designated nonattainment by the USEPA and subsequently redesignated attainment after emissions are reduced. Such an area remains designated as maintenance for a period up to 20 years at which time the state can apply for redesignation to attainment, provided that the NAAQS were sufficiently maintained throughout the maintenance period.

GENERAL CONFORMITY

The General Conformity Rule under the CAA establishes minimum values, referred to as the *de minimis* thresholds, for the criteria and precursor pollutants[7] for the purpose of:

- Identifying Federal actions with project-related emissions that are clearly negligible (*de minimis*);
- Avoiding unreasonable administrative burdens on the sponsoring agency, and;
- Focusing efforts on key actions that would have potential for significant air quality impacts.

The *de minimis* rates vary depending on the severity of the nonattainment area and further depend on whether the general Federal action is located inside an ozone transport region.[8] An evaluation relative to the General Conformity Rule (the Rule), published under 40 CFR Part 93,[9] is required only for general Federal actions that would cause emissions of the criteria or precursor pollutants, and are:

---

[6] A homogeneous geographical area, with regard to air quality, is an area, not necessarily bounded by state lines, where the air quality characteristics have been shown to be similar over the whole area. This may include several counties, encompassing more than one state, or may be a very small area within a single county.

[7] Precursor pollutants are pollutants that are involved in the chemical reactions that form the resultant pollutant. Ozone precursor pollutants are NO_x and VOC, whereas $PM_{2.5}$ precursor pollutants include NO_x, VOC, SO_x, and ammonia (NH_3).

[8] The ozone transport region is a single transport region for ozone (within the meaning of Section 176A(a) of the CAA), comprised of the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area that includes the District of Columbia, as given at Section 184 of the CAA.

[9] USEPA, 40 CFR Part 93, Subpart B, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, July 1, 2006.

- Federally-funded or Federally-approved;
- Not a highway or transit project[10];
- Not identified as an exempt project[11] under the CAA;
- Not a project identified on the approving Federal agency's Presumed to Conform list;[12] and,
- Located within a nonattainment or maintenance area.

The Proposed Project at CVG is included in a nonattainment area for ozone and maintenance area for CO. Further, the Proposed Project meets the remaining criteria for requiring an evaluation under the General Conformity Rule.

When the action requires evaluation under the General Conformity regulations, the net total direct and indirect emissions due to the Federal action may not equal or exceed the relevant *de minimis* thresholds unless:

- An analytical demonstration is provided that shows the emissions would not exceed the NAAQS; or
- Net emissions are accounted for in the SIP planning emissions budget; or
- Net emissions are otherwise accounted for by applying a solution prescribed under 40 CFR Part 93.158.

The Federal *de minimis* thresholds established under the CAA are given in **Table B-2**. Conformity to the *de minimis* thresholds is relevant only with regard to those pollutants and the precursor pollutants for which the area is nonattainment or maintenance. Notably, there are no *de minimis* thresholds to which a Federal agency would compare ozone emissions. This is because ozone is not directly emitted from a source. Rather, ozone is formed through photochemical reactions involving emissions of the precursor pollutants NO_x and volatile organic compounds (VOC) in the presence of abundant sunlight, and heat. Therefore, emissions of ozone on a project level are evaluated based on the rate of emissions of the ozone precursor pollutants, NO_x and VOC.

---

[10] Highway and transit projects are defined under Title 23 U.S. Code and the Federal Transit Act.

[11] The Proposed Project is not listed as an action exempt from a conformity determination pursuant to 40 CFR Part 93.153(c). An exempt project is one that the USEPA has determined would clearly have no impact on air quality at the facility, and any net increase in emissions would be so small as to be considered negligible.

[12] The provisions of the CAA allow a Federal agency to submit a list of actions demonstrated to have low emissions that would have no potential to cause an exceedance of the NAAQS and are presumed to conform to the CAA conformity regulations. This list would be referred to as the "Presumed to Conform" list. The FAA Presumed to Conform list was published in the Federal Register on February 12, 2007 (72 FR 6641-6656) and includes airport projects that would not require evaluation under the General Conformity regulations.

Table B-2
DE MINIMIS THRESHOLDS

CRITERIA AND PRECURSOR POLLUTANTS	TYPE AND SEVERITY OF NONATTAINMENT AREA	TONS PER YEAR THRESHOLD
Ozone (VOC or NO$_x$)[1]	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO$_x$)[1]	Marginal and moderate nonattainment inside an ozone transport regions[2]	100
	Maintenance	100
Ozone (VOC)[1]	Marginal and moderate nonattainment inside an ozone transport region[2]	50
	Maintenance within an ozone transport region[2]	50
	Maintenance outside an ozone transport region[2]	100
Carbon monoxide (CO)	All nonattainment & maintenance	100
Sulfur dioxide (SO$_2$)	All nonattainment & maintenance	100
Nitrogen dioxide (NO$_2$)	All nonattainment & maintenance	100
Coarse particulate matter (PM$_{10}$)	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
Fine particulate matter (PM$_{2.5}$) (VOC, NO$_x$, NH$_3$, and SO$_x$)[3]	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

[1] The rate of increase of ozone emissions is not evaluated for a project-level environmental review because the formation of ozone occurs on a regional level and is the result of the photochemical reaction of NO$_x$ and VOC in the presence of abundant sunlight and heat. Therefore, USEPA considers the increasing rates of NO$_x$ and VOC emissions to reflect the likelihood of ozone formation on a project level.

[2] An OTR is a single transport region for ozone, comprised of the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area that includes the District of Columbia.

[3] For the purposes of General Conformity applicability, VOC's and NH$_3$ emissions are only considered PM$_{2.5}$ precursors in nonattainment areas where either a State or USEPA has made a finding that the pollutants significantly contribute to the PM$_{2.5}$ problem in the area. In addition, NO$_X$ emissions are always considered a PM$_{2.5}$ precursor unless the State and USEPA make a finding that NO$_X$ emissions from sources in the State do not significantly contribute to PM$_{2.5}$ in the area. Refer to 74 FR 17003, April 5, 2006.

Notes: Federal thresholds that are shaded are applicable to this project.
Code of Federal Regulations (CFR), Title 40, *Protection of the Environment*.
USEPA defines *de minimis* as emissions that are so low as to be considered insignificant and negligible. Volatile organic compounds (VOC); Nitrogen oxides (NO$_x$); Ammonia (NH$_3$); Sulfur oxides (SO$_x$).

Sources: USEPA, 40 CFR Part 93.153(b)(1) & (2).

Similar to ozone, the net emissions of PM2.5 and the precursor pollutants SOx, NOx, and VOC would be evaluated and compared against the minimum threshold of 100 tons per year each for the CVG Proposed Project. If the General Conformity evaluation for this air quality assessment were to show that any of these thresholds were equaled or exceeded due to the Proposed Project, further, more detailed analysis to demonstrate conformity would be required, which is referred to as a General Conformity Determination.

Conversely, if the General Conformity evaluation were to show that none of the relevant thresholds were equaled or exceeded, the Proposed Project at CVG would be presumed to conform to the Kentucky SIP and no further analysis would be required under the CAA.

TRANSPORTATION CONFORMITY RULE APPLICABILITY

Although airport improvement projects are usually considered under the General Conformity regulations, there can be elements of a Federal action or its alternatives that may require an analysis to demonstrate Transportation Conformity, such as actions relating to transportation plans, programs, projects developed, funded, or approved under Title 23 United States Code (U.S.C.) or the Federal Transit Act (FTA),13 or involve Federal highways. In such cases, the sponsoring Federal agency would be required to coordinate with the Federal Highway Administration (FHWA), the state Department of Transportation (DOT), and the local metropolitan planning organization (MPO) to assist in completing a Transportation Conformity evaluation.

As with General Conformity, Transportation Conformity regulations apply only to Federal actions located within a nonattainment or maintenance area. The Proposed Project under consideration at CVG would not be developed, funded, or approved by the FHWA or FTA. Therefore, the Transportation Conformity regulations would not apply.

INDIRECT SOURCE REVIEW

Some states require an air quality review when a Federal action has the potential to cause an increase in net emissions from indirect sources. Indirect sources cause emissions that occur later in time or are farther removed from the Federal action. Depending on the state, indirect sources may be identified as motor vehicles on highways, parking at sports and entertainment facilities, or an increase in aircraft operations. The state requirement may be referred to as the indirect source review (ISR) and each state requiring an ISR sets thresholds for increased operation of the indirect sources. When a Federal action has the potential to exceed these thresholds, an air quality review is required to assess the character and impact of the additional emissions and determine whether a permit is required, which is separate from the analyses required under NEPA or the CAA. According to FAA, *Air Quality Procedures for Airports and Air Force Bases*,[14] Kentucky does not require an ISR.

IV. EMISSIONS INVENTORY

The impacts to air quality due to the Proposed Project were determined in accordance with the guidelines provided in FAA, *Aviation Emissions and Air Quality Handbook Version 3*,[15] and FAA Order 5050.4B[16], *National Environmental Policy Act*

---

[13] USEPA, 40 CFR Part 93.153, *Applicability*, July 1, 2006

[14] FAA, *Air Quality Procedures for Civilian Airports & Air Force Bases*, Appendix J, April 1997 and Addendum September 2004.

[15] FAA, *Aviation Emissions and Air Quality Handbook Version 3*, July 2014.

(NEPA) Implementing Instructions for Airport Actions, which together with the guidelines of FAA Order 1050.1F,[17] *Environmental Impacts: Policies and Procedures*, constitute compliance with all the relevant provisions of NEPA and the CAA.

A construction emissions inventory was calculated for the Proposed Project using U.S. EPA NONROAD and MOVES emission factors to calculate emissions for construction equipment. The emissions estimated to occur during construction of the Proposed Project at CVG is given in **Table B-3**.

Construction Emissions

Short-term temporary air quality impacts would be caused by construction of the Proposed Project. In accordance with FAA Order 1050.1F, the impacts to the environment due to construction activities must be assessed. A construction emissions inventory was calculated for the Proposed Project using the Airport Construction Emissions Inventory Tool which incorporates U.S. EPA NONROAD and MOVES emission factors to calculate emissions for construction equipment. Construction of the Proposed Project is expected to occur over a 12-month period in 2016/2017 dependent upon environmental approval.

Operational Emissions

An emissions inventory was also calculated for the Proposed Action using USEPA NONROAD and MOVES emission factors to calculate emissions for construction equipment. The emissions estimated to occur during construction of the Proposed Action at CVG is given in **Table B-3**.

Table B-3
EMISSIONS INVENTORY SUMMARY
PROPOSED TED BUSHELMAN BOULEVARD DEVELOPMENT
Cincinnati / Northern Kentucky International Airport

ANNUAL EMISSIONS SUMMARY						
EMISSION SOURCES	**CRITERIA AND PRECURSOR POLLUTANTS** (tons per year)					
	CO	**VOC**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
	CAA *DE MINIMIS* THRESHOLDS					
	100	***100***	***100***	***100***	***100***	***100***
Construction Emissions	11.68	13.78	17.69	0.07	2.35	1.04
Proposed Project Total	**11.68**	**13.78**	**17.69**	**0.07**	**2.35**	**1.04**

Note: Emissions of CO and PM10 were provided for disclosure purposes.
Source: Landrum & Brown analysis, 2016.

---

[16] FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, April 28, 2006.

[17] FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, July 16, 2015.

V. SIGNIFICANCE DETERMINATION

The air quality assessment demonstrates that the Proposed Project would not cause an increase in air emissions above the applicable *de minimis* thresholds. Therefore, the Proposed Project conforms to the SIP and the CAA and would not create any new violation of the NAAQS, delay the attainment of any NAAQS, nor increase the frequency or severity of any existing violations of the NAAQS. As a result, no adverse impact on local or regional air quality is expected by construction of the Proposed Project. No further analysis or reporting is required under the CAA or NEPA.

Construction of the Proposed Project would result in short term air quality impacts from exhaust emissions from construction equipment and from fugitive dust emissions from vehicle movement and soil excavation. As provided in Table B-3, emissions due to construction equipment would not exceed applicable thresholds.

While the construction of the Proposed Project would be expected to contribute to fugitive dust in and around the construction site, KCAB as the Sponsor would ensure that all possible measures would be taken to reduce fugitive dust emissions by adhering to guidelines included in FAA Advisor Circular, *Standards for Specifying Construction of Airports*.[18]

Methods of controlling dust and other airborne particles will be implemented to the maximum possible extent and may include, but not limited to, the following:

- Exposing the minimum area of erodible earth.
- Applying temporary mulch with or without seeding.
- Using water sprinkler trucks.
- Using covered haul trucks.
- Using dust palliatives or penetration asphalt on haul roads.
- Using plastic sheet coverings.

VI. CLIMATE

Affected Environment

Greenhouse gases (GHG) are gases that trap heat in the earth's atmosphere. Both naturally occurring and man-made GHGs primarily include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). Sources that require fuel or power at an airport are the primary sources that would generate GHGs. Aircraft are probably the most often cited air pollutant source, but they produce the same types of emissions as ground access vehicles.

---

[18] FAA Advisory Circular, *Standards for Specifying Construction of Airports*, Item P-156, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control*, AC 150/5370-10G (July 21, 2014).

Research has shown there is a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the General Accounting Office (GAO) reports that "domestic aviation contributes about three percent of total carbon dioxide emissions, according to EPA data," compared with other industrial sources including the remainder of the transportation sector (20 percent) and power generation (41 percent).[19] The International Civil Aviation Organization (ICAO) estimates that GHG emissions from aircraft account for roughly three percent of all anthropogenic GHG emissions globally.[20] Climate change due to GHG emissions is a global phenomenon, so the affected environment is the global climate.[21]

The scientific community is continuing efforts to better understand the impact of aviation emissions on the global atmosphere. The FAA is leading and participating in a number of initiatives intended to clarify the role that commercial aviation plays in GHG emissions and climate. The FAA, with support from the U.S. Global Change Research Program and its participating federal agencies (e.g., National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA), and Department of Energy (DOE)), has developed the Aviation Climate Change Research Initiative (ACCRI) in an effort to advance scientific understanding of regional and global climate impacts of aircraft emissions. FAA also funds the Partnership for Air Transportation Noise & Emissions Reduction (PARTNER) Center of Excellence research initiative to quantify the effects of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition. Similar research topics are being examined at the international level by the International Civil Aviation Organization.[22]

Climate Environmental Consequences

Although there are no federal standards for aviation-related GHG emissions, it is well-established that GHG emissions can affect climate.[23] The Council on Environmental Quality (CEQ) has indicated that climate should be considered in NEPA analyses.

The following provides an estimate of GHG emissions. These estimates are provided for information only as no federal NEPA standard for the significance of GHG emissions from individual projects on the environment has been established.

---

[19] *Aviation and Climate Change.* GAO Report to Congressional Committees, (2009).

[20] Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in *ICAO Environmental Report.* (2010).

[21] As explained by the U.S. Environmental Protection Agency, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." Climate Change Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act* 2-3 (2009).

[22] Lourdes Q. Maurice and David S. Lee. *Chapter* 5: *Aviation Impacts on Climate.* Final Report of the International Civil Aviation Organization (ICAO) Committee on Aviation and Environmental Protection (CAEP) Workshop. October 29th November 2nd 2007, Montreal.

[23] See *Massachusetts* v. *E.P.A.,* 549 U.S. 497, 508-10, 521-23 (2007).

Under the No Action Alternative, there would be no increase in project specific GHG emissions. **Table B-4** provides the GHG emissions inventory for 2016/17.

Table B-4
2016/17 GHG EMISSIONS INVENTORY
Cincinnati/Northern Kentucky International Airport

Metrics	**Annual Metric Tons**		
	CO_2	**CH_4**	**N_2O**
Construction	5,423.42	0.18	0.02
GWP_{100}	*1.00*	*25.00*	*298.00*
CO_{2e}	5,423.42	4.56	7.11
CO_{2e} Net Emissions	**5,435.09**		

CO_2: Carbon Dioxide
CO_{2e}: Carbon Dioxide equivalent
CH_4: Methane
N_2O: Nitrous oxide
GWP: Global Warming Potential
Total emissions may not sum exactly due to rounding.
Source: L&B Analysis, 2016.

Due to construction activity associated with the Proposed Project, GHG emissions would increase by 5,435 metric tons over the No Action alternative in 2016. This increase would comprise less than $7.67x10^{-7}$ percent of U.S. based GHG emissions and less than $1.07x10^{-7}$ percent of global GHG emissions.[24]

Climate Cumulative Impacts

The cumulative impact of this Proposed Project on the global climate when added to other past, present, and reasonably foreseeable future actions is not currently scientifically predictable. Aviation has been calculated to contribute approximately 3 percent of global carbon dioxide (CO_2) emissions; this contribution may grow to 5 percent by 2050. Actions are underway within the U.S. and by other nations to reduce aviation's contribution through such measures as new aircraft technologies to reduce emissions and improve fuel efficiency, renewable alternative fuels with lower carbon footprints, more efficient air traffic management, market-based measures and environmental regulations including an aircraft CO_2 standard. The U.S. has ambitious goals to achieve carbon-neutral growth for aviation by 2020 compared to a 2005 baseline, and to gain absolute reductions in GHG emissions by 2050. At present there are no calculations of the extent to which measures individually or cumulatively may affect aviation's CO_2 emissions. Moreover, there are large uncertainties regarding aviation's impact on climate. The FAA, with support from the U.S. Global Change Research Program and its participating federal agencies (e. g., NASA, NOAA, EPA, and DOE), has developed the Aviation Climate Change Research Initiative (ACCRI) in an effort to advance scientific understanding

---

[24] U.S. based GHG emission estimated at 6,821.8 million metric tons CO_2 equivalent in Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010, (April 2012). The IPCC estimates global GHGs in 2004 at 49 Gigatonnes.

of regional and global climate impacts of aircraft emissions, with quantified uncertainties for current and projected aviation scenarios under changing atmospheric conditions.[25]

VII. DESCRIPTION OF POLLUTANTS

Ozone (O_3) - Ozone is a pollutant which is not directly emitted, rather, ozone is formed in the atmosphere through photochemical reaction with nitrogen oxides (NO_X), volatile organic compounds (VOC), sunlight, and heat. It is the primary constituent of smog and problems can occur many miles away from the pollutant sources.

People with lung disease, children, older adults, and people who are active can be affected when ozone levels are unhealthy. Numerous scientific studies have linked ground-level ozone exposure to a variety of problems, including:

- Lung irritation that can cause inflammation much like a sunburn;
- Wheezing, coughing, pain when taking a deep breath, and breathing difficulties during exercise or outdoor activities;
- Permanent lung damage to those with repeated exposure to ozone pollution; and
- Aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses like pneumonia and bronchitis.

Carbon Monoxide (CO) - Carbon monoxide is a colorless, odorless gas primarily associated with the incomplete combustion of fossil fuels in motor vehicles. Carbon monoxide combines with hemoglobin in the bloodstream and reduces the amount of oxygen that can be circulated through the body. High carbon monoxide concentrations can lead to headaches, aggravation of cardiovascular disease, and impairment of central nervous system functions. Carbon monoxide concentrations can vary greatly over comparatively short distances. Relatively high concentrations are typically found near crowded intersections, along heavily used roadways carrying slow-moving traffic, and at or near ground level. Even under the most severe meteorological and traffic conditions, high concentrations of carbon monoxide are limited to locations within a relatively short distance of heavily traveled roadways. Overall carbon monoxide emissions are decreasing as a result of the Federal Motor Vehicle Control Program, which has mandated increasingly lower emission levels for vehicles manufactured since 1973.

Volatile Organic Compound (VOC) – Volatile Organic Compounds are gases that are emitted from solids or liquids, such as stored fuel, paint, and cleaning fluids. VOCs include a variety of chemicals, some which can have short and long-term adverse health effects. As previously stated, VOCs are precursor pollutants that react with heat, sunlight and nitrogen oxides (NO_X) to form ozone (O_3). VOC can also mix with other gases to form particulate matter $PM_{2.5}$ as referenced below.

---

[25] Nathan Brown, et. al. *The U.S. Strategy for Tackling Aviation Climate Impacts*, (2010). 27th International Congress of the Aeronautical Sciences.

Nitrogen Dioxide (NO_2) - Nitrogen gas, normally relatively inert (unreactive), comprises about 80% of the air. At high temperatures (i.e., in the combustion process) and under certain other conditions it can combine with oxygen, forming several different gaseous compounds collectively called nitrogen oxides (NO_x). Nitric oxide (NO) and nitrogen dioxide (NO_2) are the two most important compounds. Nitric oxide is converted to nitrogen dioxide in the atmosphere. Nitrogen dioxide (NO_2) is a red-brown pungent gas. Motor vehicle emissions are the main source of NO_x in urban areas.

Nitrogen dioxide is toxic to various animals as well as to humans. Its toxicity relates to its ability to form nitric acid with water in the eye, lung, mucus membrane and skin. In animals, long-term exposure to nitrogen oxides increases susceptibility to respiratory infections lowering their resistance to such diseases as pneumonia and influenza. Laboratory studies show susceptible humans, such as asthmatics, exposed to high concentrations of NO_2 can suffer lung irritation and potentially, lung damage. Epidemiological studies have also shown associations between NO_2 concentrations and daily mortality from respiratory and cardiovascular causes and with hospital admissions for respiratory conditions.

While the NAAQS only addresses NO2, NO and the total group of nitrogen oxides is of concern. NO and NO2 are both precursors in the formation of ozone and secondary particulate matter. Because of this and that NO emissions largely convert to NO_2, NOx emissions are typically examined when assessing potential air quality impacts.

Sulfur Dioxide (SO_2) - Sulfur oxides (SO_x) constitute a class of compounds of which sulfur dioxide (SO_2) and sulfur trioxide (SO_3) are of greatest importance. SO_2 is commonly expressed as SO_X since it is a larger subset of sulfur dioxides (SO_2). SO_2 is a colorless gas that is typically identified as having a strong odor and is formed when fuel containing sulfur, like coal, oil and jet fuel, is burned. SO_2 combines easily with water vapor, forming aerosols of sulfurous acid (H_2SO_3), a colorless, mildly corrosive liquid. This liquid may then combine with oxygen in the air, forming the even more irritating and corrosive sulfuric acid (H_2SO_4). Peak levels of SO_2 in the air can cause temporary breathing difficulty for people with asthma who are active outdoors. Longer-term exposures to high levels of SO_2 gas and particles cause respiratory illness and aggravate existing heart disease.

Particulate Matter (PM_{10} and $PM_{2.5}$) - Particulate matter includes both aerosols and solid particles of a wide range of size and composition. PM_{10} is considered coarse particles with a diameter of 10 micrometers or less, and $PM_{2.5}$, fine particles with a diameter of 2.5 micrometers or less. Emissions of $PM_{2.5}$ are a subset of emissions of PM_{10}. Particulate matter can be any particle of these sizes, including dust, dirt, and soot. Smaller particulates are of greater concern because they can penetrate deeper into the lungs than large particles.

$PM_{2.5}$ is directly emitted in combustion exhaust and formed from atmospheric reactions between various gaseous pollutants including nitrogen oxides (NO_x) sulfur oxides (SO_x) and volatile organic compounds (VOC). PM_{10} is generally emitted directly as a result of mechanical processes that crush or grind larger particles or the resuspension of dusts, most typically through construction activities and vehicular movements. $PM_{2.5}$ can remain suspended in the atmosphere for days and weeks and can be transported over long distances. PM_{10} generally settles out of the atmosphere rapidly and is not readily transported over large distances.

The principal health effect of airborne particulate matter is on the respiratory system. Short-term exposures to high $PM_{2.5}$ levels are associated with premature mortality, increased hospital admissions, and emergency room visits. Long-term exposures to high $PM_{2.5}$ levels are associated with premature mortality and development of chronic respiratory disease.

Carbon Dioxide (CO_2) - Carbon dioxide is a colorless, odorless gas produced through the incomplete combustion of fossil fuels. Carbon dioxide is considered to be the most significant greenhouse gas (GHG) that trap heat in the earth's atmosphere. Both naturally occurring and man-made greenhouse gases primarily include CO_2, water vapor (H_2O), methane (CH_4), and nitrous oxide (N_2O). These different chemical species that are emitted have a different effect on climate. The carbon dioxide equivalent (CO_{2e}) method is a way to show relative impacts on climate change of different chemical species.

Lead (Pb) - Lead is a stable compound, which persists and accumulates both in the environment and in animals. In humans, it affects the blood-forming or hematopoletic, the nervous, and the renal systems. In addition, lead has been shown to affect the normal functions of the reproductive, endocrine, hepatic, cardiovascular, immunological, and gastrointestinal systems, although there is significant individual variability in response to lead exposure. Since 1975, lead emissions have been in decline due in part to the introduction of catalyst-equipped vehicles, and decline in production of leaded gasoline. In general, an analysis of lead is limited to projects that emit significant quantities of the pollutant (i.e. lead smelters) and are generally not applied to transportation projects.

Appendix C

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

BIOLOGICAL RESOURCES AND WATER RESOURCES

This Appendix includes a copy of the threatened and endangered species surveys and wetland and stream surveys that were completed at the Project Sites, as well as copies of materials related to coordination with the U.S. Fish and Wildlife Service (USFWS), Kentucky Department of Fish & Wildlife Resources (KDFWR), the Kentucky State Nature Preserves Commission (KSNPC), and the U.S. Army Corps of Engineers (USACE). This appendix includes the following documents:

<u>USFWS and KDFWR Coordination</u>

- Request to USFWS for Informal Consultation for Site 3C per Endangered Species Act (ESA), dated March 14, 2016
- Letter from the USFWS Kentucky Ecological Services Field Office indicating Compliance with Section 7 of the ESA, dated May 11, 2016

<u>KSNPS Coordination</u>

- Letter from KSNPC with a report from the Natural Heritage Program Database search regarding any endangered, threatened, or special concern plants and animals or exemplary natural communities at or near the Proposed Bosch Facilities Expansion, dated April 29, 2016

<u>USACE and KYDOW Coordination</u>

- Submittal of Preconstruction Notification and Request for Nationwide Permit #39 and General Section 401 Water Quality Certification, dated March 3, 2016
- Request to KYDOW for waiver of stream construction permit, dated March 10, 2016
- Memorandum from USACE acknowledging review of permit application for Site 3C, dated March 10, 2016
- General Water Quality Certification for Nationwide Permit #39, dated March 15, 2016
- General Certification and Nationwide Permit #39 conditions, dated March 19, 2012
- KYDOW stream construction permit exemption letter, dated April 5, 2016

THIS PAGE INTENTIONALLY LEFT BLANK

USFWS and KDFWR Coordination

THIS PAGE INTENTIONALLY LEFT BLANK

REDWING
ECOLOGICAL SERVICES, INC. 1139 South Fourth Street • Louisville, KY 40203 • Phone 502.625.3009 • Fax 502.625.3077

March 14, 2016

Ms. Jessica Miller
U.S. Fish and Wildlife Service
JC Watts Federal Building – Suite 265
330 West Broadway
Frankfort, Kentucky 40601

Subject: Request for Informal Consultation
Airport Site 3C Project
Boone County, Kentucky
Redwing Project 15-171

Dear Ms. Miller:

Redwing Ecological Services, Inc. (Redwing), on behalf of the Kenton County Airport Board (KCAB), respectfully requests informal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding proposed habitat impacts to the federally-endangered Indiana bat (*Myotis sodalis*) and the federally-threatened northern long-eared bat (*Myotis septentrionalis*) associated with the proposed Airport Site 3C project located east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky (Figure 1).

The KCAB is proposing the clearing of Indiana and northern long-eared bat habitat within designated "Potential" habitat during the "occupied" period between April 1 and October 14. The format of this submittal follows the *Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (effective April 2015) developed by the USFWS. This report includes a brief background of the proposed project, a description of the study methodology, an effects analysis for federally threatened/endangered species that may potentially be affected by the project, and outlines the proposed mitigation measures.

PROJECT BACKGROUND

The KCAB is proposing the development of a 25-acre site located northeast of the intersection of Donaldson Highway and Point Pleasant Road and just east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky (Figure 1). It is located in the Burlington and Covington, Kentucky 7.5-minute USGS topographic quadrangle maps at Latitude 39.065505° N and Longitude 84.649623° W. The site is bound by a combination of residential, commercial and industrial development to the south and east, by an Airport employee parking lot to the north and by airport facilities to the west (Figure 2). The purpose of this project is to develop airport land that is currently underutilized and to provide additional revenue to the KCAB. The project will involve constructing a warehouse/distribution facility enclosing approximately 264,000 square feet with associated parking, infrastructure, and stormwater detention facilities.

STUDY METHODOLOGY

Redwing biologists conducted an ecological assessment of the Airport Site 3C project on February 17, 2016 to characterize the on-site natural areas and to document the presence/absence of potential habitat for the Indiana bat, northern long-eared bat, federally endangered mussel species, and running buffalo clover (*Trifolium stoloniferum*). The methodology used to identify potential habitat for each species is discussed below.

Indiana Bat: This federally-endangered species requires distinct habitat types during the winter and summer months. Indiana bat winter habitat is restricted to suitable underground hibernacula typically consisting of caves located in karst areas; however, this species also hibernates in cave-like locations, including abandoned mines. During the habitat assessment, a pedestrian survey of the project site was performed to identify caves, abandoned mines, sinkholes, and other underground features that could be used as potential winter habitat.

Summer habitat for the Indiana bat consists of a variety of forested habitats utilized for roosting, foraging, and commuting. These habitats consist of forested blocks and linear features that consist of dense or loose aggregates of trees with variable amounts of canopy closure. Suitable summer roosting habitat is defined as a tree (live or dead) with a diameter at breast height (dbh) of five inches or greater that exhibits exfoliating bark, crevices, or cracks. Typical Indiana bat foraging habitat includes closed to semi-open forested habitats, where bats forage along forest edges and the tree canopy. Commuting habitat is used to travel between roosting and foraging areas, and typically includes forest edges and linear features, including riparian corridors and fencerows. Forested areas at the project site were assessed as potential summer roosting, foraging, and commuting habitat for the Indiana bat. Identified roosting habitat was marked on aerial photographs, and the location and extent of this habitat was transferred into ArcGIS to calculate habitat acreages.

Northern Long-eared Bat: This federally-threatened species requires distinct habitat types similar to the Indiana bat. Winter habitat for the northern long-eared bat is restricted to suitable underground features including caves and mine portals. During the habitat assessment, a pedestrian survey of the project site was performed to identify caves, abandoned mines, sinkholes, and other underground features that could be used as potential winter habitat.

Summer habitat for the northern long-eared bat consists of forested habitats utilized for roosting, foraging, and commuting. Suitable summer roosting habitat is defined as a tree (live or dead) with a dbh of three inches or greater that exhibits exfoliating bark, crevices, or cracks. Northern long-eared bats have also been found roosting in man-made structures, including barns, sheds, and bat houses. Foraging habitat includes mature, upland forests along hillsides and ridges, as well as more open areas such as forest clearings, over water, and along roads. Commuting habitat is used to travel between roosting and foraging areas and typically includes forest edges and linear features, including riparian corridors and fencerows. Identified roosting habitat was marked on aerial photographs, and the location and extent of this habitat was transferred into ArcGIS to calculate habitat acreages.

Mussels: The federally-endangered mussel species documented in Boone County are found in small to large rivers in shallow or deep water. Coarse sediments, such as sand and gravel, are often preferred, though some of the species tolerate muddy sediments. There are two ephemeral streams on the property which do not contain habitat for the seven species known to occur in Boone County, Kentucky.

Running Buffalo Clover: This federally-endangered species requires habitat meeting the following conditions: mesic/rich woods; filtered light; periodic disturbance; lack of dense undergrowth and invasive species; and presence of plant species that commonly occur in association with running buffalo clover. The presence of potential habitat was evaluated via a pedestrian survey of the project area.

EFFECTS ANALYSIS

Species listed by the USFWS as occurring or having the potential to occur in Boone County, the presence/absence of suitable habitat for these species at the site and potential effects on each species are summarized in the following table and discussed below.

Scientific Name	Common Name	Status	Habitat Present?	Species Present?
Mammals				
Myotis sodalis	Indiana Bat	E	Potential Summer	Unknown
Myotis septentrionalis	Northern Long-Eared Bat	T	Potential Summer	Unknown
Mussels				
Cyprogenia stegaria	Fanshell	E	No	No
Lampsilis abrupta	Pink Mucket	E	No	No
Obovaria retusa	Ring Pink	E	No	No
Plethobasus cooperianus	Orangefoot Pimpleback	E	No	No
Plethobasus cyphyus	Sheepnose	E	No	No
Pleurobema clava	Clubshell	E	No	No
Pleurobema plenum	Rough Pigtoe	E	No	No
Plants				
Trifolium stoloniferum	Running Buffalo Clover	E	No	No

E = Federally Endangered; T = Federally Threatened

The results of the field survey are discussed below for each species.

Indiana Bat: The mature woods habitat was identified as suitable summer roosting habitat for this species, and totals 8.64 acres (Figure 2). According to a map of known Indiana bat habitat for the state of Kentucky maintained by the USFWS, the project is located within “Potential” habitat for this species (Figure 3). However, much of this habitat is of relatively poor quality, is dominated by bush honeysuckle (*Lonicera maackii*), and is isolated from other habitat blocks and corridors by industrial development and open fields.

Effects and Minimization: No caves, sinkholes, or other potential hibernacula for the Indiana bat were identified at the project site. Due to the lack of suitable hibernacula at the project site, no direct effects to hibernating Indiana bats or their hibernacula are anticipated from the project. Tree clearing for the project will result in the removal of 6.77 acres and 13 individual trees of “Potential” habitat. Due to project deadlines, the KCAB proposes to clear this habitat between April 1 and October 14 (no clearing activities will occur in June and July) during the occupied period. The KCAB proposes to address direct effects to the Indiana bat from the loss of “Potential” habitat by making a voluntary contribution to the Imperiled Bat Conservation Fund (IBCF). No cumulative effects to this species are expected from the project. Due to the potential for direct impacts to the Indiana bat from the loss of summer habitat, the project is likely to adversely affect this species.

Northern Long-eared Bat: Similar to the Indiana bat, the northern long-eared bat requires two distinct habitats during the winter and summer months. The mature woods habitat was identified as suitable summer roosting habitat for this species, and totals 8.64 acres and 13 individual trees (Figure 2). Based on a map of known northern long-eared bat habitat for the state of Kentucky maintained by the USFWS, the project is located within “Potential” habitat for this species (Figure 3). However, much of this habitat is of relatively poor quality, is dominated by bush honeysuckle, and is isolated from other habitat blocks and corridors by industrial development and open fields.

Effects and Minimization: Due to the lack of suitable hibernacula at the project site, no direct effects to hibernating northern long-eared bats or their hibernacula are anticipated from the project. The project will require the removal of 6.77 acres and 13 individual trees of suitable summer roosting habitat; however, the project is not located within 0.25 mile of a known hibernaculum or 150 feet of a known maternity roost tree. As a result, incidental take of the northern long-eared bat from the proposed tree removal is not prohibited under the final rule authorized under Section 4(d) of the Endangered Species Act for this species. The KCAB will utilize the 4(d) Rule to address potential direct, indirect, and cumulative effects to the northern long-eared bat that may result from the project. As a result, the project is not likely to adversely affect the northern long-eared bat.

Mussels: Seven federally-listed mussels are known to occur in Boone County. However, the ephemeral streams within the project site do not provide potential habitat for these species. Potential indirect impacts from the project could include increased sediment deposition within the downstream waters due to construction activities. To mitigate for the potential impacts, enhanced erosion prevention and sediment control measures will be implemented during construction.

Effects and Minimization: Due to the absence of appropriate stream size, flow and substrate, no suitable habitat for endangered mussel species is present on site and the project will have no direct impacts to the listed mussels. Utilization of best management practices (BMPs) during construction will limit indirect impacts from sedimentation or contamination of downstream waters.

Running Buffalo Clover: The preferred habitat for this federally-endangered species includes rich, mesic forests with partial to filtered sunlight that have periodic occurrences of moderate disturbance. This plant is often found on limestone derived soils. The site consists primarily of open field habitat, with two woodlots in the eastern portion of the site, and two wooded drainages in the central portion of the site. The site provides some partially shaded habitat with periodic mowing at the edges of the woods. However, this habitat is highly disturbed and has been modified through the planting of turf grasses including tall fescue and bluegrass. The understory of the woods lies under a closed canopy and contains several invasive species including bush honeysuckle, multiflora rose (*Rosa multiflora*) Japanese honeysuckle (*Lonicera japonica*), and garlic mustard (*Alliaria petiolata*). The site is not very rich and contains few indicator species that commonly occur with running buffalo clover. Therefore, it does not appear that suitable habitat for running buffalo clover is present on the site.

Effects and Minimization: Due to the lack of suitable habitat observed during the site assessment, the project is not likely to adversely affect this species.

PROPOSED MITIGATION MEASURES

The KCAB proposes to mitigate for the loss of 6.77 acres and 13 individual trees of “Potential” habitat for the Indiana bat through a voluntary payment to the IBCF, utilizing the process set forth within the *Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (April 2015). Clearing of “Potential” habitat will occur during the occupied period of April 1 through October 14 (excluding June and July), which requires a mitigation multiplier of 1.0. The KCAB will mitigate for the loss of this habitat at a rate of $3,250 per acre, for a total payment to the IBCF of $25,805.00. Payment will be made prior to any tree clearing. The payment is summarized in the table below.

Habitat Type	**Acres of Habitat Impact**	**Cost Per Acre**	**Multiplier**	**Payment**
Potential	6.77 acres	$3,250*	1.0	$22,002.50
Potential	13 trees (1.17 acres)	$3,250*	1.0	$3,802.50
			TOTAL	**$25,805.00**

* current price per acre as determined by UK Department of Agricultural Economics in the Agricultural Situation and Outlook and subject to change

Kenton County Airport Board contact information is as follows:

Kenton County Airport Board
Attn: Ms. Candace S. McGraw
Cincinnati/Northern Kentucky International Airport
P.O. Box 752000
Cincinnati, Ohio 45275-2000
(859) 767-7021
dconrad@cvgairport.com

CONCLUSION

Suitable habitat for federally-listed species identified at the project site includes 8.64 acres and 13 individual trees of summer roosting habitat for the Indiana and northern long-eared bats. Approximately 6.77 acres and 13 individual trees will be cleared during the proposed development of the site. The project is located in "Potential" habitat for the Indiana bat, and clearing will occur during the occupied period (April 1 – October 14). The loss of "Potential" habitat will result in direct effects to the Indiana bat and the KCAB proposes to mitigate for these effects through a voluntary payment to the IBCF, utilizing the process set forth within the *Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (April 2015). The project is not located within 0.25 mile of a known hibernacula or 150 feet of a known maternity roost tree for the northern long-eared bat; therefore, incidental take from the proposed tree clearing is not prohibited under the final 4(d) rule for this species. No suitable habitat for the federally-listed mussel species or running buffalo clover is present at the project site; therefore, no adverse effects to these species are anticipated as a result of the project.

We respectfully request your concurrence with the findings of this report. If you have any questions regarding this report or the overall project, please feel free to contact Bridget Carnahan or Kiersten Fuchs at (502) 625-3009.

Sincerely,

Bridget G. Carnahan
Staff Biologist

Kiersten R. Fuchs
Principal
Senior Wildlife Biologist

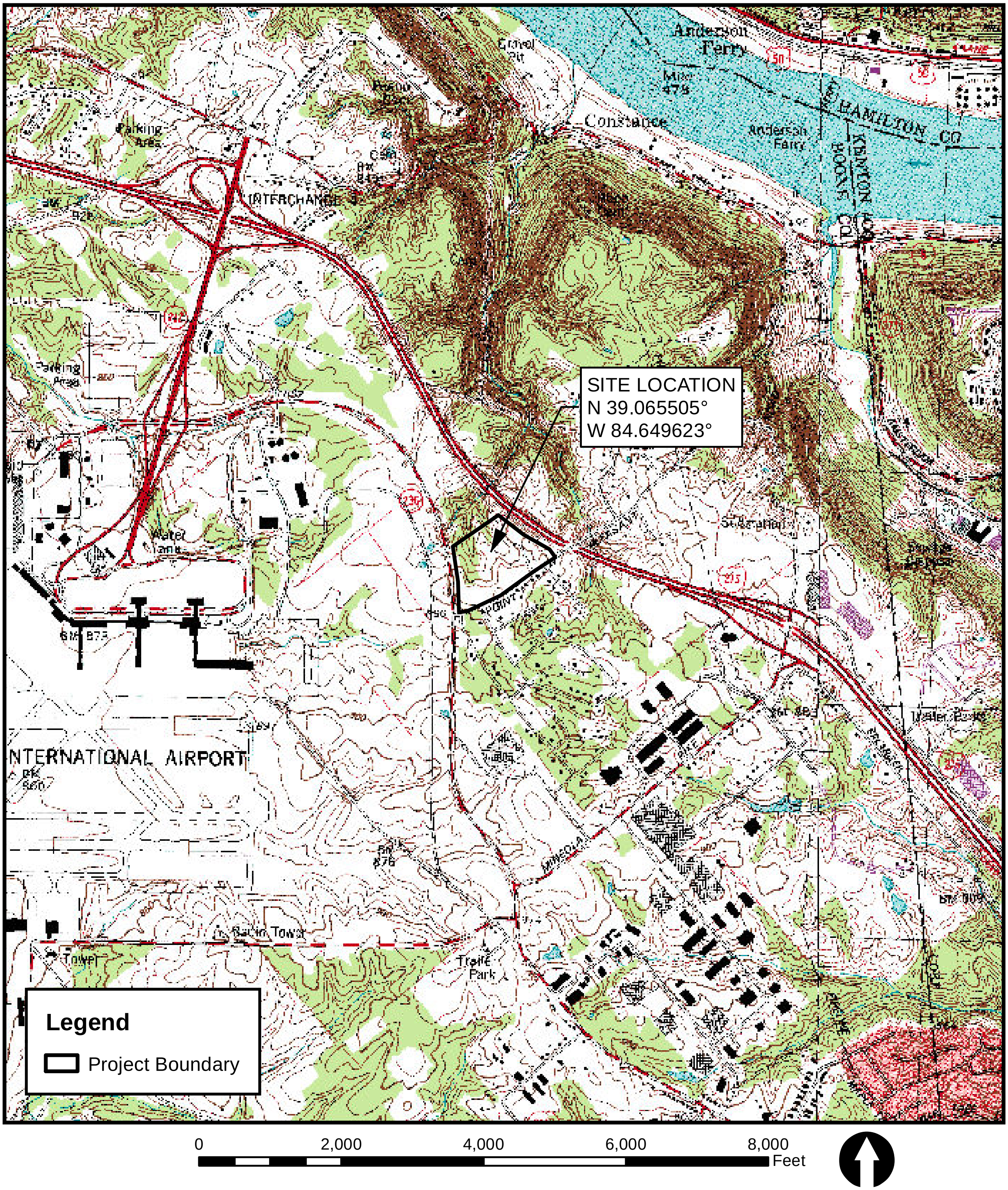
P:\2015 Projects\15-171-Airport Site 3C\Reports\USFWS\USFWS Informal Consultation.doc

cc: Mr. Scott Strine – Dermody Properties (electronic only)
Ms. Debbie Conrad – Kenton County Airport Board (electronic only)

Attachments: Figures
Photographs

FIGURES

Source: USGS 7.5-minute Topographic Map, Burlington and Covington, Kentucky Quadrangles.



AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REDWING
ECOLOGICAL SERVICES, INC.

SITE LOCATION MAP

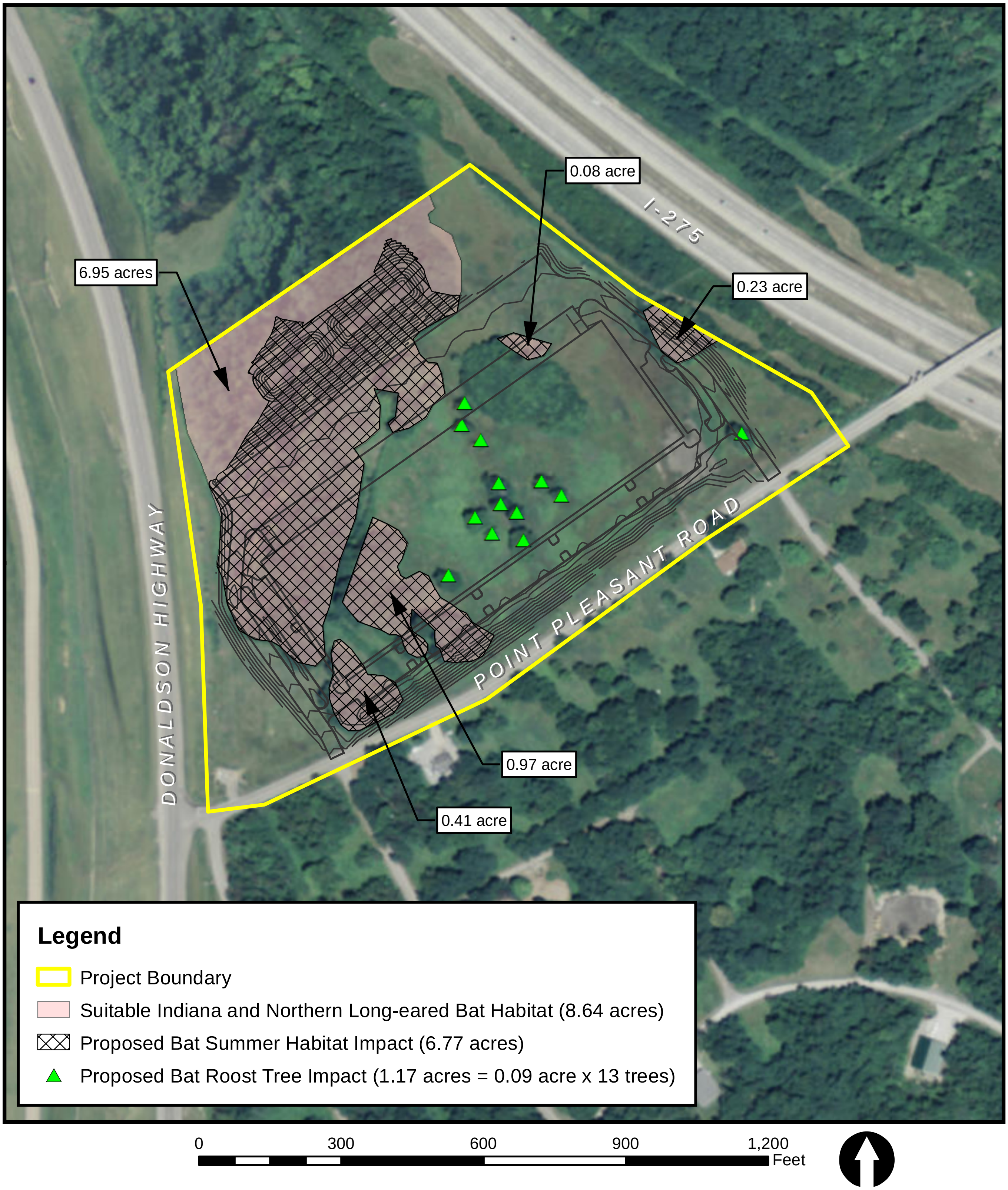
FIGURE 1

REVISED DATE: 02-15-16

DRAWN BY: BGC

P:\2015 Projects\15-171-Airport Site 3C\Figures\Site Location Map.mxd, 03-11-2016, ebowman

Source: World Imagery - Esri and the GIS User Community (2014).



AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 03-11-16

DRAWN BY: BGC/EDB

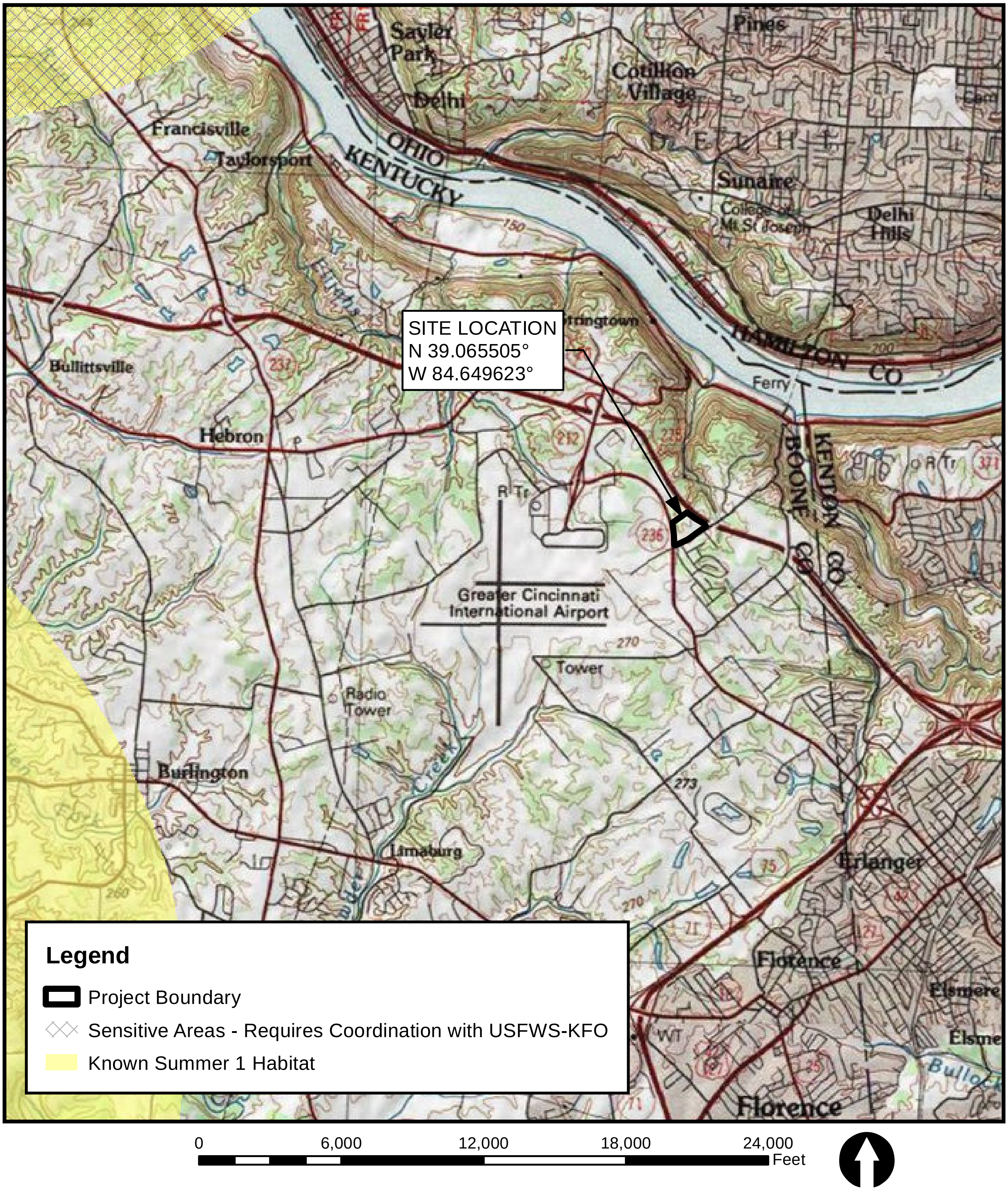
REDWING
ECOLOGICAL SERVICES, INC.

SITE DEVELOPMENT PLAN

FIGURE 2

P:\2015 Projects\15-171-Airport Site 3C\Figures\Bat Habitat Impact Map.mxd, 03-11-2016, temp

Source: USA Topo Maps, Copyright:© (2013) National Geographic Society; USFWS Kentucky Field Office - Indiana and Northern Long-eared Bat Habitat (2015).



AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REDWING
ECOLOGICAL SERVICES, INC.

KNOWN INDIANA AND
NORTHERN LONG-EARED
BAT HABITAT MAP

REVISED DATE: 03-11-16

DRAWN BY: BGC/EDB

FIGURE 3

P:\2015 Projects\15-171-Airport Site 3C\Figures\Known Bat Habitat.mxd, 03-11-2016, ebowman

PHOTOGRAPHS

Photograph 1: Upland woods habitat located across the project site. February 17, 2016.

Photograph 2: Maintained open field located across the project site. February 17, 2016.

Photograph 3: View of the powerline right-of-way, located along the northern boundary of the project site. February 17, 2016.

Photograph 4: View of scrub/shrub habitat located east of Wetland 2 and Ephemeral Stream 2. This habitat is not considered suitable bat habitat. February 17, 2016.

Photograph 5: View of Ephemeral Stream 1 which drains Wetland 1 and flows towards the Interstate 275 right-of-way. February 17, 2016.

Photograph 6: View of the upstream portion of Ephemeral Stream 2, located in the central portion of the site. February 17, 2016.

Photograph 7: View of the downstream portion of Ephemeral Stream 2. February 17, 2016.

Photograph 8: View of Ephemeral Stream 3, located in the western portion of the site. February 17, 2016.

Photograph 9: Wetland 1 is an emergent wetland located south of Ephemeral Stream 1. February 17, 2016.

Photograph 10: View of the emergent wetland portion of Wetland 2. February 17, 2016.

Photograph 11: View of the scrub/shrub portion of Wetland 2. February 17, 2016.

Photograph 12: Wetland 3 is a small forested wetland located near the northwest corner of the site. February 17, 2016.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

May 11, 2016

Ms. Kiersten R. Fuchs
Redwing Ecological Services, Inc.
1139 South Fourth Street
Louisville, Kentucky 40203

Subject: FWS 2016-B-0372, Kenton County Airport Board, Commercial Development on Site 3C, Boone County, Kentucky

Dear Ms. Fuchs:

We have received a May 11, 2016 copy of a receipt from Kentucky Natural Land Trust acknowledging the contribution Kenton County Airport Board submitted to Kentucky Natural Lands Trust for the Imperiled Bat Conservation Fund. The U.S. Fish and Wildlife Service (Service) has reviewed this contribution in relation to the proposed project and offers the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.).

Indiana Bat and Northern Long-eared Bat

The March 15, 2016 correspondence from Redwing Ecological Services, Inc. (Redwing), states that there are no caves, abandoned mines, sinkholes, or other features that could potentially provide winter habitat for these bat species. The project will involve some summer habitat removal. Your project adheres to the conservation measures associated with the Kentucky Field Office's 2015 *Conservation Strategy for Forest-Dwelling Bats* (Conservation Strategy) and the 2015 Biological Opinion: *Kentucky Field Office's Participation in Conservation Memoranda of Agreement for the Indiana Bat and/or Northern Long-eared Bat* (BO). The contribution made is the appropriate amount, following the process in the Conservation Strategy, to mitigate for the removal of the "potential" Indiana bat and northern long-eared bat habitat for this project as described in the March 15, 2016 correspondence and attachments from Third Rock. Specifically, 7.94 acres of forested habitat removal will occur during the occupied timeframe (Apr. 1 – Oct. 14), except June and July. Through the adherence to the Conservation Strategy, the Service has already analyzed the effects of your action under the BO and has concluded that the project is not likely to jeopardize the continued existence of the Indiana bat or northern long-eared bat or result in the destruction or adverse modification of designated critical habitat for either species. Any incidental take of Indiana and/or northern long-eared bats that will or could result from the forest habitat removal associated with your project are authorized under the BO. If additional forested areas not previously considered are to be removed, then you should coordinate with the Service to determine if additional compensation is necessary to be in ESA compliance.

Running Buffalo Clover

The habitat assessment conducted by Redwing biologists on February 17, 2016 did not reveal suitable habitat the running buffalo clover. The field habitat present at the site does not provide the filtered-light environment needed for this species and the forest habitat that is present has a closed canopy. Also, the forest habitat understory is dominated by bush honeysuckle, Japanese honeysuckle, multiflora rose, and garlic mustard, making the habitat unsuitable for the running buffalo clover. Based on this information, the Service concurs that the proposed project is not likely to adversely affect the running buffalo clover.

Federally-listed Mussels

The ephemeral streams within the project site do not constitute potential habitat for mussel species; however, erosion and sediment inflows to ephemeral streams may flow into perennial streams where federally-listed mussels may be present. To mitigate the effects of sediments, erosions prevention and sediment control measures will be implemented during construction. Based on this information, the Service believes that the proposed project is not likely to adversely affect federally-listed mussels.

In view of these findings we believe that the requirements of section 7 of the Endangered Species Act have been fulfilled for this project. Your obligations under section 7 must be reconsidered, however, if: (1) new information reveals that the proposed action may affect listed species in a manner or to an extent not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated.

Thank you again for your request. Your concern for the protection of endangered and threatened species is greatly appreciated. If you have any questions regarding the information that we have provided, please contact Santiago Martín at (502) 695-0468 extension 116 or santiago_martin@fws.gov.

Sincerely,

Virgil Lee Andrews, Jr.
Field Supervisor

KSNPS Coordination

THIS PAGE INTENTIONALLY LEFT BLANK

Matthew G. Bevin
Governor

Charles G. Snavely
Secretary
Energy and Environment Cabinet

Donald S. Dott, Jr.
Director

Commonwealth of Kentucky
Kentucky State Nature Preserves Commission
Teton Trail
Frankfort, Kentucky 40601-1403
502-573-2886 Voice
502-573-2355 Fax

April 29, 2016

Bridget Carnahan
Redwing Ecological Services, Inc
1139 S Fourth Street
Louisville, KY 40203

Data Request 16-114

Dear Ms. Carnahan,

This letter is in response to your data request of April 19, 2016 for the proposed Airport Site 3c Project in Boone County, Kentucky. We have reviewed our Natural Heritage Program Database to determine if any of the endangered, threatened, or special concern plants and animals or exemplary natural communities monitored by the Kentucky State Nature Preserves Commission occur within the general area of the relocation project on the Burlington USGS Quadrangle. Please see the attached reports for more information.

1-mile for all records – 2 records
5-mile for aquatic records – 31 records
5-mile for federally listed species – 19 records
10-mile for mammals and birds – 11 records

Plethodon cinereus (Redback salamander, KSNPC Special Concern) is found only in Boone, Kenton and Owen Counties in Kentucky, and is known to occur near the project area. This is a woodland species that occurs in deciduous and mixed forest types. Adults are found under logs, rocks, bark, moss and debris. In addition, *Dryobius sexnotatus* (Six-banded Longhorn Beetle) has also been recorded within one mile of the proposed project.

Many aquatic organisms have been documented in the Ohio River near Cincinnati. All of the records from this area in our database at this time are considered historic or extirpated, but we have not performed recent surveys in the Ohio River. Our data are not sufficient to guarantee absence of endangered, threatened or sensitive species from areas impacted by proposed construction.

Myotis sodalis (Indiana myotis, federally listed endangered, KSNPC endangered) has been documented between five and ten miles of the project area. In order to avoid impacts to bats, bottomland forests and riparian corridors, particularly near caves, should not be disturbed.

Trifolium stoloniferum (Running buffalo clover, federally endangered, KSNPC threatened) has been documented nearby. This plant grows in mesic soils that receive filtered light. If suitable habitat is to be disturbed, a thorough search be conducted by a qualified biologist in the months of May through July. The optimal time to search is in May, during its flowering period. Areas to search include stream banks, bars, and terraces, footpaths, dirt roads, and grazed bottomlands.

I would like to take this opportunity to remind you of the terms of the data request license, which you agreed upon in order to submit your request. The license agreement states "Data and data products received from the Kentucky State Nature Preserves Commission, including any portion thereof, may not be reproduced in any form or by any means without the express written authorization of the Kentucky State Nature Preserves Commission." The exact location of plants, animals, and natural communities, if released by the Kentucky State Nature Preserves Commission, may not be released in any document or correspondence. These products are provided on a temporary basis for the express project (described above) of the requester, and may not be redistributed, resold or copied without the written permission of the Kentucky State Nature Preserves Commission's Data Manager (801 Schenkel Lane, Frankfort, KY, 40601. Phone: (502) 573-2886).

Please note that the quantity and quality of data collected by the Kentucky Natural Heritage Program are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Kentucky have never been thoroughly surveyed and new plants and animals are still being discovered. For these reasons, the Kentucky Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Kentucky. Heritage reports summarize the existing information known to the Kentucky Natural Heritage Program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. We would greatly appreciate receiving any pertinent information obtained as a result of on-site surveys.

If you have any questions or if I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Sara Hines
Data Manager

RIH/SGH

Enclosures: Data Report and Interpretation Key

Standard Occurrence Report

KSNPC monitored species within 1 mile of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
Extant in Kentucky																		
Insects																		
IICOL03010*007 3997	*Dryobius sexnotatus*	Six-banded Longhorn Beetle	GNR	S2	T	SOMC			1996-10-08	G	D	Kenton Campbell Boone	Covington Burlington Newport	390451N	0843305W	050902030201 - Town of Newport-Ohio River 051001011305 - Lower Banklick Creek 051001011306 - DeCoursey Creek-Licking River 050902030202 - Dry Creek-Ohio River	COVINGTON, KY.	Appears to be dependent on climax hardwood forest habitat, where it principally lives on sugar maple and, to a lesser extent, beech and elm (Perry et al. 1974, Schweitzer 1989). Mid June to mid July is when adults are typically found (Mike Bratton, pers comm).
Amphibians																		
AAAAD12020*004 5532	*Plethodon cinereus*	Redback Salamander	G5	S3	S			Y	1983-04-13	S	C	Boone	Burlington	390413N	0843817W	050902030202 - Dry Creek-Ohio River	Near I-275, 1 mi E of exit 4 at KY 212 (004B), along S side of KY 8, ca 0.8 rd mi NW of jct w/ KY 20 (004C), and wooded ravine SSW of Constance (004A) as far S as just S of power line corridor nr I-275 (004D).	A woodland species that occurs in deciduous and mixed forest types. Adults are found under logs, rocks, bark, moss and debris.

THESE DATA ARE VALID ONLY ON THE DATE ON WHICH THE REPORT WAS GENERATED.
THESE DATA MAY ONLY BE USED FOR THE PROJECT NAMED ABOVE.

Provided to Redwing

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

Extant in Kentucky

Vascular Plants

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
PDFAB40250*031 7096	*Trifolium stoloniferum*	Running Buffalo Clover	G3	S2S3	T	LE		Y	1992-05	S	X	Kenton	Covington	390003N	0843505W	051001011305 - Lower Banklick Creek	Along Rice Creek, ca 0.35 air mi SW of jct KY 236 and KY 1303 (Turkey Foot Road). 	Old trails, traces, and roads; grazed bottomlands, streambanks, lawns, shoals, and cemeteries with native vegetation, prairies, well-drained and mesic soils, and filtered to partial light.

Freshwater Mussels

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV08010*012 4864	*Cumberlandia monodonta*	Spectaclecase	G3	S1	E	LE		Y	1907	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Usually found in medium to large rivers where it inhabits substrate ranging from silt to rubble and boulders in slow to swift currents of shallow to deep water (Ahlstedt 1984, Bogan and Parmalee 1983, Buchanan 1980, Nelson and Freitag 1980, Parmalee 1967). Sometimes found in or near vegetation beds, and in mud between boulders adjacent to swift water (Stansbery 1966). May become established in wing dams (Nelson and Freitag 1980).
IMBIV08010*021 2112	*Cumberlandia monodonta*	Spectaclecase	G3	S1	E	LE		Y	1895-11-01	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV10020*023 2673	*Cyprogenia stegaria*	Fanshell	G1Q	S1	E	LE		Y	1980-pre	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati, OH, Hamilton Co.	Medium to large streams and rivers with moderate to strong current in coarse sand and gravel and depth ranging from shallow to deep (Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Parmalee 1967, Johnson 1980, Gordon and Layzer 1989).
IMBIV16111*006 4529	*Epioblasma obliquata obliquata*	Catspaw	G1T1	S1	E	LE		Y	1970-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Inhabits medium to large rivers in riffles, shoals, and/or deep water in swift current (Bogan and Parmalee 1983, Parmalee 1967, Wilson and Clark 1914).
IMBIV16184*009 9096	*Epioblasma torulosa rangiana*	Northern Riffleshell	G2T2	S1	E	LE		Y	1973-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Riffles or shoals with current and substrate of sand and/or gravel in small to moderate-size rivers (Clarke 1981, Watters 1987).

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV16190*062 9990	*Epioblasma triquetra*	Snuffbox	G3	S1	E	LE		Y	1978-pre	G	X	Campbell Kenton	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Occurs in medium-sized streams to large rivers generally on mud, rocky, gravel, or sand substrates in flowing water (Baker 1928, Buchanan 1980, Johnson 1978, Murrary and Leonard 1962, Parmalee 1967). Often deeply buried in substrate and overlooked by collectors.
IMBIV21110*012 603	*Lampsilis abrupta*	Pink Mucket	G2	S1	E	LE		Y	1980-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati, OH, Hamilton Co.	Large rivers in habitats ranging from silt to boulders, but apparently more commonly from gravel and cobble. Collected from shallow and deep water with current velocity ranging from zero to swift (Ahlstedt 1983, Bogan and Parmalee 1983, Buchanan 1980), but never standing pools of water (Lauritsen 1987).
IMBIV21110*030 7546	*Lampsilis abrupta*	Pink Mucket	G2	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV31030*027 1740	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	1838	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Large river species that inhabits gravel and sand bars (Bogan and Parmalee 1983, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Stansbery 1976).
IMBIV31030*035 8492	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance.	

THESE DATA ARE VALID ONLY ON THE DATE ON WHICH THE REPORT WAS GENERATED.
THESE DATA MAY ONLY BE USED FOR THE PROJECT NAMED ABOVE.

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV34020*025 1814	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1900s	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Usually found in large rivers in sand and gravel substrates (Ahlstedt 1983, Bogan and Parmalee 1983, Miller, A.C. et al. 1986).
IMBIV34030*062 3623	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1844-Pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	(Ohio River) at Cincinnati, OH.	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV34030*068 723	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV35060*038 10662	*Pleurobema clava*	Clubshell	G1G2	S1	E	LE		Y	1844-pre	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	(Ohio River) at Cincinnati, OH.	This species is an inhabitant of small streams and rivers (Goodrich and Van Der Schalie 1944; Ortmann 1919,1925), although in Kentucky it is known from moderately large rivers. Often deeply buried in the substrate and consequently difficult to find (Watters 1987).

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV35240*006 3812	*Pleurobema plenum*	Rough Pigtoe	G1	S1	E	LE		Y	1800s	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati (Hamilton County).	Medium to large rivers in sand, gravel, and cobble substrates (Ahlstedt 1984, Bogan and Parmalee 1983, Clarke 1981, Neel and Allen 1964).
IMBIV39041*032 4411	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	LT		Y	1987-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, Cincinnati.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).

Extirpated from Kentucky

Freshwater Mussels

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV24020*007 11934	*Leptodea leptodon*	Scaleshell	G1G2	SX	X	LE		Y	1895-11-01	M	X	Boone	Burlington	390434N	0843812W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance.	
IMBIV47050*003 6547	*Villosa fabalis*	Rayed Bean	G2	SX	X	LE		Y	1870-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Occurs in small to medium-size rivers where it lives deeply buried in sand and gravel bound together by the roots of aquatic vegetation (Bogan and Parmalee 1983; Ortmann 1925, 1926; Parmalee 1967; Stansbery 1976). This small mussel is easy to overlook because of the habitat occupied.

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

Extant in Kentucky

Vascular Plants

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
PDFAB40250*031 7096	*Trifolium stoloniferum*	Running Buffalo Clover	G3	S2S3	T	LE		Y	1992-05	S	X	Kenton	Covington	390003N	0843505W	051001011305 - Lower Banklick Creek	Along Rice Creek, ca 0.35 air mi SW of jct KY 236 and KY 1303 (Turkey Foot Road). 	Old trails, traces, and roads; grazed bottomlands, streambanks, lawns, shoals, and cemeteries with native vegetation, prairies, well-drained and mesic soils, and filtered to partial light.

Freshwater Mussels

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV08010*012 4864	*Cumberlandia monodonta*	Spectaclecase	G3	S1	E	LE		Y	1907	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Usually found in medium to large rivers where it inhabits substrate ranging from silt to rubble and boulders in slow to swift currents of shallow to deep water (Ahlstedt 1984, Bogan and Parmalee 1983, Buchanan 1980, Nelson and Freitag 1980, Parmalee 1967). Sometimes found in or near vegetation beds, and in mud between boulders adjacent to swift water (Stansbery 1966). May become established in wing dams (Nelson and Freitag 1980).
IMBIV08010*021 2112	*Cumberlandia monodonta*	Spectaclecase	G3	S1	E	LE		Y	1895-11-01	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV10020*023 2673	*Cyprogenia stegaria*	Fanshell	G1Q	S1	E	LE		Y	1980-pre	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati, OH, Hamilton Co.	Medium to large streams and rivers with moderate to strong current in coarse sand and gravel and depth ranging from shallow to deep (Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Parmalee 1967, Johnson 1980, Gordon and Layzer 1989).
IMBIV16111*006 4529	*Epioblasma obliquata obliquata*	Catspaw	G1T1	S1	E	LE		Y	1970-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Inhabits medium to large rivers in riffles, shoals, and/or deep water in swift current (Bogan and Parmalee 1983, Parmalee 1967, Wilson and Clark 1914).
IMBIV16184*009 9096	*Epioblasma torulosa rangiana*	Northern Riffleshell	G2T2	S1	E	LE		Y	1973-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Riffles or shoals with current and substrate of sand and/or gravel in small to moderate-size rivers (Clarke 1981, Watters 1987).

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV16190*062 9990	*Epioblasma triquetra*	Snuffbox	G3	S1	E	LE		Y	1978-pre	G	X	Campbell Kenton	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Occurs in medium-sized streams to large rivers generally on mud, rocky, gravel, or sand substrates in flowing water (Baker 1928, Buchanan 1980, Johnson 1978, Murrary and Leonard 1962, Parmalee 1967). Often deeply buried in substrate and overlooked by collectors.
IMBIV21110*012 603	*Lampsilis abrupta*	Pink Mucket	G2	S1	E	LE		Y	1980-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati, OH, Hamilton Co.	Large rivers in habitats ranging from silt to boulders, but apparently more commonly from gravel and cobble. Collected from shallow and deep water with current velocity ranging from zero to swift (Ahlstedt 1983, Bogan and Parmalee 1983, Buchanan 1980), but never standing pools of water (Lauritsen 1987).
IMBIV21110*030 7546	*Lampsilis abrupta*	Pink Mucket	G2	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV31030*027 1740	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	1838	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Large river species that inhabits gravel and sand bars (Bogan and Parmalee 1983, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Stansbery 1976).
IMBIV31030*035 8492	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance.	

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV34020*025 1814	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1900s	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Usually found in large rivers in sand and gravel substrates (Ahlstedt 1983, Bogan and Parmalee 1983, Miller, A.C. et al. 1986).
IMBIV34030*062 3623	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1844-Pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	(Ohio River) at Cincinnati, OH.	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV34030*068 723	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV35060*038 10662	*Pleurobema clava*	Clubshell	G1G2	S1	E	LE		Y	1844-pre	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	(Ohio River) at Cincinnati, OH.	This species is an inhabitant of small streams and rivers (Goodrich and Van Der Schalie 1944; Ortmann 1919,1925), although in Kentucky it is known from moderately large rivers. Often deeply buried in the substrate and consequently difficult to find (Watters 1987).

Standard Occurrence Report

KSNPC monitored federal status species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV35240*006 3812	*Pleurobema plenum*	Rough Pigtoe	G1	S1	E	LE		Y	1800s	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati (Hamilton County).	Medium to large rivers in sand, gravel, and cobble substrates (Ahlstedt 1984, Bogan and Parmalee 1983, Clarke 1981, Neel and Allen 1964).
IMBIV39041*032 4411	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	LT		Y	1987-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, Cincinnati.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).

Extirpated from Kentucky

Freshwater Mussels

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV24020*007 11934	*Leptodea leptodon*	Scaleshell	G1G2	SX	X	LE		Y	1895-11-01	M	X	Boone	Burlington	390434N	0843812W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance.	
IMBIV47050*003 6547	*Villosa fabalis*	Rayed Bean	G2	SX	X	LE		Y	1870-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Occurs in small to medium-size rivers where it lives deeply buried in sand and gravel bound together by the roots of aquatic vegetation (Bogan and Parmalee 1983; Ortmann 1925, 1926; Parmalee 1967; Stansbery 1976). This small mussel is easy to overlook because of the habitat occupied.

Standard Occurrence Report

KSNPC monitored aquatic species within 5 miles of Airport Site 3C project in Boone County, Kentucky

Extant in Kentucky

Aquatic Snails

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMGASK5100*003 5595	*Leptoxis praerosa*	Onyx Rocksnail	G5	S3S4	S	SOMC		Y	1900-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Ohio (plotted near KY-OHIO line across from mouth of Licking River).	Call (1895) indicated that in the Ohio River at the falls it occurred in the greatest profusion where the bottom is clean rock or rock with abundant "confervoid" vegetation.

Freshwater Mussels

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV08010*012 4864	*Cumberlandia monodonta*	Spectaclecase	G3	S1	E	LE		Y	1907	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Usually found in medium to large rivers where it inhabits substrate ranging from silt to rubble and boulders in slow to swift currents of shallow to deep water (Ahlstedt 1984, Bogan and Parmalee 1983, Buchanan 1980, Nelson and Freitag 1980, Parmalee 1967). Sometimes found in or near vegetation beds, and in mud between boulders adjacent to swift water (Stansbery 1966). May become established in wing dams (Nelson and Freitag 1980).
IMBIV08010*021 2112	*Cumberlandia monodonta*	Spectaclecase	G3	S1	E	LE		Y	1895-11-01	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	

Standard Occurrence Report

KSNPC monitored aquatic species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV10020*023 2673	*Cyprogenia stegaria*	Fanshell	G1Q	S1	E	LE		Y	1980-pre	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati, OH, Hamilton Co.	Medium to large streams and rivers with moderate to strong current in coarse sand and gravel and depth ranging from shallow to deep (Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Parmalee 1967, Johnson 1980, Gordon and Layzer 1989).
IMBIV16111*006 4529	*Epioblasma obliquata obliquata*	Catspaw	G1T1	S1	E	LE		Y	1970-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Inhabits medium to large rivers in riffles, shoals, and/or deep water in swift current (Bogan and Parmalee 1983, Parmalee 1967, Wilson and Clark 1914).
IMBIV16184*009 9096	*Epioblasma torulosa rangiana*	Northern Riffleshell	G2T2	S1	E	LE		Y	1973-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Riffles or shoals with current and substrate of sand and/or gravel in small to moderate-size rivers (Clarke 1981, Watters 1987).

Standard Occurrence Report

KSNPC monitored aquatic species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV16190*062 9990	*Epioblasma triquetra*	Snuffbox	G3	S1	E	LE		Y	1978-pre	G	X	Campbell Kenton	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Occurs in medium-sized streams to large rivers generally on mud, rocky, gravel, or sand substrates in flowing water (Baker 1928, Buchanan 1980, Johnson 1978, Murrary and Leonard 1962, Parmalee 1967). Often deeply buried in substrate and overlooked by collectors.
IMBIV17120*020 1346	*Fusconaia subrotunda*	Longsolid	G3	S3S4	S			Y	1870-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati (plotted near KY-OH line across from mouth of Licking River).	Gravel bars and deep pools in large rivers and large to medium-sized streams (Ahlstedt 1984, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Parmalee 1967).
IMBIV17120*069 1344	*Fusconaia subrotunda*	Longsolid	G3	S3S4	S			Y	1895-11-01	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV21110*012 603	*Lampsilis abrupta*	Pink Mucket	G2	S1	E	LE		Y	1980-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, at Cincinnati, OH, Hamilton Co.	Large rivers in habitats ranging from silt to boulders, but apparently more commonly from gravel and cobble. Collected from shallow and deep water with current velocity ranging from zero to swift (Ahlstedt 1983, Bogan and Parmalee 1983, Buchanan 1980), but never standing pools of water (Lauritsen 1987).
IMBIV21110*030 7546	*Lampsilis abrupta*	Pink Mucket	G2	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV21130*015 3627	*Lampsilis ovata*	Pocketbook	G5	S1	E			Y	1988-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, OH.	Considered a large river species (Clench and Van Der Schalie 1944, Parmalee 1967, Stansbery 1976), but occurs in medium-sized streams in gravel, sand, or even mud (Parmalee 1967, Johnson 1970, Gordon and Layzer 1989). In the Lower Wabash and Ohio Rivers specimens were taken in deep water (6-10 feet or more) in current from sand or gravel.
IMBIV21130*041 1001	*Lampsilis ovata*	Pocketbook	G5	S1	E			Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV22020*006 1059	*Lasmigona compressa*	Creek Heelsplitter	G5	S1	E			Y	1985-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, Cincinnati, Hamilton Co., Ohio.	Generally occurs in creeks, small streams, and headwaters of larger rivers in sand, fine gravel, or mud bottoms, usually in swift water below riffles (Clarke 1981; Goodrich and Van Der Schalie 1944; Parmalee 1967; Taylor 1980a, b).
IMBIV31030*027 1740	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	1838	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Large river species that inhabits gravel and sand bars (Bogan and Parmalee 1983, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Stansbery 1976).
IMBIV31030*035 8492	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance.	

Standard Occurrence Report

KSNPC monitored aquatic species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV34020*025 1814	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1900s	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, Hamilton Co., Ohio.	Usually found in large rivers in sand and gravel substrates (Ahlstedt 1983, Bogan and Parmalee 1983, Miller, A.C. et al. 1986).
IMBIV34030*062 3623	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1844-Pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	(Ohio River) at Cincinnati, OH.	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV34030*068 723	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1895-10-30	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV35060*038 10662	*Pleurobema clava*	Clubshell	G1G2	S1	E	LE		Y	1844-pre	G	X	Kenton Campbell Boone	Covington Newport Burlington Addyston	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	(Ohio River) at Cincinnati, OH.	This species is an inhabitant of small streams and rivers (Goodrich and Van Der Schalie 1944; Ortmann 1919,1925), although in Kentucky it is known from moderately large rivers. Often deeply buried in the substrate and consequently difficult to find (Watters 1987).

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV35240*006 3812	*Pleurobema plenum*	Rough Pigtoe	G1	S1	E	LE		Y	1800s	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati (Hamilton County).	Medium to large rivers in sand, gravel, and cobble substrates (Ahlstedt 1984, Bogan and Parmalee 1983, Clarke 1981, Neel and Allen 1964).
IMBIV35250*017 9012	*Pleurobema rubrum*	Pyramid Pigtoe	G2G3	S1	E	SOMC		Y	1800s	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Inhabits medium to large rivers and usually occurs in sand or gravel bottoms in deep waters (Ahlstedt 1984, Murray and Leonard 1962, Parmalee et al. 1982).
IMBIV35250*045 1066	*Pleurobema rubrum*	Pyramid Pigtoe	G2G3	S1	E	SOMC		Y	1895-11-01	M	X	Boone	Burlington	390442N	0843807W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance, 4 mi below Cincinnati.	
IMBIV39041*032 4411	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	LT		Y	1987-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River, Cincinnati.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).
IMBIV41010*018 5881	*Simpsonaias ambigua*	Salamander Mussel	G3	S2S3	T	SOMC		Y	1985-pre	G	X	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	OHIO RIVER AT CINCINNATI.	Often found buried in substrate such as soft mud and/or gravel, and/or under flat stones in shallow water in small streams where the current may be swift (Baker 1928, Buchanan 1980, Goodrich and Van Der Schalie 1944).

Fishes

Standard Occurrence Report

KSNPC monitored aquatic species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AFCAA01020*005 8698	*Acipenser fulvescens*	Lake Sturgeon	G3G4	S1	E	SOMC		Y	1800s	G	H	Kenton Campbell	Covington Newport	390613N	0842930W	050902030201 - Town of Newport-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati. (Plotted at Hamilton-Kenton Co line).	Lakes and large rivers with a firm sand/gravel bottom (Burr and Warren 1986, Etnier and Starnes 1993).
AFCBA02010*008 7285	*Atractosteus spatula*	Alligator Gar	G3G4	S1	E	SOMC		Y	1981-pre	G	H	Campbell Kenton Boone	Newport Covington Withamsville Addyston Hooven Lawrenceburg Burlington	390457N	0843359W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River across from Hamilton Co., Ohio.	Sluggish pools and backwaters of large rivers, backwaters, and oxbow lakes (Burr and Warren 1986, Page and Burr 1991, Etnier and Starnes 1993).
AFCMA01010*002 8703	*Lota lota*	Burbot	G5	S2	S			Y	1960-04-11	M	H	Boone	Burlington	390544N	0843951W	050902030202 - Dry Creek-Ohio River	OHIO RIVER, 3.5 MI UPSTREAM OF LOCK NO 37, 2 MI DOWNSTREAM FROM CONSTANCE.	Kentucky specimens generally come from medium to large-size rivers. In the north, they inhabit cool, large and deep rivers and lakes (Becker 1983, Pflieger 1975, Scott and Crossman 1973, Smith 1979, Trautman 1981).

Amphibians

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AAAAC01011*010 8245	*Cryptobranchus alleganiensis alleganiensis*	Eastern Hellbender	G3G4T3T4	S1	E	SOMC		Y	1904-08-22	G	X?	Kenton Campbell	Covington Newport	390548N	0843216W	050902030201 - Town of Newport-Ohio River 051001011306 - DeCoursey Creek-Licking River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati, OH.	Confined to running waters of fairly large streams and rivers, especially in stretches with large flat stones.

Extirpated from Kentucky

Freshwater Mussels

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV24020*007 11934	*Leptodea leptodon*	Scaleshell	G1G2	SX	X	LE		Y	1895-11-01	M	X	Boone	Burlington	390434N	0843812W	050902030202 - Dry Creek-Ohio River	Ohio River, Constance.	

Standard Occurrence Report

KSNPC monitored aquatic species within 5 miles of Airport Site 3C project in Boone County, Kentucky

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV47050*003 6547	*Villosa fabalis*	Rayed Bean	G2	SX	X	LE		Y	1870-pre	G	X	Kenton Campbell Boone	Covington Newport Addyston Burlington	390524N	0843115W	050902030201 - Town of Newport-Ohio River 050902011208 - Ninemile Creek-Ohio River 050902030204 - Garrison Creek-Ohio River 050902030202 - Dry Creek-Ohio River	Ohio River at Cincinnati.	Occurs in small to medium-size rivers where it lives deeply buried in sand and gravel bound together by the roots of aquatic vegetation (Bogan and Parmalee 1983; Ortmann 1925, 1926; Parmalee 1967; Stansbery 1976). This small mussel is easy to overlook because of the habitat occupied.

USACE and KyDOW Coordination

THIS PAGE INTENTIONALLY LEFT BLANK

REDWING
ECOLOGICAL SERVICES, INC.
1139 South Fourth Street • Louisville, KY 40203 • Phone 502.625.3009 • Fax 502.625.3077

March 3, 2016

Mr. David Baldridge
Chief, South Section Regulatory Branch
U.S. Army Corps of Engineers
Louisville District
600 Dr. Martin Luther King, Jr. Place
Louisville, Kentucky 40202

Ms. Stephanie Hayes
Supervisor, Water Quality Section
Kentucky Division of Water
200 Fair Oaks Lane, Fourth Floor
Frankfort, Kentucky 40601

Subject: Preconstruction Notification for Nationwide Permit 39 and Request for General Section 401 Water Quality Certification Concurrence
Airport Site 3C
Boone County, Kentucky
Redwing Project No.: 15-171

Dear Mr. Baldridge and Ms. Hayes:

On behalf of the Kenton County Airport Board (KCAB), Redwing Ecological Services, Inc. (Redwing) is pleased to submit this Preconstruction Notification (PCN) and Request for Waiver for Nationwide Permit (NWP) 39 with the U.S. Army Corps of Engineers (USACE) in support of the proposed Airport Site 3C located east of the Cincinnati Airport in Boone County, Kentucky, and to request concurrence that this project meets the Kentucky Division of Water (KDOW) conditions of the general Water Quality Certification under NWP 39. The 25-acre site is located northeast of the intersection of Donaldson Highway and Point Pleasant Road in Boone County, Kentucky. (Figures 1 and 2).

Existing habitats on site consist primarily of upland woods, and maintained open field (Figure 2). The project site is located immediately south of I-275 and 2.6 miles northwest of I-71/75 near Erlanger, Kentucky. It is bound by Donaldson Highway to the west, Point Pleasant Road to the south, and I-275 to the east. Jurisdictional waters of the U.S. at the site include three ephemeral streams totaling 870 linear feet (0.043 acre) and 0.088 acre of wetland (Figure 3). The proposed project will result in unavoidable impacts to 795 linear feet (0.033 acre) of ephemeral stream and 0.085 acre of wetland (Figure 4). This report discusses the water/wetland delineation and serves as the PCN for permanent impacts to water/wetland features onsite (Figure 4).

REQUIRED INFORMATION

The following information is submitted as a PCN under NWP 39 in support of the above-mentioned project, per guidance in the Federal Register (Vol. 77, No. 34, Tuesday, February 21, 2012).

1. *Name, address, and telephone number of prospective permittee.*

Permittee:
Kenton County Airport Board
Attn: Ms. Candace S. McGraw
Cincinnati/Northern Kentucky International Airport
P.O. Box 752000
Cincinnati, Ohio 45275-2000
(859) 767-7021
dconrad@cvgairport.com

Represented by:
Redwing Ecological Services, Inc.
Attn: Ms. Kiersten Fuchs
1139 South Fourth Street
Louisville, Kentucky 40203
(502) 625-3009
kfuchs@redwingeco.com

2. *Location of proposed project.*

The 25-acre site is located northeast of the intersection of Donaldson Highway and Point Pleasant Road and just east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky (Figure 1). It is bound by a combination of residential, commercial and industrial development to the south and east, by an Airport employee parking lot to the north and by airport facilities to the west (Figure 2).

3. *Description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permits(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity.*

The purpose of this project is to develop airport land that is currently underutilized and to provide additional revenue to the KCAB. The project will involve constructing a warehouse/distribution facility enclosing approximately 264,000 square feet with associated parking, infrastructure, and stormwater detention facilities. The building site is approximately 16 acres and the remaining nine acres of the site will be disturbed during the grading work.

Jurisdictional water/wetland features will be impacted in order to fully utilize the site. In order to minimize impacts onsite, Wetland 3 will be avoided. Silt fencing, sediment traps, and other appropriate Best Management Practices will be implemented to minimize indirect impacts during construction. Jurisdictional impacts are shown on Figure 4 and summarized in the table below.

Feature	Impact Length (ft)	Area of Impact (ac)	Impact Type	Status
Ephemeral Stream 1	25	0.0004	Fill	Jurisdictional
Ephemeral Stream 2	275	0.009	Fill	Jurisdictional
Ephemeral Stream 3	495	0.023	Fill	Jurisdictional
Wetland 1	---	0.049	Fill	Jurisdictional
Wetland 2	---	0.036	Fill	Jurisdictional
Wetland 3	---	0	---	
Total Jurisdictional Impact	795	0.118		

The KCAB is requesting concurrence from the KDOW that this project meets the conditions of the general Water Quality Certification under the NWP 39. The KCAB is also requesting a waiver from KDOW Floodplain Management Section for a Stream Construction Permit because the watershed above the project is less than a square mile. An Application for Permit to Construct Across or Along a Stream and/or Water Quality Certification is provided as Appendix A.

1. *Name, address, and telephone number of prospective permittee.*

Permittee:
Kenton County Airport Board
Attn: Ms. Candace S. McGraw
Cincinnati/Northern Kentucky International Airport
P.O. Box 752000
Cincinnati, Ohio 45275-2000
(859) 767-7021
dconrad@cvgairport.com

Represented by:
Redwing Ecological Services, Inc.
Attn: Ms. Kiersten Fuchs
1139 South Fourth Street
Louisville, Kentucky 40203
(502) 625-3009
kfuchs@redwingeco.com

2. *Location of proposed project.*

The 25-acre site is located northeast of the intersection of Donaldson Highway and Point Pleasant Road and just east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky (Figure 1). It is bound by a combination of residential, commercial and industrial development to the south and east, by an Airport employee parking lot to the north and by airport facilities to the west (Figure 2).

3. *Description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permits(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity.*

The purpose of this project is to develop airport land that is currently underutilized and to provide additional revenue to the KCAB. The project will involve constructing a warehouse/distribution facility enclosing approximately 264,000 square feet with associated parking, infrastructure, and stormwater detention facilities. The building site is approximately 16 acres and the remaining nine acres of the site will be disturbed during the grading work.

Jurisdictional water/wetland features will be impacted in order to fully utilize the site. In order to minimize impacts onsite, Wetland 3 will be avoided. Silt fencing, sediment traps, and other appropriate Best Management Practices will be implemented to minimize indirect impacts during construction. Jurisdictional impacts are shown on Figure 4 and summarized in the table below.

Feature	Impact Length (ft)	Area of Impact (ac)	Impact Type	Status
Ephemeral Stream 1	25	0.0004	---	Jurisdictional
Ephemeral Stream 2	275	0.009	Fill	Jurisdictional
Ephemeral Stream 3	495	0.023	Fill	Jurisdictional
Wetland 1	---	0.049	Fill	Jurisdictional
Wetland 2	---	0.036	Fill	Jurisdictional
Wetland 3	---	0	---	
Total Jurisdictional Impact	795	0.118		

The KCAB is requesting concurrence from the KDOW that this project meets the conditions of the general Water Quality Certification under the NWP 39. The KCAB is also requesting a waiver from KDOW Floodplain Management Section for a Stream Construction Permit because the watershed above the project is less than a square mile. An Application for Permit to Constrict Across or Along a Stream and/or Water Quality Certification is provided as Appendix A.

4. *Delineation of special aquatic and other waters of U.S. on the project site.*

Jurisdictional waters of the U.S., including wetlands, were delineated on the project site by Redwing wetland scientists on February 17, 2016. The study methodology and results of the delineation are discussed below.

METHODOLOGY

The wetland delineation was accomplished through documentation of the presence/absence of hydric soils, wetland hydrology, and hydrophytic vegetation, per the guidelines of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont – Version 2.0* (April 2012). Soil, hydrology, and vegetation data were collected on Routine Wetland Determination Data Forms at nine points throughout the project site (Figure 3). These wetland data forms are provided as Appendix B. The identification of open waters, such as streams and ponds, was made based on the presence/absence of an ordinary high water mark (OHWM), defined bed and bank features, and flow regime. A Preliminary Jurisdictional Determination Form is provided as Appendix C.

RESULTS

Jurisdictional water/wetland features delineated at the site include three ephemeral streams totaling 870 linear feet (0.043 acre), and three wetlands (0.008 acre). The water/wetland features are depicted on Figure 3 and described in more detail below.

Feature	Length (ft)	Area (ac)	Status
Ephemeral Stream 1	25	0.0004	Jurisdictional
Ephemeral Stream 2	315	0.018	Jurisdictional
Ephemeral Stream 3	530	0.024	Jurisdictional
Ephemeral Stream Total	**870**	**0.043**	Jurisdictional
Wetland 1	---	0.049	Jurisdictional
Wetland 2	---	0.036	Jurisdictional
Wetland 3	---	0.003	
Wetland Total	---	**0.088**	
TOTAL JURISDICTIONAL WATERS	**870**	**0.131**	

Ephemeral Streams: Three ephemeral streams were identified during the field assessment, and are located high in the watershed on the property.

Ephemeral Stream 1 is located near the eastern corner of the site and acts as a drainage for Wetland 1. Ephemeral Stream 1 measures 25 linear feet (0.0004 acre), is six to twelve inches wide, with bank heights of six inches. The substrate is primarily composed of silt and gravel. Up to half an inch of water was observed in the channel during the delineation. Ephemeral Stream 1 is considered jurisdictional due to its connection to the offsite interstate right-of-way drainage system.

Ephemeral Stream 2 is part of the main drainage located within the eastern portion of the site and is connected to Wetland 2. Ephemeral Stream 2 measures 315 linear feet (0.018 acre), is two to three feet wide, with bank heights ranging from three to six inches. The substrate is composed primarily of silt, gravel, and cobble.

One to two inches of water was observed in low-lying areas within the channel from a recent rainfall and snow melt during the field assessment. Ephemeral Stream 2 is considered to be jurisdictional due to its direct connection to downstream waters.

Ephemeral Stream 3 is a small stream that is located in the western portion of the site. Ephemeral Stream 3 flows for approximately 530 linear feet (0.024 acre) before it exits the property to the northwest. The stream is one to three feet wide, with bank heights ranging from six inches to 3 feet. The substrate is composed entirely of silt and gravel. During the site visit, up to two inches of water was observed in the channel. Ephemeral Stream 3 is considered to be jurisdictional due to its direct connection to downstream waters.

Wetlands: Three wetlands totaling 0.088 acre were identified during the delineation.

Wetland 1 (0.049 acre) is an emergent wetland located near the southeastern project boundary. Wetland 1 drains into the interstate right-of-way and is considered jurisdictional.

Wetland 2 (0.036 acre) is an emergent and scrub/shrub wetland located in the central portion of the site. Due to the connection to downstream waters via Ephemeral Stream 2, Wetland 2 is considered to be jurisdictional.

Wetland 3 (0.003 acre) is a forested wetland located near the northwest corner of the site. Wetland 3 appears to have formed within a former drainage swale that has been blocked, allowing for the area to hold water. Wetland 3 is considered jurisdictional by overland flow to an offsite drainage ditch.

General site characteristics of soil, hydrology, and vegetation for the project site are discussed below.

Soils: The Soil Survey Geographic Database for Boone, Campbell, and Kenton Counties, Kentucky maps the property as being underlain by Rossmoyne silt loam, Jessup silt loam, and Cynthiana flaggy silty clay loam (Figure 5). None of these soils are listed on the Boone County Hydric Soils List. Hydric soil indicators were observed at four data points within or adjacent to the wetlands, and included the depleted matrix (F3) hydric soil indicator.

Hydrology: The project site primarily drains to the west and north along Ephemeral Streams 1 and 2. The main sources of hydrology are precipitation and surface runoff from adjacent uplands. Indicators of wetland hydrology were observed at seven data points, and included surface water, high water table, saturation, water-stained leaves and sparsely vegetated concave surface. The study area is not located within the 100-Year floodplain (Figure 6).

Vegetation: The site consists primarily of upland woods and maintained open field. Common species observed in the maintained open field include fescue (*Schedonorus arundinaceus*), Kentucky bluegrass (*Poa pratensis*), field garlic (*Allium vineale*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica),* teasel (*Dipsacus fullonum*), and wingstem (*Verbesina alternifolia*). These species are listed as facultative upland (FACU), and facultative (FAC) in the National Wetland Plant List (NWPL-Lichvar et al. 2014).

Dominant species found within the upland woods include black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), box elder (*Acer negundo*), bush honeysuckle (*Lonicera maackii*), Japanese honeysuckle, honey locust (*Gleditsia triacanthos*), white ash (*Fraxinus americana*), garlic mustard (*Alliaria petiolata*), field garlic, sugar maple (*Acer saccharum*), and tulip tree (*Liriodendron tulipifera*). These species are listed as upland (UPL), FACU, and FAC in the NWPL (2014).

Dominant species found within the emergent, scrub/shrub and forested wetlands include green bulrush (*Scirpus atrovirens*), Frank's sedge (*Carex frankii*), fescue, rough barnyard grass (*Echinochloa muricata*), creeping bentgrass (*Agrostis alba*), black willow (*Juglans nigra*), and sycamore (*Platanus occidentalis*). These species are listed as FACU, facultative wetland (FACW) and obligate wetland (OBL) in the NWPL (2014).

5. *Discussion of compensatory mitigation proposal that offsets unavoidable losses of waters of the United States or justification explaining why compensatory mitigation should not be required*.

Impacts to jurisdictional waters associated with the proposed project include 795 linear feet (0.033 acre) of ephemeral stream, and 0.085 acre wetland (Figure 4). Impacts to the on-site ephemeral streams will be mitigated through the project's stormwater management system. The mitigation required for wetland impacts is summarized in the following table.

Wetland	Acreage	Mitigation Ratio	Mitigation Required
1	0.049	2:1	0.1 acre
2	0.036	2:1	0.07 acre
Total	**0.085**		**0.17 acre**

Compensation for the wetland impacts will be provided through the purchase of 0.17 acre of wetland mitigation credit of the appropriate habitat type from an approved mitigation bank or in-lieu fee program.

6. *Identification of threatened/endangered species or critical habitat potentially affected by the proposed work.*

Potential impacts to federally-listed species as a result of the proposed project were evaluated during an ecological assessment of the project site, conducted in conjunction with the water/wetland delineation. Based on a review of occurrence records from the U.S. Fish and Wildlife Service (USFWS), federally-listed species that are known to occur in Boone County are summarized in the following table.

Scientific Name	Common Name	Status	Habitat Present?	Species Present?
Mammals				
Myotis sodalis	Indiana Bat	E	Potential Summer	Unknown
Myotis septentrionalis	Northern Long-Eared Bat	T	Potential Summer	Unknown
Mussels				
Cyprogenia stegaria	Fanshell	E	No	No
Lampsilis abrupta	Pink Mucket	E	No	No
Obovaria retusa	Ring Pink	E	No	No
Plethobasus cooperianus	Orangefoot Pimpleback	E	No	No
Plethobasus cyphyus	Sheepnose	E	No	No
Pleurobema clava	Clubshell	E	No	No
Pleurobema plenum	Rough Pigtoe	E	No	No
Plants				
Trifolium stoloniferum	Running Buffalo Clover	E	No	No

E = Federally Endangered; T = Federally Threatened

Potential impacts to federally listed species as a result of the proposed project were evaluated during a habitat assessment of the project site conducted concurrently with the delineation. During the assessment, no caves, abandoned mines, sinkholes, bridges, culverts, or other cave-like features were identified at the site that provide potential roosting habitat or hibernacula for the gray, Indiana, or northern long-eared bats. The mature woods habitat was identified as suitable summer roosting, foraging, and commuting habitat for the Indiana and northern long-eared bats. The project is located within an area designated by the USFWS as “Potential” habitat for these species, and the project is not located within 0.25 mile of a known hibernaculum or 150 feet of a known maternity roost tree for the northern long-eared bat. No suitable gray bat foraging habitat is present on site.

The ephemeral streams onsite do not represent habitat for the federally-listed mussel species based on the lack of flow regime and unsuitable substrate. The site also lacks suitable habitat for running buffalo clover. Based on the results of the habitat assessment, no adverse effects to the federally listed plant species are anticipated as a result of the project.

Approximately 10 acres of suitable summer habitat for the Indiana and northern long-eared bats will be cleared for the project, which could result in direct effects to these species. The KCAB is proposing clearing this habitat during the occupied period (April 1 – October 14), with the exception of June and July when clearing of bat habitat is prohibited. The KCAB will mitigate for direct effects to the Indiana bat through a voluntary payment to the Imperiled Bat Conservation Fund, utilizing the process set forth within the *Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (April 2015). Incidental take of the northern long-eared bat from the proposed project is not prohibited under Section 4(d) of the ESA for this species; therefore, direct and cumulative effects to the northern long-eared bat will be addressed under the final 4(d) rule for this species. Consultation with the USFWS will be initiated in conjunction with this PCN submittal.

7. *Identification of historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places.*

A Phase I Archaeological and Cultural Historic Resource survey of the site has been conducted. The report summarizing the results of the survey has been submitted to the State Historic and Preservation Office (SHPO) for review. The results of the SHPO review will be forwarded to the USACE.

SUMMARY

This report serves as Preconstruction Notification under NWP 39 for the industrial development of the approximately 25-acre Airport Site 3C in Boone County, Kentucky. The proposed project will result in impacts to approximately 795 linear feet (0.033 acre) of ephemeral stream, and 0.085 acre of wetland. Mitigation for wetland impacts will be accomplished through the purchase of 0.17 acre of wetland credit from an approved wetland mitigation bank or in-lieu fee program. Ephemeral stream impacts will be mitigated using the stormwater collection system for the site.

No adverse effects to threatened/endangered species are anticipated as a result of the project, with the exception of the Indiana bat. Direct effects to this species are anticipated from the project due to the loss of “Potential” habitat. Mitigation for these direct effects is proposed through a voluntary payment to the Imperiled Bat Conservation Fund. An archaeological/cultural historic resource survey has been conducted and is currently being reviewed by the State Historic and Preservation Office. The result of the review will be forwarded to the USACE once completed.

We respectfully request your concurrence with the applicability of a NWP 39 and general Water Quality Certification under NWP 39 for the proposed project. Please contact Bridget Carnahan or Kiersten Fuchs at (502) 625-3009 with any questions regarding this submittal or the overall project.

Sincerely,

Bridget G. Carnahan
Staff Biologist

Kiersten R. Fuchs
Principal
Senior Wildlife Biologist

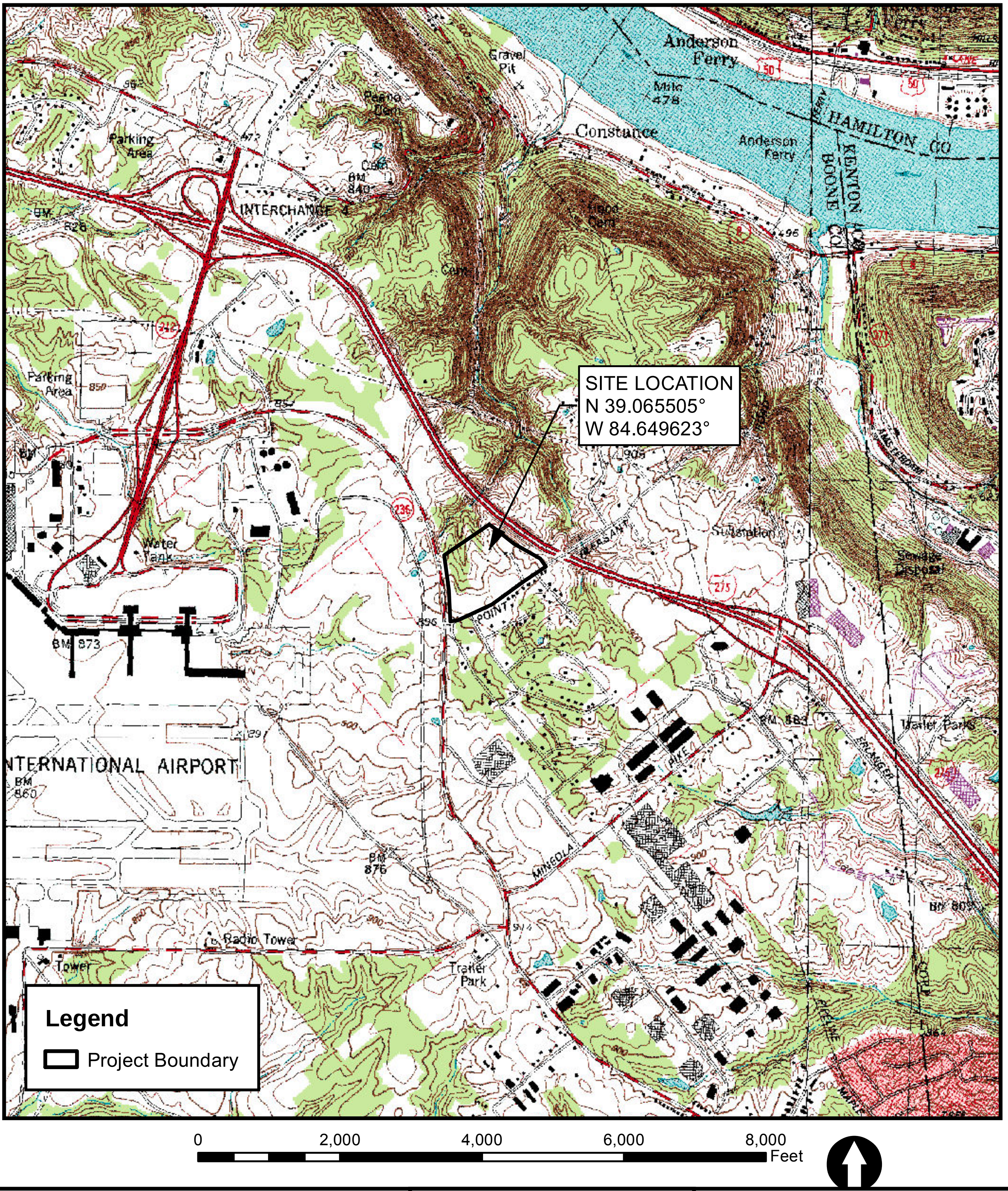
P:\2015 Projects\15-171-Airport Site 3C\Reports\PCN\Airport Site 3C_PCN.doc

cc: Mr. Scott Strine – Dermody Properties
Ms. Debbie Conrad – Kentucky County Airport Board

Attachments:
- Figures
- Photographs
- Appendix A – KDOW Water Quality Certification Application
- Appendix B – Wetland Determination Data Forms
- Appendix C – Preliminary Jurisdictional Determination Form

FIGURES

Source: USGS 7.5-minute Topographic Map, Burlington and Covington, Kentucky Quadrangles.



SITE LOCATION
N 39.065505°
W 84.649623°

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REDWING
ECOLOGICAL SERVICES, INC.

SITE LOCATION MAP

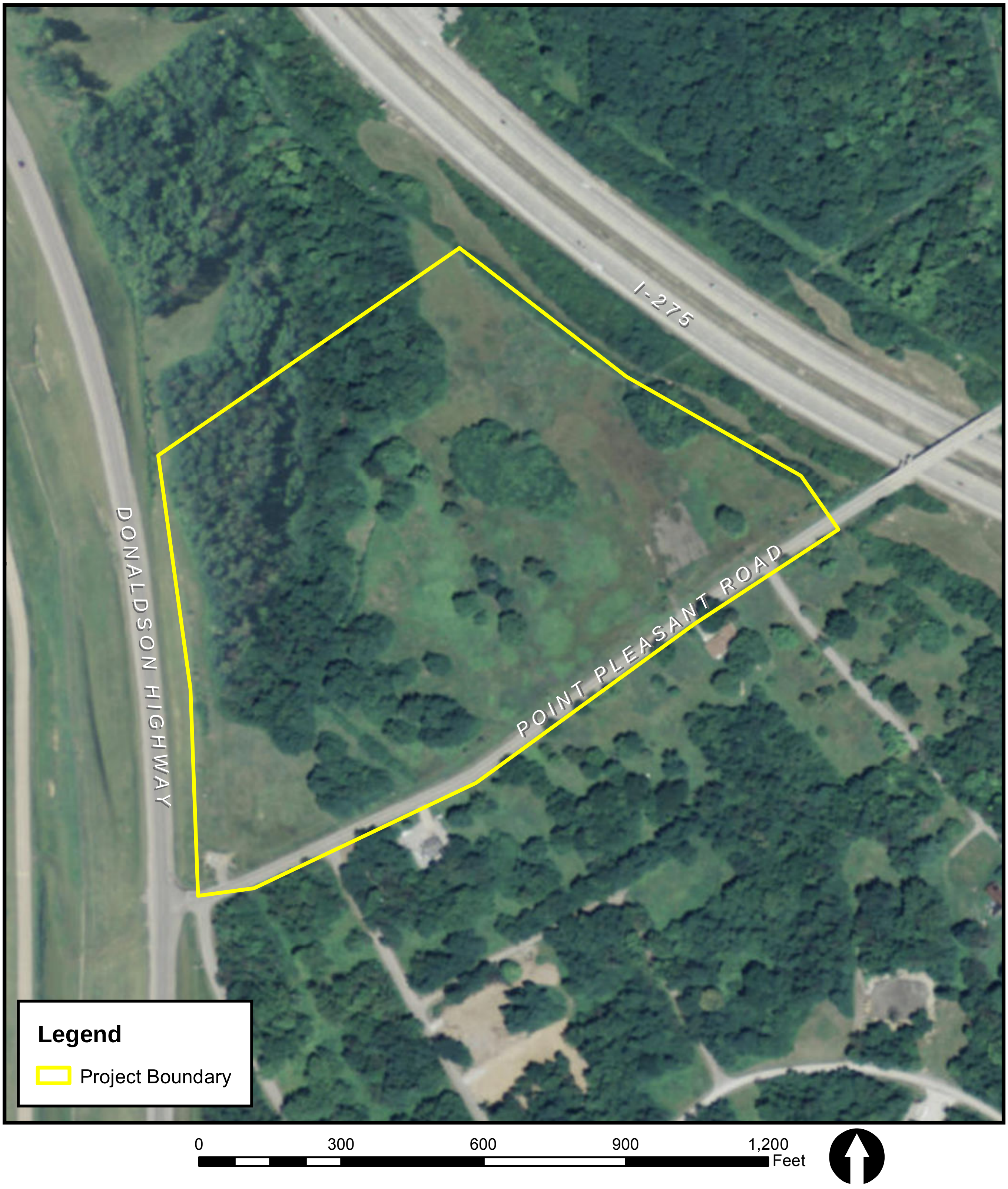
REVISED DATE: 02-15-16

DRAWN BY: BGC

FIGURE 1

P:\2015 Projects\15-171-Airport Site 3C\Figures\Site Location Map.mxd, 02-22-2016, ebowman

Source: World Imagery - Esri and the GIS User Community (2014).



AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REDWING
ECOLOGICAL SERVICES, INC.

AERIAL PHOTOGRAPH MAP

REVISED DATE: 02-15-16

DRAWN BY: BGC

FIGURE 2

P:\2015 Projects\15-171-Airport Site 3C\Figures\Aerial.mxd, 02-22-2016, ebowman

Source: World Imagery - Esri and the GIS User Community (2014); Linework provided by Viox & Viox.

Feature	Length (feet)	Area (acre)	Regulatory Status
Ephemeral Stream 1	25	0.0004	Jurisdictional
Ephemeral Stream 2	315	0.018	Jurisdictional
Ephemeral Stream 3	530	0.024	Jurisdictional
Total Ephemeral Stream	**870**	**0.043**	
Wetland 1	---	0.049	Jurisdictional
Wetland 2	---	0.036	Jurisdictional
Wetland 3		0.003	Jurisdictional
Total Wetland	**---**	**0.088**	
TOTAL JURISDICTIONAL WATERS	**870**	**0.131**	

Legend

- ▭ Project Boundary
- ━ Jurisdictional Ephemeral Stream
- ▨ Jurisdictional Wetland
- ● Wetland Determination Data Point

NOTE: A WATER/WETLAND DELINEATION WAS CONDUCTED BY REDWING WETLAND SCIENTISTS ON FEBRUARY 17, 2016. THESE BOUNDARIES HAVE NOT BEEN VERIFIED BY THE U.S. ARMY CORPS OF ENGINEERS. USE OF THIS MAP IS FOR PRELIMINARY PLANNING PURPOSES ONLY.

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 02-22-16 | DRAWN BY: BGC/EDB

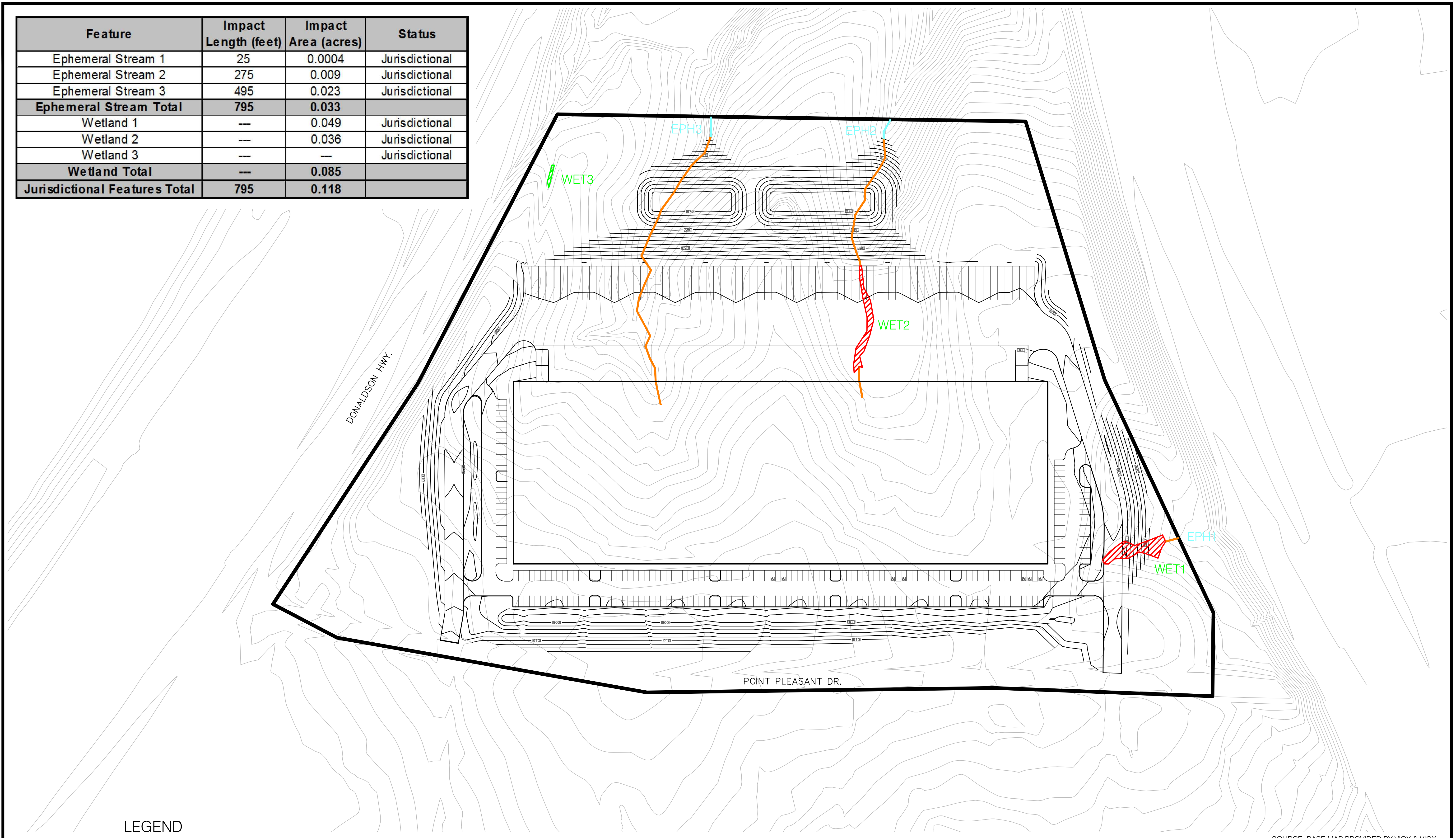
REDWING
ECOLOGICAL SERVICES, INC.

WATER/WETLAND
LOCATION MAP

FIGURE 3

P:\2015 Projects\15-171-Airport Site 3C\Figures\WaterWetland Map.mxd, 02-22-2016, ebowman

Feature	Impact Length (feet)	Impact Area (acres)	Status
Ephemeral Stream 1	25	0.0004	Jurisdictional
Ephemeral Stream 2	275	0.009	Jurisdictional
Ephemeral Stream 3	495	0.023	Jurisdictional
Ephemeral Stream Total	**795**	**0.033**	
Wetland 1	---	0.049	Jurisdictional
Wetland 2	---	0.036	Jurisdictional
Wetland 3	---	---	Jurisdictional
Wetland Total	**---**	**0.085**	
Jurisdictional Features Total	**795**	**0.118**	



SOURCE: BASE MAP PROVIDED BY VIOX & VIOX.

LEGEND

- ▬ PROJECT BOUNDARY
- ▬ EPHEMERAL STREAM
- ▬ PROPOSED EPHEMERAL STREAM IMPACT
- ▨ JURISDICTIONAL WETLAND
- ▨ PROPOSED JURISDICTIONAL WETLAND IMPACT

NOTE: JURISDICTIONAL WATER/WETLAND BOUNDARIES WERE DELINEATED AND SURVEYED USING GLOBAL POSITIONING SYSTEM EQUIPMENT BY REDWING WETLAND SCIENTISTS ON FEBRUARY 17, 2016. THESE BOUNDARIES HAVE NOT BEEN VERIFIED BY THE U.S. ARMY CORPS OF ENGINEERS. USE OF THIS MAP IS FOR PRELIMINARY PLANNING PURPOSES ONLY.

150 75 0 150
SCALE IN FEET

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 03-02-16
DRAWN BY: EDB

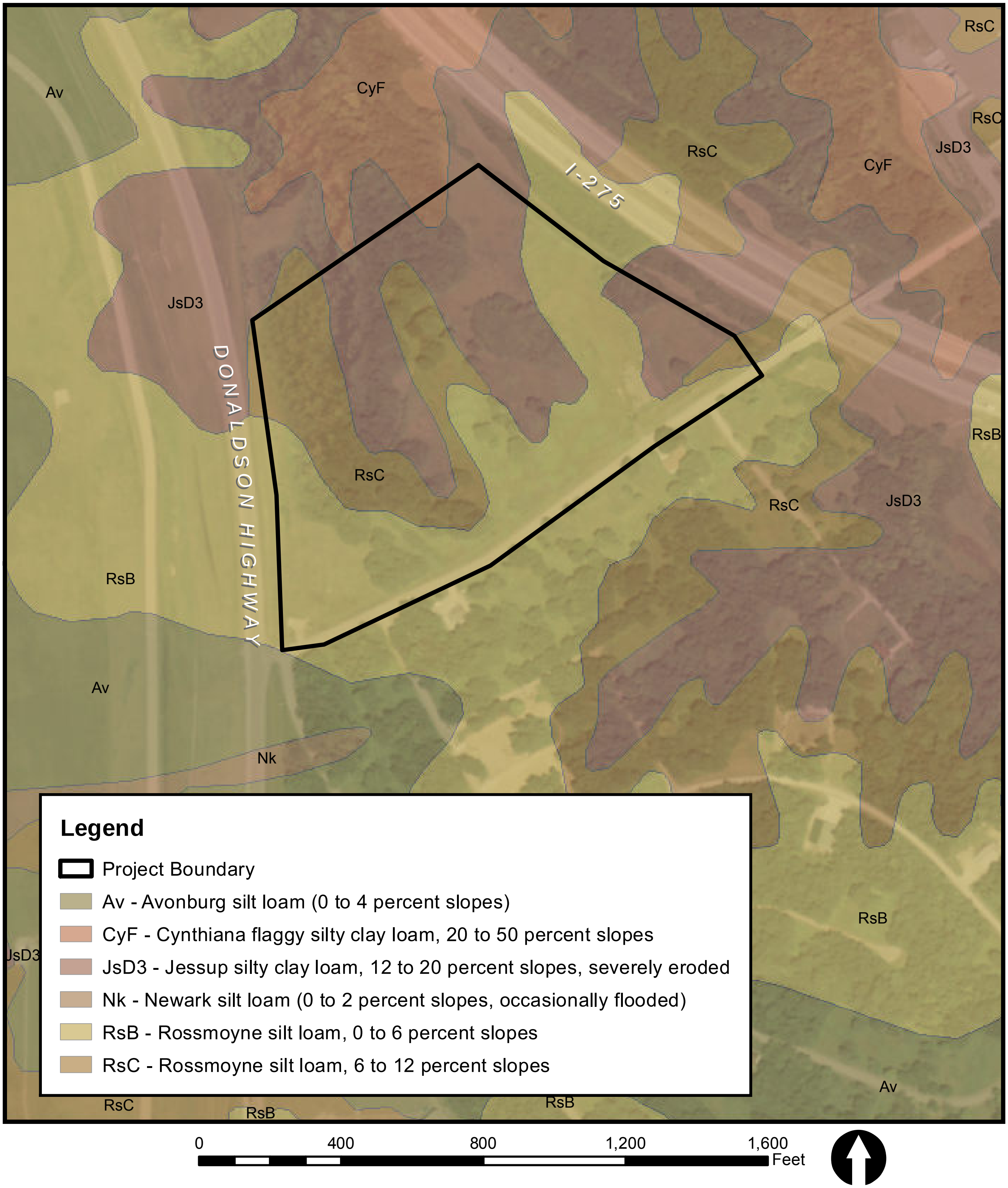
REDWING
ECOLOGICAL SERVICES, INC.

SITE DEVELOPMENT
PLAN

FIGURE 4

P:\2015 Projects\15-171-Airport Site 3C\Figures\RW-15-171-Site Plan , Site Plan, Eric Bowman, 3/3/2016 1:48 PM

Source: World Imagery - Esri and the GIS User Community (2014); Soil Survey Geographic (SSURGO) database for Boone, Campbell, and Kenton Counties, Kentucky (2014).



AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REDWING
ECOLOGICAL SERVICES, INC.

SOIL SURVEY MAP

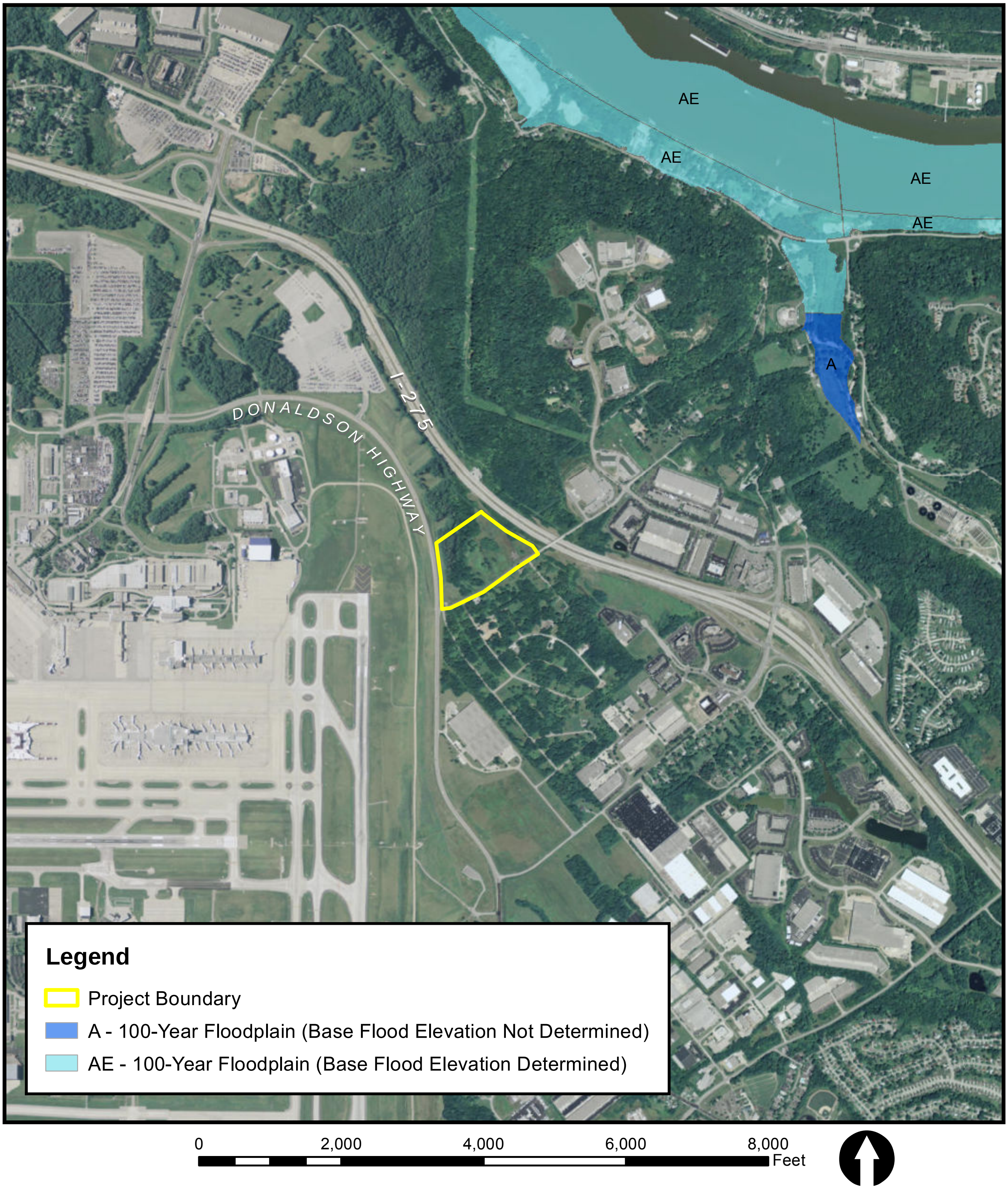
REVISED DATE: 02-16-16

DRAWN BY: BGC

FIGURE 5

P:\2015 Projects\15-171-Airport Site 3C\Figures\Soils Map.mxd, 02-22-2016, bborries

Source: World Imagery - Esri and the GIS User Community (2014); FEMA Q3 Flood Data (2012).



AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 02-15-16

DRAWN BY: BGC

REDWING
ECOLOGICAL SERVICES, INC.

FEMA FLOODPLAIN MAP

FIGURE 6

P:\2015 Projects\15-171-Airport Site 3C\Figures\FEMA.mxd, 02-22-2016, ebowman

PHOTOGRAPHS

Photograph 1: Upland woods habitat located across the project site. February 17, 2016.

Photograph 2: Maintained open field located across the project site. February 17, 2016.

Photograph 3: View of the recently cleared powerline right-of-way, located along the northern boundary of the project site. February 17, 2016.

Photograph 4: View of scrub/shrub habitat located east of Wetland 2 and Ephemeral Stream 2. This habitat is not considered suitable bat habitat. February 17, 2016.

Photograph 5: View of Ephemeral Stream 1 which drains Wetland 1 and flows towards the Interstate 275 right-of-way. February 17, 2016.

Photograph 6: View of the upstream portion of Ephemeral Stream 2, located in the central portion of the site. February 17, 2016.

Photograph 7: View of the downstream portion of Ephemeral Stream 2. February 17, 2016.

Photograph 8: View of Ephemeral Stream 3, located in the western portion of the site. February 17, 2016.

Photograph 9: Wetland 1 is an emergent wetland located south of Ephemeral Stream 1. February 17, 2016.

Photograph 10: View of the emergent wetland portion of Wetland 2. February 17, 2016.

Photograph 11: View of the scrub/shrub portion of Wetland 2. February 17, 2016.

Photograph 12: Wetland 3 is a small forested wetland located near the northwest corner of the site. February 17, 2016.

APPENDIX A

KDOW WATER QUALITY CERTIFICATION APPLICATION

COMMONWEALTH OF KENTUCKY
ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER

APPLICATION FOR PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM AND / OR WATER QUALITY CERTIFICATION

Chapter 151 of the Kentucky Revised Statutes requires approval from the Division of Water prior to any construction or other activity in or along a stream that could in any way obstruct flood flows or adversely impact water quality. *If the project involves work in a stream, such as bank stabilization, dredging or relocation, you will also need to obtain a 401 Water Quality Certification (WQC) from the Division of Water.* This completed form will be forwarded to the Water Quality Branch for WQC processing. The project may not start until all necessary approvals are received from the KDOW. For questions concerning the WQC process, contact the WQC section at 502/564-3410.

If the project will disturb one or more acres of land, or if the project is part of a larger common plan of development or sale that ultimately will disturb one or more acres, you will also need to complete a Notice of Intent for general permit coverage for storm water discharges associated with construction activities (NOI-SWCA). This general permit will require you to create and implement an erosion control plan for the project. You may find the forms for Kentucky Pollution Discharge Elimination System (KPDES) at the KPDES Web site http://www.water.ky.gov/homepage_repository/kpdes_permit_aps.htm. Return forms to the Floodplain Management Section of the KDOW.

1. **OWNER:** Kenton County Airport Board, Candace McGraw, CEO
   Give name of person(s), company, governmental unit, or other owner of proposed project.
   MAILING ADDRESS: P.O. Box 752000, Cincinnati, Ohio 45275
   TELEPHONE #: 859-767-7021 **EMAIL:** dconrad@cvgairport.com
2. **AGENT:** Kiersten Fuchs
   Give name of person(s) submitting application, if other than owner.
   ADDRESS: 1139 South 4th Street, Louisville, Kentucky 40203
   TELEPHONE #: 502-625-3009 **EMAIL:** kfuchs@redwingeco.com
3. **ENGINEER:** Alison Chadwell **P.E. NUMBER:** 25712
   Contact Division of Water if waiver can be granted.
   TELEPHONE #: 859-727-3293 **EMAIL:** achadwell@vioxinc.com
4. **DESCRIPTION OF CONSTRUCTION:** The construction of a 264,000 square foot industrial warehouse building with associated roads, utilities, parking, and required detention areas. The proposed project will impact approximately 795 linear feet of ephemeral stream and 0.085 acre of wetland.
   Describe the type and purpose of construction and describe stream/wetland impact
5. **COUNTY:** Boone **NEAREST COMMUNITY:** Erlanger
6. **USGS QUAD NAME** Burlington **LATITUDE/LONGITUDE:** 39.065505 N / 84.649623 W
7. **STREAM NAME:** Ephemeral Streams 1, 2 and 3 **WATERSHED SIZE (in acres):** 24 ac
8. **LINEAR FEET OF STREAM IMPACTED AND/OR ACRES OF WETLAND IMPACT:** 795 linear feet (0.033 ac) ephemeral stream and 0.085 acre of wetland.
9. **DIRECTIONS TO SITE:** From I-71/75 in Erlanger, take Exit 184 (Erlanger KY-236). Turn left at the end of the exit ramp on KY-236 west (Donaldson Hwy). Travel approximately 2.9 miles and turn right onto Point Pleasant Road. The site is located immediately northeast of the intersection of Donaldson Hwy and Point Pleasant Road.

10. **IS ANY PORTION OF THE REQUESTED PROJECT NOW COMPLETE?** ☐Yes ☑No If yes, identify the completed portion on the drawings you submit and indicate the date activity was completed. DATE: __________

11. **ESTIMATED BEGIN CONSTRUCTION DATE:** Summer 2016

12. **ESTIMATED END CONSTRUCTION DATE:** Spring 2017

13. **HAS AN APPLICATION BEEN SUBMITTED TO THE US ARMY CORPS of ENGINEERS?** ☑Yes ☐No
Concurrently

14. **AN APPLICANT FOR A PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM MUST ADDRESS PUBLIC NOTICE:**

(a) PUBLIC NOTICE HAS BEEN GIVEN FOR THIS PROPOSAL BY THE FOLLOWING MEANS:
☐ Public notice in newspaper having greatest circulation in area (provide newspaper clipping or affidavit)
☐ Adjacent property owner(s) affidavits (Contact Division of Water for requirements.)

(b) ☑ **I REQUEST WAIVER OF PUBLIC NOTICE BECAUSE:**
The project site is less than 1 mi^2 watershed in size.

Contact Division of Water for requirements.

* **PUBLIC NOTICE FOR 401 WATER QUALITY CERTIFICATIONS IS GOVERNED BY 401 KAR 9:010**

15. **I HAVE CONTACTED THE FOLLOWING CITY OR COUNTY OFFICIALS CONCERNING THIS PROJECT:**

Give name and title of person(s) contacted and provide copy of any approval city or county may have issued.

16. **LIST OF ATTACHMENTS:** Attached Request for NWP 39/General Section 401 WQC application package
List plans, profiles, or other drawings and data submitted. Attach a copy of a 7.5 minute USGS topographic map clearly showing the project location.

17. **I,** Candace S McGraw **(owner) CERTIFY THAT THE OWNER OWNS OR HAS EASEMENT RIGHTS ON ALL PROPERTY ON WHICH THIS PROJECT WILL BE LOCATED OR ON WHICH RELATED CONSTRUCTION WILL OCCUR (for dams, this includes the area that would be impounded during the design flood).**

18. **REMARKS:** __________

I hereby request approval for construction across or along a stream as described in this application and any accompanying documents. To the best of my knowledge, all the information provided is true and correct.

SIGNATURE: __________
Owner or Agent sign here. (If signed by Agent, a Power of Attorney should be attached.)

DATE: 3/3/2016

SIGNATURE OF LOCAL FLOODPLAIN COORDINATOR:

Permit application will be returned to applicant if not properly endorsed by the local floodplain coordinator.

DATE: __________

SUBMIT APPLICATION AND ATTACHMENTS TO:

Floodplain Management Section
Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

APPENDIX B

WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C City/County: Boone Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board State: Kentucky Sampling Point: DP 1
Investigator(s): B. Carnahan, L. Darnell Section, Township, Range: ______
Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): sloped Slope (%): 1-2
Subregion (LRR or MLRA) LRR N Lat.: 39.057814° N Long.: 84.63869° W Datum: ______
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded NWI Classification: ______
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ______, soil ______, or hydrology ______ significantly disturbed?
Are vegetation ______, soil ______, or hydrology ______ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? Yes
Hydric soil present? No
Wetland hydrology present? Yes

Is the Sampled Area within a Wetland? No

Remarks: (Explain alternative procedures here or in a separate report.)
Upland point taken adjacent to Wetland 1.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes	X	No		Depth (inches):	12
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	6

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 1

	Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
			0	= Total Cover	

	Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
			0	= Total Cover	

	Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Agrostis cf. alba*		60	Yes	FACW
2	*Echinochloa muricata*		20	Yes	FACW
3	*Schedonorus arundinaceus*		15	No	FACU
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
			95	= Total Cover	

	Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
			0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:		
OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid test for hydrophytic vegetation
- X 2 - Dominance test is >50%
- ___ 3 - Prevalence index is ≤3.0*
- ___ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	10YR 3/3	100					silty clay	
2-10	2.5Y 4/3	70	7.5YR 4/6	20	C	M	silty clay	gravel present
			2.5Y 5/1	10	D	M		
10-14	7.5YR 4/6	65	2.5Y 5/1	5	D	M	clay	
			2.5Y 4/3	20	D	M		
			10YR 2/1	10	C	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

____ Histisol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Stratified Layers (A5)
____ 2 cm Muck (A10) **(LRR N)**
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
____ Sandy Gley Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)

____ Dark Surface (S7)
____ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
____ Thin Dark Surface (S9) (**MLRA 147, 148)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)
____ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
____ Umbric Surface (F13) (**MLRA 136, 122)**
____ Piedmont Floodplain Soils (F19) **(MLRA 148)**
____ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

____ 2 cm Muck (A10) **(MLRA 147)**
____ Coast Prairie Redox (A16) **(MLRA 147, 148)**
____ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ____________________

Depth (inches): ____________________

Hydric soil present? No

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C
City/County: Boone
Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board
State: Kentucky
Sampling Point: DP 2
Investigator(s): B. Carnahan, L. Darnell
Section, Township, Range: ____
Landform (hillslope, terrace, etc.): swale
Local relief (concave, convex, none): concave
Slope (%): 2-3
Subregion (LRR or MLRA) LRR N
Lat.: 39.057845° N
Long.: 84.638769° W
Datum: ____
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded
NWI Classification: ____
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed?
Are vegetation ____, soil ____, or hydrology ____ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Wetland hydrology present? Yes

Is the Sampled Area within a Wetland? Yes

Remarks: (Explain alternative procedures here or in a separate report.)
Point taken within Wetland 1.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No		Depth (inches):	<1
Water table present?	Yes	X	No		Depth (inches):	2
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 2

Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Agrostis cf. alba*	20	Yes	FACW
2	*Echinochloa muricata*	20	Yes	FACW
3	*Schedonorus arundinaceus*	20	Yes	FACU
4	*Carex frankii*	10	No	OBL
5	*Poa pratensis*	10	No	FACU
6	*Scirpus atrovirens*	10	No	OBL
7	*Carex vulpinoidea*	5	No	FACW
8	*Juncus effusus*	5	No	FACW
9				
10				
11				
12				
13				
14				
15				
		100	= Total Cover	

Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 66.67% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid test for hydrophytic vegetation

X 2 - Dominance test is >50%

___ 3 - Prevalence index is ≤3.0*

___ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes

Remarks: (Include photo numbers here or on a separate sheet)

SOIL **Sampling Point:** DP 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 4/2	98	7.5YR 4/6	2	C	M	silty clay	
4-14	2.5Y 5/2	70	7.5YR 4/6	10	C	M	clay	gravel present
			2.5Y 4/3	15	C	M		
			5Y 4/1	5	D	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)

___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ____________________

Depth (inches): ____________________

Hydric soil present? Yes

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C　City/County: Boone　Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board　State: Kentucky　Sampling Point: DP 3
Investigator(s): B. Carnahan, L. Darnell　Section, Township, Range: ____
Landform (hillslope, terrace, etc.): edge of swale　Local relief (concave, convex, none): sloped　Slope (%): 2-3
Subregion (LRR or MLRA) LRR N　Lat.: 39.057865° N　Long.: 84.638801° W　Datum: ____
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded　NWI Classification: ____
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed?
Are vegetation ____, soil ____, or hydrology ____ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? No
Hydric soil present? No
Wetland hydrology present? No

Is the Sampled Area within a Wetland? No

Remarks: (Explain alternative procedures here or in a separate report.)
Upland point taken adjacent to Wetland 1.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Inundation Visible on Aerial Imagery (B7)
____ Water-Stained Leaves (B9)
____ Aquatic Fauna (B13)
____ True Aquatic Plants (B14)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres on Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Thin Muck Surface (C7)
____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

____ Surface Soil Cracks (B6)
____ Sparsely Vegetated Concave Surface (B8)
____ Drainage Patterns (B10)
____ Moss Trim Lines (B16)
____ Dry-Season Water Table (C2)
____ Crayfish Burrows (C8)
____ Saturation Visible on Aerial Imagery (C9)
____ Stunted or Stressed Plants (D1)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ Microtopographic Relief (D4)
____ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes		No	X	Depth (inches):	N/A
Saturation present? (includes capillary fringe)	Yes		No	X	Depth (inches):	N/A

Wetland hydrology present? No

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 3

	Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
			0	= Total Cover	

	Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
			0	= Total Cover	

	Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Schedonorus arundinaceus*		30	Yes	FACU
2	*Poa pratensis*		25	Yes	FACU
3	*Scirpus atrovirens*		20	Yes	OBL
4	*Dipsacus fullonum*		15	No	FACU
5	*Agrostis gigantea*		10	No	FACW
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
			100	= Total Cover	

	Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
			0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 33.33% (A/B)

Prevalence Index Worksheet

Total % Cover of:		
OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid test for hydrophytic vegetation

____ 2 - Dominance test is >50%

____ 3 - Prevalence index is ≤3.0*

____ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? No

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/3	100					silty clay	
5-6	2.5Y 4/3	80	7.5YR 4/6	15	C	M	silty clay	
			2.5Y 5/1	5	D	M		
6-14	2.5Y 5/3	68	2.5Y 5/1	10	D	M	clay	
			7.5YR 4/6	20	C	M		
			10YR 2/1	2	D	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)

___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric soil present? No

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C
City/County: Boone
Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board
State: Kentucky
Sampling Point: DP 4
Investigator(s): B. Carnahan, L. Darnell
Section, Township, Range:
Landform (hillslope, terrace, etc.): slight swale
Local relief (concave, convex, none): slightly sloped
Slope (%): 1-2
Subregion (LRR or MLRA) LRR N
Lat.: 39.057981° N
Long.: 84.640863° W
Datum:
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded
NWI Classification:
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed?
Are vegetation ____, soil ____, or hydrology ____ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? No
Hydric soil present? No
Wetland hydrology present? Yes

Is the Sampled Area within a Wetland? No

Remarks: (Explain alternative procedures here or in a separate report.)
Upland point taken adjacent to Wetland 2.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Water-Stained Leaves (B9)
- Aquatic Fauna (B13)
- True Aquatic Plants (B14)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Sparsely Vegetated Concave Surface (B8)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes	X	No		Depth (inches):	12
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	9

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 4

Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Schedonorus arundinaceus*	75	Yes	FACU
2	*Juncus effusus*	15	No	FACW
3	*Poa pratensis*	10	No	FACU
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		100	= Total Cover	

Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:		
OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

____ 1 - Rapid test for hydrophytic vegetation
____ 2 - Dominance test is >50%
____ 3 - Prevalence index is ≤3.0*
____ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? No

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	2.5Y 3/2	100					silty clay	
2-12	2.5Y 4/3	80	7.5YR 4/6	15	C	M	clay	gravel present
			2.5Y 5/1	5	D	M		
12-14	7.5YR 4/6	70	2.5Y 5/1	10	D	M	clay	
			2.5Y 4/3	20	D	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ______________________

Depth (inches): ______________________

Hydric soil present? No

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C City/County: Boone Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board State: Kentucky Sampling Point: DP 5
Investigator(s): B. Carnahan, L. Darnell Section, Township, Range: ___
Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): slightly concave Slope (%): 2-3
Subregion (LRR or MLRA) LRR N Lat.: 39.057723° N Long.: 84.640805° W Datum: ___
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded NWI Classification: ___
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ___, soil ___, or hydrology ___ significantly disturbed?
Are vegetation ___, soil ___, or hydrology ___ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Wetland hydrology present? Yes

Is the Sampled Area within a Wetland? Yes

Remarks: (Explain alternative procedures here or in a separate report.)
Point taken within Wetland 2.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface water present? Yes X No ___ Depth (inches): <1
Water table present? Yes X No ___ Depth (inches): 6
Saturation present? Yes X No ___ Depth (inches): 0-2
(includes capillary fringe)

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 5

	Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1	*Salix nigra*		35	Yes	OBL
2	*Platanus occidentalis*		10	Yes	FACW
3					
4					
5					
6					
7					
8					
9					
10					
			45	= Total Cover	

	Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1	*Salix nigra*		2	No	OBL
2					
3					
4					
5					
6					
7					
8					
9					
10					
			2	= Total Cover	

	Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Schedonorus arundinaceus*		50	Yes	FACU
2	*Juncus effusus*		15	No	FACW
3	*Agrostis cf. hyemalis*		10	No	FAC
4	*Epilobium coloratum*		5	No	FACW
5	*Typha latifolia*		2	No	OBL
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
			82	= Total Cover	

	Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1					
2					
3					
4					
5					
			0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 66.67% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species ____ ____

FACW species ____ ____

FAC species ____ ____

FACU species ____ ____

UPL species ____ ____

Column totals ____ ____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid test for hydrophytic vegetation

X 2 - Dominance test is >50%

___ 3 - Prevalence index is ≤3.0*

___ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	10YR 4/3	100					silty clay	
2-14	10YR 5/1	58	7.5YR 4/6	15	C	M	clay	
			2.5Y 4/3	10	C	M		
			2.5Y 6/1	10	D	M		
			Gley 1 6/10 GY	2	D	M		
			2.5Y 6/6	5	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2]Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)

___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric soil present? Yes

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C
City/County: Boone
Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board
State: Kentucky
Sampling Point: DP 6
Investigator(s): B. Carnahan, L. Darnell
Section, Township, Range:
Landform (hillslope, terrace, etc.): hillslope
Local relief (concave, convex, none): slightly convex
Slope (%): 2-3
Subregion (LRR or MLRA) LRR N
Lat.: 39.057769° N
Long.: 84.640843° W
Datum:
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded
NWI Classification:
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ___, soil ___, or hydrology ___ significantly disturbed?
Are vegetation ___, soil ___, or hydrology ___ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? No
Hydric soil present? Yes
Wetland hydrology present? No

Is the Sampled Area within a Wetland? No

Remarks: (Explain alternative procedures here or in a separate report.)
Upland point taken adjacent to Wetland 2.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes		No	X	Depth (inches):	N/A
Saturation present? (includes capillary fringe)	Yes		No	X	Depth (inches):	N/A

Wetland hydrology present? No

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 6

Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Schedonorus arundinaceus*	70	Yes	FACU
2	*Poa pratensis*	20	Yes	FACU
3	*Dipsacus fullonum*	5	No	FACU
4	*Allium vineale*	2	No	FACU
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		97	= Total Cover	

Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid test for hydrophytic vegetation
___ 2 - Dominance test is >50%
___ 3 - Prevalence index is ≤3.0*
___ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? No

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	10YR 4/3	100					silty clay	
2-4	2.5Y 5/3	79	10YR 2/1	5	D	M	silty clay	
			7.5YR 5/8	5	C	M		
			7.5YR 4/6	10	C	M		
			Gley 1 6/10 GY	1	D	M		
4-14	2.5Y 4/2	90	7.5YR 5/8	5	C	M	silty clay	
			10YR 4/6	5	C	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ____________________

Depth (inches): ____________________

Hydric soil present? Yes

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C City/County: Boone Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board State: Kentucky Sampling Point: DP 7
Investigator(s): B. Carnahan, L. Darnell Section, Township, Range:
Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 1-2
Subregion (LRR or MLRA) LRR N Lat.: 39.057594° N Long.: 84.642863° W Datum:
Soil Map Unit Name: RsC - Rossmoyne silt loam, 6 to 12 percent slopes NWI Classification:
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ___, soil ___, or hydrology ___ significantly disturbed?
Are vegetation ___, soil ___, or hydrology ___ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Wetland hydrology present?	Yes

Is the Sampled Area within a Wetland? Yes

Remarks: (Explain alternative procedures here or in a separate report.)
Point taken within Wetland 3.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- __ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- __ Aquatic Fauna (B13)
- __ True Aquatic Plants (B14)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres on Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- __ Thin Muck Surface (C7)
- __ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- __ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- __ Drainage Patterns (B10)
- __ Moss Trim Lines (B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Stunted or Stressed Plants (D1)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes	X	No		Depth (inches):	3
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0-3

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 7

Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		0	= Total Cover	

Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 0 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

____ 1 - Rapid test for hydrophytic vegetation

____ 2 - Dominance test is >50%

____ 3 - Prevalence index is ≤3.0*

____ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes

Remarks: (Include photo numbers here or on a separate sheet)

No vegetation present within assessment area due to evidence of standing water and forested canopy. Vegetation criteria assumed to be present.

SOIL

Sampling Point: DP 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type^1	Loc^2		
0-3	2.5Y 4/3	100					silty clay	
3-6	2.5Y 4/2	90	7.5YR 4/6	10	C	M	clay	
6-14	10YR 5/6	95	2.5Y 5/3	5	D	M	clay	

^{1}Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - ^{2}Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)

___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric soil present? Yes

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C
City/County: Boone
Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board
State: Kentucky
Sampling Point: DP 8
Investigator(s): B. Carnahan, L. Darnell
Section, Township, Range:
Landform (hillslope, terrace, etc.): swale
Local relief (concave, convex, none): sloped
Slope (%): 3-4
Subregion (LRR or MLRA) LRR N
Lat.: 39.057526° N
Long.: 84.642811° W
Datum:
Soil Map Unit Name: RsC - Rossmoyne silt loam, 6 to 12 percent slopes
NWI Classification:
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed?
Are vegetation ____, soil ____, or hydrology ____ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	No
Hydric soil present?	No
Wetland hydrology present?	Yes

Is the Sampled Area within a Wetland? No

Remarks: (Explain alternative procedures here or in a separate report.)
Upland point taken adjacent to Wetland 3.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- __ Surface Water (A1)
- __ High Water Table (A2)
- X Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Water-Stained Leaves (B9)
- __ Aquatic Fauna (B13)
- __ True Aquatic Plants (B14)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres on Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- __ Thin Muck Surface (C7)
- __ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- __ Surface Soil Cracks (B6)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Drainage Patterns (B10)
- __ Moss Trim Lines (B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Stunted or Stressed Plants (D1)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes		No	X	Depth (inches):	N/A
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	10

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 8

Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1	*Lonicera maackii*	15	Yes	UPL
2				
3				
4				
5				
6				
7				
8				
9				
10				
		15	= Total Cover	

Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Lonicera japonica*	5	Yes	FACU
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		5	= Total Cover	

Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species		
FACW species		
FAC species		
FACU species		
UPL species		
Column totals		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid test for hydrophytic vegetation
___ 2 - Dominance test is >50%
___ 3 - Prevalence index is ≤3.0*
___ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? No

Remarks: (Include photo numbers here or on a separate sheet)
The indicator for Lonicera japonica in the Eastern Mountains and Piedmont Region was changed from FAC to FACU via an appeal request to the NWPL dated May 22, 2014. The change is effective immediately, as presented on the NWPL website at http://rsgisias.crrel.usace.army.mil/NWPL/

SOIL

Sampling Point: DP 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-5	10YR 2/2	100					silty clay loam	
5-8	10YR 3/3	85	7.5YR 5/6	15	C	M	silty clay	
8-14	10YR 6/8	98	10YR 6/1	2	D	M	clay	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
___ Sandy Gley Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) (**MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
___ Umbric Surface (F13) (**MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric soil present? No

Remarks:

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont

Project/Site: Airport Site 3C
City/County: Boone
Sampling Date: 2/17/16
Applicant/Owner: Kenton County Airport Board
State: Kentucky
Sampling Point: DP 9
Investigator(s): B. Carnahan, L. Darnell
Section, Township, Range:
Landform (hillslope, terrace, etc.): swale
Local relief (concave, convex, none): sloped
Slope (%): 2-3
Subregion (LRR or MLRA) LRR N
Lat.: 39.056676° N
Long.: 84.641322° W
Datum:
Soil Map Unit Name: JsD3 - Jessup silty clay loam, 12 to 20 percent slopes, severely eroded
NWI Classification:
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed?
Are vegetation ____, soil ____, or hydrology ____ naturally problematic?
Are "normal circumstances" present? Yes
(If needed, explain any answers in remarks)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	No
Hydric soil present?	No
Wetland hydrology present?	Yes

Is the Sampled Area within a Wetland? No

Remarks: (Explain alternative procedures here or in a separate report.)
Point taken in south central portion of property.

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Water-Stained Leaves (B9)
- Aquatic Fauna (B13)
- True Aquatic Plants (B14)
- Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Sparsely Vegetated Concave Surface (B8)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	N/A
Water table present?	Yes	X	No		Depth (inches):	3
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0-2

Wetland hydrology present? Yes

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) -- Use scientific names of plants

Sampling Point: DP 9

Tree Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Sapling/Shrub Stratum	Plot Size (15')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
		0	= Total Cover	

Herb Stratum	Plot Size (5')	Absolute % Cover	Dominant Species	Indicator Status
1	*Schedonorus arundinaceus*	60	Yes	FACU
2	*Microstegium vimineum*	20	Yes	FAC
3	*Rosa multiflora*	10	No	FACU
4	*Aster sp.*	5	No	---
5	*Carex cf. tribuloides*	5	No	FACW
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
		100	= Total Cover	

Woody Vine Stratum	Plot Size (30')	Absolute % Cover	Dominant Species	Indicator Status
1				
2				
3				
4				
5				
		0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across all Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	50.00%	(A/B)

Prevalence Index Worksheet

Total % Cover of:			
OBL species			
FACW species			
FAC species			
FACU species			
UPL species			
Column totals			(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

____ 1 - Rapid test for hydrophytic vegetation

____ 2 - Dominance test is >50%

____ 3 - Prevalence index is ≤3.0*

____ 4 - Morphological adaptations* (provide supporting data in Remarks or on a separate sheet)

____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Four Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? No

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	2.5Y 4/2	100					silty clay	
2-7	2.5Y 5/3	88	10YR 2/1	5	D	M	clay	
			10YR 4/6	5	C	M		
			2.5Y 5/2	2	D	M		
7-14	10YR 5/3	83	10YR 4/6	15	C	M	clay	
			2.5Y 5/2	2	D	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains - [2] Location: PL=Lining, M=Matrix

Hydric Soil Indicators:

Indicators for Problematic Hydric Soils:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1) **(LRR,N MLRA 147, 148)**
- ___ Sandy Gley Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)

- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S9) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) (**MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N MLRA 136)**
- ___ Umbric Surface (F13) (**MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric soil present? No

Remarks:

APPENDIX C

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

ATTACHMENT

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD):

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:

Permittee:
Kenton County Airport Board
Attn: Ms. Candace S. McGraw
Cincinnati/Northern Kentucky International Airport
P.O. Box 752000
Cincinnati, Ohio 45275-2000
(859) 767-7021
dconrad@cvgairport.com

Represented by:
Redwing Ecological Services, Inc.
Attn: Ms. Kiersten Fuchs
1139 South Fourth Street
Louisville, Kentucky 40203
(502) 625-3009
kfuchs@redwingeco.com

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: The project site is located immediately south of I-275 and 2.6 miles northwest of I-71/75 near Erlanger, KY. It is bound by Donaldson Highway to the west, Point Pleasant Road to the south, and I-275 to the east. Adjacent lands are occupied by residential, commercial and industrial development and the Cincinnati/Northern Kentucky International Airport. The project will involve constructing a warehouse/distribution facility enclosing approximately 264,000 square feet with associated parking, infrastructure, and stormwater detention facilities.

(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)

State: Kentucky County/parish/borough: Boone City: Erlanger
Center coordinates of site (lat/long in degree decimal format):
Lat. 39.065505 ° N, Long. 84.649623° W

Name of nearest waterbody: Ohio River

Identify (estimate) amount of waters in the review area:
Non-wetland waters: 870 linear feet 0.043 acre
Cowardin Class: R6

Wetlands 0.088 acre
Cowardin Class: PEM, PSS, and PFO

Name of any water bodies on the site that have been identified as Section 10 waters:
Tidal:
Non-Tidal:

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization

on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Redwing, October 2015

☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☐ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☐ U.S. Geological Survey Hydrologic Atlas: .
  ☐ USGS NHD data.
  ☐ USGS 8 and 11 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name: 1:24,000 – Burlington, Kentucky Quadrangle.

☒ USDA Natural Resources Conservation Service Soil Survey. Citation: Soil Survey Geographic Database for Boone, Kenton, and Campbell Counties, Kentucky (2014).

☐ National wetlands inventory map(s). Citation:

☐ State/Local wetland inventory map(s): .

☒ FEMA/FIRM maps: FEMA DFIRM Flood Data for Kentucky (2006)

☐100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): World Imagery – ESRI and the GIS User Community (2014).
  or ☒ Other (Name & Date): Site photographs – February 17, 2016.

☐ Previous determination(s). File no. and date of response letter: .

☐ Other information (please specify): .

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

____
Signature and date of
Regulatory Project Manager
(REQUIRED)

____
Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining the signature is impracticable)

Site number	Latitude	Longitude	Cowardin Class	Estimated amount of aquatic resource in review area	Class of aquatic resource
Ephemeral Stream 1	39.057897° N	84.638704° W	R6	25 linear feet / 0.0004 acre	non-section 10 – non-wetland
Ephemeral Stream 2	39.05837° N	84.641327° W	R6	315 linear feet / 0.018 acre	non-section 10 – non-wetland
Ephemeral Stream 3	39.057642° N	84.6.42189° W	R6	530 linear feet / 0.024 acre	non-section 10 – non-wetland
Wetland 1	39.057765° N	84.638845° W	PEM	0.049 acre	non-section 10 – wetland
Wetland 2	39.057907° N	84.640867° W	PEM/PSS	0.036 acre	non-section 10 – wetland
Wetland 3	39.057597° N	84.642862° W	PFO	0.003 acre	non-section 10 – wetland

THIS PAGE INTENTIONALLY LEFT BLANK

REDWING
ECOLOGICAL SERVICES, INC.
1139 South Fourth Street • Louisville, KY 40203 • Phone 502.625.3009 • Fax 502.625.3077

March 10, 2016

Mr. Ron Dutta
Floodplain Management Section
Kentucky Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

Subject: **Permit to Construct Across or Along a Stream Waiver Request**
Airport Site 3C
Boone County, Kentucky
Redwing Project No.: 15-171

Dear Mr. Dutta:

On behalf of Kenton County Airport Board (KCAB), Redwing Ecological Services, Inc. (Redwing) is pleased to submit this waiver request for a Permit to Construct Across or Along a Stream for the proposed Airport Site 3C project located in Boone County, Kentucky. The 25-acre site is located northeast of the intersection of Donaldson Highway and Point Pleasant Road and just east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky. It is bound by a combination of residential, commercial and industrial development to the south and east, by an Airport employee parking lot to the north and by airport facilities to the west.

We respectfully request a waiver for a Stream Construction Permit due to the fact that the watershed size of the project (24 acres) is less than 1mi^2. Please find the attached Application for a Permit to Construct Across or Along a Stream and/or Water Quality Certification. Additionally, we have attached the *Pre-Construction Notification for Nationwide Permit 39 and Request for General Section 401 Water Quality Certification* that was submitted to the U.S. Army Corps of Engineers and Kentucky Division of Water for your review. Please contact Bridget Carnahan or Kiersten Fuchs at (502) 625-3009 should you need any further information during your review of the project.

Sincerely,

Bridget G. Carnahan
Staff Biologist

Kiersten R. Fuchs
Principal
Senior Wildlife Biologist

P:\2015 Projects\15-171-Airport Site 3C\Reports\Floodplain\Airport Site 3C-Floodplain Permit Waiver Request.doc

cc: Mr. Scott Strine – Dermody Properties
Ms. Debbie Conrad – Kenton County Airport Board

Attachment: Application for Permit to Construct Across or Along a Stream and/or Water Quality Certification
Preconstruction Notification for Nationwide Permit 39 and Request for General Section 401 Water Quality Certification

COMMONWEALTH OF KENTUCKY
ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER

APPLICATION FOR PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM AND / OR WATER QUALITY CERTIFICATION

Chapter 151 of the Kentucky Revised Statutes requires approval from the Division of Water prior to any construction or other activity in or along a stream that could in any way obstruct flood flows or adversely impact water quality. *If the project involves work in a stream, such as bank stabilization, dredging or relocation, you will also need to obtain a 401 Water Quality Certification (WQC) from the Division of Water.* This completed form will be forwarded to the Water Quality Branch for WQC processing. The project may not start until all necessary approvals are received from the KDOW. For questions concerning the WQC process, contact the WQC section at 502/564-3410.

If the project will disturb one or more acres of land, or if the project is part of a larger common plan of development or sale that ultimately will disturb one or more acres, you will also need to complete a Notice of Intent for general permit coverage for storm water discharges associated with construction activities (NOI-SWCA). This general permit will require you to create and implement an erosion control plan for the project. You may find the forms for Kentucky Pollution Discharge Elimination System (KPDES) at the KPDES Web site http://www.water.ky.gov/homepage_repository/kpdes_permit_aps.htm. Return forms to the Floodplain Management Section of the KDOW.

1. **OWNER:** Kenton County Airport Board, Candace McGraw, CEO
   Give name of person(s), company, governmental unit, or other owner of proposed project.
   MAILING ADDRESS: P.O. Box 752000, Cincinnati, Ohio 45275
   TELEPHONE #: 859-767-7021 **EMAIL:** dconrad@cvgairport.com
2. **AGENT:** Kiersten Fuchs
   Give name of person(s) submitting application, if other than owner.
   ADDRESS: 1139 South 4th Street, Louisville, Kentucky 40203
   TELEPHONE #: 502-625-3009 **EMAIL:** kfuchs@redwingeco.com
3. **ENGINEER:** Alison Chadwell **P.E. NUMBER:** 25712
   Contact Division of Water if waiver can be granted.
   TELEPHONE #: 859-727-3293 **EMAIL:** achadwell@vloxinc.com
4. **DESCRIPTION OF CONSTRUCTION:** The construction of a 264,000 square foot industrial warehouse building with associated roads, utilities, parking, and required detention areas. The proposed project will impact approximately 795 linear feet of ephemeral stream and 0.085 acre of wetland.
   Describe the type and purpose of construction and describe stream/wetland impact
5. **COUNTY:** Boone **NEAREST COMMUNITY:** Erlanger
6. **USGS QUAD NAME** Burlington **LATITUDE/LONGITUDE:** 39.065505 N / 84.649623 W
7. **STREAM NAME:** Ephemeral Streams 1, 2 and 3 **WATERSHED SIZE (in acres):** 24 ac
8. **LINEAR FEET OF STREAM IMPACTED AND/OR ACRES OF WETLAND IMPACT:** 795 linear feet (0.033 ac) ephemeral stream and 0.085 acre of wetland.
9. **DIRECTIONS TO SITE:** From I-71/75 in Erlanger, take Exit 184 (Erlanger KY-236). Turn left at the end of the exit ramp on KY-236 west (Donaldson Hwy). Travel approximately 2.9 miles and turn right onto Point Pleasant Road. The site is located immediately northeast of the intersection of Donaldson Hwy and Point Pleasant Road.

10. **IS ANY PORTION OF THE REQUESTED PROJECT NOW COMPLETE?** ☐Yes ☑No If yes, identify the completed portion on the drawings you submit and indicate the date activity was completed. DATE: ____________

11. **ESTIMATED BEGIN CONSTRUCTION DATE:** Summer 2016

12. **ESTIMATED END CONSTRUCTION DATE:** Spring 2017

13. **HAS AN APPLICATION BEEN SUBMITTED TO THE US ARMY CORPS of ENGINEERS?** ☑Yes ☐No
Concurrently

14. **AN APPLICANT FOR A PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM MUST ADDRESS PUBLIC NOTICE:**

(a) PUBLIC NOTICE HAS BEEN GIVEN FOR THIS PROPOSAL BY THE FOLLOWING MEANS:

☐ Public notice in newspaper having greatest circulation in area (provide newspaper clipping or affidavit)
☐ Adjacent property owner(s) affidavits (Contact Division of Water for requirements.)

(b) ☑ **I REQUEST WAIVER OF PUBLIC NOTICE BECAUSE:**
The project site is less than 1 mi² watershed in size.

Contact Division of Water for requirements.

* **PUBLIC NOTICE FOR 401 WATER QUALITY CERTIFICATIONS IS GOVERNED BY 401 KAR 9:010**

15. **I HAVE CONTACTED THE FOLLOWING CITY OR COUNTY OFFICIALS CONCERNING THIS PROJECT:**

Give name and title of person(s) contacted and provide copy of any approval city or county may have issued.

16. **LIST OF ATTACHMENTS:** Attached Request for NWP 39/General Section 401 WQC application package

List plans, profiles, or other drawings and data submitted. Attach a copy of a 7.5 minute USGS topographic map clearly showing the project location.

17. **I,** Wallace S McCown **(Owner) CERTIFY THAT THE OWNER OWNS OR HAS EASEMENT RIGHTS ON ALL PROPERTY ON WHICH THIS PROJECT WILL BE LOCATED OR ON WHICH RELATED CONSTRUCTION WILL OCCUR** (for dams, this includes the area that would be impounded during the design flood).

18. **REMARKS:** ____________

I hereby request approval for construction across or along a stream as described in this application and any accompanying documents. To the best of my knowledge, all the information provided is true and correct.

SIGNATURE: ____________
Owner or Agent sign here. (If signed by Agent, a Power of Attorney should be attached.)

DATE: 3/3/2016

SIGNATURE OF LOCAL FLOODPLAIN COORDINATOR: ____________
Permit application will be returned to applicant if not properly endorsed by the local floodplain coordinator.

DATE: 3/9/16

SUBMIT APPLICATION AND ATTACHMENTS TO:

Floodplain Management Section
Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY

US. ARMY ENGINEER DISTRICT,
LOUISVILLE CORPS OF ENGINEERS
CELRL-OPF-S, Room 752
P O BOX 59
LOUISVILLE, KENTUCKY 40201-0059
FAX (502) 315-6677
http:/www.lrl.usace.army.mil

March 10, 2016

Operations Division
Regulatory Branch (South)
ID No. LRL-2016-248-mdh

Memorandum for Coordinating Agencies
Subject: Agency Coordination Procedures Under NWP GC 31(d)

This office is currently reviewing an application submitted by:
Kenton County Airport Board
Cincinnati/Northern Kentucky International Airport
PO Box 752000
Cincinnati, Ohio 45275-2000

Project Name: Proposed commercial development on a 25-acre parcel located northeast of the intersection of Donaldson Highway and Point Pleasant Road just east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky (Lat. 39°-03’-26” (N); Lon. 84°-38’-27” (W)).

Project Description: The applicant proposes to impact 795 linear feet (0.033 acre) of three (3) ephemeral stream channels and 0.085 of an acre of two (2) wetlands for the purpose of commercial development (see *Figures 1-4*).

We are reviewing this proposal under the terms for Nationwide Permit (NWP) No. 39, *Commercial and Institutional Developments* in accordance with § 404 of the Clean Water Act. The Corps’s NWP agency notification procedures were published in the Federal Register, 77 Fed. Reg. 10287 (February 21, 2012), as codified at 33 C.F.R. § 330 Part C (13).

Specifically, we are soliciting comments from you to aide us in making the minimal adverse effect determination regarding the request for a waiver of the 300 linear foot limitation to ephemeral stream bed and the proposed activity’s compliance with the terms and conditions of NWP# 39 in general. You will have **10 calendar days** from the date of this notification to submit comments.

Comments may be submitted by mail to the above address, ATTN: Michael Hasty (LRL-2016-248-mdh), CELRL-OPF-S, or through one of the following methods:
Facsimile: (502)315-6677
Email: michael.d.hasty@usace.army.mil
Telephone: (502)315-6676

Sincerely,

Michael Hasty
Senior Project Manager, South Section
Regulatory Branch

Attachments:
Figures 1, 2, 3 & 4

NWP GC 31(d) Kentucky Coordinating Agencies:

Mr. Lee Andrews
Supervisor
U.S. Fish and Wildlife Service
330 West Broadway
Room 266
Frankfort, Kentucky 40601
Lee_Andrews@fws.gov
(502)695-1024

Mr. Duncan Powell
United States Environmental Protection Agency, Region IV
Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia 30303-8960
Powell.Duncan@epa.gov
(404) 562-9258

Ms. Sarah Atherton
Energy and Environment Cabinet
Division of Water
200 Fair Oaks
Frankfort, KY 40601
Sarah.Atherton@ky.gov
(502) 564-3410, Ext. 4060

Mr. Doug Dawson
Kentucky Department of Fish & Wildlife Resources
#1 Sportsman's Lane
Frankfort, Kentucky 40601
doug.dawson@ky.gov
(502) 564-4519

Mr. Craig Potts
Executive Director and
State Historic Preservation Officer
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601
craig.potts@ky.gov
(502)564-5820

LRL-2016-278-mdh

MAR 04 2016

MAR 04 2016

REDWING
ECOLOGICAL SERVICES, INC. 1139 South Fourth Street • Louisville, KY 40203 • Phone 502.625.3009 • Fax 502.625.3077

March 3, 2016

Mr. David Baldridge
Chief, South Section Regulatory Branch
U.S. Army Corps of Engineers
Louisville District
600 Dr. Martin Luther King, Jr. Place
Louisville, Kentucky 40202

Ms. Stephanie Hayes
Supervisor, Water Quality Section
Kentucky Division of Water
200 Fair Oaks Lane, Fourth Floor
Frankfort, Kentucky 40601

Subject: Preconstruction Notification for Nationwide Permit 39 and Request for General Section 401 Water Quality Certification Concurrence
Airport Site 3C
Boone County, Kentucky
Redwing Project No.: 15-171

Dear Mr. Baldridge and Ms. Hayes:

On behalf of the Kenton County Airport Board (KCAB), Redwing Ecological Services, Inc. (Redwing) is pleased to submit this Preconstruction Notification (PCN) and Request for Waiver for Nationwide Permit (NWP) 39 with the U.S. Army Corps of Engineers (USACE) in support of the proposed Airport Site 3C located east of the Cincinnati Airport in Boone County, Kentucky, and to request concurrence that this project meets the Kentucky Division of Water (KDOW) conditions of the general Water Quality Certification under NWP 39. The 25-acre site is located northeast of the intersection of Donaldson Highway and Point Pleasant Road in Boone County, Kentucky. (Figures 1 and 2).

Existing habitats on site consist primarily of upland woods, and maintained open field (Figure 2). The project site is located immediately south of I-275 and 2.6 miles northwest of I-71/75 near Erlanger, Kentucky. It is bound by Donaldson Highway to the west, Point Pleasant Road to the south, and I-275 to the east. Jurisdictional waters of the U.S. at the site include three ephemeral streams totaling 870 linear feet (0.043 acre) and 0.088 acre of wetland (Figure 3). The proposed project will result in unavoidable impacts to 795 linear feet (0.033 acre) of ephemeral stream and 0.085 acre of wetland (Figure 4). This report discusses the water/wetland delineation and serves as the PCN for permanent impacts to water/wetland features onsite (Figure 4).

REQUIRED INFORMATION

The following information is submitted as a PCN under NWP 39 in support of the above-mentioned project, per guidance in the Federal Register (Vol. 77, No. 34, Tuesday, February 21, 2012).

1. *Name, address, and telephone number of prospective permittee.*

Permittee:
Kenton County Airport Board
Attn: Ms. Candace S. McGraw
Cincinnati/Northern Kentucky International Airport
P.O. Box 752000
Cincinnati, Ohio 45275-2000
(859) 767-7021
dconrad@cvgairport.com

Represented by:
Redwing Ecological Services, Inc.
Attn: Ms. Kiersten Fuchs
1139 South Fourth Street
Louisville, Kentucky 40203
(502) 625-3009
kfuchs@redwingeco.com

2. *Location of proposed project.*

The 25-acre site is located northeast of the intersection of Donaldson Highway and Point Pleasant Road and just east of the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky (Figure 1). It is bound by a combination of residential, commercial and industrial development to the south and east, by an Airport employee parking lot to the north and by airport facilities to the west (Figure 2).

3. *Description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permits(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity.*

The purpose of this project is to develop airport land that is currently underutilized and to provide additional revenue to the KCAB. The project will involve constructing a warehouse/distribution facility enclosing approximately 264,000 square feet with associated parking, infrastructure, and stormwater detention facilities. The building site is approximately 16 acres and the remaining nine acres of the site will be disturbed during the grading work.

Jurisdictional water/wetland features will be impacted in order to fully utilize the site. In order to minimize impacts onsite, Wetland 3 will be avoided. Silt fencing, sediment traps, and other appropriate Best Management Practices will be implemented to minimize indirect impacts during construction. Jurisdictional impacts are shown on Figure 4 and summarized in the table below.

Feature	Impact Length (ft)	Area of Impact (ac)	Impact Type	Status
Ephemeral Stream 1	25	0.0004	Fill	Jurisdictional
Ephemeral Stream 2	275	0.009	Fill	Jurisdictional
Ephemeral Stream 3	495	0.023	Fill	Jurisdictional
Wetland 1	---	0.049	Fill	Jurisdictional
Wetland 2	---	0.036	Fill	Jurisdictional
Wetland 3	---	0	---	
Total Jurisdictional Impact	795	0.118		

The KCAB is requesting concurrence from the KDOW that this project meets the conditions of the general Water Quality Certification under the NWP 39. The KCAB is also requesting a waiver from KDOW Floodplain Management Section for a Stream Construction Permit because the watershed above the project is less than a square mile. An Application for Permit to Construct Across or Along a Stream and/or Water Quality Certification is provided as Appendix A.

4. *Delineation of special aquatic and other waters of U.S. on the project site.*

Jurisdictional waters of the U.S., including wetlands, were delineated on the project site by Redwing wetland scientists on February 17, 2016. The study methodology and results of the delineation are discussed below.

METHODOLOGY

The wetland delineation was accomplished through documentation of the presence/absence of hydric soils, wetland hydrology, and hydrophytic vegetation, per the guidelines of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont – Version 2.0* (April 2012). Soil, hydrology, and vegetation data were collected on Routine Wetland Determination Data Forms at nine points throughout the project site (Figure 3). These wetland data forms are provided as Appendix B. The identification of open waters, such as streams and ponds, was made based on the presence/absence of an ordinary high water mark (OHWM), defined bed and bank features, and flow regime. A Preliminary Jurisdictional Determination Form is provided as Appendix C.

RESULTS

Jurisdictional water/wetland features delineated at the site include three ephemeral streams totaling 870 linear feet (0.043 acre), and three wetlands (0.008 acre). The water/wetland features are depicted on Figure 3 and described in more detail below.

Feature	Length (ft)	Area (ac)	Status
Ephemeral Stream 1	25	0.0004	Jurisdictional
Ephemeral Stream 2	315	0.018	Jurisdictional
Ephemeral Stream 3	530	0.024	Jurisdictional
Ephemeral Stream Total	**870**	**0.043**	Jurisdictional
Wetland 1	---	0.049	Jurisdictional
Wetland 2	---	0.036	Jurisdictional
Wetland 3	---	0.003	
Wetland Total	---	**0.088**	
TOTAL JURISDICTIONAL WATERS	**870**	**0.131**	

Ephemeral Streams: Three ephemeral streams were identified during the field assessment, and are located high in the watershed on the property.

Ephemeral Stream 1 is located near the eastern corner of the site and acts as a drainage for Wetland 1. Ephemeral Stream 1 measures 25 linear feet (0.0004 acre), is six to twelve inches wide, with bank heights of six inches. The substrate is primarily composed of silt and gravel. Up to half an inch of water was observed in the channel during the delineation. Ephemeral Stream 1 is considered jurisdictional due to its connection to the offsite interstate right-of-way drainage system.

Ephemeral Stream 2 is part of the main drainage located within the eastern portion of the site and is connected to Wetland 2. Ephemeral Stream 2 measures 315 linear feet (0.018 acre), is two to three feet wide, with bank heights ranging from three to six inches. The substrate is composed primarily of silt, gravel, and cobble.

One to two inches of water was observed in low-lying areas within the channel from a recent rainfall and snow melt during the field assessment. Ephemeral Stream 2 is considered to be jurisdictional due to its direct connection to downstream waters.

Ephemeral Stream 3 is a small stream that is located in the western portion of the site. Ephemeral Stream 3 flows for approximately 530 linear feet (0.024 acre) before it exits the property to the northwest. The stream is one to three feet wide, with bank heights ranging from six inches to 3 feet. The substrate is composed entirely of silt and gravel. During the site visit, up to two inches of water was observed in the channel. Ephemeral Stream 3 is considered to be jurisdictional due to its direct connection to downstream waters.

Wetlands: Three wetlands totaling 0.088 acre were identified during the delineation.

Wetland 1 (0.049 acre) is an emergent wetland located near the southeastern project boundary. Wetland 1 drains into the interstate right-of-way and is considered jurisdictional.

Wetland 2 (0.036 acre) is an emergent and scrub/shrub wetland located in the central portion of the site. Due to the connection to downstream waters via Ephemeral Stream 2, Wetland 2 is considered to be jurisdictional.

Wetland 3 (0.003 acre) is a forested wetland located near the northwest corner of the site. Wetland 3 appears to have formed within a former drainage swale that has been blocked, allowing for the area to hold water. Wetland 3 is considered jurisdictional by overland flow to an offsite drainage ditch.

General site characteristics of soil, hydrology, and vegetation for the project site are discussed below.

Soils: The Soil Survey Geographic Database for Boone, Campbell, and Kenton Counties, Kentucky maps the property as being underlain by Rossmoyne silt loam, Jessup silt loam, and Cynthiana flaggy silty clay loam (Figure 5). None of these soils are listed on the Boone County Hydric Soils List. Hydric soil indicators were observed at four data points within or adjacent to the wetlands, and included the depleted matrix (F3) hydric soil indicator.

Hydrology: The project site primarily drains to the west and north along Ephemeral Streams 1 and 2. The main sources of hydrology are precipitation and surface runoff from adjacent uplands. Indicators of wetland hydrology were observed at seven data points, and included surface water, high water table, saturation, water-stained leaves and sparsely vegetated concave surface. The study area is not located within the 100-Year floodplain (Figure 6).

Vegetation: The site consists primarily of upland woods and maintained open field. Common species observed in the maintained open field include fescue (*Schedonorus arundinaceus*), Kentucky bluegrass (*Poa pratensis*), field garlic (*Allium vineale*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica),* teasel (*Dipsacus fullonum*), and wingstem (*Verbesina alternifolia*). These species are listed as facultative upland (FACU), and facultative (FAC) in the National Wetland Plant List (NWPL-Lichvar et al. 2014).

Dominant species found within the upland woods include black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), box elder (*Acer negundo*), bush honeysuckle (*Lonicera maackii*), Japanese honeysuckle, honey locust (*Gleditsia triacanthos*), white ash (*Fraxinus americana*), garlic mustard (*Alliaria petiolata*), field garlic, sugar maple (*Acer saccharum*), and tulip tree (*Liriodendron tulipifera*). These species are listed as upland (UPL), FACU, and FAC in the NWPL (2014).

Dominant species found within the emergent, scrub/shrub and forested wetlands include green bulrush (*Scirpus atrovirens*), Frank's sedge (*Carex frankii*), fescue, rough barnyard grass (*Echinochloa muricata*), creeping bentgrass (*Agrostis alba*), black willow (*Juglans nigra*), and sycamore (*Platanus occidentalis*). These species are listed as FACU, facultative wetland (FACW) and obligate wetland (OBL) in the NWPL (2014).

5. *Discussion of compensatory mitigation proposal that offsets unavoidable losses of waters of the United States or justification explaining why compensatory mitigation should not be required.*

Impacts to jurisdictional waters associated with the proposed project include 795 linear feet (0.033 acre) of ephemeral stream, and 0.085 acre wetland (Figure 4). Impacts to the on-site ephemeral streams will be mitigated through the project's stormwater management system. The mitigation required for wetland impacts is summarized in the following table.

Wetland	Acreage	Mitigation Ratio	Mitigation Required
1	0.049	2:1	0.1 acre
2	0.036	2:1	0.07 acre
Total	**0.085**		**0.17 acre**

Compensation for the wetland impacts will be provided through the purchase of 0.17 acre of wetland mitigation credit of the appropriate habitat type from an approved mitigation bank or in-lieu fee program.

6. *Identification of threatened/endangered species or critical habitat potentially affected by the proposed work.*

Potential impacts to federally-listed species as a result of the proposed project were evaluated during an ecological assessment of the project site, conducted in conjunction with the water/wetland delineation. Based on a review of occurrence records from the U.S. Fish and Wildlife Service (USFWS), federally-listed species that are known to occur in Boone County are summarized in the following table.

Scientific Name	Common Name	Status	Habitat Present?	Species Present?
Mammals				
Myotis sodalis	Indiana Bat	E	Potential Summer	Unknown
Myotis septentrionalis	Northern Long-Eared Bat	T	Potential Summer	Unknown
Mussels				
Cyprogenia stegaria	Fanshell	E	No	No
Lampsilis abrupta	Pink Mucket	E	No	No
Obovaria retusa	Ring Pink	E	No	No
Plethobasus cooperianus	Orangefoot Pimpleback	E	No	No
Plethobasus cyphyus	Sheepnose	E	No	No
Pleurobema clava	Clubshell	E	No	No
Pleurobema plenum	Rough Pigtoe	E	No	No
Plants				
Trifolium stoloniferum	Running Buffalo Clover	E	No	No

E = Federally Endangered; T = Federally Threatened

Potential impacts to federally listed species as a result of the proposed project were evaluated during a habitat assessment of the project site conducted concurrently with the delineation. During the assessment, no caves, abandoned mines, sinkholes, bridges, culverts, or other cave-like features were identified at the site that provide potential roosting habitat or hibernacula for the gray, Indiana, or northern long-eared bats. The mature woods habitat was identified as suitable summer roosting, foraging, and commuting habitat for the Indiana and northern long-eared bats. The project is located within an area designated by the USFWS as "Potential" habitat for these species, and the project is not located within 0.25 mile of a known hibernaculum or 150 feet of a known maternity roost tree for the northern long-eared bat. No suitable gray bat foraging habitat is present on site.

The ephemeral streams onsite do not represent habitat for the federally-listed mussel species based on the lack of flow regime and unsuitable substrate. The site also lacks suitable habitat for running buffalo clover. Based on the results of the habitat assessment, no adverse effects to the federally listed plant species are anticipated as a result of the project.

Approximately 10 acres of suitable summer habitat for the Indiana and northern long-eared bats will be cleared for the project, which could result in direct effects to these species. The KCAB is proposing clearing this habitat during the occupied period (April 1 – October 14), with the exception of June and July when clearing of bat habitat is prohibited. The KCAB will mitigate for direct effects to the Indiana bat through a voluntary payment to the Imperiled Bat Conservation Fund, utilizing the process set forth within the *Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (April 2015). Incidental take of the northern long-eared bat from the proposed project is not prohibited under Section 4(d) of the ESA for this species; therefore, direct and cumulative effects to the northern long-eared bat will be addressed under the final 4(d) rule for this species. Consultation with the USFWS will be initiated in conjunction with this PCN submittal.

7. *Identification of historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places.*

   A Phase I Archaeological and Cultural Historic Resource survey of the site has been conducted. The report summarizing the results of the survey has been submitted to the State Historic and Preservation Office (SHPO) for review. The results of the SHPO review will be forwarded to the USACE.

SUMMARY

This report serves as Preconstruction Notification under NWP 39 for the industrial development of the approximately 25-acre Airport Site 3C in Boone County, Kentucky. The proposed project will result in impacts to approximately 795 linear feet (0.033 acre) of ephemeral stream, and 0.085 acre of wetland. Mitigation for wetland impacts will be accomplished through the purchase of 0.17 acre of wetland credit from an approved wetland mitigation bank or in-lieu fee program. Ephemeral stream impacts will be mitigated using the stormwater collection system for the site.

No adverse effects to threatened/endangered species are anticipated as a result of the project, with the exception of the Indiana bat. Direct effects to this species are anticipated from the project due to the loss of "Potential" habitat. Mitigation for these direct effects is proposed through a voluntary payment to the Imperiled Bat Conservation Fund. An archaeological/cultural historic resource survey has been conducted and is currently being reviewed by the State Historic and Preservation Office. The result of the review will be forwarded to the USACE once completed.

We respectfully request your concurrence with the applicability of a NWP 39 and general Water Quality Certification under NWP 39 for the proposed project. Please contact Bridget Carnahan or Kiersten Fuchs at (502) 625-3009 with any questions regarding this submittal or the overall project.

Sincerely,

Bridget G. Carnahan
Staff Biologist

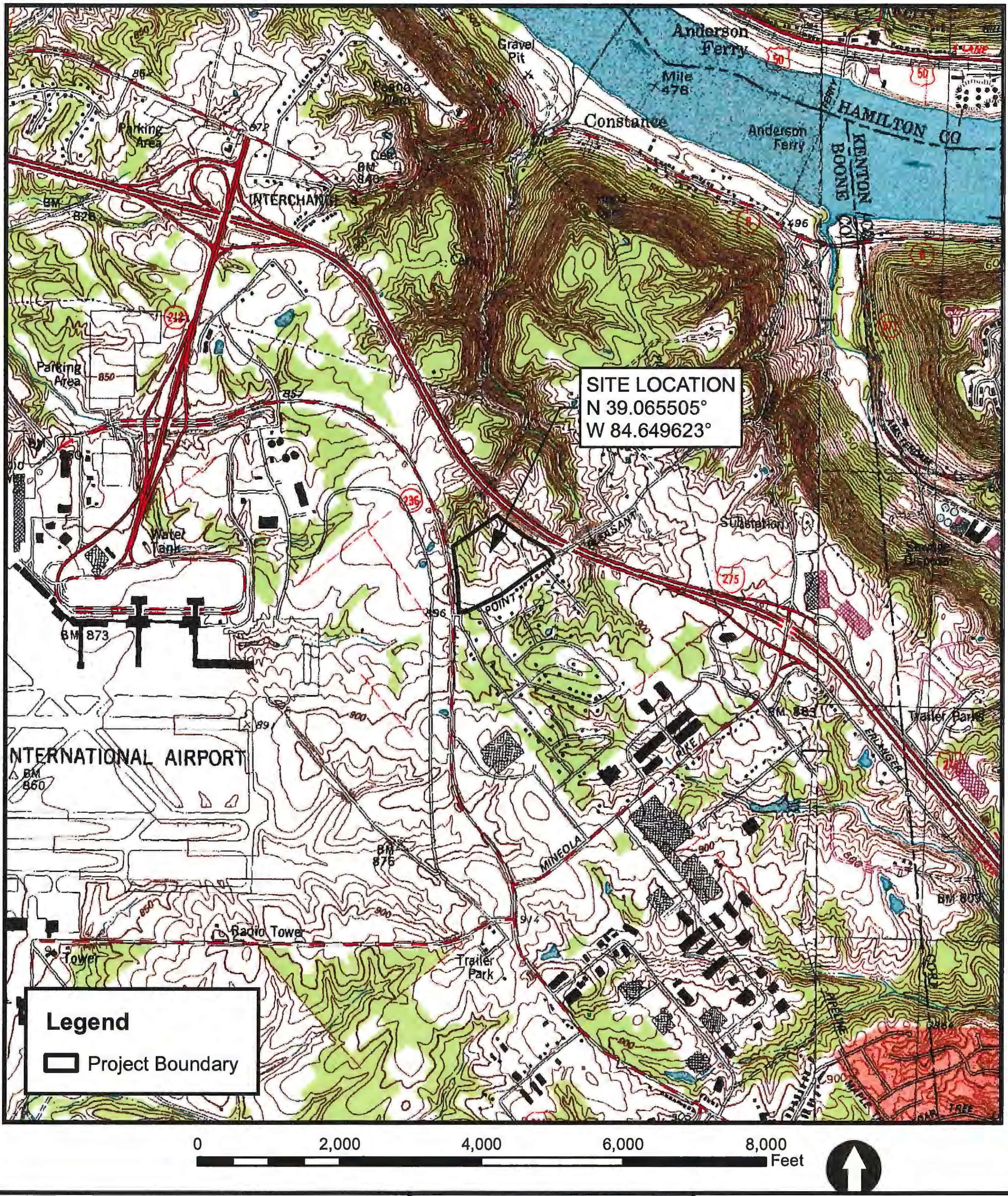
Kiersten R. Fuchs
Principal
Senior Wildlife Biologist

P:\2015 Projects\15-171-Airport Site 3C\Reports\PCN\Airport Site 3C_PCN.doc

cc: Mr. Scott Strine – Dermody Properties
Ms. Debbie Conrad – Kentucky County Airport Board

Attachments:
- Figures
- Photographs
- Appendix A – KDOW Water Quality Certification Application
- Appendix B – Wetland Determination Data Forms
- Appendix C – Preliminary Jurisdictional Determination Form

Source: USGS 7.5-minute Topographic Map, Burlington and Covington, Kentucky Quadrangles.



SITE LOCATION
N 39.065505°
W 84.649623°

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REDWING
ECOLOGICAL SERVICES, INC.

SITE LOCATION MAP

REVISED DATE: 02-15-16 | DRAWN BY: BGC

FIGURE 1

P:\2015 Projects\15-171-Airport Site 3C\Figures\Site Location Map.mxd, 03-3-2016, ebowman

Source: World Imagery - Esri and the GIS User Community (2014).

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 02-15-16

DRAWN BY: BGC

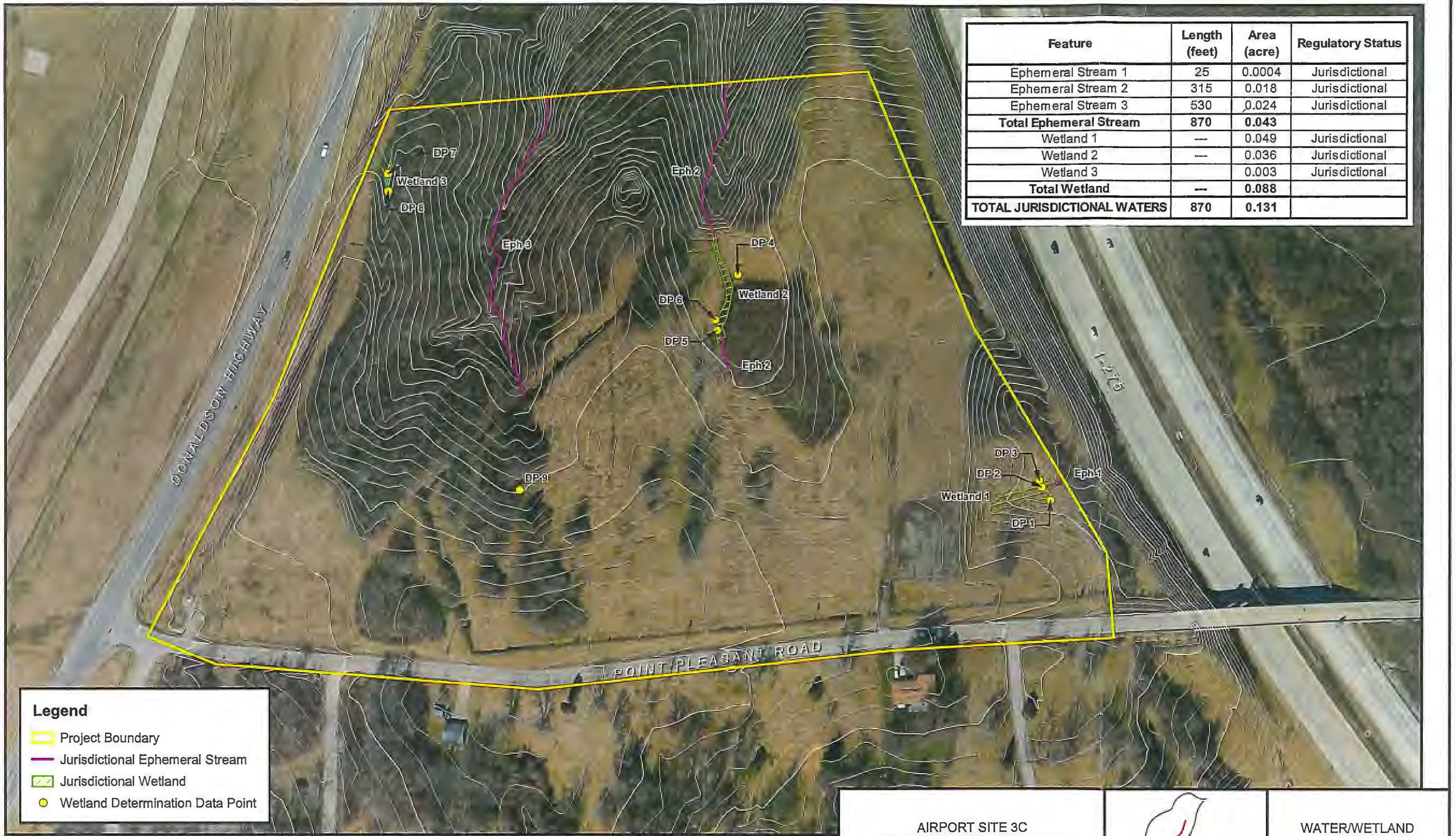
REDWING
ECOLOGICAL SERVICES, INC.

AERIAL PHOTOGRAPH MAP

FIGURE 2

P:\2015 Projects\15-171-Airport Site 3C\Figures\Aerial.mxd, 03-3-2016, ebowman

Source: World Imagery - Esri and the GIS User Community (2014); Linework provided by Viox & Viox.



Feature	Length (feet)	Area (acre)	Regulatory Status
Ephemeral Stream 1	25	0.0004	Jurisdictional
Ephemeral Stream 2	315	0.018	Jurisdictional
Ephemeral Stream 3	530	0.024	Jurisdictional
Total Ephemeral Stream	**870**	**0.043**	
Wetland 1	---	0.049	Jurisdictional
Wetland 2	---	0.036	Jurisdictional
Wetland 3		0.003	Jurisdictional
Total Wetland	**---**	**0.088**	
TOTAL JURISDICTIONAL WATERS	**870**	**0.131**	

Legend

- 🟨 Project Boundary
- — Jurisdictional Ephemeral Stream
- ▨ Jurisdictional Wetland
- ● Wetland Determination Data Point

0 75 150 300 450 600
Feet

NOTE: A WATER/WETLAND DELINEATION WAS CONDUCTED BY REDWING WETLAND SCIENTISTS ON FEBRUARY 17, 2016. THESE BOUNDARIES HAVE NOT BEEN VERIFIED BY THE U.S. ARMY CORPS OF ENGINEERS. USE OF THIS MAP IS FOR PRELIMINARY PLANNING PURPOSES ONLY.

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 02-22-16 | DRAWN BY: BGC/EDB

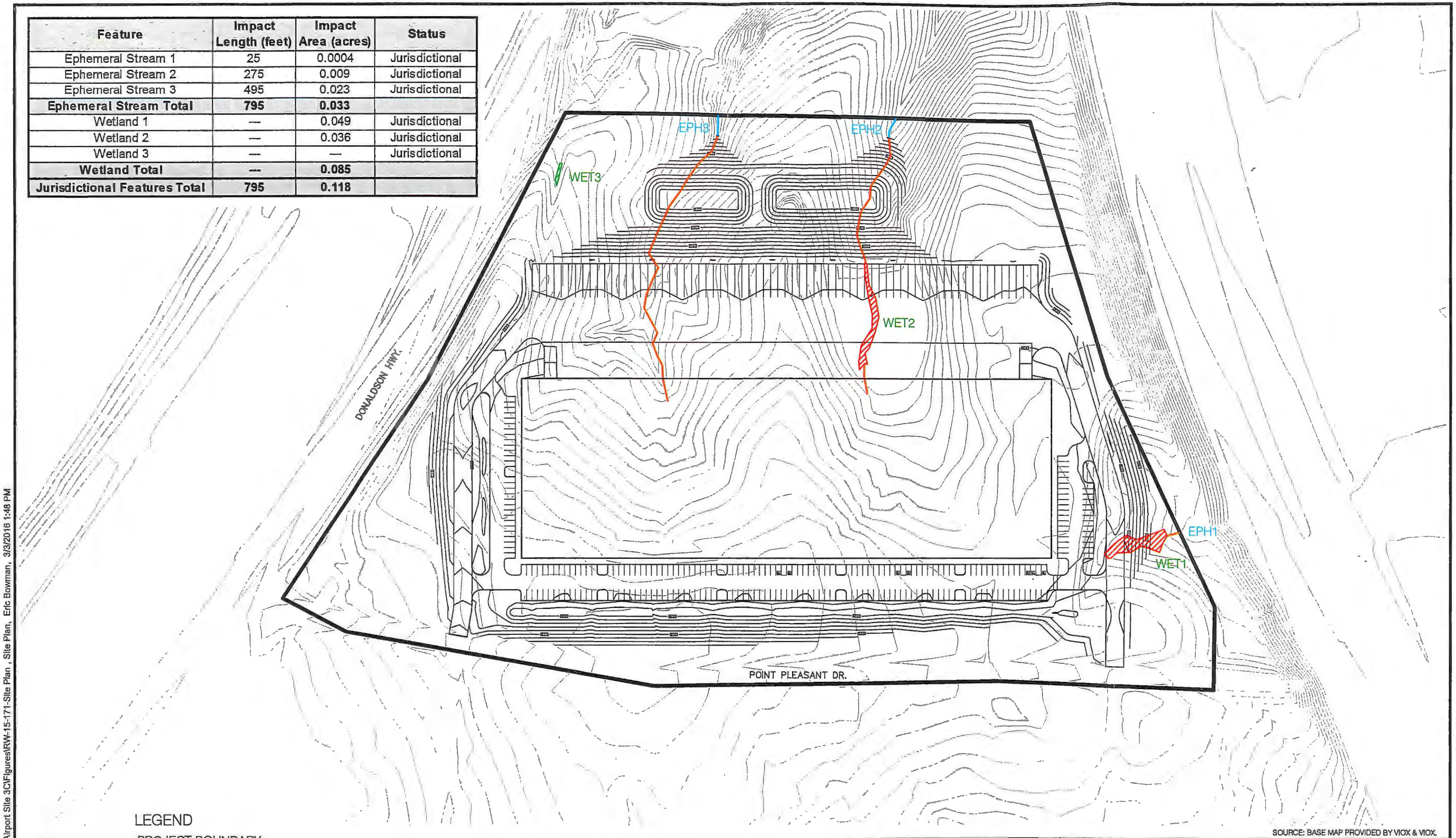
REDWING
ECOLOGICAL SERVICES, INC.

WATER/WETLAND
LOCATION MAP

FIGURE 3

P:\2015 Projects\15-171-Airport Site 3C\Figures\Water\Wetland Map.mxd, 03-3-2016, ebowman

Feature	Impact Length (feet)	Impact Area (acres)	Status
Ephemeral Stream 1	25	0.0004	Jurisdictional
Ephemeral Stream 2	275	0.009	Jurisdictional
Ephemeral Stream 3	495	0.023	Jurisdictional
Ephemeral Stream Total	**795**	**0.033**	
Wetland 1	—	0.049	Jurisdictional
Wetland 2	—	0.036	Jurisdictional
Wetland 3	—	—	Jurisdictional
Wetland Total	**—**	**0.085**	
Jurisdictional Features Total	**795**	**0.118**	



SOURCE: BASE MAP PROVIDED BY VIOX & VIOX.

LEGEND

- PROJECT BOUNDARY
- EPHEMERAL STREAM
- PROPOSED EPHEMERAL STREAM IMPACT
- ▨ JURISDICTIONAL WETLAND
- ▨ PROPOSED JURISDICTIONAL WETLAND IMPACT

NOTE: JURISDICTIONAL WATER/WETLAND BOUNDARIES WERE DELINEATED AND SURVEYED USING GLOBAL POSITIONING SYSTEM EQUIPMENT BY REDWING WETLAND SCIENTISTS ON FEBRUARY 17, 2016. THESE BOUNDARIES HAVE NOT BEEN VERIFIED BY THE U.S. ARMY CORPS OF ENGINEERS. USE OF THIS MAP IS FOR PRELIMINARY PLANNING PURPOSES ONLY.

150 75 0 150
SCALE IN FEET

AIRPORT SITE 3C
BOONE COUNTY, KENTUCKY

REVISED DATE: 03-02-16
DRAWN BY: EDB

REDWING
ECOLOGICAL SERVICES, INC.

SITE DEVELOPMENT
PLAN

FIGURE 4

P:\2015 Projects\15-171-Airport Site 3C\Figures\RW-15-171-Site Plan , Site Plan, Eric Bowman, 3/3/2016 1:48 PM

MATTHEW G. BEVIN
GOVERNOR

CHARLES G. SNAVELY
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

March 15, 2016

Kenton County Airport Board
Attn: Ms. Candace S. McGraw
P.O. Box 752000
Cincinnati, OH 45275

Re: Nationwide Permit No. 39
Cincinnati Northern KY International Airport
KCAB Site 3C
AI No.: 197; Activity ID: APE20160001
UTs of the Ohio River
Boone County, Kentucky

Dear Ms. McGraw:

This letter transmits to you a copy of our General Water Quality Certification for Nationwide Permit #39 for Commercial and Institutional Developments. An individual Water Quality Certification is not necessary for this activity provided that this project has received the appropriate Nationwide Permit from the U.S. Army Corps of Engineers and all conditions of the attached General Water Quality Certification are met.

Although an Individual WQC is not needed, other permits from the Division of Water may be required. If this activity occurs within a floodplain, a Permit to Construct Across or Along a Stream may be required. Please contact the Floodplains Supervisor (502-564-3410) for more information. If the project will disturb one acre or more of land, or is part of a larger common plan of development or sale that will ultimately disturb one acre or more of land, a Kentucky Pollution Discharge Elimination System (KPDES) stormwater permit shall be required from the Surface Water Permits Branch. This permit requires the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must include erosion prevention and sediment control measures. Contact: Surface Water Permits Branch (SWPB) Support (502-564-3410 or SWPBSupport@ky.gov)

All future correspondence on this project must reference **AI No. 197**. If you should have any questions concerning this letter, please contact Sarah Atherton at Sarah.Atherton@ky.gov or at (502) 564-3410.

Sincerely,

Sarah Atherton

Sarah Atherton, Project Manager
Water Quality Certification Section
Kentucky Division of Water

Attachment
cc: Michael Hasty, USACE: Louisville (via email: Michael.D.Hasty@usace.army.mil)
Kiersten Fuchs, Redwing Ecological Services (via email: KFuchs@redwingeco.com)

THIS PAGE INTENTIONALLY LEFT BLANK

STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

General Certification--Nationwide Permit # 39
Commercial and Institutional Developments

This General Certification is issued March 19, 2012, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C. §1341), as well as Kentucky Statute KRS 224.16-050.

For this and all nationwide permits, the definition of surface water is as per 401 KAR 10:001 Chapter 10, Section 1(80): Surface Waters means those waters having well-defined banks and beds, either constantly or intermittently flowing; lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface. Lagoons used for waste treatment and effluent ditches that are situated on property owned, leased, or under valid easement by a permitted discharger are not considered to be surface waters of the commonwealth.

The Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 10, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under NATIONWIDE PERMIT 39, namely Commercial and Institutional Developments, provided that the following conditions are met:

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.

2. The activity will impact less than 1/2 acre of wetland/marsh.

3. The activity will impact less than 300 linear feet of impact to surface waters of the Commonwealth. Realignment of streams and in-stream stormwater detention/retention basins are not authorized under this general certification.

4. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.

5. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.

6. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.

7. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
   - Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
   - Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
   - Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
   - Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access.
   - To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
   - Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
   - Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
   - If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
   - Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

MATTHEW G. BEVIN
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

CHARLES G. SNAVELY
SECRETARY

April 5, 2016

Kenton County Airport Board
PO Box 752000
Cincinnati, OH 45275

RE: Airport Site C3 - **Construction of a 264,000 SF industrial warehouse with associated appurtenances in the floodplain of Ohio River, with coordinates 39.065505, -84.649623, in Boone County**. AI: 129098

Dear Ms. McGraw :

Construction (other than dams or other impounding structures) in or along a stream where the **watershed is less than one square mile** is exempted from the permit requirements of KRS 151.250 by regulation 401 KAR 4:050, except for projects whose construction might pose a threat to life or property due to increased flooding. Therefore, since it appears that the construction you propose meets exemption criteria, *a stream construction permit will not be required.* Any deviation from the submitted project scope shall require a revised application which may result in the issuance of a permit should it be needed.

If this activity will result in a discharge of dredged or fill material into waters of the United States, additional permits may be required from the U.S. Army Corps of Engineers and the Kentucky Division of Water. Examples of discharges include but are not limited to placement of dirt, culverts, rock or pipelines in a stream or wetland. Please contact the Water Quality Certification Section staff at 502/564-3410 for additional information. Also, a storm water control permit may be required if the total surface disturbance is more than 1 (one) acres. Please contact Ronnie Thompson at the same number.

This exemption is issued from the standpoint of stream obstruction only and does not constitute certification of any other aspect of proposed construction. The applicant is liable for any damage resulting from the construction, operation or maintenance of the project and is responsible for obtaining any other permits or licenses required by this cabinet and other state, federal and local agencies. This document is being furnished to you in lieu of a Stream Construction Permit for the referenced activity.

If you have any questions, please call Mr. Ross Bishop at (502) 564-3410.

Sincerely,

Ron Dutta

Ron Dutta, P.E., Supervisor
Floodplain Management Section
Surface Water Permit Branch

RD/RB/
pc: Florence Regional Office
Mark Martin – Boone County Floodplain Coordinator
Kiersten Fuchs- Redwing Ecological Services, Inc.
Allisoin Chadwell, PE- Viox & Viox
Candace McGraw, CEO
File

kfchs@redwingeco.com
achadwell@vioxinc.com
dconrad@cvgairpor.com

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix D

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

CULTURAL RESOURCES

This Appendix includes a copy of the coordination materials related to Section 106 coordination between the FAA and the Kentucky Heritage Council / State Historic Preservation Office.

THIS PAGE INTENTIONALLY LEFT BLANK

U.S. Department
of Transportation
**Federal Aviation
Administration**

Memphis Airports District Office
2600 Thousand Oaks Blvd, Suite 2250
Memphis, TN 38118

Phone: 901-322-8180

May 6, 2016

Mr. Craig Potts
Executive Director and State Historic Preservation Officer
Kentucky Heritage Council
300 Washington Street
Frankfort, KY 40601

Dear Mr. Potts:

**RE: DETERMINATION OF EFFECTS
CINCINNATI/NORTHERN KENTUCKY INTERNATIONAL AIRPORT
BOONE COUNTY, KY
KHC # 46675-5**

The Federal Aviation Administration (FAA) Memphis Airports District Office (ADO) is seeking concurrence for a determination under Section 106 of the National Historic Preservation Act (NHPA) for a proposed undertaking at the Cincinnati/Northern Kentucky International Airport (CVG) in Hebron, KY. The proposed undertaking consists of constructing a commercial structure, parking lot, and stormwater facilities on the east side of the airfield. The structure is projected to be approximately 264,000 square feet in size and located at the northeast corner of the intersection of Donaldson Highway and Point Pleasant Road in Boone County, KY.

After reviewing the project related information, which included correspondence from your office dated April 20, 2016, the FAA has concluded the proposed undertaking would not affect historic properties and that obligations under Section 106 of the National Historic Preservation Act have been fulfilled. I respectfully request your review of the proposed undertaking as well as your concurrence or objection to the enclosed determination. If you have any questions, please feel welcome to contact me at (901) 322-8192 or by email at aaron.braswell@faa.gov.

Sincerely,

Aaron Braswell

Aaron Braswell
Environmental Protection Specialist, Memphis Airports District Office

Enclosure

cc: Debbie Conrad, Kenton County Airport Board (electronic copy)
Rob Adams, Landrum & Brown (electronic copy)

FAA Section 106 Effects Determination

Airport and Project Proponent Information:

Airport: Cincinnati/Northern Kentucky International Airport (CVG), 2939 Terminal Drive, Hebron, KY 41048

Project Proponent: Kenton County Airport Board, Post Office Box 752000, Cincinnati, OH 45275

Description of Undertaking/Proposed Action:

The Kenton County Airport Board (KCAB) is proposing a project that would involve the following elements as shown on the attached Exhibit 1:

1. Site preparation of Site 3C (Latitude 39° 03' 24" Longitude -84° 38' 32"), which measure approximately 25 acres in size and are located at the northeast corner of the intersection of Donaldson Highway and Point Pleasant Road in Boone County, KY.
2. Construction and operation of a 264,000 square foot commercial structure.
3. Construction of parking and circulation areas to support operations for the building.
4. Grading of land to facilitate stormwater flow, including the creation of a stormwater detention facilities.

Determination of and Description of the Area of Potential Effects (APE):

The APE for the assessment of cultural resources was defined for the project site. The APE for the viewshed/above ground resources was defined by a 1,000 foot radius around the project site. The abundance of mature trees and other development around the project site limited the size of the APE.

Steps Taken to Identify Historic Properties in the APE:

A Phase I Cultural Resources Survey was completed by Environment & Archaeology, LLC in February 2016 at Site 3C. The survey identified one archaeological site, two non-site localities, and one prehistoric isolated find within the project area, along with many locales of field debris of non-diagnostic historic material. The author of the Phase I survey Report concluded that none of these were eligible for the National Register of Historic Places (NRHP) and recommended no further archaeological work be completed. The Phase I Report was submitted to, and reviewed by, the Kentucky Heritage Council (KHC). KHC responded to the report in a letter dated April 20, 2016 (See KHC # 46675-5). Based on the letter, KHC concurred with the findings and recommendations in the report.

There are two single family detached homes and several accessory structures and small commercial structures located within the 1,000-foot viewshed portion of the APE (See Exhibit 2 for graphic depiction of area of potential effect and survey areas). The two residences were constructed in 1956 and 1961. The residential areas and other buildings are located on Point

Pleasant Drive, Pleasant Drive, and Piedmont Circle in an area known as Rolling Green Acres. Residential homeowners in this area were previously offered voluntary acquisition by the KCAB per the land use mitigation program. Four of the lots within the subdivision remain residential, two of which are in the 1,000-foot viewshed, while other lots have been converted to commercial/industrial use by the landowner. Area reconnaissance of the area for viewshed impacts did not identify any features that would indicate the homes are in any way unique or different than other similar homes in the area. Therefore, none of these homes are considered potentially eligible for the NRHP.

Conclusions:

- Based on Phase I Surveys, the proposed action is not likely to impact cultural resources.
- Based on reconnaissance of the viewshed area, there are no resources potentially eligible for the NRHP within the APE. Unidentified historic structures may exist within the viewshed but outside of the APE. However, adverse impacts to such properties are not anticipated due to 1) existing trees and other foliage between those properties and the development site and 2) the proposed undertaking is consistent with existing industrial/commercial development in the project vicinity.

FAA Determination of Effects:

Based on an evaluation of the details of the proposed undertaking/proposed action in conjunction with the research and precautionary measures summarized above, FAA has concluded that the proposed undertaking/proposed action would not affect any historic properties.

Pursuant to 36 CFR § 800.3(c)(4), the FAA intends to proceed to the next step if the SHPO does not respond within 30 days of receipt of this determination. For this undertaking, the next step will be completion of the Section 106 process.

Aaron Braswell

5-6-16

Aaron Braswell
Environmental Protection Specialist
Federal Aviation Administration
Memphis Airports District Office

Date

THIS PAGE INTENTIONALLY LEFT BLANK

Environment & Archaeology
LLC

Project E&A - 2622
FY16-8657

April 6, 2016

REVISED
PHASE I CULTURAL RESOURCES SURVEY FOR THE KENTON COUNTY AIRPORT BOARD CINCINNATI/NORTHERN KENTUCKY INTERNATIONAL AIRPORT SITE 3C PROJECT IN BOONE COUNTY, KENTUCKY

Prepared For:
Kenton County Airport Board
P.O. Box 752000
Cincinnati, Ohio 45275
Attention: Debbie Conrad

Prepared By:
Environment & Archaeology, LLC
221 Main Street
Florence, Kentucky 41042
(859) 746-1778

Andrea D. Crider

Andrea D. Crider, MA, RPA
Principal Investigator

Courtney Stoll

Courtney Stoll, MA, RPA
Primary Author

ABSTRACT

Kenton County Airport Board is considering the development potential of an area next to the airport in Boone County, Kentucky, but has not yet proposed any specific development plans for this area. This potential development area is being referred to as the Site 3C Project Area. The project area is bordered by I-275 to the northeast, KY-236 to the southwest, Point Pleasant Road to the southeast, and a parking lot to the north. This project is to the northeast of the current airport. The total area surveyed was approximately 50.4 acres (20.4 hectares).

The Kenton County Airport Board retained *Environment & Archaeology, LLC* to identify and delineate any cultural resources within the survey area. Included in this report are the results of the archaeological survey and background research conducted for the survey area. The project area lies within the Outer Bluegrass Physiographic Province. The project is within the Middle Ohio-Laughery watershed. The nearest water is Dry Creek, approximately 4,900 feet to the northeast, which runs to the north to the Ohio River. The Ohio River at its closest is 5,100 feet to the north of the project area.

The survey identified one archaeological site, two non-site localities, and one prehistoric isolated find within the project area, along with many locales of nondiagnostic historic isolated finds of nondiagnostic historic material. Site 15Be681 was a historic residential site that was the former location of a residence constructed in the late 19th century (S#3), and outbuildings that were constructed in the mid 20th century (S#7 and S#8). No structures were still standing, nor was there evidence of foundations. Historic maps indicate that the structures were demolished between 1951 and 1961, prior to the purchase of the property by the airport. The majority of the artifacts were recovered from the surface, and many of the shovel tests, particularly in the area of the highest concentration of artifacts at the surface, showed disturbed soils. Due to the level of disturbance at this site, the absence of features, and that the artifacts are no longer in situ, this site is not recommended as eligible for the National Register of Historic Places. No further archaeological assessment is recommended.

NSL #1 was a structure on the parcel that formerly had a pay-to-park lot. A review of historic maps did not show a structure at this location at any time, and the artifacts were predominantly nondiagnostic with some modern artifacts included. A review of the Kenton County Airport Board's documents showed that when they purchased this property in 1974, a pay-to-park lot was present on the parcel, along with associated buildings for car maintenance. The photos of the buildings show structures that were constructed less than 50 years ago, and the documents indicated that this business had not been functioning for very long, but was very successful, and the airport was considering running the lot themselves after the purchase. It is clear however that instead the facility was destroyed. As it is not present on the 1961, 1969, 1974, or 1991 topographic maps, it is presumed that it was destroyed shortly after purchase in 1974, and that the construction happened after the creation of the 1969 map. Therefore this represents a demolition site of a structure that may have been associated with a car parking facility that was constructed less than 50 years ago. Review

by the Kentucky Office of State Archaeology determined that this finding did not warrant a site number. No further archaeological assessment is recommended.

NSL #2 was the location of a no longer extant historic residence with an associated garage with a second floor rental property. It was constructed in the mid 20th century and the demolition likely occurred in the 1970s. A structure is shown in the southern portion of this non-site locality on historic maps from 1961 to 1974 (S#18). No features remained for the main residence, although a dry laid stone wall holding back a dirt embankment was present near the former location of the main residence. The foundation of the garage/apartment was present, but was throughly disturbed. No historic structures were indicated on any of the historic maps at the location of this foundation. The artifacts at the location of the main residence were sparse in nature, and were in disturbed context. The majority of the artifacts were recovered from the surface, and many of the shovel tests did show disturbed soils. Review by the Kentucky Office of State Archaeology determined that this finding did not warrant a site number. No further archaeological assessment is recommended.

Isolated Find (IF) #1 was a single piece of debitage. This debitage was a secondary flake composed of Boyle chert. This single finding did not warrant a site number and no further archaeological assessment is recommended.

Nondiagnostic historic isolated finds were present throughout the project area. These artifacts were collected at the surface at the location of systematic sample loci at 65-foot intervals throughout the project area. Any artifacts located at the surface were collected before shovel tests were excavated, and artifacts recovered from the surface and from within shovel tests were bagged separately in order to maintain provenience. A total of 42 artifacts were collected. Much of the project area was disturbed, and it is known that numerous structures had been razed within the project area in the past. The artifacts consisted of nondiagnostic material such as brick, concrete, window glass, wire nails, kitchen glass, and unidentified rusted metal. The nondiagnostic historic isolated finds were not in concentrations large enough to warrant a designation of a non-site locality. These artifacts were not in concentration around any former structure locations as indicated by historic maps. They are artifacts that have been distributed across the project area from demolition activities, agriculture, and erosion. They do not warrant site numbers or further investigation.

It is the opinion of *Environment & Archaeology, LLC* the project area does not maintain any potential for the presence of intact cultural resources that may be eligible for the National Register of Historic Places. As such, no further consultation under Section 106 of the National Historic Preservation Act is recommended for this project.

If any unidentified cultural deposits, such as trash pits, house foundations, or human burials are identified during the construction, the project engineer will cease work and contact the Kentucky State Historic Preservation Office (SHPO) at the Kentucky Heritage Council (KHC).

TABLE OF CONTENTS

CHAPTER

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOGRAPHS

INTRODUCTION

Kenton County Airport Board is considering the development potential of an area next to the airport in Boone County, Kentucky, but has not yet proposed any specific development plans for this area (Figure 1). This potential development area is being referred to as the Site 3C Project Area. The project area is bordered by I-275 to the northeast, KY-236 to the southwest, Point Pleasant Road to the southeast, and a parking lot to the north (Figure 2). The project area is to the northeast of the existing airport. The total area surveyed was approximately 50.4 acres (20.4 hectares).

The Kenton County Airport Board retained *Environment & Archaeology, LLC* to identify and delineate any cultural resources within the survey area. This survey complied with various Federal regulations intended to protect the nation's cultural heritage from destruction. These include the National Historic Preservation Act of 1966, as amended; National Environmental Protection Act; Executive Order 11593 (Protection and Enhancement of the Cultural Environment); Archaeological and Historic Preservation Act of 1974; Native American Graves Protection and Repatriation Act; and Archaeological Resources Protection Act.

The purpose of the survey was to identify archaeological sites within the project area and determine which, if any, are potentially eligible for inclusion on the *National Register of Historic Places*. Included in this report are the results of the background research and archaeological survey for this project. Fieldwork was conducted in November 2015. Field direction was the responsibility of R. Vince Whitlatch, BA. Project and report preparation oversight were the responsibility of Principal Investigator, Andrea D. Crider, MA, RPA, and Courtney Stoll, MA, RPA. Report compilation was the responsibility of the primary author, Courtney Stoll, MA, RPA. Resumes of personnel are included in Appendix A. Copies of this report are on file with the Kentucky Heritage Council, the Kenton County Airport Board, and *Environment & Archaeology, LLC*. The Phase I survey was conducted for Debbie Conrad of the Kenton County Airport Board.

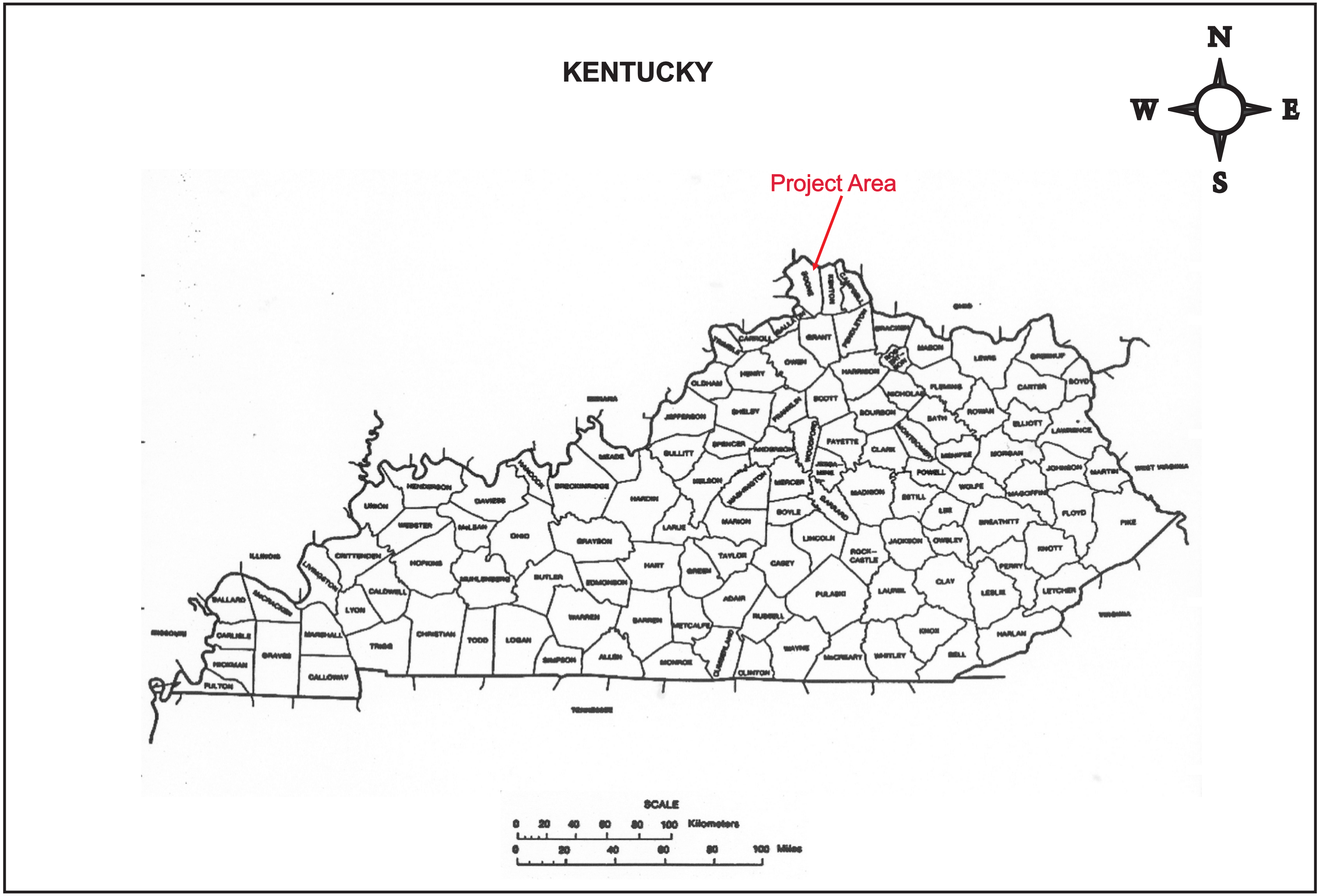
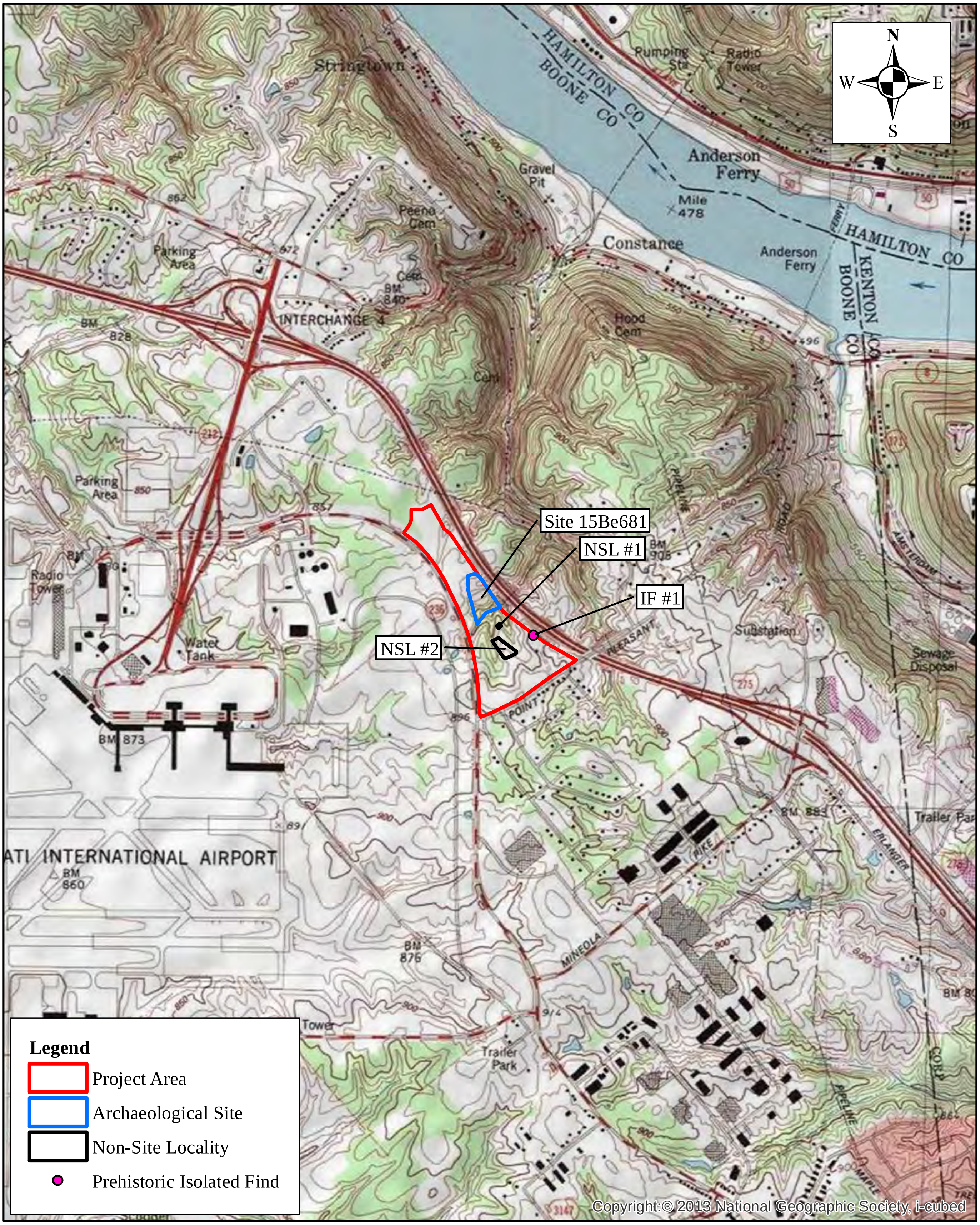


Figure 1. State Map of Kentucky Showing the Project Area Location.



Copyright: © 2013 National Geographic Society, i-cubed

Figure 2	Kenton County Airport Board Site 3C Project Boone County, Kentucky	USGS 7.5-Minute Topographic Map Burlington and Covington, KY Quadrangles 0 1,000 2,000 4,000 Feet *Environment & Archaeology, LLC*

ENVIRONMENTAL OVERVIEW

Any discussion of past human lifeways must include an examination of environmental conditions. An understanding of an area's climate, vegetation, faunal resources, soils, water resources, and geomorphic agencies are paramount when considering where archaeological sites are likely to occur. All of these variables influence what types of resources were available to past human inhabitants within a given area. This, in turn, will affect the prehistoric subsistence, settlement, and land use patterns. The following summary of the natural history of Kentucky describes the environmental setting in which this region's cultural history developed.

Physiography and Geology

The study area is located in Boone County, Kentucky, near the town of Hebron. Located in north-central Kentucky, Boone County lies in the Kentucky Outer Bluegrass Physiographic Region. The Bluegrass physiographic province dominates north-central Kentucky. This region encompasses the Cincinnati Arch, an area of contiguous outcrops of Ordovician, Silurian, and Devonian rocks (McGrain 1983). The strata of the Outer Bluegrass are Late Ordovician with many formations containing interbedded shales and limestones. Surface waters have cut valleys in the soft bedrock. Consequently, hills and steep slopes dominate the landscape, and flat land is scarce. The study area discussed in this report is located in the portion of Kentucky affected by past glacial activity.

Drainage and Hydrology

The project area is only 0.97 miles south of the Ohio River, and is 0.93 miles southwest of Dry Creek. The project area lies within the Middle Ohio-Laughery watershed. The survey area was not on any floodplain or alluvial soils.

Paleoenvironment

The structure of vegetation controls the structure and composition of animal populations and is "fundamental to hunting communities in determining their life style" (Evans 1978:4). This is true also for early Euro-American communities where the perception of vegetational patterns determined, in large part, the choice of settlement locations (Jordon 1979; Hulbert 1930).

The following floral and faunal reconstructions are based on two types of evidence: palynological assessments and early traveler's records. The former indicated types and frequencies of floral species present in an assemblage, while the latter give evidence for the distribution of natural forest types prior to European settlement. For example, the earliest vegetational patterns of the post-glacial succession, as well as shifts in climax forest constituents, are derived primarily from palynological evidence. The forest types present during the Woodland culture period (900 B.C. to European contact) are assumed to be quite similar to those present at the time of contact, as described in pioneer reports. This later assumption is also supported with work done by Yarnell which revealed that "the climate probably remained much the same for the past 4,000 years...and the general vegetational patterns have not changed much during this period" (Yarnell 1964:47).

During the period of peak glacial advance (21,000 B.C. to 14,500 B.C.) when the ice sheet extended to a point north of the Ohio River, there existed a 60 to 100 kilometer wide belt of tundra which may have reached into portions of the Appalachians (Delcourt and Delcourt 1981:123-165). Maxwell and Davis (1972) also described pollen evidence that suggests the presence of tundra vegetation along the alpine zone south of the ice margin. By about 13,000 B.C., the eastward expansion of spruce and jack pine forests had spread well into Kentucky, as had the northern expansion of conifer and northern hardwood forests (Delcourt and Delcourt 1981:147). Later, the xerothermic interval (8,000 to 3,000 B.C.) would have provided a warmer and drier climate which allowed the glaciers to retreat north of the Great Lakes and permitted the northern advance of oak-hickory and mixed hardwood forests. Forest characteristics under which prehistoric cultural colonization occurred were apparently formed during a trend of gradual cooling and increased precipitation which began about 3,000 B.C. Contemporary forest communities in the study area are second and third growth stands which have replaced original forests that were impacted by logging, land clearing, and the chestnut blight of the 1930's and are only moderately similar to the historical conditions under which Native Americans existed.

Any climatic or precipitation changes that have occurred during the Late Holocene period to the present are interpreted as minor shifts compared to those that occurred during earlier periods (Carbone 1976; Muller 1986:51). By the Late Holocene, the climate and environment was very similar to what is seen today with respect to the tremendous variety of floral species (Funk 1993). An important point to note from these diverse tree species is the fact that they provide a variety of plant food sources for prehistoric populations. Acorns, chestnuts, hickory nuts, wild cherry, mulberry, etc., were all available within a limited distance. Also available in greater numbers were seed plants that could have been used for food or medicinal purposes (Fernald and Kinsey 1958). Deer, turkey, and a wide variety of small mammals along with waterfowl and an assortment of aquatic resources also were available to the prehistoric populations. Although these climatic shifts were not catastrophic in their effect on aboriginal populations, the changes in the distribution of plant and animal populations may have caused some settlement shifts in response (Muller 1986).

Braun's (1950) pioneering description of the eastern deciduous forests has provided the groundwork upon which Jobe et al. (1980), Niquette and Henderson (1984), and others have based their characterizations of Kentucky's native flora. These studies provide information on the inferred vegetational assemblages which occupied the pre-European contact landscape. Braun defined this area as the Appalachian Plateau which displays a variety of oak-hickory forests, oak-tuliptree forests, and mixed mesophytic communities according to location, water availability, slope and altitude (Braun 1950:136). The oak-hickory forests, with black and white oak, hickory, ash, dogwood, sweet and black gum, elm, and black walnut occupies most of the uplands while beech, tuliptree (yellow poplar), sugar maple, and chestnut occupied the low areas (Braun 1950:138).

Additional information for the area states that prior to European settlement, within an area of ten square miles, there would have been approximately 750,000 trees, 2,810,000 shrubs, 230-460 million herbaceous plants (Black 1967: 573). In the early 1800's, the main tree species noted in field notes were oak, hickory, elm, ash, walnut, gum and honey locust. Other species noted were pawpaw, persimmon, sassafras, grapevine, and wild cherry (Black 1967).

In prehistoric times, deer were probably distributed at densities of 10 to 15 individuals per square mile (Hay and Stevenson 1984:3), and their seasonal feeding patterns made them an efficiently exploitable subsistence resource. In the fall months, deer congregated in areas of heavy mast production, enabling hunters and gatherers to harvest both vegetable and animal foods. When winter temperatures and snowfall were moderate, deer were fairly evenly distributed across the countryside, but during severe winter weather they tended to shelter in narrow valleys, forcing hunter-gatherers to move to those locales. In the spring and summer, deer again maintained a fairly even distribution.

Black bears probably had a distribution of one adult for every 5 to 15 forested square miles (Hay and Stevenson 1984:4). Higher elevations covered by dense understory, where berries and other wild fruit were plentiful, would have supported the most bear. Wild turkeys, another important aboriginal subsistence resource, were probably prehistorically as dense as 8 to 13 individuals per square mile (Hay and Stevenson 1984:4). Their preferred habitat, a mature oak forest with a high percentage of white oaks, would have been found predominately on upper slopes and dry ridgetops.

Soils

Soil types vary with topographic setting. Some settings were more conducive to prehistoric and historic occupations than others. Characteristics of some general soil associations include various indicators of the physical characteristics of the settings and the limitations or benefits that may be provided to a culture occupying a site and the sites potential to be preserved over time. These characteristics can include soil depth, drainage, vegetation, slope, and relative acidity. Soils that form in alluvial settings provide evidence for the age and geomorphic/environmental contexts of archaeological sites. Alluvial soils are also useful for reconstructing site formation histories (Holliday 1992:1).

The project is within the Rossmoyne-Jessup soil association. This association is nearly level to moderately steep, and is found on ridgetops and side slopes of the glacial uplands (USDA 1989). The soil types identified in the Phase I survey areas are shown in Table 1 and Figure 3.

Table 1. Soils Identified in the Site 3C Project Area.

Soil Type	Landform	Drainage	Parent Material
Av, Avonburg silt loam, 0 to 4 percent slopes	flats	somewhat poorly drained	thick fine-silty noncalcareous loess over loamy outwash
CyF, Cynthiana flaggy silty clay loam, 20 to 50 percent slopes	hills	well drained	clayey residuum weathered from limestone
JsD3, Jessup silty clay loam, 12 to 20 percent slopes, severely eroded	hills	well drained	thin noncalcareous loess over clayey outwash over residuum weathered from limestone
RsB, Rossmoyne silt loam, 0 to 6 percent slopes	ridges	moderately well drained	thin fine-silty noncalcareous loess over loamy outwash
RsC, Rossmoyne silt loam, 6 to 12 percent slopes	ridges	moderately well drained	thin fine-silty noncalcareous loess over loamy outwash

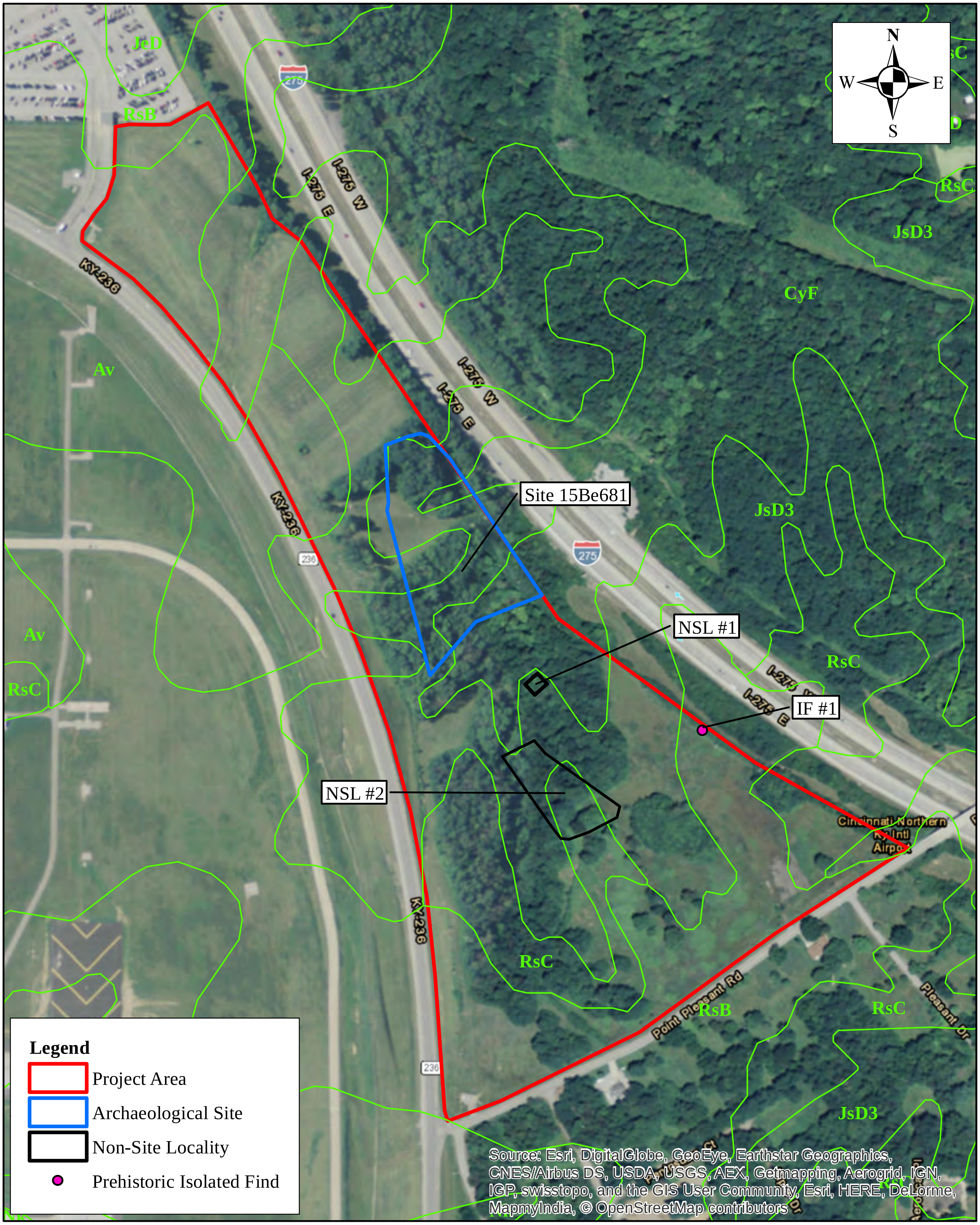
Vegetation

Bailey (1978) places the study area in the Humid Temperate Domain, Hot Continental Division, Eastern Deciduous Forest Province, in the Oak-Hickory Forest Section. The land-surface form classification is Dfa (humid continental warm summer).

The regional flora is dominated by temperate deciduous forest. The forest community is composed of tall, broadleaf trees that provide a continuous and dense canopy in summer but shed their leaves completely in the winter. Understory trees and shrubs are generally poor in species. The major forest community on uplands consists of mixed oak forests with white oak, hickory, southern red oak, post oak, and northern red oak. On lowlands, mixed forests dominate with pin oak, sweet gum, cottonwood, yellow poplar, white ask, red gum, red and silver maple, pecan, sycamore, swamp chestnut oak, swamp white oak, bald cypress, and tupelo (Küchler 1964).

Climate

The current climate of Kentucky, best characterized as temperate and humid, is very similar to that reported by its first settlers (USDA 1989). In Boone County, the average annual temperature is 54 degrees Fahrenheit, ranging from an average of 33 degrees Fahrenheit in January to an average of 76 degrees Fahrenheit in July. Average rainfall is approximately 40 inches per year, with precipitation well distributed throughout the year. Thunderstorms occur approximately 50 days per year, and are more frequent between the months of March and August. The average growing season lasts approximately 186 days (USDA 1989). According to Dunnell (1972:7), climatic variations severe enough to have modified the region's basic environment have not occurred in the past 5,000 years.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Figure 3	Kenton County Airport Board Site 3C Project Boone County, Kentucky	Aerial Map with USDA Soil Overlay Aerial Map Provided by ESRI Map Services 0 250 500 1,000 Feet *Environment & Archaeology, LLC*

CULTURAL OVERVIEW

The following discussion serves as a synthesis of various sources regarding the known prehistoric and historic cultures of the Upper and Central Ohio River Valley. Pertinent regional information provides a framework within which the problem of site significance may be addressed and research questions formulated concerning the cultural resources of the study area.

Information from surrounding areas, including the Ohio Valley, which encompasses southwestern Pennsylvania, northwestern West Virginia, and southeastern Ohio must be used. An even larger geographic area can be examined for information concerning the Paleoindian occupation due to the limited representation of these sites in the eastern United States.

Paleoindian Occupation (10,000-8,000 BC)

Archaeologists speculate that the initial entrance of man into the New World from Asia, via the Bering land bridge, may have occurred as early as 40,000 years ago, although evidence to support this theory remains inconclusive. The earliest inhabitants, the nomadic Paleoindians, probably entered the project area from the South or West during the late Pleistocene. In the eastern half of North America, the earliest cultural material is found at the Meadowcroft Rockshelter in Pennsylvania, with a C-14 date of between 14,225 BC and 11,300 BC (SI-2354) (Adovasio et al. 1977). Freeman et al. (1996:386) speculated that Paleoindian peoples entered Kentucky around 11,500 BP or 9,550 BC.

The Paleoindian cultural tradition in the eastern states is recognized as part of a widespread, homogeneous, conservative New World culture typified by a distinctive lithic artifact assemblage. The most visible and diagnostic item in this assemblage is the fluted projectile point. Clovis points have been found in every state in the eastern United States, as well as in many in the west (Justice 1987:21). Due to similarities between tool assemblages in both western and eastern North America, it can be deduced that the early Paleoindians moved rapidly across the continent, probably along game trails and grassland belts (Smith 1990:245). Clovis points vary in size from 2.8 to 19.5 centimeters in length, with the largest Clovis point being documented by Rolingson as coming from Woodford County, Kentucky (Tankersley 1990a:78). Similarly-sized Clovis points have been found in Washington, Idaho, Montana, Colorado and New York, as well as at the Lincoln Hills Site in Illinois (Tankersley 1990b:278). Projectile points in the Clovis cluster that have been found in Kentucky and the surrounding states are Ross County and Redstone. (Justice 1987:21-25). Other artifact types, which remain consistent from the Holcombe Beach site in Michigan (Fitting et al. 1966) to the Debert site in Nova Scotia (MacDonald 1968), represent predominantly hunting, butchering, and hide-working activities. Although tools of wood, plant fibers, antler and bone were used, they were "portable and disposable" and more subject to decomposition than the stone points (Tankersley 1996:24).

Paleoindian sites are reported from the American Southwest to the East Coast, and from as far north as Nova Scotia to as far south as Florida with very little interregional variation in material culture

(Tankersley 1996:24). Because sites from this period reflect areas where small groups of people performed specified tasks for a short time, they maintain low archaeological profiles. Most information about this earliest cultural development must therefore be inferred from sparse surface recoveries of artifacts and considered in conjunction with relevant paleoecological and geomorphological data.

Traditionally, Paleoindians have been viewed as big game hunters who traveled in small migratory bands in search of a primarily meat diet. However, in the eastern states, there is an almost total lack of direct associations of fluted projectile points and Pleistocene megafauna (Freeman et al. 1996:385). This should not be taken to mean that the Paleoindians in the East did not utilize large game. For example, the Adams Mastodon in Harrison County, Kentucky shows evidence of butcher marks on its bones, but no tools were recovered (Walters 1988:43). Also, several Clovis points have been recovered at Big Bone Lick, in Boone County Kentucky, but evidence of direct associations with megafauna is not present (Tankersley 1996:28). While it is likely that Paleoindians did hunt large species, other smaller game as well as many plant species were abundant for subsistence, and most likely utilized (Freeman et al. 1996:385). Investigations in eastern Missouri (Graham et al. 1981), also indicate that Paleoindian occupation occurred in areas of deciduous forest and open grasslands where a variety of floral and faunal resources were available.

The archaeological evidence of Paleoindians suggests that they lived in small, highly mobile bands that could travel from 50-220 kilometers every year (Tankersley 1989:271). Although they most likely followed migratory animals, Anderson suggests that some groups may have “settled” into habitual usage of smaller, resource-rich territories, such as those along major rivers (1995:5, 7). Anderson believes that due to cultural perceptions of group size and spacing, Paleoindians may have limited their mobility to avoid land use redundancy (1995:11). While Paleoindians traveled in small groups as a rule, it is likely that these groups interacted with one another on a loosely set schedule, meeting at conspicuous spots on the landscape once or twice a year (Anderson 1995:11-15). Many of these “prominent points” were associated with water, which could indicate that Paleoindians used water-based modes of transport (Anderson 1995:15). These meetings would have given the Paleoindians chances to trade technology and resources, as evidenced by the presence of lithic tools 900 kilometers from their source (Tankersley 1989:269-270). Goods were not the only things traded at these meetings: they provided the opportunity for intermarriage between groups (Anderson 1995:7, 13; Tankersley 1989:270).

Based on the information gathered so far, post-Pleistocene subsistence strategies must have been superbly geared for coping with a harsh and rapidly changing environment. Evidence suggests that open grazing lands and boreal forests along the glaciers’ margins were exploited for woodland musk ox, mastodon, barren ground caribou, woolly mammoth, giant beaver, and moose-elk (Muller 1986:52). During the Paleoindian period, the climate changed, resulting in shifts in vegetation thus affecting the faunal population by aiding in the decline of the megafauna (Anderson 1990:196; Tankersley 1996:32). Subsistence activities shifted to more of a mixed foraging strategy, where both large and small animals were hunted. By about 8,500 B.C., the Pleistocene was over, and most of the megafauna was extinct (Tankersley 1996:35). The late Paleoindians were somewhat less mobile than the early Paleoindians, because subsistence resources were more evenly distributed in the arboreal environment, and it was not essential to travel as far to obtain everything needed.

Most of Kentucky's early Paleoindian sites are found in the Bluegrass (e.g. Big Bone Lick, Adams Mastodon, and Clay's Ferry Crevice), Jackson Purchase (e.g. Henderson and Roach), and Western Coalfields (e.g. Morris and Parrish) geographical regions (Rolingson and Schwartz 1966; Sanders 1983). Although no early Paleoindian sites have been found in the Mountains, late Paleoindian bands explored the region, despite its rugged landscape (Tankersley 1996:35). The late Paleoindians were the first groups to utilize rockshelters on a regular basis (Tankersley 1996:35). Regional archaeological complexes began to develop during the middle Paleoindian period. These regionally specific styles replaced the Clovis point tradition with such point types as the Cumberland, Quad, Simpson, Suwannee, and in the late Paleoindian period with Dalton (Meserve), and Hardaway-Dalton (Justice 1987:8-9; Niquette and Henderson 1984:30; Smith 1990:230).

Several researchers have attempted to determine correlates between the occurrence of Paleoindian points from surface contexts and their locational parameters. In addition to work by Gatus and Maynard (1978), Jobe et al. (1980:18), "suggest an exploitative pattern concentrated in major stream valleys" with the expectation that further investigation will discover Paleoindian materials in smaller tributary drainages. Seeman and Prufer (1982) updated an earlier survey of fluted point distribution in Ohio by Prufer and Baby (1963) which details several factors that influence the location of fluted points. These factors are restated, updated, and localized to Kentucky by Tankersley (1996:37). Seeman and Prufer identify two positive and one negative correlation with locational variables: 1) fluted points are frequently found in major stream valleys and confluences, 2) they tend to occur in proximity to quality flint resources, and 3) these points are rarely found in extensive swampy lowlands or in rugged highlands. Tankersley's research indicates that Paleoindian sites are most likely to be found in specific microenvironments over a large area. The floodplains of major streams and their confluences are likely to contain Paleoindian sites, as well as the fringes of ponds and bogs, saline springs, major game trails, and especially those areas that exhibit such characteristics and provide a substantial source of high-quality lithic raw material (Tankersley 1996:37). Freeman et al. (1996:390) summarize Rolingson's survey of Paleoindian sites in Kentucky by saying that Paleoindian points were found in their highest densities along major salt licks and springs, as well as known game trails connecting such features. This correlation is especially prominent in the Bluegrass region

Cunningham (1973:125) describes a general pattern for the Central Ohio Valley in which open sites were located on hills or knobs overlooking habitats used by grazers and browsers. Such sites on terraces or knolls overlooking river bottoms were placed near routes leading to the lowlands and were often situated close to salt licks and springs like those in the Big Bone Lick area near the project area. Although no Paleoindian sites have been professionally excavated in northeastern Kentucky, Clovis and Quad projectile points do occur in isolated surface contexts at various localities in the vicinity of the proposed project area (Rolingson 1964:65). Several Clovis points have been recovered from the Big Bone Lick area (Tankersley 1996:27). A date of 8650+/-250 B.C. was obtained from a radiocarbon assay of wood found with the remains of megafauna at Big Bone

Lick, which could also be accepted as a likely date for Clovis occupation at the site (Tankersley 1990a:81). In addition to the environmental and topographical characteristics of Paleoindian sites previously, other factors must not be discounted. For example, rockshelters were used by Paleoindians, and cave sites have been reported for years, although they are often poorly documented (Freeman *et al.* 1996: 390-1).

Archaic Occupation (8,000 to 1,000 BC)

Brown and Cleland (1968) postulate that while Paleoindians exploited post-Pleistocene biotic communities that were mosaic in nature, Archaic cultures represent adaptations to the rather recent zonation of floral and faunal assemblages. This zonation of biotic communities presented Archaic peoples with particular geographic regions occupied by specifically adapted flora and fauna. The consolidation of differentially maturing resources into zones allowed Archaic bands to schedule the procurement of subsistence items as they became seasonally available. This type of restricted wandering strategy was not possible in a more mosaic environment where resources were randomly distributed. Archaic inhabitants lived as part of this developing system, and their subsistence strategies and settlement patterns reflected the changing environmental conditions.

Jefferies (1996:39) suggests that the environment of the Archaic peoples in Kentucky was changing from that of the Pleistocene to conditions resembling those of today. Many archaeologists suggest that cultural changes result from the changing environment of Archaic times (Styles, et al. 1983:265). The environment was still cooler and wetter than current conditions, but the floral assemblage was changing (Jefferies 1988:97). Deciduous trees were replacing the spruce and hemlock, throughout much of Kentucky, though many coniferous trees were still present. In addition, a wide variety of modern faunal species replaced the extinct Pleistocene megafauna (Jefferies 1996:39; 1988:94).

Early Archaic (8,000 to 6,000 BC).

Concurrent with the shift from postglacial to temperate environment, the large fluted points of the Paleoindian period were replaced in the Early Archaic period (8,000 to 6,000 BC) by smaller, more diversified projectiles better suited to the hunting of smaller game. This change to projectile points with notched bases was the biggest change in tool assemblage from Paleoindian times to the Early Archaic period (Jefferies 1996:40). The appearance of Kirk, LeCroy, Stanley, MacCorkle, Thebes St. Charles and several bifurcated-base style points, ubiquitous throughout the Southeast and Midwest, indicates the continued exploitation of large territories by small hunting bands (Jefferies 1996:41; Dragoo 1976). Several deeply buried sites in central, eastern and western Kentucky (i.e., Longworth-Gick site, Morrisroe site, Whalen Site, Cloudsplitter site, Deep Shelter site, and Lawrence site) contained Early Archaic deposits, most in stratified contexts (Rolingson and Schwartz 1966; Dorwin et al. 1970; Mocas 1977; Nance 1988; Cowan et al. 1981). Cowan (1976) and Nance (1988) demonstrated that Early Archaic projectile point clusters for the Red River Gorge are very similar to LeCroy and Kirk sequences secured from stratified sites outside the area. The addition of sandstone abraders and mortars to the Early Archaic people's tool kit indicates that vegetable foods were becoming a more substantial part of the diet. Aquatic resources, such as fish and mussels, have not often been found in Early Archaic sites; thus they were not likely to have been of much importance (Jefferies 1996:40). A hunting bias is reflected, however, by a settlement pattern of small, seasonal hunting camps and rockshelters near game trails (Dragoo 1976:11). Perhaps such small, seasonal camps could be encountered in the study area, although it is quite probable that most of these sites tended to cluster in the main river valleys.

Little is known about Early Archaic peoples, but several factors indicate that they lived in small, highly mobile bands (Jefferies 1996:40; Nance 1986). These factors are: the presence of tools from nonlocal materials, and the absence of features, such as burials and middens. They also used rockshelters, often repeatedly yet only temporarily, as indicated at Modoc Rockshelter in Illinois, Cloudsplitter and Deep Shelter Rockshelters as well as the Lawrence site in Kentucky (Styles et al. 1983:278; Jefferies 1996:42; Mocas 1977). Unfortunately, in Kentucky, many of the Early Archaic sites are found as aspects of multi-component sites or as surface collection (Jefferies 1990:151).

Several Early and Middle Archaic sites have been found in Boone County, along Gunpowder Creek, which is also on airport property (Edging 1987:1). Since little is known about Early and Middle Archaic outside of the major river valleys in northern Kentucky, these upland creek sites are of importance to understand Archaic period adaptation in the uplands south of the Ohio River (Sussenbach 1986:69). Many of the tools found during the surveys were made of Boyle, the most readily available chert in the area, although other cherts, such as Ste. Genevieve, St. Louis, Flint Ridge and Paoli were also important (Edging 1987:26). There were no midden or pit features located at the sites along Gunpowder Creek (15Be315 and 15Be317), but the artifacts found evidenced a wide variety of activities (Edging 1987:39). Edging suggests that these sites were seasonally occupied small base camps that "reflect numerous revisits and short-term habitation" (1987:40). The upland camps nearby that overlook Gunpowder Creek (15Be324 and 15Be325) appear to be large hunting and processing camps, and no artifacts of a more generalized nature were found (Edging 1987:43). The Gunpowder Creek sites may have been associated with larger base camps along the Ohio River, whose occupants would have utilized the valuable resources not found in riverine environments. Also, due to the large frequency of Archaic sites in uplands areas, Edging (1987:43) suggests that upland resources were vital to Archaic adaptation.

Middle Archaic (6,000-3,000 BC).

During the Middle Archaic period (6,000-3,000 BC) in the Midwest and Southeast, the continuing alteration of the climate led to an even greater variety of available resources. Pollen records from parts of the region indicate that drier climate conditions associated with the hypsithermal interval reached their maximum around 5,000 BC (King and Allen 1977). The Middle Archaic economy became more varied, retaining the emphasis on deer hunting, but including utilization of an ever wider variety of plant foods (Cleland 1966:92-93). An influx of grasses and the decrease of arboreal communities changed the sorts of plant resources available, thus affecting Middle Archaic subsistence practices (Jefferies 1990:151; Nance 1985). Hickory nuts were utilized, as were other nuts, fruits, seeds, and greens (Jefferies 1988:102). Specialization in certain activities generated a more sedentary lifestyle, which in turn increased the complexity of the social structure within the band network (Jefferies 1995:76; Brown and Vierra 1983).

The material remnants of Middle Archaic culture expanded to reflect an increasingly sophisticated technology adapted to the intensive exploitation of forest and riverine biomes. The Middle Archaic point types identified in the western part of the state include Eva I and II, Kirk, Cyprus Creek I and II, Sykes, Morrow Mountain I, and Big Sandy projectile points (Fitzhugh 1972:8; Jefferies 1988:105). This period of time was marked by the development of regional projectile point styles, as well as the appearance of various specialized tools, which indicate new processing techniques of plant resources (Jefferies 1990:151). There was an increase in ground and polished stone tools including full grooved axes, pendants, and winged and cylindrical atlatl weights. Bone tools also appear in the artifact assemblage (Anslinger 1996:5; Jefferies 1996:48). The common occurrence of mortars, pestles, manos, metates, grinding slabs, nutting stones, grooved axes, and celts at Middle Archaic sites suggests a harvesting economy (Boisvert 1977:12).

Although many Middle Archaic sites indicate that groups had high mobility and occupied the same areas for only short times, other sites suggest longer-term habitations (Jefferies 1990:151; 1988:105 Styles et al. 1983:284). The archaeological record for the Middle Archaic contains larger accumulations of artifacts, suggesting larger populations and/or longer occupations (Kerr 1996:5). Anslinger proposes that certain places, such as the Koster site in western Illinois and Modoc Rockshelter in southern Illinois, were the locations of base camps that were occupied year-round (1996:5). He argues that the wide variety of resources that were now available provided less incentive for mobility, and such "localized groups developed more efficient adaptive strategies in order to exploit the wide range of plant and animal resources available" (1996:5). He reports that in the Ohio Valley, relatively large Middle Archaic sites with midden stains, pit features, and human and canine burials occur late in the subperiod. Studies at Modoc Rockshelter indicate that the peoples of the Middle Archaic tended toward more selective plant use, a wider food base which included more aquatic resources, and long-term habitations rather than short-term occupations (Styles, *et al.* 1983:292).

In parts of the central Ohio Valley, the Middle Archaic apparently relates to the early (Laurentian) Late Archaic Lamoka Phase, despite Ritchie's (1980:38) argument that Lamoka is "peculiarly a New York State culture," and a Late Archaic one at that. Sites of this category are usually found along major waterways where artifacts reflect a reliance on aquatic resources and an unusually high number of bone tools are often present. Rarely, Lamoka sites are located on streams and large springs up to a mile away from navigable and fishable waters. Jefferies seems to believe that the use of the term Lamoka means that the site was non-ceramic and similar to the Lamoka Lake site (1990:144). According to Justice, Lamoka sites in the Ohio Valley (Ohio, Kentucky, and Indiana) occur in very low frequency (1987:129). Floral and faunal remains indicate that nuts, white-tailed deer, turkey, and passenger pigeon predominated in the diet (Cantley and Novick 1980). Funk (1976) hypothesized that Laurentian culture may have been "imported" from the Midwest.

Late Archaic (3,000 to 1,000 BC).

During the Late Archaic period (3,000 to 1,000 BC), a great diversity of pre-Woodland cultural traditions blossomed throughout eastern North America, as the trend toward regional specialization and adaptation that started in the Middle Archaic continued (Jefferies 1988:106). Kerr describes this cultural variability by stating: "...each group tailored its own brand of subsistence strategy for maximum exploitation of locally available resources" (1996:8). The recognized cultural differentiation of the Late Archaic was associated with what Caldwell (1959) defines as primary forest efficiency: a complete and effective adaptation to and intensive utilization of a forest-edge environment. The general pattern of site distributions suggests an economy oriented toward a broad range of resources. In the Falls of the Ohio region, near present-day Louisville, there are more sites that can be dated to the Late Archaic than any previous period (Jefferies 1988:117). Janzen (1977:138) categorizes this abundance of sites in this area as "a period of unparalleled prehistoric cultural growth." This probably resulted from the diverse, reliable food supply found at the convergence of several microenvironments.

During the Late Archaic, the subsistence focus was still on hunting and gathering a diverse array of wild resources (Jefferies 1990:153). Some Late Archaic groups scheduled their procurement activities to take full advantage of variously available resources, which resulted in the archaeological record showing camps in a variety of environments (Kerr 1996:7). These groups traveled in a yearly cycle, exploiting the seasonally available resources of various areas as they became accessible (Granger 1988:107). This cycle affected the nature of the groups, in that they were organized and structured to move seasonally, and efficiently collect these foodstuffs (Jefferies 1990:153).

Along the Green River Valley in Kentucky, for instance, many Late Archaic sites are located adjacent to riverine habitats suitable for mussel propagation (Muller 1986:72). The presence of huge quantities of shell in the form of shell mounds suggests a very specialized adaptation to the local environment. However, these shell mound sites were probably occupied for several seasons of the year, rather than the entire year (Jefferies 1996:60; Webb 1946). Several large shell mound sites in west-central Kentucky, such as Chiggerville (Webb and Haag 1939), Indian Knoll (Webb 1946), and Carlson Annis (Webb 1950), contain large, complex mortuary and ceremonial components with evidence of increased interregional trade (Jefferies 1996:58; Goad 1980; Winters 1968). Due to repeated disturbance by humans as well as continued alluvial deposits, these floodplain sites became very receptive to colonization by the food plants of the Eastern Agricultural Complex (Smith 1992:102). Plant remains from these sites indicates that the most common plant remains were nuts (hickory, acorn, and walnut). However, with minimal direct human intervention, plants such as *chenopodium*, goosefoot, sumpweed, sunflower and squash were beginning to be cultivated and domesticated as early as the Late Archaic (Smith 1992:102; Crawford 1982). These cultigens served as supplements to a diet of diverse wild animal and plant resources, especially nuts (Watson 1989:562-3). This "dump heap" model of domestication served as a stepping stone to the development of horticulture during the Woodland period (Jefferies 1996:74).

The archaeological evidence of the Late Archaic in the Eastern Mountains region indicates long-term occupations, especially in rockshelters and narrow valleys (Jefferies 1996:65). Site types range from large seasonal base camps on floodplains to upland and rockshelter sites occupied on a recurring basis during the fall and winter (Jefferies 1990:208-9). In the Late Archaic in the Kentucky Mountains, Native Americans began to utilize horticulture as a method of subsistence supplementing their efforts at foraging (Ison 1991:1). Upland, hillside garden plots possessed several advantages over floodplain locations, especially when the cultivation involved was not very labor-intensive (Ison 1991:9). Evidence for early cultigens has been found at Cloudsplitter Rockshelter in eastern Kentucky, as well as at the Koster site in central Illinois, and Carlson Annis and Bowles in west-central Kentucky (Anslinger 1996:8). Certain plants were domesticated, but were still not used as widely as they would be in the Woodland period.

The archaeological evidence of the Late Archaic in the lower Tennessee-Cumberland Valleys indicate that Late Archaic camps were sporadically used short-term camps (Nance 1977). Both uplands and floodplains were exploited by Late Archaic peoples. Upland sites were used for hunting and processing animals with little evidence of plant processing, while floodplain sites were used to exploit both upland and floodplain resources (i.e., animal hunting and processing and plant resource exploitation) (Nance 1977).

Material culture in the Late Archaic reflects an emphasis on gathering and processing nut foods (e.g. hickory nuts, walnuts, acorns) as well as fruit (e.g. grapes, hawthorn and honey locust) (Wymer 1987). During this time there is a proliferation of nutting stones, mortars, pestles, manos, and metates (Purrington 1967:44; Jefferies 1996:70). These stone grinding tools had another effect on the archaeological record, as well: by analyzing the tooth decay of humans found in the Carlson Annis Mound, Adkins (1988) determined that Late Archaic peoples had a diet that was highly abrasive from the grit introduced by using stone grinding tools to process nuts and seeds. Projectile point types show an increase in both quantity and stylistic variation, but are accompanied by a decrease in the quality of individual workmanship. Nance (1986) has shown, through the presence of straight point types (Ledbetter-Pickwick and Adena like points), that they make up 60 to 80 percent of the points recovered in some terminal Archaic assemblages. The use of locally available cherts from many Late Archaic sites may indicate that a more sedentary lifestyle was emerging (e.g., Site 15McN20 - Butler et al. 1981:122). However, the recovery of non-local raw materials in Late Archaic collections also indicates that there was some movement into other regions or trade by Late Archaic peoples (Goad 1980; Winters 1968; Rothschild 1979).

Woodland Occupation (1,000 BC to AD 1,000)

The adoption of ceramic vessels by essentially Late Archaic groups marks the transition into the Woodland culture period. While there are several other criteria separating Late Archaic and Early Woodland populations, the presence of ceramics is the most archaeologically visible (Railey 1996:81). The development of pottery improved methods of food processing, especially the cooking of grains (Seeman 1986:564). Other factors indicating the progression to Early Woodland from Late Archaic are the emergence of stemmed projectile points, the deliberate construction of mortuary earthworks and the increased use of cultigens (Emerson 1986:622). In addition, bone beamers began to be used instead of chipped stone endscrapers, and ungrooved celts replaces grooved axes (Railey 1990:248).

The Woodland stage appears to represent a cultural expansion of the Late Archaic period, characterized by a greater tendency toward territorial permanence and an increasing elaboration of ceremonial exchange and mortuary rituals. Traits that were once considered innately Woodland are now known to have originated in the Archaic (Dragoo 1976:16). For example, certain burial practices that formed the core around which Woodland mortuary complexes evolved, were extant throughout the Archaic (Griffin 1968:133-134), such as the several cemeteries in Illinois that were previously thought to be Early Woodland and have now been shown to be of Late Archaic origin (Emerson 1986:621). In the Midwest, evidence that even the Early Woodland diet was supplemented by various domesticated native and Mesoamerican cultigens, including *chenopodium* and sunflower (Struever and Vickery 1973:11-19), should be prefaced to note an Archaic antecedent in Missouri and Kentucky (Yarnell 1973; Chomko and Crawford 1978:405).

Early Woodland (1,000 to 200 BC).

The Woodland Period is often divided into three sub-periods: the Early, Middle, and Late Woodland (Railey 1990:249). The people of the Early Woodland period (1,000-200 BC) were very similar to those of the Late Archaic. They subsisted by hunting a variety of animals, gathering many plant foods, and supplementing that diet with plant products they cultivated (Railey 1996:84). Rockshelters were utilized, as evidenced by finds in Newt Kash Hollow and Salts Cave (Railey 1996:81). The oldest textiles found in Kentucky come from these locations, dating to the Early Woodland. The Conley-Greene Rockshelter in Elliott County was also used during the Early Woodland time frame, and was possibly a base camp habitation (Railey 1991b:100). During the Early Woodland period, Late Archaic lowland base camps saw reduced use as people moved away into smaller settlements such as rockshelters (Railey 1996:87). The use of horticulture increased during the Early Woodland, which, contrary to what is commonly assumed, did not necessitate larger settlements (Railey 1991b:99). This does not indicate higher mobility; rather it only means that the Early Woodland peoples may have been just as sedentary as those of the Late Archaic, but that they chose to live in smaller, more scattered groups. The increased use of horticulture contributed to more territorial behaviors as well (Railey 1991a:58). Ison (1991:9) points out the advantages of upland ridge horticulture over such activities on floodplain localities, especially for smaller groups.

When looking at the archaeological record, there seems to be a dearth of Early Woodland sites compared to the amount of Late Archaic sites, especially those which can be classified as habitation sites, or base camps. This can be explained partially by the length of time considered to be in each period: The Early Woodland period is only 20-30 percent as long as the Late Archaic period (Lewis 1986a:596).

The inclination towards territoriality influenced the advance of the Adena culture. The term Adena was initially synthesized by Webb and Snow in 1945 as an Early Woodland phenomenon. Although

Adena is an important component of the Early Woodland period in the region, the terms are not synonymous (Seeman 1986:566). If radiocarbon dates are taken into account, the Adena culture was only present for the second half of the Early Woodland period. In addition, some dates indicate that in Kentucky, the Adena culture continued into the Middle Woodland period as well (Railey 1996:79; Seeman 1986:567). Current research suggests that the Adena peoples were not present until after 500 B.C. (Railey 1996:98). Griffin (1978:242) described the Adena Tradition as the most widely known yet poorly understood Early Woodland culture in the Northeast, partly because it is usually discussed only in terms of its elaborate burial ceremonialism. The Adena sphere of influence was quite far reaching. Encompassing not only Kentucky--its heartland--and surrounding states, it extended to some degree to the northeast through parts of southern New England, to the north through the Upper Great Lakes, and to the south as far as the Florida panhandle, as evidenced by the presence of Adena Stemmed projectile points (Justice 1987:196). The actual Adena culture, however, was limited to the central Ohio River Valley and its tributaries. Griffin (1978:242) feels that Pittsburgh, Pennsylvania serves well for the eastern boundary of purely indigenous Adena cultural manifestations.

The Adena culture did not remain constant through time. The mortuary facilities increase in size and complexity from the Early to the Late Adena phase (Railey 1996:98). Late Adena burial mounds often have log tombs or sub-mound structures, and contain many ritual objects such as gorgets, incised tablets, mica crescents and copper bracelets (Railey 1996:98). The best expression of Adena culture in Kentucky is found in the Bluegrass region. Adena mounds are found in the Eastern Mountains region, but they are restricted to the lower Levisa Fork drainage and are absent from the Kentucky and Licking drainages (Niquette and Henderson 1984:44). However, Adena artifacts from these sites suggest that local rockshelter inhabitants were influenced by the Adena culture and had similar mortuary rituals (Railey 1990:316).

Adena culture continued until about 300 AD, when the construction of large burial mounds ceased (Railey 1996:100). This places Adena partially in the Middle Woodland period. The Middle Woodland period stretches from about 200 BC to AD 500. Most of the early Middle Woodland is very similar to the late Early Woodland culture, with Adena and Hopewell being predominant (Railey 1996:91). Most likely, these groups lived in small, scattered settlements with ritual spaces and earthworks providing territorial markers and focal points (Railey 1990:251). Settlements during this time period tend toward nucleated villages. The subsistence strategies are still based on hunting and gathering, but there is an increase in the use of cultigens (Railey 1990:252).

Middle Woodland (200 BC to AD 400).

In the eastern woodlands, in general, the Middle Woodland period (200 BC to AD 400) represents a period of complex sociocultural integration across regional boundaries via trade networks. This concept has been described as the Hopewell Interaction Sphere by Caldwell (1964) and Struever (1964). The designation Hopewell is applied to a particular archaeological assemblage that has been found from western New York to Kansas City and from the Gulf of Mexico to Lake Huron. It is estimated that at the time of European contact, at least 27 separate languages were spoken across the regions where Hopewell-style artifacts are found (Seeman 1995:124). The transition from Adena to Hopewell culture has been documented to be linear in Ohio, but in Kentucky it seems that they were contemporaneous for a time (Railey 1990:252). Also, several Hopewellian sub-mound structures were found beneath the Riley Mound, and other sites in Ohio show a similar “blending” of Hopewell and Adena characteristics (Railey 1990:303).

Hopewell is characterized by elaborate geometric earthworks, enclosures, and mounds that are often associated with multiple burials and a wide array of exotic ceremonial goods. Ceremonially, the Hopewell appear to represent a continuation of the Adena, but on a more expanded and elaborate scale (Dragoo 1962:13). However, Railey believes slightly otherwise, at least relating to Kentucky: “Adena should be viewed as an early regional expression of Hopewell rather than as its predecessor” (1996:10). Hopewellian trade networks were apparently extensive since materials used in the manufacture of ceremonial objects were acquired from diverse regions of North America. Copper and silver came from the upper Great Lakes, quartz crystals and mica from the Lower Allegheny regions, obsidian and grizzly bear teeth from the west, and shark and alligator teeth, marine shell, and pearls came from the Gulf Coast (Prufer 1964:75). Some of the ceremonial artifacts manufactured included knives and blades of obsidian; stone platform pipes with human and animal effigies; breast plates, ear spools, and celts of copper; zoomorphic and geometric shapes of mica; and highly decorated ceramic vessels (Railey 1990:254). Artifact types attributed to the Hopewell are Snyder’s points, Hopewell leaf-shaped blades, small side-notched points, prismatic blades and associated polyhedral cores, and flake knives, most of which were manufactured from Flint Ridge flint, another important trade commodity (Chapman and Otto 1976:23; Mayer-Oakes 1955:15). Hopewell mounds often contained architecturally complex submound structures, instead of the simpler Adena circular, single-room structures (Clay 1986:584).

In northern Kentucky, the Hopewell culture may be represented by the Biggs site (15Gp8), a small ceremonial center in Greenup County (Maynard and Gatus n.d.). Most Hopewell sites in eastern Kentucky are confined to the Ohio River Valley (Niquette and Henderson 1984:46). Although southern Ohio and Indiana were inhabited sequentially by Archaic, Adena, Hopewell, and Fort Ancient groups, the cultural sequence, at this point, for the Bluegrass region of northern Kentucky lacks evidence for strong penetration of Hopewell culture (Boisvert 1979:v). Instead, the customary distinctions between Middle and Late Woodland cultures are of a more transitory nature than those of Ohio, with the Newtown phase of Late Woodland society emerging during the Middle Woodland, contemporary with Hopewell (Railey 1991a:60-61). Railey suggests that Adena continues through much of the Middle Woodland (until approximately A.D. 250-300), and when it ends it is replaced by the Newtown phase of the Middle and Late Woodland, with little time for the development of a Hopewell presence in northern Kentucky (1991a:61). The contemporaneity of Newtown and Hopewell is indicated by the artifact assemblage at the Bentley site in Greenup County, where both Newtown and Hopewellian ceramics were associated spatially and contextually (Henderson and Pollack 1985:163).

The Hopewell culture represented the climax of the Woodland period in much of the Ohio Valley. Lasting only about 200 years, its influence waned after about A.D. 450. Ceremonial centers were abandoned, trade networks dissipated, and less emphasis was placed on burial ceremonialism. This decline marked the beginning of the Late Woodland Period, and a return to the more mundane, generalized characteristics of the Woodland Tradition with an increased reliance on domesticated plants supplemented by hunting and intensive gathering. The invention and use of the bow and arrow was an important development in hunting and warfare technology (Railey 1996:111). In northern Kentucky, the Newtown Phase emerges as early as A.D. 300, and continues until approximately A.D. 700 (Railey 1991a:61).

Late Woodland (AD 400-900).

In the Late Woodland period (AD 400-900), many groups moved into the areas surrounding upland tributaries, with an emphasis on rockshelters, as well as to the tributaries' floodplains (Niquette 1992:16). In western Kentucky, Woodland communities included a range of settlement sizes from small camps to large villages with mounds and plazas (Kreisa 1988; Sussenbach and Lewis 1987). During this period, the nucleated village emerged. These villages consisted of a circular village with a central public space around a group of houses, work areas and trash pits often along bluff edges and river banks and often enclosed by earthen embankments (Railey 1996:111-112).

The Late Woodland period in the Bluegrass Management Area, and specifically the Northern Bluegrass Section that Boone County is in, has less sites documented than the Early or Middle Woodland periods. Most of the research in this section of Kentucky has come from Boone County. The mound sites in Boone County from the Early-Middle Woodland typically have one or two burial minds with no local residential settlement (e.g. Robbins, Riley, Landing, Crigler, and Hartman sites), while mound sites from the Middle-Late Woodland period had local habitation areas (e.g. Rogers and Ogden-Moore sites). One of the primary cultural units within the Late Woodland Period is the Newtown phase. Several sites have been identified within the Northern Bluegrass region that have been assigned to this phase (Rogers Site Complex, Comic Vista, Site15Be431, and Froman). Other sites in the region have been identified as possible Newtown sites (Ogden-Moore Mound and Village Complex, Big Bone Lick, and Site 15On50) (Applegate 2008:482).

The Newtown phase was first used as a cultural describer by Griffin (1956:187) in relation to materials found in a Late Woodland component of the Turpin site in Ohio (Oehler 1973). In Kentucky, the Newton phase has so far been dated from the late Middle to the early Late Woodland, ca. A.D. 200-800 (Pollack and Henderson 2000). The primary diagnostic artifact of the Newtown phase is Newtown series pottery, identified as plain, cordmarked, and check-stamped types. They are associated with local and imported stamped and brushed pottery. These include Connestee series, Complicated Stamped, Pickwick/Mann, Turner Simple Stamped, McGraw series, Miami series, and Chillicothe Rocker Stamped (Applegate 2008: 482). Diagnostic lithic bifaces for the Newtown period include Lowe cluster, Jacks Reef Pentagonal and Corner Notched, and large triangular types. Other artifacts that may be found at a Newtown phase site include chert bladelets, limestone hoes, chert adzes, chipped stone pick-like objects, expanded-center polished stone bars, rectangular bone and slate gorgets, groundstone celts and manos, and large quantities of fire cracked rock (Applegate 2008: 482-3).

In the Newtown phase, generalized hunting-gathering-horticulture was the normal subsistence base. Newtown sites include both large circular villages and smaller camps. The nucleated villages have intrasite artifact patterns, and the structures are rectangular, oval or circular, with posts that are frequently chinked with sandstone. Stone or earth-stone mounds are sometimes associated with these sites.

Fort Ancient Period (ca AD 900 to AD 1750)

Fort Ancient is the dominant late prehistoric archaeological complex of the Central Ohio Valley, in general, and north-central and eastern Kentucky, in particular. Encompassing the area between southeastern Indiana and western West Virginia, this complex spans a period between A.D. 1000 and A.D. 1700 with some evidence of occupation during Contact times (Henderson *et al.* 1992:253). The complex societies of the Mississippian Period were contemporaneous with the Fort Ancient culture, but the areas of Kentucky affected by the Mississippian culture were mainly in the south and western parts of the state (Lewis 1996:128). There was some controversy as to whether Fort Ancient developed endogenously or whether it represents an intrusive influence, but investigations in Kentucky support the theory that Fort Ancient developed indigenously and did not result from Mississippian invasion or migration (Pollack and Henderson 1992:282; Sharp 1996:166). Regardless, it does reflect an elaboration of the late Woodland subsistence base and social organization, with the Newtown peoples being the direct ancestors of Fort Ancient (Cowan 1987:9). Village sites are larger, often palisaded, and located in valley bottoms which would accommodate agricultural activities (Sharp 1996:161). These towns were the first permanent settlements in the middle Ohio Valley, and were inhabited by several hundred people at any one time (Cowan 1987:2). Maize, squash, gourds and beans were grown in fields and gardens adjacent to the village, and other indigenous food plants were mostly disregarded (Smith 1992: 112; Watson 1989:563). The most importance was placed on maize, which made up the majority of the Fort Ancient diet (Cowan 1987:19; Smith 1992:112; Wagner 1984:65). Hickory nuts, walnuts, and beans were also found at Fort Ancient sites in northern Kentucky (Wagner 1984:65). Hunting and foraging were also important, and evidenced by camps and seasonally occupied rockshelter sites found throughout tributary drainages (Sharp 1996:161).

In the early part of the Fort Ancient period, the basic community was made of the family hamlet, but the villages grew larger as time passed and different families grew interdependent on the cultivation of maize, squash and beans (Pollack and Henderson 1992:284; Sharp 1996:181). In the Middle Fort Ancient period, the dependence on corn became even more pronounced, as the culture became one of "true farmers" (Sharp 1996:170). Hunting was still important to supplement the diet, however. By 1400, the Madisonville horizon was spreading, influencing changes in pottery and projectile point styles (Sharp 1996:171). These trends were still continuing at the time of European contact, as evidenced by the presence of Euro-American materials at late Fort Ancient sites (Sharp 1990:471). Such cultural changes throughout the Fort Ancient time period reflect adaptations to an increasing population, increasing warfare, and changes in technology, ideology (Pollack and Henderson 1992:282). Trade and warfare played important roles in Fort Ancient Society, as many exotic artifacts appear in assemblages in Kentucky and throughout the region, and many individuals showing evidence mortal wounds have been found (Sharp 1996:180).

Several Madisonville Phase Fort Ancient sites have been found in northeastern Kentucky. A few of these have been located in Boone County. The Petersburg site is an important Middle and Late Fort Ancient site in the Hills of the Bluegrass area (Henderson 1993:3). It had two major year-round occupations, one between 1200-1400, and the other between 1400-1500 (Henderson 1993:49). The prehistoric components were found through the town of Petersburg, in a semicircle with an edge on the bank of the Ohio River (Henderson 1993:11). Many aboriginal burials were found when historic residents dug house foundations or basements (Henderson 1993:5). Several Fort Ancient projectile points and ceramics were found in a site at Big Bone Lick, near the surface (Miller and Duerksen 1995:149). In other areas in the central Ohio Valley, year-round village occupations with ancillary hunting stations have been observed during the Madisonville Phase, such as Augusta, Bentley, Hardin and Lower Shawneetown (Sharp 1996:171). The most recent Fort Ancient people can be identified with the historic Shawnee (Cowan 1987:16).

Protohistoric and Historic Aboriginal Occupation (ca. A.D. 1700 on)

By the beginning of the sixteenth century A.D., the Ohio Valley was populated by a number of apparently sedentary aboriginal groups. It is assumed that as long as 200 years before direct contact with Europeans was established in the Ohio Valley, their presence in the New World affected an ecological system that had existed over many millennia (Sharp 1996:181). Through indirect exchange, the Fort Ancient/Shawnee peoples of the Ohio Valley obtained European trade goods, as well as European diseases (Cowan 1987: 30-31; Sharp 1996:181): Etiological studies of disease have shown that contagion follows the same routes along which goods and information are transmitted. Consequently, the diseases that remained muted as endemic forms in European raged in epidemic proportions in the New World, devastating the aboriginal inhabitants.

After 1680, aboriginal groups in the Ohio Valley were disrupted by stress created in the wake of shifting fur trade patterns, as other tribes from the northeast forced the local groups out to utilize the territory to hunt for beaver pelts (Cowan 1987:31; Sharp 1996:181). The economics of fur trading demanded a reorganization of territories that had previously been exploited only for hunting and gathering. In 1672, the Iroquois conquered the Shawnee and forced them from Ohio and Kentucky to Illinois, South Carolina and Alabama. The consequences of this, coupled with the increasing westward displacement of eastern aboriginal groups, resulted in the region being "repopulated by Indian groups whose original homes lay beyond its borders" (Hunter 1978:588).

In the 1750's, the Shawnee returned to the central Ohio Valley, only to face the Europeans rather than the Iroquois (Cowan 1987:31). Although the majority of the Shawnees lived north of the Ohio River, there were numerous small settlements through Kentucky by 1750 in addition to the large Shawnee trading centers of Lower Shawneetown and Eskipakithiki along the Warriors Trail (Jobe *et al.* 1980:36). Shawnee villages were semi-permanent settlements composed of bark-covered lodges, sweathouses, and central structures used for ritual and secular celebrations (Clark 1974:85-90). During the summer months, crops were tended in fields near the towns, and in the fall, the inhabitants dispersed to winter camps in sheltered valleys to hunt and trap, as the fur trade had become part of the Shawnee economy (Muller 1986:264). By 1795, when the Treaty of Greenville absorbed the previously aboriginal land of Ohio into the United States, very few Native American communities remained in the area (Henderson *et al.* 1992:270).

Contact Period sites in northeastern Kentucky such as Hardin Village (occupied between 1500-1600) and Bentley (occupied from 1730-1758) have yielded European trade goods in association with artifacts diagnostic of the Madisonville Phase of Fort Ancient (Railey 1996:171-175). The artifact assemblage of the Bentley site (also known as Lower Shawneetown) contains both Madisonville Phase artifacts, similar to those found at Hardin Village, and Euro-American trade goods dated to the middle of the eighteenth century (Henderson *et al.* 1992:271). Because Lower Shawneetown is a historically documented Shawnee village, they suggest that at least some of the Madisonville Fort Ancient sites are historically antecedent to later Shawnee groups.

Early Historic Occupation (ca. AD 1700 on)

Throughout the first half of the eighteenth century, Britain and France vied for control of much of the area west of the Alleghenies since access to a profitable fur trading network was at stake. The fur traders themselves served as surrogates for the respective countries in this network, and their presence in the New World entangled the aboriginal groups with whom they were trading, (in particular, the Shawnees), in nationalistic conflicts. The frontier was shattered by tensions between aboriginal groups displaced by expanded hunting territories and encroaching settlers, between foreign governments struggling for control of valuable trade networks, and between foreign governments and nonallied aboriginal groups. The number of factions which resulted in intermittent skirmishes and full-scale war was staggering.

Following the American Revolution, the peace treaty signed with the British granted America a boundary that extended to the Mississippi River. Along with this territory, the British abandoned their native allies as well, and it was within this context that post-war Indian policy was formulated. The treaty signed at Fort Stanwix in 1784, for example, reflected the notion that the Iroquois had forfeited all claim to their land by fighting with the British against the emerging American nation (Johnson *et al.* 1978:80). Prior to the Treaty of Fort Stanwix, the area was still claimed by the Iroquois Confederacy, together with the Shawnees, Delawares and Mingos.

Aboriginal trails were used extensively by the first settlers, and not only directed their movements but also outlined many later transportation systems (Wallace 1971). The trails provided direct routes between villages and towns, and most traversed dry, level land. They provided the first access to suitably habitable areas and later guided engineers in constructing stable, permanent road systems. The evolution of the modern highway network parallels the development of settlements. Initial settlement was retarded not only by the uncertainty of land titles and the danger of Indian attacks, but also by inadequate transportation. Farmsteads were geared to subsistence partly because marketing products was difficult and expensive. The chief avenues for bringing goods and provisions into the project area, prior to the building of all-weather roads, were the major drainages and their larger tributaries. Before massive deforestation and subsequent stream siltation occurred, navigable waters were more extensive.

The pioneers who settled northern Kentucky followed several different routes to their destination in the rolling hills south of the Ohio River. One was the overland route from Virginia, across the mountains and into central Kentucky, from where settlers moved into perimeter areas of the state such as northern Kentucky. Also used was the route down the Ohio River to Maysville, Cincinnati/Covington, and Louisville.

Agriculture, originally for subsistence and later for profit, often shaped settlement priorities in the Central Ohio Valley. As choice land along larger drainages became inhabited, later settlers were forced to move inland to less immediately hospitable environments. In the upland areas, one of the most important criteria for situating early Euro-American homesteads was the proximity of a source of pure water. Perceptions of vegetation as an indicator of soil fertility played a part as well. Since wells were an expensive proposition, settlements were often made near springs (Hulbert 1930:144). In addition, the farms of the settlers frequently used natural topographic features as boundaries--generally creeks or the tops of ridges. As a result, farmsteads were often shaped like bowls, since farm buildings were laid out in valleys, and the surrounding uplands formed the boundaries. The first homesteads were built of unhewn logs joined by a mixture of moss or straw and mud. Later, as sawmills increased production, frame dwellings were built, along with occasional brick or stone houses. Besides the main dwelling structure and a shelter for livestock, farmsteads often included a springhouse, woodhouse, and smokehouse.

Around 1800, the primary source of energy harnessed to exploit the environment was human labor. After 1830, livestock were employed to draw carts, plows, cultivators, and harvesting equipment. With the introduction of improved farm machinery, there was an increased demand for horses and a general displacement of oxen. In the winter, however, oxen could be driven through the snow more safely than horses, and were depended upon to initially clear the roads. In 1885, the combined harvester and thresher was developed. When this combination was harnessed to a steam-powered (and later a gasoline-powered) traction device farm acreage increased, and labor subsequently decreased. By the beginning of the twentieth century, the total number of acres devoted to farming in the state began to shrink, as did the number of farms and farmers, while the absolute size of individual farms began to increase. This was partly due to the intensification of technology, the amalgamation of small plots, encroaching urbanization, and the abandonment of poorer districts (Warminski 2000).

Saw mills and grist mills were the first industries to extensively utilize local resources. Originally, lumbering was chiefly a by-product of land clearing for agricultural purposes, with local consumers being the chief beneficiaries. However, with the advent of steam-powered machinery (1815-1825), saw mills began to produce lumber for outside markets. While lumber mills were apparently transient and subject to the supply of timber in a local area, grist mills, sometimes located beside or near lumber mills, provided a stabilizing influence on regional economics. Indeed, the primary purpose of most early roads was to provide access to mills for farmers to grind their grain. The successful harnessing of water power ensured that productive energy was concentrated in a single, fixed location, which caused the further concentration of auxiliary shops and services (Warminski 2000).

Specific events in the study area occurred within the larger developmental pattern of early American history. In 1768, the Treaty of Fort Stanwix wrested Kentucky from the Iroquois confederacy, the Shawnees, and the Delawares. Prior to this time it was illegal for white settlers to encroach upon the Kentucky area because it had been reserved as Indian territory. Trappers and traders, however, paid little heed to the law. Kentucky was made part of Fincastle County, Virginia, by the Treaty of Fort Stanwix and placed under the ultimate jurisdiction of the British Crown until after the American Revolution. Kentucky County was created out of Fincastle County in 1776 by the Virginia Colonial government, and much of the county's lands were appropriated early in 1779 to recompense Revolutionary soldiers loyal to the American cause. After several other subdivisions of counties in the late 1780's, Kentucky was made a Commonwealth in 1792. Counties were again reformed with northern Kentucky being part of Scott County, also in 1792 (Warminski 2000).

Boone County

Originally part of Woodford County, Virginia, Boone County was formed from Campbell County in 1798 but was not officially established until 1799. European settlement began in 1789 when a party from Pennsylvania, led by Baptist preacher John Tanner, founded Tanner's Station (now known as Petersburg) on the Ohio River in northwest Boone County. Many of Boone County's settlers came from Virginia, western Pennsylvania and the Carolinas. While the earliest migrants traveled down the Ohio, most of those who came later journeyed overland. Others relocated from central Kentucky counties such as Fayette and Woodford (Warminski 1993, 2000).

Several ethnic groups left their mark on the county's built environment, town development and institutions. A large group of German emigrants relocated from the Shenandoah Valley of Virginia in the early Nineteenth century, settling in the northern section of the county and in the vicinity of the present-day communities of Hebron and Hopeful Heights (now part of Florence). Irish Catholics established a community in the vicinity of Verona in the 1850s. The county's slave population began to decline before the Civil War; following emancipation, many remaining African-Americans left the county. A small community, however, formed in north Walton (Warminski 1993, 2000).

Boone County experienced steady growth during its first few decades. It slowed in the 1860s, most likely because of the Civil War; it recovered in the 1870s and dropped again in the 1890s, perhaps reflecting the panic and national agricultural depression of that decade. During the 1910s, 20s and 30s population remained nearly static; it rebounded quickly, however, in the 1940s (Warminski 1993, 2000).

While commerce and industry played a significant role in the county's development, agriculture formed the basis of the county's economy through most of its history. The county has a tradition of small, family-run, diversified farms; while it has varied over time, the average farm size has remained near 100 acres through most of its history. Primary cash crops were corn, tobacco, wheat, oats and hay. Most farms included livestock for cash sale, including hogs, sheep, chickens or cattle. Dairy farming also developed as a major industry during the Twentieth century. Farmers sent produce and dairy products to local markets, primarily Cincinnati and Covington, while wheat and corn were processed into flour or whiskey for shipment to distant markets (Warminski 1993, 2000).

While the county remained largely rural throughout most of the its history, in the years after World War II its character changed dramatically. The founding of the Cincinnati-Northern Kentucky International Airport near Hebron; the construction of Interstate 75 along the county's eastern periphery; the development of the Florence Mall, and the creation of the Northern Kentucky Industrial Park south of Florence gave impetus to rapid suburban development. By 1996 the county had become the fastest-growing in the state. Shopping centers clustered around the Florence Mall. Industries and corporate headquarters located along Interstate 275, near the airport, and along the Dixie Highway. Residential subdivisions proliferated around Florence, Union, Richwood, Hebron and Burlington. In the process many rural historic resources, especially in the populous eastern corridor, were lost to development. The relatively isolated western river corridor, however, remains largely rural (Warminski 1993, 2000).

CULTURAL RESOURCE SENSITIVITY

To meet the needs of the client and fulfill the level of work deemed appropriate by the Kentucky Heritage Council (KHC), the scope of work included several requirements to be satisfied through fieldwork, analysis, and report preparation. First, potentially sensitive areas of site location along the proposed project areas were delineated on the basis of background research synthesized into a predictive model of historic and prehistoric site location. Second, the scope of the survey required that the proposed project areas be inspected for extant historic and prehistoric resources. Third, the results of the survey are evaluated in terms of expected results derived from the predictive model.

Predictive Model

The objectives of this suggestion are the prediction of culturally sensitive areas using information derived from regional settlement pattern statistics, as well as evaluation of the model through field testing. In general, the most probable locations for prehistoric and historic sites are the floodplains of major drainages, terraces, and slope benches above streams, areas on and near the height-of-land, ridgetops near spring-fed headwaters, caves and rockshelters, and areas near long-established roads.

Site Location Influences: Prehistoric

In general, the most important locational requirements of both prehistoric and historic habitation sites were proximity to water, slope angle, availability of natural resources, and well drained soil. Throughout time, many prehistoric groups in the Central Ohio Valley favored living near the propitious fishing grounds of large streams. In addition, intensive Woodland period horticultural villages were commonly situated on wide, fertile bottomlands where crop raising was most productive. In areas where floodplains were too narrow or otherwise unsuitable for occupation, terraces and slope benches above the drainages were sometimes inhabited instead. Prehistoric sites also frequently clustered around stream confluences, further indicating a desire for living near waterways that provided ample resources and an adequately large infrastructure for travel, trade, and communication.

Large or long-term habitation sites, characterized by relatively dense depositions of artifacts and cultural debris, were seldom located on minor interior drainages. Ephemeral, low profile sites representing small, temporary or seasonal occupations and procurement stations, however, were often positioned on the banks of low rank streams; often these places served as ancillary or winter camps for groups who lived on larger streams nearby. Upland exploitative, portage and enroute encampments were often situated near the height-of-land between drainages. The height-of-land offered both immediate access to a variety of ecological zones and an easier route along the ridge backs than one which led a traveler across drainages. Caves and rockshelters also provided convenient locations for habitation as well. Small, fortified protohistoric sites were often located in the uplands, especially near spring-headwater regions along ridgetops. Such areas were also selected by later historic occupants.

Locational prerequisites for special purpose sites--places where the dead were interred, spots of religious significance, game drops, chert quarries and the like--may not have been as restricted as those for habitation sites. Cemeteries, as well as mounds and other earthworks, have been noted on floodplains, terraces, slope benches, and ridgetops. Petroglyphs and similar phenomena are sometimes found in caves and rockshelters, under rock overhangs, on rocky cliff faces, and even on large boulders. Sites where short-term subsistence activities were performed usually go undetected, although many finds of isolated projectile points are probably correctly identified as the results of hunting incidents. Chert outcrops are not always well known, as chert currently has little marketable value.

Site Location Influences: Historic

Initially, aboriginal trails interconnected prehistoric settlements and areas where natural resources were exploited. Early Euro-American pioneers followed these small trails to habitable locales, converting many of them progressively to wagon roads, turnpikes and interstate highways (Wallace 1987). As a result, some continuity of settlement pattern does exist from prehistoric into historic times.

As knowledge of transport routes and potential resources increased, so did the number of incoming settlers. Settlers often preceded official land title offices or treaties by some time, with a concomitant increase in tensions over land claims between settlers and Native Americans, or between the settlers themselves. Settlement pattern was variable; if resources were extensively distributed (such as animal furs or the water-borne tobacco industry) the result was a decentralized settlement pattern (Reps 1972; Cronon 1983). Settlement patterns based on the requirements of the fur trade have been extensively studied (Phillips 1961; Innis 1962; Ewen 1986; Tordoff 1983). If settlement was inspired by religious zeal, organized land development companies, or a clear and present military threat, the resulting settlement pattern was far more centralized (Garvan 1951; Reps 1965, 1972).

For the most part, early settlements were subsistence economies, which, if successful, gradually engaged in trade on a regional scale. In the following period of intensification, the scope of trade networks grew to include a national, and eventually a world consumer market. Local participation in a growing world market economy may be traced in the local archaeological record (Adams 1976, 1977; Riordan and Adams 1985; Paynter 1982; Miller and Hurry 1983).

At first, Euro-American settlers occupied only the valleys of major rivers and their larger tributaries, but soon they spread inland. Mills were built along nearly every sufficiently powerful stream, and the establishment of ancillary shops and services followed shortly. Mill sites provide a useful topographically predictable touchstone for reconstructing regional development. Roads were constructed to provide access to mills, and population clusters soon developed at major crossroads in the highway network. After roads were established, people situated their houses and farms further from large drainages and closer to watersheds, or heights-of-land.

As population and industry intensified, so did the need for civic regulation; the land was shired into townships, counties, territories and states, each with an administrative center located at a convenient transport nexus. When an area came under formal administration, settlements began to acquire a "paper trail" which can often still be traced. Historic maps displaying roads are a particularly useful research tool for assessing the probability of historic-period occupation for specific project areas. Once a site is located, tax assessments, censuses, and probate inventories may provide information on the occupants themselves.

A predictive model of historic settlement pattern should target those resource characteristics of the physiographic province attractive to initial settlement and subsequent development i.e., Native American trails and navigable waterways. Targeted resources will vary with the historically known economic strategies practiced by the settlers. Sought-after resources may include particular farming soils, minerals, and indigenous plant or animal communities. Good farming soils are the product of geological weathering, previous biological communities, and human activity. It is possible to use current soil surveys to predict desirable settlement loci of the past. Desirable soils were often identified by the types of native plants encountered at initial contact; thus the native biome has been used to provide hints on historic settlement location (Lutzow 1988). Extractive sites, such as quarries, coal mines, and logging camps were naturally located near their target resources. Manufacturing sites such as potteries, iron smelting furnaces, lime kilns, coke ovens, and brickyards were usually positioned near a source of raw material as well as an abundant water supply.

Literature Review

Prior to conducting any field work, a detailed Literature Review was conducted by the Office of State Archaeology (OSA) in Lexington. The literature search identified 17 previously identified archaeological sites and 18 previously conducted archaeological surveys within a 2-kilometer (1.2-mile) radius of the project area. None of the sites were within or adjacent to the current project area. Several surveys were near the current project, but none overlapped with the current project area. Table 2 lists the details for all of the sites within two kilometers of the Site 3C survey area, and Table 3 lists all of the previous archaeological surveys within two kilometers of the Site 3C survey area. Figure 4 shows the locations of the previous archaeological surveys in the vicinity of the current project area. A summary of the previous surveys is presented after Figure 4.

Table 2. Previously Recorded Archaeology Sites Located Within a 2-Kilometer Radius of the Proposed Project Area.

Site #	Site Name	Topographic Setting	Type Of Site	Cultural Affiliation	Site Area	Distance to Water	Elevation	Surveyed By, Affiliation, Date Recorded	NRHP Status
15Be10	Klasserner	Hillside	Mound and Burial Field	Unassigned Prehistoric	N/A	unnamed stream 950 ft. W	850' amsl	U.K. Museum of Anthropology	N/A
15Be11	Jergen Site	Hilltop	Mound	Adena	~10,680 square ft.	unnamed stream 50 ft. NE	880' amsl	MJ Rodeffer 1968	Unknown
15Be12	Herbstreit	Hillside	Village	Unassigned Prehistoric	N/A	unnamed stream 535 ft. W	600' amsl	U.K. Museum of Anthropology	N/A
15Be13	Peeno Site	Ridgetop	Mound	Not Listed Prehistoric	Unknown	unnamed stream ~460 ft. S	870' amsl	Unknown	Unknown
15Be66	N/A	Hilltop	Camp	Unassigned Prehistoric	1,800 square ft.	unnamed stream 570 ft. N	890' amsl	MJ Rodeffer 1968	Unknown
15Be296	N/A	Ridgetop	Historic Farm/Residence	Historic Non-Indian, 1851-1950	14,500 square meters	Gunpowder Creek, 300 m	910' amsl	A.G. Henderson, Univ. of KY, 1985	Inventory Site
15Be313	N/A	Hillslope	Undetermined	Unassigned, Historic Non-Indian, 1901-1950	1,200 square meters	intermittent stream, 250 m	870' amsl	T. Sussenbach, Univ. Of KY, 1986	Inventory Site
15Be321	N/A	Hillslope	Open Habitation w/o Mounds	Unassigned Prehistoric	100 square meters	intermittent stream, 80 m	880' amsl	T. Sussenbach, Univ. Of KY, 1986	Inventory Site
15Be322	N/A	Ridgetop	Undetermined	Unassigned Prehistoric	50 square meters	Intermittent Steam, 150 m	880' amsl	T. Sussenbach, Univ. Of KY, 1986	Inventory Site

Table 2 (con). Previously Recorded Archaeology Sites Located Within a 2-Kilometer Radius of the Proposed Project Area.

Site #	Site Name	Topographic Setting	Type Of Site	Cultural Affiliation	Site Area	Distance to Water	Elevation	Surveyed By, Affiliation, Date Recorded	NRHP Status
15Be323	N/A	Ridgetop	Open Habitation w/o Mounds	Late Archaic	3,000 square meters	Intermittent Steam, 200 m	900' amsl	T. Sussenbach, Univ. Of KY, 1986	Not Assessed
15Be325	N/A	Bench/ Hillslope	Open Habitation w/o Mounds	Early and Late Archaic, Late Woodland/ Mississippian	8,000 square meters	Intermittent Steam, 100 m	880' amsl	T. Sussenbach, Univ. Of KY, 1986	Not Assessed
15Be326	N/A	Ridgetop	Undetermined	Unassigned Prehistoric	200 square meters	Intermittent Steam, 100 m	900' amsl	T. Sussenbach, Univ. Of KY, 1986	Inventory Site
15Be336	N/A	Bench	Open Habitation w/o Mounds	Early Archaic	5,000 square meters	Intermittent Steam, 80 m	870' amsl	T. Sussenbach, Univ. Of KY, 1986	Inventory Site
15Be458	Hood Cemetery Mound	Ridge	Prehistoric Mound, Historic Cemetery	Unassigned Prehistoric, Historic 1801-1900	400 square meters	450 m to Ohio River	890' amsl	French and Schatz	Eligible for National Register
15Be475	N/A	Ridge	Historic Farm/ Residence	1801-1950	1,600 square meters	1,500' to Ohio River	800' amsl	NES, Inc. 1997	Not Assessed
15Be538	Masters 2 Cemetery	Bench at Edge of Ravine on Hill Slope	Cemetery	1801-1950	509 square meters	unnamed drainage, 10 meters	262 meters amsl	Natural and Ethical Environmental Solutions, 2003	National Register Status Not Assessed
15Be543	N/A	Ridge	Prehistoric Open Habitation without Mounds	Unassigned Prehistoric	N/A	unnamed stream, 318 m, 113 degrees	888' amsl	Cultural Resource Analysts, Inc. 2004	Inventory Site

Table 3. Previously Recorded Archaeology Surveys Located Within a 2-Kilometer Radius of the Proposed Project Area.

Author	Year	Title
Rodeffer, Michael J.	1968	*An Archaeological Survey and Preliminary Test Excavation: Interstate 275, Section 9, Boone, Campbell and Kenton Counties, Kentucky.*
Schock, Jack M.	1984	*A Cultural Reconnaissance of 6.8 Acres for the Proposed W. M. Smith Substation in Northeastern Boone County, Kentucky.*
Niquette, Charles M. and W. Kevin Pape	1985	*A Phase I Archaeological Assessment of Borrow Areas for the proposed Mineola Interchange Boone and Kenton Counties, Kentucky.*
Henderson, A. Gwynn	1985	*Cultural Resource Assessment of Selected Areas within and Adjacent to the Greater Cincinnati International Airport.* Prepared for Kenton County Airport Board. Prepared by Program for Cultural Resource Assessment.
Sussenbach, Tom	1986	*A Cultural Resource Assessment of a Thirteen Acre Tract at the Greater Cincinnati International Airport.* Prepared for Kenton County Airport Board. Prepared by Program for Cultural Resource Assessment.
Sussenbach, Tom	1986	*Cultural Resources Assessment of a Proposed New Runway at the Greater Cincinnati Airport*. Prepared for Greiner Engineering Sciences, Inc. Prepared by Program for Cultural Resource Assessment.
Sussenbach, Tom	1986	*Cultural Resource Assessment of a 450 Acre Tract at the Greater Cincinnati International Airport, Boone County, Kentucky.* Prepared for Greater Cincinnati International Airport. Prepared by University of Kentucky, 008-052.
Fenwick, Jason M. and Marcia K. Weinland	1978	*A Reconnaissance and Evaluation of Archaeological Sites in Boone County, Kentucky.* Archaeological Survey Report No. 8, Kentucky Heritage Commission, Frankfort.
Tuttle, Elisabeth and Richard W. Jefferies	1986	*Cultural Overview of Historic Period Occupation at the Greater Cincinnati International Airport, Boone County, Kentucky.* Prepared for Greiner Engineering Sciences, Inc. Prepared by Program for Cultural Resource Assessment.
Corso, Robert A. and Joseph E. Wakeman	1992	*Literature Review and Reconnaissance Survey of the Proposed Texas Eastern Products Pipeline Company Limited Partnership Pipeline in Whitewater and Miami Townships, Hamilton County, Ohio and Boone County, Kentucky, and Addendum.* Prepared by Archaeological Services Consultants, Inc. Prepared for Texas Eastern Products Pipeline Company.
Mozzi, Marina E.	2000	*Phase I Archaeology Survey for Expansion of Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.*
Clifford, Laura	2001	*Phase I Archaeology Survey for the New Electrical Department Building at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared for PB Aviation. Prepared by Environment & Archaeology, LLC.
Breetzke, David	2001	*Phase I Archaeological Survey for the New Delta Parking Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared for Landrum & Brown. Prepared by Environment & Archaeology, LLC.

Table 3 (con). Previously Recorded Archaeology Surveys Located Within a 2-Kilometer Radius of the Proposed Project Area.

Author	Year	Title
French, Michael W., A. Gwynn Henderson, and David Schatz	2001	*An Inventory and Assessment of Prehistoric Mounds and Earthworks in Boone County, Kentucky.* University of Kentucky Program for Archaeological Research.
Haney, Jennifer M. and Heather D. Burge	2004	*An Archaeological Survey of the Proposed Interchange at I-275/KY 20 in Boone County, Kentucky.* Prepared by Cultural Resource Analysts, Inc. Prepared for Kentucky Transportation Cabinet.
Stoll, Courtney	2010	*Abbreviated Phase I Archaeology Report for the Kenton County Airport Proposed Gas Station/Restaurant Project, Burlington, Boone County, Kentucky.* Prepared by *Environment & Archaeology, LLC.* Prepared for Kenton County Airport Board.
Stoll, Courtney and Andrea Crider	2013	*Phase I Cultural Resources Survey for the Kenton County Airport Board Cincinnati/Northern Kentucky International Airport North Development Area Project in Boone County, Kentucky.* Prepared by *Environment & Archaeology, LLC.* Prepared for Kenton County Airport Board.
Leone, Karen and John W. Picklesimer	2014	*Phase I Cultural Resources Survey for Five Parcels (3-A, 3-B, 6-A, 6-B, and 6-C) at the Cincinnati/Northern Kentucky International Airport, Boone County, Kentucky.*

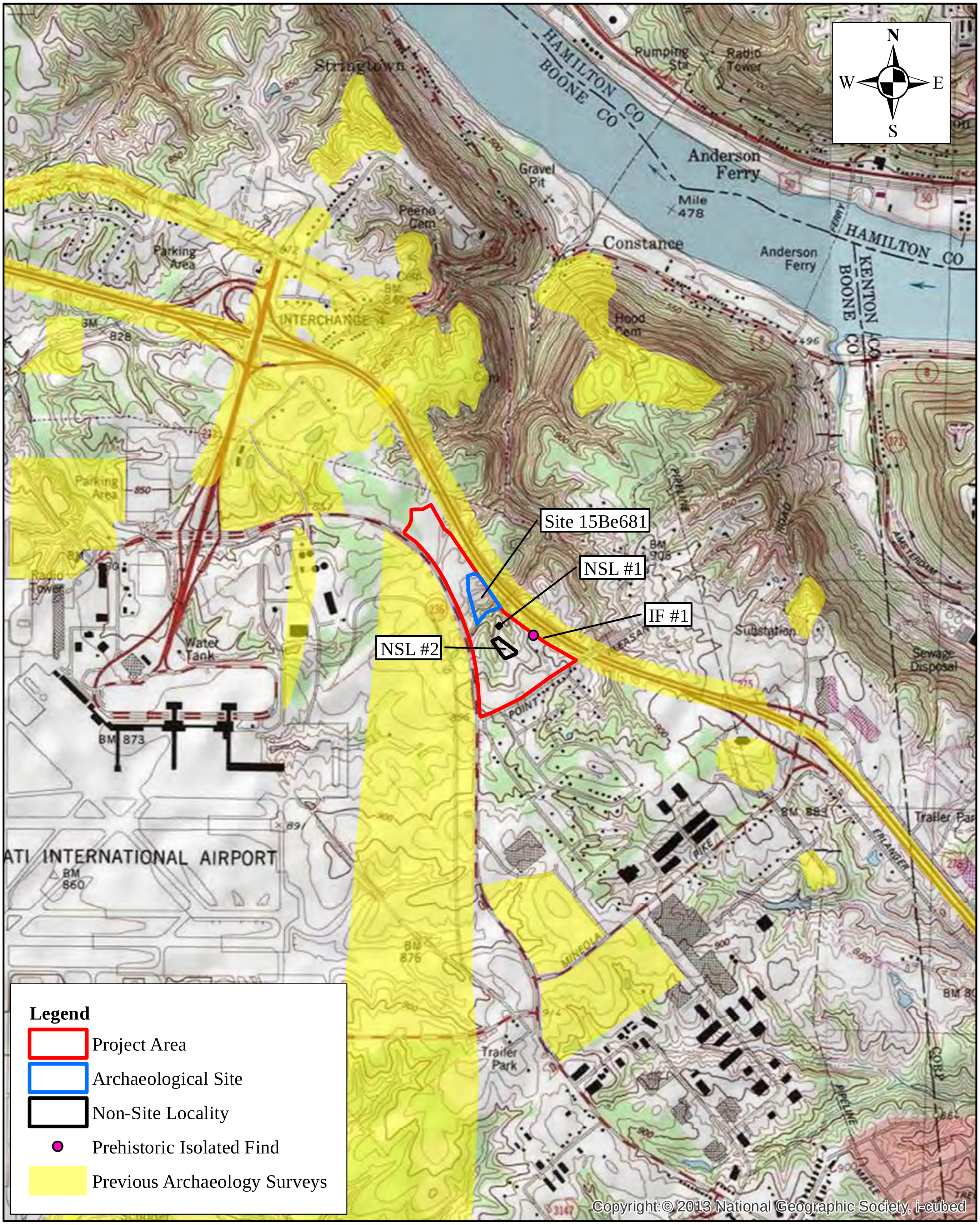


Figure 4	Kenton County Airport Board Site 3C Project Boone County, Kentucky	USGS 7.5-Minute Topographic Map with Previous Surveys Burlington and Covington, KY Quadrangles 0 1,000 2,000 4,000 Feet *Environment & Archaeology, LLC*

Descriptions of the sixteen archaeological surveys that could be found in the records within a 2 kilometer radius of the project area follow.

Rodeffer, Michael J.
1968 *An Archaeological Survey and Preliminary Test Excavation: Interstate 275, Section 9, Boone, Campbell and Kenton Counties, Kentucky.*

This survey was conducted for the proposed route of Interstate 275, Section 9. This section was approximately 24.5 miles in length. This survey was conducted in three stages: Phase I site survey; Phase II preliminary test excavations; and Phase III intensive excavation of selected sites. This report covers the Phase I and Phase II stages of survey. Sites identified by this survey included 15Be11 and 15Be66 that are within the 1.2-mile radius of the current project area, and are listed in Table 2. Site 15Be11 was recommended for further work, while it was suggested that 15Be66 did not require further exploration.

Schock, Jack M.
1984 *A Cultural Reconnaissance of 6.8 Acres for the Proposed W. M. Smith Substation in Northeastern Boone County, Kentucky.*

This reconnaissance covered 6.8 acres for a proposed electric power substation. The entire project area was walked and examined, with only one location identified as having the potential for archaeological sites. This area had been previously bushhogged and had left adequate ground visibility for surface investigation. No prehistoric or historic sites were identified within the project area and no further work was recommended.

Niquette, Charles M. And W. Kevin Pape
1985 *A Phase I Archaeological Assessment of Borrow Areas for the proposed Mineola Interchange Boone and Kenton Counties, Kentucky.*

This assessment was conducted over approximately 20 acres for a proposed borrow area, of which only approximately 5.75 acres was undisturbed. The disturbed areas had been massively disturbed by grading and artificial fill and were subjected to surface inspection at 15 to 30 meter intervals. The undisturbed area was subjected to pedestrian survey at 15 meter intervals, but no prehistoric or historic archaeological sites were identified. It was recommended that the proposed activities would have no negative impact on any cultural properties.

Henderson, A. Gwynn
1985 *Cultural Resource Assessment of Selected Areas within and Adjacent to the Greater Cincinnati International Airport.* Prepared for Kenton County Airport Board. Prepared by Program for Cultural Resource Assessment.

This survey covered areas totaling approximately 100 acres in five survey tracks within and adjacent to the Greater Cincinnati International Airport. Extensive disturbance was identified during this survey from filling and construction activities. Two new sites were documented through shovel testing, including Site 15Be296 that was within the two-kilometer radius of the current project. The sites were not recommended for further assessment and were not recommended as eligible for the National Register of Historic Places (NRHP).

Sussenbach, Tom
1986 *A Cultural Resource Assessment of a Thirteen Acre Tract at the Greater Cincinnati International Airport.* Prepared for Kenton County Airport Board. Prepared by Program for Cultural Resource Assessment.

This survey covered a thirteen acre tracts for a proposed service road at the Greater Cincinnati International Airport. This survey was conducted through pedestrian survey and shovel probing. Pedestrian survey was conducted in those areas where visibility was 40 to 50 percent. Disturbed areas were noted during the survey from previous construction of the airport. No cultural resources were identified, and no further assessment was recommended.

Sussenbach, Tom
1986 *Cultural Resources Assessment of a Proposed New Runway at the Greater Cincinnati Airport*. Prepared for Greiner Engineering Sciences, Inc. Prepared by Program for Cultural Resource Assessment.

This archaeology reconnaissance covered approximately 600 acres within and adjacent to the Greater Cincinnati International Airport. Portions of the project area were found to have been extensively disturbed by earth moving activities from construction at the airport, construction and demolition of historic houses, and the construction of a temporary race track. Fourteen new archaeological sites were identified, and one previously recorded site was revisited and its boundaries were considerable extended. Six historic sites were recommended as potentially eligible for the National Register of Historic Places and were recommended for further evaluation. No further work was recommended for the other identified sites. Two non-site localities were also identified: a historic cemetery and a historic bridge. The two graves in the cemetery were recommended to be disinterred and reinterred elsewhere. The bridge was recommended for further investigations.

Sussenbach, Tom
1986 *Cultural Resource Assessment of a 450 Acre Tract at the Greater Cincinnati International Airport, Boone County, Kentucky.* Prepared for Greater Cincinnati International Airport. Prepared by University of Kentucky, 008-052.

This survey consisted of approximately 450 acres at the Greater Cincinnati International Airport. Twenty-eight archaeological sites and two historic cemeteries were located. Eight sites were recommended as potentially eligible for nomination to the NRHP. It was recommended that the significance of these eight sites be further evaluated. Also recommended was the removal of the burials contained in the two cemeteries, and their reinterment elsewhere.

Fenwick, Jason M. and Marcia K. Weinland
1978 *A Reconnaissance and Evaluation of Archaeological Sites in Boone County, Kentucky.* Archaeological Survey Report No. 8, Kentucky Heritage Commission, Frankfort.

This report detailed a survey of major archaeological sites throughout Boone County in Kentucky, prepared for the Kentucky Heritage Commission. This survey was opportunistic, focusing on major sites throughout the county rather than a systematic survey of a discrete area. Their survey found three Archaic sites, five Woodland sites, and two Fort Ancient sites. This survey was important in spurring further archaeological research in the region, and provided overviews essential for comparison of later archaeological findings.

Tuttle, Elisabeth and Richard W. Jefferies
1986 *Cultural Overview of Historic Period Occupation at the Greater Cincinnati International Airport, Boone County, Kentucky.* Prepared for Greiner Engineering Sciences, Inc. Prepared by Program for Cultural Resource Assessment.

This survey was an archival assessment of six historic sites located during a Phase I survey that were considered to be potentially eligible for the NRHP.

Corso, Robert A. and Joseph E. Wakeman
1992 *Literature Review and Reconnaissance Survey of the Proposed Texas Eastern Products Pipeline Company Limited Partnership Pipeline in Whitewater and Miami Townships, Hamilton County, Ohio and Boone County, Kentucky, and Addendum.* Prepared by Archaeological Services Consultants, Inc. Prepared for Texas Eastern Products Pipeline Company.

This survey was completed for a proposed pipeline that extends approximately 15 miles across Kentucky and Ohio. The area was partitioned into 93 areas during the survey process based on topography, ground cover, and property lines. A total of 53 archaeological sites were identified during the Phase I survey, but several pipeline alignment changes were made to avoid potentially eligible cultural resources. A total of 34 archaeological sites remained as potentially effected by the pipeline construction. Evaluation determined that 28 of these sites did not have the potential for significant information and were recommended as not eligible. Six sites were recommended as potentially eligible and were recommended for further work. This project did cover some alluvial areas which were deep tested for potential intact buried cultural horizons.

Mozzi, Marina E.
2000 *Phase I Archaeology Survey for Expansion of Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.*

This survey was conducted for the CVG airport due to plans to expand the existing airport facilities. The FAA required an evaluation of the potential impact to cultural resources by the proposed expansion. This Phase I survey employed shovel testing at 15-meter intervals in areas with less than

15 percent slope and less than 75 percent visibility. Systematic surface reconnaissance was conducted in areas with greater than 15 percent slope and in areas with greater than 75 percent visibility. The survey area was approximately 1,760 acres, with 84.74 acres of that total remaining to be tested. The survey identified a total of 30 archaeological sites and 67 isolated finds. Ten of the archaeological sites were recommended for Phase II investigation. The remaining 20 sites were recommended as requiring no further work.

Clifford, Laura
2001 *Phase I Archaeology Survey for the New Electrical Department Building at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared for PB Aviation. Prepared by Environment & Archaeology, LLC.

This survey was conducted over approximately 16.0 acres that would potentially be impacted by a proposed electrical department building. The entire project area was surveyed at 15-meter intervals with sample loci. Approximately 37 percent of these sample loci were found to disturbed from previous construction activities. A foundation less than 50 years in age was identified along with associated material. Due to the recent age it was not considered an archaeological site under Section 106. No archaeological sites were identified as a result of this survey and no further archaeological assessment was recommended.

Breetzke, David
2001 *Phase I Archaeological Survey for the New Delta Parking Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared for Landrum & Brown. Prepared by Environment & Archaeology, LLC.

This report was prepared for the survey of approximately 32 acres for proposed new parking facilities at the Cincinnati-Northern Kentucky International Airport. Systematic shovel testing was performed in all grassy and wooded areas of low slope. Pedestrian reconnaissance indicated that large portions of the project area had been previously disturbed by construction, demolition, and the emplacement of parking facilities with asphalt paving. Additional areas had been graded for landscaping throughout the project area. One known site (15Be11) was reidentified during the survey and is listed in Table 2. This site was already surrounded by protective fencing. Close interval shovel testing was conducted around the fencing to test for any additional material from the site, but none was located. Three isolated finds were identified during the survey and were recommended for no further work due to the degree of disturbance and lack of substantial artifacts.

French, Michael W., A. Gwynn Henderson, and David Schatz
2001 *An Inventory and Assessment of Prehistoric Mounds and Earthworks in Boone County, Kentucky.* University of Kentucky Program for Archaeological Research.

This report was on a survey conduced in 1996 by the University of Kentucky's Program for Archaeological Research whose goals were to identify, document, and photograph new and previously recorded prehistoric mounds and earthworks. A total of 33 mounds or alleged mound locations were assessed, with a total of six new mounds identified. Preservation strategies and further research goals were assessed for each mound studied.

Haney, Jennifer M. and Heather D. Burge
2004 *An Archaeological Survey of the Proposed Interchange at I-275/KY 20 in Boone County, Kentucky.* Prepared by Cultural Resource Analysts, Inc. Prepared for Kentucky Transportation Cabinet.

This survey was conducted over approximately 36 acres for the proposed I-275/KY 20 interchange. One site was identified during this survey (15Be543). No further work was recommended for this site.

Stoll, Courtney
2010 *Abbreviated Phase I Archaeology Report for the Kenton County Airport Proposed Gas Station/Restaurant Project, Burlington, Boone County, Kentucky.* Prepared by *Environment & Archaeology, LLC.* Prepared for Kenton County Airport Board.

This survey was conducted for the proposed construction of a new gas station/restaurant on the property of the Cincinnati/Northern Kentucky Airport. The location was proposed for the construction of a fueling station and fast food restaurant. The project area totaled approximately 4.68 acres (1.89 hectares). The entire project area had been previously disturbed for a concrete construction company, and part of the project area was paved or graveled. The disturbed area was surface inspected with 12 shovel tests excavated to confirm disturbed soils in areas not paved or graveled. No prehistoric or historic cultural material was encountered during the course of the field survey. No further consultation under Section 106 of the National Historic Preservation Act was recommended for this project.

Stoll, Courtney and Andrea Crider
2013 *Phase I Cultural Resources Survey for the Kenton County Airport Board Cincinnati/Northern Kentucky International Airport North Development Area Project in Boone County, Kentucky.* Prepared by *Environment & Archaeology, LLC.* Prepared for Kenton County Airport Board.

This survey was conducted of three adjacent parcels that were approximately 42.0 acres in size. Extensive disturbance was found at the project area from grading and filling of the land, push piles, and utility installation. Of the 42.0 acres surveyed, 30.2 acres were found to be clearly disturbed at the surface. One concrete pad was identified that could have been the platform for an outbuilding, but no evidence was identified that could associated with any historic structure. No cultural resources were identified during the survey, and no further work was recommended.

Leone, Karen and John W. Picklesimer
2014 *Phase I Cultural Resources Survey for Five Parcels (3-A, 3-B, 6-A, 6-B, and 6-C) at the Cincinnati/Northern Kentucky International Airport, Boone County, Kentucky.*

This survey was conducted for the Kenton County Airport on five parcels of land to establish any potential impacts should the airport choose to expand within these areas. The total area surveyed was approximately 184.4 acres. This survey utilized systematic shovel testing in all areas where surface visibility was less than 20 percent at 15-meter intervals, and conducted surface survey on all other areas. The survey identified two new archaeological sites and four isolated finds within the project area. None were recommended as eligible for the National Register of Historic Places, and no further work for the project was recommended.

In addition, historic maps were consulted in order to identify any historic resources within the project area. Historic maps showed numerous structures within the project area across time. All of the historic maps and the structures that were present on them is illustrated in summary form in Table 4 to allow for easier visual understanding of when structures appeared and disappeared from the maps. The earliest historic map of the area is an 1883 atlas map (Figure 5) that shows two historic structures (S#1 and S#2) within the project area and a residential access.

The 1898 topographic map (Figure 6) does not show that S#1 or S#2 are still extant in 1898. One structure is shown within the project area (S#3), and the residential access has been converted into a road that runs roughly north-south through the project area.

The 1912 Ohio-Kentucky Cincinnati Topographic Map (Figure 7) shows S#3 as still extant in 1912, and shows one additional structure within the project area (S#4), and two additional structures adjacent to the project area (S#5 and S#6). The road running north-south is still present.

A 1938 Aerial Map (Figure 8) obtained from the Boone County GIS website shows several structures in or adjacent to the project area. Structure S#3 is the only structure that remains that was also shown on previous maps since 1898. The additional structures shown within and adjacent to the project area on the 1912 topographic map (S#4, S#5, and S#6) are no longer present on this 1938 aerial. The map appears to show approximately nine new structures (S#7-S#15), which includes both residences and outbuildings, but the number is an estimate as the resolution of the image is low. The airport was not in existence during this time.

The 1951 USGS Burling topographic map (Figure 9) shows no new structures since the 1938 aerial. S#3 that was first present in 1898 is still present. Of the nine new structures that were present on the 1938 aerial, two are no longer extant (S#7 and S#12). The seven other structures that first appeared in 1938 are still located on this 1951 topographic map (S#8, S#9, S#10, S#11, S#13, S#14, and S#15). The north-south road is no longer marked as a full road, but has been terminated at a residence in the middle of the project area, and is marked as a residential access coming from the north. An additional residential access is shown in the southeast corner of the project area that leads to a structure outside of the project area.

On the 1961 Burlington topographic map (Figure 10), S#3 originally shown on the 1898 map, disappears. Additional structures that first appeared on the 1938 aerial also disappear on the 1961 topographic map (S#8 and S#15). Structures that remain on this map that originally were shown on earlier maps all first were shown on the 1938 aerial (S#9, S#10, S#11, S#13, and S#14). Five new structures appear on this 1961 map (S#16-S#20). The residential access from the north is now labeled as Jergen's Lane. Two additional residential access roads now extend from the south, as many new residences appear on the roads around the project area.

The 1969 Burlington topographic map (Figure 11) is a photorevised version of the 1961 map. No structures that were present on the 1961 map have been removed. Three new structures are shown on this 1969 photo-revision (S#21-S#23).

On the 1974 Burlington topographic map (Figure 12), structures S#9, S#10, and S#19 are no longer extant, indicating they were removed between 1969 and 1974. Structures S#9 and S#19 are in the path of new roadways, and were likely razed for their construction. Several structures do remain that first showed on earlier maps. Three structures that originally appeared on the 1938 aerial are still present (S#11, S#13, and S#14). Four structures that originally appeared on the 1961 map are still present (S#16, S#17, S#18, and S#20). All three of the structures that first appeared on the photorevised 1969 topographic map are still present (S#21, S#22, and S#23). Only one new structure appears on this map since the creation of the 1969 topographic map (S#24).

The 1991 topographic map shows a great change in the landscape of the area. The airport purchased all of the property within this parcel in 1974. By the time the 1991 topographic map was created, all structures previously noted were gone except for S#24 which first appeared on a map in 1974 (Figure 13). Many of the structures were razed just after purchase of the land in 1974, and no new structures were shown to be present on the map.

On the 2006 parcel map for the Kenton County Airport Board, S#24 is still present, and five new buildings have been added in a row on the north end of the project area (S#25-29) (Figure 14). The most notable change throughout the years on these maps is the disappearance of all but one structure between the 1974 and 1991 topographic maps. The one structure that was still shown on the maps only first appeared on the 1974 topographic map (S#24). The disappearance of all of these structures is because the airport bought all of this property in 1974, and within a few years of the purchase had razed all of the structures present except for S#24.

Table 4 - Appearance and Disappearance of Structures on Historic Maps in the 3C Project Area.

	Map Year (highlight denotes building present)									
Structure	1883	1898	1912	1938	1951	1961	1969	1974	1991	2006
S#1	■									
S#2	■									
S#3		■	■	■	■					
S#4			■							
S#5			■							
S#6			■							
S#7				■						
S#8				■	■					
S#9				■	■	■	■			
S#10				■	■	■	■			
S#11				■	■	■	■	■		
S#12				■						
S#13				■	■	■	■	■		
S#14				■	■	■	■	■		
S#15				■	■					
S#16						■	■	■		
S#17						■	■	■		
S#18						■	■	■		
S#19						■	■			
S#20						■	■	■		
S#21							■	■		
S#22							■	■		
S#23							■	■		
S#24								■	■	■
S#25										■
S#26										■
S#27										■
S#28										■
S#29										■

Figure 5

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

1883 DJ Lake Atlas of Boone County, KY

0 1000 2000 4000 feet

Environment & Archaeology, LLC

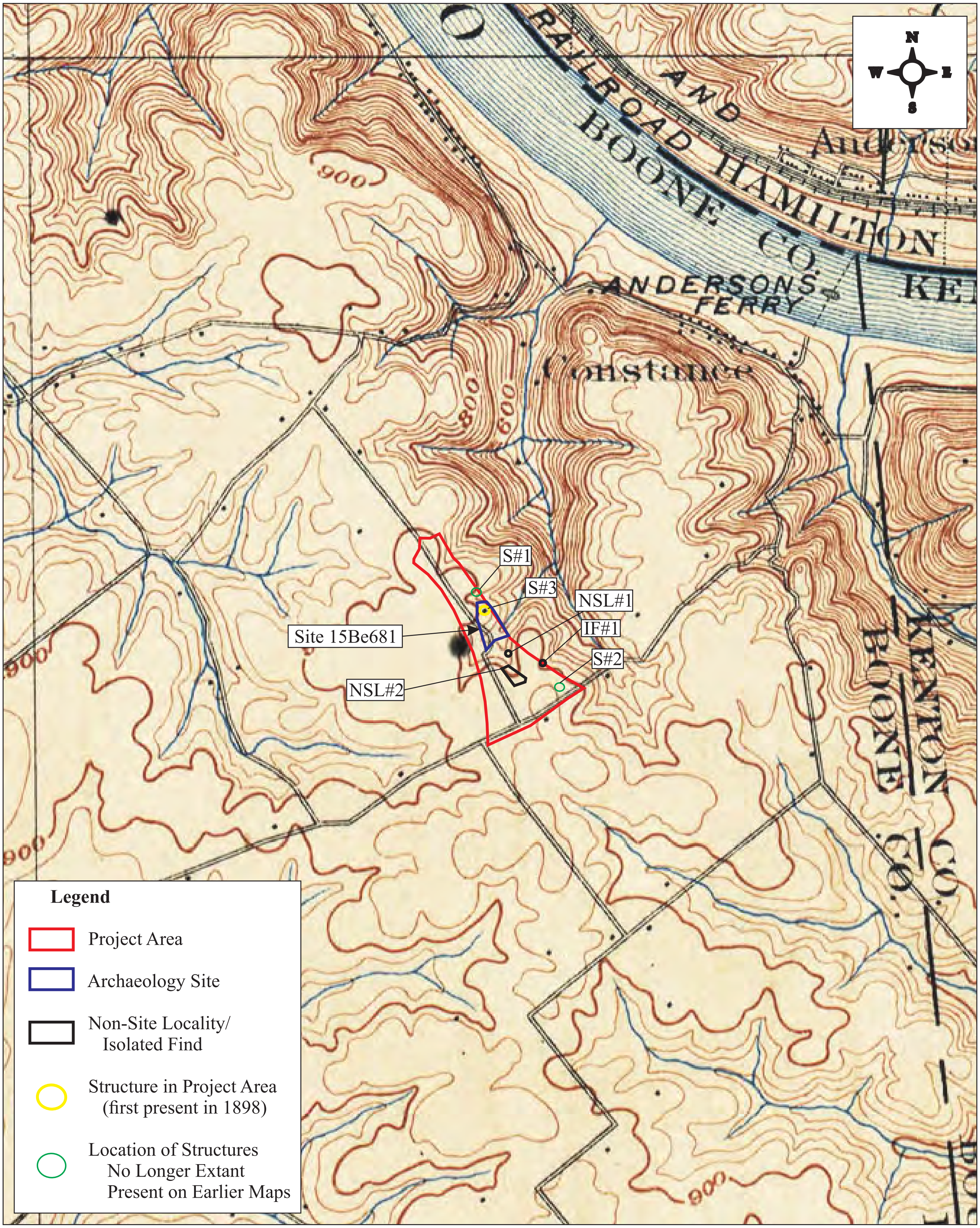


Figure 6

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

1898 West Cincinnati Topographic Map, KY and OH

0 1000 2000 4000 feet

Environment & Archaeology, LLC

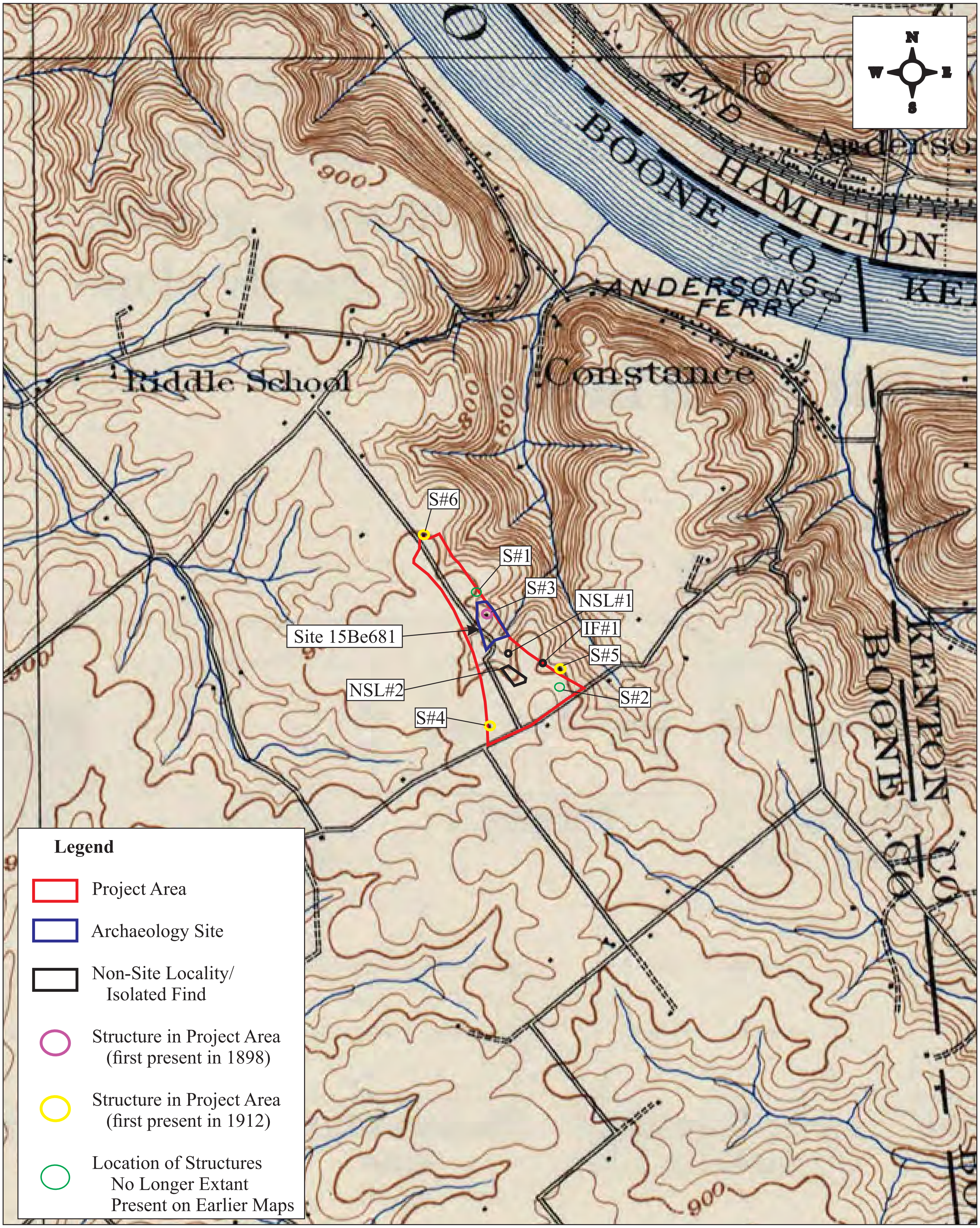


Figure 7	Kenton County Airport Board Site 3C Project Boone County, Kentucky	1912 West Cincinnati Topographic Map, KY and OH 0 1000 2000 4000 feet *Environment & Archaeology, LLC*

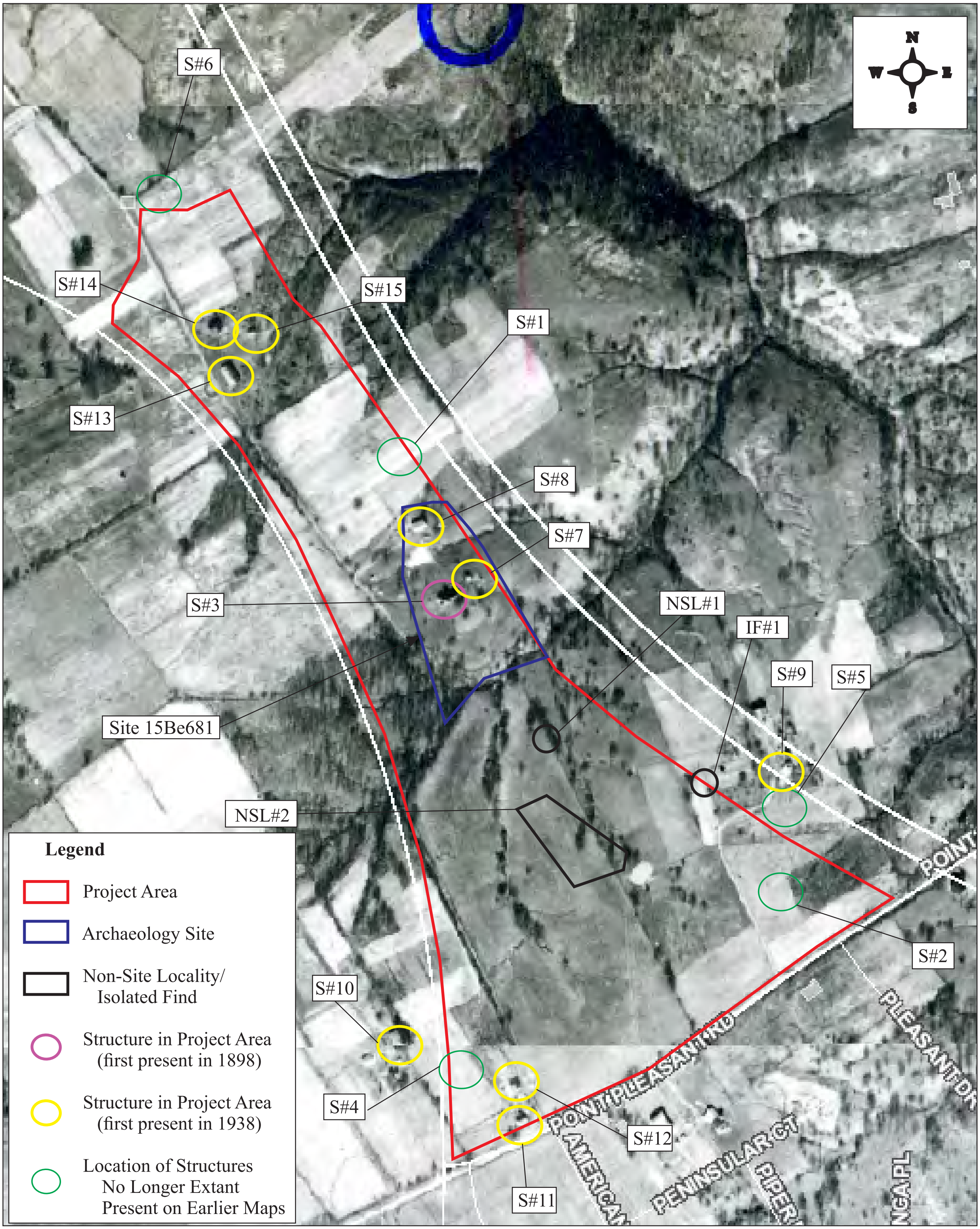


Figure 8	Kenton County Airport Board Site 3C Project Boone County, Kentucky	1938 Burlington Aerial from Boone County GIS 0 250 500 1000 feet *Environment & Archaeology, LLC*

Figure 9

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

1951 Burlington Topographic Map, KY and OH

0 1000 2000 4000 feet

Environment & Archaeology, LLC

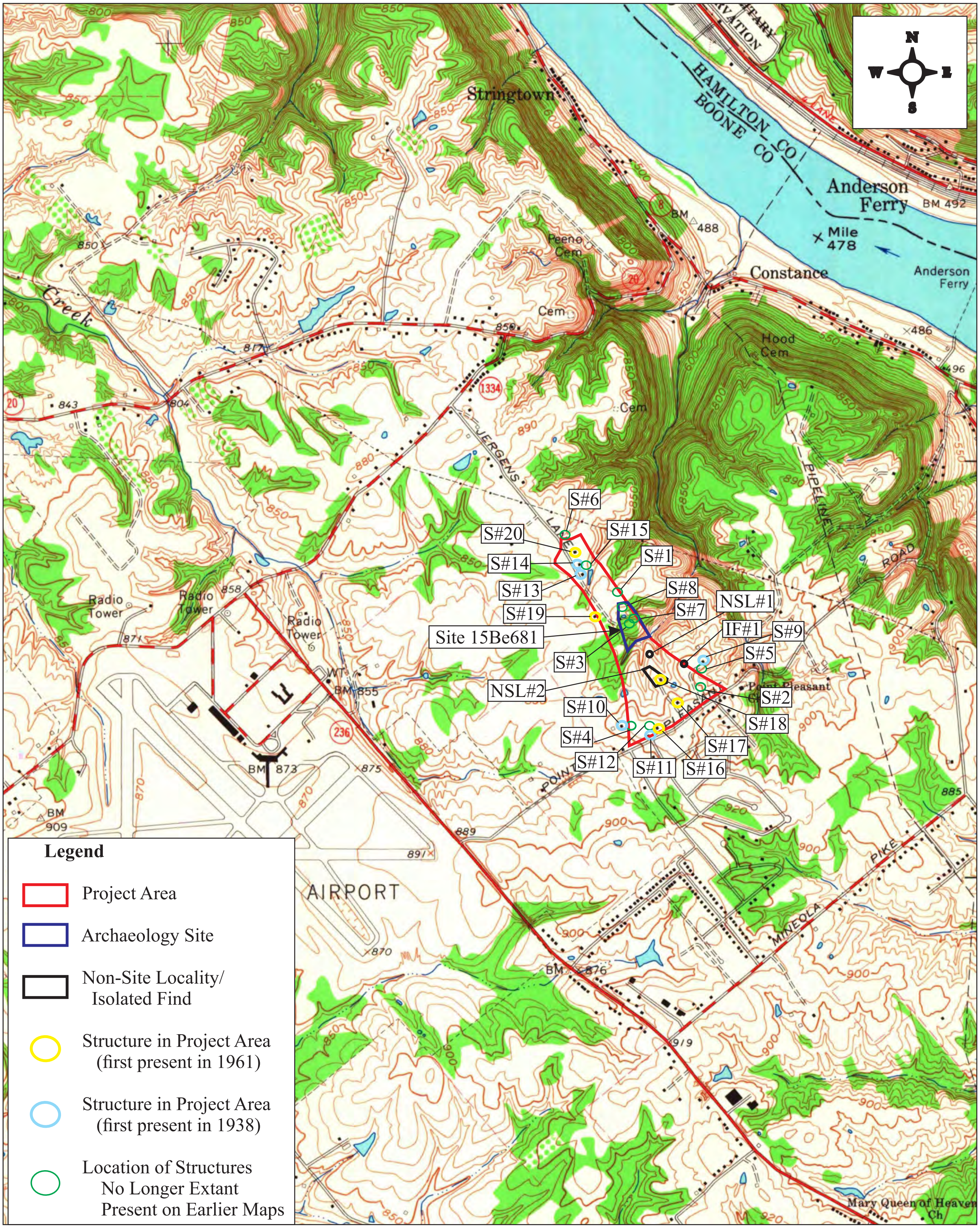


Figure 10	Kenton County Airport Board Site 3C Project Boone County, Kentucky	1961 Burlington Topographic Map, KY and OH 0 1000 2000 4000 feet *Environment & Archaeology, LLC*

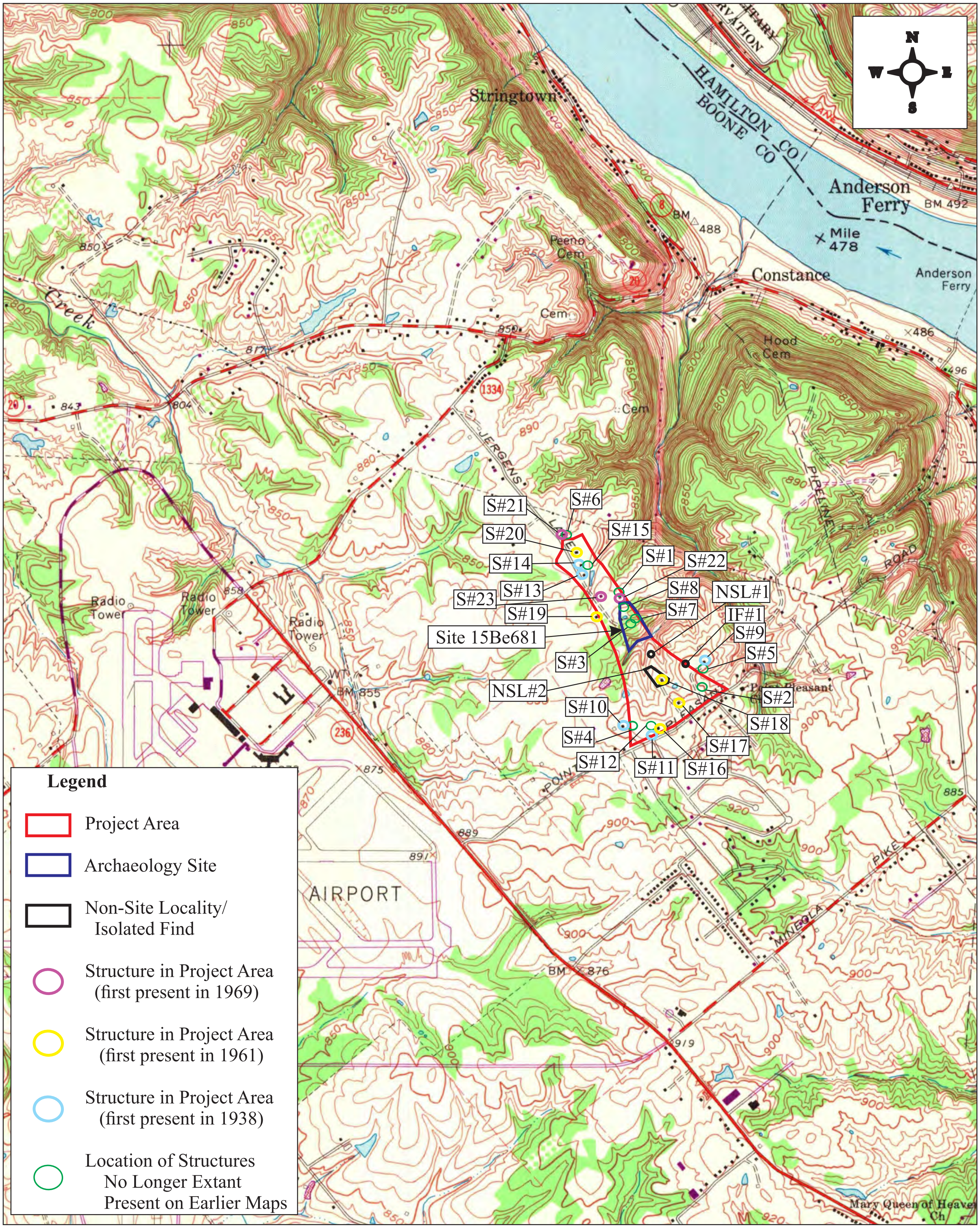


Figure 11

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

1969 Burlington Topographic Map, KY and OH

0 1000 2000 4000 feet

Environment & Archaeology, LLC

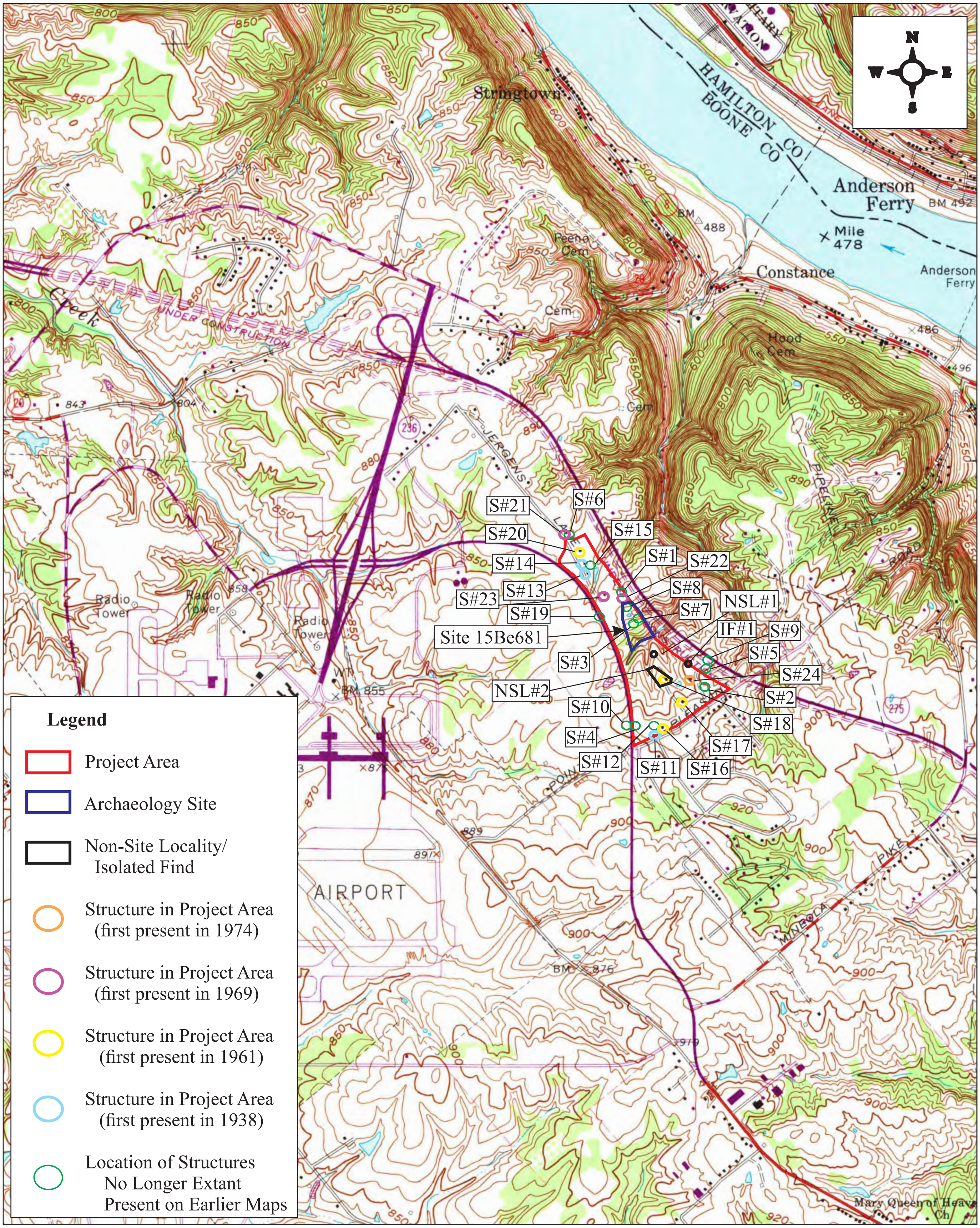


Figure 12

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

1974 Burlington Topographic Map, KY and OH

0 1000 2000 4000 feet

Environment & Archaeology, LLC

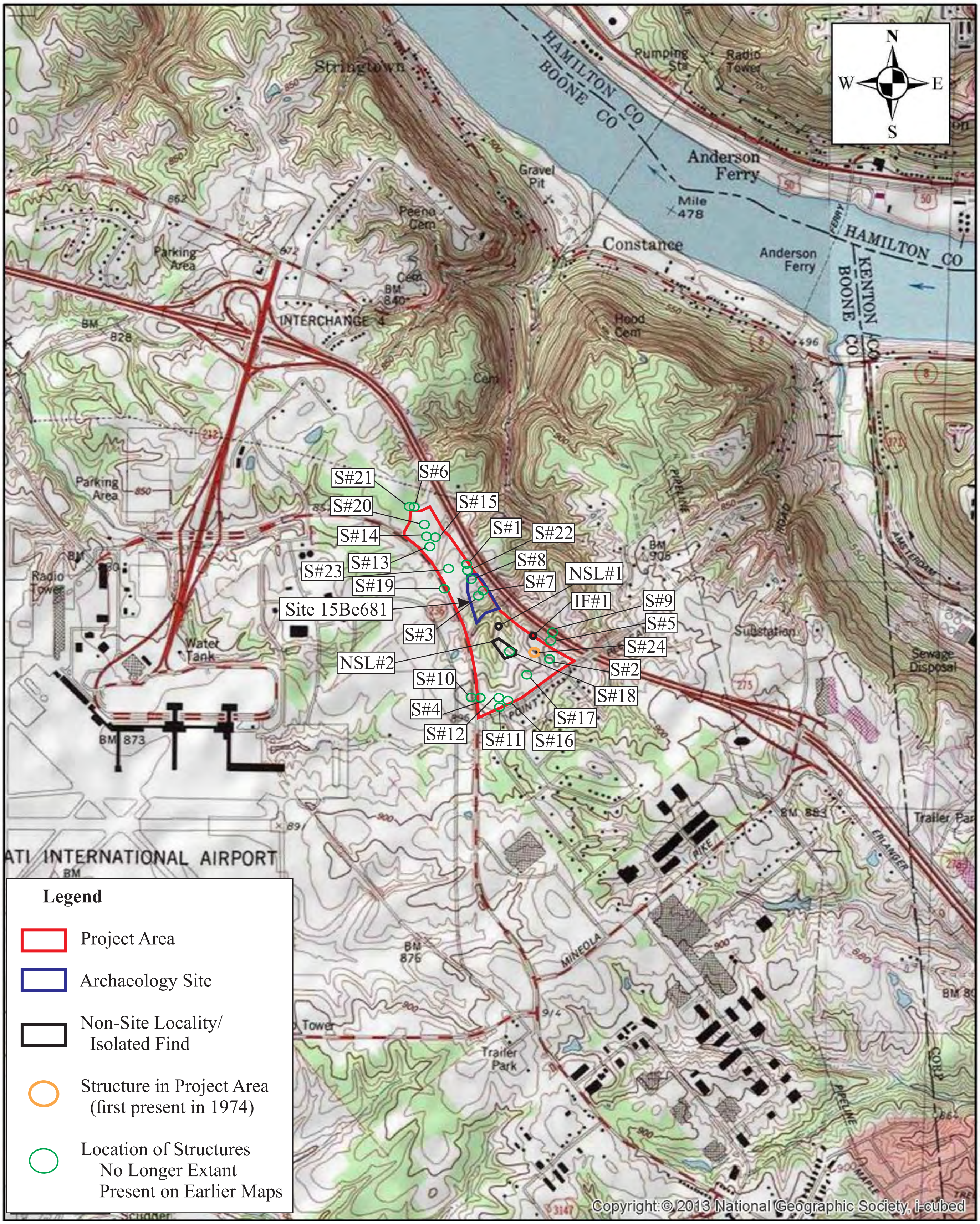


Figure 13

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

1991 USGS 7.5-Minute Topographic Map
Burlington and Covington, KY Quadrangles
0 1000 2000 4000 feet
Environment & Archaeology, LLC

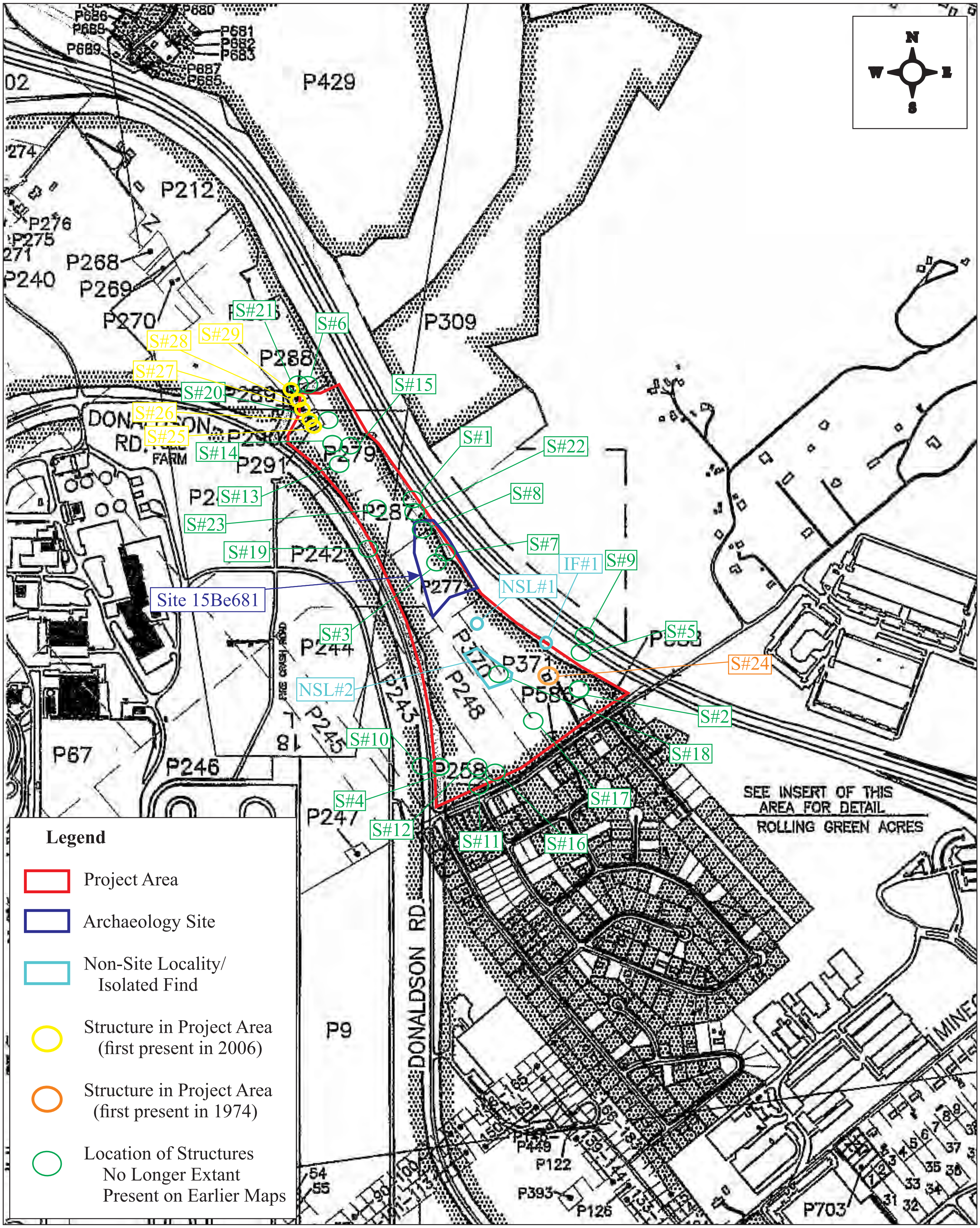


Figure 14

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

2006 Kenton County Airport Board Parcel Map

0 500 1000 2000 feet

Environment & Archaeology, LLC

Project Expectations

Based on the information obtained about previously recorded archaeological sites and the topographic variables involved in the project area, expectations regarding the potential of archaeological resource occurrence can be made.

Given the general preference for settlements near riverine environments demonstrated from the Archaic through the Mississippian cultural periods and the preference of early historic settlements to be near waterways, the location of the project area near the Ohio River and several tributaries would suggest a high probability for both prehistoric and historic archaeological sites. This in turn is supported by the large number of archaeological sites recorded within a 1.2-mile radius of the project area. However, historic research through maps and discussions with the Kenton County Airport Board indicates that this area has been highly disturbed. This disturbance would include a large amount of grading of the original surface. Therefore, there is a low probability of any undisturbed, in situ cultural deposits within the project area.

However, it is expected due to the large number of residences that once stood in the project area that secondary deposits of historic material from the razing of these structures will be found. Figure 13 shows the most recent topographic map of the area from 1991. Structures labeled S#1 through S#20 are the locales of former structures whose original construction dates to at least 50 years ago, thus giving these locales the potential for historic material. The field director was given all historic maps prior to field work in order to ascertain the locales of greatest likelihood of cultural deposits in the field. The methods used in these areas will be discussed under Field Methods, and how the history of these areas relates to these findings will be discussed under Survey Results.

FIELD METHODS

A variety of field methods were employed during the survey of this project area. The methods employed for this Phase I survey included surface reconnaissance and shovel testing based on requirements outlined in the *Specifications for Conducting Fieldwork and Preparing Cultural Resource Assessment Reports* produced by the Kentucky State Historic Preservation Office (KY SHPO 2006).

In general, areas containing slope are subjected to a visual survey for structures, rock outcrops, and rock shelters. No shovel testing is conducted in these areas. In areas where slope is less than 15 percent and surface visibility is greater than 75 percent, systematic surface reconnaissance is conducted. In areas containing less than 75 percent surface visibility, shovel tests measuring 30 centimeters (0.98 feet) are excavated in natural levels. Shovel tests were conducted at 65-foot (20-meter) intervals. Any artifacts found on the surface at the location of a shovel test were collected, then the shovel test was excavated. Artifacts were bagged by their provenience so that artifacts found at the surface of a shovel test and those found within a shovel test could be differentiated. If prehistoric or historic artifacts were recovered during shovel testing, intra-site testing in a cruciform pattern was conducted. This process includes the excavation of additional shovel test pits at 7.5-meter intervals in the four cardinal directions. This process continued until two consecutively negative shovel test pits were excavated or the boundaries of the project area were reached. If a large amount of artifacts were denoted at a surface location, such as at a dump or the site of a structure demolition, or if features were noted at the surface (e.g. foundations), additional shovel tests would be excavated around the concentration or feature in order to look for middens, builder's trenches, and other features. If the number of artifacts at the surface was too great for a complete collection, or if the artifacts were too large to return to the laboratory, a relative sample of diagnostic artifacts would be collected at the Field Director's discretion, and photo documentation would be taken of all artifacts not collected for transport to the laboratory.

The Field Director was provided with historic maps of the area prior to field work. He was aware of the locations of all former structures, and was also aware that much of the area had been razed when these structures were removed. Shovel testing was maintained at 15-meter intervals through these areas, and surface inspection was conducted as well to ascertain if there were any foundational remains. Due to the demolition and disturbed nature of much of the site, along with the knowledge that there had been several buildings constructed and then removed within the past 50 years, the field director excavated additional shovel test pits in locales where artifacts were diagnostic over 50 years old, and/or deposits appeared to be undisturbed, and/or within and around any foundation or other structural remains identified.

Shovel tests were excavated into culturally sterile subsoil deposits or until an impasse was reached. All soils were screened through ¼-inch mesh hardware cloth, and the artifacts were retained for analysis. A record of soil stratigraphy was made using Munsell soil color charts and United States Department of Agriculture (USDA) soil classifications. When present, natural soils are referred to by their pedogenic nomenclature (A_p-horizon, B-horizon, etc.). The location of all shovel tests were recorded with handheld GPS units.

LABORATORY METHODS

All archaeological data and specimens recovered during the project were transported to the *Environment & Archaeology, LLC* laboratory in Florence, Kentucky. Each artifact was washed with water and a soft toothbrush and dried. Items considered too unstable for wet washing were either dry-brushed or left unwashed. After processing the assemblage, stylistic attributes were described and recorded within a Microsoft Excel spreadsheet.

Prehistoric Artifacts

Lithic Artifact Analysis

Lithic artifacts were analyzed using the following methods structured on analysis developed by Andrefsky (2005). These data provided information on the range of materials present in and assisted in addressing research questions. Specific methods and procedures used to analyze lithic artifacts collected during the project are discussed below.

Raw Materials

Raw materials were identified on the basis of macroscopic characteristics: color, texture, hardness, and inclusions. Magnification with a 10X hand lens were used to identify inclusions and to evaluate texture and structure. Several raw material types are likely to be identified during the analysis. Various raw material types are listed below, followed by a brief description of its physical properties. Descriptive properties were taken from Taylor et al. 1996.

Chert is cryptocrystalline quartz. Unlike vein quartz and rock quartz crystal, chert tends to occur within sedimentary rock formations. In general, most varieties of chert are amenable to flaking because they are homogeneous or isotropic materials that fracture in a clear conchoidal pattern.

Quartz is one of the most common minerals found on earth. It is formed from igneous magma and hydrothermal veins. Quartz is fairly conducive to knapping due to a conchoidal fracture pattern, but due its many fractures planes, breakage often happens during knapping. It is also very hard making it difficult in the reduction process. The material was most likely derived from a local source.

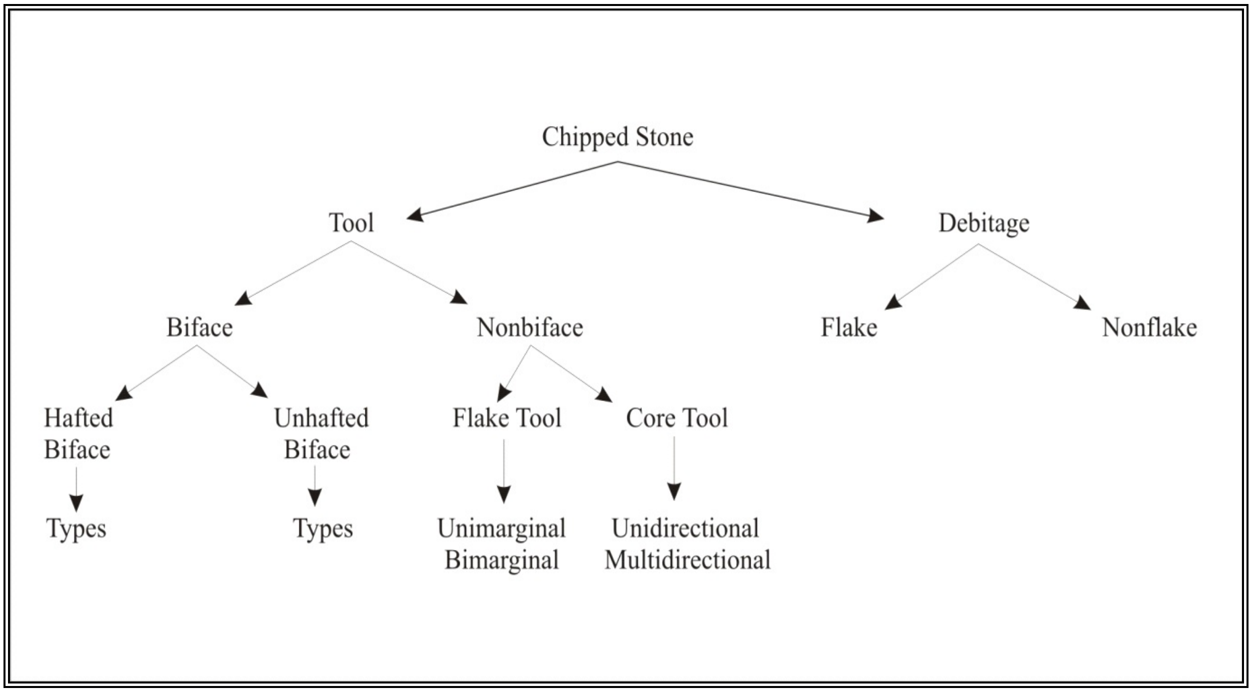
Quartzite, like quartz, exhibits a conchoidal fracture pattern. Quartzite has been traditionally considered a metamorphosed sandstone. Heat and/or pressure transform the sandstone into a more homogeneous matrix, which more readily transmits fractures through individual sand grains rather than around them. The material was most likely derived from local material found in and around the Project Area.

Chalcedony, like chert, is from a form of cryptocrystalline quartz. The term chalcedony is applied to a specific type of fine-grained raw material.

Sandstone is composed of bonded sand grains.

Tool Analysis

Identification of lithic types within the chipped stone assemblage was accomplished through the use of a standardized morphological typology as presented in Andrefsky (2005). This typology divides the lithic assemblage into categories that are discussed below. The typology was based upon the morphology of chipped stone artifacts and is not intended to suggest function nor chronology. These categories were based on the presence or absence of particular attributes on a specimen.



Morphological Typology of Chipped Stone Tools and Debitage (After Andrefsky 2005: Figure 4.7).

The chipped lithic assemblage was initially classified into two groups: tools and debitage. Tools were separated by the presence of known attributes attributed to human behavior. Patterns of flaking indicating intentional modification (flaking) and/or utilization (use-wear) defined a tool. All tools were recorded using standardized metric spatial dimensions including length, width, thickness, and weight. Tools will then be divided into two groups; bifaces and nonbifaces. Bifaces are defined as objective pieces that have been extensively modified, and have two sides or faces that meet to form a single edge that circumscribes the entire artifact. Both faces show evidence of previous flake removals. If evidence of bifacial flaking is absent, the artifact will be included with the non-bifacial tools (flake or core tools). Debitage was defined as the materials removed from tools in their shaping process.

Bifacial Tools. Bifaces were divided into categories of hafted or unhafted bifaces. Hafting elements are recognized on bifaces by the presence of notches or shoulders, or by the presence of wear along the edges of the biface. These include ground or dulled edges. However, certain points have less obvious hafting elements, and it must be inferred that they were meant to be hafted. Hafting can be inferred for small triangular types such as the Madison and Ft. Ancient from cumulative knowledge associated hafting technology, frequency of impact fractures, microwear patterns, symmetry, and patterns of retouch. Hafted bifaces were further identified as projectile point, knives, drills etc. in order to encompass the common technological traditions of the region and distinguish subcategories of bifacial chipped technologies and their temporal and cultural affiliations. Unhafted bifaces are bifaces that conform to the category of biface, but lacked a recognizable or inferred hafting element.

Identification of diagnostic lithic artifacts were made by consulting existing comparative collections and available regional literature. The analysis of hafted biface typologies were aided by reference works such as *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States* (Justice 1987) and *New York Projectile Points* (Ritchie 1971).

Nonbiface Tools. Non-bifaces were divided into flake tools and core tools. Flake tools are defined as those tools that are modified, but have a recognizable dorsal and ventral surface. Flake tools are modified by either intentional retouching to form an edge, surface, or shape; or as a result of tool use. Many endscrapers, backed blades, microliths and microblades categories can be fitted into the flake tool typology but unifaces and retouched flakes are the most common types that fit into this morphological typology. The flake tool type is distinguished by the location of the wear or retouch. Unimarginal flake tools exhibit modification on either the ventral or dorsal side. Both sides can be modified if there are in different locations. Bimarginal flakes are modified on both the ventral and dorsal surfaces in the same location. Combination flake tools exhibit both kinds of modification.

A core tool is an objective piece that has had flakes removed from its surface and is best understood as a modified nucleus (sometimes referred to as chunk) or mass of chippable stone rather than a tool with some particular function. The nucleus is not recognizable as a flake or biface. Core tools include formal and informal cores, as well as core fragments. Core tools are then divided into unidirectional and multidirectional core types. Unidirectional cores are defined as a core which has had removals made from one direction, while if the pieces were detached from multiple directions, the core is defined as a multidirectional core.

Debitage

Debitage is defined as flaked debris, lithic waste flakes that exhibit intentional removal from a parent piece and exhibited no further modification or use. Debris occurs in large numbers on most sites, exhibit evidence of the stage of manufacture in which it was produced, and is usually deposited in the location it was produce. The interpretation of chipped stone debris is important to answering questions regarding site use and function.

Any recovered debitage which passes through a ¼ inch screen were subjected to counting and weighing only and not included in the analysis. As ¼ inch screen is used during field recovery, smaller flakes, or microdebitage, represent an inconsistent and opportunistic sample and are not included in further analysis. The remaining debitage were then stratified into flakes and nonflakes. Flakes are defined as having recognizable dorsal and ventral surfaces. Nonflakes do not exhibit flake characteristics and therefore fall into the category of blocky shatter.

Flakes were classified according to the following criteria:

- Primary Flakes are typically thick and have cortex on all or most of their dorsal surfaces. They are identified by one or less dorsal scars.
- Secondary Flakes are generally, relatively thin. They may have some cortex on their dorsal side. Secondary flakes are identified by two or three dorsal scars.
- Tertiary Flakes are small and thin. They were also known as biface finishing flakes and may be the result of producing the edge of a tool. Tertiary flakes have three or more dorsal scars and rarely exhibit cortex.
- Flake Fragment are flakes which lack sufficient features of flake morphology to be included into the above categories. They typically lack platforms, percussion bulbs, or their original edges.

Ground Stone Analysis

Artifacts in this category are produced using one or more techniques, including grinding, abrading, pecking, polishing, and chipping. These implements may have been manufactured for a particular function or used more expediently and thus formed by actual use. Groundstone artifacts are identified by raw material, physical attributes such as size and weight, manufacturing techniques, and /or use wear (Adams 2002). These include artifacts used to alter surfaces (i.e grooved abraders and burnishing stones), those engaged in fatigue wear or abrasion (i.e. manos, metates, mortars, pestles, and pitted stones), stones used to chip or smash away other items (hammerstones), and formal tools exhibiting hafting (adzes, celts, and axes).

Prehistoric Ceramic Analysis

Ceramic assemblages were sorted by size and surface condition. Since very small and/or eroded sherds seldom contain discernable features such as temper type and size, design technique and motif and surface treatment, sherdlets measuring less than one square centimeter were counted and excluded from further analysis. Ceramic sherds larger than one square centimeter are first sorted by paste and temper type and size. These three features are the most diagnostic of vessel lots, as well as the most readily identifiable. Next, color, surface treatment and decorative applications are identified and used to further subdivide the ceramic sample. Lastly, the assemblage is sorted by vessel element and, if possible, vessel type. Upon completion of this analysis, current regional literature is searched for ceramic typological sequences and recovered assemblages containing similar attributes.

Historic Artifacts

The historical record can be best used to develop expectations which can be tested through archaeological methods. Material culture can be used to discern how patterns in the archaeological record may provide data on cultural patterns including economics, social change, ethnicity, and behavior (Miller 1980; Cheek and Friedlander 1990; Spencer-Wood 1987; Genheimer 1988).

Artifact analysis methods at historic sites may include a variety of techniques designed to meet the particular needs of individual sites and settings. Initially, artifacts are divided into categories based on artifact type. For example, glass, ceramics, and metals are separated and subjected to differing types of analysis. These are then further divided into functional categories, such as Kitchen, Architecture, Tools, etc (see South 1977) which can establish use-wear patterns within a site. The following is a brief discussion on the techniques and criteria by which each artifact types are typically evaluated.

Kitchen Group

Historic Ceramics

The historical ceramic artifact analysis and categorization conducted by *Environment & Archaeology, LLC* is defined as being a "ware based" system. An initial classification is conducted on historic ceramics based on morphology and decoration. A visual inspection provides information regarding ware type based on attributes such as paste, glaze, and decoration.

Nonvitreous white bodied wares, when accurately classified, provide an extremely good indication of the age of some archaeological deposits. Nonvitreous white bodied wares include creamware, pearlware, and whiteware. Semivitreous white ware includes ironstone. These common tablewares are often the most ubiquitous artifacts found on eighteenth through twentieth century historical sites. Several of the historic ceramic ware types are temporally diagnostic through both ware and decoration. Some of these are discussed below.

Porcelain is a vitreous white-paste, usually glazed, ware of a variety of compositions. Due to porcelain's long range of use and manufacture, it can not be used as a temporal indicator based on ware alone. However, decorative techniques can be used as temporal indicators based both on the beginning of their use, and the dates of their popularity.

Creamware is a non-vitreous white-paste earthenware with a cream colored glaze which was first exported to the United States in 1769 from England (Noel-Hume 1978: 125). By the end of the 18th century, creamware was the dominant ware in much of the American market. However, circa 1810 pearlware began to replace creamware in popularity. Creamware was produced in a variety of decorations, including over and underglaze transfer printing, annular or dipped preparation, over and underglaze hand paint, and molding.

Pearlware is a non-vitreous and semi-vitreous, white-pasted earthenware. The glaze on pearlware has a faint blue-green tint cause by the addition of cobalt to a clear lead glaze. Pearlware was developed in England, and had become the most common tableware in the United States in circa 1810. The popularity of pearlware declined by 1840 (Majewski and O'Brien 1987:118-119, Noel Hume 1978: 128-132; Price 1982:10-11). Pearlware and whiteware are very similar in appearance. One method of distinguishing between the two is to look in places on the ware where the glaze would have pooled, especially in footrings. The cobalt addition in pearlware creates a distinctive blue color with the glaze has accumulated.

Whiteware is a non-vitreous and semi-vitreous, white-paste earthenware that usually has a clear, colorless glaze. Whiteware is very similar in appearance to pearlware and ironstone. Whiteware became popular in the United States by 1820, were it was in common use throughout the 1800s, and is still being manufactured today. The era of the greatest popularity of whiteware in the United States was between 1830 and 1890 (Majewski and O'Brien 1987:119-125, Miller 1980:16-17, Noel-Hume 1978:130-131, Price 1982).

Ironstone refers to a semi-vitreous, white-paste ware that contains petunse (china stone). Ironstone was popular in the United States by the 1840s, imported from England. They were often decorated to imitate Chinese porcelain. Post 1850, ironstone was predominantly undecorated, with some occurrences of molded geometric, floral, or foliate motifs. American manufacturers began to produce ironstone during the Civil War. Embossed ironstone was most popular between 1840 and 1907 (Majewski and O'Brien 1987:20-21).

Redwares are non-vitreous wares with a red, buff, or brown paste. While redwares may be unglazed, they are more commonly found with a clear or mottled lead glaze, or a black or brown glaze resulting from iron additions to the glaze. Redware was at the height of its popularity through the mid-1800s.

Stoneware is a semi-vitreous ware, usually glazed and found in thick, utilitarian forms. Stoneware paste can range in color from red to buff to brown, and may turn grey during firing. Stoneware is categorized primarily by its exterior surface treatment, with the most popular being salt glazed. Stoneware was popular in the United States by the mid-1800s and largely replaced redware as the utilitarian ware of choice.

Yellow ware is a semi-vitreous or non-vitreous ware with yellow- or cream- colored paste, which usually have a clear or mottled (Rockingham) lead glaze. The Ohio River Valley is well known for its yellowware potteries (Gates and Ormerod 1982). Yellowware was popular between about 1830 and the 1920s.

Bottle/Jar Glass

Glass date ranges are based on manufacturing techniques and the date range of certain colors. For example, sun-colored amethyst glass was produced after the late 1870s in an attempt to produce a very clear glass. The chemical composition, manganese oxide, interacted with sunlight and the glass soon turned various shades of amethyst (Jones and Sullivan 1985). Selenium began to replace the use of manganese oxide as a decolorizer around 1915, and the replacement became complete by 1918 (Deiss 1981:78-83). When selenium glass is exposed to ultraviolet light, the glass turns a straw-yellow color.

Manufacturing techniques also changed throughout the nineteenth century and may be used to establish date ranges for certain styles or techniques. For example, dip molds used single piece iron or wood molds to give a vessel shape. The base of these bottles could be either the same width or smaller than the shoulder of the vessel. These were used as late as 1860 (Deiss 1981). Multipart molds with dip molded bodies (Rickett's molds) were made into the 1920s. To finish the neck of these bottles, a glass-tipped rod (pontil) was attached to the base to hold it steady (Jones and Sullivan 1985).

Crown caps (modem soda bottle tops) were invented in the early 1890s. The Owen's automatic bottle making machine was patented in 1903. Both of these inventions help mark the arrival of modern style bottles and jars in the archaeological record (Jones and Sullivan 1985). The Owen's machine left a distinct mark on the base of the vessel, and by 1917, most glass containers were made using this machine (Miller and Sullivan 1984).

Table Glass

Circa 1820, press molding of hollowware for table glass became possible. In the early 1800s this glass was often decorated with relief motifs and a finely stipple or mat background to hide defects in glass. These pieces were so heavily decorated that they were often referred to as "lacy glass." These pieces were often made using leaded glass which reflected light.

Pattern molding was popular in the late 1700s and to mid 1800s (Jones and Sullivan 1985). This method involves a two part process. First the glass is blown into a mold that gives it a basic shape and decoration, such as ribs, panels or stars. This is then removed from the mold and free blown. The enlargement of the vessel causes the decoration on the body to become very diffuse.

Improvements in the manufacturing process in the 1850s eliminated the need to decorate elaborately to hide defects. In the 1870s, additional improvements in formula allowed for pressed glass to be made in a variety of colors, increased its popularity, and decreased the use of leaded glass (Davis and Davis 1967, Deiss 1981, Innes 1976, McKearin and McKearin 1948). Consequently, press molded, leaded glass tableware becomes scarce in the record post 1870. Carnival glass was a type of popular press molded table glass that was coated with metallic paint to imitate more expensive forms. The height of carnival glass's production was between the 1890s and the 1930s (Deiss 1981).

Other Kitchen

This category includes all kitchen artifacts not accommodated by the above categories, including utensils, cooking vessels, metal cans, metal can pull-tabs, glass bottle crown caps, metal foil, and other wrapping materials, etc.

Architecture Group

Nails

As with many other materials found on archaeological sites, nails have undergone major changes due to the impact of industrialization. Nails can be used to identify chronology on sites using the manufacturing process (wrought, cut, wire) and sometimes their size (Nelson 1968). Wrought nails are the earliest iron nails, and were often made locally by a smith or forge. These nails are usually square or rectangular in cross-section, and taper on all sides towards the point. Wrought nails were in common use through the 1830s and 1840s, when they began to be replaced by cheaper cut nails.

Cut nails were manufactured from a sheet of steel. These nails were stamped out, and tend to taper on only two sides. Early cut nails have a constricted shank below the head, and were first produced in the late 1790s. Later cut nails lack this constriction and were in common use by the late 1830s. Cut nails are still manufactured today for special purposes.

Wire nails are manufactured by cutting hardened steel wire. These nails are round in cross-section. They became common in usage around the 1880s, and are still the primary form manufactured today (Nelson 1968).

Window Glass

The thickness of window glass in a large assemblage can be a useful chronological indicator (Ball 1983, McBride and Sharp 1991, Moir 1987, Roenke 1978). Window glass thickness can be a useful indicator particularly when multiple structures appear to have been located at one site. However, ceramic as a chronological indicator is more reliable. To determine chronology with window glass, the average thickness of one concentration must first be established. The thickness is most accurately measured with calipers. This average thickness can then be inserted into Moir's formula (Moir 1987) to determine an approximate date. Moir's formula is:

$$[\text{Initial Date} = (84.22 \text{ x average thickness}) + 1712.7]$$

Bricks

The manufacturing of bricks changed from locally made, hand-crafted varieties to machine-produced in the nineteenth century. With this chronological information in mind, bricks are classified according to method of manufacture (Gurke 1987). The fragmentary nature of most recovered bricks at archaeological sites often precludes an accurate assessment of age.

Hardware and Other Building Materials

The hardware groups includes metal items such as nuts, bolts, hinges, window sash weights, locks, knobs, screws, staples, hooks, bands, braces, tacks, insulators, wire, and other unidentified architectural metal hardware (Priess 1971, 2000). The other building materials category includes items made of various materials, including mortar, plaster, roofing materials, buildings stone, glass and ceramic insulators, and ceramic tiles.

Small Finds

This category encompasses several functional groups: Furniture, Arms, Clothing, Personal, Transportation, Job/Activity, Fuel and Other. The artifacts typically recovered in these categories are either sparse in number, poor chronological indicators, or vary so widely that only once an artifact is recovered it can be useful to research it for chronology (e.g. the manufacturing dates for a toy), economic indicators (e.g. jewelry), or trade patterns.

Furniture Group

A variety of artifacts associated with furnishings and household fixtures are often recovered in small numbers from historic sites. Examples of these include lamp globe or chimney parts, mirror glass, faucet parts, fireplace equipment, clock parts, drawer pulls, flower pots and similar items (Thuro 1976). Furniture hardware and other materials can be dated by style and method of manufacture, but are not good chronological indicators of a site’s age due to the fact that this only reveals the date at which the furniture was originally made.

Arms Group

This category includes firearm parts, lead balls or bullets, cartridge casings, percussion caps, bullet molds, lead sprue, powder horn parts, and gunflints.

Clothing Group

This category of artifacts consists of artifacts associated with clothing, such as buttons, collar studs, buckles, shoe leather, irons, eyelets, garter snaps, thimbles, straight and safety pins, and hooks and eyes (Luscomb 1967). The presence of clothing items in an assemblage can aid in discussing activities that might have occurred at a site, as well as discussions of lifestyle**.**

Personal Group

This category includes objects typically reserved for one person's exclusive use, which often could be carried in a pocket or purse, such as smoking pipes, watches, clasp knives, gaming pieces, toys, jewelry, combs and brushes, coins, etc. (Bradley 2000).

Transportation Group

Artifacts assigned to this category include those associated with any form of wheeled transport, and those associated with horse, mule or ox harnessing and shoeing (Light 2000). Hand tools are also included in this category.

Job/Activity Group

This category includes items associated with any type of job or activity that occurs on a site such as tools associated with agricultural activities, woodworking, iron smithing, and general farm maintenance.

Fuel Group

This category includes items such as coal, coal cinders, ash, slag, and charcoal. Coal was adopted as a primary fuel in the middle to late nineteenth century, prior to which firewood and charcoal were used both domestically and commercially as an energy source.

Other

This category includes all materials that are not readily assignable to a major group. Items in this category include, for example, unidentified rusted metal artifacts and fragments of synthetic materials such as plastic, etc.

MATERIALS RECOVERED

This chapter describes the artifacts collected from the project area during the Phase I Survey of the Site 3C project area. Artifacts are the primary means by which archaeological sites are identified during field investigations. Historic artifacts represent a variety of past cultural activity and typically include domestic remains (i.e. ceramics, glass, etc.), structural debris (brick, wood, metal and iron objects) and subsistence-related remains (i.e. butchered animal bones, etc). A detailed artifact catalogue is provided in a table in Appendix B.

Prehistoric Artifacts

The entire prehistoric assemblage recovered from the project area consisted of two artifacts, recovered from NSL #2, and from IF #1.

Chert Typology

The lithic artifacts in the assemblage at the Site 3C Project were composed of chert. Chert artifacts were subjected to a macroscopic analysis in order to determine chert type. Chert typology can indicate the degree to which local chert was utilized compared to imported cherts that may have been acquired from trade.

Both chert artifacts were identified as Boyle chert. Boyle chert occurs in the Boyle formation in Kentucky, and follows the streams and drainages to the Ohio River, and would have been relatively easy to obtain. The color is variable from gray to browns, with some occasions of grays so light that they appear white. It is a waxy to earthy chert that is generally opaque, with some fossiliferous nodules (DeRegnaucourt and Georgiady 1998). Both the secondary flake from IF #1, and the tertiary flake from NSL #2 were composed of Boyle chert.

Debitage

Debitage is the by-product of the chert-knapping process, and is the most common lithic artifact category recovered from prehistoric sites. The class of debitage contained various types of flakes and flaking debris such as primary flakes, secondary flakes, tertiary flakes, indeterminate flakes, and chunks/shatter. The relevant debitage types used to determine whether early or late stage lithic reduction was taking place included: (1) primary flakes, and shatter as indicators of the early-stage processing of lithic raw material, and; (2) secondary and tertiary flakes as evidence of the final step in tool manufacturing or tool maintenance.

The lithic debitage assemblage recovered from the Site 3C project area contained one raw material type: chert. The prehistoric debitage was recovered from NSL #2 and from IF #1. The chert was subjected to macroscopic analysis in order to determine the chert type. Both pieces of debitage were composed of Boyle chert. No evidence of heat treatment was present.

The debitage assemblage was too sparse to make any conclusions about what stages of tool production might have occurred at the project area. The assemblage was comprised of one secondary flake from IF #1, and one tertiary flake from NSL #2.

Prehistoric Artifact Summary

The prehistoric artifact assemblage was all collected from Strata I of shovel tests, with all artifacts collected. The paucity of artifacts collected during this survey (n=2), indicates that within this project area, prehistoric occupation of the area was ephemeral or the artifacts were the result of secondary deposition.

The lithic assemblage was too limited to determine what stages of lithic production was occurring in the project area. The material did not conclusively determine whether they could have been produced at this location, or whether they were brought in either through cultural or natural processes.

Historic Artifacts

The total historic assemblage recovered from the Phase I Survey of the Site 3C project area consisted of 254 artifacts. Historic artifacts were found at Site 15Be681, NSL #1, NSL #2, and from many locales of scattered nondiagnostic historic isolated finds. The historic assemblage discussed in the following section includes all of the historic material collected from the project area. In the areas of dense artifact concentrations many artifacts were observed and recorded but not collected. This material recovered section will focus on the artifacts collected and returned to the laboratory for analysis. A separate section at the end will discuss the artifacts that were observed and not collected. The many locales of nondiagnostic historic isolated finds suggest they are no longer in situ and have been scattered through the field by agricultural activities, demolition of residences, and razing of the area. Table 5 represents the historic artifacts recovered by groups for the Site 3C project area.

Several factors can classify a historic artifact as nondiagnostic. Reasons an artifact may be classified as nondiagnostic include:

- The artifact was too small to make any accurate diagnostic determinations.
- The artifact was devoid of diagnostic markers such as decor, coloration, maker's marks, or construction method.
- The artifact was in an isolated context with no contextualizing additional artifacts or features to indicate a diagnostic nature.
- The artifact was in an isolated context and within a disturbed area that indicated the artifact no longer retained original provenience.

The historic artifacts were categorized into discrete chronological and functional groups. A definition and explanation of the artifact categories are presented below. The concept of artifact pattern analysis was introduced by Stanley South (1977) as a method for quantitative description of historic artifact assemblages. This method of analysis provides a straightforward method for comparison of collections from different sites. The artifact groups proposed by South are as follows: Kitchen, Architecture, Furniture, Arms, Clothing, Fuel, Personal, Activities, Tobacco Pipes, and Bone. The artifact pattern analysis strategy used in this study follows the work of South (1977) but, has been modified slightly and uses a system created by Louis Berger and Associates (Azizi *et al.* 1996).

Kitchen Group

Ceramics

The historical ceramic artifact analysis and categorization conducted by *Environment & Archaeology, LLC* is defined as being a "ware based" system. Nonvitreous white bodied wares and stonewares, when accurately classified, provide an extremely good indication of the age of some archaeological deposits. Nonvitreous white bodied wares include creamware, pearlware, whiteware. Semivitreous white ware includes ironstone. These common tablewares are often the most ubiquitous artifacts found on eighteenth through twentieth century historic sites. Ten ceramic sherds were recovered from the Site 3C project area, all from Site 15Be681. The ceramics included ironstone (n=1), stoneware (n=4), and whiteware (n=5). The decor present was a light blue glaze on the ironstone, a gray salt glazed stoneware sherd, three white glazed stoneware sherds with blue under-glaze hand painting, and a purple transfer printed whiteware sherd (Photo 1).

Ceramics are used by historical archaeologists to date sites and reconstruct depositional processes as well as to compare these durable household goods with consumer behavior. In many cultures, pottery represented an important element for expressing position and status, as well as conveying regional themes and motifs. Refined earthenware and stonewares were well integrated into daily farming activities of the region, which is why they are seen so frequently in assemblages from rural farmsteads. The paucity of sherds and the limited decor present on them in this assemblage, unfortunately precludes the drawing of any conclusions regarding consumer behavior. However, the purple transfer print does indicate occupation in the late 19th or 20th centuries. In addition, the underglaze hand painting on the white glazed stoneware read "Clover Blossom Cottage Cheese", and research indicated this Cincinnati based company produced these crocks during a 1920s promotional campaign.

Container and Table Glass

Glass date ranges are based on manufacturing techniques and the date range of certain colors. For example, amethyst glass was produced after the late 1870s in an attempt to produce a very clear glass. The chemical composition, however, interacted with sunlight and the glass soon turned various shades of amethyst (Jones and Sullivan 1985). Manufacturing techniques also changed throughout the nineteenth century and may be used to establish date ranges for certain styles or techniques. For example, crown caps (modern soda bottle tops) were invented in the early 1890s, and the Owen's automatic bottle making machine was patented in 1903. Both of these inventions help mark the arrival of modern style bottles and jars in the archaeological record (Jones and Sullivan 1985). Earlier developments in bottle manufacturing techniques included the development of molds for bottles resulting in the discontinuance of blown bottles with pontil marks by the 1870s (Jones and Sullivan 1985).

A total of 29 Kitchen Group glass artifacts were recovered from the Site 3C project area. They were recovered from Site 15Be681 (n=17), NSL #1 (n=2), NSL #2 (n=6), and from various locales of scattered historic debris (n=4). Much of the glass recovered were whole, or nearly whole vessels, which allowed for some designation of type of vessel. Bottle glass (n=19) was defined as vessels with a narrow neck and opening that would predominantly be used for liquids that could easily be poured from the opening. Jar glass (n=3) were from vessels with very wide necks and openings that may have contained thicker quality substances that may have required a utensil in order to remove. Jug glass (n=1) was similar to bottle glass with the narrow neck and opening, but was distinguished by a very wide and long body, along with an attached jug handle. The glass that was too fragmented to classify into one of these categories was listed as vessel glass (n=6).

No temporally diagnostic glass colors were present. The glass consisted of clear glass (n=20), brown glass (8), and green glass (n=1). However as many of the bottles were whole or nearly whole, molded or printed lettering was still present on many of the bottles which sometimes indicated their

Table 5. Historic Artifacts Recovered from the Site 3C Project Area

ARTIFACT GROUP/CLASS	NUMBER
KITCHEN	
CERAMICS	
Ironstone-Light Blue Glaze	1
Stoneware-Gray Salt Glazed	1
Stoneware-White Glazed with Blue Underglaze Hand Painting	3
Whiteware-Purple Transfer Print	1
Whiteware-Undecorated	4
CERAMICS TOTAL	10
GLASS	
Bottle Glass-Green	1
Bottle Glass-Brown	6
Bottle Glass-Clear	12
Jug Glass-Clear	1
Jar Glass-Clear	3
Unidentified Vessel Glass-Clear	4
Unidentified Vessel Glass-Brown	2
GLASS TOTAL	29
OTHER KITCHEN	
Aluminum Lid	1
Aluminum Pull Tab	1
Unidentified Plastic Vessel-White	1
OTHER KITCHEN TOTAL	3
KITCHEN TOTAL	42
ARCHITECTURAL	
Asphalt-Shingle	10
Brick	8
Structural Clay Tile-Red	44
Concrete with bit of Structural Clay Tile	2
Cast Concrete	1
Concrete	5
Window Glass-Clear	76
Metal Door Handle with Door Plate	1
Metal Door Handle with Full Inside Lock Plate/Bolt	1
Metal Grate	1
Large Metal Door Hinge with five Wire Nails	1
Small Metal Hinge with two Wire Nails	1
Wire Nails	4
Mortar	1
Plaster	1
ARCHITECTURAL TOTAL	157
ARMS	
Plastic Shotgun Shell Casing	1
ARMS TOTAL	1
FUEL	
Coal	2
FUEL TOTAL	2
FURNITURE	
Ceramic Toilet Bowl Portion	1
Metal Bed Spring	1
FURNITURE TOTAL	2
JOB/ACTIVITY	
Terracotta Flower Pot	7
JOB/ACTIVITY TOTAL	7
PERSONAL	
Metal Bed Pan	1
PERSONAL TOTAL	1
TRANSPORTATION	
Metal Horse Shoe	1
Metal Parking Sign	1
TRANSPORTATION TOTAL	2
UNIDENTIFIED	
Unidentified Rusted Metal	21
Large Metal Hinged Connectors with Bolts	2
Small Metal Hinged Connector with Bolts	1
Metal Rods with Washers	2
Metal-Possible Shoehorn	1
Unknown Plastic	4
Pumice-like Material	2
Galvanized Rubber	1
Wood	6
UNIDENTIFIED TOTAL	40
PROJECT AREA TOTAL	**254**

Photo 1. Kitchen Group Ceramics from Project 3C. Top Row-White Glazed Stoneware with Blue Underglaze Hand Painting, All Mend (Site 15Be681); Bottom Row-Left: Gray Saltglazed Stoneware (Site 15Be681); Middle: Pueple Transfer Printed Whiteware (Site 15Be681); Right: Light Blue Glazed Ironstone (Site 15Be681).

original contents or place of origin. Some of these included “Sunrae, Toledo”; “Roman Cleanser”, “CLOROX”; “Quality Dana Beverage”; “Universal Milk Bottle Service, Inc. Cincinnati”, and “57 Spice Islands” (Photo 2). Several bottles for Clorox, Roman Cleanser, and Universal Milk were recovered. These suggest residential occupation. The collection of marks indicate dates from the early to mid 20th century, and a frequent usage of nearby Ohio suppliers for goods.

Other Kitchen

Three additional artifacts were collected in the Kitchen Group, but which did not fall into either the ceramic or glass categories. The items included an aluminum lid (NSL #2), an aluminum pull-top (NSL #1), and a piece of a plastic container (NSL #2). The aluminum lid and pull-top would both have topped an aluminum or other metal can or vessel. The plastic container was most likely a utilitarian kitchen container such as a mixing bowl.

Architecture Group

A total of 157 architectural group artifacts were recovered at Site 15Be681 (n=6), NSL #1 (n=102), NSL #2 (n=26), and various other locales of nondiagnostic historic isolated finds (n=23). This assemblage included asphalt shingle (n=10), brick fragments (n=8), structural clay tile (n=44), cast concrete (n=1), concrete with structural clay time (n=2), concrete (n=5), window glass (n=76), door handles with plates or bolts (n=2), a metal grate (n=1), large door hinges with wire nails (n=1), small hinges with wire nails (n=1), wire nails (n=4), mortar (n=1), and plaster (n=1) (Photo 3). The majority of the artifacts were from NSL #1 which is the location of a structure that was likely associated with a former car park facility that was less than 50 years in age. The architectural isolated finds across the project area are likely associated with the demolition of several structures across the property spread through earth moving activities or agriculture. While the Architectural Group artifact count seems high (n=157), once it is considered that historic maps show at least ten structures across the project area, along with the car park that never appeared on the topographic maps and unmapped outbuildings, the architectural artifact count is actually quite low. At least 102 of the artifacts were from the building that may have been associated with the former car park, meaning that only 55 remaining artifacts reflect the demolition of at least ten buildings. This suggests that much of the material from the demolished buildings was removed from the project area, and that the remaining artifacts are likely in secondary context.

Arms Group

One plastic shotgun shell casing was the only artifact in the Arms Group. The shotgun shell was found at NSL #2, and is likely from modern hunting activities. This artifact is not diagnostic.

Photo 2. Kitchen Group Glass from Project 3C. Left to Right: Clear Bottle Glass "Universal Milk Bottle Service, Inc. Cincinnati" (Site 15Be681); Clear Bottle Glass Base "Universal Milk Bottle Service, Inc. Cincinnati" (Site 15Be681); Brown Bottle Glass "CLOROX" (Site 15Be681); Brown Bottle Glass Base "Contents made by the Sinclair MFC CO SIB REC U.S. PAT. OFF. SUNRAE TOLEDO" (Site 15Be681); Brown Bottle Glass "Roman Cleanswer" (Site 15Be681); Clear Bottle Glass Body "Quality Dana Beverage" (NSL #2).

Photo 3. Architecture Group from Project 3C. Top Row Left to Right: Metal Door Handle with Plate (NSL #2); Metal Door Handle with Lock Plate (NSL #2); Large Door Hinge with Wire Nails (NSL #2); Small Hinge with Wire Nails (NSL #2).
Bottom Row Left to Right: Metal Grate (Site 15Be681); Structural Clay Time (NSL #1); Structural Clay Tile (NSL #1); Concrete with Tile (NSL #1); Window Glass (NSL #1); Wire Nail (NSL #1).

Fuel Group

Two pieces of coal were the only artifacts in the Fuel Group. They were both from nondiagnostic historic isolated finds in the project area. There is a possibility that these artifacts were not cultural in nature, and that they are in secondary locations. These artifacts are not diagnostic.

Furniture Group

Two artifacts were assigned to the Furniture Group. These artifacts were a large portion of a white, ceramic toilet, and a metal bed spring. These artifacts were recovered from Site 15Be681 and at a locale of nondiagnostic historic isolated finds. Neither artifact is diagnostic.

Job/Activity Group

All of the artifacts in the Job/Activity Group were portions of terracotta flower pots (n=7). These were recovered from NSL #1 and NSL #2. These artifacts are not diagnostic, but do indicate residential dwellings were once present.

Personal Group

One artifact was recovered from the Personal Group. This was a metal bed pan recovered from NSL #2. This artifact is not diagnostic.

Transportation Group

Two artifacts were recovered from the Transportation Group. A metal horse shoe was recovered from Site 15Be681, and a modern metal parking sign was recovered in a nondiagnostic historic isolated finds context. Neither of these artifacts is diagnostic.

Unknown/Unidentified Groups

A total of 40 artifacts were assigned to the Unknown/Unidentified group from Site 15Be681 (n=7), NSL #1 (n=12), NSL #2 (n=11), and locales of nondiagnostic historic isolated finds (n=10). These artifacts were unidentified rusted metal (n=21), hinged connectors with bolts (n=2), metal rods with washers (n=2), small hinged connector with bolts (n=1), possible shoehorn (n=1), plastic (n=4), pumice-like material (n=2), galvanized rubber (n=1), and wood (n=6). These artifacts are not diagnostic.

Historic Artifacts Observed and Not Collected

In the areas of greatest artifact concentration (Site 15Be681, NSL #1, and NSL #2), the artifacts appeared to be a part of a dumping or razing episode. Some of these areas still had foundation remains. Not all of the artifacts at these locales could be collected due to size, but they were photo documented. In the case of artifacts such as glass bottles, representative bottles were collected and many of those left behind were either nondiagnostic, or were identical to ones returned to the lab.

Artifacts observed but not collected from Site 15Be681 included large metal tins and buckets, stoneware, glass bottles, metal machine parts, light bulbs, large metal drums, a tire, a car wheel, and a large enamel topped table. Artifacts observed but not collected from NSL #1 included structural clay tiles, an enamel pot lid, garage door rails, 55 gallon drums, steel I-beams, hardware cloth, enameled brick, metal sheeting, concrete, cinder blocks, metal boxes, rebar, plastic sheeting, glass bottles, metal buckets, concrete encased pillar bases, assorted metal car parts, tires, and duct work. Artifacts observed but not collected from NSL #2 included metal sheeting, tires, chicken wire, glass, cinder blocks, roofing tile, lumber with nails, a mirror, ceramic bricks, rain gutter, garden hose, metal door tracks, a metal skillet, and an old electric washing machine.

Historic Artifact Summary

While 254 historic artifacts at first seems like a sizeable number of artifacts for the project area, it becomes less so when it is taken into account that historic research shows that at least 11 structures, and likely additional structures such as outbuildings, once stood within the project area. Combined with the fact that 123 of these artifacts were recovered from NSL #1 which was the location of a building that may have been associated with a no longer extant car park that was constructed less than 50 years ago, the number of artifacts is actually quite sparse for the project area. All of the artifacts that were documented but not returned to the lab were located at either Site 15Be681, NSL #1, or NSL #2. All artifacts were recovered from the surface or Strata I. Given that no structures are still extant, and that many soil profiles are disturbed, it is likely that the vast majority of these artifacts are in secondary contexts and no longer have any locational integrity. The majority of diagnostic artifacts were recovered from Site 15Be681 which was the former location of a house whose original construction dates to the late 19th century. Many artifacts that were clearly modern in nature were found across the project area. It is likely that the demolition of the structures and later activity has disturbed the majority if not all of the artifact deposits within the project area.

SURVEY RESULTS

This portion of the report details the survey results, and recommendations resulting from the Phase I Survey for the Kenton County Airport Board Site 3C Project Area. Approximately 50.4 acres were investigated during the survey (Photographs 4 through 7).

Survey methods included systematic shovel testing at 20 meter intervals in areas where disturbance was not evident at the surface, and systematic surface survey in transects spaced 20 meters apart in areas where disturbance was evident at the surface. Very little of the project area was immediately evident as disturbed from surface inspection. However excavated shovel tests showed extensive disturbance within the soil profiles, which is consistent with the demolition of the many residences after these parcels were purchased by the airport in 1974.

The Phase I survey resulted in the investigation of 553 sample loci across the 50.4 acre project area. Figure 15 shows the location of all sample loci within the project area. Sample loci in the project area include the following:

- 202 were excavated and found undisturbed;
- 299 were excavated and found disturbed;
- 6 were excavated and found to be water filled;
- 2 were visibly wet at the surface and were not excavated;
- 30 were visibly previously disturbed at the surface and were not excavated;
- 14 were in areas of greater than 15 percent slope and were subjected to pedestrian survey.

Disturbance included grading and filling of the land. The soil profiles of the disturbed areas confirmed grading and filling. The disturbance of the land included the razing/bulldozing of structures both prior to and after the Kenton County Airport purchased the land. Disturbance also occurred as the result of the construction of KY-236 and I-275, two major roadways which border the western and eastern portions of the project area respectively. Aside from historic documentation of activities of disturbance, the disturbance could be seen within the soil profiles of the shovel tests and at the surface. Evidence of disturbance within shovel tests was indicated by extreme mixing of the soils, presence of extensive human-introduced gravel and/or modern artifacts mixed in with the soils, and absence of any stratigraphy including evidence of soils being either a natural A-horizon or subsoil, which indicated complete removal of the plowzone. Evidence of disturbance at the surface included currently paved areas. The field director, R. Vincent Whitlatch, recorded these shovel tests as excavated and exhibiting disturbance, and provided written details of their disturbance and photography of this disturbance. The disturbance across the project area will follow in a discussion. Each section that follows in detail of the project area disturbance can be seen in Figure 16, and is grouped in order to discuss areas in which historic maps showed former structures.

Southwest Portion Disturbance

Photos 8 and 9 are views of the southwestern portion of the project area that were bulldozed, at the intersection of KY-238 and Point Pleasant Road. The shovel tests in this area had a top strata that was 10YR 6/3, 10YR 5/2, 10YR 3/6, 10YR 5/4, or 10YR 6/4 silty clay, sometimes mixed with gravel fill, and extended between 6 and 35 centimeters below the surface (cmbs). Sometimes there was no second strata. Those that did have a second strata included 10YR 5/6, 10YR 6/4, 10YR 6/6, and 10YR 5/8 clay to silty clay, to sandy clay, and often more than one soil was included and mixed together, along with human introduced gravel. Figure 17 shows an example of a disturbed soil profile from this area. This area is the former location of structures S#4, S#11, S#12, and S#16. Structure S#10 is outside of the project area to the west of this section with in the ROW of KY-236.

Southeast Portion Disturbance

Photo 10 shows a disturbed shovel test that was excavated within this section of the project area. Photos 11 and 12 show the project area within this portion of the survey area. Some excavated and disturbed shovel tests within this area were entirely gravel fill. Others exhibited only one strata of 10YR 2/2, 10YR 3/2, 10YR 3/3, 10YR 4/4, and 10YR 4/6 silty clay loam that was mixed with human introduced gravel fill. This strata extended between 4 and 35 cmbs. In some shovel tests a second strata of 10YR 5/4, 10YR 5/6, 10YR 6/4, and/or 10YR 6/6 silty clay was present, frequently mixed. Figure 17 shows an example of a disturbed soil profile from this area. This area is the former location of structures S#2, S#17, and S#24. Structures S#5 and S#9 are outside the project area to the east of this section within I-275 and the ROW of I-275.

Central Portion Disturbance

Photo 13 shows the project area within this portion of the survey area. All of the disturbed shovel tests in this area exhibited only one strata of soil. This was fill from razing and filling activities, and the shovel tests occasional terminated in gravel. The soils in this area were a 10YR 4/4, 10YR 4/6, 10YR 3/6, 10YR 5/6, or 10YR 6/6 silty clay loam excavated between 10 and 35 cmbs. Figure 17 shows an example of a disturbed soil profile from this area. This area is the former location of structures S#1, S#22, and S#23. Structure S#19 is outside this portion of the project area to the west, within KY-236.

North Portion Disturbance

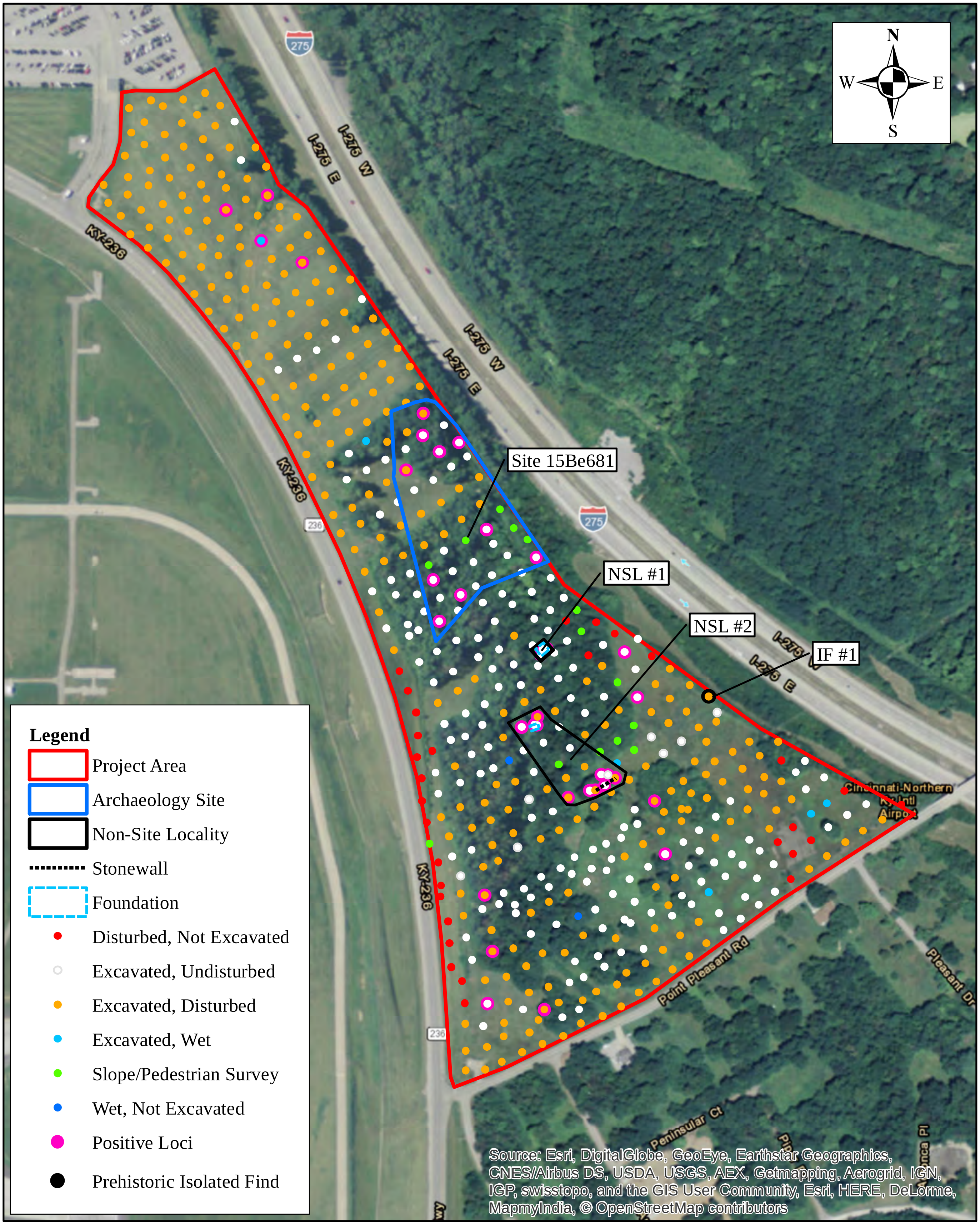
Photo 14 shows the project area within this portion of the survey area. The disturbed shovel tests in this area were similar to those of the Central Portion Disturbance. The majority of the disturbed soil profiles exhibited only one strata of soil due to fill from razing and filling activities, with shovel tests occasionally terminating in gravel and gravel frequently mixed in with the soils. The soils in this area were 10YR 3/4, 10YR 3/6, 10YR 4/4, 10YR 4/6, 10YR 5/4, or 10YR 5/6 silty clay loam that extended 4 to 40 cmbs. Occasionally disturbed soil profiles had a second strata of 10YR 4/4 or 10YR 5/6 silty clay loam. Figure 17 shows an example of a disturbed soil profile from this area. This area is the former location of structures S#13, S#14, S#15, S#20, S#25, S#26, and S#27. Structures S#6, S#21, S#27, S#28, and S#29 were outside of the project area in this portion to the north within the existing parking lot and parking lot access road.

Photo 4. View of 3C Project Area, Facing North.

Photo 5. View of 3C Project Area, Facing Northwest.

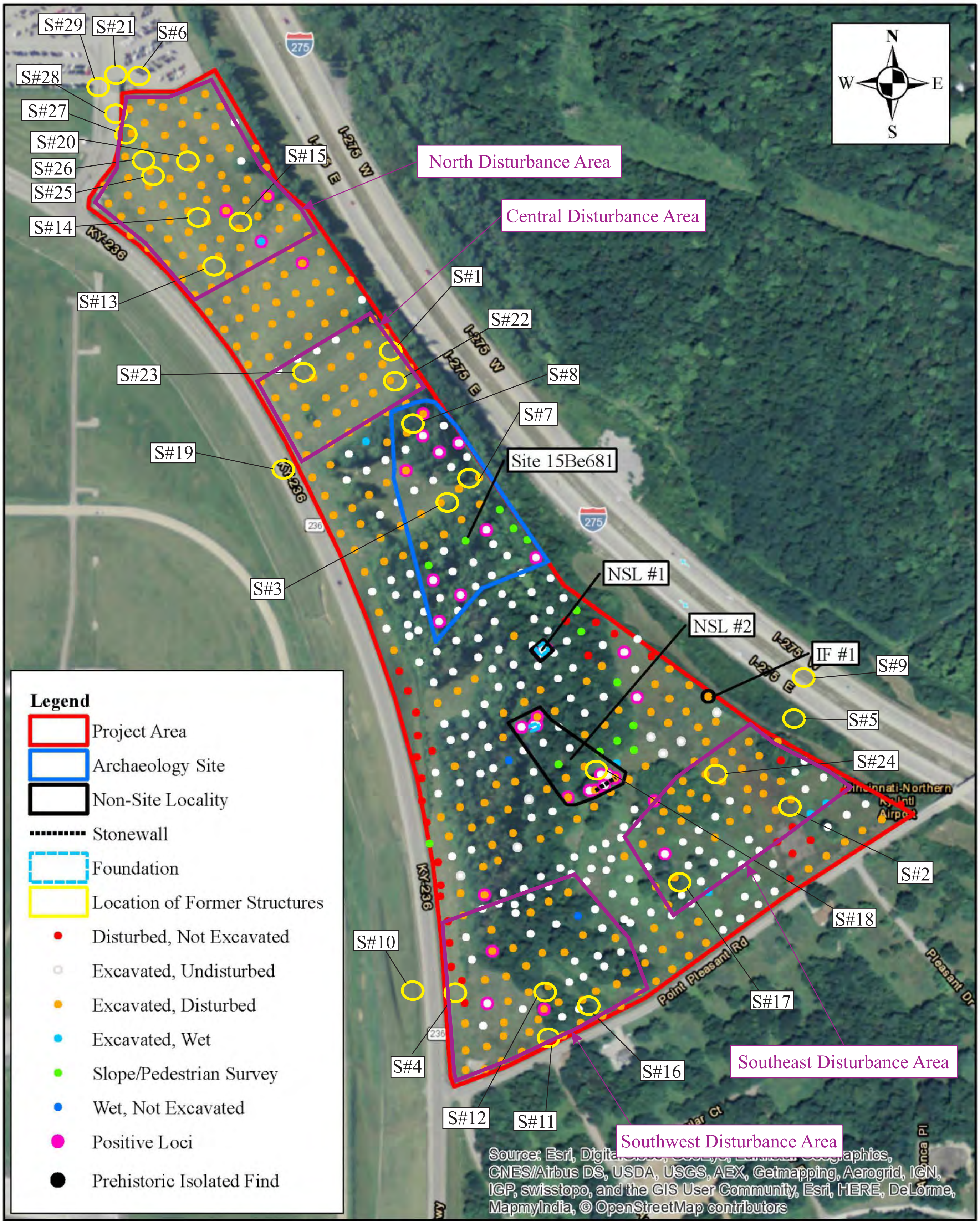
Photo 6. View of 3C Project Area, Facing Northeast.

Photo 7. View of 3C Project Area, Facing East. View of Car on I-275 Adjacent to the Project Area.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Figure 15	Kenton County Airport Board Site 3C Project Boone County, Kentucky	Aerial Map with Sample Loci Aerial Map Provided by ESRI Map Services 0 250 500 1,000 Feet *Environment & Archaeology, LLC*



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

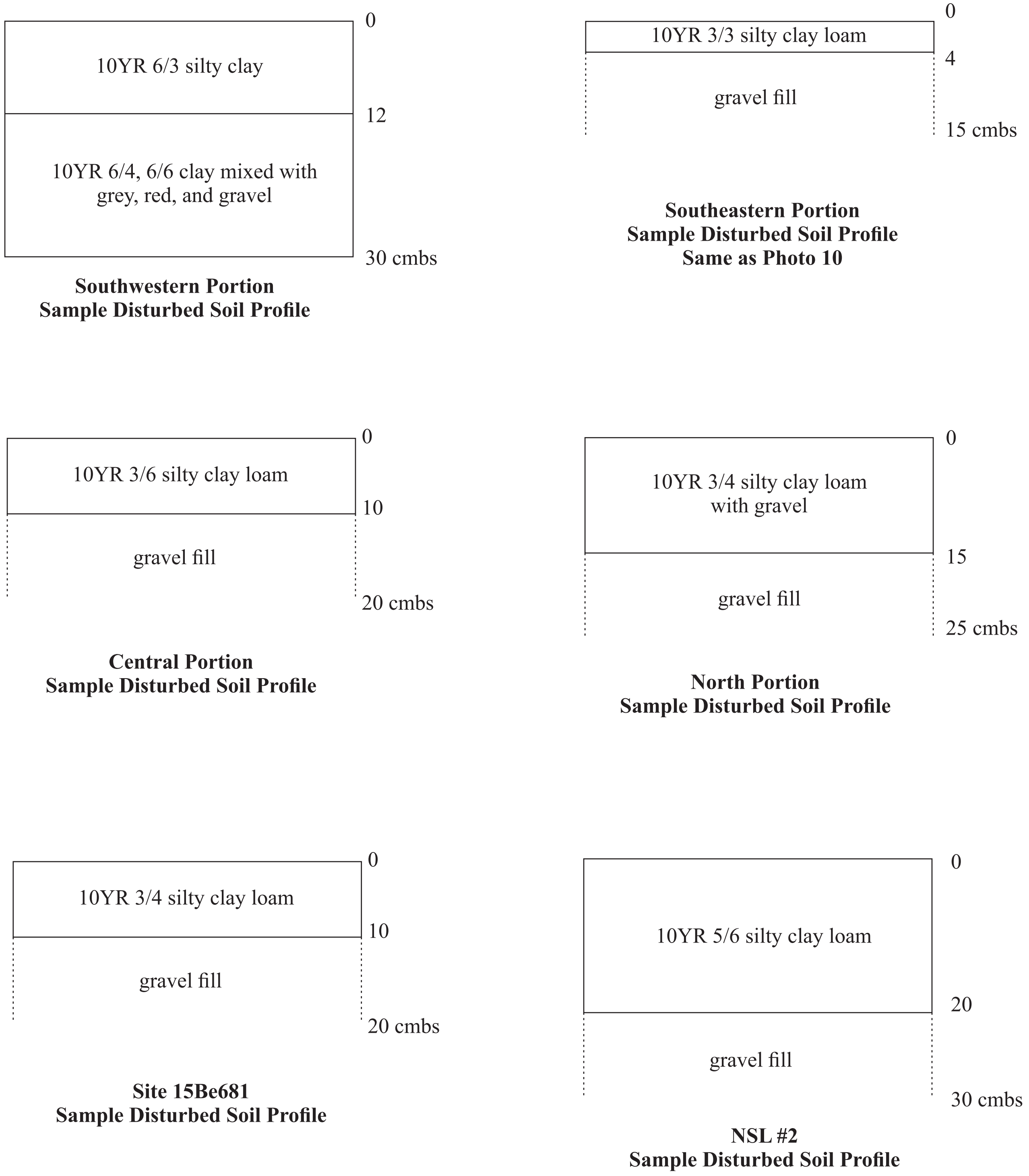
Figure 16

Kenton County Airport Board
Site 3C Project
Boone County, Kentucky

Aerial Map with Sample Loci and Former Structure Locations

0 250 500 1000 feet

Environment & Archaeology, LLC



Southwestern Portion
Sample Disturbed Soil Profile

Southeastern Portion
Sample Disturbed Soil Profile
Same as Photo 10

Central Portion
Sample Disturbed Soil Profile

North Portion
Sample Disturbed Soil Profile

Site 15Be681
Sample Disturbed Soil Profile

NSL #2
Sample Disturbed Soil Profile

Figure 17	Kenton County Airport Board Site 3C Project Boone County, Kentucky	Sample Disturbed Soil Profiles -not to scale- *Environment & Archaeology, LLC*

Photo 8. View of Southwestern Disturbed Area, Facing South.

Photo 9. View of Southwestern Disturbed Area, Facing East by Northeast.

Photo 10. Disturbed Shovel Test in Southeastern Disturbed Area.

Photo 11. View of Southeastern Disturbed Area Along I-275, Facing South.

Photo 12. View of Southeastern Disturbed Area, Facing West.

Photo 13. View of Central Disturbed Area, Facing Southeast.

Photo 14. View of Northern Disturbed Area, Facing Northwest.

The soil profiles in undisturbed shovel tests across the project area were relatively uniform with just slight variations. The soil profiles consisted of a top Strata I that extended 4 to 26 centimeters below the surface (cmbs), and was a 10YR 3/4, 4/3, 4/4, or 5/4 silty clay loam. Many shovel tests across the project area terminated within this horizon at bedrock possibly due to previous episodes of razing. Others were underlain by a second strata that was a 10YR 4/4, 5/4, 5/6,6/4, or 6/6 silty clay loam or silty clay.

Historic maps had shown that many structures had once stood in the project area, however no standing structures were found during the survey of the project area. Only one structure was still standing on the airport's parcel map from 2006 (S#24), but even that was no longer present during the survey. Some evidence of these structures was found, but the areas they were in were heavily wooded, with large adult trees growing within the site. This indicated that the demolition of the structures had occurred several decades prior to the survey, most likely just after the airport purchased the properties in 1974. Table 6 which follows lists each structure that was identified during the historic map analysis, and in what context those localities were found during the survey. If artifacts were found within the vicinity, these are listed within the table.

Table 6. Former Structures and Associated Context During Survey.

Structure	Map Date Range	Soil/Ground Condition	Evidence of Structure Foundation?	Artifacts Found/ Associated Site or NSL
S#1	1883	disturbed soil profiles	No	none in vicinity
S#2	1883	disturbed and wet soil profiles	No	none in vicinity
S#3	1898-1951	disturbed soil profiles	No	none in immediate vicinity, but included in Site 15Be681-see site description
S#4	1912	disturbed visibly at surface in KY-236 ROW	No	one piece of coal approximately 100 feet east
S#5	1912	outside project area in I-275 ROW	No	none in vicinity
S#6	1912	outside project area in parking lot	No	none in vicinity
S#7	1938	disturbed soil profiles	No	artifacts approximately 100 feet north. Included in Site 15Be561-see site description
S#8	1938-1951	disturbed and undisturbed soil profiles	Yes	part of Site 15Be561-see site description
S#9	1938-1969	outside project area in median of I-275	No	none in vicinity
S#10	1938-1969	outside project area in KY-236 ROW	No	none in vicinity
S#11	1938-1974	disturbed soil profiles	No	one piece of coal approximately 100 feet north in disturbed soils
S#12	1938	disturbed soil profiles	No	one piece of coal approximately 50 feet south in disturbed soils
S#13	1938-1974	disturbed soil profiles	No	none in vicinity
S#14	1938-1974	disturbed soil profiles	No	one piece of cast concrete approximately 100 feet east in disturbed soils
S#15	1938-1951	disturbed soil profiles	No	one piece of cast concrete, two pieces of brick, one piece of structural clay tile, two wire nails, one window glass fragment within a 100-foot radius, all within disturbed or wet soil profiles
S#16	1961-1974	disturbed and undisturbed soil profiles	No	none in vicinity

Table 6 (con). Former Structures and Associated Context During Survey.

Structure	Map Date Range	Soil/Ground Condition	Evidence of Structure Foundation?	Artifacts Found/ Associated Site or NSL
S#17	1961-1974	disturbed and undisturbed soil profiles	No	seven pieces of unidentified rusted metal approximately 75 feet north
S#18	1961-1974	disturbed and undisturbed soil profiles	No	stone retaining wall and artifacts-see description of NSL#2. Deemed not eligible for site number by Nancy O'Malley of OSA.
S#19	1961-1969	outside project area within KY-236	No	none in vicinity
S#20	1961-1974	disturbed soil profiles	No	none in vicinity
S#21	1969-1974	outside project area within parking lot	No	none in vicinity
S#22	1969-1974	disturbed soil profiles	No	none in vicinity
S#23	1969-1974	disturbed and undisturbed soil profiles	No	none in vicinity
S#24	1974-2006	disturbed soil profiles	No	none in vicinity
S#25	2006	disturbed soil profiles	No	none in vicinity
S#26	2006	disturbed soil profiles	No	none in vicinity
S#27	2006	disturbed soil profiles	No	none in vicinity
S#28	2006	outside project area on access road to parking lot	No	none in vicinity
S#29	2006	outside project area in parking lot	No	none in vicinity

A total of one archaeological site, two non-site localities, and one isolated find were identified during the survey. The designation of whether or not findings qualified for a site number was made by Nancy O'Malley of the OSA. Their descriptions follow. Due to the extensive disturbance over the years, additional findings of non-diagnostic historic material was found in locations across the project area, frequently within disturbed and/or wet soils. Any artifacts that were in the vicinity (100 feet or less) of the location of a former standing structure are listed in Table 6 above. None were identifiable as diagnostic of a structure or site. Since these were sparsely distributed and not diagnostic to over 50 years in age, these findings were treated as nondiagnostic historic isolated finds dispersed by the disturbance to the area.

SITE DESCRIPTION

Site 15Be681
Residential Site

USGS Topographic Map: Burlington, KY
Zone: 16
UTM North: 4326152
UTM East: 0703956
Elevation: 880 feet amsl
Physiography: ridge and slope
Proximity to Water Source: 1700 meters from the Ohio River
Vegetative Cover: Mixed deciduous forest and undergrowth
Soil Types: Cynthiana flaggy silt loam, 20-50% (CyF); Jessup silty clay loam, 12-20% slopes, severely eroded (JsD3); Rossmoyne silt loam, 0-6% slopes (RsB)
Typical Soil Profile: 0-20 cmbs Strata I: 10YR 3/4 silty clay loam
20-30 cmbs Strata II: 10YR 4/4 silty clay loam
Visibility: 0-50%
Area: 16,473 square meters

Description: Site 15Be681 was the former location of a historic residence and its associated outbuilding (Photos 15-18). This site was identified during the Phase I survey for the Site 3C project (Figure 18). The site was centered along a ridgetop, and included slope going down from the ridgetop both to the north and to the south (see Figure 2).

The site was within mixed deciduous forest with brush undergrowth. The boundary of the site to the east was determined by the project area boundary. While it is possible that the site could continue to the east beyond these boundaries, it is unlikely that any material would be present in undisturbed contexts as the area just to the east of the project area is entirely I-275 right-of-way (ROW), and is likely highly disturbed by the highway construction. The boundaries of the site on the other sides were determined through shovel testing, surface collection, and historic maps. The central portion of the site on the top of the ridge was completely devoid of artifacts or features, but according to historic maps, a residence was present at this location as early 1898 (S#3) (Figure 6).

The residence (S#3) is still present in this location on the 1912 topographic map (Figure 7), along with a historic road that runs to the west of the residence. Two more structures are shown within this area on the 1938 aerial (S#7 and S#8). On the 1951 topographic map, S#7 is no longer present, but S#8 is still shown as present downslope from the residence, and is indicated as an outbuilding (Figure 9). Due to the proximity, it was likely constructed for the residence present on the rise in the land. At this time the historic road has been shortened to a residential access that terminates by this residence. Neither S#3 or S#8 are shown on the 1961 topographic map (Figure 10), so it is deduced that the residence and outbuilding were removed sometime during the ten year period between the creation of the 1951 and 1961 topographic maps. However the residential access is still indicated as being present on this map. The residential access is also present in the same location on the 1969 topographic map (Figure 11), but on the 1974 topographic map (Figure 12), the residential access is shown to terminate at a shorter length, further north of the former location of this residence. By the creation of the 1991 topographic map (Figure 2), this residential access is no longer extant, and the vast majority of other residences in the area are no longer extant.

No foundation or other evidence of any of the structures was still present. The artifacts recovered downslope both to the north and the south from this location were similar in nature and were consistent with a residence dating to the late 19th and early 20th centuries. The airport purchased this property in 1974. It was determined that the artifacts recovered to the north and south of the ridge were the result of erosion downslope after the residence and outbuilding were demolished, and the artifacts are no longer in situ. The shovel tests throughout this site were recorded with a handheld GPS and mapped within ArcGIS. The artifacts collected from Site 15Be681 are listed in Table 7 below.

Table 7. Site 15Be681 Collected Artifacts

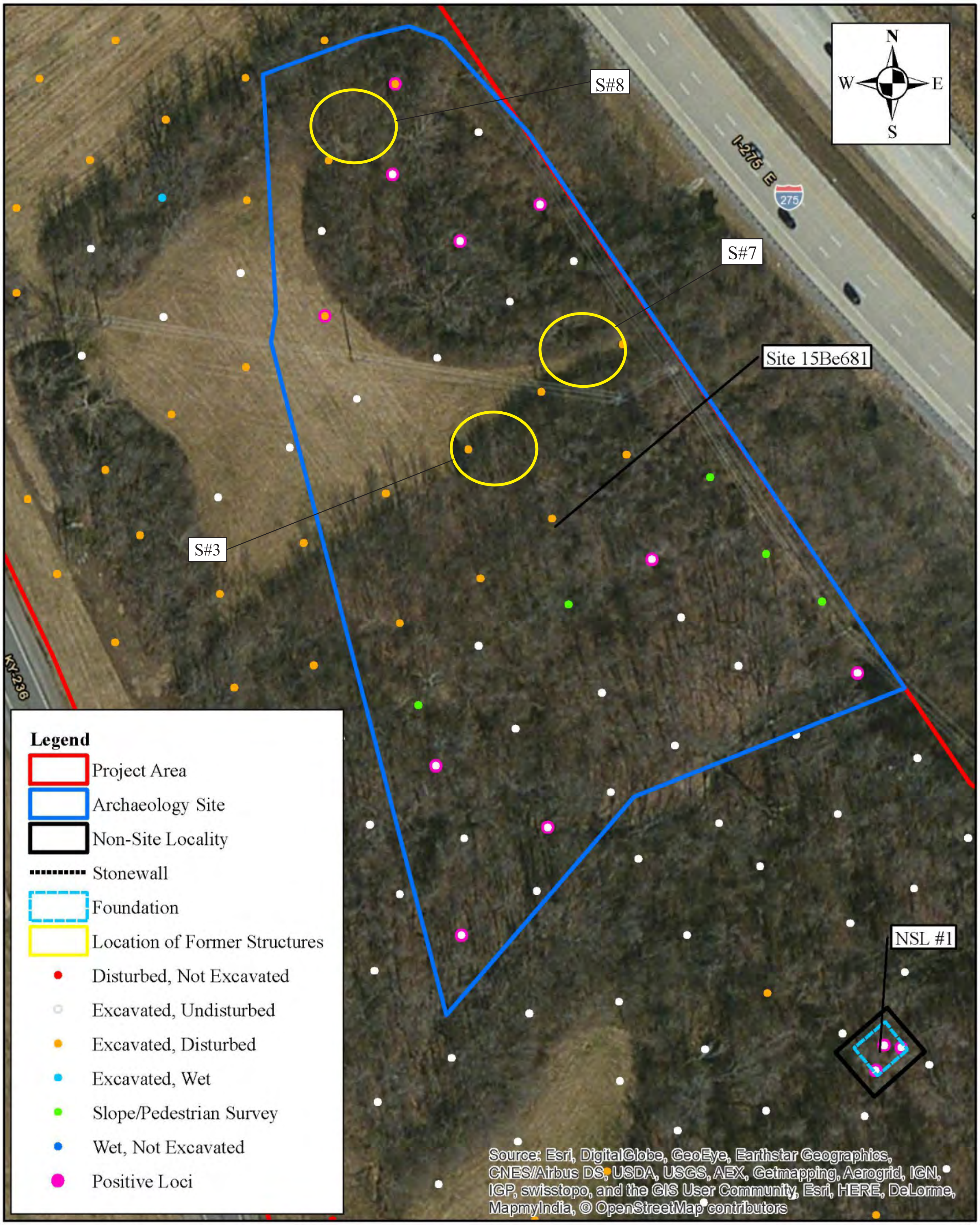
ARTIFACT GROUP/CLASS	NUMBER
HISTORIC ARTIFACTS	
KITCHEN	
Undecorated Whiteware	4
Light Blue Glazed Ironstone	1
Gray Salt Glazed Stoneware	1
White Glazed Stoneware with Underglaze Blue Lettering	3
Bottle Glass-Clear	10
Bottle Glass-Brown	4
Jar Glass-Clear	2
Vessel Glass-Brown	1
KITCHEN TOTAL	26
ARCHITECTURAL	
Brick	1
Flat Glass	1
Metal Grate	1
ARCHITECTURAL TOTAL	3
FURNITURE	
Ceramic Toilet Portion	1
FURNITURE TOTAL	1
TRANSPORTATION	
Metal Horse Shoe	1
TRANSPORTATION TOTAL	1
UNKNOWN	
Unidentified Rusted Metal	5
Unidentified Use Wood	2
UNIDENTIFIED TOTAL	7
HISTORIC TOTAL	**38**
COLLECTED SITE TOTAL	**38**

Photo 15. Overview of Site 15Be681, Facing South.

Photo 16. Overview of Site 15Be681, Facing Northeast.

Photo 17. Artifacts Found at Site 15Be681.

Photo 18. View of Site 15Be681, Facing East.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Figure 18	Kenton County Airport Board Site 3C Project Boone County, Kentucky	Aerial Map with Site 15Be681 Aerial Map Provided by ESRI Map Services 0 50 100 200 Feet *Environment & Archaeology, LLC*

The site is approximately 16,473 square meters (4.1 acres) in size, with a north-south extent of approximately 183 meters and an east-west extent of approximately 100 meters. The site is amorphous in shape. The artifacts were densest on the northern slope, with a total of 24 artifacts collected in an area measuring approximately 75 meters by 50 meters. A total of 20 were recovered at the surface, with only four from inside shovel tests. A number of additional artifacts were observed in this area and not collected. This concentration of artifacts is near the former location of S#8 which was indicated on maps as an outbuilding. A total of 14 artifacts were collected on the south slope, all but two of which were within shovel tests. This area measured approximately 100 meters by 50 meters, and no additional artifacts were seen within this area. No structures were indicated in this vicinity in historic map research. All artifacts that were collected within shovel tests were within the A/Ap-horizon of the soils. The ridge was devoid of artifacts, but based on the historic maps of this area, this ridge is clearly the former location of the house (S#3) and one other structure that appeared on the 1938 aerial (S#7).

Most of the site is within mixed deciduous forest. The present of large, mature trees at the former location of the residence and across the site reinforces the conclusions that this residence was demolished between 1951 and 1961. No features associated with the former residence and other buildings were identified. No foundations, wells, walls, or other architectural features were extant.

The majority of the collected artifacts belonged to the Kitchen Group (n=26). These artifacts included vessel glass (n=17) and ceramics (n=6). Much of the collected glass was whole or nearly whole glass bottles or jars, which is how they were divided in the bottle and jar categories. Glass fragments that could not clearly be attributed to bottle or jar glass was classified as generic vessel glass. Much of the glass had distinctive molded lettering that indicated the use or place of manufacture of the glass. Some of the markings included "Universal Milk Bottle Service, Inc. Cincinnati", "Roman Cleanser", "Clorox", "Contents made by the Sinclair MFC CO SIB REC U.S. PAT. OFF. SUNRAE TOLEDO". The kitchen ceramics included whiteware, ironstone, and stoneware. Three of the stoneware sherds mended and were part of a utilitarian crock. In underglaze blue, the sherds were marked "Clover Blossom Cottage Cheese". Research indicated the Clover Blossom Cottage Cheese Company was located in Cincinnati and was manufacturing these crocks as a method of advertising circa 1925.

The remaining artifacts collected at the site consisted of three artifacts from the Architecture Group (brick, window glass, and a metal grate), one from the Furniture Group (ceramic toilet part), one from the Transportation Group (metal horse shoe), and seven artifacts from the Unidentified/Unknown Group (five unidentified metal and two pieces of wood). Additional artifacts were seen on the surface at the northern slope of the site that were not collected and are not included in Table 7. These included large metal tins and buckets, additional stoneware, additional glass bottles, metal machine parts, light bulbs, large metal drums, a tire, a car wheel, and a large enamel topped table.

The collection strategy for this project was shovel tests at 20-meter intervals. If large deposits were visible at the surface, sample collections were taken focusing on diagnostic artifacts, with photos taken of items that were not collected. The majority of the artifacts at this site were located on the surface in one concentrated area on the north slope. The concentration was such that it indicates that these artifacts were dumped in this location, likely following the demolition of the former residence.

The artifacts found within shovel tests were all within the A/Ap-horizon, and these soil profiles did not show any obvious signs of disturbance. The positive shovel tests in the southern portion of the site exhibited soil profiles with a Strata I that extended 3 to 20 centimeters below the surface (cmbs) and was a 10YR 3/4 to 10YR 4/4 silty clay loam. This was underlain by a 10YR 4/4 to 10YR 5/4 silty clay loam strata. The positive shovel tests in the northern portion of the site, along with one shovel test in the southern portion of the site at the eastern border, were along a ephemeral creek bed. These soils extended 4 to 30 centimeters below the surface, and were a uniform 10YR 3/4 to 10YR 5/4 silty clay or sandy clay. In the area of the greatest concentration of artifacts at the surface in the northern portion of the site, no artifacts were recovered from within shovel tests.

Many of the shovel tests in the area where artifacts were recovered at the surface did show evidence of disturbance. This disturbance was the result of grading and filling episodes at this location. The soil profiles in this area frequently consisted of only one strata of 10YR 3/4 or 10YR 3/6 silty clay loam that was excavated 10 to 25 cmbs before terminating in imported gravel or bedrock. These disturbed profiles are similar to those in the North and Central Disturbance Areas. A sample disturbed soil profile is shown in Figure 17.

Recommendation: Site 15Be681 was a historic residential site that was the former location of a residence constructed in the late 19th century (S#3), and two probable outbuildings that were constructed in the mid 20th century (S#7 and S#8). No structures were still standing, nor was there evidence of foundations. Historic maps indicate that all structures were demolished between 1951 and 1961, prior to the purchase of the property by the airport.

Historic maps indicated that the primary residence (S#3) was formerly located on the top of the ridge in the middle of this site, but no artifacts were found at this location. All artifacts were found downslope both to the north and the south. The southern artifacts were very sparse in nature and are likely no longer in situ artifacts that eroded after the house was demolished. The artifacts are much denser to the north of the ridge where one outbuilding once stood (S#8). This is likely the remains of debris after the destruction of the outbuilding, along with artifacts that eroded from the top of the ridge from the location of the residence. A few artifacts were recovered from inside shovel tests. The majority of the artifacts however were recovered from the surface, and many of the shovel tests, particularly in the area of the highest concentration of artifacts at the surface, did show disturbed soils.

Due to the level of disturbance at this site, the absence of features, and that the artifacts are no longer in situ, this site is not recommended as eligible for the National Register of Historic Places. No further archaeological assessment is recommended.

Non-Site Localities and Isolated Finds

Whether an area was considered an archaeological site and needed a site number was determined by Ms. Nancy O'Malley of the Kentucky Office of State Archaeology. Descriptions of all areas with cultural resources were sent to her for her evaluation. The following cultural resources were determined to not meet the criteria to receive a site number. Two non-site localities (NSL) and one isolated find (IF) were identified during the survey of the Site 3C project area (see Figure 15).

NSL #1

NSL #1 consisted of 123 collected artifacts and was the location of a foundation that measured 28 feet east-west, and 25.5 feet north-south. The foundation was not in a location of a former structure noted anywhere on the historic maps. The artifacts were predominantly from the architecture group (n=102), and included brick (n=2), structural clay tile (n=31), concrete (n=6), window glass (n=60), wire nail (n=1), mortar (n=1), and plaster (n=1). The other artifacts at the site consisted of terracotta flower pot fragments (n=6), vessel glass (n=2), a metal pull tab (n=1), unidentified metal (n=3), unidentified plastic (n=2), burnt pumice (n=2), galvanized rubber (n=1), and wood (n=4). Artifacts observed but not collected from NSL #1 included structural clay tiles, an enamel pot lid, garage door rails, 55 gallon drum, steel I-beams, hardware cloth, enameled brick, metal sheeting, concrete, cinder blocks, metal boxes, rebar, plastic sheeting, glass bottles, metal buckets, concrete encased pillar bases, assorted metal car parts, tires, and duct work. The artifacts were recovered both from the surface and from within Strata I of shovel tests.

No structure was indicated on any of the historic maps at this location, and the artifacts were predominantly nondiagnostic with some modern artifacts included. A review of the Kenton County Airport Board's documents showed that when they purchased this property in 1974, a pay-to-park lot was present on the parcel, along with associated buildings for some car maintenance. The photos of the buildings show structures that were constructed less than 50 years ago, and the documents indicated that this business had not been functioning for very long, but was very successful, and the airport was considering running the lot themselves after the purchase. It is clear however that instead the facility was destroyed. It appears to have been destroyed shortly after purchase in 1974. This is potentially the former location of a structure associated with a car parking facility that was constructed less than 50 years ago, and the site is did not warrant a site number.

NSL #2

NSL #2 was the former location of a historic residence and its associated garage with second floor apartment A residence is first shown at this location on a historic 1960 aerial at the southern portion of the site, and is shown on the 1961 topographic map (S#18). The 1973 property evaluation conducted by the Airport Board prior to purchasing the property mentioned a second structure on the property. This secondary structure does not appear on any of the historic maps. This second structure was a garage with an apartment above that the owner's rented to tenants. It is likely that the airport dismantled these structures sometime shortly after their purchase of the land in 1974.

NSL #2 has two very distinct concentrations of artifacts/features, one in the north, and one in the south. The central portion of the site is devoid of artifacts or features, but all is included as one NSL due to documentation that indicates these two concentrations were part of the same property.

The southern concentration measures approximately 55 meters east-west, and 15 meters north-south. No foundation or other evidence of the main residence (S#18) is present at this location. Only four historic artifacts were collected in this southern portion of the site. The artifacts in the southern portion of the site consisted of two pieces of window glass, one wire nail, one piece of purple transfer-printed whiteware, and one prehistoric tertiary flake. A dry-laid stonewall that is deteriorating was present at this location. In appears to have been placed to prevent a small rise in the land from eroding downslope.

The northern portion was much denser in artifacts and features. This concentration measures approximately 30 meters east-west by 20 meters north-south. A foundation measuring 25 feet east-west by 16 feet 8 inches north-south was present at this location. No structure is shown at this location on any topographic map. It is likely that this was the garage/apartment described in the property evaluation conducted by the airport in 1973. Artifacts collected from the northern part of NSL #2 and returned to the lab were 48 in number, with the majority falling into the Architecture Group (n=26). Architecture group artifacts included ten pieces of asphalt shingle, two pieces of brick, ten fragments of window glass, a metal door handle with place, a metal door handle with plate and bolt apparatus, a large metal door hinge with five wire nails in the hinges, and a small metal hinge with two wire nails in the hinges. The Kitchen Group (n=8) consisted of four vessel glass fragments, an aluminum lid, and a plastic vessel. Additional artifacts included a shotgun shell casing, a terracotta flower pot, a metal bed pan, nine pieces of unidentified/unknown metal, and two pieces of unidentified plastic. The observed and uncollected artifacts included metal sheeting, tires, chicken wire, glass, cinder blocks, roofing tile, lumber with nails, a mirror, ceramic bricks, rain gutter, garden hose, metal door tracks, a metal skillet, and an old electric washing machine.

Disturbance was evident within the boundaries of NSL#2, exhibited in shovel test profiles. This disturbance was the result of grading and filling episodes throughout the project area. The disturbed soil profiles consisted of one strata that was a 10YR 3/4, 10YR 4/4, or 10YR 4/6 silty clay loam that was excavated between 20 and 30 cmbs. A sample disturbed soil profile is shown in Figure 17.

Historic maps, artifacts, and other documentation indicated that the residence formerly at this location was constructed in the 1950s. Nancy O'Malley of the OSA determined that this locale was too recent in age to warrant a site number.

IF#1

Isolated Find (IF) #1 was a single piece of debitage. This debitage was a secondary flake composed of Boyle chert. This single finding did not warrant a site number and no further archaeological assessment is recommended.

Nondiagnostic Historic Isolated Finds

Nondiagnostic historic material was present throughout the project area. These artifacts were collected at the surface at the location of systematic sample loci at 65-foot intervals throughout the project area. Any artifacts located at the surface were collected before shovel tests were excavated, and artifacts recovered from the surface and from within shovel tests were bagged separately in order to maintain provenience. A total of 42 artifacts were collected. Much of the project area was disturbed, and it is known that numerous structures had been razed within the project area in the past. The artifacts consisted of nondiagnostic material such as brick, concrete, window glass, wire nails, kitchen glass, and unidentified rusted metal. The nondiagnostic historic isolated finds were not in concentrations large enough to warrant a designation of a non-site locality. These artifacts were not in concentration around any former structure locations as indicated by historic maps. They are artifacts that have been distributed across the project area from demolition activities, agriculture, and erosion. They do not warrant site numbers or further investigation.

CONCLUSIONS AND RECOMMENDATIONS

The Phase I Archaeology Survey for the proposed Kenton County Airport Board's Site 3C Project Area was conducted in November 2015. Kenton County Airport Board is considering the development potential of an area next to the airport in Boone County, Kentucky, but has not yet proposed any specific development plans for this area. The project area is bordered by I-275 to the northeast, KY-236 to the southwest, Point Pleasant Road to the southeast, and a parking lot to the north. Route 212 to the west, and Route 236 to the south. The project area is to the northeast of the current airport. The total area surveyed was approximately 50.4 acres (20.4 hectares).

The survey identified one archaeological site, two non-site localities, and one prehistoric isolated find within the project area, along with many locales of nondiagnostic historic isolated finds of nondiagnostic historic material. Site 15Be681 was a historic residential site that was the former location of a residence constructed in the late 19th century (S#3), and outbuildings that were constructed in the mid 20th century (S#7 and S#8). No structures were still standing, nor was there evidence of foundations. Historic maps indicate that the structures were demolished between 1951 and 1961, prior to the purchase of the property by the airport. The majority of the artifacts were recovered from the surface, and many of the shovel tests, particularly in the area of the highest concentration of artifacts at the surface, showed disturbed soils. Due to the level of disturbance at this site, the absence of features, and that the artifacts are no longer in situ, this site is not recommended as eligible for the National Register of Historic Places. No further archaeological assessment is recommended.

NSL #1 was a structure on the parcel that formerly had a pay-to-park lot. A review of historic maps did not show a structure at this location at any time, and the artifacts were predominantly nondiagnostic with some modern artifacts included. A review of the Kenton County Airport Board's documents showed that when they purchased this property in 1974, a pay-to-park lot was present on the parcel, along with associated buildings for car maintenance. The photos of the buildings show structures that were constructed less than 50 years ago, and the documents indicated that this business had not been functioning for very long, but was very successful, and the airport was considering running the lot themselves after the purchase. It is clear however that instead the facility was destroyed. As it is not present on the 1961, 1969, 1974, or 1991 topographic maps, it is presumed that it was destroyed shortly after purchase in 1974, and that the construction happened after the creation of the 1969 map. Therefore this represents a demolition site of a structure that may have been associated with a car parking facility that was constructed less than 50 years ago. Review by the Kentucky Office of State Archaeology determined that this finding did not warrant a site number. No further archaeological assessment is recommended.

NSL #2 was the location of a no longer extant historic residence with an associated garage with a second floor rental property. It was constructed in the mid 20th century and the demolition likely occurred in the 1970s. A structure is shown in the southern portion of this non-site locality on historic maps from 1961 to 1974 (S#18). No features remained for the main residence, although a dry laid stone wall holding back a dirt embankment was present near the former location of the main residence. The foundation of the garage/apartment was present, but was throughly disturbed. No historic structures were indicated on any of the historic maps at the location of this foundation. The artifacts at the location of the main residence were sparse in nature, and apeared to be in disturbed context. The majority of the artifacts were recovered from the surface, and many of the shovel tests did show disturbed soils. Review by the Kentucky Office of State Archaeology determined that this finding did not warrant a site number. No further archaeological assessment is recommended.

Isolated Find (IF) #1 was a single piece of debitage. This debitage was a secondary flake composed of Boyle chert. This single finding did not warrant a site number and no further archaeological assessment is recommended.

Nondiagnostic historic isolated finds were present throughout the project area. These artifacts were collected at the surface at the location of systematic sample loci at 65-foot intervals throughout the project area. Any artifacts located at the surface were collected before shovel tests were excavated, and artifacts recovered from the surface and from within shovel tests were bagged separately in order to maintain provenience. A total of 42 artifacts were collected. Much of the project area was disturbed, and it is known that numerous structures had been razed within the project area in the past. The artifacts consisted of nondiagnostic material such as brick, concrete, window glass, wire nails, kitchen glass, and unidentified rusted metal. The nondiagnostic historic isolated finds was not in concentrations large enough to warrant a designation of a non-site locality. These artifacts were not in concentration around any former structure locations as indicated by historic maps. They are artifacts that have been distributed across the project area from demolition activities, agriculture, and erosion. They do not warrant site numbers or further investigation.

It is the opinion of *Environment & Archaeology, LLC* the project area does not maintain any potential for the presence of intact cultural resources that may be eligible for the National Register of Historic Places. As such, no further consultation under Section 106 of the National Historic Preservation Act is recommended for this project.

REFERENCES

Adams, W.H.

1976 Trade Networks and Interaction Spheres--A View From Silcott. *Historical Archaeology* 10:99-112.

1977 Silcott, Washington: Ethnoarchaeology of a Rural American Community. *Reports of Investigations No. 54*. Laboratory of Anthropology, Washington State University, Pullman.

Adams, J.

2002 *Ground Stone Artifacts: A Technological Approach.* University of Utah Press, Salt Lake City, Utah.

Adkins, Audrey M.

1988 Diet and Dental Health in Archaic and Fort Ancient Populations in Kentucky. In *New Deal Era Archaeology and Current Research in Kentucky* edited by D. Pollack and M.L. Powell, pp. 97-104. Kentucky Heritage Council, Frankfort, Kentucky.

Adovasio, James M., J.D. Gunn, J. Donahue, and R. Stuckenrath

1977 Meadowcroft Rockshelter: Retrospect 1976. *Pennsylvania Archaeologist* 47:2-3.

Anderson, David G.

1990 The Paleo-Indian Colonization of Eastern North America: A View From the Southeastern United States. In *Research in Economic Anthropology Supplement 5: Early Paleo-Indian Economies of Eastern North America* edited by K.B. Tankersley and B.L. Isaac, pp. 163-216. JAI Press, Greenwich, Connecticut.

1995 Paleo-Indian Interaction Networks in the Eastern Woodlands. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands* edited by M.S. Nassaney and K.E. Sassaman, pp. 3-26. University of Tennessee Press, Knoxville.

Andrefsky Jr., William

2005 *Lithics: Macroscopic Approaches to Analysis,* second ed. Cambridge University Press, Cambridge.

Andriot, J. L., editor and compiler.

1980 *Population Abstract of the United States.* Andriot Associates, McLean, Virginia

Anonymous

1883 Article in the *Daily Commonwealth* dated January 31, 1883.

Anslinger, C. Michael

1996 The Archaic Period in the Falls of the Ohio Region of Kentucky. *Http://www.crai-ky.com/Falls.htm.* Cultural Resource Analysts, Inc.

Applegate, Darlene
2008 "Chapter 5: Woodland Period." In *The Archaeology of Kentucky: An Update, Volume 1.* Pp. 339-604. Ed. David Pollack. Kentucky Heritage Council.

Azizi, Sharla C., Diane Dallal, Mallory A. Gordon, Meta F. Janowitz, Nadia N. S. Maczaj, Marie-Lorraine Pipes, Gerrald P. Scharfenberger
1996 *Analytical Coding System for Historic Period Artifacts*. The Cultural Resource Group, Louis Berger and Associates, East Orange, New Jersey.

Bailey, R. G.
1978 *Description of the Ecoregions of the United States*. Ogden, Utah: Forest Service, U.S. Dept. of Agriculture.

Ball, D
1983 Approaches Toward the Dating of 19th Century Ohio Valley Flat Glass. In *Proceedings of the Symposium in Ohio Valley Urban and Historic Archaeology*. Vol. I, pp. 129-137. Louisville, Kentucky.

Black, Glenn
1967 *Angel Site: Archaeological, Historical, and Ethnological Study, Volume Two.* Indiana Historical Society, Indianapolis.

Boisvert, Richard A.
1977 A reconnaissance and evaluation of archaeological sites in Hardin County, Kentucky. *Kentucky Heritage Commission*, Frankfort.

1979 *Mortuary practices, modes of exchange and culture change : archaeological evidence from the lower Ohio Valley*. Scottsville, Kentucky: Kentucky Archaeological Association.

Bradley, C.
2000 "Smoking Pipes for the Archaeologist." In *Studies in Material Culture Research.* Ed. K. Karklins. Uniontown, PA.

Braun, E. Lucy
1950 *The Deciduous Forests of Eastern North America*. Blakiston, Philadelphia.

Breetzke, David
2001 *Phase I Archaeological Survey for the New Delta Parking Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared for Landrum & Brown. Prepared by Environment & Archaeology, LLC.

2001 *Phase II Archaeological Investigation of Site 15Be509 for Expansion of Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared by Environment & Archaeology, LLC. Prepared for Landrum & Brown.

Brown, James D., and Charles E. Cleland
1968 The Late Glacial and Early Postglacial Faunal Resources in Midwestern Biomes Newly Opened to Human Habitation. In *The Quaternary of Illinois*, edited by R.E. Bergstrom.

Brown, James A. and Robert K. Vierra
1983 What Happened in the Middle Archaic? Introduction to the Ecological Approach to Koster Site Archaeology. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and James A. Brown, pp. 165-195. Academic Press, New York.

Butler, Brian M., JoAnne M. Penney, and Cathy A. Robinson
1981 *Archaeological Surveys and Evaluation for the Shawnee 200 MW A.F.B.C. Plant, McCracken County, Kentucky*. Research Papers No. 21. Center for Archaeological investigations, Southern Illinois University, Carbondale.

Cabot, Susan M., and Michael D. Rouse
1998 *Boone County*, Images of America series. Arcadia Publishing, Charleston, South Carolina.

Caldwell, Joseph R.
1959 Trend and Tradition in the Prehistory of the Eastern United States. *American Anthropological Association, Memoir 88*. Menasha, Wisconsin.

1964 Interaction Spheres in Prehistory. In: *Hopewellian Studies*, J.R. Caldwell and R.L. Hall, editors. Illinois State Museum, Scientific Ver 2(6):13-14. Springfield, Illinois.

Cantley, C.E., and A.L. Novick
1980 Archaeological Research in the Hocking River Valley Ohio: A Research Design for Hocking County. Manuscript on file at the Ohio Historical Society, Department of Archaeology, Columbus, Ohio.

Carbone, Victor A.
1976 *Environment and Prehistory in the Shenandoah Valley*. Ph.D. dissertation on file at the Department of Anthropology, The Catholic University of America, Washington, D.C.

Chapman, Jefferson R. and Martha P. Otto
1976 An Archaeological Reconnaissance Survey of the Sandy Springs Area, Adams County, Ohio. Manuscript on file at the Ohio Historical Society, Department of Archaeology, Columbus, Ohio.

Cheek, C.D. and A. Friedlander
1990 Pottery and Pig's Feet: Space, Ethnicity, and Neighborhood in Washington, D.C., 1880-1940. *Historical Archaeology* 24(1):34-60.

Chomko, Stephen A. and Gary W. Crawford

1978 Plant Husbandry in Prehistoric Eastern North America: New Evidence for Its Development. *American Antiquity* 43(3):405-407.

Clark, J.

1974 Shawnee Indian Migration: a System Analysis. Unpublished Ph.D. dissertation, Department of Anthropology, University of Kentucky, Lexington, Kentucky.

Clay, R. Berle

1986 Adena Ritual Spaces. In *Early Woodland Archaeology: Kampsville Seminars in Archaeology Volume Two* edited by K.B. Farnsworth and T.E. Emerson, pp. 581-594. Center for American Archaeology Press, Kampsville, Illinois.

Cleland, Charles W.

1966 The Prehistoric Animal Ecology and Ethnozoology of the Upper Great Lakes Region. University of Michigan Museum of Anthropology, *Anthropology Papers, No. 29.*

Clifford, Laura

2001 *Phase I Archaeology Survey for the New Electrical Department Building at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.* Prepared for PB Aviation. Prepared by Environment & Archaeology, LLC.

Conrad, William.

1985 *The Top of Kentucky: An Educational and Historical Tour Through Northern Boone County.* Published privately by author. Boone County Public Library, Florence.

Corso, Robert A. and Joseph E. Wakeman

1992 *Literature Review and Reconnaissance Survey of the Proposed Texas Eastern Products Pipeline Company Limited Partnership Pipeline in Whitewater and Miami Townships, Hamilton County, Ohio and Boone County, Kentucky, and Addendum.* Prepared by Archaeological Services Consultants, Inc. Prepared for Texas Eastern Products Pipeline Company.

Cowan, C. Wesley

1976 *Test Excavations in the Proposed Red River Lake, Kentucky: 1974 Season.* University of Kentucky, Museum of Anthropology, Lexington, Kentucky.

1987 *First Farmers of the Middle Ohio Valley: Fort Ancient Societies, A.D. 1000-1670.* Cincinnati Museum of Natural History, Cincinnati, Ohio.

Cowan, C. Wesley, H. Edwin Jackson, Katherine Moore, Andrew Nickerhoff, and Tristine L. Smart

1981 The Cloudsplitter Rockshelter, Menifee County, Kentucky: A Preliminary report. *Southeastern Archaeological Conference Bulletin* 24:60-76.

Crawford, Gary W.
1982 Late Archaic Plant Remains from West Central Kentucky: A Summary. *Midcontinental Journal of Archaeology* 7:205-224.

Cronon, W.
1983 *Changes in the Land*. Hill and Wang, New York.

Cunningham, R.M.
1973 Paleo Hunters along the Ohio River. In *Archaeology of Eastern North America*. Eastern States Archaeological Federation.

Davis, Martin and Helen Davis
1967 *Antique Bottles.* Gandee Printing Center, Medford, Oregon.

Deiss, Ronald W.
1981 *The Development and Application of a Chronology for American Glass.* Unpublished Master's thesis, Department of History, Illinois State University, Normal.

Delcourt, Paul A., and H.R. Delcourt
1981 Vegetation maps for eastern North America: 40,000 B.C. to the Present. In: *Geobotany 11*, edited by R.C. Romans, pp. 123-165. Plenum Publishing, New York.

Dragoo, Don W.
1962 The Development of the Adena Culture and Its Role in the Formation of Ohio Hopewell. In: *Hopewellian Studies*, J. Caldwell and R. Hall, eds., pp. 1-34. Illinois State Museum Scientific Papers 12.

1976 Some Aspects of Eastern North American Prehistory: A review 1975. *American Antiquity* 41:3-27.

Dorwin, John T., Edward Henson, Larry Meadow, and Donald T. Warholic
1970 *Archeological Investigation of the Deep Shelter, Cave Run Reservoir Area, Rowan County, Kentucky*. University of Kentucky, Museum of Anthropology, Lexington, Kentucky.

Dunnell, R.C.
1972 The prehistory of Fishtrap, Kentucky. Department of Anthropology, Yale University, *Publications in Anthropology* 75.

Edging, R.
1987 Archaeological investigations in the Gunpowder Creek Uplands, Boone County, Kentucky. Archaeological Report #168, Program for Cultural Resource Assessment, University of Kentucky, Lexington.

Emerson, Thomas E.

1986 A Retrospective Look at the Earliest Woodland Cultures in the American Heartland. In *Early Woodland Archaeology: Kampsville Seminars in Archaeology Volume Two* edited by K.B. Farnsworth and T.E. Emerson, pp. 621-633. Center for American Archaeology Press, Kampsville, Illinois.

Evans, J.G.

1978 *An Introduction to Environmental Archaeology*. Cornell University Press, Ithaca, New York.

Ewen, C.R.

1986 Fur Trade Archaeology: A Study of Frontier Hierarchies. *Historical Archaeology* 20(1):15-28.

Fernald, Merritt Lyndon and Alfred Charles Kinsey

1958 *Edible Wild Plants of Eastern North America*. Dover Publications Inc., New York.

Fitting, James E., J. DeVischer and E.J. Wahla

1966 The Paleo-Indian Occupation of the Holcombe Beach. University of Michigan Museum of Anthropology, *Anthropology Paper No. 27*.

Fitzhugh, William

1972 The Eastern Archaic: Commentary and Northern Perspective. *Pennsylvania Archaeologist* 42(4):I-19.

Freeman, A.K.L., Edward E. Smith, Jr., and Kenneth B. Tankersley

1996 A Stone's Throw from Kimmswick: Clovis Period Research in Kentucky. In The *Paleo-Indian and Early Archaic Southeast*, edited by D.G. Anderson and K.E. Sassaman, pp. 385-403. University of Alabama Press, Tuscaloosa.

Funk, Robert E.

1976 Recent Contributions to Hudson Valley Prehistory. *New York State Museum and Science Service Memoir* 22. The University of the State of New York, the State Education Department, Albany, New York.

1993 *Archaeological Investigations In The Upper Susquehanna Valley, New York State*. Persimmon Press, Buffalo, New York.

Garvan, A.N.B.

1951 *Architecture and Town Planning in Colonial Connecticut*. Yale University Press, New Haven.

Gates, William C. And Dana E. Ormerod

1982 The East Liverpool, Ohio, Pottery District: Identification of Manufacturers and Marks. *Historical Archaeology 16(1-2):* 1-358.

Gatus, Thomas W., and David R. Maynard

1978 Karst Topography: A Factor Associated with Paleo-Indian Settlement in Certain Areas of Kentucky. *Tennessee Anthropologist* 3(2):205-210.

Genheimer, Robert A.

1988 *An Historical Archaeological Assessment of the East Main Street Phase II Project in Frankfort, Franklin County, Kentucky.* Cultural Resource Analysts, Inc. Lexington, KY.

Goad, Sharon I.

1980 Patterns of Late Archaic Exchange. *Tennessee Anthropologist* 5:1-16.

Graham, R.W.; C.V. Haynes; D.L. Johnson and M. McKay

1981 Kimmswick: A Clovis-Mastodon Association in Eastern Missouri. *Science* 213 (4512):1115-1116.

Granger, Joseph E.

1988 Late/Terminal Archaic Settlement in the Falls of the Ohio River Region of Kentucky: An Examination of Components, Phases, and Clusters. In *Paleo-Indian and Archaic Research in Kentucky* edited by C.D. Hockensmith, D. Pollack, and T.N. Sanders, pp. 153-203. Kentucky Heritage Council, Frankfort.

Griffin, James B.

1956 The Late Prehistoric Cultures of the Ohio Valley. *Ohio State Archaeological and Historical Quarterly* 61(2):186-195.

1968 Observation on Illinois Prehistory in Late Pleistocene and Early Recent Times. In: *The Quaternary of Illinois*, R.E. Bergstrom, ed., Illinois College of Agriculture, Urbana, Illinois.

1978 The Midlands and Northeastern United States. In *Ancient Native Americans*, J.D. Jennings, ed., pp. 221-280. W.H. Freeman and Co., San Francisco, California.

Gurke, K.

1987 *Bricks and Brickmaking: A Handbook for Historical Archaeology.* University of Idaho Press, Moscow.

Haney, Jennifer M. And Heather D. Burge

2004 *An Archaeological Survey of the Proposed Interchange at I-275/KY 20 in Boone County, Kentucky.* Prepared by Cultural Resource Analysts, Inc. Prepared for Kentucky Transportation Cabinet.

Hay, C. and C. Stevenson

1984 *The State College By-Pass Archaeological Project--Final Mitigation Research.* Report on file at the Pennsylvania Bureau for Historic Preservation.

Henderson, A.G.
1985 *Cultural Resource Assessment of Selected Areas within and Adjacent to the Greater Cincinnati International Airport.* Prepared for Kenton County Airport Board. Prepared by Program for Cultural Resource Assessment.

1993 Prehistoric Research at Petersburg, Boone County, Kentucky. University of Kentucky Program for Cultural Resource Assessment Archaeological Report 289.

Henderson, A.G. & D. Pollack
1985 The Late Woodland Occupation of the Bentley Site. In *Woodland Period Research in Kentucky*, edited by D. Pollack, T.N. Sanders, and C.D. Hockensmith, pp. 140-164. Kentucky Heritage Council, Frankfort.

Henderson, A.G., D. Pollack, & C.A. Turnbow
1992 Chronology and Cultural Patterns. In *Monographs in World Archaeology No. 8: Fort Ancient Cultural Dynamics* edited by A.G. Henderson, pp. 253-279. Prehistory Press, Madison, Wisconsin.

Holliday, Vance T. ed.
1992 Soil Formation, Time and Archaeology. *In Soils In Archaeology; Landscape Evolution and Human Occupation*. Smithsonian Institution Press, Washington D.C.

Hulbert, A.B.
1930 *Soil: Its Influence on the History of the United States; With Special Reference to Migration and the Scientific Study of Local History*. Yale University Press, New Haven, Connecticut.

Hunter, W.A.
1978 History of the Ohio Valley. In: *Handbook of North American Indians*, Vol. 15, Northeast, B.G. Trigger, ed., pp. 588-593, Smithsonian Institute, Washington, D.C.

Innes, Lowell
1976 *Pittsburgh Glass 1797-1891: A History and Guide for Collectors.* Houghton Mifflin, Boston, MA.

Innis, H.A.
1962 *The Fur Trade in Canada: an Introduction to Canadian Economic History*. Yale University Press, New Haven.

Ison, Cecil R.
1991 Prehistoric Upland Farming Along the Cumberland Plateau. In *Studies in Kentucky Archaeology* edited by C.D. Hockensmith, pp. 1-10. Kentucky Heritage Council, Frankfort, Kentucky.

Janzen, Donald E.

1977 An Examination of Late Archaic Development in the Falls of the Ohio River Area. In *For the Director: Research Essays in Honor of James B. Griffin* edited by C.E. Cleland, pp. 123-143. University of Michigan Museum of Anthropology, Anthropology Papers, No. 61.

Jefferies, Richard W.

1988 Archaic Period Research in Kentucky: Past Accomplishments and Future Directions. In *Paleo-Indian and Archaic Research in Kentucky*, edited by C.D. Hockensmith, D. Pollack, and T.N. Sanders, pp. 85-126. Kentucky Heritage Council, Frankfort.

1990 The Archaic Period. In *Archaeology of Kentucky: Past Accomplishments and Future Directions, Volume One* edited by D. Pollack, pp. 143-246. Kentucky Heritage Council, Frankfort.

1995 Late Middle Archaic Exchange and Interaction in the North American Midcontinent. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands* edited by M.S. Nassaney and K.E. Sassaman, pp. 73-99. University of Tennessee Press, Knoxville.

1996 Hunters and Gatherers After the Ice Age. In *Kentucky Archaeology* edited by R.B. Lewis, pp. 39-78. University Press of Kentucky, Lexington.

Jobe, C.E., M. Stafford, and Richard A. Boisvert

1980 An Archaeological Survey and Assessment of Various Timber Sale Areas, Road Rights-of-way, and Land Exchanges Within the Daniel Boone National Forest. *University of Kentucky, Department of Anthropology, Archaeological Report 29.*

Johnson, William C., J.B. Richardson, and A.S. Bohnert

1978 *Archaeological Site Survey in Northwest Pennsylvania, Region IV.* Report submitted to the Pennsylvania Historical and Museum Commission, Harrisburg, Pennsylvania.

Jones, O. and C. Sullivan

1985 The Parks Canada Glass Glossary for the description of containers, tableware, flat glass, and closures. In *The Studies of Archaeology, Architecture, and History*. Parks Canada.

Jordan, T.G.

1979 Between the Forest and the Prairie. In *Geographic Perspective on America's Past*, D. Ward, ed., Oxford University Press, New York, New York.

Justice, Noel D.

1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States*. Indiana University Press, Indianapolis.

Kerr, Jonathan P.
1996 Prehistory of the Upper Cumberland River Drainage in the Kentucky, Virginia and Tennessee Border Region. *http://www.crai-ky.com/cumberland.htm* Cultural Resource Analysts, Inc.

Kerr, Jonathan P.
1996 Prehistory of the Upper Cumberland River Drainage in the Kentucky, Virginia and Tennessee Border Region. *http://www.crai-ky.com/cumberland.htm.* Cultural Resource Analysts, Inc.

King, James E., and William H. Allen Jr.
1977 A Holocene Vegetation Record from the Mississippi River Valley, Southeastern Missouri. *Quaternary Research* 8:307-323.

Kreinbrink, Jeannine and Doug VonStrohe
2012 *Phase I Archaeology Survey: Airpark International II Lot 1A, 4.8 Acre Development, Boone County, Kentucky.* Prepared by K&V Cultural Resources Management, LLC. Prepared for Airpark International II.

Kreisa, Paul P.
1988 *Second order Communities in Western Kentucky: Site Survey and Test Excavations at Late Woodland and Mississippian Period Sites*. Report 7. Western Kentucky Project, Department of Anthropology, University of Illinois, Urbana.

Kuchler, A.W.
1964 *Potential Natural Vegetation of the Conterminous United States*. American Geographical Society Special Publication 36.

KYSHPO (Kentucky State Historic Preservation Office)
2006 *Specifications for Conducting Fieldwork and Preparing Cultural Resource Assessment Reports.* Thomas N. Sanders, editor.

Lake Publishing Company
1883 Atlas of Boone, Campbell, and Kenton Counties, Kentucky. Lake Publishing Company, Philadelphia, Pennsylvania.

Lentz, Rev. H. Max.
1902 *A History of the Lutheran Churches in Boone County, Kentucky*. P. Anstadt and Sons, York, Pennsylvania.

Lewis, R. Barry

1986a Why Are Early Woodland Base Camps So Rare? In *Early Woodland Archaeology: Kampsville Seminars in Archaeology Volume Two* edited by K.B. Farnsworth and T.E. Emerson, pp. 596-597. Center for American Archaeology Press, Kampsville, Illinois.

1996 Mississippian Farmers. In *Kentucky Archaeology* edited by R.B. Lewis, pp. 127-160. University Press of Kentucky, Lexington, Kentucky.

Light, John

2000 "A Field Guide to the Identification of Metal." In *Studies of Material Culture Research.* Ed. K. Karklins. Pp. 3-19. The Society for Historical Archaeology, California.

Luscomb, S.C.

1967 *The Collector's Encyclopedia of Buttons.* Bonanza Books, New York.

Lutzow, C.

1988 The Davis Site: A Case Study for the Development of a Rural Subsistence Model Dependent Upon Indigenous Plant Materials. Historic Archaeology in Illinois. in C. Rohrbaugh and T. Emerson (eds.) *Papers from the Second Conference on Historic Archaeology in Illinois:* 117-152.

McBride, W. Stephen and William Sharp

1991 *Archaeological Investigations at Camp Nelson: A Union Quartermaster Depot and Hospital in Jessamine County, Kentucky.* Program for Cultural Resource Assessment Report No. 241, University of Kentucky, Lexington.

MacDonald, G.F.

1968 Debert: a Paleo-Indian Site in Central Nova Scotia. National Museum of Canada *Anthropology Papers No. 16.*

McGrain, Preston

1983 *The Geologic Story of Kentucky.* Lexington: Kentucky Geological Survey, University of Kentucky.

McKearin, George and Helen McKearin

1948 *American Glass.* Crown Publishers, New York.

Majewski, T. and M.J. O'Brien

1987 The Use and Misuse of Nineteenth Century English and American Ceramics Archaeological Analysis. In *Advances in Archaeological; Method and Theory.* Vol. 11. Edited by Michael B. Schiffer. Academic Press Inc., New York, New York.

Mayer-Oakes, William J.
1955 Prehistory of the Upper Ohio Valley: An Introductory Archaeological Study. Anthropological Series 2, Annals of the Carnegie Museum 34, Pittsburgh, Pennsylvania.

Maynard, D.R., and T.W. Gatus
N.D. A Reconnaissance and Evaluation of Archaeological Sites in Greenup County, Kentucky. *Kentucky Heritage Commission*, Frankfort.

Maxwell, J.A., and M.B. Davis
1972 Pollen evidence of Pleistocene and Holocene.

Miller, George L.
1980 Classification and Economic Scaling of Nineteenth Century Ceramics. *Historic Archaeology* 14:1-40.

Miller, D.A. and K. Duerksen
1995 Excavation of a Prehistoric Feature at Big Bone Lick, Boone County, Kentucky. In *Current Archaeological Research in Kentucky*, Volume Three edited by J.F. Doershuk, C.A. Bergman, and D. Pollack, pp. 89-113. Kentucky Heritage Council, Frankfort.

Miller, G. and S. Hurry
1983 Ceramic Supply in an Economically Isolated Frontier Community: Portage County of the Ohio Western Reserve, 1800-1825. *Historical Archaeology* 17(2):80-92.

Miller, George L. and Catherine Sullivan
1984 Machine-made Glass Containers and the End of Production for Mouth-Blown Bottles. *Historical Archaeology* 18(2): 83-96.

Mocas, Steven T.
1977 *Excavations at the Lawrence Site, 15Tr33, Trigg County, Kentucky.* University of Louisville Archaeological Survey, Louisville, Kentucky.

Moir, Randall W.
1987 Socioeconomic and Chronometric Patterning of Window Glass in Historic Buildings, Material Culture, and People of the Prairie Margin, edited by David H. Jurney and Randall W. Moir pp. 73-81. Richland Creek Technical Series vol. V. Southern Methodist University, Dallax, Texas.

Mozzi, Marina E.
2000 *Phase I Archaeology Survey for Expansion of Facilities at the Cincinnati-Northern Kentucky International Airport in Boone County, Kentucky.*

Muller, Jon D.
1986 *Archaeology of the Lower Ohio River Valley.* Academic Press Inc., New York.

Nance, Jack D.
1977 Aspects of Late Archaic Culture in the Lower Tennessee-Cumberland River Valleys. *Tennessee Archaeologist* 33:1-15.

1985 *The Archaic Sequence in the Lower Tennessee-Cumberland-Ohio Region*. Ms on file, Department of Archaeology, Simon Fraser University, Burnaby, British Columbia.

1986 The Morrisroe Site: Projectile Point Types and Radiocarbon Dates from the Lower Tennessee Valley. *Midcontinental Journal of Archaeology* 11:11-50.

1988 The Archaic Period In the Lower Tennessee-Cumberland-Ohio Region. In *Paleo-Indian and Archaic Research in Kentucky*. Edited by Charles D. Hockensmith, David Pollack and Thomas Sanders. Kentucky Heritage Council, Frankfurt, Kentucky.

Nelson, Lee H.
1968 "Nail Chronology as an Aid to Dating Old Buildings." *History News* 24, Technical Leaflet #48, no. 11 (November 1968). [2, 3, 5].

Niquette, Charles M.
1992 Woodland Settlement Patterns in the Kentucky/West Virginia Border Region. In *Cultural Variability in Context: Woodland Settlements of the Mid-Ohio Valley, MCJA Special Paper #7* edited by M.F. Seeman, pp. 15-18. Kent State University Press, Kent.

Niquette, Charles M. and A. Gwynn Henderson
1984 Background to the Historic and Prehistoric Resources of Eastern Kentucky. Bureau of Land Management, Eastern States Office, *Cultural Resource Series No. 1.*

Niquette, Charles M. And W. Kevin Pape
1985 *A Phase I Archaeological Assessment of Borrow Areas for the Proposed Mineola Interchange Boone and Kenton Counties, Kentucky.*

Noel-Hume, Ivor
1978 *A Guide to the Artifacts of Colonial America.* Alfred A. Knopf: New York.

Oehler, Charles M.
1973 *The Turpin Indians.* Popular Series No. 1. Cincinnati Museum of Natural History, Cincinnati.

Paynter, R.
1982 *Models of Spatial Inequality: Settlement Patterns in Historical Archaeology*. Academic Press, New York.

Phillips, P.C.
1961 *The Fur Trade*. University of Oklahoma Press, Norman.

Pollack, David and A. Gwynn Henderson

1992 Toward a Model of Fort Ancient Society. In *Monographs in World Archaeology No. 8: Fort Ancient Cultural Dynamics* edited by A.G. Henderson, pp. 281-294. Prehistory Press, Madison, Wisconsin.

2000 Late Woodland Cultures in Kentucky. In *Late Woodland Societies: Tradition and Transformation across the Midcontinent,* edited by Thomas E. Emerson, Dale L. McElrath, and Andres C. Fortier, pp. 613-641. University of Nebraska Press, Lincoln.

Price, Cynthia R.

1982 *Nineteenth Century Ceramics in the Eastern Ozark Border Region.* Center for Archaeological Research, Monograph Series No. 1. Southwest Missouri State University: Springfield.

Priess, Peter J.

1971 Historic Swings on a Poorly Described Hinge: Reflections on the State of Research in Building Hardware. *The Association for Preservation Technology Bulletin* 3(4): 31-39.

2000 Historic Door Hardware. In *Studies in Material Culture Research,* edited by Karlis Karklins. The Society for Historical Archaeology, California, Pennsylvania.

Prufer, Olaf H.

1964 The Hopewell Complex of Ohio. In: *Hopewellian Studies*, J.R. Caldwell and R.L. Hall, eds., Illinois State Museum Scientific Papers 12.

Prufer, Olaf H., and R.S. Baby

1963 *Paleo-Indians of Ohio*. Ohio Historical Society, Columbus, Ohio.

Purrington, Burton L.

1967 Prehistoric horizons and traditions in the eastern mountains of Kentucky. Unpublished Master's thesis, University of Kentucky, Department of Anthropology, Lexington, Kentucky

Railey, Jimmy A.

1990 Woodland Period. In *Archaeology of Kentucky: Past Accomplishments and Future Directions, Volume One*, edited by D. Pollack, pp. 247-374. Kentucky Heritage Council, Frankfort, Kentucky.

1991a Woodland Settlement Trends and Symbolic Architecture in the Kentucky Bluegrass. In *The Human Landscape In Kentucky's Past* edited by C. Stout and C.K. Hensley, pp. 56-57. Kentucky Heritage Council, Frankfort.

1991b The Conley-Greene Rockshelter (15EL4): An Early Woodland Occupation in the Cumberland Plateau of Northeastern Kentucky. In *Studies in Kentucky Archaeology* edited by C.D. Hockensmith, pp. 66-101. Kentucky Heritage Council, Frankfort.

1996 Woodland Cultivators. In *Kentucky Archaeology* edited by R.B. Lewis, pp. 79-126. University Press of Kentucky, Lexington.

Rennick, Robert M.
1984 *Kentucky Place Names.* University Press of Kentucky, Lexington.

Reps, J.W.
1965 *The Making of Urban America*. Princeton University Press, Princeton.

1972 *Tidewater Towns, City Planning in Colonial Virginia and Maryland*. Colonial Williamsburg Foundation, Williamsburg, Va.

Riordan, T. and W. Adams
1985 Commodity Flows and National Market Access. *Historical Archaeology* 19(2):5-18

Ritchie, William A.
1971 *A Typology and Nomenclature for New York Projectile Points*. New York State Museum and Science Service Bulletin No. 384. Albany, University of the State of New York.

1980 *The Archaeology of New York State*. Natural History Press, Garden City, New York.

Rodeffer, Michael J.
1968 *An Archaeological Survey and Preliminary Test Excavation: Interstate 275, Section 9, Boone, Campbell, and Kenton Counties, Kentucky.*

Roenke, K.G.
1978 Flat Glass, Its Use as a Dating Tool for Nineteenth Century Archaeological Sites in the Pacific Northwest and Elsewhere. *Northwest Anthropological Research Notes,* Memoir No. 4. Moscow, Idaho.

Rolingson, Martha A.
1964 Paleo-Indian Culture in Kentucky: A Study Based on Projectile Points. *Studies in Anthropology 2*, University of Kentucky, Lexington, Kentucky.

Rolingson, M.A. and D.W. Schwartz
1966 *Late Paleo-Indian and Early Archaic Manifestations in Western Kentucky.* Studies in Archaeology 3, University of Kentucky, Lexington, Kentucky.

Sanders, Thomas N.
1983 *The Manufacturing of Chipped Stone Tools at a Paleo-Indian Site in Western Kentucky*. Unpublished M.A. Thesis from the University of Kentucky, Lexington.

Schock, Jack M.

1984 *A Cultural Reconnaissance of 6.8 Acres for the Proposed W. M. Smith Substation in Northeastern Boone County, Kentucky.*

Seeman, Mark F.

1986 Adena 'Houses' and Their Implications for Early Woodland Settlement Models in the Ohio Valley. In *Early Woodland Archaeology: Kampsville Seminars in Archaeology Volume Two* edited by K.B. Farnsworth and T.E. Emerson, pp. 564-580. Center for American Archaeology Press, Kampsville, Illinois.

1995 When Words Are Not Enough: Hopewell Interregionalism and the Use of Material Symbols at the GE Mound. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands*, edited by M.S. Nassaney and K.E. Sassaman, pp. 122-143. University of Tennessee Press, Knoxville.

Seeman, Mark F., and Olaf H. Prufer

1982 An Updated Distribution of Ohio Fluted Points. *Midcontinental Journal of Archaeology 7* (2): 155-169.

Sharp, William E.

1990 The Fort Ancient Period. In *The Archaeology of Kentucky: Past Accomplishments and Future Directions* edited by D. Pollack, pp. 467-557. Kentucky Heritage Council, Frankfort.

1996 Fort Ancient Farmers. In *Kentucky Archaeology* edited by R.B. Lewis, pp. 161-182. University Press of Kentucky, Lexington, Kentucky.

Smith, Edward E., Jr.

1990 Paleo-Indian Economy and Settlement Patterns in the Wyandotte Chert Source Area, Unglaciated South-Central Indiana. In *Research in Economic Anthropology Supplement Five: Early Paleoindian Economies of Eastern North America* edited by K.B. Tankersley and B.L. Isaac, pp. 217-258. JAI Press, Greenwich, Connecticut.

Smith, Bruce D.

1992 Prehistoric Plant Husbandry in Eastern North America. In *The Origins of Agriculture: An International Perspective*, edited by C.W. Cowan and P.J. Watson, pp. 101-119. Smithsonian Institution Press, Washington.

South, Stanley

1977 *Method and Theory in Historical Archaeology*. Academic Press, New York.

Spencer-Wood, S.M. (editor)

1987 *Consumer Choice in Historical Archaeology*. Plenum Press, New York.

Stoll, Courtney

2010 *Abbreviated Phase I Archaeology Report for the Kenton County Airport Proposed Gas Station/Restaurant Project, Burlington, Boone County, Kentucky.* Prepared by *Environment & Archaeology, LLC.* Prepared for Kenton County Airport Board.

Struever, Stuart

1964 The Hopewell Interaction Sphere in Riverine-Westem Great Lakes Culture History. Illinois State Museum, *Scientific Paper*, 12(3):85-106. Springfield, Illinois.

Struever, Stuart, and Kent D. Vickery

1973 The Beginnings of Cultivation in the Midwest-Riverine Area of the United States. *American Anthropologist* 75(5):1197-1220.

Styles, Bonnie W., Stephen R. Ahler, and Melvin C. Fowler

1983 Modoc Rockshelter Revisited. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J.L. Phillips and J.A. Brown, pp. 261-297. Academic Press, New York.

Sussenbach, Tom

1986 *Cultural Resource Assessment of a 450 Acre Tract at the Greater Cincinnati International Airport, Boone County, Kentucky*. Archaeological Report 151, Program for Cultural Resource Assessment, University of Kentucky, Lexington.

1986 *A Cultural Resource Assessment of a Thirteen Acre Tract at the Greater Cincinnati International Airport.* Prepared for Kenton County Airport Board. Prepared by Program for Cultural Resource Assessment.

1986 *Cultural Resources Assessment of a Proposed New Runway at the Greater Cincinnati Airport.* Prepared for Greiner Engineering Sciences, Inc. Prepared by program for Cultural Resource Assessment.

Sussenbach, Tom and R. Barry Lewis

1987 *Archaeological Investigations in Carlisle, Hickman, and Fulton Counties Kentucky: Site Survey and Excavations*. Report 4. Western Kentucky Project, Department of Anthropology, University of Illinois, Urbanna.

Tankersley, Kenneth B.

1989 A Close Look at the Big Picture: Early Paleoindian Lithic Resource Procurement in the Midwestern United States. In *Eastern Paleoindian Lithic Resource Use* edited by C.J. Ellis and J.C. Lothrop, pp. 259-292. Westview Press, Boulder.

1990a The Paleoindian Period. In *Archaeology of Kentucky: Past Accomplishments and Future Directions, Volume One*, edited by D. Pollack, pp. 73-142. Kentucky Heritage Council, Frankfort.

1990b Late Pleistocene Lithic Exploitation in the Midwest and Midsouth: Indiana, Ohio, and Kentucky. In *Research in Economic Anthropology Supplement Five: Early Paleoindian Economies of Eastern North America* edited by K.B. Tankersley and B.L. Isaac, pp. 259-299. JAI Press, Greenwich, Connecticut.

1996 Ice Age Hunters and Gatherers. In *Kentucky Archaeology* edited by R.B. Lewis, pp. 21-38. University Press of Kentucky, Lexington.

Taylor, Randy, Brad Koldehoff, Alex Ortiz, Robert Wall, and Ludomir Lozney
1996 *A Guide to Lithica: An R-Base Analysis System*. The Cultural Resource Group, Louis Berger & Associates, Inc. East Orange, New Jersey.

Thuro, Catherine M. V.
1976 *Oil Lamps: The Kerosene Era in North America.* Wallace-Homestead Book Co., Des Moines, Iowa.

Tordoff, J.D.
1983 *An Archaeological Perspective on the Organization of the Fur Trade in 18th Century New France*. Ph.D. Dissertation, Michigan State University. University Microfilms, Ann Arbor.

Tuttle, Elisabeth and Richard W. Jefferies
1986 *Cultural Overview of Historic Period Occupation at the Greater Cincinnati International Airport, Boone County, Kentucky.* Prepared for Greiner Engineering Sciences, Inc. Prepared by Program for Cultural Resource Assessment.

U.S. Federal Census
1850, 1860, 1870, 1880, 1900, 1910 for Boone County. Boone County Public Library, Florence.

USDA
1989 *Soil Survey of Boone, Campbell, and Kenton Counties, Kentucky*. United States Department of Agriculture, Soil Conservation Service and Forest Service, in cooperation with Kentucky Agricultural Experimentation Station.

Wallace, P.A.W.
1971 Indian Paths of Pennsylvania. Pennsylvania Historical and Museum Commission, Harrisburg, Pennsylvania.

Walters, Mathews M.
1988 The Adams Mastodon Site, Harrison County, Kentucky. In *Paleoindian and Archaic Research in Kentucky*, edited by C.D. Hockensmith, D. Pollack, and T.N. Sanders, pp. 43-46. Kentucky Heritage Council, Frankfort.

Wagner, G.E.

1984 Fort Ancient Plant Remains From Northern Kentucky. In *Late Prehistoric Research in Kentucky* edited by D. Pollack, C.D. Hockensmith, and T.N. Sanders, pp. 50-66. Kentucky Heritage Council, Frankfort.

Warminski, Margo

1993 *Survey of Historic Structures in Boone County, Kentucky.* Report prepared for and on file with the Boone County Historic Preservation Review Board.

2000 *Historic Resources Survey Report for the Expansion of Facilities at the Cincinnati/Northern Kentucky International Airport in Boone County, Kentucky*. Report prepared for Landrum & Brown of Cincinnati, Ohio.

Watson, Patty Jo

1989 Early Plant Cultivation in the Eastern Woodlands of North America. In *Foraging and Farming: The Evolution of Plant Exploitation*, edited by D.R. Harris and G.C. Hillman, pp. 555-571. Unwin Hyman, Winchester, Massachusetts.

Webb, William S.

1946 *Indian Knoll, Site Oh 2, Ohio County Kentucky.* Reports in Anthropology and Archaeology 4(3), Part I:113-365. University of Kentucky, Lexington.

1950 *The Carlson Annis Mound, Site 5, Butler County, Kentucky*. Reports in Anthropology 7(4), University of Kentucky, Lexington.

Webb, William S., and William G. Haag

1939 *The Chiggerville Site, Site 1, Ohio County, Kentucky*. Reports in Anthropology and Archaeology 4(l):1-62. University of Kentucky, Lexington.

Webb, W.S., and C.E. Snow

1945 The Adena People. University of Kentucky, *Reports in Anthropology* 6.

Winters, Howard D.

1968 Value System and Trade Cycles of the late Archaic in the Midwest. In *New Perspectives in Archaeology*, ed. Sally R. Binford and Lewis r. Binford pp. 175-221. Aldine, Chicago.

Wymer, Dee Ann

1987 The Paleoethnobotanical Record of the Lower Tennessee Cumberland Region. *Southeastern Archaeology* 6:124-129.

Yarnell, Richard A.

1964 Aboriginal Relationships Between Culture and Plant Life in the Upper Great Lakes Region. Museum of Anthropology, University of Michigan *Anthropology Papers* No. 23.

1973 The Origins of Agriculture: Native Plant-Husbandry North of Mexico. Paper Presented for the IXth International Congress of Anthropological and Ethnological Sciences, Chicago, Illinois.

APPENDIX A

Curriculum Vitae of Project Principals

Andrea D. Crider, MA
Principal Investigator
Environment & Archaeology, LLC
acrider@environment-archaeology.com

EDUCATION

- M.A., Anthropology, Archaeology, Northern Arizona University, Flagstaff, May 2001.
- B.S.W, Social Work, University of Cincinnati, Cincinnati, Ohio, June 1996.

PROFESSIONAL EXPERIENCE

Ms. Crider is responsible for the implementation and execution of archaeological research projects. She plans and conducts surveys and excavations of prehistoric and historic sites and is responsible for the preparation of technical reports and proposals for cultural resource management projects throughout the southeast, northeast, midwest, and mid-Atlantic regions of the United States. She also oversees the function of the archaeology laboratory including material analysis and curation procedures. Ms. Crider has served as Principal Investigator for Environment & Archaeology, LLC for the past four years. She has authored over 100 technical reports. Ms. Crider's major projects include:

Phase II and III Excavations:

2011 Phase II Testing of Site 36Br295 for the Marc I project in Bradford County, Pennsylvania. For AK Environmental, LLC

2010 Phase III Data Recovery of Site 34GR77 for the HUB III project in Greene County, Pennsylvania. For Dominion Transmission, Inc.

2008 Phase III Data Recovery of Site 11Pk1702 For the Rockies Express Pipeline- East (Rex-East) Project in Pike County, Illinois. For Caprock Environmental Services, LLC.

2008 Phase III Data Recovery of Site 11Pk1599 For the Rockies Express Pipeline- East (Rex-East) Project in Pike County, Illinois. For Caprock Environmental Services, LLC.

2008 Phase III Data Recovery of Site 46Bo419 for the TL-263 Expansion Project in Boone County, West Virginia. For Dominion Transmission, Inc.

2006 Archaeological Testing (Phase II) of Site 12B1337, Project STP-3403(002) in Bartholomew County, Indiana. For Indiana Department of Transportation.

2005 Archaeological Phase II Assessment of Site 12Da1354, 12Da1378, and 12Da1380 for the Corning Mine Permit Area (S00308) in Daviess County, Indiana. For Black Beauty Coal Mine.

2005 Archaeological Testing (Phase II) for Site 12-Al-120 in Allen County, Indiana. For Allen County Parks and Recreation.

2004 Archaeological Phase II Assessment of Site 12Vi888 on SR 42 and Swalls Road, Vigo County, Indiana. For DLZ Indiana, LLC.

2004 Archaeological Testing (Phase II) on Site12Sh337 for the Reconstruction of SR 244 in Shelby County, Indiana. For Butler, Fairman, and Seufert.

2003 A Phase II National Register Evaluation of 15Cl174 within the Verizon Wireless Ghent Telecommunication Tower in Carroll County, Kentucky. For Verizon Wireless.

Phase I

Ms. Crider has participated in numerous Phase I level survey projects in the past 10 years as a Principal Investigator and/or Field Director. These include large-scale surveys for natural gas pipelines, tranportation projects, and surface mining. Surveys were completed for various agencies including U.S. Army Corps of Engineers, Federal Energy Regulatory Commission, Federal Communications Commission, the Federal Aviation Administration, and the Natural Resources Conservation Servive. Representative projects include:

2010 Phase I Cultural Resources Survey for the Empire Tioga County Extension Project in Steuben, Ontario, and Chemung Counties, New York. For Hatch Mott MacDonald

2010 Phase I Cultural Resources Survey for the MARC I HUB Line Project in Bradford, Sullivan, and Lycoming Counties, Pennsylvania. For AK Environmental, LLC

2010 Phase I Cultural Resources Survey for the Lovell Heirs Wetland Restoration Project in Union County, Kentucky. For Natural Resources Conservation Service

2010 Phase I Cultural Resources Survey for the Charles Urban Wetland Restoration Project in Wayne County, Ohio. For Natural Resources Conservation Service

2010 Phase I Cultural Resources Survey for the Eastern Shore Natural Gas Mainline Extension Interconnect in Chester and Lancaster Counties, Pennsylvania. For Hatch Mott MacDonald

2007 Archaeological Field Reconnaissance for 1,393 Acre Knox Pit East Amendment, Miller Creek Mine in Knox County, Indiana. For Peabody Energy Midwest

2006 Archaeological Field Reconnaissance Francisco Coal Mine Expansion Area (S-301), Gibson County, Indiana. For Peabody Energy Midwest

2006 Archaeological Field Reconnaissance for 1,032 Acre Glen Ayr Coal Facility in Knox County, Indiana. For Peabody Energy Midwest

2007 Archaeological Field Reconnaissance for 1,393 Acre Knox Pit East Amendment, Miller Creek Mine in Knox County, Indiana. For Peabody Energy Midwest

2006 Archaeological Field Reconnaissance Francisco Coal Mine Expansion Area (S-301), Gibson County, Indiana. For Peabody Energy Midwest

2006 Archaeological Field Reconnaissance for 1,032 Acre Glen Ayr Coal Facility in Knox County, Indiana. For Peabody Energy Midwest

2005 Archaeological Field Reconnaissance for a Columbus Commercial Development in Bartholomew County, Indiana. For Patriot Engineering.

2005 Archaeological Field Reconnaissance: Re-Investigation of Site 12Sp972, 973, and 975 and a Phase Ib Survey of Site 12Sp1014/Du637 for the US 231 and I-64 Interchange. Project NH-075-3, Des. Nos.8461360, 9161365, 926136A, 926136B, 926136C, and 926136D, Spencer and Dubois Counties, Indiana. For Indiana Department of Transportation.

2005 Archaeological Field Reconnaissance for the Salem Municipal Airport, Washington County, Indiana. Indiana. For R. W. Armstrong.

2004 Archaeological Field Reconnaissance for the Meyer Tract of the Miller Creek Mine, Sugar Ridge Pit in Clay County, Indiana. For Black Beauty Coal Mine.

2003 Archaeological Baseline Study for the Proposed Woodbine Connector Road in Whitley and Knox Counties, Kentucky (Item 11-112.00). For Kentucky Transportation Cabinet.

2003 Archaeological Baseline Survey of the Proposed Reconstruction of KY 1830 (Jimtown Road) in Graves County, Kentucky (Item 1-8001.00). For Kentucky Transportation Cabinet

2003 Archaeological Baseline Survey of the Reconstruction of KY 536 (Mt. Zion Road) from Near the Boone/Kenton County Line to KY 17 in Kenton County Kentucky (6-162.00). For Kentucky Transportation Cabinet.

2003 Archaeological Survey of the US 421 (Leestown Road) Reconstruction in Fayette County (Item No. 7-223.00). For Kentucky Transportation Cabinet

2002 Archaeological Survey of the Towne Mall Bypass (Item No. 4-8003.00) in Hardin County Kentucky. For Kentucky Transportation Cabinet

2002 An Archaeological Baseline Study of the KY 3005 Extension in Hardin County, Kentucky (Item No.4-7010.00). For Kentucky Transportation Cabinet

PREVIOUS EMPLOYMENT:

Project Manager
July 2005 to April 2007
Archaeological Resources Management Service, Ball State University, Muncie, Indiana

Archaeological Field Director
April 2004 to July 2005
Archaeological Resources Management Service, Ball State University, Muncie, Indiana

Archaeological Field Supervisor
September 2002 to January 2004
Cultural Resource Analysts, Inc., Lexington, Kentucky

Archaeological Field Technician
March 2004- April 2004
Mannick and Smith Group, Maumee, Ohio

May 2002-August 2002
Cultural Resource Analysts, Inc., Lexington, Kentucky

May 2001-March 2002
Cultural Resource Analysts, Inc., Hurricane, West Virginia

ADDITIONAL TRAINING:

2010 Environmental Review and Compliance for Natural Gas Facilities Seminar. Federal Energy Regulatory Commission. Pittsburgh, Pennsylvania.

2008 Online Excavation Competent Person Class. Construction Safety Council

2000 Project Archaeology. Bureau of Land Management, Heritage Education Program

PROFESSIONAL PRESENTATIONS:

2010 "The Use of Residue Analysis in Determining Resource Procurement Strategies: A View from Appalachia." Society for American Archaeology Annual Meeting, St. Louis, Missouri

2000 "Archaeology in the Museum Maze." Society for Applied Anthropology Annual Retreat. Ghost Ranch, New Mexico.

2000 With Akhire Ebisu, Marie Sardier and Heather Tamietti. "An Anthropological Approach to Regional Assessment and Planning in Northern Arizona: Camp Verde Community Values, Issues, Expectations and Desires Related to the Use and Management of Forest Lands in the Verde Valley." Poster Presentation. Society for Applied Anthropology Annual Meeting. San Francisco, California.

AFFILIATIONS:

Society for American Archaeology
American Archaeological Conservancy
Society for Pennsylvania Archaeology

Technical Reports Authored

2011 Phase II Testing of Site 36Br295 for the MARC I project in Bradford County, Pennsylvania. Prepared for AK Emvironmental, LLC.

2011 Phase II and III Data Recovery of Site 36Gr77 for the Dominion HUB III Project in Greene County, Pennsylvania. Prepared for Dominion Transmission, Inc.

2010 Phase III Archaeological Evaluation of Site 11Pk1599 for the Rockies Express Pipeline-East (REX East) Project, Pike County, Illinois. Prepared for Caprock Environmental, LLC.

2010 Phase I Cultural Resource report for the AMS-002 Pipeline Project in Terry Township, Bradford County, Pennsylvania. Prepared for Appalachian Midstream Services.

2010 Abbreviated Phase I Archaeology and Deep Testing Report for the Tygart Valley River HDD Crossing, Well # PHL1AHS Phillipi Pipeline Project, Barbour County, West Virginia. Prepared for Consol Energy.

2010 Phase I Cultural Resources Report for the Coal Mountain Pipeline, Cummings and Cogan House Township, Lycoming County, Pennsylvania. For AK Environmental, LLC.

2010 Phase I Cultural Resources Survey for the Empire Tioga County Extension Project in Steuben, Ontario, and Chemung Counties, New York. For Hatch Mott MacDonald.

2010 Phase I Cultural Resources Survey for the MARC I HUB Line Project in Bradford, Sulli van, and Lycoming Counties, Pennsylvania. For AK Environmental, LLC.

2010 Phase I Cultural Resources Survey for the Lovell Heirs Wetland Restoration Project in Union County, Kentucky. For Natural Resources Conservation Service

2010 Phase I Cultural Resources Survey for the Charles Urban Wetland Restoration Project in Wayne County, Ohio. For Natural Resources Conservation Service

2010 Phase I Cultural Resources Survey for the Eastern Shore Natural Gas Mainline Extension Interconnect in Chester and Lancaster Counties, Pennsylvania. For Hatch Mott MacDonald

2010 Phase II and II Data Recovery of Site 46Bo419 for the TL-263 Expansion Project, Boone County, West Virginia. Prepared for Dominion Transmission, Inc.

2009 Phase I Cultural Resources Survey, East Ohio Gas Company (EOG) PIR 052 Mahoning Road Phase II Replacement Project, L#152, 4236, 448, and 504 (3C07189704) Pipeline Infrastructure Replacement (PIR) Project, Canton, Stark County, Ohio. Prepared for East Ohio Gas Company.

2009 Phase I Cultural Resources Survey, East Ohio Gas Company (EOG) Akron-Thornton, L#105, 879, 1070, 3963, 24, 49, 281, 417, 519, 727, 760, 761, 838, 849, 927, 928, 1008, 1067, 1068, 1160, 1161, 1164, 2003, 2938, 3676, 3719, 3884, 838, 509, 729, 839, and 851 (2A07144675) Pipeline Infrastructure Replacement (PIR) Project, Akron City, Summit County, Ohio. Prepared for East Ohio Gas Company.

Courtney Stoll, M.A., R.P.A.
Archaeology Principal Investigator, Archaeology and Architectural History Report Author, GIS Specialist

EDUCATION

- M.A., Anthropology, Temple University, 2008
- B.A., Anthropology, University of Kentucky, 2003

Master's Thesis: "Domestic Archaeological Tourism in Japan: Intersecting Theories of the Audience in the Anthropology of Japan, Archaeology, and the Anthropology of Tourism." 125 pages, © August 2008

PROFESSIONAL EXPERIENCE

Responsible for the analysis of artifacts in the archaeology lab and also collates information from literature reviews, client data, research, and analysis in order to reach conclusions and recommendations after archaeological surveys. This information is then compiled into reports for the client and local SHPOs. Preparation of site forms for submittal and the analysis of artifacts and the production of reports for both large and small scale historic and prehistoric sites in the Southeast, Northeast, and Midwest. Confirmed by the Pennsylvania, West Virginia, Ohio, Tennessee, Arkansas, and Mississippi SHPO's as meeting the Secretary of the Interior's guidelines for acting as Principal Investigator. She has also been very successful in learning and utilizing ArcGIS and has become one of the primary processors of GIS data from archaeological field projects. Since and prior to joining *Environment & Archaeology, LLC,* Ms. Stoll's projects have included:

SEMINARS:

2013 Completed the *Federal Energy Regulatory Commission Environmental Review and Compliance for Natural Gas Facilities Seminar.* February 26-28, Orlando, FL. Presented by the Department of Energy Federal Energy Regulatory Commission.

2011 Completed the *Section 106 Advanced Seminar*. September 15, Nashville, TN. Presented by the Advisory Council on Historic Preservation.

PUBLICATIONS:

2014

Stoll, Courtney (principal investigator)

2014 *Phase I Cultural Resource Report for the Texas Eastern Transmission, LP TN Giles, Maury Test Sections 2014 LN 10 SCC Hydrostatic Testing Pipeline, Giles and Maury Counties, Tennessee.* Prepared for Texas Eastern Transmission. Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Cultural Resources Survey for the Proposed Dominion Transmission, Inc. Clarington Project in Switzerland Township, Monroe County, Ohio.* Prepared for Dominion Transmission, Inc. Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Negative Survey Form for the Texas Eastern Transmission, LP 2014 Perry Cathodic Protection System Installation, Perry County, Pennsylvania.* Prepared for Texas Eastern Transmission, LP. Prepared by *Environment & Archaeology, LLC.*

2014 *Addendum Phase I Negative Survey Form for the Dominion Transmission, Inc. G-136 Pipeline Maintenance, Greene County, Pennsylvania.* Prepared for Dominion Transmission, Inc. Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Cultural Resources Survey for the Tennessee Gas Pipeline Company, LLC MLV 210-3 Class Change Project Guernsey County, Ohio.* Prepared for Tennessee Gas Pipeline Company, LLC. Prepared by *Environment & Archaeology, LLC.*

2014 *Addendum Phase I Cultural Resources Survey for the Tennessee Gas Pipeline Company, LLC MLV 210-3 Class Change Project Guernsey County, Ohio.* Prepared for Tennessee Gas Pipeline Company, LLC. Prepared by *Environment & Archaeology, LLC.*

2014 *Revised Phase I Cultural Resources Survey for the Proposed Bond Well Pad in Seneca Township, Noble County, Ohio.* Prepared for Antero Resources Corporation. Prepared by *Environment & Archaeology, LLC.*

Stoll, Courtney (primary author) and Margo Warminski (architectural historian)
2014 *Phase I Historic Architectural Review for the Clarington Project, Switzerland Township, Monroe County, Ohio.* Prepared for Dominion Transmission, Inc. Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Historic Architectural Review for the Pirl (P-21) Well Site, Salem Township, Monroe County, Ohio. 2014-MOE-28478.* Prepared for Statoil. Prepared by *Environment & Archaeology, LLC.*

Stoll, Courtney (primary author/principal investigator) and Andrea Crider (principal investigator)
2014 *Phase II Testing of Site 15SC327 for the Proposed Stamping Ground2-Caudill Wireless Cellular Tower in Scott County, Kentucky. FY15-8216.* Prepared for Trileaf Environmental & Property Consultants. Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Cultural Resources Survey for the Wilson and Rudy Wetlands Reserve Enhancement Program (WREP) in Fulton County, Kentucky.* Prepared for The Nature Conservancy. Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Cultural Resources Survey for the Texas Eastern Transmission, LP 2014 DOT Encroachment Program DANV-OWSV-Line 10, 15, & 25 in Madison County Kentucky.* Prepared by *Environment & Archaeology, LLC.*

2014 *Phase I Cultural Resources Report for the Dominion Transmission, Inc. 2014 TL-283 Replacement Project in Doddridge County, West Virginia.* Prepared for Dominion Transmission, Inc. Prepared by *Environment & Archaeology, LLC.*

Stoll, Courtney (GIS archaeology maps)
2014 Columbia Gas Transmission, LLC Hanover Replacement Project, York and Adams Counties, Pennsylvania.

2014 Columbia Gas Transmission, LLC Columbia Line 1655 North, Adams County, Pennsylvania.

2013

Stoll, Courtney (principal investigator)

2013 *Phase I Cultural Resources Report for the Texas Eastern Transmission, LP North Little Rock Line 1 MP 231.98-ML232.30 Pipeline Replacement Project. Lonoke County, Arkansas.* Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resource Report for the East Tennessee Natural Gas, LLC 2014 DOT Encroachment Program Ridgetop Line 2100-1 MP 3.23 to MP 3.43 - Class 3 Replacement, Robertson County, Tennessee.* Prepared for East Tennessee Natural Gas, LLC. Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resources Survey for the Proposed Monroe Well Pad in Seneca Township, Monroe County, Ohio.* Prepared for Antero Resources Corporation. Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resources Survey for the Proposed Myron Well Pad in Seneca Township, Noble County, Ohio.* Prepared for Antero Resources Corporation. Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resources Survey for the Tennessee Gas Pipeline Company, LLC 2013 Strain Relief Excavation Projects Groups 3, 4, 5, 6, 7, and 8 Athens, Morgan, Guernsey, and Tuscarawas Counties, Ohio.* Prepared for Tennessee Gas Pipeline Company, LLC. Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resources Survey for the Proposed Billi/Fledder Pad in Seneca Township, Noble County, Ohio.* Prepared for Antero Resources Corporation. Prepared by *Environment & Archaeology, LLC.*

2013 Negative Survey Form for the Dominion Transmission, Inc. G-136 Pipeline Replacement, Greene County, Pennsylvania.

2013 *Abbreviated Phase I Archaeology Report for the Dominion Transmission, Inc. H-18733 Replacement Project, Wyoming County, West Virginia.* Prepared for Dominion Transmission, Inc. Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resources Report for the EQT Production Company Gessler Centralized Impoundment Project in Doddridge County, West Virginia. FR#13-135-DO.* Prepared for Potesta & Associates, Inc. Prepared by *Environment & Archaeology, LLC.*

Stoll, Courtney (primary author/principal investigator) and Andrea Crider (principal investigator)

2013 *Phase I Cultural Resources Survey for the Texas Eastern Transmission, LP MP 408.5 Cathodic Protection Installation in Casey County, Kentucky.*

2013 *Phase I Cultural Resources Survey for the Kenton County Airport Board Cincinnati/Northern Kentucky International Airport North Development Area Project in Boone County, Kentucky.* Prepared by *Environment & Archaeology, LLC.*

2013 *Phase I Cultural Resources Survey for the Fort Jefferson Wetland Restoration Project (WRP) in Ballard County, Kentucky.* Prepared by *Environment & Archaeology, LLC.*

2013 *Abbreviated Phase I Archaeology Report for the Natural Resource Conservation Service Proposed Alfred Allen WREP Project, Hickman County, Kentucky.* Prepared for USDA Natural Resources Conservation Service. Prepared by *Environment & Archaeology, LLC.*

Stoll, Courtney (GIS archaeology maps)
2013 East Tennessee Natural Gas Boyd Creek Pipeline Project Greene County, Tennessee.

2013 East Tennessee Natural Gas, LLC 2013 Dixon Springs SCC Project Smith and Trousdale Counties, Tennessee.

2013 Tennessee Gas Pipeline Company 2012 MLV 205-2+11.39 (Priority 9) Morgan County, Ohio.

2013 Kleinfelder NITE S005-S006 Armstrong County, Pennsylvania.

2013 Columbia Gas Transmission, LLC Columbia Line 8012 Proposed Project Mineral County, West Virginia and Allegany County, Maryland.

2013 Dominion Transmission, Inc. TL-323 Washout Monongalia County, West Virginia.

Stoll, Courtney (GIS biology maps)
2013 Tennessee Gas Pipeline Company 2013 MLV 109-2, 109-3 and 109-5 Maps, Rowan County, Kentucky.

2013 Tennessee Gas Pipeline Company, LLC 2013 TN Anomaly Remediation Project MLV 71-4 to MLV 79-4 Hardeman, McNairy, Decatur, and Perry Counties, Tennessee.

2013 Tennessee Gas Pipeline Company 2013 TN Anomaly Remdiation Project MLV 559-2 to 564-2 Hickman, Dickson, Cheatham and Robertson Counties, Tennessee.

2013 Tennessee Gas Pipeline Company, LLC 2013 TN Anomaly Remediation Project MLV 559-3 to MLV 560-3 Hickman and Dickson Counties, Tennessee.

2013 Tennessee Gas Pipeline Company, LLC 2013 TN Anomaly Remediation Project MLV 559-1 to MLV 565-1 Hickman, Dickson, Cheaham, Davidson, and Robertson Counties, Tennessee.

2013 Tennessee Gas Pipeline Company, LLC 2013 TN Anomaly Remediation Project MLV 69-1 to MLV 71-1 Benton and Hardeman Counties, Tennessee.

2013 East Tennessee Natural Gas, LLC 2013 Dixon Springs SCC Project Smith and Trousdale Counties, Tennessee.

2013 Tennessee Gas Pipeline Company 2013 TN Anomaly Remediation Project MLV 856-1 to 860-1 Wayne and Perry Counties, Tennessee.

2013 TETLP Rosehill, Hickman County, Tennessee.

2013 Texas Eastern Transmission, LP 2013 MP 226.4 to 226.73 Revetment Project Amite County, Mississippi.

2013 Texas Eastern Transmission, LP 2013 MP 223.76 Revetment Project Amite County, Mississippi.

2013 Tennessee Gas Pipeline Company 2013 MS Anomalies - MLV 847-1 to MLV 851-1 Union County, Mississippi.

2013 Tennessee Gas Pipeline Company 2012 MLV 205-2+11.39 (Priority 9) Morgan County, Ohio.

2013 Tennessee Gas Pipeline Company 2012 MLV 205-2+15.83 (Priority 10) Morgan County, Ohio.

2013 Tennessee Gas Pipeline Company 2012 MLV 205-2+10.80 (Priority 8) Morgan and Athens Counties, Ohio.

2013 Tennessee Gas Pipeline Company, LLC 2013 Group 4 - MLV 206-2+0.38 Pipeline Replacement Project Homer Township, Morgan County, Ohio.

2013 Tennessee Gas Pipeline Company, LLC 2013 Strain Relief Excavation Projects Groups 3, 4, 5, 6, 7, and 8 Athens, Morgan, Guernsey, and Tuscarawas Counties, Ohio.

2013 Tennessee Gas Pipeline Company, LLC OH Backhaul Project Line 200-1 Replacements/Line 200-3 New MLV Greenup County, Kentucky, Carroll, Scioto and Athens County, Ohio.

2013 Tennessee Gas Pipeline Company 2013 OH Anomaly Remediation Project-MLV 216-2+8.74 Mahoning County, Ohio.

2013 Tennessee Gas Pipeline Company 2013 OH Anomalies Lines 200-1 and 200-2 Scioto County, Ohio.

2013 Tennessee Gas Pipeline Company, LLC 2013 Group 7 - MLV 206-3+0.12 & MLV 206-4+0.09 Pipeline Replacement Project Homer Township, Morgan County, Ohio.

2013 Dominion Transmission, Inc. 2013 TL283 Pipeline Replacement Project Tyler and Doddridge Counties, West Virginia.

2013 Dominion Hope Gas, Inc. 2013 M-1657 Pipeline Replacement Project Doddridge County, West Virginia.

2013 Dominion TL-344 Lewis County, West Virginia.

2013 Stone Energy Corporation Central Mary Pad Project Wetzel County, West Virginia.

Robert Vincent Whitlatch
Senior Archaeological Field Director
River Restoration Survey Field Director
Pipeline Environmental Inspector

EDUCATION

- B.A., Ohio University, Athens, Ohio, 1991, Anthropology
- President, Ohio University Anthropology Club, 1989/1990 and 1990/1991

.

EXPERIENCE

Mr. Whitlatch is the Senior Field Director for Cultural Resources Management projects at *Environment and Archaeology, LLC*. He is experienced in historic and prehistoric archaeology. Mr. Whitlatch has extensive field-supervisory experience, and has directed small and large sized Cultural Resource surveys, archaeological monitoring and data recovery projects throughout the Northeast, Southeast, Midwest and Mid Atlantic areas of the United States. Mr. Whitlatch has more than twenty-one years experience in archaeological field work. Mr. Whitlatch is also a certified Erosion and Sediment Control Responsible Land Disturber with the Commonwealth of Virginia Soil and Water Conservation Board (certificate 18223). Mr. Whitlatch has also been involved with *E&A, LLC* surveying and testing of stream restoration projects,wetland biology assistant technician and an environmental inspector for pipeline construction. He has also conducted pipeline right-of-way restoration projects.

Mr. Whitlatch is responsible for the surveying of various projects using a variety of survey grade GPS systems, data collectors or a Topcon total station.

SELECTED PROJECT EXPERIENCE

Environment and Archaeology, LLC - June 1997 to Present

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed North Canton Extension Project in Tyler Co.,West Virginia.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed Eureka Lateral Project in Tyler Co., West Virgina. Antero Resources.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed Nite S004 Pipeline Project in Armstrong Co., Pennsylvania. Kleinfelder.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed Spectra SR141 New Highway Pipeline Replacement Project in Trousdale Co.,Tennessee. Spectra Energy.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed EP - 2012 Yalobusha River Project in Boone Co., Mississippi. El Paso Energy Houston, TX.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed Texas Gas Pipeline replacement at the Bear Run Mine in Sullivan Co., Indiana . AK Environmental.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed KY NRCS Jimmy Edwards WRP in McCracken, Co., Kentucky . For KY NRCS.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed KY NRCS Thomas Massey WRP in McCracken, Co., Kentucky . For KY NRCS.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed CVG Forcemain Reroute Project in Boone Co., Kentucky. For CVG Airport Boone Co.,KY.

2012 **Field Director:** Phase I Cultural Resources Survey for the proposed MAA - Turner Smith Cave Broadcast Tower project in Co., KY.

2012 **Field Director:** Phase I Cultural Resources Survey for proposed ESNG Greenspring Expansion Pipeline and related facilities in New Castle and Kent Counties, Delaware. Hatch Mott McDonald, Holyoke, MA.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS Canton - Hickok Pipeline and facilities project in Sullivan, Lycoming and Bradford Counties, Pennsylvania. AK Environmental.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS Coal Mountain Pipeline, in Lycoming County, Pennsylvania. AK Environmental.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS Ogontz Well pad, facilities and Pipeline project, in Lycoming County, Pennsylvania. AK Environmental.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed Chesapeake Energy Chase Gathering Pipeline, Bradford Co., Pennsylvania. Hanover Engineering.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed Chesapeake Energy Kinnarney Lateral Pipeline survey, Pennsylvania. Hanover Engineering.

2011 **Field Director:** Phase II Archaeological Excavations and Deep Testing at Site 36BR295 on the Susquehanna River flood plain for the proposed CNYOG MARC I Pipeline Crossing, in Bradford County, Pennsylvania. AK Environmental.

2011 **Archaeological Monitor** for the ANR - 206 Transcanada Fairfax Lateral Replacement project in Holt Co., Missouri. Sauk, Fox and Kansas Tribes requested monitoring for ANR.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed Potesta Pike Fork Well Pipeline, West Virginia. For Potesta.

2011 **Field Director:** Phase I Cultural Resources Survey for the proposed TGP-EOG 2012 MLV 204 Uprates on Lines 200 & 300, Athens, Ohio. For TGP.

2011 **Field Director:** Background research and site cultural evaluation to formulate a Cultural Resource Survey for a proposed AWP Development and future re-logging of the privately owned portion of the

Blackwater Canyon, West Virginia. For CTL. Various other research project for other clients and projects also conducted throughout the year.

2011 **Volunteer Excavating**: Working vacation for a few weeks excavating at the amazingly intact Fox Farm Site (Middle Fort Ancient Component Village site) with Dr. Dave Pollock and Dr. Gwyenn Henderson and their students at the UKY archaeology field school in Mason Co., KY. A week to volunteer excavating at Dr. Robert Riordan's.

10/11 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS Laurel Mtn. Phase III Pipeline Project, Lycoming County, Pennsylvania. AK Environmental.

10/11 **Field Director:** Phase I Cultural Resources Survey for the proposed MARC I Pipeline and it's facilities, in Steuben, Bradford and Lycoming Counties, Pennsylvania. AK Environmental.

10/11 **Field Director:** Phase I Cultural Resources Survey for the proposed National Fuel East to West Overton to Leidy Pipeline project and it's facilities, in Elk, Jefferson, Clearfield, Clinton and Cameron Counties, Pennsylvania. Hatch Mott McDonald.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Eastern Shore TETCO Supply Pipeline, in Chester and Lancaster Counties, Pennsylvania. For Hatch Mott McDonald.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS North - South Pipeline, in Bradford County, Pennsylvania. For AK Environmental.

2010 **Field Director:** Phase III Archaeological Data Recovery at Site 36GR77 for the proposed Dominion HUB III Pipeline, in Greene County, Pennsylvania. For Dominion Transmission.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Gas Station / Restaurant Complex near CVG Boone Co., Kentucky. For Landrum and Brown.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS 6-Mile Pipeline Project with relocated roads and well pads, Lycoming Co., Pennsylvania. For AK Environmental.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Empire Tioga Expansion Pipeline and Facilities Project , in Tioga County, Pennsylvania and Steuben County, Ontario County, and Chemung County, New York. For Hatch Mott McDonald.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Chesapeake Gowan Gathering AMS-002 Systems Pipeline Project, in Bradford County, Pennsylvania. For Chesapeake Development.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Chesapeake Kellogg Gathering 10-064 Line Systems Pipeline Project, in Bradford County, Pennsylvania. For Chesapeake Development.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Waterline Project, Brooke Co.,West Virginia.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed ULS Hickok Pipeline, Pennsylvania. For AK Environmental.

2010 **Field Director:** Phase I Cultural Resources Survey for the proposed Dominion TL-342 2010 Longwall Mining Project. For Dominion Transmission.

09/10 **Field Director:** Phase I Cultural Resources Survey for the proposed Eastern Shore Natural Gas TETCO Supply Pipeline, in Chester and Lancaster Counties, Pennsylvania. For Hatch Mott McDonald.

2009 **Field Director:** Phase II Archaeological Excavations at Site 36GR77 and Site 36GR304 (this site had a remote sensing survey as well as excavations) for the proposed Dominion HUB III Pipeline, in Greene County, Pennsylvania. For Dominion Transmission.

2009 **Field Director:** Phase II Archaeological Investigation for the proposed CNYOG Thomas Corners Project, New York. For AK Environmental.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed SALTEC gas storage facility, pipelines and associated facilities. Mississippi. For AK Environmental.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed DOM/EOG - Bare Steel Projects Mahoning Road PIR survey. Ohio. For East Ohio Gas.

2009 **Field Director:** Phase I Cultural Resources Surveys for the proposed multiple (24+)cell tower projects for CTL & Terracon in KY.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed MARC I Pipeline and it's facilities, New York and Pennsylvania. AK Environmental.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed DOM/EOG - Bare Steel Projects Marietta Lateral survey. Ohio. For East Ohio Gas.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed KY NRCS Swan Lake Project, Kentucky. For Kentucky NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Conewango Dam #6 Project, Chataqua CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed the EP-8 Sites outside the ROW Project, Potter Co., PA. For Dominion Transmission.

2009 **Field Director:** Phase I Cultural Resources Survey subsequent deep testing and background research for the proposed CORE Knoxville Landings Project, Knoxville, TN. For CORE Landings.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Darren Chicchia Project, Erie CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Lee D. North Project, Erie CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Orchard Avenue Project, Wayne CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Tim Whitcomb Project, Wayne CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Genesee Equip Project, Wayne CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Youngman Brothers Project, Wayne CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Christopher Hance EQIP Project, Wayne CO., New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed NY NRCS Miller Eqip Project, New York. For New York NRCS.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed Antero 8.2 Acres Well Pad, pipeline an associated Pit Road and a historic cemetery survey, Pennsylvania. For Antero.

2009 **Field Director:** Surface Survey and archaeologically probing for buried headstones and possible graves in the historic Vaughn Cemetery (recently deforested and light surface disturbance from recent clearing) Boone Co., Kentucky. E&A volunteered manpower and equipment to help Vaughn family.

2009 **Field Director:** Phase I Cultural Resources Survey for the proposed Cunningham Bros. Pine Creek Crossing Project, Tioga and Potter Counties, Pennsylvania. For Cunningham Bros.?

2009 **Field Director:** Phase I Cultural Resources Surveys for the proposed NY NRCS Agos and Mulvaney Projects, New York. For New York NRCS.

08/09 **Field Director:** Phase II Archaeological Investigation for the proposed Dominion Hub III Project, Pennsylvania. For Dominion Transmission.

Appendix B

Artifact Catalog

Appendix B-Artifact Catalog

Locale	STP	Depth (cmbs)	#	Function Group	Material Type	Material Sub	color/décor	portion	details
NSL #2	O8	surf	10	Architecture	Asphalt	Shingle	black		
Hist Debris	OO5	0-20	2	Architecture	Ceramic	Brick	red		
Hist Debris	QQ7	0-20	1	Architecture	Ceramic	Brick	red		
NSL #1	ZZZ1 (TR)	0-40	2	Architecture	Ceramic	Brick	red		molded
Site 15Be681	DD7	0-25	1	Architecture	Ceramic	Brick			
NSL #2	ZZZ2 (TO)	0-30	2	Architecture	Ceramic	Brick			
Hist Debris	G2	0-15	12	Architecture	Ceramic	Structural Clay Tile	red		
Hist Debris	QQ7	0-20	1	Architecture	Ceramic	Structural Clay Tile	red		
NSL #1	ZZZ1 (TR)	0-40	8	Architecture	Ceramic	Structural Clay Tile	red		
NSL #1	ZZZ2 (foundation)	I (Ap)	22	Architecture	Ceramic	Structural Clay Tile	red		
NSL #1	ZZZ3	surf	1	Architecture	Ceramic	Structural Clay Tile	red		
Hist Debris	QQ5	0-10	1	Architecture	Concrete	Cast Concrete			
Hist Debris	F3	surf	1	Architecture	Concrete	Concrete with bit of structural clay tile			
NSL #1	ZZZ2 (foundation)	I (Ap)	1	Architecture	Concrete	Concrete with bit of structural clay tile			
NSL #1	ZZZ1 (TR)	0-40	4	Architecture	Concrete		Molded "FF"		
NSL #1	ZZZ1 (TR)	0-40	1	Architecture	Concrete				connect to piece of red tile/brick
Hist Debris	I3	0-15	2	Architecture	Glass	Window Glass	clear		
Hist Debris	OO5	0-20	1	Architecture	Glass	Window Glass	clear		
NSL #1	ZZZ1 (TR)	0-40	36	Architecture	Glass	Window Glass	clear		
NSL #1	ZZZ2 (foundation)	I (Ap)	8	Architecture	Glass	Window Glass	clear		
NSL #1	ZZZ3	surf	16	Architecture	Glass	Window Glass	clear		
Site 15Be681	K9	0-10	2	Architecture	Glass	Window Glass	clear		
Site 15Be681	U9	0-4	1	Architecture	Glass	Window Glass	clear		
NSL #2	O7+15m	0-20	1	Architecture	Glass	Window Glass	clear		
NSL #2	O8	surf	1	Architecture	Glass	Window Glass	clear		
NSL #2	ZZZ2 (TO)	0-30	8	Architecture	Glass	Window Glass	clear		
NSL #2	O8	surf	1	Architecture	Metal	Door handle with door plate			
NSL #2	O8	surf	1	Architecture	Metal	Door handle with full inside lock plate/bolt			
Site 15Be681	U9	0-4	1	Architecture	Metal	Grate			
NSL #2	O8	surf	1	Architecture	Metal	Large Door Hinge with 5 wire nails			
NSL #2	O8	surf	1	Architecture	Metal	Small Hinge with two wire nails			
Hist Debris	OO5	0-20	1	Architecture	Metal	Wire Nail			
Hist Debris	QQ7	0-20	1	Architecture	Metal	Wire Nail			
NSL #1	ZZZ1 (TR)	0-40	1	Architecture	Metal	Wire Nail			
Site 15Be681	K10	0-20	1	Architecture	Metal	Wire Nail			
NSL #1	ZZZ1 (TR)	0-40	1	Architecture	Mortar		sphere		could have been used as marble
NSL #1	ZZZ1 (TR)	0-40	1	Architecture	Plaster/Tile		Molded "IN" or "NI"		
NSL #2	O8	surf	1	Arms	Plastic	Shotgun Shell Casing	green		
Hist Debris	C5	0-21	1	Fuel	Coal				big chunk
Hist Debris	D2	18-28	1	Fuel	Coal				
Site 15Be681	U9	0-4	1	Furniture	Ceramic	Plumbing fixture-sink or toilet	white		
Hist Debris	S4	16	1	Furniture	Metal	Bed Spring			
NSL #1	ZZZ1 (TR)	0-40	5	Job/Activity	Ceramic	Terracota	red		all mend
NSL #1	ZZZ1 (TR)	0-40	1	Job/Activity	Ceramic	Terracota	red		
NSL #2	O7+15m	0-20	1	Job/Activity	Ceramic	Terracota	red		
Site 15Be681	U9	0-4	1	Kitchen	Ceramic	Ironstone	light blue glazed		

Locale	STP	Depth (cmbs)	#	Function Group	Material Type	Material Sub	color/décor	portion	details
Site 15Be681	BB5/BB6	surf	1	Kitchen	Ceramic	Stoneware	gray salt glazed, dk brown interior, large utilitarian		
Site 15Be681	BB5/BB6	surf	3	Kitchen	Ceramic	Stoneware	white glazed, large utilitarian, blue underglaze lettering	side, lip, base	all mend, "Clover Blossom Cottage Cheese"
Site 15Be681	K8	0-20	1	Kitchen	Ceramic	Whiteware	purple transfer print		
Site 15Be681	X7	0-20	4	Kitchen	Ceramic	Whiteware	Undecorated		
Hist Debris	G2	0-15	1	Kitchen	Glass	Bottle Glass	brown		
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	brown	base	"Contents made by the Sinclair MFC CO SIB REC U.S. PAT. OFF. SUNRAE TOLEDO" "Duraglas"
NSL #2	O8	surf	1	Kitchen	Glass	Bottle Glass	brown, 2-part mold, screw lip	whole	"not to be refilled"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	brown, multi-part, screw lip	whole	"Roman Cleanser" "Registered" "One Quart"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	brown, screw lip	mostly whole, side partly broken	"Duraglas"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	brown, stopper lip	whole	"CLOROX"
NSL #2	O8	surf	2	Kitchen	Glass	Bottle Glass	clear	side	print in yellow "Quality Dana Beverage"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, circular	base	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, crimp rim, multi-part mold with pontil	whole	"Universal Milk Bottle Service Inc." "Cincinnati"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, metal screw top	whole	"federal law prohibits sale or re-use of this bottle"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, multi-part, molded top, likely pop off cap	mostly whole, side partly broken	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, multi-part, screw lip	mostly whole, side partly broken	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, narrow, screw lip	top/lip/half body	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, screw lip	whole	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, square	base	"Universal Milk Bottle Service Inc." "Cincinnati"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, thick, rectangular w/ plastic screw lid	whole with cracks	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Bottle Glass	clear, tiny, 2-part mold with pontil	whole	little arrows pointing up in finger placements spots at top
NSL #2	O8	surf	1	Kitchen	Glass	Bottle Glass	Green	base	"not to be refilled"
NSL #2	O8	surf	1	Kitchen	Glass	Glass Jug	clear, 2-part mold, white metal screw cap, jug handle	top/lip	
NSL #2	O8	surf	1	Kitchen	Glass	Jar Glass	clear, 2-part mold, screw lip	whole	"57 Spice Islands"
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Jar Glass	clear, little, multi-part, screw top	whole	
Site 15Be681	BB5/BB6	surf	1	Kitchen	Glass	Jar Glass	clear, screw lip	whole	"Made in U.S.A."
NSL #1	ZZZ3	surf	1	Kitchen	Glass	Vessel Glass	brown, molded	base	"CLOROX"
Site 15Be681	W4	surf	1	Kitchen	Glass	Vessel Glass	brown, molded	whole	"Roman Cleanser", yellow print instructions
Hist Debris	M13	0-20	1	Kitchen	Glass	Vessel Glass	clear		
NSL #1	ZZZ3	surf	1	Kitchen	Glass	Vessel Glass	clear		
Hist Debris	O13	0-28	2	Kitchen	Glass	Vessel Glass	clear, molded		

Appendix B-Artifact Catalog

Locale	STP	Depth (cmbs)	#	Function Group	Material Type	Material Sub	color/décor	portion	details
NSL #2	O8	surf	1	Kitchen	Metal	Aluminum Lid, formerly with pull tab			"please don't litter"
NSL #1	ZZZ3	surf	1	Kitchen	Metal	Pull Tab			
NSL #2	O8	surf	1	Kitchen	Plastic	Plastic Vessel	white	top/lip	
NSL #2	O8	surf	1	Personal	Metal	Bed pan			
IF#1	K16	0-20	1	Prehistoric	Chert	Secondary Flake	Boyle Chert		
NSL #2	K10	0-20	1	Prehistoric	Chert	Tertiary Flake	Boyle Chert		
Site 15Be681	V5	stream	1	Transportation	Metal	Horse Shoe			
Hist Debris	I13	surf	1	Transportation	Metal	Parking sign			"POLICE CARS"
Hist Debris	F12	0-25	7	Unidentified	Metal	Unidentified Rusted Metal			
Hist Debris	M13	0-20	2	Unidentified	Metal	Unidentified Rusted Metal			
Hist Debris	MM6	0-10	1	Unidentified	Metal	Unidentified Rusted Metal			
NSL #1	ZZZ1 (TR)	0-40	2	Unidentified	Metal	Unidentified Rusted Metal			
NSL #1	ZZZ2 (foundation)	I (Ap)	1	Unidentified	Metal	Unidentified Rusted Metal			
Site 15Be681	BB7	0-20	1	Unidentified	Metal	Unidentified Rusted Metal			
Site 15Be681	CC6	0-26	2	Unidentified	Metal	Unidentified Rusted Metal			
Site 15Be681	U4	0-30	2	Unidentified	Metal	Unidentified Rusted Metal			
NSL #2	O8	surf	3	Unidentified	Metal	Unidentified Rusted Metal			
NSL #2	O8	surf	2	Unknown	Metal	Large hinged connectors (2-piece each) with bolts			Possibly for machinery?
NSL #2	O8	surf	2	Unknown	Metal	Metal Rods with Washers			
NSL #2	O8	surf	1	Unknown	Metal	Shoe horn?	red		
NSL #2	O8	surf	1	Unknown	Metal	Small hinged connector (2-piece) with bolts			Possibly for machinery?
NSL #1	ZZZ1 (TR)	0-40	1	Unknown	Plastic		clear		
NSL #2	O8	surf	2	Unknown	Plastic		pink		
NSL #1	ZZZ1 (TR)	0-40	1	Unknown	Plastic		white		
NSL #1	ZZZ1 (TR)	0-40	2	Unknown	Pumice-like				burnt
NSL #1	ZZZ1 (TR)	0-40	1	Unknown	Rubber	Galvanized Rubber	black		
NSL #1	ZZZ1 (TR)	0-40	2	Unknown	Wood				
NSL #1	ZZZ2 (foundation)	I (Ap)	2	Unknown	Wood				
Site 15Be681	U9	0-4	2	Unknown	Wood				

THIS PAGE INTENTIONALLY LEFT BLANK

MATTHEW G. BEVIN
GOVERNOR

DON PARKINSON
SECRETARY

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL
THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

REGINA STIVERS
DEPUTY SECRETARY

CRAIG A. POTTS
EXECUTIVE DIRECTOR
& STATE HISTORIC
PRESERVATION OFFICER

April 20, 2016

Ms. Courtney Stoll
Environment and Archaeology, LLC
221 Main Street
Florence, KY 41042

Re: **REVISED: Phase I Cultural Resources Survey for the Kenton County Airport Board Cincinnati/Northern Kentucky International Airport Site 3C Project in Boone County, Kentucky** prepared byt Andrea Crider and Courtney Stoll of Environment and Archaeology, LLC. Report dated April 6, 2016

Dear Ms. Stoll:

Thank you for the above referenced revised report, received April 8, 2016. This report describes the Phase I investigation of a parcel, designated Site 3C, located on the northeastern side of the Cincinnati/Northern Kentucky Airport. Field investigation consisted of intensive pedestrian survey supplemented by screened shovel probes. As a result of the survey, one new historic archaeological site was defined. Site 15Be681 is a historic habitation site defined primarily on the distribution of artifacts on ground surface. Although the location of this site corresponds to a structure depicted on a 19th Century map, the collected artifacts primarily date to the early to middle 20th Century. Soil conditions across the site were generally disturbed from ground moving activities, and no evidence of intact subsurface feature was identified. The investigators recommended no additional work for this site. We concur with the findings and recommendations of the report.

If the project design or boundaries change, this office should be consulted to determine the nature and extent of additional documentation that may be needed. In the event of the unanticipated discovery of an archaeological site or object of antiquity, the discovery should be reported to the Kentucky Heritage Council and to the Kentucky Office of State Archaeology in the Anthropology Department at the University of Kentucky in accordance with KRS 164.730. In the event that human remains are encountered during project activities, all work should be immediately stopped in the area and the area cordoned off, and in accordance with KRS 72.020 the county coroner and local law enforcement must be contacted immediately. Upon confirmation that the human remains are not of forensic interest, the unanticipated discovery must be reported to the Kentucky Heritage Council.

Should you have any questions, feel free to contact Nick Laracuente of my staff at (502) 564-7005, extension 122.

Sincerely,

Craig A. Potts,
Executive Director and
State Historic Preservation Officer

CP: KHC # 46675-5

#Preservation50: Commemorating the 50th anniversary of the National Historic Preservation Act and the Kentucky Heritage Council 1966-2016

KentuckyUnbridledSpirit.com Kentucky UNBRIDLED SPIRIT An Equal Opportunity Employer M/F/D

THIS PAGE INTENTIONALLY LEFT BLANK

MATTHEW G. BEVIN
GOVERNOR

DON PARKINSON
SECRETARY

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL
THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

REGINA STIVERS
DEPUTY SECRETARY

CRAIG A. POTTS
EXECUTIVE DIRECTOR
& STATE HISTORIC
PRESERVATION OFFICER

June 9, 2016

Mr. Aaron Braswell
Environmental Protection Specialist
Memphis Airports District Office
Federal Aviation Administration
2600 Thousand Oaks Blvd, Suite 2250
Memphis, TN 38118

Re: Determination of Effects
Cincinnati / North Kentucky International Airport (CVG)
Boone County, KY KHC# 46675-5

Dear Mr. Braswell:

Thank you for the information concerning the above referenced project. This proposed undertaking consists of constructing a commercial structure, parking lot, and stormwater facility on the east side of the airfield.

We concur with your assessment that there will be No Historic Properties Affected.

Should the project plans change, or should additional information become available regarding cultural resources or citizens' concerns regarding impacts to cultural resources, please submit that information to our office as additional consultation may be warranted. Should you have any questions, feel free to contact Nick Laracuente of my staff at 502.564.7005, extension 122.

Sincerely,

Craig A. Potts,
Executive Director and
State Historic Preservation Officer

CP:nrl KHC # 46929

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix E

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E

TRAFFIC STUDY

This Appendix includes a copy of the traffic study that was conducted for the Project Sites.

THIS PAGE INTENTIONALLY LEFT BLANK

TRAFFIC IMPACT STUDY
COMMERCIAL WAREHOUSE DEVELOPMENT

Point Pleasant Road, Boone County, Kentucky

Prepared for:

CVG Site 3C

VIOX&VIOX
Civil Engineers, Surveyors, and Landscape Architects
466 Erlanger Road • Erlanger, Kentucky 41018
Ph (859) 727-3293 • Fax (859) 727-8452 • www.vioxinc.com

Prepared By:
Alison S. Chadwell, PE, PTOE
April 25, 2016

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIX

1 INTRODUCTION

The purpose of this Traffic Impact Study (TIS) is to:

Describe and measure the impact of traffic generated by the proposed development on the existing public roadway system, and provide a list of conclusions and recommendations required to fully mitigate such impact.

The proposed development is located along the north side of Point Pleasant Road between Donaldson Highway (KY236) and Interstate 275. Per the current Kentucky Transportation Cabinet guidelines, the next intersections within 4800 linear feet were evaluated for opening year conditions (2017), future no build conditions (2027 No Build) and future build conditions (2027 Build). The site is a proposed land lease of property owned by the Kenton County Airport Board (the controlling board of the Cincinnati/Northern Kentucky International Airport). It should be noted that while there is a subdivision on the south boundary of Point Pleasant Road, the access points to this area were considered negligible because the majority of those lots are also owned by the Kenton County Airport Board and are no longer residential.

Figure 1 – Development Site Location Map

2 SCOPE OF WORK

Preliminary discussions were held with the staff at District 6, Kentucky Transportation Cabinet (KYTC) concerning the required work tasks associated with traffic analysis for the proposed development site. It was determined the traffic analysis would be focused on two critical intersections:

- Point Pleasant Road and Donaldson Highway
- Point Pleasant Road and Airport Exchange Boulevard

The study area is shown in Figure 1.

The following work tasks were performed as part of this study:

1. **Meeting/discussions with Project Team, KYTC, and/or public agencies –**Discussions and/or meetings were held with the various jurisdictional agencies and interested parties for the purpose of the establishment of details of scope of work and technical traffic engineering analysis methodology.

2. **Existing traffic conditions –** A site reconnaissance was conducted for the purpose of identifying aspects of ingress/egress and important roadway characteristics on Point Pleasant Road. Included in the reconnaissance was traffic lane geometry and utilization, pavement width, roadway characteristics, posted speed limit, traffic controls, signage, applicable Manual of Uniform Traffic Control Devices standards, lighting, and any potential safety issues related to intersection sight distance.

   Existing peak hour turning movements were counted for the weekday morning (7:00 – 9:00 am) and evening (4:30- 6:30 pm) time periods at the two study area intersections.

   Opening day for the Build scenarios will be the year 2017. Existing turning movement counts were assumed as opening day traffic volumes.

3. **New traffic volumes and distribution of trips –**Trip volumes were estimated for full Build out of the Development. These trips were calculated by using the Institute of Transportation Trip Generation Manual (Ninth Edition). New trip turning movements for vehicles were assigned to the adjacent street system using demographic information and existing traffic flow distribution.

4. **Turn Lane Warrant Analysis -** The need for exclusive left turn and right turn lanes was investigated at the intersection of the Point Pleasant Rd and Donaldson Hwy.

5. **Projected Year Traffic-** The analysis was completed for the opening day, year 2017 No-Build and Build scenarios as well as 10 years projected traffic, 2027 No-Build and Build scenarios. Future year 2027, No-Build and Build, traffic volumes were estimated by applying a regional growth factor to year 2015 traffic volumes. Although traffic has been decreasing for roughly the past ten years, the generally accepted growth rate for this area is 1.5% annually, as noted by OKI.

6. **Level of Service Analysis -** Both of the intersections in the study area were analyzed for morning and evening peak hour traffic volumes for each of the Build and No Build scenarios.

7. **Traffic Impact Study Report –** The TIS report was prepared describing the methodology used for the traffic analysis. The report includes appropriate traffic engineering analysis, conclusions, and recommendations to fully mitigate any potential adverse traffic impacts. The report full conforms to the regulations and standards adopted by KYTC

The report will provide an opinion about the impact of the Development traffic volumes on the existing roadway and overall traffic operations. The report will recommend any necessary roadway and traffic control improvements necessary to fully mitigate the impact of the new traffic.

The final report will be submitted to the KYTC for review and approval.

3 EXISTING AREA CONDITIONS

Point Pleasant Road provides access to I-275 via Airport Exchange Industrial Park and Mineola Pike. Donaldson Highway provides access to I-75 and I-275 to the south and to I-275 to the north.

Point Pleasant Road is a two lane roadway with a posted speed limit of 35 mph. In the vicinity of the proposed site development, Point Pleasant is generally flat and straight. The intersection of Point Pleasant Road to the west of the site is with Donaldson Hwy (KY 236), a two lane, 50 mph urban arterial roadway, at a one-way stop controlled T-intersection. There are currently no turn lanes on either Point Pleasant Road or Donaldson Hwy. The site is bound on the east by I-275. There is no direct access to I-275, but there is an existing overpass.

The intersection analyzed to the east is approximately 1700 feet from the proposed site and is a four-way stop controlled intersection. The intersection is a four leg approach with various exclusive and/or shared turn lane configurations. (See the attached HCS AWST Intersection reports for lane configurations.)

Manual turning movement counts were taken at the two intersections in early March, 2016. The turning movement counts were conducted during the morning hours (7:00-9:00) and the afternoon hours (4:30-6:30). The PM count was adjusted from the normal criteria to account for the typical 9:00 am to 6:00 pm shift at BlueStar, which is located between the site and the analyzed intersection. The highest 60 minute period was selected as the peak hour. Peak hours are 7:15 – 8:15 AM and 4:45 – 5:45 PM.

Truck classification counts were also conducted for the approaches at each intersection. Trucks, as a percent of the total vehicle stream were:

Point Pleasant and Donaldson: 7%
Point Pleasant and Airport Exchange Blvd: 4%

4 PROPOSED SITE DEVELOPMENT

The proposed development is a combination Warehouse/Office located at the intersection of Point Pleasant Road and Donaldson Highway, Boone County, Kentucky.

The total building area is anticipated to be 264,000 sf with approximately 250,800 sf of warehouse area and 13,200 sf of office space. There will be 70 spaces for trailer parking, up to 55 dock doors in the truck court, and approximately 229 spaces for employee/visitor parking. Maximum shift employment is estimated will be about 140 employees. There will be two, full-access, driveways serving the site (see Figure 1) from Point Pleasant Road and will provide access for both trucks and autos.

Trip Generations for the proposed site were estimated utilizing the Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition) average trip rates. As is typical for this type of development in the area Land Use Code #152 High-Cube Warehouse, was used for final estimates.

Table 1. Estimated New Site Trips

High-Cube 264,000 sf

	ADT	Enter	Exit	AM Peak	Enter	Exit	PM Peak	Enter	Exit
Truck Only	168	84	84	8	6	2	11	4	7
Autos	276	138	138	29	20	9	31	12	19
Total Trips	**444**	**222**	**222**	**37**	**26**	**11**	**42**	**16**	**26**

The observed 2016 No-Build peak hour trips were used as the basis to project No-Build AM and PM peak hour volumes for the years 2017 & 2027 based on background regional growth. The above noted trip generation was then added to the No Build data to generate the Build model. The percent of trucks for the 2027 Build conditions was calculated on percentages for a High-Cube type development because this model best delineates the percentage of trucks to passenger vehicles.

Projected truck volumes, as a percentage of the vehicle stream for future build conditions were:

Point Pleasant and Donaldson: 10%
Point Pleasant and Airport Exchange Blvd: 7%

Figures 2 & 3 show the resulting 2017 AM/PM traffic volumes for No Build conditions.

Figures 4 & 5 show the resulting 2017 AM/PM traffic volumes for Build conditions.

Figures 6 & 7 show the resulting 2027 AM/PM traffic volumes for No Build conditions.

Figures 8 & 9 show the resulting 2027 AM/PM traffic volumes for Build conditions.

Peak hour turning movement counts, forecasted volumes and Level of Service for each scenario are shown in the traffic analysis section.

5 TRAFFIC ANALYSIS

Capacity Analysis

A capacity analysis was performed for the study area intersections as indicated in the previous sections of this report. All the analyses were completed for existing conditions/opening day traffic using Highway Capacity Software (HCS). Capacity of an intersection is quantified by the Level of Service (LOS) which is based upon the amount of delay a vehicle experiences while at a particular intersection. The criterion for unsignalized intersections is listed below as defined in Chapter 19 of the most recent Highway Capacity Manual (HCM 2010), Volume 3.

Table 2. Level of Service Criteria

Unsignalized Intersection LOS Criteria (Exhibit 19-1 HCM)	
LOS	**Control Delay per Vehicle (seconds/vehicle)**
A	*< 10*
B	*>10 – 15*
C	*>15 – 25*
D	*>25 – 35*
E	*>35 – 50*
F	*>50*

The following is a list of code definitions that are used in the capacity analysis results:

- EB/WB/NB/SB – Eastbound/Westbound/Northbound/Southbound
- L – Left Turn Movement (exclusive left-turn lane or lanes)
- T – Through Movement (exclusive through lane or lanes)
- R – Right Turn Movement (exclusive right turn lane or lanes)
- LT– Shared left turn and through movement lane
- LTR – This provides movements in all directions
- TR – Shared through and right turn movement lane

Table 3. Intersection Summary – Donaldson Hwy Peak AM Trips

Point Pleasant Road at Donaldson Hwy

AM	Point Pleasant Drive Westbound			Donaldson Hwy Northbound			Donaldson Hwy Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2016 Existing	5	0	22	0	292	47	75	267	0
2017 No Build	6	0	23	0	297	48	77	272	0
2017 No Build LOS	**B (12.4s)**			**N/A**			**A (8.4s)**		
Trips Generated By Development	5	0	5	0	0	12	12	0	0
2017 Build	11	0	28	0	297	60	89	272	0
2017 Build LOS	**B (13.4s)**			**N/A**			**A (8.5s)**		
2027 No Build	7	0	27	0	345	56	90	316	0
2027 No Build LOS	**B (13.6s)**			**N/A**			**A (8.6s)**		
2027 Build	**12**	**0**	**32**	**0**	**345**	**68**	**102**	**316**	**0**
2027 Build LOS	**B (14.8s)**			**N/A**			**A (8.7s)**		

Table 4. Intersection Summary – Airport Exchange Boulevard Peak AM Trips

Point Pleasant Road at Airport Exchange Blvd.

	EB			WB			NB			SB		
AM	Point Pleasant Drive From South			Point Pleasant Drive From North			Airport Exchange Road From East			Arbor Tech Drive From West		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2016 Existing	32	6	69	4	9	4	54	105	1	0	14	9
2017 No Build	33	7	71	5	10	5	55	107	2	0	15	10
2017 No Build LOS	**A (7.9s)**			**A (8.0s)**			**A (8.5s)**			**A (7.6s)**		
Trips	0	0	1	0	0	0	2	0	0	0	0	0
2017 Build	33	7	72	5	10	5	57	107	2	0	15	10
2017 Build LOS	**A (7.9s)**			**A (8.0s)**			**A (8.5s)**			**A (7.6s)**		
2027 No Build	39	9	83	6	12	6	64	125	3	0	18	12
2027 No Build LOS	**A (8.1s)**			**A (8.1s)**			**A (8.8s)**			**A (7.8s)**		
2027 Build	**39**	**9**	**84**	**6**	**12**	**6**	**66**	**125**	**3**	**0**	**18**	**12**
2027 Build LOS	**A (8.2s)**			**A (8.2s)**			**A (8.8s)**			**A (7.8s)**		

Table 5. Intersection Summary – Donaldson Hwy Peak PM Trips

Point Pleasant Road at Donaldson Hwy

PM	**Point Pleasant Drive Westbound**			**Donaldson Hwy Northbound**			**Donaldson Hwy Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2016 Existing	60	0	61	0	317	17	20	280	0
2017 No Build	61	0	62	0	322	18	21	285	0
2017 No Build LOS	**C (15.9s)**			**N/A**			**A (8.2s)**		
Trips	11	0	12	0	0	8	7	0	0
2017 Build	72	0	74	0	322	26	28	285	0
2017 Build LOS	**C (15.1s)**			**N/A**			**A (8.2s)**		
2027 No Build	71	0	72	0	374	21	25	331	0
2027 No Build LOS	**C (16.2s)**			**N/A**			**A (8.4s)**		
2027 Build	**82**	**0**	**84**	**0**	**374**	**29**	**32**	**331**	**0**
2027 Build LOS	**C (22s)**			**N/A**			**A (8.4s)**		

Table 6. Intersection Summary – Airport Exchange Boulevard Peak PM Trips

Point Pleasant Road at
Airport Exchange Blvd.

	EB			WB			NB			SB		
PM	Point Pleasant Drive From South			Point Pleasant Drive From North			Airport Exchange Road From East			Arbor Tech Drive From West		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2016 Existing	4	14	56	3	5	0	57	14	8	10	121	33
2017 No Build	5	15	57	4	6	0	58	15	9	11	123	34
2017 No Build LOS	**A (7.8s)**			**A (8.2s)**			**A (8.3s)**			**A (8.6s)**		
Trips	0	0	3	0	0	0	1	0	0	0	0	0
2017 Build	5	15	60	4	6	0	59	15	9	11	123	34
2017 Build LOS	**A (7.8s)**			**A (8.2s)**			**A (8.3s)**			**A (8.6s)**		
2027 No Build	6	18	67	5	7	0	68	18	11	13	143	40
2027 No Build LOS	**A (8.0s)**			**A (8.4s)**			**A (8.5s)**			**A (9.0s)**		
2027 Build	**6**	**18**	**70**	**5**	**7**	**0**	**69**	**18**	**11**	**13**	**143**	**40**
2027 Build LOS	**A (8.2s)**			**A (8.4s)**			**A (8.6s)**			**A (8.8s)**		

Figure 2 – 2017 No Build AM Peak Traffic Movements

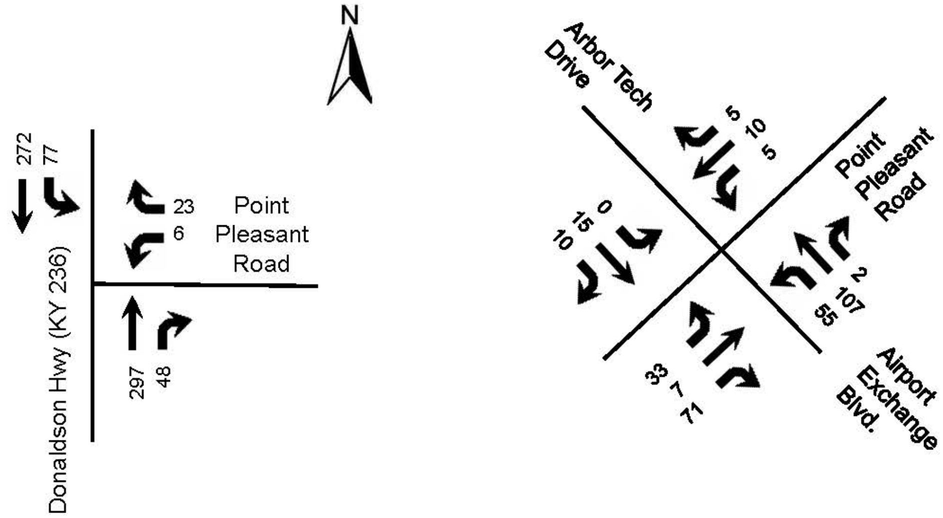


Figure 3 – 2017 No Build PM Peak Traffic Movements

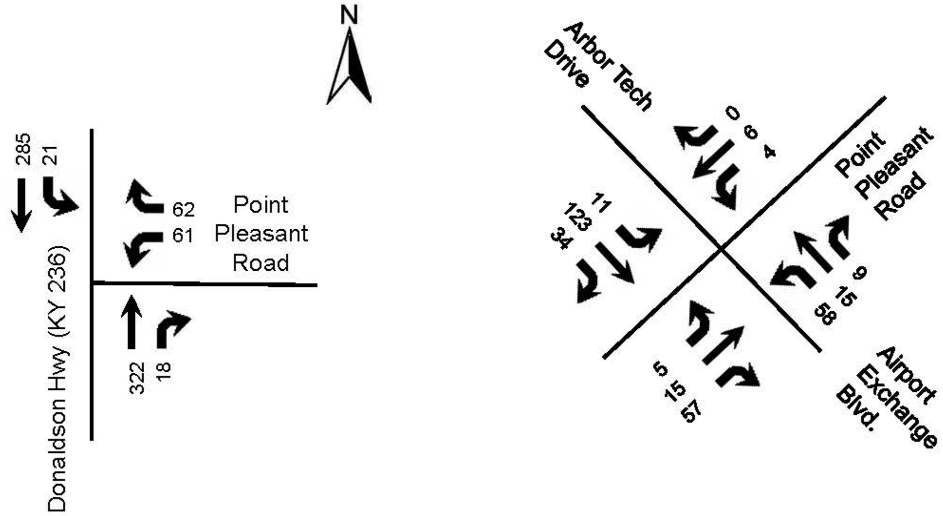
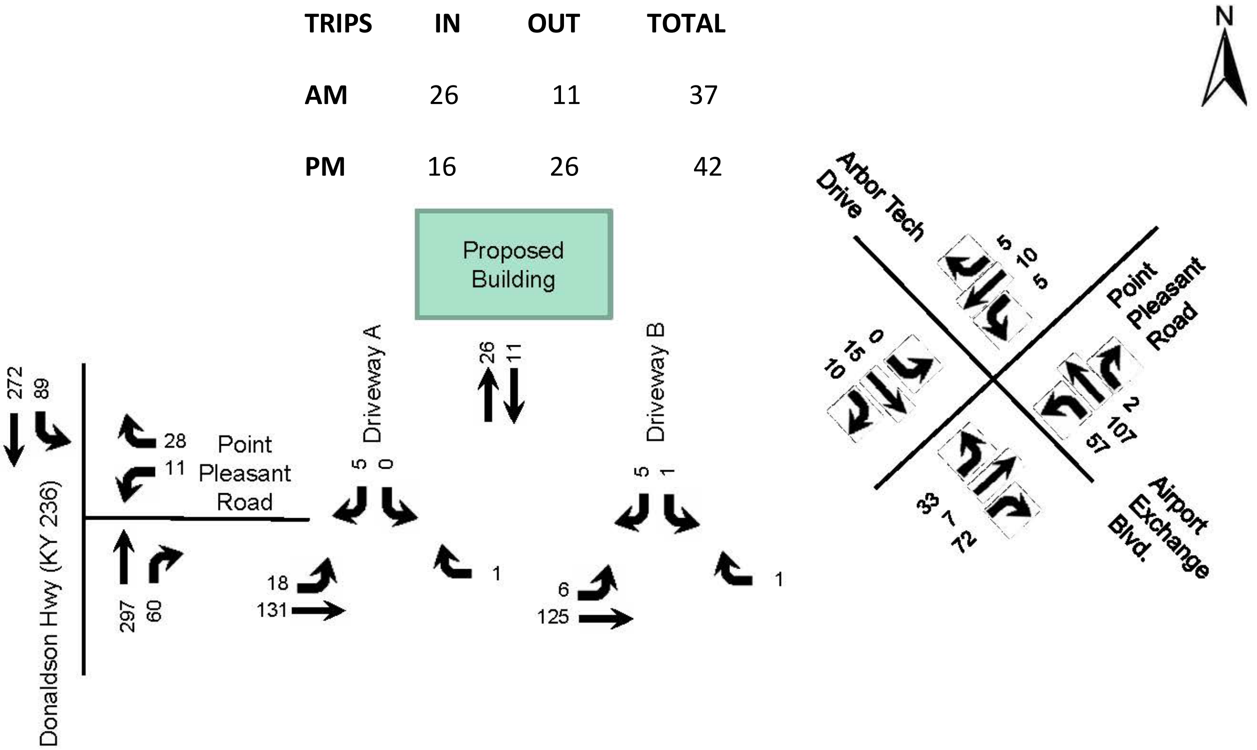


Figure 4 – 2017 AM Build Peak Traffic Movements



TRIPS	IN	OUT	TOTAL
AM	26	11	37
PM	16	26	42

Figure 5 – 2017 PM Build Peak Traffic Movements

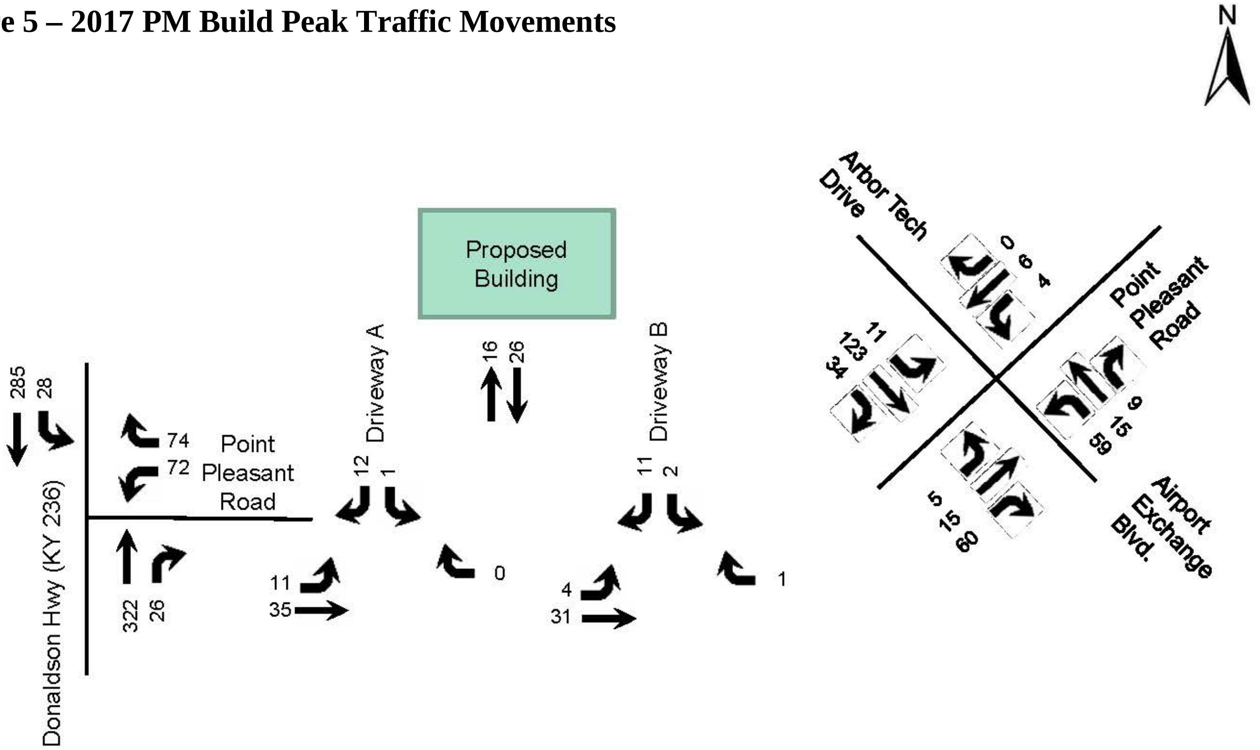


Figure 6 – 2027 AM No Build Peak Traffic Movements

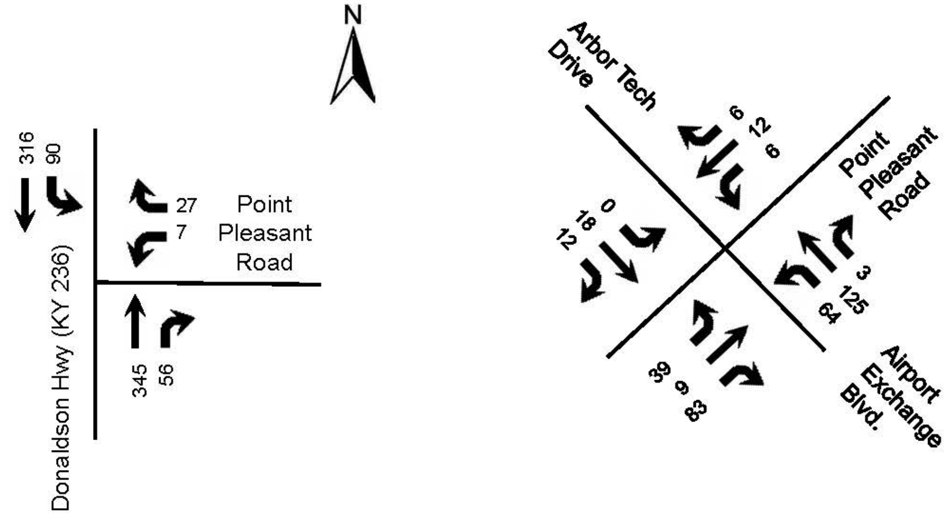


Figure 7 – 2027 PM No Build Peak Traffic Movements

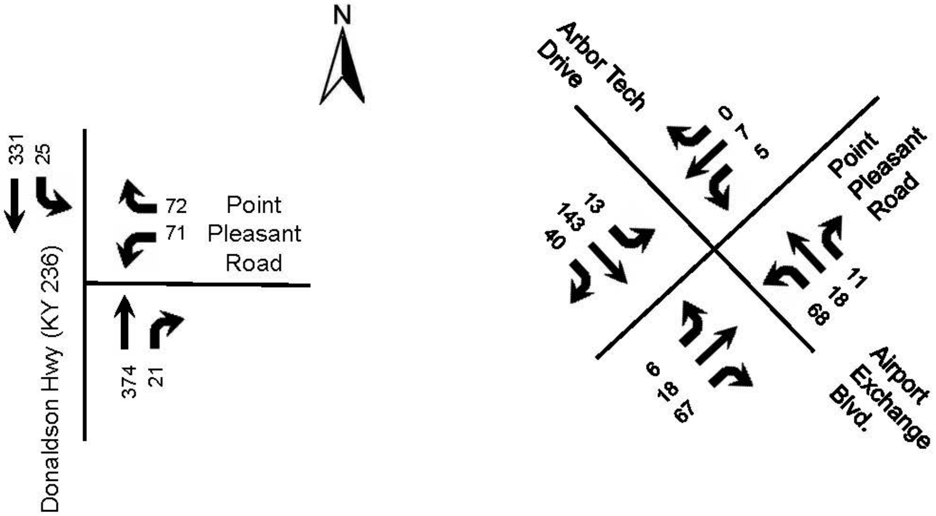
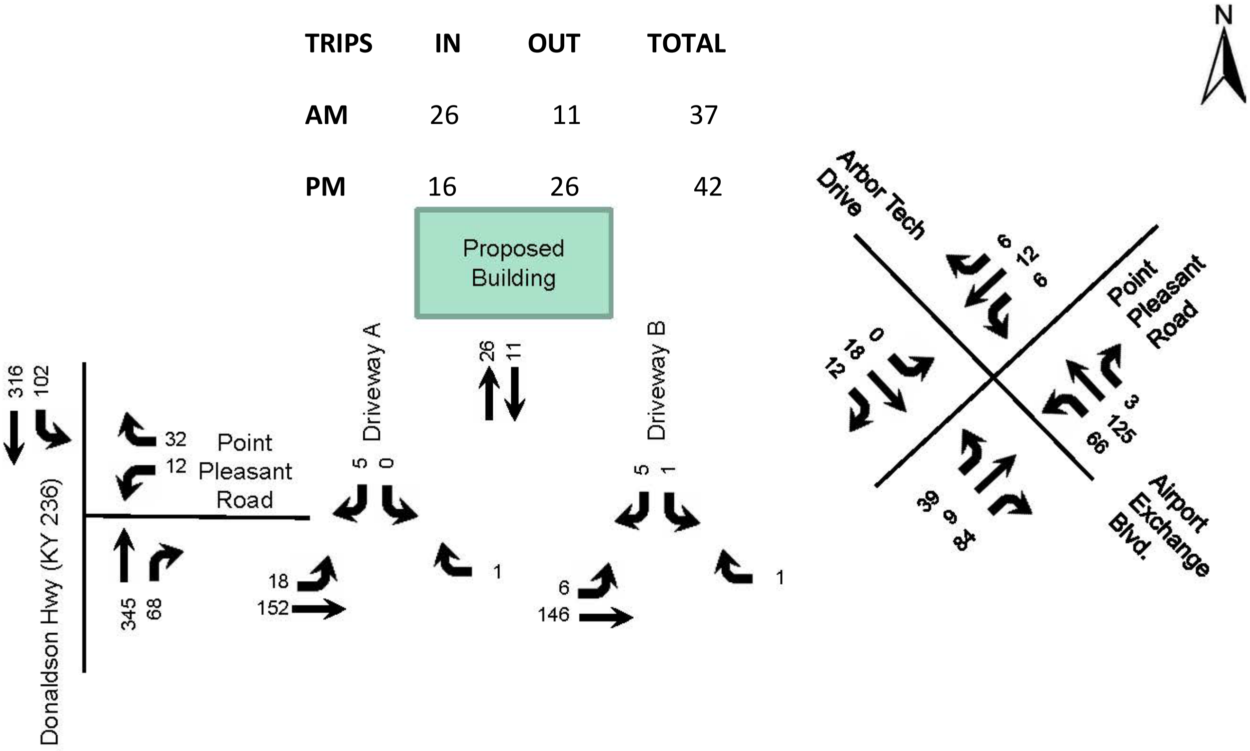
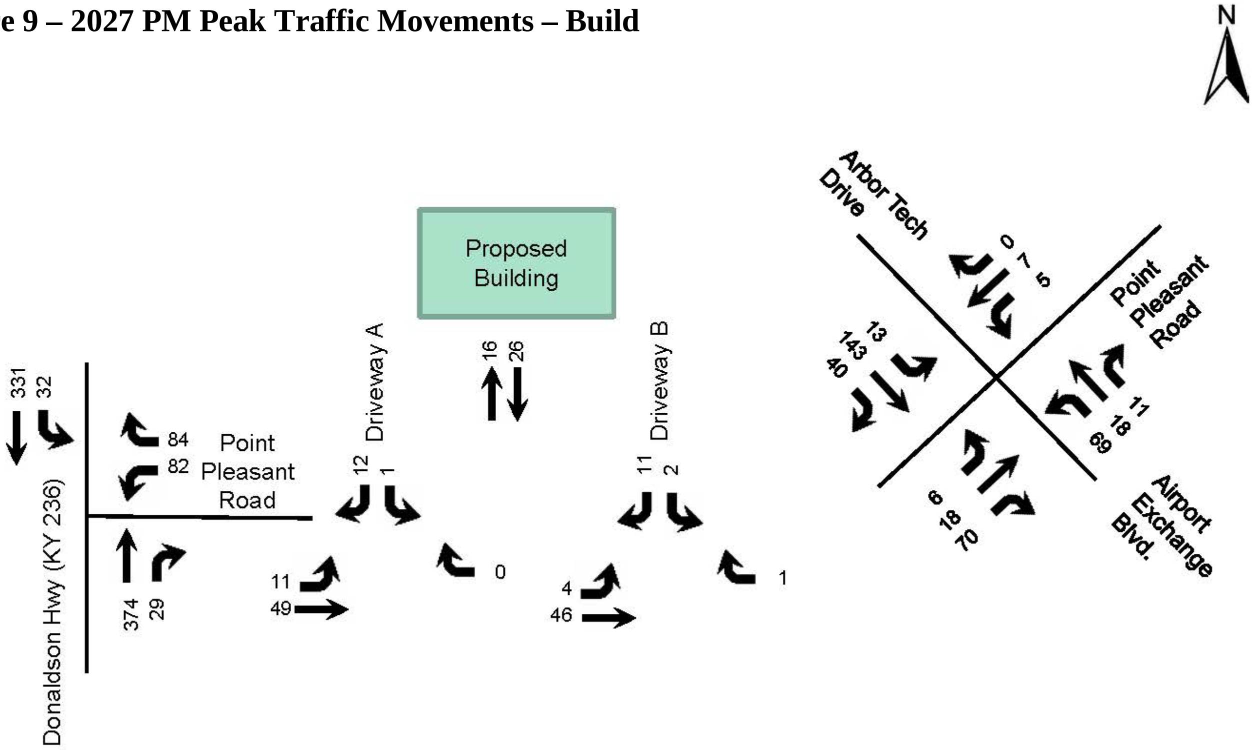


Figure 8 – 2027 AM Peak Traffic Movements – Build



TRIPS	IN	OUT	TOTAL
AM	26	11	37
PM	16	26	42

Figure 9 – 2027 PM Peak Traffic Movements – Build



Exclusive Turn Lane Warrant Analysis

Intersection of Point Pleasant Road and Donaldson Hwy

Table 7. Donaldson Hwy Improvement Summary

Design Profile	Southbound Left Turn Lane	Length	Northbound Right Turn Lane	Length
2017 No Build AM	WARRANTED	275	NOT WARRANTED	NA
2017 No Build PM	NOT WARRANTED	NA	NOT WARRANTED	NA
2017 Build AM	WARRANTED	275	NOT WARRANTED	NA
2017 Build PM	NOT WARRANTED	NA	NOT WARRANTED	NA
2027 No Build AM	WARRANTED	275	NOT WARRANTED	NA
2027 No Build PM	NOT WARRANTED*	NA	NOT WARRANTED	NA
2027 Build AM	WARRANTED	275	NOT WARRANTED	NA
2027 Build PM	WARRANTED	275	NOT WARRANTED	NA

* This data point in on the decision line for warrant.

A southbound left turn lane is currently warranted for the AM peak hour and will continue to be warranted with or without the development of this project. It is not currently warranted in the PM peak. The KYTC turn lane warrant plots a data point along a decision line to determine if the lane is warranted; for the 2027 No Build PM analysis, the data point is on the “warranted” side of the decision line, but the output is “not warranted”. The left turn lane is warranted for the 2027 Build PM peak condition. Due to the inconsistency in the data, it appears that the turn lane will be warranted as a result of growth in the area, and not due to the development.

A northbound right turn lane is not warranted for any of the analysis periods.

Point Pleasant Improvements at Donaldson Hwy.

The maximum 95% Queue Length for the 2027 Build conditions results is 2.7 or 3 vehicles. There is approximately 330’ from the intersection to the first driveway along the westbound side of Point Pleasant and would provide adequate storage without modification to this approach.

Intersection of Point Pleasant Road and Airport Exchange Blvd

The Level of Service analysis shows that this intersection will operate at satisfactory LOS A all Build conditions in 2017 and 2027. No additional lane improvements will be necessary as a result of the new site traffic.

6 FINDINGS

Previous sections of this report presented a detailed analysis of traffic conditions related to the No Build and Build scenarios for the proposed development.

Level of Service Analysis

The Level of Service analysis in Section 5 of this report showed acceptable LOS for 2017 and 2027 Build conditions for both AM and PM periods for both intersections within the study area. No additional improvements, roadway widening, or change in existing traffic control related to anticipated capacity efficiency will be necessary in order to accommodate the increased traffic associated with the proposed development.

Exclusive Turn Lanes

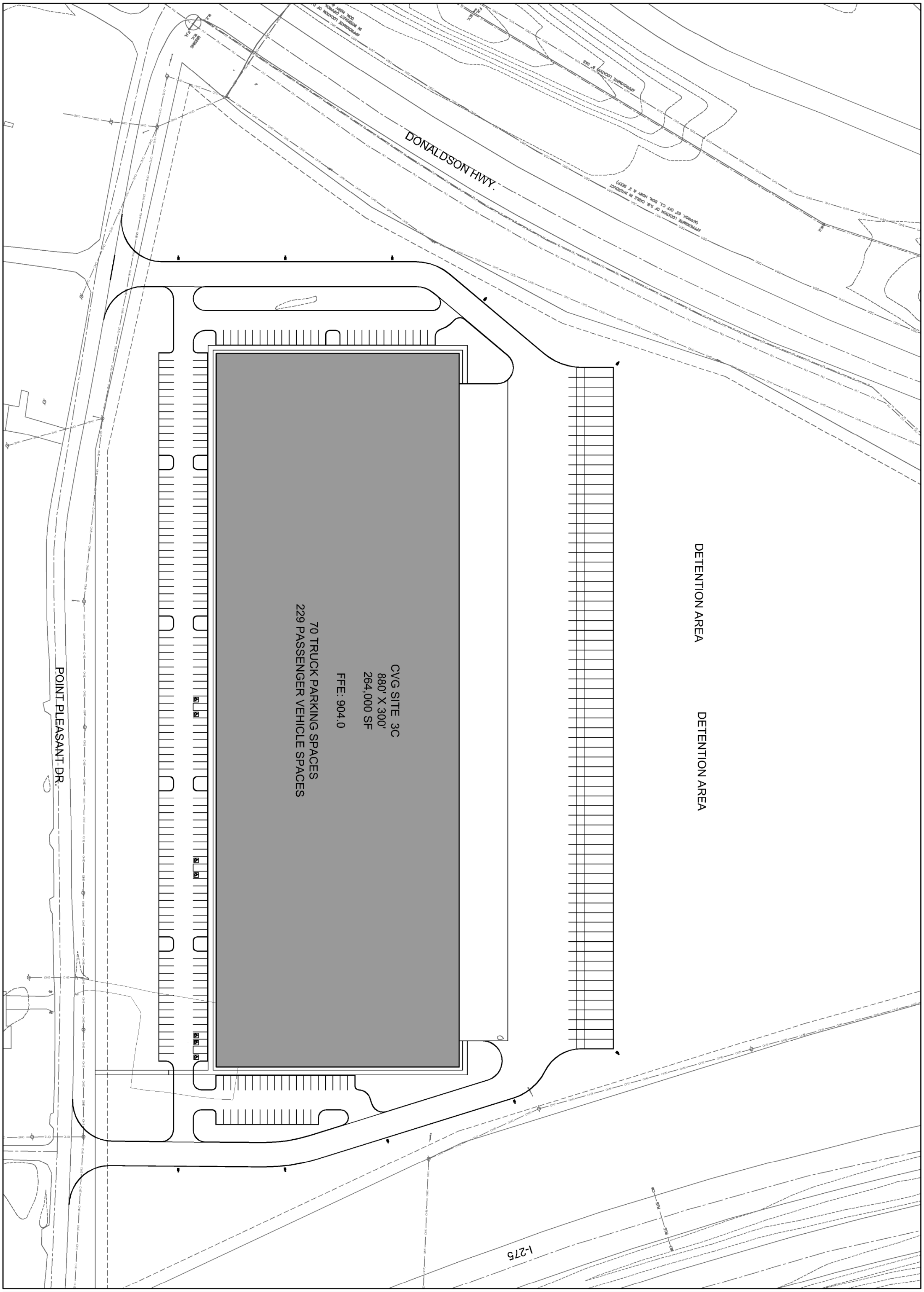
The provision of separate turn lanes is an important part of traffic operations and control on the public highway system. The warrants for exclusive turn lanes were tested for the intersection of Donaldson and S. Airfield. No turn lanes were directly warranted as a result of this project and are not planned for construction at this time.

Traffic Control and Design Standards

All driveway construction, including lane width and curb return radius should be consistent with KYTC design standards.

APPENDIX A

Site Plan



Sheet:

CVG Site 3C

POINT PLEASANT ROAD
UNINCORPORATED BOONE CO, KENTUCKY

VIOX&VIOX
Civil Engineers, Surveyors, and Landscape Architects
466 Erlanger Road • Erlanger, Kentucky 41018
Ph (859)727-3293 • Fax (859) 727-8452 • www.vioxinc.com

Project No:	Design By:	Approval:	Approval:	Approval:	Approval:
Date: 01/15/2016	Review By:	Plot Stamp:			

Stamp

Item	Revision	Date	By	Chk.

CVG
CINCINNATI/NORTHERN KENTUCKY INTERNATIONAL AIRPORT

SCALE: 1" = 50
0
50
75

N

APPENDIX B

Traffic Count Data

VIOX&VIOX
Civil Engineers, Surveyors, and Landscape Architects
466 Erlanger Road • Erlanger, Kentucky 41018
Ph (859) 727-3293 • Fax (859) 727-8452 • www.vioxinc.com

Cummins Consulting Services, PLLC

4661 Marlberry Place
Lexington, KY 40509
859.361.2589
"simplifying Data Collection since 2004"

Partly Clouydy - 30 Degrees
KCPS in Session

File Name : Donaldson_at_Point_Pleasant_296327_03-02-2016
Site Code : Site 1
Start Date : 3/2/2016
Page No : 1

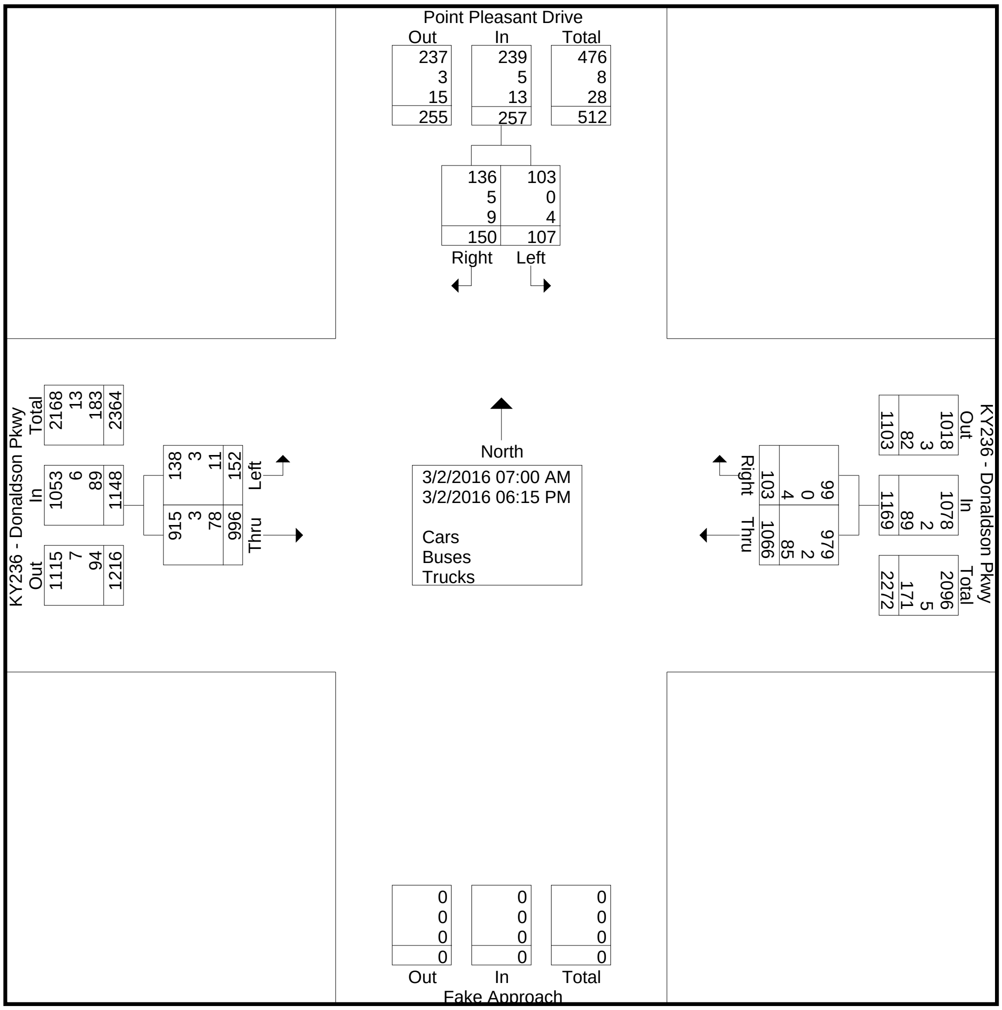
Groups Printed- Cars - Buses - Trucks

	Point Pleasant Drive From North			KY236 - Donaldson Pkwy From East			KY236 - Donaldson Pkwy From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
07:00 AM	4	9	13	47	2	49	4	65	69	131
07:15 AM	0	4	4	65	8	73	11	76	87	164
07:30 AM	1	10	11	79	11	90	17	65	82	183
07:45 AM	1	2	3	82	20	102	29	61	90	195
Total	6	25	31	273	41	314	61	267	328	673
08:00 AM	3	6	9	66	8	74	18	65	83	166
08:15 AM	1	4	5	62	8	70	14	46	60	135
08:30 AM	1	2	3	34	9	43	8	40	48	94
08:45 AM	3	2	5	33	4	37	8	29	37	79
Total	8	14	22	195	29	224	48	180	228	474
04:30 PM	9	8	17	88	5	93	3	96	99	209
04:45 PM	9	12	21	68	4	72	6	62	68	161
Total	18	20	38	156	9	165	9	158	167	370
05:00 PM	23	26	49	79	10	89	9	78	87	225
05:15 PM	11	11	22	79	0	79	3	72	75	176
05:30 PM	17	12	29	91	3	94	2	68	70	193
05:45 PM	9	9	18	65	4	69	6	63	69	156
Total	60	58	118	314	17	331	20	281	301	750
06:00 PM	13	26	39	70	4	74	6	57	63	176
06:15 PM	2	7	9	58	3	61	8	53	61	131
Grand Total	107	150	257	1066	103	1169	152	996	1148	2574
Apprch %	41.6	58.4		91.2	8.8		13.2	86.8		
Total %	4.2	5.8	10	41.4	4	45.4	5.9	38.7	44.6	
Cars	103	136	239	979	99	1078	138	915	1053	2370
% Cars	96.3	90.7	93	91.8	96.1	92.2	90.8	91.9	91.7	92.1
Buses	0	5	5	2	0	2	3	3	6	13
% Buses	0	3.3	1.9	0.2	0	0.2	2	0.3	0.5	0.5
Trucks	4	9	13	85	4	89	11	78	89	191
% Trucks	3.7	6	5.1	8	3.9	7.6	7.2	7.8	7.8	7.4

Cummins Consulting Services, PLLC

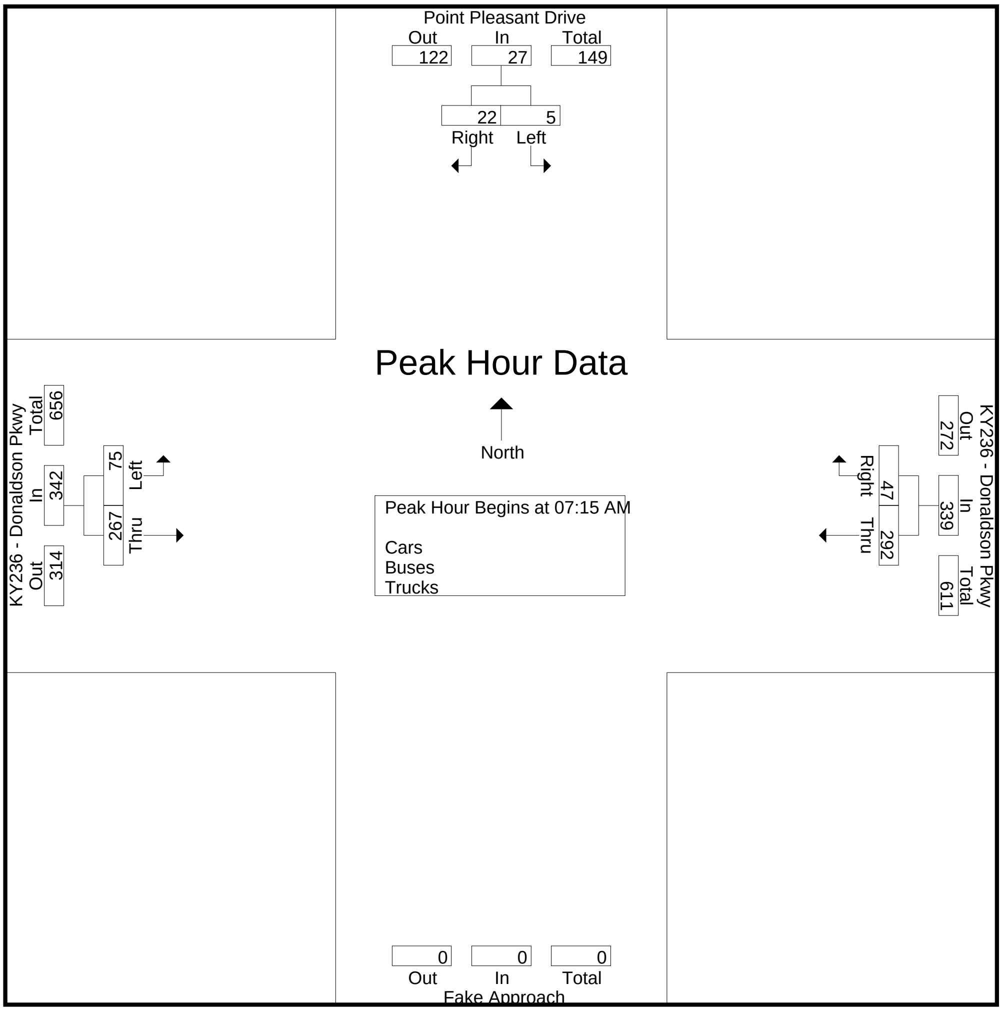
4661 Marlberry Place
Lexington, KY 40509
859.361.2589
"simplifying Data Collection since 2004"

File Name : Donaldson_at_Point_Pleasant_296327_03-02-2016
Site Code : Site 1
Start Date : 3/2/2016
Page No : 2



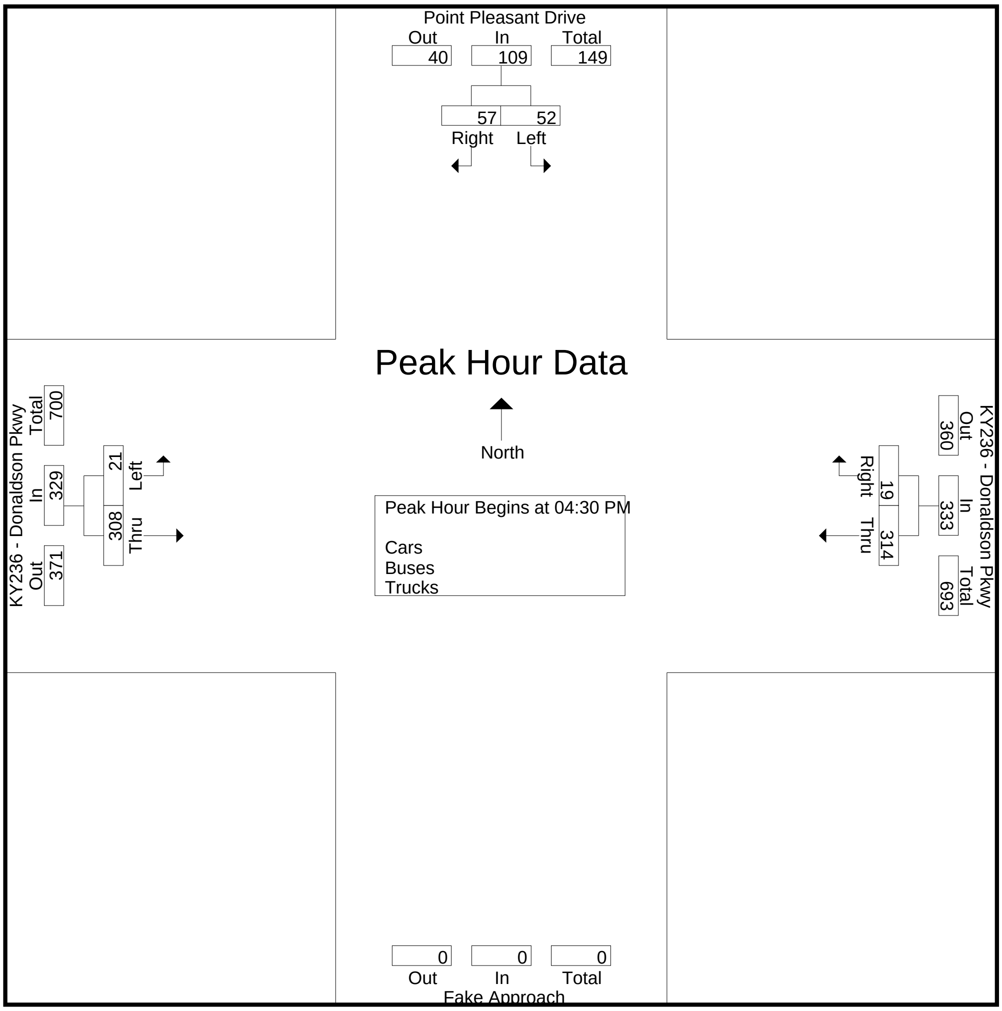
File Name : Donaldson_at_Point_Pleasant_296327_03-02-2016
Site Code : Site 1
Start Date : 3/2/2016

	Point Pleasant Drive From North			KY236 - Donaldson Pkwy From East			KY236 - Donaldson Pkwy From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15 AM										
07:15 AM	0	4	4	65	8	73	11	**76**	87	164
07:30 AM	1	**10**	**11**	79	11	90	17	65	82	183
07:45 AM	1	2	3	**82**	**20**	**102**	**29**	61	**90**	**195**
08:00 AM	**3**	6	9	66	8	74	18	65	83	166
Total Volume	5	22	27	292	47	339	75	267	342	708
% App. Total	18.5	81.5		86.1	13.9		21.9	78.1		
PHF	.417	.550	.614	.890	.588	.831	.647	.878	.950	.908



File Name : Donaldson_at_Point_Pleasant_296327_03-02-2016
Site Code : Site 1
Start Date : 3/2/2016
Page No : 4

	Point Pleasant Drive From North			KY236 - Donaldson Pkwy From East			KY236 - Donaldson Pkwy From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	9	8	17	**88**	5	**93**	3	**96**	**99**	209
04:45 PM	9	12	21	68	4	72	6	62	68	161
05:00 PM	**23**	**26**	**49**	79	**10**	89	**9**	78	87	**225**
05:15 PM	11	11	22	79	0	79	3	72	75	176
Total Volume	52	57	109	314	19	333	21	308	329	771
% App. Total	47.7	52.3		94.3	5.7		6.4	93.6		
PHF	.565	.548	.556	.892	.475	.895	.583	.802	.831	.857



Cummins Consulting Services, PLLC

4661 Marlberry Place
Lexington, KY 40509
859.361.2589
"simplifying Data Collection since 2004"

Partly Cloudy - 30 Degrees
KCPS in Session

File Name : Airport_Exchange_at_Point_Pleasant__296328_03-02-2016
Site Code : Site 2
Start Date : 3/2/2016
Page No : 1

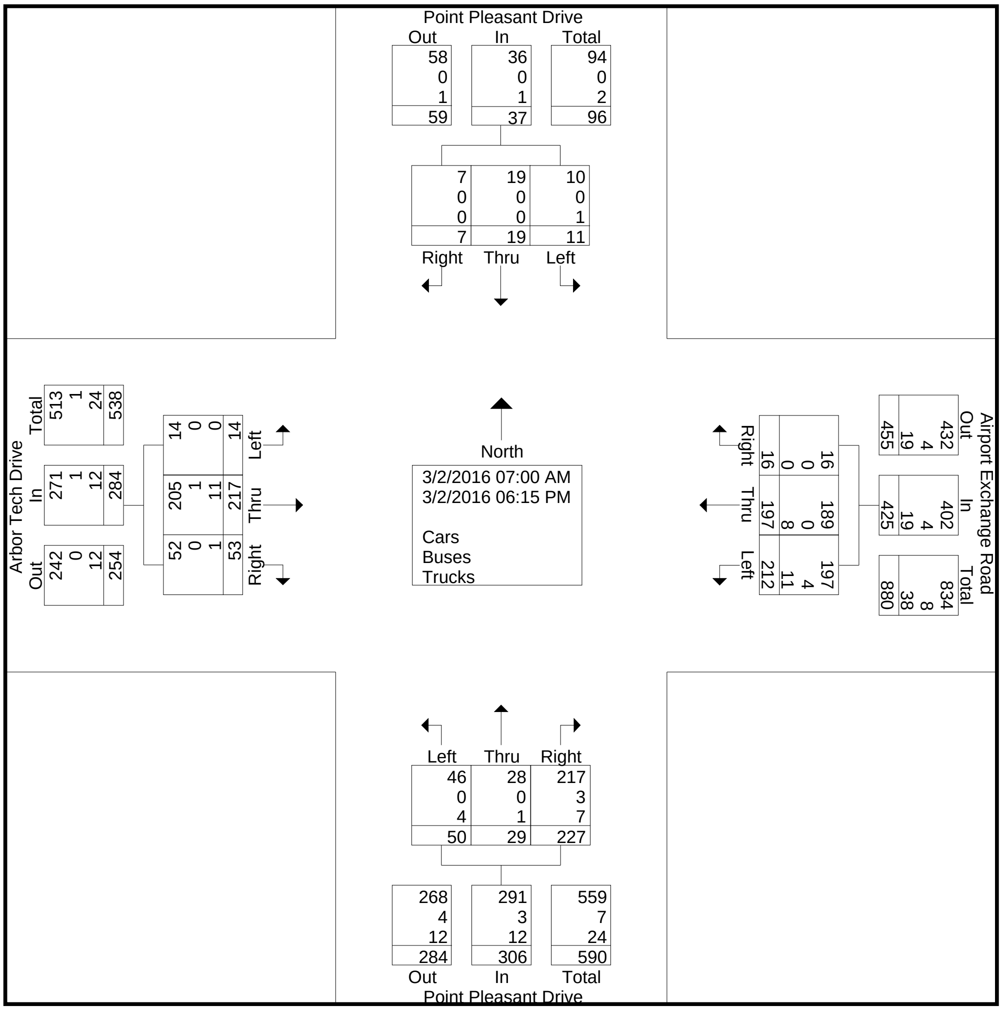
Groups Printed- Cars - Buses - Trucks

	Point Pleasant Drive From North				Airport Exchange Road From East				Point Pleasant Drive From South				Arbor Tech Drive From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	0	0	0	12	15	0	27	2	1	8	11	0	3	1	4	42
07:15 AM	1	0	1	2	6	28	0	34	6	2	8	16	1	3	0	4	56
07:30 AM	1	3	0	4	12	29	0	41	2	2	15	19	0	4	0	4	68
07:45 AM	0	3	4	7	13	26	1	40	13	2	30	45	0	5	3	8	100
Total	2	6	5	13	43	98	1	142	23	7	61	91	1	15	4	20	266
08:00 AM	3	3	0	6	16	28	0	44	10	0	15	25	0	2	2	4	79
08:15 AM	0	0	0	0	13	22	0	35	7	2	9	18	0	3	4	7	60
08:30 AM	2	0	0	2	16	8	0	24	2	0	7	9	0	10	0	10	45
08:45 AM	0	1	0	1	30	15	0	45	3	0	4	7	0	8	1	9	62
Total	5	4	0	9	75	73	0	148	22	2	35	59	0	23	7	30	246
04:30 PM	1	2	0	3	10	2	1	13	0	2	6	8	0	22	4	26	50
04:45 PM	1	0	0	1	16	5	2	23	1	3	8	12	2	18	5	25	61
Total	2	2	0	4	26	7	3	36	1	5	14	20	2	40	9	51	111
05:00 PM	0	3	0	3	18	3	3	24	2	7	20	29	6	55	19	80	136
05:15 PM	2	2	0	4	12	0	2	14	1	0	11	12	1	24	7	32	62
05:30 PM	0	0	0	0	11	6	1	18	0	4	17	21	1	24	2	27	66
05:45 PM	0	2	2	4	12	5	3	20	0	0	11	11	2	13	2	17	52
Total	2	7	2	11	53	14	9	76	3	11	59	73	10	116	30	156	316
06:00 PM	0	0	0	0	12	1	3	16	1	1	49	51	0	14	2	16	83
06:15 PM	0	0	0	0	3	4	0	7	0	3	9	12	1	9	1	11	30
Grand Total	11	19	7	37	212	197	16	425	50	29	227	306	14	217	53	284	1052
Apprch %	29.7	51.4	18.9		49.9	46.4	3.8		16.3	9.5	74.2		4.9	76.4	18.7		
Total %	1	1.8	0.7	3.5	20.2	18.7	1.5	40.4	4.8	2.8	21.6	29.1	1.3	20.6	5	27	
Cars	10	19	7	36	197	189	16	402	46	28	217	291	14	205	52	271	1000
% Cars	90.9	100	100	97.3	92.9	95.9	100	94.6	92	96.6	95.6	95.1	100	94.5	98.1	95.4	95.1
Buses	0	0	0	0	4	0	0	4	0	0	3	3	0	1	0	1	8
% Buses	0	0	0	0	1.9	0	0	0.9	0	0	1.3	1	0	0.5	0	0.4	0.8
Trucks	1	0	0	1	11	8	0	19	4	1	7	12	0	11	1	12	44
% Trucks	9.1	0	0	2.7	5.2	4.1	0	4.5	8	3.4	3.1	3.9	0	5.1	1.9	4.2	4.2

Cummins Consulting Services, PLLC

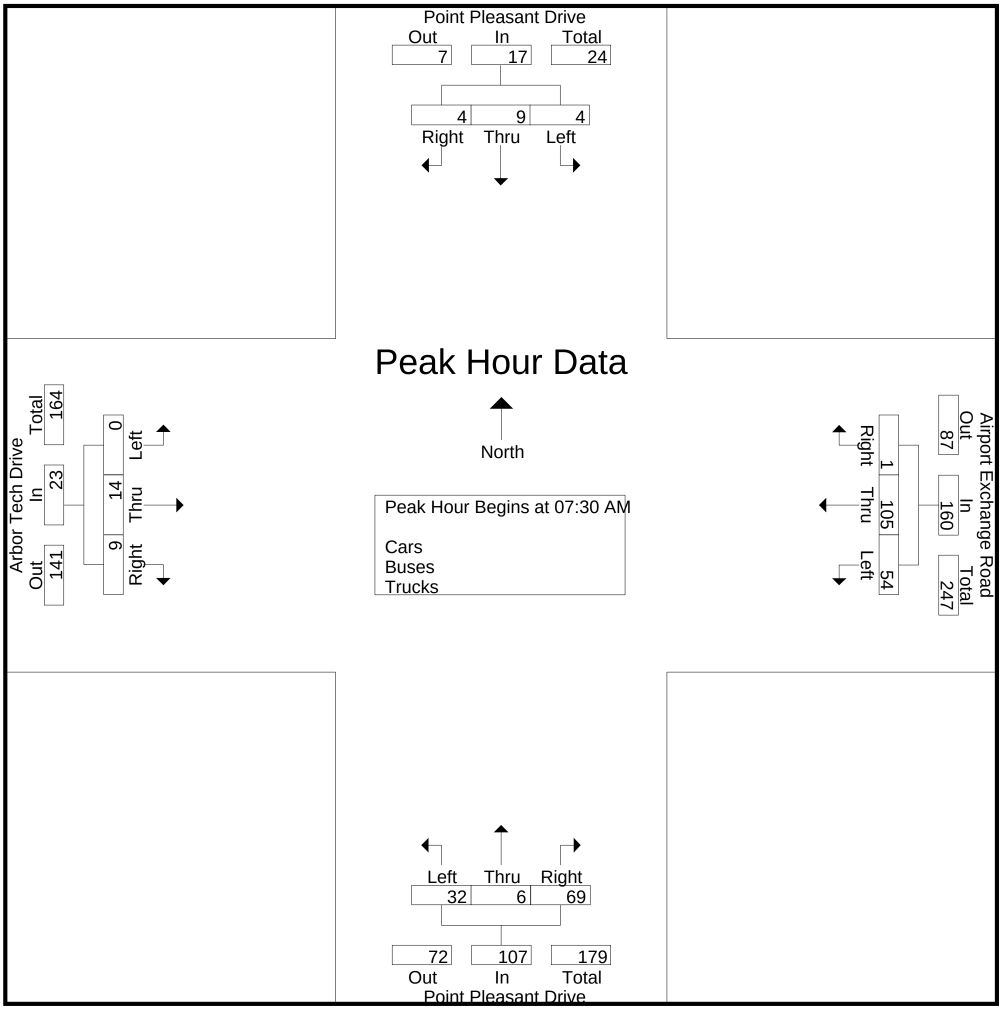
4661 Marlberry Place
Lexington, KY 40509
859.361.2589
"simplifying Data Collection since 2004"

File Name : Airport_Exchange_at_Point_Pleasant__296328_03-02-2016
Site Code : Site 2
Start Date : 3/2/2016
Page No : 2



File Name : Airport_Exchange_at_Point_Pleasant__296328_03-02-2016
Site Code : Site 2
Start Date : 3/2/2016
Page No : 3

	Point Pleasant Drive From North				Airport Exchange Road From East				Point Pleasant Drive From South				Arbor Tech Drive From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	1	**3**	0	4	12	**29**	0	41	2	**2**	15	19	0	4	0	4	68
07:45 AM	0	3	**4**	**7**	13	26	**1**	40	**13**	2	**30**	**45**	0	**5**	3	**8**	**100**
08:00 AM	**3**	3	0	6	**16**	28	0	**44**	10	0	15	25	0	2	2	4	79
08:15 AM	0	0	0	0	13	22	0	35	7	2	9	18	0	3	**4**	7	60
Total Volume	4	9	4	17	54	105	1	160	32	6	69	107	0	14	9	23	307
% App. Total	23.5	52.9	23.5		33.8	65.6	0.6		29.9	5.6	64.5		0	60.9	39.1		
PHF	.333	.750	.250	.607	.844	.905	.250	.909	.615	.750	.575	.594	.000	.700	.563	.719	.768

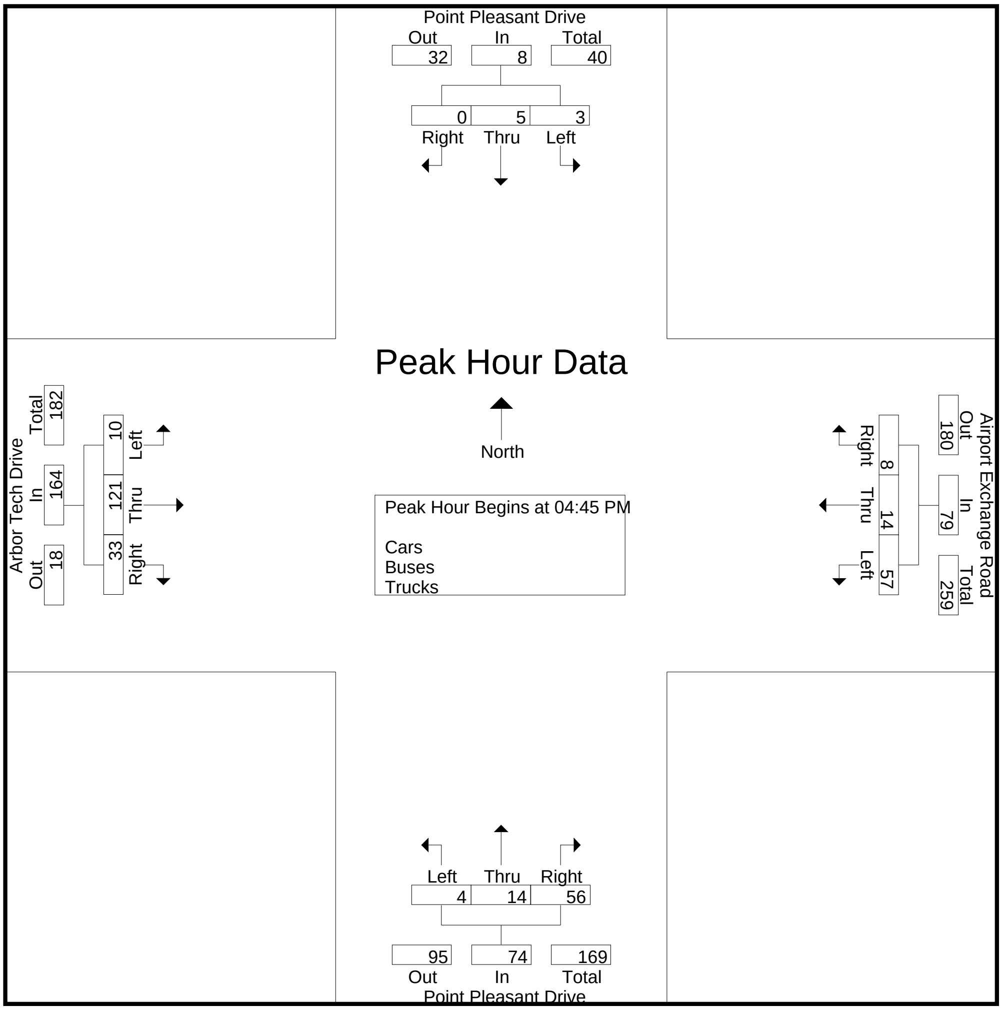


Cummins Consulting Services, PLLC

4661 Marlberry Place
Lexington, KY 40509
859.361.2589
"simplifying Data Collection since 2004"

File Name : Airport_Exchange_at_Point_Pleasant__296328_03-02-2016
Site Code : Site 2
Start Date : 3/2/2016
Page No : 4

	Point Pleasant Drive From North				Airport Exchange Road From East				Point Pleasant Drive From South				Arbor Tech Drive From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	1	0	0	1	16	5	2	23	1	3	8	12	2	18	5	25	61
05:00 PM	0	**3**	0	3	**18**	3	**3**	**24**	**2**	**7**	**20**	**29**	**6**	**55**	**19**	**80**	**136**
05:15 PM	**2**	2	0	**4**	12	0	2	14	1	0	11	12	1	24	7	32	62
05:30 PM	0	0	0	0	11	**6**	1	18	0	4	17	21	1	24	2	27	66
Total Volume	3	5	0	8	57	14	8	79	4	14	56	74	10	121	33	164	325
% App. Total	37.5	62.5	0		72.2	17.7	10.1		5.4	18.9	75.7		6.1	73.8	20.1		
PHF	.375	.417	.000	.500	.792	.583	.667	.823	.500	.500	.700	.638	.417	.550	.434	.513	.597



APPENDIX C

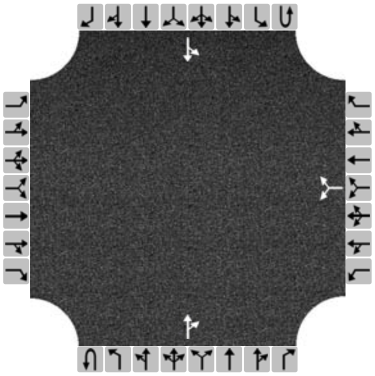
HCS Analysis

VIOX&VIOX
Civil Engineers, Surveyors, and Landscape Architects
466 Erlanger Road • Erlanger, Kentucky 41018
Ph (859) 727-3293 • Fax (859) 727-8452 • www.vioxinc.com

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2017	North/South Street	Donaldson Hwy
Time Analyzed	AM Peak - NO BUILD	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						6		23			297	48		77	272	
Percent Heavy Vehicles						7		7						8		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

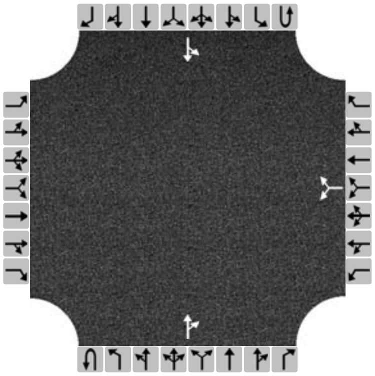
Flow Rate (veh/h)							32							380		
Capacity							520							1152		
v/c Ratio							0.06							0.33		
95% Queue Length							0.2							0.2		
Control Delay (s/veh)							12.4							8.4		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					12.4								2.4			
Approach LOS					B								A			

HCS 2010 Two-Way Stop Control Summary Report

General Information / Site Information

General Information		Site Information	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2017	North/South Street	Donaldson Hwy
Time Analyzed	PM Peak - No Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						61		62			322	18		21	285	
Percent Heavy Vehicles						7		7						8		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

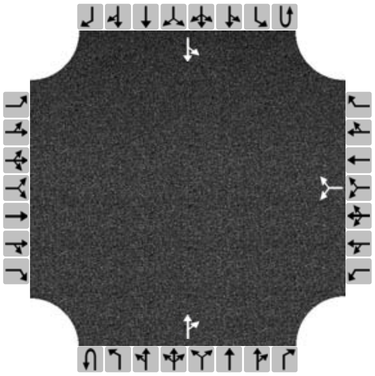
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							133							333		
Capacity							461							1157		
v/c Ratio							0.29							0.29		
95% Queue Length							1.2							0.1		
Control Delay (s/veh)							15.9							8.2		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)					15.9								0.7			
Approach LOS					C								A			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2017	North/South Street	Donaldson Hwy
Time Analyzed	AM Peak - BUILD	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						11		28			297	60		89	272	
Percent Heavy Vehicles						7		7						8		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

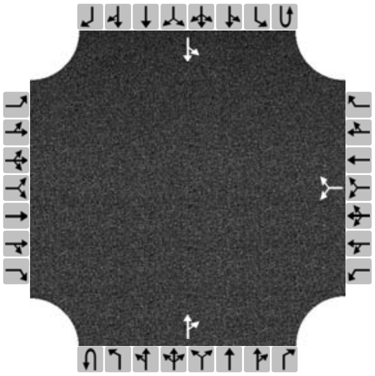
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							42							393		
Capacity							470							1140		
v/c Ratio							0.09							0.34		
95% Queue Length							0.3							0.3		
Control Delay (s/veh)							13.4							8.5		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					13.4								2.7			
Approach LOS					B								A			

HCS 2010 Two-Way Stop Control Summary Report

General Information		**Site Information**	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2017	North/South Street	Donaldson Hwy
Time Analyzed	PM Peak - BUILD	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						72		74			322	26		28	285	
Percent Heavy Vehicles						12		12						9		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							158							340		
Capacity							513							1144		
v/c Ratio							0.31							0.30		
95% Queue Length							1.3							0.1		
Control Delay (s/veh)							15.1							8.2		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)					15.1								1.0			
Approach LOS					C								A			

HCS 2010™ TWSC Version 6.70

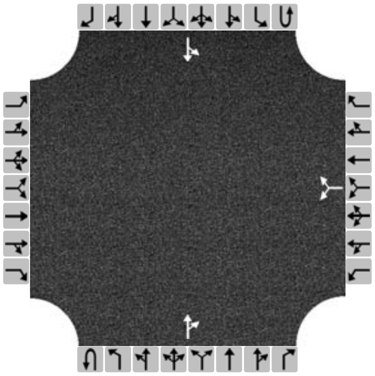
Generated: 4/25/2016 9:39:21 AM

TWSC-Point Pleasant - Donaldson - Build 2017 PM.xtw

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2027	North/South Street	Donaldson Hwy
Time Analyzed	AM PEAK - No Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						7		27			345	56		90	316	
Percent Heavy Vehicles						7		7						8		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

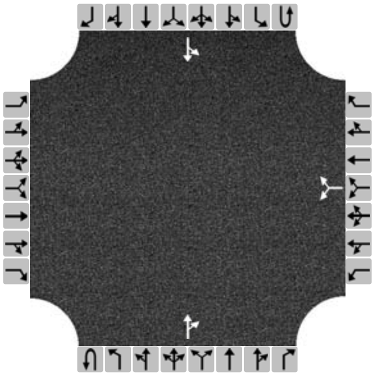
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							37							441		
Capacity							457							1093		
v/c Ratio							0.08							0.40		
95% Queue Length							0.3							0.3		
Control Delay (s/veh)							13.6							8.6		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					13.6								2.7			
Approach LOS					B								A			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2027	North/South Street	Donaldson Hwy
Time Analyzed	PM Peak - No Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						71		72			374	21		25	331	
Percent Heavy Vehicles						7		7						8		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							155							387		
Capacity							474							1099		
v/c Ratio							0.33							0.35		
95% Queue Length							1.4							0.1		
Control Delay (s/veh)							16.2							8.4		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)					16.2								0.8			
Approach LOS					C								A			

HCS 2010™ TWSC Version 6.70

Generated: 3/15/2016 1:35:43 PM

TWSC-Point Pleasant - Donaldson - No Build 2027 PM.xtw

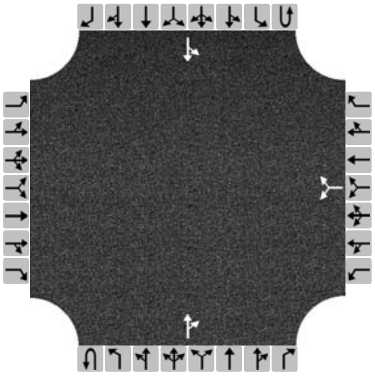
HCS 2010 Two-Way Stop Control Summary Report

General Information

Site Information

Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2027	North/South Street	Donaldson Hwy
Time Analyzed	AM PEAK - Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						12		32			345	68		102	316	
Percent Heavy Vehicles						12		12						9		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

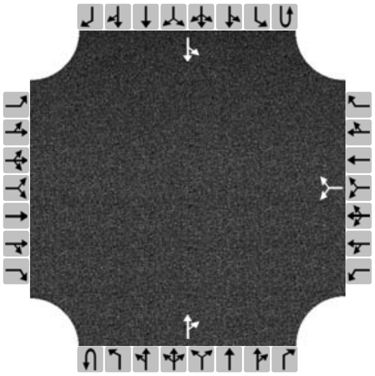
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							48							454		
Capacity							413							1081		
v/c Ratio							0.12							0.42		
95% Queue Length							0.4							0.3		
Control Delay (s/veh)							14.8							8.7		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					14.8								3.0			
Approach LOS					B								A			

HCS 2010 Two-Way Stop Control Summary Report

General Information		**Site Information**	
Analyst	Alison Chadwell	Intersection	Point Pleasant/KY 236
Agency/Co.		Jurisdiction	
Date Performed	3/10/2016	East/West Street	Point Pleasant
Analysis Year	2027	North/South Street	Donaldson Hwy
Time Analyzed	PM PEAK - Build	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	CVG - Ste 3C		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						82		84			374	29		32	331	
Percent Heavy Vehicles						12		12						9		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							180							395		
Capacity							389							1091		
v/c Ratio							0.46							0.36		
95% Queue Length							2.4							0.1		
Control Delay (s/veh)							22.0							8.4		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)					22.0								1.1			
Approach LOS					C								A			

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*AM Peak - No Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2017*

Project ID

East/West Street: *Point Pleasant*

North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	33	7	71	5	10	5
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	55	107	2	0	15	10
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	33	78	20		55	109	0	25
% Heavy Vehicles	8	3	9		5	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.3		1.0	0.0	0.0	0.0
Prop. Right-Turns	0.0	0.9	0.3		0.0	0.0	0.0	0.4
Prop. Heavy Vehicle	0.1	0.0	0.1		0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.6	0.1		0.6	0.1	0.0	-0.2

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.03	0.07	0.02		0.05	0.10	0.00	0.02
hd, final value (s)	5.62	4.40	5.14		5.43	4.90	4.97	4.78
x, final value	0.051	0.095	0.029		0.083	0.148	0.000	0.033
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.3	2.1	2.8		3.1	2.6	2.7	2.5

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	660	780	667		688	727		833
Delay (s/veh)	8.6	7.6	8.0		8.6	8.5	7.7	7.6
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	7.9		8.0		8.5		7.6	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.2							
Intersection LOS	A							

HCS+^{TM} Version 5.6

Generated: 4/25/2016 9:44 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*PM Peak - No Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2017*

Project ID

East/West Street: *Point Pleasant*

North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	15	57	4	6	0
%Thrus Left Lane						
Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	58	15	9	11	123	34
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	5	72	10		58	24	11	157
% Heavy Vehicles	8	3	9		5	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.4		1.0	0.0	1.0	0.0
Prop. Right-Turns	0.0	0.8	0.0		0.0	0.4	0.0	0.2
Prop. Heavy Vehicle	0.1	0.0	0.1		0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.5	0.2		0.6	-0.2	0.5	-0.1

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.00	0.06	0.01		0.05	0.02	0.01	0.14
hd, final value (s)	5.74	4.60	5.42		5.43	4.65	5.29	4.72
x, final value	0.008	0.092	0.015		0.088	0.031	0.016	0.206
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.4	2.3	3.1		3.1	2.4	3.0	2.4

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	500	800	500		644	800	550	748
Delay (s/veh)	8.5	7.8	8.2		8.7	7.5	8.1	8.6
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	7.8		8.2		8.3		8.6	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.3							
Intersection LOS	A							

HCS+^{TM} Version 5.6

Generated: 4/25/2016 9:45 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*AM Peak - Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2017*

Project ID

East/West Street: *Point Pleasant*

North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	33	7	72	5	10	5
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	55	107	2	0	15	10
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	33	79	20		55	109	0	25
% Heavy Vehicles	8	3	9		5	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.3		1.0	0.0	0.0	0.0
Prop. Right-Turns	0.0	0.9	0.3		0.0	0.0	0.0	0.4
Prop. Heavy Vehicle	0.1	0.0	0.1		0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.6	0.1		0.6	0.1	0.0	-0.2

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.03	0.07	0.02		0.05	0.10	0.00	0.02
hd, final value (s)	5.62	4.40	5.14		5.44	4.90	4.98	4.78
x, final value	0.051	0.096	0.029		0.083	0.148	0.000	0.033
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.3	2.1	2.8		3.1	2.6	2.7	2.5

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	660	790	667		688	727		833
Delay (s/veh)	8.6	7.6	8.0		8.6	8.5	7.7	7.6
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	7.9		8.0		8.5		7.6	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.2							
Intersection LOS	A							

HCS+^{TM} Version 5.6

Generated: 4/25/2016 9:48 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*PM Peak - Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2017*

Project ID

East/West Street: *Point Pleasant*

North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	15	60	4	6	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	59	15	9	11	123	34
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	5	75	10		59	24	11	157
% Heavy Vehicles	8	3	9		5	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.4		1.0	0.0	1.0	0.0
Prop. Right-Turns	0.0	0.8	0.0		0.0	0.4	0.0	0.2
Prop. Heavy Vehicle	0.1	0.0	0.1		0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.5	0.2		0.6	-0.2	0.5	-0.1

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.00	0.07	0.01		0.05	0.02	0.01	0.14
hd, final value (s)	5.75	4.60	5.43		5.44	4.66	5.30	4.73
x, final value	0.008	0.096	0.015		0.089	0.031	0.016	0.206
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.4	2.3	3.1		3.1	2.4	3.0	2.4

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	500	750	500		656	800	550	748
Delay (s/veh)	8.5	7.8	8.2		8.7	7.5	8.1	8.7
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	7.8		8.2		8.3		8.6	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.4							
Intersection LOS	A							

HCS+^{TM} Version 5.6

Generated: 4/25/2016 9:49 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*AM PEAK - No Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2027*

Project ID

East/West Street: *Point Pleasant*

North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	39	9	83	6	12	6
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	64	125	3	0	18	12
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	39	92	24		64	128	0	30
% Heavy Vehicles	8	3	9		5	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.3		1.0	0.0	0.0	0.0
Prop. Right-Turns	0.0	0.9	0.3		0.0	0.0	0.0	0.4
Prop. Heavy Vehicle	0.1	0.0	0.1		0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.6	0.1		0.6	0.1	0.0	-0.2

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.03	0.08	0.02		0.06	0.11	0.00	0.03
hd, final value (s)	5.71	4.49	5.25		5.50	4.97	5.07	4.88
x, final value	0.062	0.115	0.035		0.098	0.177	0.000	0.041
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.4	2.2	2.9		3.2	2.7	2.8	2.6

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	650	836	800		640	711		750
Delay (s/veh)	8.8	7.8	8.1		8.8	8.7	7.8	7.8
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	8.1		8.1		8.8		7.8	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.4							
Intersection LOS	A							

HCS+^{TM} Version 5.6

Generated: 4/25/2016 9:50 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*PM PEAK - No Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2027*

Project ID *CVG 3C*

East/West Street: *Point Pleasant* North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	6	18	67	5	7	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	68	18	11	13	143	40
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	6	85	12		68	29	13	183
% Heavy Vehicles	8	3	9		5	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.4		1.0	0.0	1.0	0.0
Prop. Right-Turns	0.0	0.8	0.0		0.0	0.4	0.0	0.2
Prop. Heavy Vehicle	0.1	0.0	0.1		0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.5	0.2		0.6	-0.2	0.5	-0.1

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.01	0.08	0.01		0.06	0.03	0.01	0.16
hd, final value (s)	5.85	4.72	5.56		5.51	4.72	5.35	4.78
x, final value	0.010	0.111	0.019		0.104	0.038	0.019	0.243
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.6	2.4	3.3		3.2	2.4	3.1	2.5

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	600	773	600		680	725	650	763
Delay (s/veh)	8.6	8.0	8.4		8.8	7.6	8.2	9.0
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	8.0		8.4		8.5		9.0	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.6							
Intersection LOS	A							

HCS+™ Version 5.6 Generated: 4/25/2016 9:51 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*AM PEAK - Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2027*

Project ID

East/West Street: *Point Pleasant*

North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	39	9	84	6	12	6
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	66	125	3	0	18	12
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	39	93	24		66	128	0	30
% Heavy Vehicles	8	10	9		11	4	0	5
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.3		1.0	0.0	0.0	0.0
Prop. Right-Turns	0.0	0.9	0.3		0.0	0.0	0.0	0.4
Prop. Heavy Vehicle	0.1	0.1	0.1		0.1	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.5	0.1		0.7	0.1	0.0	-0.2

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.03	0.08	0.02		0.06	0.11	0.00	0.03
hd, final value (s)	5.72	4.62	5.26		5.62	4.98	5.09	4.89
x, final value	0.062	0.119	0.035		0.103	0.177	0.000	0.041
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.4	2.3	3.0		3.3	2.7	2.8	2.6

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	650	775	600		660	711		750
Delay (s/veh)	8.8	7.9	8.2		9.0	8.7	7.8	7.8
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	8.2		8.2		8.8		7.8	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.5							
Intersection LOS	A							

HCS+™ Version 5.6

Generated: 4/25/2016 9:55 AM

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Alison Chadwell*
Agency/Co.	*Viox & Viox*
Date Performed	*3/10/2016*
Analysis Time Period	*PM PEAK - Build*

Site Information

Intersection	*Airport Exchange*
Jurisdiction	*Boone Co.*
Analysis Year	*2027*

Project ID *CvG 3C*

East/West Street: *Point Pleasant*	North/South Street: *Airport Exchange*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	6	18	70	5	7	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	69	18	11	13	143	40
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LTR		L	TR	L	TR
PHF	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Flow Rate (veh/h)	6	88	12		69	29	13	183
% Heavy Vehicles	8	10	9		11	4	0	0
No. Lanes	2		1		2		2	
Geometry Group	5		4b		5		5	
Duration, T	1.00							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.4		1.0	0.0	1.0	0.0
Prop. Right-Turns	0.0	0.8	0.0		0.0	0.4	0.0	0.2
Prop. Heavy Vehicle	0.1	0.1	0.1		0.1	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.4	0.2		0.7	-0.2	0.5	-0.2

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20		3.20	3.20	3.20	3.20
x, initial	0.01	0.08	0.01		0.06	0.03	0.01	0.16
hd, final value (s)	5.85	4.83	5.56		5.62	4.74	5.37	4.71
x, final value	0.010	0.118	0.019		0.108	0.038	0.019	0.240
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	3.6	2.5	3.3		3.3	2.4	3.1	2.4

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	600	733	600		627	725	650	763
Delay (s/veh)	8.6	8.2	8.4		9.0	7.6	8.2	8.9
LOS	A	A	A		A	A	A	A
Approach: Delay (s/veh)	8.2		8.4		8.6		8.8	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.6							
Intersection LOS	A							

HCS+™ Version 5.6 Generated: 4/25/2016 9:56 AM

APPENDIX D

Turn Lane Warrants

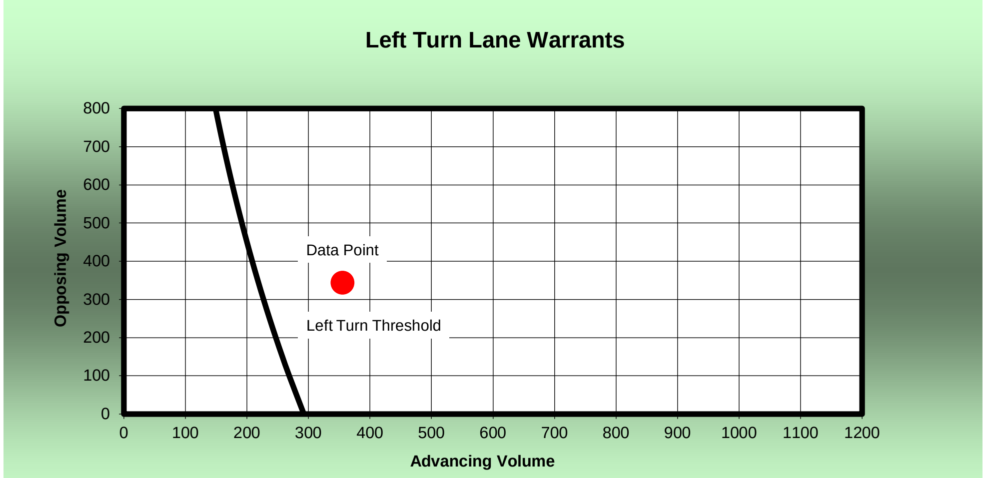
VIOX&VIOX
Civil Engineers, Surveyors, and Landscape Architects
466 Erlanger Road • Erlanger, Kentucky 41018
Ph (859) 727-3293 • Fax (859) 727-8452 • www.vioxinc.com

2017 AM - No Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	77	Speed Limit (mph)	50
Advancing Volume (vph)	349	No. of through lanes	1
Opposing Volume (vph)	345	Percent Heavy Vehicles (decimal percent)	0.07



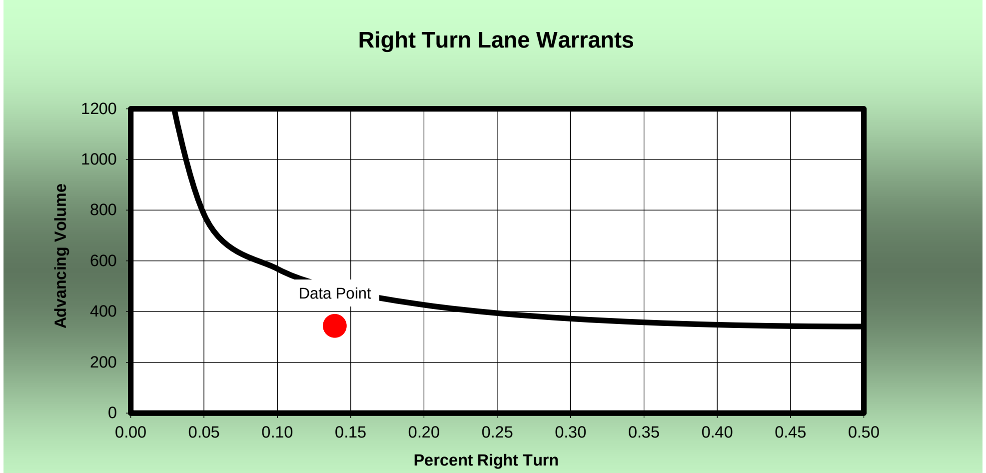
Left Turn Lane WARRANTED

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph)	48	Speed Limit (mph)	50
Advancing Volume (vph)	345		



Right Turn Lane NOT Warranted

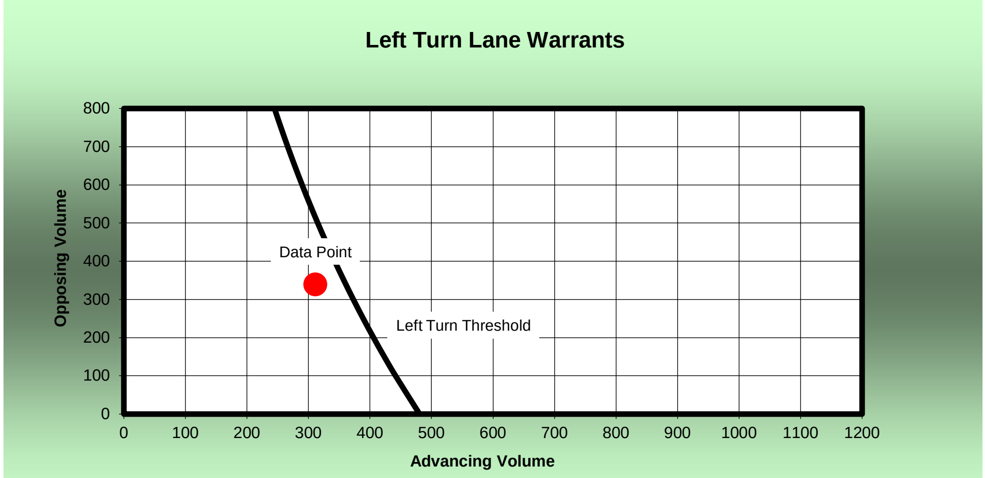
Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2017 PM - No Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	21	Speed Limit (mph)	50
Advancing Volume (vph)	306	No. of through lanes	1
Opposing Volume (vph)	340	Percent Heavy Vehicles (decimal percent)	0.07



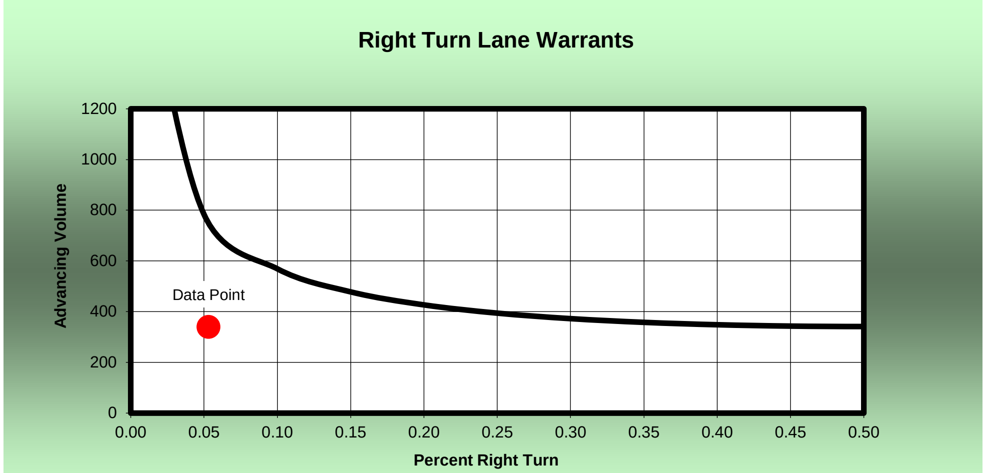
Left Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph)	18	Speed Limit (mph)	50
Advancing Volume (vph)	340		



Right Turn Lane NOT Warranted

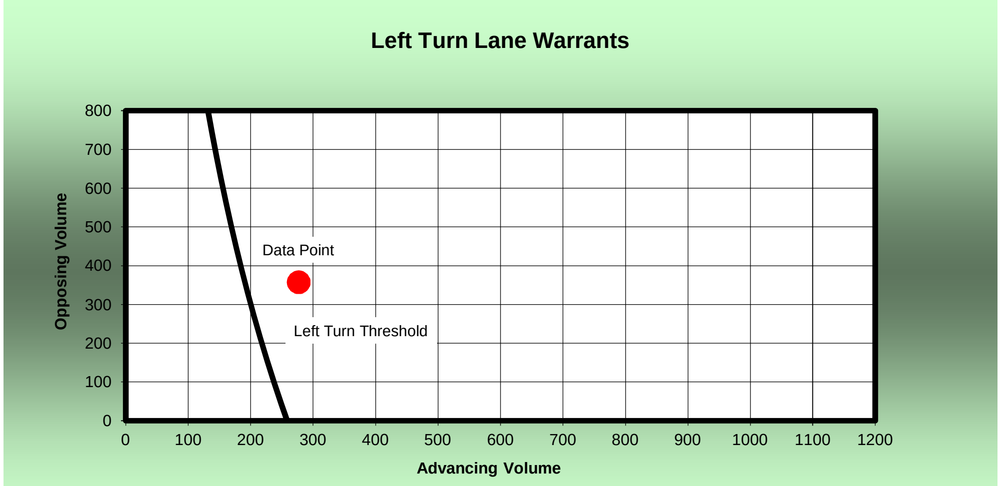
Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2017 AM - Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	89	Speed Limit (mph)	50
Advancing Volume (vph)	272	No. of through lanes	1
Opposing Volume (vph)	357	Percent Heavy Vehicles (decimal percent)	0.07



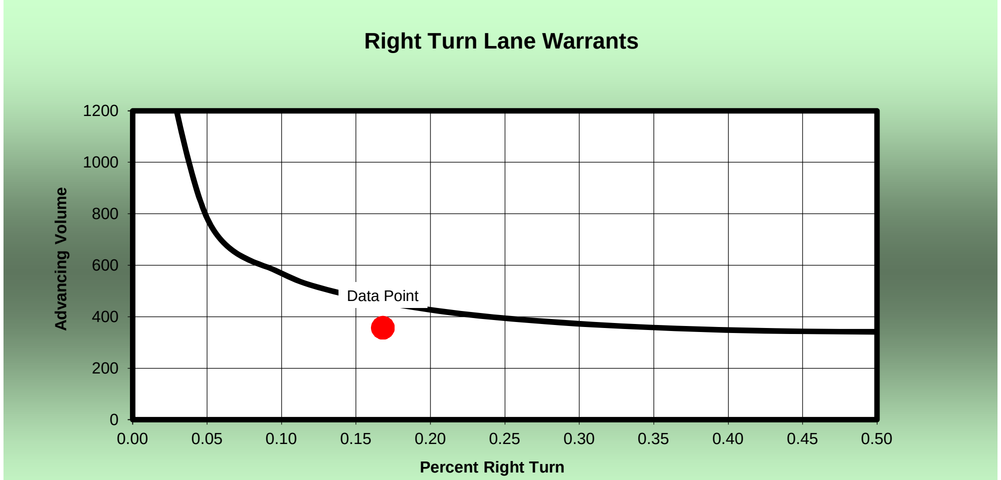
Left Turn Lane WARRANTED

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph)	60	Speed Limit (mph)	50
Advancing Volume (vph)	357		



Right Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2017 PM - Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph) 28

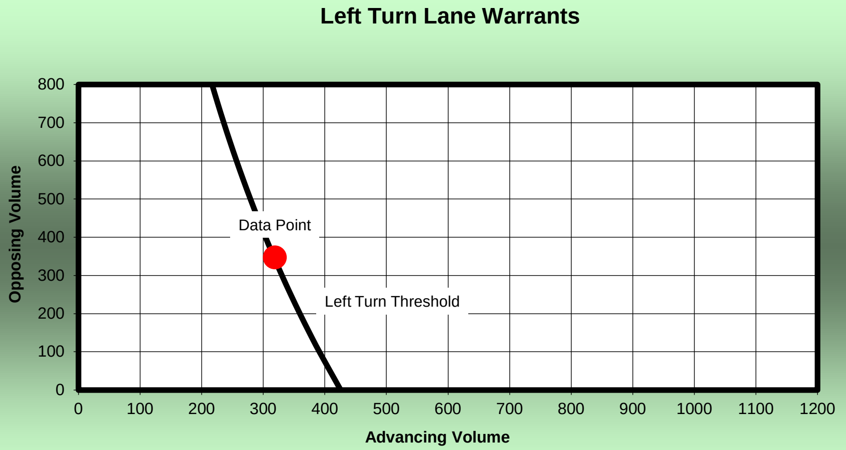
Advancing Volume (vph) 313

Opposing Volume (vph) 348

Speed Limit (mph) 50

No. of through lanes 1

Percent Heavy Vehicles (decimal percent) 0.07



Left Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph) 26

Advancing Volume (vph) 348

Speed Limit (mph) 50

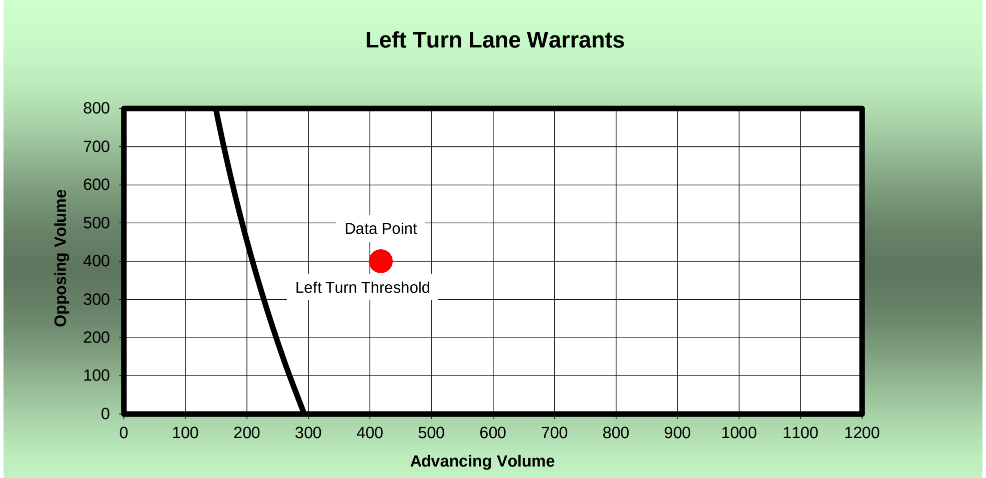
Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2027 AM - No Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	90	Speed Limit (mph)	50
Advancing Volume (vph)	406	No. of through lanes	1
Opposing Volume (vph)	401	Percent Heavy Vehicles (decimal percent)	0.1



Left Turn Lane WARRANTED

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

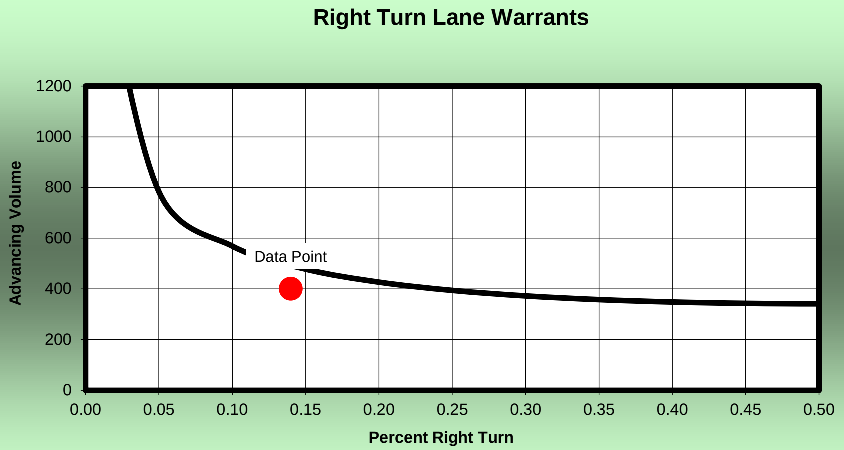
Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph) 56

Speed Limit (mph) 50

Advancing Volume (vph) 401



Right Turn Lane NOT Warranted

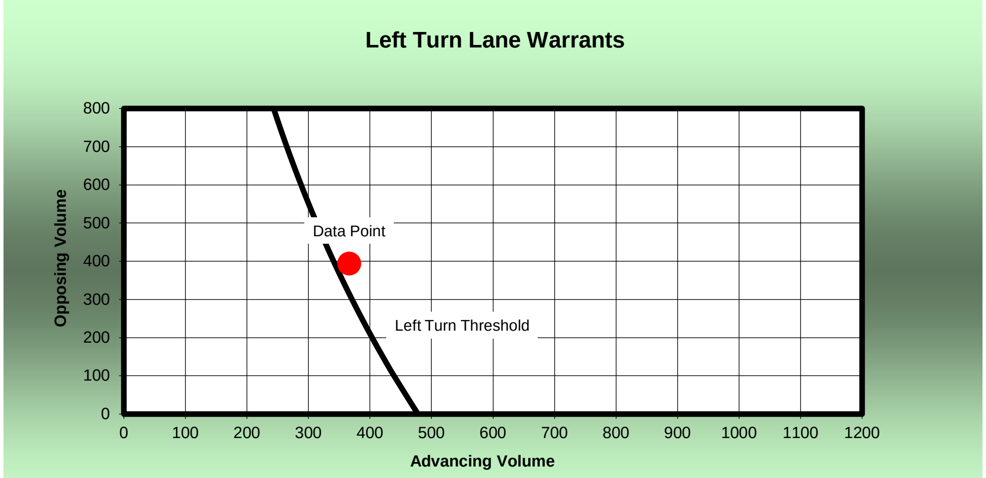
Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2027 PM - No Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	25	Speed Limit (mph)	50
Advancing Volume (vph)	356	No. of through lanes	1
Opposing Volume (vph)	395	Percent Heavy Vehicles (decimal percent)	0.1



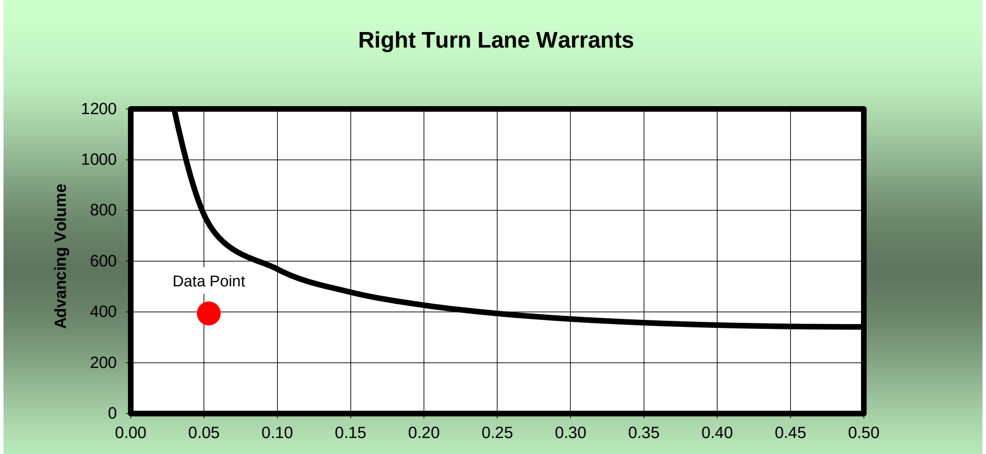
Left Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph)	21	Speed Limit (mph)	50
Advancing Volume (vph)	395		



Right Turn Lane NOT Warranted

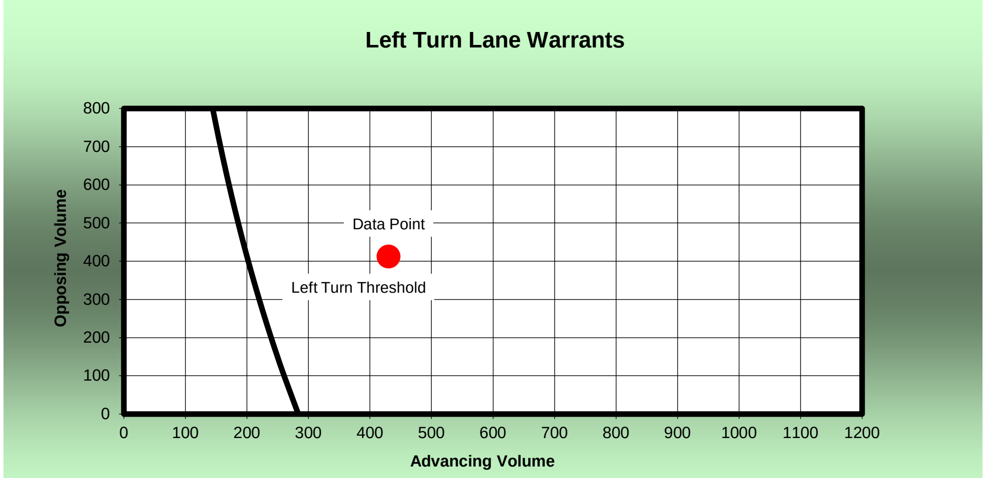
Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2027 AM - Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph)	102	Speed Limit (mph)	50
Advancing Volume (vph)	418	No. of through lanes	1
Opposing Volume (vph)	413	Percent Heavy Vehicles (decimal percent)	0.1



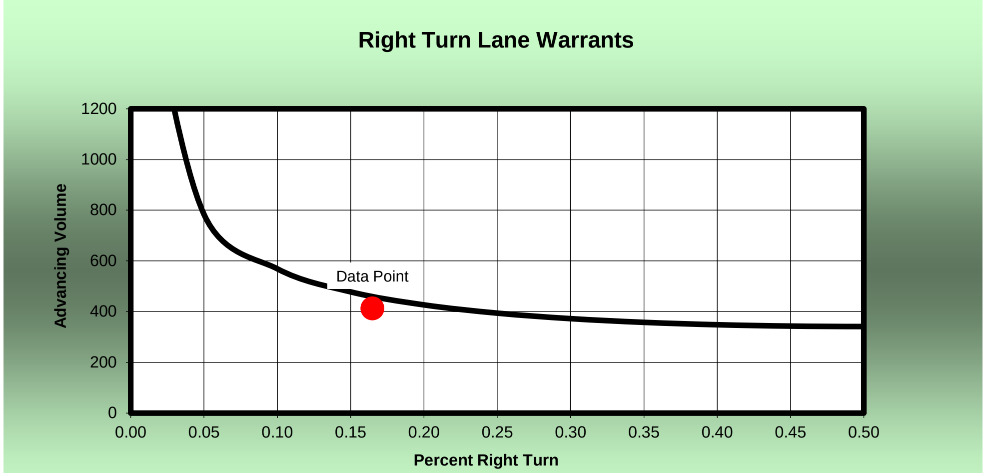
Left Turn Lane WARRANTED

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph)	68	Speed Limit (mph)	50
Advancing Volume (vph)	413		



Right Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

2027 PM - Build

Left Turn Lane Warrants

Input Fields

Left Turn Volume (vph) 32

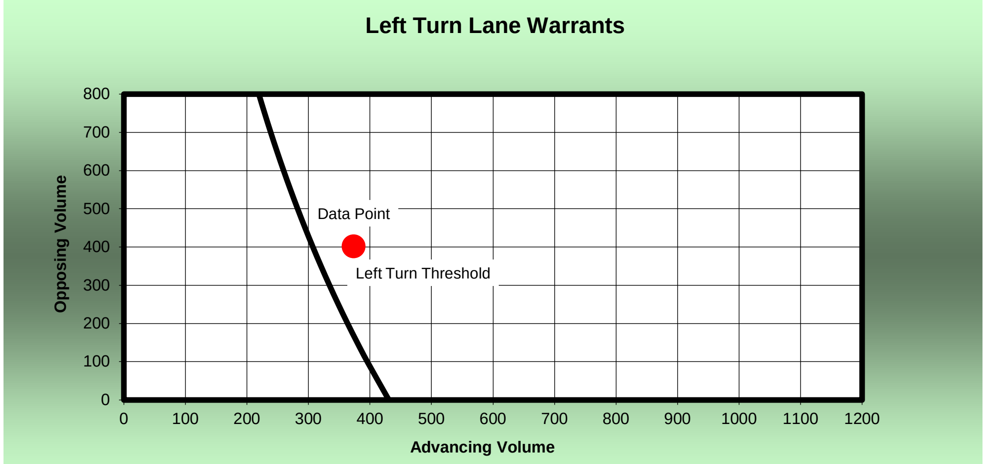
Advancing Volume (vph) 363

Opposing Volume (vph) 403

Speed Limit (mph) 50

No. of through lanes 1

Percent Heavy Vehicles (decimal percent) 0.1



Left Turn Lane WARRANTED

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.

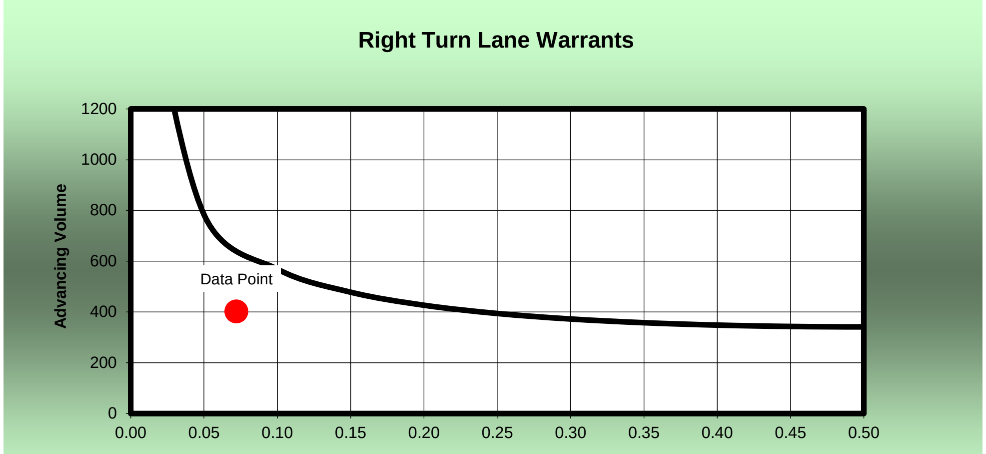
Right Turn Lane Warrants

Input Fields

Right Turn Volume (vph) 29

Speed Limit (mph) 50

Advancing Volume (vph) 403



Right Turn Lane NOT Warranted

Note: This spreadsheet is intended to supplement the guidance provided in the Auxiliary Turn Lane policy outlined in the KYTC Highway Design Manual. This policy should be fully reviewed and understood prior to using this application.