Final Environmental Impact Statement
North Hillside Road Extension

FHWA-CT-EIS-08-01-D

Mansfield, Connecticut

October 2011

U.S.Department of Transportation

Federal Highway Administration

Connecticut Department of Transportation
University of Connecticut

Cooperating Agencies:
U.S. Army Corps of Engineers

Participating Agencies:
Connecticut Department of Energy and Environmental Protection
Connecticut Department of Public Health

Submitted Pursuant to 42 U.S.C. 4332 (2)(c)

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by the
U.S. Department of Transportation, Federal Highway Administration,
Connecticut Department of Transportation, and
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October 2011

12/6/2011	
Date of Approval	for Federal Highway Administration
11/4/11	
Date of Approval	for Connecticut Department of Transportation
10/21/11	
Date of Approval	for University of Connecticut

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EXECUTIVE SUMMARY

ES.1 Introduction

On December 29, 2008, the Federal Highway Administration (FHWA), in cooperation with the University of Connecticut (UConn), released for circulation and review by federal, state, and local agencies and other interested parties, a Draft Environmental Impact Statement (DEIS) for the extension of North Hillside Road on the UConn Storrs campus from its current terminus northward to U.S. Route 44 in the town of Mansfield, Connecticut (Figure ES-1 and Figure ES-2). The proposed project will construct an approximately 3,400-foot, 2-lane, 32-foot wide road through a portion of land adjacent to the Storrs core academic campus known as the "North Campus." The project will provide an alternative entrance to the University, relieve traffic on surrounding roads, and facilitate the development of the North Campus. In addition to FHWA and UConn, the Connecticut Department of Transportation (CTDOT) is also a Joint Lead Agency as defined in 23 CFR §771.109. CTDOT is administering the approximately $6 million that was appropriated by the Federal government for the construction of the North Hillside Road Extension. (Note that new utilities are not eligible for federal-aid participation.) The DEIS was prepared and circulated pursuant to the National Environmental Policy Act (NEPA), codified in Title 23 of the Code of Federal Regulations, Part 771, Section (§) 771.119 and §771.135 (23 CFR 771.119 and 771.135).

A public hearing was held on January 29, 2009 to solicit public and agency comments on the DEIS. The public comment period for the DEIS closed on February 13, 2009. Comments received from local officials and the public during the comment period supported the extension of North Hillside Road and subsequent development of the North Campus under the preferred development concept identified in the DEIS (referred to as the "DEIS Preferred Alternative"). In their comments, local officials and the public also requested adequate opportunity to review and comment on permit applications and construction plans prior to their approval and implementation. The regulatory agencies also identified several substantive issues, among other minor comments, including:

- Clarification of the definition of the No Action Alternative.
- Consideration of alternative roadway alignments that would further reduce wetland and vernal pool impacts compared to the DEIS Preferred Alternative.
- Potential secondary and cumulative impacts on wetlands and vernal pools from application of roadway deicers, roadway and parking lot lighting, and introduction of invasive species during construction.
- Incorporation of permeable pavement in proposed parking lots and other paved areas as an element of the project's stormwater management system.
- Consideration of additional reductions in the amount of proposed parking for the North Campus development parcels and the feasibility of a reduced travel lane width.
- Evaluation of potential cumulative off-campus impacts on housing and services as a result of the North Campus development.
- Consideration of greenhouse gas emissions resulting from construction and operation of the roadway extension and the North Campus development.
- Consideration of the feasibility of a 150-foot wetland buffer for Red Maple Swamp 1A.

In response to the agency comments on the DEIS, additional evaluations were undertaken including a comparison of potential environmental impacts associated with the roadway alignments that were considered in previous CEPA Environmental Impact Evaluations as well as a modified version of one of the previous roadway alignments to further reduce wetland impacts based upon the current wetland and vernal pool delineations for the project site.

In May 2009, the Connecticut Department of Environmental Protection (CT DEP) and the U.S. Army Corps of Engineers (ACOE) raised additional concerns regarding the project design based upon revised state and federal permit applications, which were submitted to the agencies in December 2008. The resource agencies requested consideration and analysis of additional alternative road alignments, wetland crossing designs, and the proposed North Campus development envelope to further reduce impacts to aquatic resources as compared to the DEIS Preferred Alternative. The ACOE also requested additional information and analysis of alternatives to substantiate the selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) in compliance with the Federal Clean Water Act.

A series of meetings were held with the CT DEP and ACOE between May 2009 and February 2010 to further evaluate roadway alignment alternatives and wetland crossing designs that would minimize impacts to aquatic resources and maintain vernal pool habitat connectivity. Several alternative roadway alignments were considered and evaluated during this process. However, the resource agencies primarily requested additional supporting information to compare the Option A (DEIS Preferred Alternative) roadway alignment with an alignment that would place the roadway east of Vernal Pool #1 (Option A-5). Modified wetland crossing designs were also considered for the Option A alignment to further reduce impacts to aquatic resources and to maintain vernal pool habitat connectivity. Reductions in the proposed development envelope were also considered for portions of the North Campus parcels.

The additional agency coordination and expanded alternatives evaluation resulted in the selection of a preferred alternative roadway alignment and North Campus development scenario. The Option A roadway alignment, which is the recommended alignment under the DEIS Preferred Alternative, remains the preferred roadway alignment in this FEIS. However, the two wetland crossings of greatest concern, as expressed by the resource agencies, have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Additionally, the North Campus concept development plan has been modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres of land on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. The revised North Campus development concept is referred to as "Alternative 2C" in this FEIS.

The FEIS identifies the roadway alignment Option A and North Campus development Alternative 2C as the preferred alternative ("FEIS Preferred Alternative"). The ACOE will formally determine whether the preferred alternative presented in this FEIS complies with the Federal Clean Water Act Section 404(b)(1) Guidelines as the LEDPA through the Section 404 permitting process.

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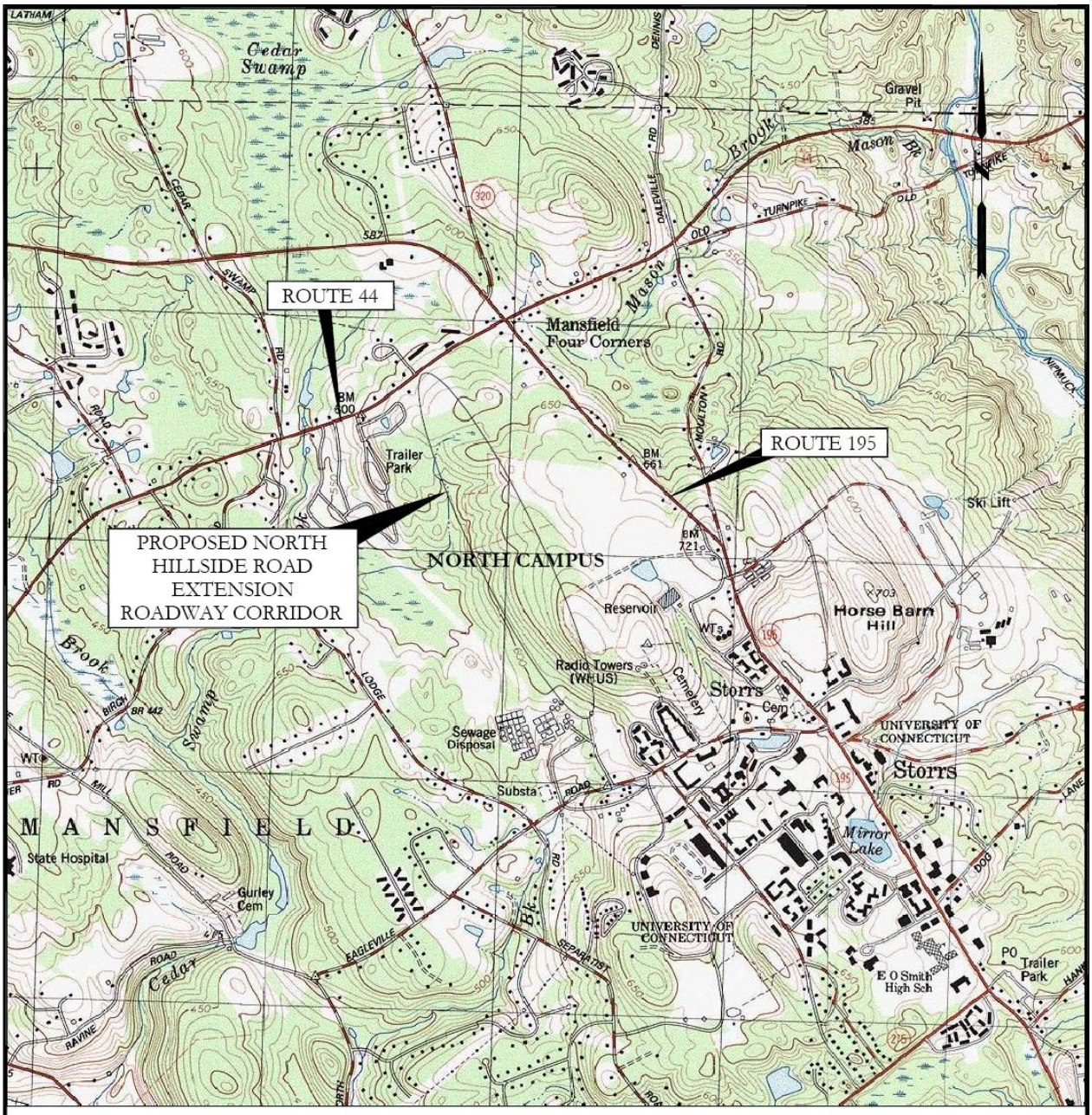
Figure ES-1. Locus Map



MAP REFERENCE:
THIS MAP WAS PREPARED FROM THE FOLLOWING 7.5 MINUTE SERIES TOPOGRAPHIC MAP: COVENTRY, CONN. 1974, PHOTOREVISED 1983

IDENTIFYING LOCATION
THE CENTER OF THE SITE SHOWN ABOVE IS APPROXIMATELY 1.25 MILES FROM THE INTERSECTION OF CT ROUTE 195 AND EAGLEVILLE ROAD.

THIS DRAWING HAS BEEN REDUCED - DO NOT SCALE

SCALE: HORZ: 1"=2000' VERT.: DATUM: HORZ.: VERT.: 0 1000 2000 GRAPHIC SCALE	WWW.FandO.COM FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD RD MANCHESTER, CT 06040 860.646.2469	THE UNIVERSITY OF CONNECTICUT LOCUS MAP NORTH HILLSIDE ROAD EXTENSION STORRS CONNECTICUT	PROJ. No.: 20050147.A20 DATE: NOVEMBER 2007

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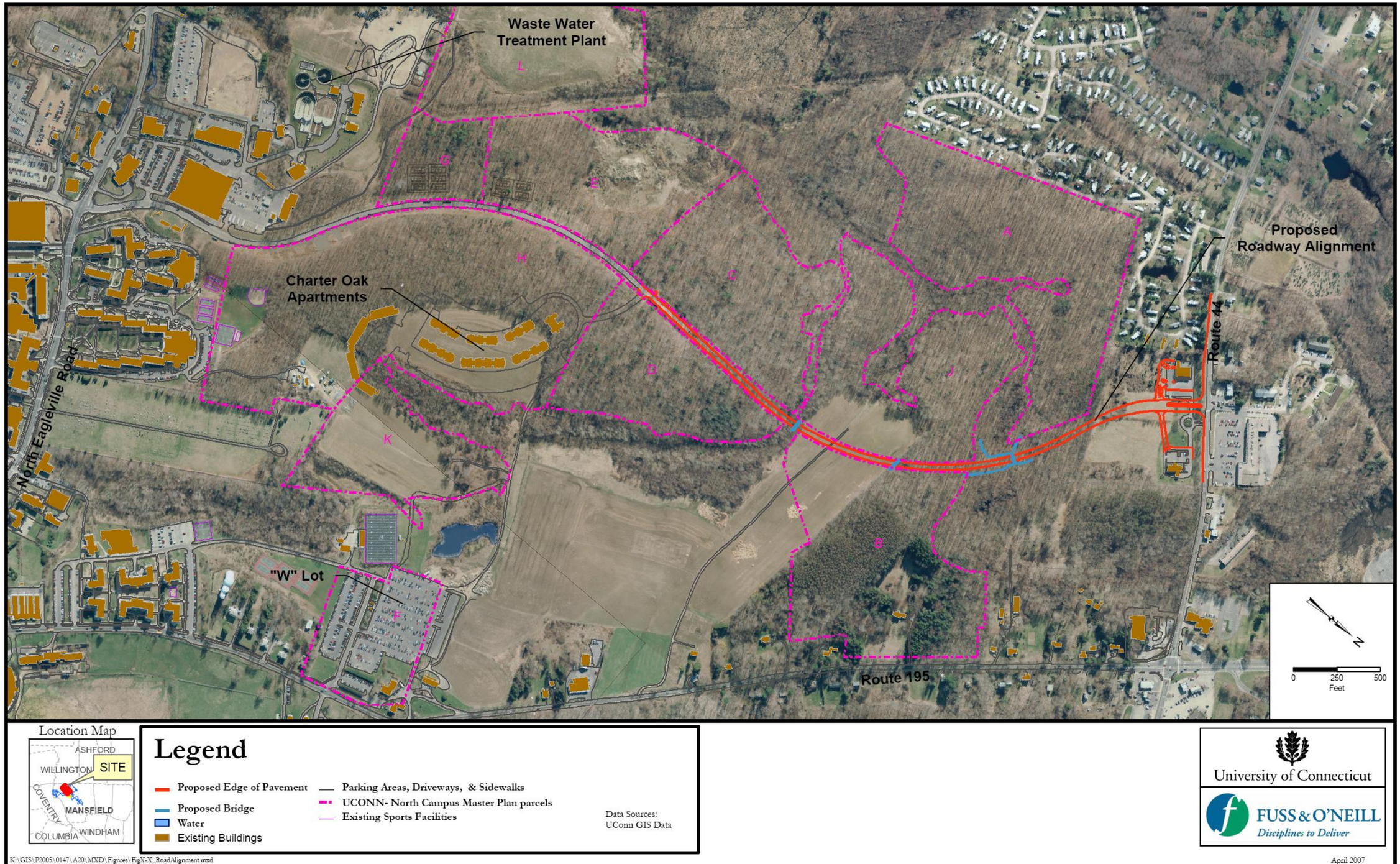
Figure ES-2. Proposed Roadway Alignment and North Campus Development Parcels



ES.1.1 Background

This EIS is the fourth environmental review document to address the construction of a roadway from North Eagleville Road to U.S. Route 44. The construction of a roadway from North Eagleville Road (State Route 430) to U.S. Route 44 has been contemplated since the 1970s, when the area of land known as the North Campus was considered for the development of a research and technology park (Frederic R. Harris, 1994). In 1987, the construction of an approximately 3,800 linear foot North Hillside Road was reviewed in an Environmental Impact Evaluation (EIE) prepared pursuant to the Connecticut Environmental Policy Act (CEPA). After approval of the EIE, the State began construction of the existing North Hillside Road, which was completed in summer 1989. After a change in developer, a CEPA EIE for *Actions Associated with a Research and Technology Park* was released in May 1994. In the 1994 EIE six alternative site layouts with slightly different roadway alignments and parcel configurations were initially considered, and then two configurations, called Option A and Option B, were analyzed in detail in the 1994 EIE. Although a preferred alternative for the alignment was not explicitly identified in the EIE, following approval of the document, the Connecticut Department of Transportation began design for the Option B road alignment. UCEPI was unsuccessful at developing the research project and design plans for the North Hillside Road Extension halted at the 60% design stage.

In June 2000, UConn released the Outlying Parcels Master Plan (JJR, 2000) that includes a master plan for development of the North Campus. An EIE for actions associated with the development of the North Campus was completed in 2001 (Frederic R. Harris, 2001). In it, the Hillside Road Extension utilizes the Option A alignment proposed in the 1994 EIE, which was more environmentally sensitive than the Option B alignment, resulting in fewer impacts to inland wetland resources and farmland soils (Frederic R. Harris, 1994; 2001). The Connecticut Office of Policy and Management (OPM) subsequently found the 2001 EIE to adequately comply with CEPA, but required that a comparative analysis be conducted for the development of future projects, beyond the roadway project and the Charter Oak Apartments, which were approved previously under the 1994 EIE. In 2005, the first such comparative analysis was performed for the relocation of tennis courts to the North Campus, which was subsequently approved by OPM.

In 2005, approximately $6 million was appropriated by the Federal government for the construction of the North Hillside Road Extension. (Note that new utilities are not eligible for federal-aid participation.) The presence of federal funding for the project necessitates compliance with the National Environmental Policy Act (NEPA). The FHWA, together with the Connecticut Department of Transportation, determined that an Environmental Impact Statement (EIS) is the appropriate level of NEPA documentation for the project. In addition, given the lapse of time since the 2001 EIE for the North Campus Master Plan, OPM requested a comparative analysis due to concerns regarding potential differences in background traffic growth anticipated by the previous EIEs and current traffic projections. The comparative analysis was submitted to OPM in January 2007. OPM issued a decision letter dated October 1, 2007, indicating that, based on their review of the submitted documentation, the 2001 EIE is still valid relative to the impacts associated with the North Hillside Road extension project.

ES.1.2 Project Termini

The existing North Hillside Road begins at North Eagleville Road and extends approximately 4,000 feet to the north terminating just north of the Charter Oak Apartments. The new roadway will extend approximately 3,400 linear feet from the existing terminus near the Charter Oak Apartments northward to U.S. Route 44 (Figure ES-2). The roadway will terminate at U.S. Route 44 between the two parcels occupied by New Alliance Bank, and Bank of America across from Professional Park Drive, creating a four-way intersection, approximately 2,000 feet west of Route 195 (Storrs Road).

Route 44 will be widened at the intersection with the proposed North Hillside Road Extension to add exclusive eastbound and westbound left turn lanes, an eastbound right turn lane and a new traffic signal at the intersection, while still maintaining pedestrian access in this area. The North Hillside Road approach to this intersection will be treated as a main University entrance with appropriate signage, boulevard median plantings, and landscaping.

UConn expects to acquire a Right-of-Way (ROW) along areas of the existing driveway that would need to be widened for the proposed intersection of North Hillside Road and Route 44. There are no residential properties in this area and the ROW would not require, nor is UConn proposing, relocation of the two existing businesses at this intersection. UConn has requested CTDOT to act as its agent for ROW acquisition and is currently developing a Memorandum of Understanding with CTDOT to formalize this arrangement.

In addition to the roadway, there will be construction of utilities consisting of water, non-potable reclaimed water, sanitary sewer, storm drainage, telecommunications, primary electrical, and natural gas, as well as street lighting and code blue emergency phones. New utilities are not eligible for federal-aid participation. The project design includes a bituminous pedestrian sidewalk on the east side of the roadway and a separate bicycle lane within the curb line in each direction. Guide rails will be installed where necessary.

The study area consists of the proposed North Hillside Road corridor and the adjacent land identified for development on the North Campus. The North Campus is bounded on the north by Middle Turnpike (Route 44), to the east by Storrs Road (Route 195), to the south by North Eagleville Road, and to the west by Hunting Lodge Road.

ES.2 Purpose and Need for Action

The purpose of the project is to construct a new road, by extending the existing North Hillside Road, to provide alternate entrance to the University and to facilitate the development of a North Campus expansion. The need for the North Hillside Road Extension results from the existing and anticipated traffic in the vicinity of the Storrs Campus and the associated effects on roadway capacity and level of service in the area surrounding the campus, especially U.S. Route 44, Route 195, and Hunting Lodge Road. The new road is also intended to facilitate the development of University-related academic and research buildings and student facilities on the North Campus, consistent with the Outlying Parcels Master Plan.

ES.3 Alternatives

The alternatives analysis for this FEIS incorporated information on prior analyses conducted as part of the review of the North Campus development and North Hillside Road extension under the Connecticut Environmental Policy Act (CEPA). The analyses were revisited in light of updated information obtained to describe natural and physical resources in the project area. In addition to the No Action Alternative, other reasonable alternatives considered include alternative development sites, alternative roadway alignments, and alternative North Campus development plans.

ES.3.1 No Action Alternative

The No Action or No Build Alternative assumes that no Federal funds would be expended for the completion of North Hillside Road. In the absence of Federal funding for the roadway extension, it is uncertain what future development, if any, would occur on the North Campus. Due to the uncertainty surrounding other sources of project funding, for the purposes of this FEIS, it is assumed that no further development of the North Campus would occur under the No Action Alternative.

The State Traffic Commission (STC) Certificate of Operation for the UCONN 2000 Campus Master Plan development projects identified the North Hillside Road extension as an important measure for mitigating traffic impacts from the UCONN 2000 construction. If the extension is not constructed, an important measure for mitigating increased traffic resulting from the UCONN 2000 development program will not be implemented and outbound (northbound) vehicles will not be shifted from both Hunting Lodge Road and Route 195 north of North Eagleville Road during the peak afternoon traffic hour. Under the No Action Alternative, no further development of the North Campus would occur, an important traffic mitigation measure required by the STC Certificate of Operations for the UCONN 2000 Campus Master Plan development projects would not be implemented, and the objectives of the Outlying Parcels Master Plan for the North Campus would not be achieved. The No Action alternative is inconsistent with the STC Certificate, the Outlying Parcels Master Plan, and the Connecticut Department of Transportation State Transportation Improvement Plan and is therefore not considered an acceptable alternative.

ES.3.2 Alternative Development Sites

Alternative development sites can be considered in terms of (1) feasible alternative roadway locations and (2) feasible alternative locations for the development of a research and technology park such as the one described in the Outlying Parcels Master Plan. There is no other site in the vicinity of the campus that would allow for traffic from the Storrs core academic campus to reach Route 44, so there is no other feasible alternative for a new roadway into campus that would divert existing traffic from residential areas near Route 44 (thereby satisfying State Traffic Commission Certificate traffic mitigation commitments) and provide a more direct route and gateway entrance to the University.

The 1994 EIE examined the suitability of the former Mansfield Training School (now called the Depot Campus), the other large tract of land in proximity to the main campus, for potential

development of a research park. The conclusion in the 1994 EIE was that the site was not suitable for the technology park that was envisioned at the time due to regulatory barriers and physical site constraints. This was reaffirmed in the 2001 EIE and both the EIE and the Outlying Parcels Master Plan identified the North Campus site as suitable for a research and development technology park.

ES.3.3 Build Alternatives

Roadway Alignment

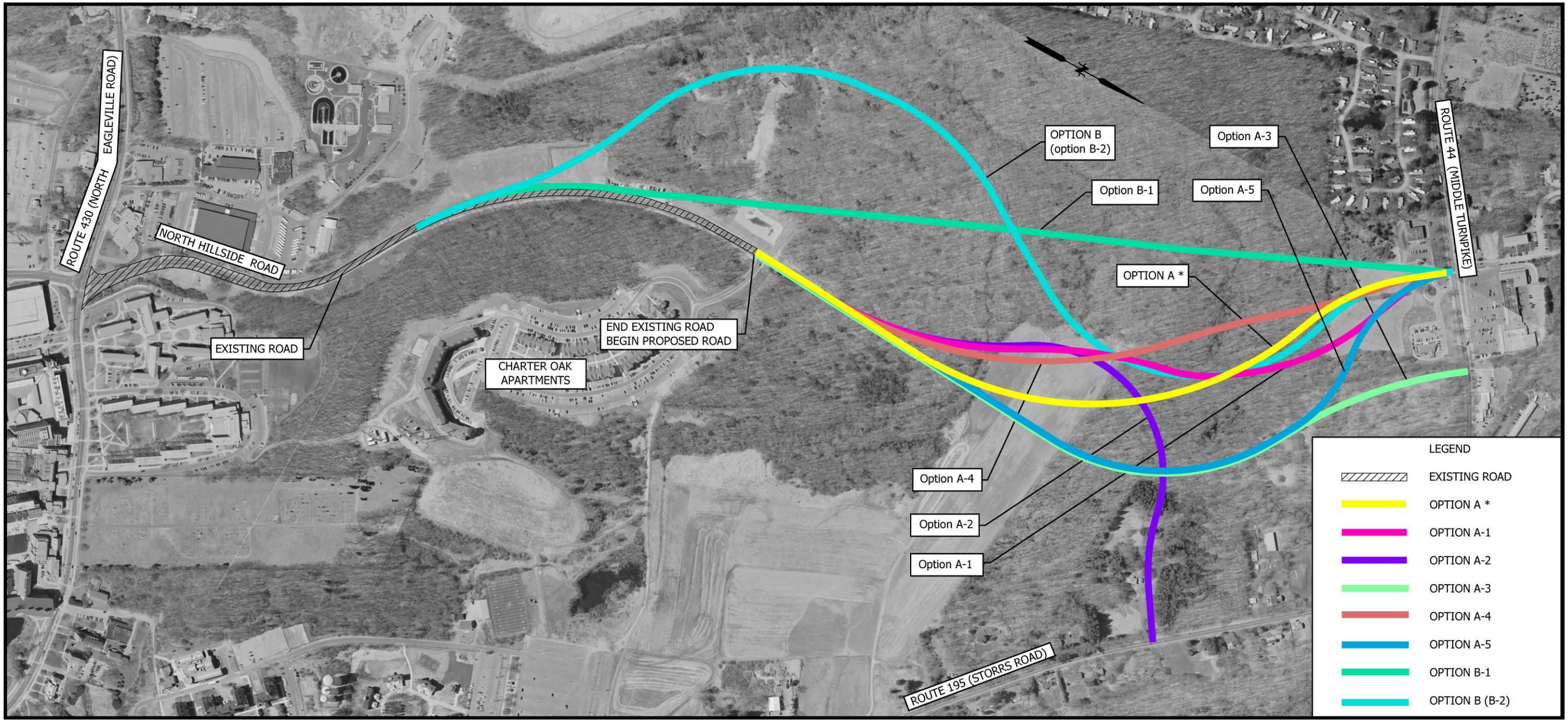
The 1994 EIE initially examined six alternative roadway alignments, referred to as "Options" in the EIE (Figure ES-3). Each of these alignments was examined to determine their impact on wetlands, public safety, traffic congestion relief, and value to research park development. Through the EIE process, the roadway alignment alternatives were narrowed to Option A (a composite of the A-1 through A-4 options) and Option B (a modification of Option B-2 which connected to the existing North Hillside Road). Ultimately, a 4,000 foot roadway alignment presented in the 1994 EIE as Option B was selected. In the 2001 North Campus Master Plan EIE the Option A roadway alignment was presented because it was more environmentally sensitive, with fewer impacts on wetlands and farmlands than Option B. This preferred alignment was approved by the State of Connecticut Office of Policy and Management and is the alignment that the current design follows.

For the preparation of the DEIS, the potential wetlands impacts of the Option A and Option B alignments were reviewed in light of the 2006 wetlands delineation. The Option B alignment would result in approximately 0.86 acres of wetland impacts compared to 0.34 acres of wetland impacts for Option A. Consequently, Option A, identified as the preferred alternative alignment in the 2001 EIE, was identified in the DEIS as the most feasible and prudent alternative that balances the need for the roadway extension with avoiding and minimizing environmental impacts. Option A was identified in the DEIS as the preferred roadway alignment (i.e., the DEIS Preferred Alternative).

Based on comments received from the resource agencies on the DEIS, the roadway alignments that were considered in the previous EIEs (Options A, A-1, A-2, A-3, A-4, B-1, and B-2) were further evaluated based on potential impacts to wetlands and other environmental resources, including vernal pools (and related amphibian migration), which had not yet been identified at the project site when the previous EIEs were prepared. One additional roadway alignment was also evaluated (Option A-5), which is a modification of the A-3 alignment as described below.

Each of these roadway alignments was evaluated based on wetland impacts, habitat connectivity, and other environmental factors. Based on the results of the evaluation, the CT DEP and ACOE requested additional information to support the selection of the LEDPA for the North Hillside Road extension. Specifically, the resource agencies requested additional supporting information to compare the Option A roadway alignment and the Option A-5 alignment, which would not sever Vernal Pool 1 from the Red Maple Swamp vernal pool complex to the west.

Figure ES-3. Alternative Roadway Alignments Considered



Note: Alternative (Option) A (the proposed alternative from the 1994 and 2001 EIEs and the current design alternative) is a composite of Alternatives A-1 through A-4 in the 1994 EIE. Alternative B is a modification of Alternative B-2 in the 1994 EIE.

Further coordination with the CT DEP and ACOE in January and February 2010 resulted in several key project modifications of the Option A alignment to address the remaining concerns regarding wetland impacts and habitat connectivity for aquatic resources. The two wetland crossings of greatest concern (Crossings A and C) were re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Crossing A is designed as a 40-foot precast concrete rigid frame with open bottom designed to comply with the Connecticut Department of Energy and Environmental Protection (CT DEEP, formerly the Connecticut Department of Environmental Protection) and ACOE stream crossing standards, and Crossing C is designed as a 76-foot clear span bridge to completely avoid wetland impacts and maintain vernal pool habitat connectivity for semi-aquatic resources and terrestrial wildlife.

With these design modifications, the Option A alignment is the preferred alignment in this FEIS and recommended as the LEDPA.

North Campus Development

Alternatives for the development of the North Campus have been analyzed in the 1994 EIE (Frederic R. Harris, 1994), the Outlying Parcels Master Plan (JJR, 2000) and associated North Campus Master Plan EIE (Frederic R. Harris, 2001), and again as part of the EIS and wetlands permitting (Section 404) process.

In the 1994 EIE, the development alternatives were driven by the roadway alignment and the goal of avoiding both inland wetlands and associated wetland buffer areas. In the 1994 EIE, the North Campus development alternatives were narrowed to development plans associated with the roadway alignment Options A and Option B (as described above). Both alternatives included five primary building sites and both were presented as possible designs for the technology park development.

The 2000 Outlying Parcel Master Plan revisited the development concepts for the North Campus in terms of the University's long-term master planning, with an emphasis on optimal resource utilization and efficient development that incorporates sustainable design principles. This approach inherently reduces indirect impacts from the roadway extension. The Master Plan identified 12 potential development parcels located on both sides of a proposed North Hillside Road extension that followed the roadway alignment of Option A presented in the 1994 EIE. The 2001 EIE for the North Campus Master Plan defined 10 development sites, while still achieving the total maximum building space of 1.2 million square feet.

As part of the Section 404 wetlands permitting and the preparation of the DEIS and FEIS, the North Campus development alternatives were revisited. Five conceptual North Campus development alternatives (Alternative 1, 2, 2A, 2B, and 2C) were evaluated, including consideration of development area, impervious cover, and wetland impacts. The proposed roadway alignment is the same for all five development scenarios (Option A as discussed in the previous section). Alternatives 1 through 2B reflect the box culvert wetland crossing design that was presented in the DEIS Preferred Alternative. Alternative 2C reflects the modified crossing

designs at Crossings A and C. All five alternative development concepts reflect the most recent wetland delineation for the entire North Campus project area performed in 2006 and the 2008 updated wetland delineation for Parcel C.

Alternative 1 was based on the Option A layout presented in the 1994 EIE. This alternative results in eight areas of wetland impacts on four development parcels and three areas of wetland impacts along the roadway, totaling approximately 2.64 acres and numerous encroachments into the 100-foot upland envelope surrounding the wetlands. Based on these impacts, Alternative 1 was found to be environmentally unacceptable and was dismissed.

Alternative 2 was developed based upon the planning principles and recommended land uses contained in the Outlying Parcels Master Plan and the associated 2001 EIE. This alternative reduces wetland impacts but includes some development within the 100-foot upland envelope. This alternative results in two areas of wetland impacts isolated to Parcel C and three areas of wetland impacts along the roadway, totaling approximately 1.23 acres, and several encroachments into the 100-foot upland envelope.

A third alternative was developed (Alternative 2A) in an effort to further reduce wetland impacts and development within the 100-foot upland envelope, while still meeting the building floor area, parking, and land use program requirements outlined in the Outlying Parcels Master Plan and the 2001 EIE and associated EIE Record of Decision (ROD). Alternative 2A provides approximately 1.2 million square feet of total building area and 4,475 parking spaces, including existing parking on Parcel F and Parcel H. This alternative results in one area of wetland impacts on Parcel C and three areas of wetland impacts along the roadway, totaling approximately 0.77 acres.

The North Campus development concept was further refined (referred to as Alternative 2B) based upon issues and concerns raised by the Connecticut Department of Environmental Protection, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service during an agency coordination meeting and site walk held at the UConn Storrs Campus on March 6, 2008. The proposed development on the northern portion of Parcel J was re-located to the former agricultural field between wetlands A and B to preserve an undisturbed wetland and amphibian migration corridor on the northern portion of the site. Proposed development on Parcel C was also reconfigured to limit site disturbance to the northern side of the existing dirt access road. Alternative 2B was identified as the preferred North Campus development alternative in the DEIS, resulting in further reduced wetland impacts (0.56 acres) and improved habitat connectivity on the northern portion of the site.

Additional coordination with the CT DEP and ACOE in January and February 2010 resulted in several modifications to the North Campus concept development plan to address the remaining concerns regarding wetland impacts and habitat connectivity for aquatic resources. The North Campus concept development plan was modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. The revised North Campus development concept is referred to as "Alternative 2C" in this FEIS.

Alternative 2C (Figure ES-4) provides approximately 1.2 million square feet of total building area and 4,475 parking spaces, including existing parking on Parcel F (W-Lot), Parcel L (landfill parking lot), and Parcel H (Charter Oak residential units), while limiting total wetland disturbance from the roadway extension and North Campus development to 0.31 acres. Development that was previously proposed for Parcel A under Alternative 2B has been re-allocated by increasing the density of development on Parcel B to maintain a maximum building space for the North Campus of approximately 1.2 million square feet.

The North Campus development Alternative 2C, combined with the modified wetland crossings for roadway alignment Option A, reflects the overall roadway and parcel development scenario that best addresses the University's goals for development of the North Campus while minimizing impacts to the on-site wetlands and maintaining habitat connectivity. This alternative is referred to as the "FEIS Preferred Alternative" and is recommended as the LEDPA.

ES.4 Environmental Consequences

The following sections summarize the principal environmental consequences of the proposed project, including direct impacts associated with the roadway extension and indirect or secondary impacts resulting from development of the North Campus parcels. Most of the environmental consequences associated with the project are due to indirect impacts associated with the development of the North Campus.

ES.4.1 Land Use

All alternative alignments considered for the roadway corridor will have a relatively limited direct impact in terms of land use conversion. The alternative roadway alignments will have similar indirect land use impacts in terms of conversion of woodland and agricultural land to developed areas. However, since the area of the proposed project has access to sufficient infrastructure to support development, includes the expansion of higher education within Connecticut, and since the proposed project is specifically identified as a development area in each of the relevant land use plans, the indirect land uses change resulting from the North Hillside Road extension is consistent with overall land use planning on the local, regional, and state level.

ES.4.2 Farmland

Direct impacts to farmland soils from the proposed North Hillside Road Extension are limited to 2.3 acres along the roadway corridor. Indirect impacts to farmland soils are associated with development of the North Campus parcels, including portions of Parcels B, H, J, and K (29.6 acres) and the creation of a wetland mitigation area adjacent to existing wetlands located east of Parcel D. The University acknowledges its responsibility to comply with the acre-for-acre farmland mitigation terms identified in the 1994 and 2001 CEPA EIEs. The University's Chief Operating Officer will work with the Dean of the College of Agriculture and Natural Resources (CANR) to replace a total of 34.1 acres of prime farmland on University-owned property

located near UConn's Depot Campus and Spring Manor Farm. The University also proposes to preserve 41.5 acres of prime farmland for cultivation by CANR on University-owned property located on or adjacent to the North Campus.

ES.4.3 Relocation and Rights-of-Way Acquisition

UConn expects to acquire a Right-of-Way (ROW) along areas of the existing driveway that would need to be widened for the proposed intersection of North Hillside Road and Route 44. There are no residential properties in this area and the ROW would not require, nor is UConn proposing, relocation of the two existing businesses at this intersection. UConn has requested CTDOT to act as its agent for ROW acquisition and is currently developing a Memorandum of Understanding with CTDOT to formalize this arrangement. If needed, UConn will determine the extent of mitigation required, if any, at a later point in the roadway design process. The University will take into account existing land use and underlying zoning during the ROW acquisition process in order to avoid or minimize effects on parking and ensure consistency with local zoning.

ES.4.4 Economic

The facilities constructed on the North Campus will result in new opportunities for employment. The University of Connecticut is already one of the major employers in Mansfield and the North Campus development is anticipated to not only generate new jobs in the area but also jobs that fall in the NCAIS sector of professional, scientific and technical services, which has the highest average annual wage of all NCAIS sectors represented in Mansfield. The North Campus development is anticipated to attract such employers by providing state-of-the-art facilities, close proximity to a leading research and development university and access to a highly educated work force. The 2001 EIE estimated that each 300 square feet of research/technology space would result in 1 employee. Using the same formula, the 841,000 square feet of research/technology space would potentially result in approximately 2,800 jobs. Additional jobs are also likely to be generated from the recreational and special academic facilities to be located on the North Campus.

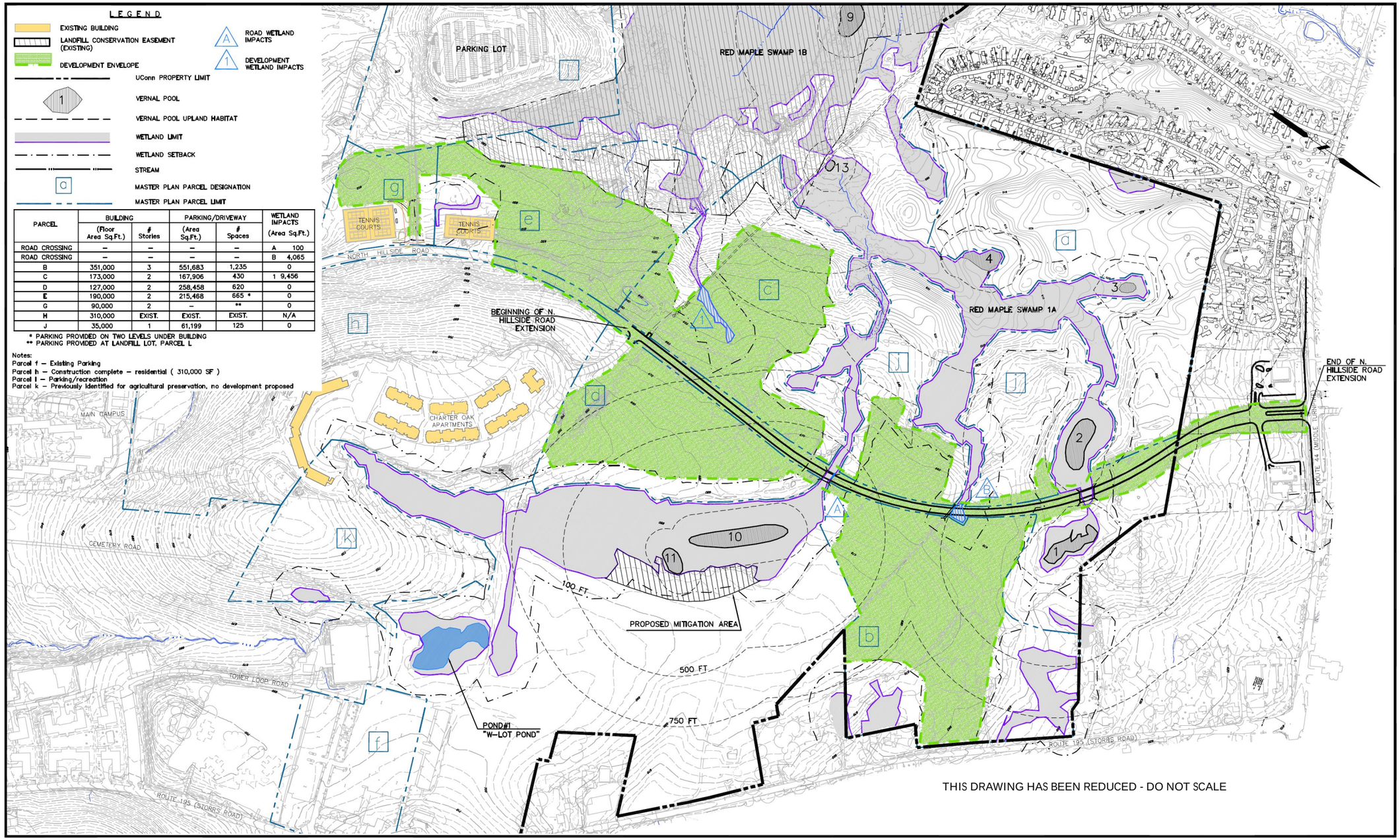
ES.4.5 Traffic

Additional traffic generated as a result of the development of the North Campus will result in declines in the Level of Service (LOS) at intersections in the project area. Under the 2030 Full Build condition, optimizing the signal timing at each intersection within the network will allow most of the signalized intersections to continue to operate acceptably during both peak hours. Several geometric improvements are recommended at full build out of the North Campus development in order to maintain acceptable levels of service at all of the signalized intersections within the study area.

ES.4.6 Air Quality

Analysis of microscale impacts on CO concentrations were evaluated using existing projected traffic data and EPA's CAL3QHC, a line source dispersion model and traffic algorithm for estimating vehicular queue lengths at signalized intersections, were used to estimate the

Figure ES-4. FEIS Preferred Alternative - North Campus Development



PARCEL	BUILDING (Floor Area Sq.Ft.)	BUILDING # Stories	PARKING/DRIVEWAY (Area Sq.Ft.)	PARKING/DRIVEWAY # Spaces	WETLAND IMPACTS (Area Sq.Ft.)
ROAD CROSSING	–	–	–	–	A 100
ROAD CROSSING	–	–	–	–	B 4,065
B	351,000	3	551,683	1,235	0
C	173,000	2	167,906	430	1 9,456
D	127,000	2	258,458	620	0
E	190,000	2	215,468	665 *	0
G	90,000	2	–	**	0
H	310,000	EXIST.	EXIST.	EXIST.	N/A
J	35,000	1	61,199	125	0

* PARKING PROVIDED ON TWO LEVELS UNDER BUILDING
** PARKING PROVIDED AT LANDFILL LOT, PARCEL L

Notes:
Parcel f – Existing Parking
Parcel h – Construction complete – residential (310,000 SF)
Parcel l – Parking/recreation
Parcel k – Previously identified for agricultural preservation, no development proposed

No.	DATE	DESCRIPTION	BY
1.			

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

SEAL

SEAL

University of Connecticut

SCALE:
HORZ.: 1" = 200'
VERT.:
DATUM:
HORZ.:
VERT.:
200 100 0 200
GRAPHIC SCALE

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NORTH CAMPUS
CONCEPT DEVELOPMENT PLAN
(2001 MASTER PLAN)
ALT. 2C
STORRS CONNECTICUT

PROJ. No.: 2001.219.A41
DATE: JUNE 2010

maximum ambient CO concentrations at intersections anticipated to experience the largest decline in LOS under 2030 full build conditions. Although the study area intersections are impacted by increased traffic, maximum one-hour and eight-hour CO concentrations at the subject intersections are estimated to be well below the Connecticut and National Ambient Air Quality CO standards.

The Connecticut Department of Transportation conducted mesoscale analysis using the MOBILE6.2 emissions model to calculate NO_x and VOC emissions and determine conformity with NAAQS for ozone. The analysis found an overall decrease in emissions of VOCs and NO_x by 2030 is anticipated in the air quality district in which the project is located due to a decline in ozone precursor compound emissions as a result of more stringent national emissions control programs. The projected emissions are below those required to maintain compliance with the State Implementation Plan and the NAAQS for ozone.

Construction of the proposed road extension and North Campus facilities will result in increased indirect GHG emissions primarily from fuel usage by vehicles traveling to and from the facilities, direct stationary emissions from fuel usage in the on-site buildings, and indirect stationary emissions from energy consumption (co-generation and off-site energy sources). The North Campus buildout is projected to increase state-wide transportation CO_2 emissions by 0.1%. Connecticut transportation-related CO_2 emissions are approximately 0.05% of the global total CO_2 emissions. The North Campus buildout is projected to increase campus CO_2 emissions from energy consumption by approximately 7-8%. Additional campus-wide CO_2 emissions reductions will be realized through on-going building retrofits and other measures including UConn's sustainable energy initiatives and LEED Silver Policy, as well as the Climate Action Plan emissions reduction targets.

The Proposed Action includes a number of design elements and mitigation measures that will reduce potential increases in GHG emissions associated with the roadway extension and the North Campus facilities. The North Campus facilities will be developed following the University's Sustainable Design & Construction Policy, which has provisions requiring any new building construction or renovation project entering the pre-design planning phase to establish the Leadership in Energy & Environmental Design (LEED) Silver rating as a minimum performance requirement. Comprehensive approaches to energy efficiency in the design of the new buildings will help to offset increased energy consumption and reduce potential increases in GHG emissions. UConn, through its Environmental Policy Advisory Council and related workgroups, will continue to update and implement the recommendations of its Climate Action Plan, which will also guide the design of the North Campus facilities.

ES.4.7 Noise

Future peak-hour noise levels were predicted using the Traffic Noise Model 2.5 (TNM). The model uses FHWA Vehicle Noise Emission Levels and was used to determine noise impacts associated with the proposed project at receivers previously identified in the 1994 EIE. The maximum predicted noise level increase associated with site-generated traffic in the 2030 Build scenario is 2.2 dBA over existing conditions. All are below the 67 dBA noise abatement criteria for the relevant Category B land use activity used by FHWA.

ES.4.8 Surface Water and Groundwater Resources

The proposed development of the North Campus is anticipated to result in an increased water demand of approximately 90,000 gallons per day, in addition to the approximately 45,000 gallons per day consumed by the existing Charter Oak residential units. Under normal streamflow conditions with all demands realized, including the proposed development of the North Campus, the University would have an adequate amount of water under both average and peak month conditions with the full registered withdrawals from the Fenton and Willimantic River wellfields, which are the University water supply. However, intermittent seasonal low flow conditions have the potential to cause voluntary limits on withdrawal to rates that are less than the registered diversions. The University has modified withdrawal protocols at the Fenton River wellfield to incorporate recommendations of the Fenton River study. UConn is also following the demand-based water conservation recommendations outlined in the Willimantic River study, which are based on Willimantic River streamflow values that trigger voluntary or mandatory water conservation actions under the drought response plan. The University is also considering the use of non-potable reclaimed water to address the water demands of the UConn Central Utility Plant and campus irrigation.

The build-out of parcels along North Hillside Road, or any other campus developments with potential impacts to water demand, will not happen all at once and is likely to occur over a 20-30 year time frame. Each new development along North Hillside Road will require at least a CEPA Comparative Evaluation. The Comparative Evaluation will include a refined analysis of parcel-specific water demand with respect to available supply at the time of the proposed development. Additionally, any new facilities built along North Hillside Road will be held to a high standard of water conservation through the use of high-efficiency fixtures and other features consistent with UConn's Sustainable Design & Construction Policy.

The proposed extension of North Hillside Road and development of the North Campus will increase the amount of impervious cover (IC) at the project site. If unmitigated, this increase in impervious area could result in a number of hydrologic changes at the site that could impact the water quality of the receiving water bodies. The approximately 35 acres of new impervious cover resulting from the roadway extension and North Campus development would result in an approximately 2% increase in IC of the Cedar Swamp Brook subwatershed and an approximately 1% increase in IC of the Mason Brook subwatershed. It is estimated that IC in the subwatersheds will remain at 10% or less, levels which are generally indicative of healthy stream systems that have been minimally impacted by human activity. Potential impacts associated with increases in IC as a result of the proposed project will be mitigated by the project design, including the preservation of wetland/watercourse buffers and the proposed stormwater management system, as described elsewhere in this document.

The potential impacts of new impervious cover on Parcel G, a portion of which will discharge to Eagleville Brook, will be effectively mitigated by preserving wetland/watercourse buffers and implementing new stormwater management controls for the entire North Campus development, which is consistent with the Eagleville Brook IC Total Maximum Daily Load objectives.

The western portion of Parcel A lies within the area of contribution to the supply wells that serve the Rolling Hills Mobile Home Park. Under the preferred North Campus concept development scenario, the previously proposed development on Parcel A has been eliminated, preserving the land through a conservation easement. The eastern portion of Parcel B is located within the Fenton River watershed, which is a public water supply watershed. Under any of the project alternatives, the proposed development in this area could potentially impact groundwater quality resulting from infiltration of untreated stormwater runoff or release of chemicals or other hazardous materials to the environment. In addition to stormwater management practices to reduce the effects of IC, construction-phase best management practices will also be implemented to reduce the potential for impacts on nearby public drinking water supply wells and surface water supplies.

ES.4.9 Stormwater Management

Construction of the proposed roadway and subsequent development of the North Campus will result in increased stormwater runoff. The proposed stormwater management system for the roadway extension and the conceptual stormwater management system for the North Campus development include a variety of stormwater management methods, including Low Impact Development (LID) techniques, to achieve stormwater quantity and quality objectives consistent with the stormwater management standards and design guidelines in the CT DEEP *Connecticut Stormwater Quality Manual* and the University's Sustainable Design & Construction Policy. The project will not result in increases in peak runoff over existing conditions for storms up to and including the 100-year storm for any of the drainage areas analyzed within the project area. In addition, the proposed stormwater management system for the project site is designed to preserve the existing hydrologic conditions to the extent possible, including drainage patterns, runoff volume, groundwater recharge, and runoff quality.

ES.4.10 Wetlands

Two wetland areas, totaling 0.09 acres, will be impacted by the proposed roadway construction. Indirect impacts to wetlands resulting from the development of the North Campus parcels are estimated at 0.22 acres. The wetlands to be disturbed are primarily broad-leaf deciduous forested areas. The total area of proposed wetland impacts for the roadway extension and associated North Campus development is 0.31 acres. The proposed mitigation consists of an approximately 2.2-acre wetland creation involving expansion of the forested wetland adjacent to an agricultural field. Other wetland mitigation measures include preservation of an undisturbed wetland and amphibian migration corridor on the northern portion of the site through a conservation easement, a comprehensive stormwater management system design for the North Campus development, wetland crossing designs that avoid or minimize wetland impacts and maintain habitat connectivity, avoidance of the 100-foot upland envelope around the existing wetlands, limiting development to less than 25% of the area within the 750-foot critical upland habitat area of vernal pools, preservation of 85% or more of the upland habitat within 500 feet of vernal pools, and stream bank restoration of an on-site intermittent stream on the project site.

ES.4.11 Water Body Modification and Wildlife Habitat

The proposed project does not include impoundment, relocation, channel deepening, filling, or other modifications to water bodies or watercourses as a primary goal of the project. Direct and indirect impacts of the roadway extension include loss of existing woodland, grassland & field, and wetland habitat. The amount of habitat types impacted is a function of the roadway corridor alignment and the conceptual design for development of the North Campus. The roadway alignment identified in the Outlying Parcels Master Plan and as the Preferred Alternative in this document is intended to reduce wetland impacts. Potential direct and indirect impacts in this alternative result in greater loss of woodland habitat and field areas, both as a result of the proposed roadway alignment and the resulting development. Indirect impacts resulting from the development of the North Campus will result in partial loss of the woodland that is located between the proposed road, the Charter Oak residential area, and the existing agricultural field (except for wooded wetlands located in this area that will be preserved). Woodlands to the west of this area, as well as other areas on the northwest portion of the project site, are proposed for development under each of the North Campus development alternatives. Given the higher habitat value of the wetland areas, loss of woodlands will likely result in less overall wildlife impact compared to wetland disturbance of similar magnitude.

ES.4.12 Threatened or Endangered Species

No Federally-listed threatened or endangered species have been identified in the project area. The 2006 field investigations indicate that state-listed grassland bird species do not appear to use the small grasslands present at the site as breeding habitat, but cornfields present at the site may serve as staging and migratory habitat for grassland-associated bird species. Loss of this potential staging and migratory habitat will be offset by farmland mitigation activities will result in fields similar to that which currently exists, and in similar quantities. Unmitigated loss of woodlands is not expected to affect state-listed species. The build alternatives could result in potential impacts to the state-listed Northern Spring Salamander, which has not been observed on-site but which has been reported in 2008 two miles away from the North Campus. Proposed mitigation measures to offset potential impacts to the Northern Spring Salamander include a construction time window to cross the intermittent stream to the extent practicable, maintaining significant forest canopy around the intermittent stream, wetland crossing designs that maintain habitat connectivity, and reducing and managing road runoff to the intermittent stream during and after construction.

ES.4.13 Historic and Archaeological Preservation

A Phase 1A Archaeological Assessment Survey of the North Campus area (1987) and Phase 1B and Phase 2 archaeological surveys (2005, 2006) of the roadway corridor have been completed. The results of the surveys indicate that construction of the North Hillside Road extension along the proposed corridor alignment will not result in significant impacts to historical and archaeological resources. This finding is consistent with correspondence from the State Historic Preservation Office (SHPO) and Tribal Historic Preservation Officers (THPOs) regarding the project that found no effect associated with the roadway. However, development Parcels A, C, J, E, and G contain potential areas of prehistoric value, and Parcel B contains an area of potential historic value. The development of these parcels (with the exception of Parcel

A, which will remain undeveloped through a conservation easement) will require additional archaeological surveys prior to development to determine if development activities could impact cultural resources. Further archaeological assessment may also be required prior to development of Parcel H since the limits of previous archaeological studies did not fully encompass the boundaries of this parcel. Parcel F contains two state-listed historic structures. The conceptual North Campus development plan calls for those structures to remain, so no impact to historic resources is anticipated. The University will be responsible for coordinating with the SHPO and appropriate THPOs regarding the future development of the North Campus area.

ES.4.14 Visual and Aesthetic Resources

The construction of the roadway extension and development of the North Campus will inevitably have an impact upon the aesthetic character of the site. The roadway extension itself, while located within a viewshed as defined by the Town of Mansfield, will not directly impact the drumlin or other hill areas identified in the Town of Mansfield Scenic Resources and Classifications Map. Secondary impacts resulting from development of the proposed parcels are likely to include the partial disruption of vistas from Route 195 and the Charter Oak residential units, as well as some disruption of vistas from Route 44. The Outlying Parcels Master Plan and 2001 EIE recommend measures to reduce the visual impacts upon the aesthetic character of the project site and the surrounding area including roadside plantings and vegetated buffers between property boundaries and development areas. The preservation of Parcel A through a conservation easement will maintain an undisturbed visual buffer between the Rolling Hills Mobile Home Park and the proposed North Campus development.

ES.4.15 Title VI and Environmental Justice

No direct impacts to minority or low-income populations will result from the extension of North Hillside Road. The area of the North Campus proposed for development does not contain, nor is it directly adjacent to, areas of EJ populations and therefore, no disproportionately high impacts to protected groups will occur due to the construction or operation of the facilities identified for the North Campus development. In fact, minority and low-income populations within the Storrs campus student population, as well as the overall student body, will ultimately benefit from the expanded facilities constructed as part of the North Campus development.

ES.4.16 Construction Impacts

The construction impacts associated with each of the build alternatives are relatively similar and result primarily from the noise, fugitive dust, construction equipment exhaust, erosion and sedimentation, traffic and pedestrian relocation, and visual impacts that occur with roadway construction and subsequent site development activity and do not extend in duration past the construction period. Mitigation measures would be provided during construction to reduce impacts on natural resources and communities. Most mitigation measure are incorporated into the construction specifications as requirements or best management practices (BMPs).

ES.4.17 Secondary and Cumulative Impacts

Construction of the proposed North Hillside Road extension will facilitate the development of the North Campus which is a distinct, but connected, action. Consequently, the majority of secondary impacts result from the construction and operation of facilities on the North Campus parcels and consists of the types of impacts discussed above. Because these impacts are associated with the North Campus development, they are similar in nature and magnitude for all roadway alignments considered.

In considering cumulative impacts, resources affected by the project were identified; the relevant geographic area for a particular resource affected by the project was identified; other relevant past, present, and reasonably foreseeable future actions were considered; and the overall cumulative effect of the proposed action and these other actions were analyzed. In general, the direct and indirect effects of the project will not contribute substantially to cumulative effects, although the development of the North Campus will generate additional vehicle trips and is anticipated to have a positive economic effect due to the number and type of jobs created.

The proposed North Campus development will provide significant new and expanded high-technology employment opportunities in Mansfield and the region. The new jobs created by the proposed action will create an increased demand for existing and new housing, which will create a gradual increased demand for housing and services in the local community and in the region. The increased demand for housing could induce the sale of some existing housing units, and the private sector would likely respond to an increased housing demand by constructing more housing, as authorized by local land use boards and commissions. Construction of new housing has the potential for secondary and cumulative impacts to wetlands, water quality, farmland, traffic, air quality, utilities, and other environmental resources. All such new housing developments would need to comply with local zoning and be subject to their own environmental reviews on a case by case basis. Mitigation measures, as necessary, for this new housing will be implemented as a condition of local project approval, as well as applicable state and federal permit requirements.

ES.5 Required Permits and Approvals

The following federal and state permits and approvals are required for the extension of North Hillside Road, including consideration of potential indirect impacts associated with subsequent development of the North Campus:

- Record of Decision – A Record of Decision (ROD) must be issued by FHWA following the release of the FEIS and before the continuation of project design in accordance with 23 CFR 771.127.

- Final Design and Rights-of-Way Acquisition – Final roadway and mitigation design and acquisition of lands for rights-of-way and any mitigation, as needed.

- United States Army Corps of Engineers Section 404 Individual Permit – Although the proposed roadway extension will result in direct wetland impacts of 0.09 acres, which is

significantly lower then the 1-acre threshold for a Section 404 permit, the U.S. Army Corps of Engineers has previously determined that a Section 404 permit is required given the potential secondary wetland impacts associated with the development of the North Campus.

- CT DEEP Inland Wetland & Watercourses Permit – Required by an action undertaken by a state agency (in this case, UConn) in or affecting floodplains or natural or man-made storm drainage facilities. The actions in this instance are stormwater impacts associated with the extension of North Hillside Road, and subsequent impact of development of the North Campus parcels.

- CT DEEP 401 Water Quality Certificate – Required for Connecticut Department of Energy and Environmental Protection review of a federal permit application for discharges to navigable waters, including wetlands. A 401 Water Quality Certificate is required for the proposed project since coverage under the ACOE Section 404 individual permit is required.

- CT DEEP Flood Management Certification – Required for a State action (in this case, the actions of UConn) in or affecting floodplains or natural or man-made storm drainage facilities. The actions in this instance are stormwater impacts and wetland loss associated with the extension of North Hillside Road, and subsequent impact of development of the North Campus parcels.

- CT DEEP Water Diversion Permit (Non-consumptive Use) – Required for a State action that results in the alteration of surface water flows, including the collection and discharge of stormwater runoff from a watershed area greater than 100 acres. The proposed North Campus development concept includes a stormwater drainage system that would collect and manage stormwater runoff from a total of approximately 120 acres.

- CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (Construction Stormwater General Permit) – Required for construction projects that disturb more than an acre of land, regardless of project phasing. Greater than 1 acre of disturbance is anticipated to occur as part of the proposed project.

The following permits and approvals are anticipated to be required for the subsequent development of the North Campus parcels:

- Connecticut Environmental Policy Act (CEPA) Comparative Evaluation,
- General Permit for the Discharge of Stormwater Associated with Industrial Activities,
- General Permit for the Discharge of Stormwater Associated with Commercial Activities,
- State Traffic Commission Certificate of Safe Traffic Operation,
- Underground Storage Tank Registration (if applicable),
- New Source Review (Air Quality).

ES.6 Mitigation Summary

Mitigation measures to reduce or offset potential adverse impacts associated with the proposed action are summarized in Table ES-1.

Table ES-1. Summary of Mitigation Measures

Environmental Sector	Proposed Mitigation
Farmland Impacts	• Preservation of 41.5 acres of prime farmland for cultivation by the College of Agricultural and Natural Resources on University-owned property located on or adjacent to the North Campus, all of which is currently in agricultural use. • Conversion of 34.1 acres of University-owned land to Prime and Statewide Important Farmland located near the UConn Depot Campus and Spring Manor Farm to achieve the acre-for-acre farmland mitigation identified in previous CEPA documents. • A certified soil scientist will perform a field reconnaissance of the proposed farmland mitigation sites at the Depot Campus prior to finalizing the farmland conversion plans to assess the presence of wetlands and watercourses. The CT DEEP Natural Diversity Database will also be consulted regarding listed species for these areas prior to finalizing the farmland conversion plans.
Relocation Impacts and Rights-of-Way Acquisition	• The need for mitigation associated with ROW acquisition will be determined at a later point in the roadway design process. Existing land use and underlying zoning will be taken into account in the ROW acquisition process to avoid or minimize affects on parking and zoning. • Development of a Memorandum of Understanding with CTDOT to formalize the ROW acquisition agreement.
Traffic	• Optimization of signal timing at signalized intersections in the study area. • Geometric improvements at selected intersections to maintain acceptable levels of service at all of the signalized intersections within the study area. • Conduct a warrant analysis at the unsignalized intersection of North Eagleville Road at Hunting Lodge Road to determine if a roundabout or a traffic signal is necessary.
Air Quality	• See construction impacts • Design elements that will reduce potential increases in GHG emissions associated with the roadway extension and the North Campus facilities, including LEED Silver performance standards for building design and operation, sustainable site design measures and LID stormwater management, and alternative transportation measures such as accommodations for pedestrians and bicycles (bike lanes in both directions) as well as use of the existing campus shuttle system • UConn will also consider other measures for the design, construction, and operation of the North Campus facilities to further reduce energy consumption and GHG emissions including additional Transportation Demand Management measures and small-scale on-site renewable energy generation
Noise	• See construction impacts
Surface Water and Groundwater Resources	• Follow the Fenton River wellfield withdrawal protocol recommendations outlined in the Fenton River instream flow study and the 2007 Water and Wastewater Master Plan, as dictated by stream flow conditions. • Follow the demand-based water conservation recommendations outlined in the

Table ES-1. Summary of Mitigation Measures

Environmental Sector	Proposed Mitigation
	Willimantic River study, which are based on Willimantic River streamflow values that trigger voluntary or mandatory water conservation actions. • Follow the comprehensive wellfield management plan protocols as part of the revised UConn water supply plan (May 2011). • The use of non-potable reclaimed water to address the utility plant and irrigation water demands is expected to off-set the amount of potable water that would have otherwise been used in those applications. • Future developments on the North Campus will employ water conservation measures consistent with the University's targeted conservation initiatives that are described in the 2007 Water and Wastewater Master Plan and UConn's Sustainable Design Guidelines and Sustainable Design & Construction Policy. • Incorporate project design elements that limit or reduce potential aquatic impacts of stormwater runoff from impervious cover. • Implement construction-phase best management practices (see construction impacts) to reduce the potential for impacts on nearby public drinking water supply wells and surface water supplies.
Stormwater Management	• Design measures to reduce or limit impervious cover (reduced parking ratio, use of structured and shared parking, reduced sidewalk width) • A combination of centralized and LID stormwater management measures for the roadway extension and North Campus development consistent with the CT DEEP *Connecticut Stormwater Quality Manual*. ○ Pervious pavement for parking areas, water quality swales/basins, rain gardens/bioretention, infiltration of roof runoff, stormwater ponds with sediment forebays, underground detention systems, swirl concentrator units, and level spreaders. • Non-structural source controls and pollution prevention measures (street and parking lot sweeping, catch basin cleaning, drainage system and stormwater treatment system operation and maintenance, etc.). • Stormwater management O&M Plan • Construction-phase best management practices (see construction impacts)
Wetland Impacts	• Wetland creation area adjacent to the farm field and forested wetland • Roadway wetland crossing designs (clear span bridge, 3-sided rigid frame, and embedded box culvert) will minimize wetland impacts and maintain habitat connectivity • Roadway design to include vertical barriers to direct amphibians through the wetland crossings, and sloped curbing to reduce the potential for retention of amphibians on the road. • Grading at wetland crossings will be 2:1 or steeper to minimize wetlands disturbances. • Stormwater management measures • Avoiding construction within the vernal pools and within the 100-foot envelope of the vernal pools, preservation of 85% or more of the upland habitat within the 500-foot review area, and minimizing development within the 750-foot critical upland area to less than 25%, which is consistent with the guidance provided in Calhoun and Klemens (2002). • Maintain an undeveloped forested habitat around the vernal pools, including the

Table ES-1. Summary of Mitigation Measures

Environmental Sector	Proposed Mitigation
	canopy and understory. • Preserving an undisturbed wetland and amphibian migration corridor through a conservation easement, thereby protecting the vernal pools with the highest rating and ecological value, with an emphasis on maintaining wetland connectivity following the recommendations of Calhoun (2008). • Creation of an area of reduced salt application in the vicinity of the wetland crossings, where feasible based on safety considerations. • Placement of catch basins up-gradient of the wetland crossings to collect runoff containing de-icing and anti-icing materials. • Improving the efficiency of de-icing and anti-icing practices to minimize application, which is part of the University's on-going planning for more efficient winter roadway maintenance • Compliance with the relevant state laws and the campus Sustainable Design Guidelines regarding lighting, strategic placement of lighting fixtures and control of lighting directionality to minimize light at the wetland crossings to the extent practicable while still maintaining public safety and complying with the requirements for full cutoff lighting. • Implement invasive species monitoring and control program. • Stormwater basins located within 750 feet of a vernal pool will be designed with a smaller permanent pool (e.g., micropool extended detention) or as dry basins combined with other controls targeted at pollutant removal (bioretention or water quality swales) to reduce the potential for the stormwater basins to function as "decoy wetlands" and disrupt amphibian migration patterns.
Water Body Modification and Wildlife Impacts	• Avoidance and minimization of impacts to wetland areas, mitigation for wetlands to be lost, preservation of wetland buffers on the project site, a proposed conservation easement, mitigation of losses to field habitat through agricultural preservation and replication of converted farmland, wetland crossing designs that maintain habitat connectivity and are consistent with CT DEEP and ACOE stream continuity and crossing guidelines, and locating development to reduce woodland impacts where practicable. • Site clearing or grading within 750 feet of a vernal pool will be performed outside of the spring amphibian migration period (mid-March to the end of May), to the extent practicable. Construction should be staggered and silt fence should be minimized within 750 feet of the vernal pools. Silt fence should be used to exclude amphibians from active construction areas. • Preserve large-diameter trees to the extent practicable. • Prior to development activity on existing agricultural fields on the North Campus between late April and July, UConn will perform a field survey of these fields to verify a lack of nesting state-listed grassland birds.
Threatened or Endangered Species	• Farmland mitigation measures, which will provide staging and migratory habitat for the state-listed grassland bird species similar to that which currently exists, and in similar quantities. • Use of low-relief buildings to limit impacts to migrant birds. • Site clearing or grading within 750 feet of a vernal pool will be performed outside of the spring amphibian migration period (mid-March to the end of May), to the extent practicable. Construction should be staggered and silt fence should be

Table ES-1. Summary of Mitigation Measures

Environmental Sector	Proposed Mitigation
	minimized within 750 feet of the vernal pools. Silt fence should be used to exclude amphibians from active construction areas. • Proposed mitigation measures to offset potential impacts to the Northern Spring Salamander include a construction time window (November to March) to cross the intermittent stream to the extent practicable, maintaining significant forest canopy around the intermittent stream, and reducing and managing road runoff to the intermittent stream during and after construction.
Historic and Archaeological Preservation and Section 4(f) Resources	• Additional cultural resource investigation and coordination with the SHPO and THPOs prior to development of the North Campus parcels.
Visual and Aesthetic Resources	• Roadside plantings along roadside cut slopes. • Vegetated buffers between proposed development areas and adjacent property lines (30-foot width minimum). Buffer widths in excess of 30 feet will be determined on a case-by-case basis. • Design criteria for exterior lighting to include minimizing unnecessary light spillage. • Farmland preservation, limiting development on steep slopes, and providing pedestrian and bicycle facilities. New buildings will be between one and three stories, with at-grade or below-grade structured parking to reduce building footprints and associated environmental and aesthetic impacts.
Energy	• Use of environmentally-friendly technologies for energy efficiency for development on the North Campus consistent with the UConn Sustainable Design & Construction Policy, which has provisions requiring any new building construction or renovation project entering the pre-design planning phase to establish the Leadership in Energy & Environmental Design (LEED) Silver rating as a minimum performance requirement.
Construction Impacts	• Appropriate construction signage, uniformed officers, and prohibition of construction traffic on designated local roads. The preferred construction access will be from Route 44 to avoid use of campus roadways. Construction access to and from the project site will be incorporated into the final project plans and specifications. • Existing traffic patterns will be maintained to the extent feasible during peak traffic hours. • Good "housekeeping" practices such as watering exposed earth areas, covering dust-producing materials during transport, limiting dust-producing construction activities during high wind conditions, and providing street sweeping or tire washes for trucks leaving the site. • Prohibition of excessive construction equipment idling and the use of air pollution control devices (e.g., oxidation catalysts and particulate filters) and clean fuels for the project construction where appropriate. • Conformance with Connecticut noise regulations • In project specifications, require contractors to limit construction noise • Limiting construction to daytime hours • Use and regular maintenance of mufflers on construction equipment • Use of appropriate erosion and sediment controls during construction

Table ES-1. Summary of Mitigation Measures

Environmental Sector	Proposed Mitigation
	• Provisions for emergency spill response during construction, hazardous material storage and disposal to prevent vandalism and undetected releases, construction vehicle fueling and maintenance procedures, notification of affected public water systems and CT DPH of the construction start date, and procedures for notification of CT DPH and CT DEEP in the event of a chemical/fuel spill at the construction site. • Construction in the vicinity of the vernal pools will take place outside amphibian movement periods in early spring and fall. Construction should be staggered and silt fence should be minimized within 750 feet of the vernal pools. Silt fencing should be used to exclude amphibians from active construction areas.

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NORTH HILLSIDE ROAD EXTENSION
University of Connecticut
U.S. Department of Transportation
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G	Stormwater Management Plan (on CD-ROM only)
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K	Cultural Resource Investigations and Related Correspondence (on CD-ROM only)
L	Connecticut Office of Policy and Management CEPA Correspondence
M	Resource Agency Meeting Notes
N	DEIS Comments and Responses

ACRONYMS AND UNITS

ACOE	Army Corps of Engineers
ADT	Average Daily Traffic
AMCS	American Cultural Specialist, Inc.
AST	Aboveground Storage Tank
BMP	Best Management Practice
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CANR	University of Connecticut College of Agricultural and Natural Resources
CBRA	Coastal Barrier Resources Act
CEPA	Connecticut Environmental Policy Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CL&P	Connecticut Light and Power Company
CMAQ	Community Multiscale Air Quality
CNG	Connecticut Natural Gas Corporation
CO_2	Carbon Dioxide
COG	Council of Governments
CTDOT	Connecticut Department of Transportation
CT DEP	Connecticut Department of Environmental Protection
CT DEEP	Connecticut Department of Energy and Environmental Protection (formerly Connecticut Department of Environmental Protection)
CT DPH	Connecticut Department of Public Health
CT DPW	Connecticut Department of Public Works
CT DCS	Connecticut Department of Construction Services (formerly Connecticut Department of Public Works)
CUP	Central Utility Plant
CZMP	Coastal Zone Management Program
DE	Diesel Exhaust
DEHS	University of Connecticut Department of Environmental Health and Safety
DEIS	Draft Environmental Impact Statement
EHHD	Eastern Highlands Health District
EIE	Environmental Impact Evaluation
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FR	Federal Register
GHG	Greenhouse Gas
HAP	Hazardous Air Pollutant
HLV	Hazard Limiting Value
HWSF	Hazardous Waste Storage Facility
IC	Impervious Cover
IRIS	Integrated Risk Information System

ITE	Institute of Traffic Engineers
LEDPA	Least Environmentally Damaging Practicable Alternative
Leq	Equivalent Level
LIT	Leachate Interception Trenches
LMA	Labor Market Area
LOS	Level of Service
LTMP	Long-Term Monitoring Plan
MOU	Memorandum of Understanding
ROD	Record of Decision
MMT	Million Metric Tons
MSATs	Mobile Source Air Toxics
MTBE	Methyl Tertiary Butyl Ether
MUTCD	Manual on Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NAICS	North American Industry Classification System
NATA	National Air Toxics Assessment
NCHRP	National Cooperative Highway Research Program
NDDB	Natural Diversity Data Base
NEE	New England Environmental, Inc
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NFWS	National Fish and Wildlife Service
NLEV	National Low Emission Vehicle
NRCS	Natural Resource Conservation Service
NSPS	New Source Performance Standards
OPM	Connecticut Office of Policy and Management
PGP	Programmatic General Permit
PILOT	Payment in Lieu of Taxes
POTW	Publicly Owned Treatment Works
PZC	Planning and Zoning Commission
RAP	Remedial Action Plan
RCSA	Regulations of Connecticut State Agencies
RFG	Reformulated Gasoline
ROD	Record of Decision
ROW	Right of Way
SHPO	Connecticut State Historic Preservation Office
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SR	State Route
STC	Connecticut State Traffic Commission
STIP	Statewide Transportation Improvement Program
TASC	Toxic Air Study in Connecticut
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
UConn	University of Connecticut
UCEPI	University of Connecticut Educational Properties, Inc.

USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
V/C	Volume to Capacity Ratio
VMT	Vehicle Miles Traveled
WINCOG	Windham Regional Council of Governments
WQC	Water Quality Certification
gpd	Gallons Per Day
cfs	Cubic Feet per Second
dBA	A-weighted Decibel
g/hr	Grams per Hour
gpm	Gallons per Minute
g/mi	Grams per Mile
kV	Kilovolt
mgd	Million Gallons per Day
mg/m^3	Milligrams per Cubic Meter
mph	Miles per Hour
MW	Megawatts
ppm	Parts Per Million
psig	Pounds per Square Inch Gauge
sf	Square Feet
$\mu g/m^3$	Micrograms per Cubic Meter

1.0 PROJECT DESCRIPTION

1.1 Introduction

On December 29, 2008, the Federal Highway Administration (FHWA), in cooperation with the University of Connecticut (UConn), released for circulation and review by federal, state, and local agencies and other interested parties, a Draft Environmental Impact Statement (DEIS) for the extension of North Hillside Road on the UConn Storrs campus from its current terminus northward to U.S. Route 44 in the town of Mansfield, Connecticut (Figure ES-1 and Figure ES-2). In addition to FHWA and UConn, the Connecticut Department of Transportation (CTDOT) is also a Joint Lead Agency as defined in 23 CFR §771.109. CTDOT is administering the approximately $6 million that was appropriated by the Federal government for the construction of the North Hillside Road Extension. (Note that new utilities are not eligible for federal-aid participation.) The DEIS was prepared and circulated pursuant to the National Environmental Policy Act (NEPA), codified in Title 23 of the Code of Federal Regulations, Part 771, Section (§) 771.119 and §771.135 (23 CFR 771.119 and 771.135).

A joint environmental and design public hearing was held on January 29, 2009 to solicit public and agency comment on the DEIS. The public comment period for the DEIS closed on February 13, 2009. Comments received from local officials and the public during the comment period supported the extension of North Hillside Road and subsequent development of the North Campus under the preferred development concept identified in the DEIS (referred to as the "DEIS Preferred Alternative"). In their comments, local officials and the public also requested adequate opportunity to review and comment on permit applications and construction plans prior to their approval and implementation. The regulatory agencies also identified several substantive issues, among other minor comments, including:

- Clarification of the definition of the No Action Alternative.
- Consideration of alternative roadway alignments that would further reduce wetland and vernal pool impacts compared to the DEIS Preferred Alternative.
- Potential secondary and cumulative impacts on wetlands and vernal pools from application of roadway deicers, roadway and parking lot lighting, and introduction of invasive species during construction.
- Incorporation of permeable pavement in proposed parking lots and other paved areas as an element of the project's stormwater management system.
- Consideration of additional reductions in the amount of proposed parking for the North Campus development parcels and the feasibility of a reduced travel lane width.
- Evaluation of potential cumulative off-campus impacts on housing and services as a result of the North Campus development.
- Consideration of greenhouse gas emissions resulting from construction and operation of the roadway extension and the North Campus development.
- Consideration of the feasibility of a 150-foot wetland buffer for the Red Maple Swamp 1A.

In response to the agency comments on the DEIS, additional evaluations were undertaken including a comparison of potential environmental impacts associated with the roadway alignments that were considered in previous CEPA Environmental Impact Evaluations as well as a modified version of one of the previous roadway alignments to further reduce wetland impacts based upon the current wetland and vernal pool delineations for the project site.

In May 2009, the Connecticut Department of Environmental Protection (CT DEP) and the U.S. Army Corps of Engineers (ACOE) raised additional concerns regarding the project design based upon revised state and federal permit applications, which were submitted to the agencies in December 2008. The resource agencies requested consideration and analysis of additional alternative road alignments, wetland crossing designs, and the proposed North Campus development envelope to further reduce impacts to aquatic resources as compared to the DEIS Preferred Alternative. The ACOE also requested additional information and analysis of alternatives to substantiate the selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) in compliance with the Federal Clean Water Act.

The permit applications were subsequently withdrawn, and a series of meetings were held with the CT DEP and ACOE between May 2009 and February 2010 to further evaluate roadway alignment alternatives and wetland crossing designs that would minimize impacts to aquatic resources and maintain vernal pool habitat connectivity. Notes from these meetings are provided in Appendix M. Several alternative roadway alignments were considered and evaluated during this process. However, the resource agencies primarily requested additional supporting information to compare the Option A (DEIS Preferred Alternative) roadway alignment with an alignment that would place the roadway east of Vernal Pool #1 (Option A-5). Modified wetland crossing designs were also considered for the Option A alignment to further reduce impacts to aquatic resources and to maintain vernal pool habitat connectivity. Reductions in the proposed development envelope were also considered for portions of the North Campus parcels.

The additional agency coordination and expanded alternatives evaluation resulted in the selection of a preferred alternative roadway alignment and North Campus development scenario. The Option A roadway alignment, which is the recommended alignment under the DEIS Preferred Alternative, remains the preferred roadway alignment in this FEIS. However, the two wetland crossings of greatest concern, as expressed by the resource agencies, have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Additionally, the North Campus concept development plan has been modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. The revised North Campus development concept is referred to as "Alternative 2C" in this FEIS. The results of the revised alternatives evaluation and the selection of the Preferred Alternative are discussed in Section 3.

The FEIS identifies the roadway alignment Option A and North Campus development Alternative 2C as the preferred alternative (FEIS Preferred Alternative). The ACOE will formally determine whether the preferred alternative presented in this FEIS complies with the Federal Clean Water Act Section 404(b)(1) Guidelines as the LEDPA through the Section 404 permitting process.

1.2 Preparation of FEIS

The purpose of the FEIS is to respond to public and agency comments on the DEIS, and present any additional information resulting from the post-DEIS review and coordination process. This FEIS has been prepared in accordance with NEPA, following the format specified in the Council on Environmental Quality (CEQ) regulations and FHWA guidance on preparing NEPA FEIS documents (FHWA, Technical Advisory 6640.8A). The FEIS includes information on changes in the project, impacts, technical analysis and mitigation that has been updated since the DEIS was circulated. Changes to the document since the release of the DEIS and new information are shaded in gray. The FEIS summarizes the additional evaluations that were completed in response to agency comments on the DEIS and subsequent coordination with the regulatory agencies.

The FEIS identifies the preferred alternative and describes the agency coordination and public input that resulted in selection of the preferred alternative. Appendix N contains copies of the DEIS comments and the responses to written and oral comments received at the public hearing on the DEIS, during the public comment period, and resulting from subsequent agency coordination. The individual comment letters and public hearing transcript are numbered to highlight specific comments and provide a reference to the corresponding response. Specific responses are provided, where applicable, or reference is provided to the appropriate section of the FEIS that addresses the comment.

1.3 Project Description

The proposed project will construct an approximately 3,400 foot road through a portion of land adjacent to the Storrs core academic campus known as the "North Campus." The roadway will facilitate the development of UConn-related academic and research buildings and student facilities on the North Campus, consistent with the master planning for that portion of the Storrs campus (JJR, 2000). It will also provide an alternate entrance to the University and relieve traffic on U.S. Route 44, Route 195, and Hunting Lodge Road.

The existing North Hillside Road begins at North Eagleville Road and extends approximately 4,000 feet to the north terminating just north of the Charter Oak Apartments. The new roadway will extend approximately 3,400 linear feet from the existing terminus near the Charter Oak Apartments northward to U.S. Route 44. The roadway will terminate at U.S. Route 44 between the two parcels occupied by New Alliance Bank, and Bank of America across from Professional Park Drive, creating a four way intersection, approximately 2,000 feet west of Route 195 (Storrs Road).

The roadway will be 32 feet wide, with two 11-foot wide bituminous concrete travel lanes and 5-foot bicycle lanes and shoulders. Route 44 will be widened at the intersection with the proposed North Hillside Road Extension to add exclusive eastbound and westbound left turn lanes, an eastbound right turn lane and a new traffic signal at the intersection, while still maintaining pedestrian access in this area. Additional right-of-way acquisition is anticipated to accommodate the widening of Route 44. The North Hillside Road approach to this intersection will be treated as a main University entrance with appropriate signage, boulevard median plantings, and landscaping.

In addition, there will be construction of utilities consisting of water, non-potable reclaimed water, sanitary sewer, storm drainage, telecommunications, primary electrical, and natural gas, as well as street lighting and code blue emergency phones. The project design includes a bituminous pedestrian sidewalk on the east side of the roadway (with Americans with Disabilities Act-compliant ramps) and a separate bicycle lane within the curb line in each direction. Guide rails will be installed where necessary.

1.4 Study Area

The study area consists of the proposed North Hillside Road corridor and the adjacent land identified for development on the North Campus. The North Campus is bounded on the north by Middle Turnpike (Route 44), to the east by Storrs Road (Route 195), to the south by North Eagleville Road, and to the west by Hunting Lodge Road. Figure 1-1 presents a site locus map for the project, and Figure 1-2 presents an existing conditions plan of the North Campus and surrounding areas.

The University of Connecticut Outlying Parcels Master Plan (SmithGroup JJR, 2000) identified specific parcels for development within the North Campus (Figure 1-3), assuming that North Hillside Road will be extended to Route 44. The intent of the Master Plan was to determine the optimal development potential for the North Campus within a conservation-based planning approach. Taking into account strategic campus relationships, protection of sensitive and regulated environmental resources, and opportunities for sustainable development, the Master Plan identifies primary or optimal land use, as well as secondary or acceptable land uses for the parcels. A more detailed description of the proposed North Campus development plan is presented in Section 3.

The North Campus consists of approximately 330 acres of hardwood forest, rolling topography, stream corridors, wetland areas, and agricultural land. The site has a change in elevation of approximately 220 feet, sloping from a high point on its south edge northwest to a low point. Topographic slopes on the site range from approximately 4 to 20 percent. The wetlands and prime farmland areas comprise approximately one-half of the North Campus. Many of the planning recommendations of the Master Plan are geared specifically at preserving woodlands, wetlands, streams, steep slopes, and prime farmland to the extent possible. The remaining acres are proposed for development opportunities, consistent with the Master Plan recommendations.

Existing development in the North Campus area includes the existing segment of North Hillside Road, the Charter Oak Apartments and Charter Oak Suites (collectively referred to hereafter as "Charter Oak Apartments") located on the east side of North Hillside Road (Parcel H in the Outlying Parcels Master Plan), and tennis courts along the west side of North Hillside Road that were relocated to the North Campus from elsewhere on campus (Parcel G and a portion of Parcel E). The former UConn solid waste landfill is located in the southwestern portion of the North Campus (Parcel L) and is being converted to a parking lot as part of the final remedial capping of the landfill.

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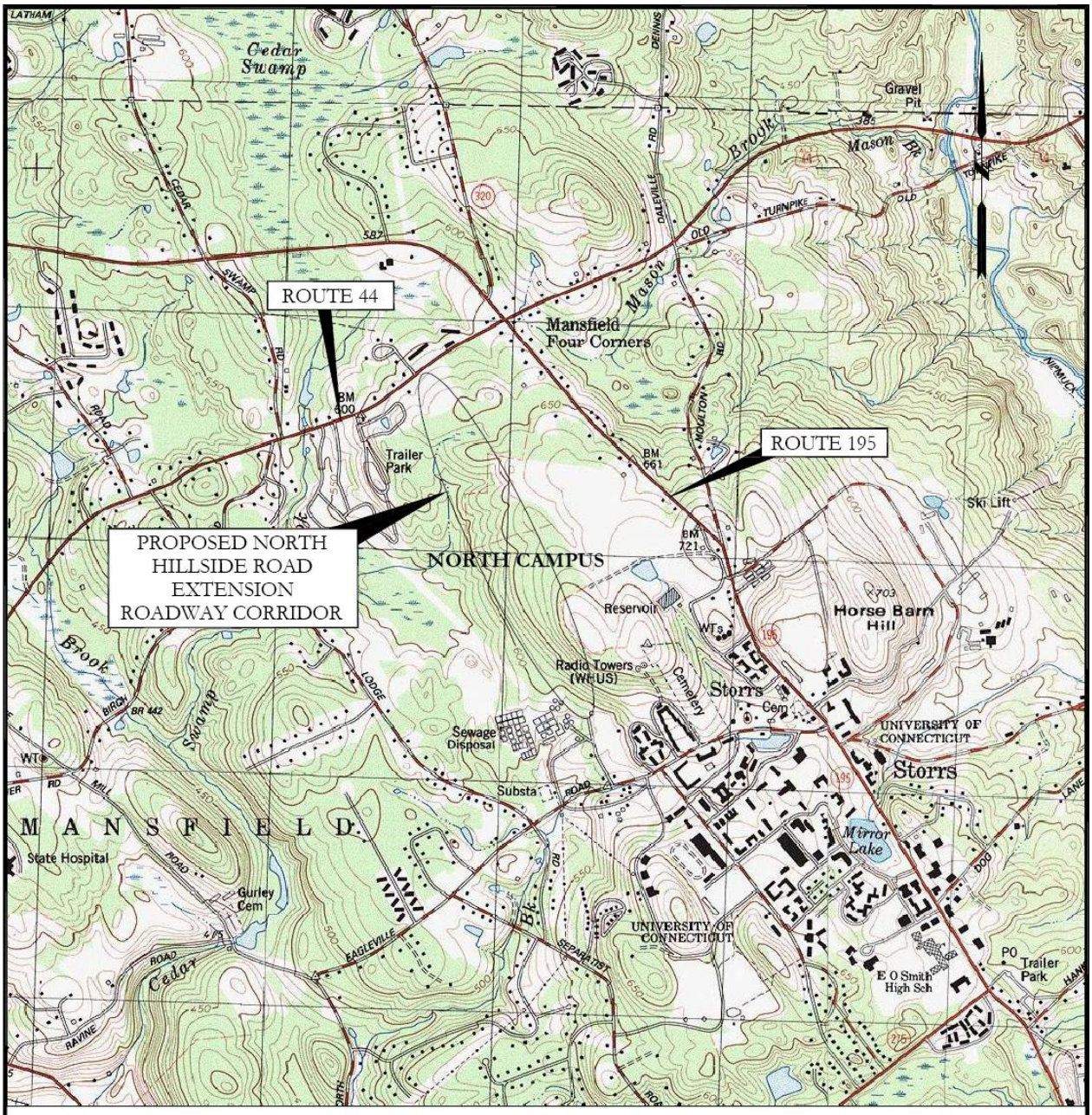
Figure 1-1. Locus Map



MAP REFERENCE:
THIS MAP WAS PREPARED FROM THE FOLLOWING 7.5 MINUTE SERIES TOPOGRAPHIC MAP: COVENTRY, CONN. 1974, PHOTOREVISED 1983

IDENTIFYING LOCATION
THE CENTER OF THE SITE SHOWN ABOVE IS APPROXIMATELY 1.25 MILES FROM THE INTERSECTION OF CT ROUTE 195 AND EAGLEVILLE ROAD.

THIS DRAWING HAS BEEN REDUCED - DO NOT SCALE

SCALE: HORZ: 1"=2000' VERT.: DATUM: HORZ.: VERT.: 0 1000 2000 GRAPHIC SCALE	WWW.FandO.COM FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD RD MANCHESTER, CT 06040 860.646.2469	THE UNIVERSITY OF CONNECTICUT LOCUS MAP NORTH HILLSIDE ROAD EXTENSION STORRS CONNECTICUT	PROJ. No.: 20050147.A20 DATE: NOVEMBER 2007

F:\P2005\0147\A20\FEIS\Figures\Figure 1-1.doc

Figure 1-2. North Campus Existing Conditions

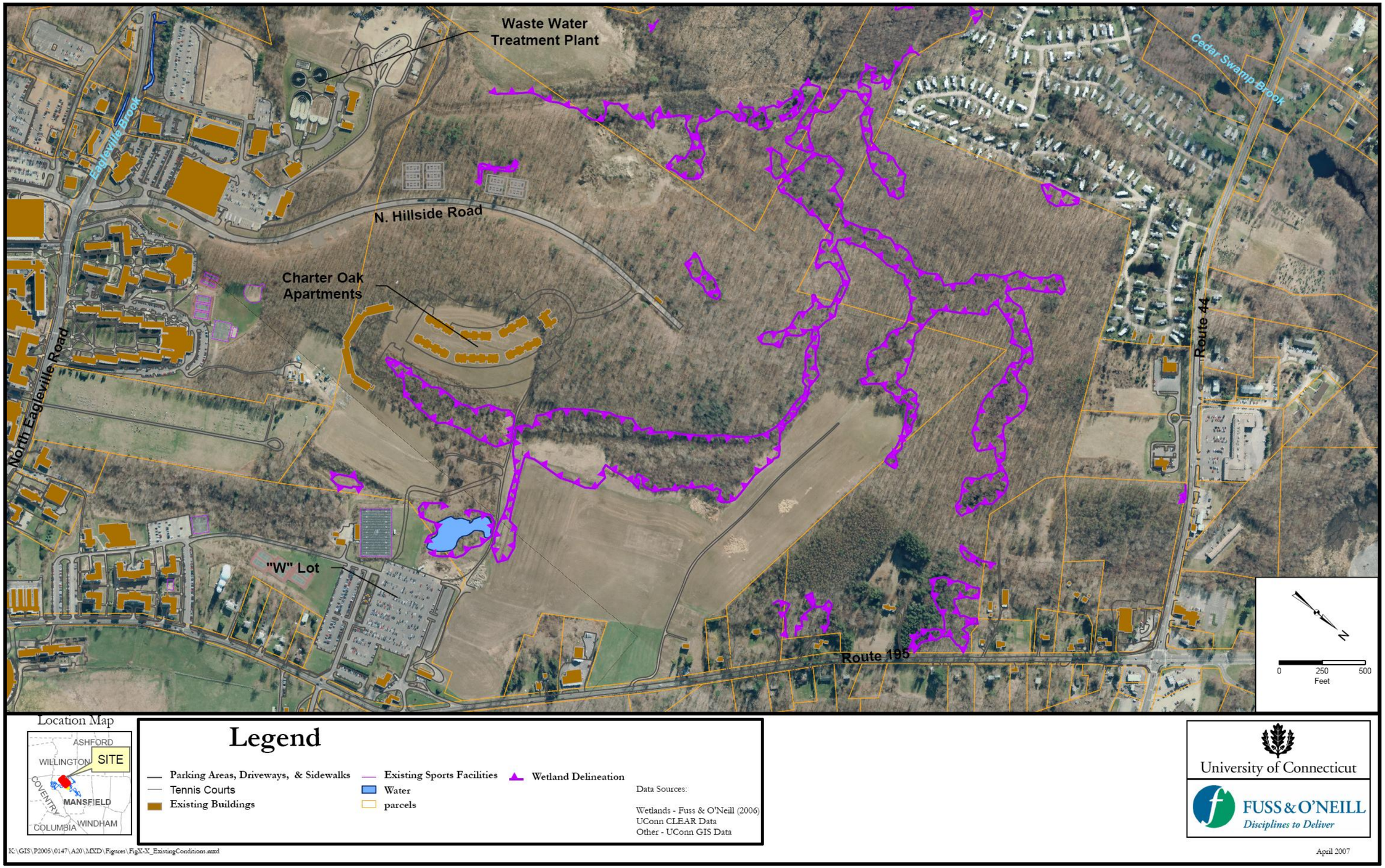
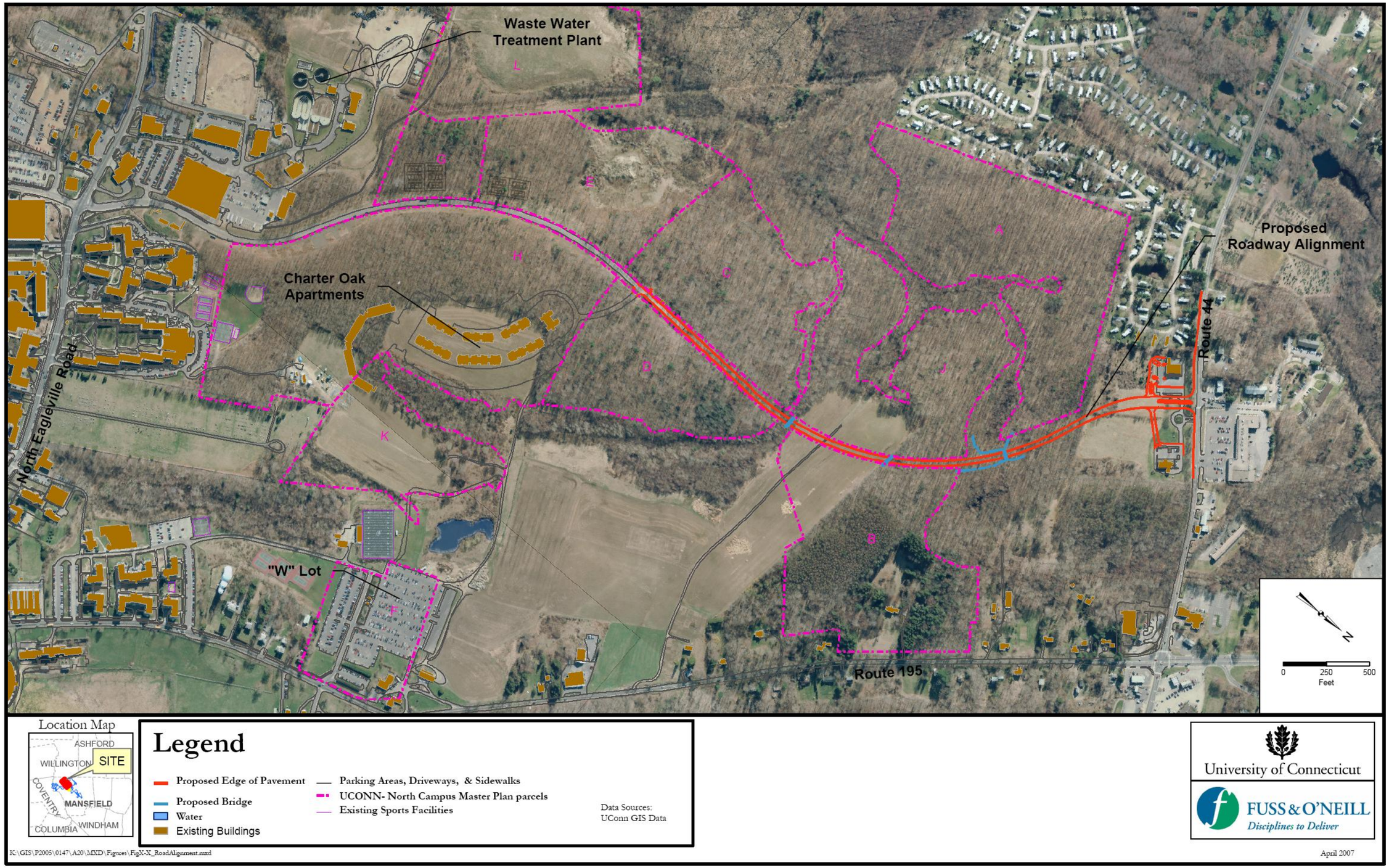


Figure 1-3. Proposed Roadway Alignment and North Campus Development Parcels



1.5 Project History

As indicated in the project history summary in Table 1-1, the construction of a roadway from North Eagleville Road (State Route 430) to U.S. Route 44 has been contemplated since the 1970s, when the area of land known as the North Campus was considered for the development of a research and technology park (Frederic R. Harris, 1994). In 1982, the non-profit entity called the University of Connecticut Educational Properties, Inc. (UCEPI) was formed to develop a research park on the area of state-owned land north of the UConn main campus, now called the North Campus.

UCEPI contracted a private developer, Sunrise Development Company, to formulate and implement a master plan for the "Connecticut Technology Park" on the North Campus. A concept master plan was prepared by Gibbons and Gibbons in 1983 and revised several times, the last revision being in 1986 (Frederic R. Harris, 1994).

In1986, full interest in the project was transferred from Sunrise Development Company to ConnTech Development Company. That year, the Town of Mansfield approved a zoning change for the 390-acre parcel from Rural Residential to Research and Development/Limited Industrial and the State of Connecticut approved $2 million for the construction of the southern portion of an access roadway and utilities into the proposed research park area. The construction of the approximately 3,800 linear foot North Hillside Road was reviewed under the Connecticut Environmental Policy Act (CEPA). The Environmental Impact Evaluation (EIE), *Connecticut Technology Park Access Road*, was released in July 1987 and a Record of Decision (ROD) submitted to the Connecticut Office of Policy and Management (OPM) in May 1988. After approval by OPM, the State began construction of the existing North Hillside Road, which was completed in summer 1989. ConnTech also sought and obtained approvals from the Town of Mansfield for roadways within the proposed research park in 1988.

In 1990, UCEPI terminated its relationship with the private developer due to lack of progress on the project (none of the proposed internal roadways or building had been built) and a contractual dispute. UCEPI then assumed the role of developer and revisited the design of the research park. An EIE for *Actions Associated with a Research and Technology Park* was released in May 1994. A copy of the 1994 EIE (on CD) is included in Appendix A of this document. The EIE described a less intense development master plan for the proposed research park than had been considered previously. The 1994 EIE, which was co-sponsored by the Connecticut Department of Economic Development (now called the Department of Economic and Community Development), was found to be adequate for the Hillside Road Extension (called the "Spine Roadway" in the 1994 EIE), the utility extension along the roadway, and the construction of one building, which was included in the EIE because of the Department of Economic Development (now the Department of Economic and Community Development) involvement with the funding of the building.

In the 1994 EIE six alternative site layouts with slightly different roadway alignments and parcel configurations, were initially considered, and then two configurations, called Option A and Option B were analyzed in detail in the 1994 EIE. Although a preferred alternative for the alignment was not explicitly identified in the EIE, following approval of the document, the Connecticut Department of Transportation began design for the Option B road alignment.

UCEPI was unsuccessful at developing the research project and design plans for the North Hillside Road Extension halted at the 60% design stage.

In June 2000, UConn released the Outlying Parcels Master Plan (JJR, 2000) that includes a master plan for development of the North Campus. The master planning emphasizes minimizing impacts to wetlands, prime farmland, trees, topography, and other sensitive areas (Frederic R. Harris, 2001). An EIE for actions associated with the development of the North Campus was completed in 2001. A copy of the 2001 EIE (on CD) is included in Appendix A of this document. In both documents, the Hillside Road Extension utilizes the Option A alignment proposed in the 1994 EIE, which was more environmentally sensitive than the Option B alignment, resulting in fewer impacts to inland wetland resources and farmland soils (Frederic R. Harris, 1994; 2001). The Office of Policy and Management (OPM) subsequently found the 2001 EIE to adequately comply with CEPA, but required that a comparative analysis be conducted for the development of future projects, beyond the roadway project and the Charter Oak Apartments, which were approved previously under the 1994 EIE. Each analysis must compare the anticipated impacts described in the 2001 EIE with the actual impacts from a proposed project. Such a comparative analysis was completed and approved for new tennis courts recently constructed along the southern portion of the road (Fuss & O'Neill, 2004).

In 2004, UConn resumed design of the North Hillside Road Extension. In 2005, $6.1 million was appropriated by the Federal government for the construction of the North Hillside Road Extension. The presence of federal funding for the project necessitates compliance with the National Environmental Policy Act (NEPA). The Federal Highway Administration (FHWA), together with the Connecticut Department of Transportation, determined that an Environmental Impact Statement (EIS) is the appropriate level of NEPA documentation for the project. In addition, given the lapse of time since the 2001 EIE for the North Campus Master Plan and, OPM requested a comparative analysis due to concerns regarding potential differences in background traffic growth anticipated by the previous EIEs and current traffic projections. The comparative analysis was submitted to OPM in January 2007. OPM issued a decision letter dated October 1, 2007, indicating that, based on their review of the submitted documentation, the 2001 EIE is still valid relative to the impacts associated with the North Hillside Road extension project.

Table 1-1. Project History Summary

Year	Development
1970s	Need for research and technology park initially identified
1982	University Educational Properties, Inc. (UCEPI) formed to develop a research park on the North Campus and hires private developer
1987	CEPA EIE prepared for the Connecticut Technology Park Access Road (existing North Hillside Road)
1989	Existing North Hillside Road constructed
1990	UCEPI terminates contract with private developer
1994	CEPA EIE prepared for Actions Associated with a Research and Technology Park, also known as the UCEPI project; subsequent approval by OPM.
1990s (year unknown)	UCEPI ceases operation, CTDOT design plans for roadway extension halted at 60% stage

Table 1-1. Project History Summary

Year	Development
2000	Outlying Parcels Master Plan, including master planning for development of the North Campus, released
2001	CEPA EIE for the North Campus Master Plan prepared; subsequent approval by OPM with Comparative Evaluation process required for North Campus projects other than the Charter Oak Apartments, one research building and North Hillside Road Extension
2003	Upgrade/reconstruction of existing portion of North Hillside Road
2005	$6.1 million in Federal funding appropriated for North Hillside Road Construction
2006	NEPA process and CEPA Comparative Evaluation process begin for the North Hillside Road Extension
2007	CEPA Comparative Evaluation process completed for the North Hillside Road Extension
2008	North Hillside Road Extension DEIS released for public and agency review
2009	DEIS Public Hearing

1.6 Public Participation Process and Agency Coordination

Significant public participation and agency coordination have occurred to date for the proposed North Hillside Road Extension through the development of the Outlying Parcels Master Plan (JJR, 2000) and through the CEPA review process which generated the 1994 and 2001 EIEs, as well as the CEPA Comparative Evaluation process for the proposed action. Preparation of the DEIS and this FEIS has involved additional public participation and agency coordination consistent with the requirements of the National Environmental Policy Act (NEPA). A Notice of Intent to prepare an EIS, dated April 13, 2006 was published in the Federal Register on April 21, 2006. The notice, included in Appendix B, initiated the NEPA process, inviting federal, state, and local agencies to attend the public and agency scoping meetings and public hearing, and to review the DEIS when complete and submit comments regarding the project.

FHWA is the Lead Agency for the project. Both the Connecticut Department of Transportation and the University of Connecticut (the Project Sponsor) are Joint Lead Agencies as defined in 23 CFR §771.109. Federal and state agencies were invited to become involved in the NEPA process for the project as Cooperating Agencies or Participating Agencies in letters from FHWA, dated May 10, 2006, and from UConn, dated May 16, 2006. As a result of these letters, the Army Corps of Engineers has accepted the invitation to be a Participating and Cooperating Agency; Connecticut DEP, and Department of Public Health (DPH) are Participating Agencies; the Connecticut State Traffic Commission Environmental Planning Office has responded that they will be active in the process; and the Connecticut Department of Public Works and Council on Environmental Quality have declined the invitation.

Public and agency scoping meetings were held on June 15, 2006 at the Storrs campus. The public scoping meeting was attended by nine members of the public, including a representative of the Willimantic River Alliance. The agency scoping meeting was attended by representatives of the U.S. Army Corps of Engineers, the Connecticut Department of Environmental Protection, UConn, the Connecticut Department of Public Health, Windham Council of

Governments, and the Town of Mansfield. Both scoping meetings were facilitated by representatives of FHWA, UConn, and Fuss & O'Neill. Verbal comments were received from agencies and the public during these meetings. The scoping comment period ended June 29, 2006. Written comments were received following the scoping meeting from the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the Connecticut Department of Environmental Protection, and the Connecticut Department of Public Health.

An agency coordination meeting was subsequently held on December 13, 2006 to review the progress of the DEIS, obtain input from the regulatory agencies on the coordinated wetlands permitting and NEPA process, and review the project schedule. The meeting was attended by representatives from FHWA, CTDOT, UConn, CT DEP, ACOE, the U.S. Environmental Protection Agency (EPA) Region I, the Connecticut Department of Economic and Community Development (DECD), and Fuss & O'Neill, Inc. A copy of the meeting minutes is included in Appendix B.

An agency coordination meeting and site walk was held at the UConn Storrs Campus on March 6, 2008. The purpose of the meeting was to review the status of the DEIS and obtain input from the regulatory agencies on the proposed wetland mitigation for the project, including potential secondary impacts related to development of the North Campus. The meeting was attended by representatives from CTDOT, UConn, CT DEP, ACOE, EPA Region I, the U.S. Fish and Wildlife Service (USFWS), and Fuss & O'Neill, Inc. A copy of the meeting minutes is included in Appendix B.

On December 29, 2008, the FHWA, in cooperation with UConn and CTDOT, released for circulation and review by federal, state, and local agencies and other interested parties, a DEIS for the extension of North Hillside Road. A Notice of Availability of the DEIS was published in the Federal Register on December 29, 2008. The DEIS was prepared and circulated pursuant to NEPA. A joint environmental and design public hearing was held on January 29, 2009 to solicit public and agency comment on the DEIS. The public comment period for the DEIS closed on February 13, 2009.

This project has also followed the "Highway Methodology," which integrates the ACOE Section 404 permit requirements under the Clean Water Act with highway design and engineering and the NEPA process. The goal of the Highway Methodology is to integrate the agencies involved and streamlines the NEPA EIS process and ACOE Section 404 permit process. To date, UConn has coordinated with both the ACOE and the Connecticut Department of Energy and Environmental Protection (CT DEEP, formerly known as the Connecticut Department of Environmental Protection) as part of the federal and state wetlands permitting process for the project.

Revised state and federal wetland permit applications were submitted to the CT DEP and ACOE in December 2008. In May 2009, following their review of the permit applications, both agencies raised additional concerns regarding the project design and requested consideration and analysis of additional alternative road alignments and wetland crossing designs to further reduce impacts to aquatic resources as compared to the DEIS Preferred Alternative. The ACOE also requested additional information and analysis of alternatives to substantiate the selection of the LEDPA in compliance with the Clean Water Act.

The permit applications were subsequently withdrawn, and a series of meetings were held with the CT DEP and ACOE between May 2009 and February 2010 to further evaluate roadway alignment alternatives and wetland crossing designs that would minimize impacts to aquatic resources and maintain vernal pool habitat connectivity. The additional agency coordination and expanded alternatives evaluation resulted in the selection of a preferred alternative roadway alignment and North Campus development scenario. The Option A roadway alignment, which is the recommended alignment under the DEIS Preferred Alternative, remains the preferred roadway alignment in this FEIS. However, two of the wetland crossings have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Additionally, the North Campus concept development plan has been modified to eliminate the previously proposed development on Parcel A and preserve additional acreage on the North Campus through a conservation easement.

1.7 Permit Requirements

The following federal and state permits and approvals are required for the extension of North Hillside Road, including consideration of potential indirect impacts associated with subsequent development of the North Campus:

- Record of Decision – A Record of Decision (ROD) must be issued by FHWA following the release of the FEIS and before the continuation of project design in accordance with 23 CFR 771.127.

- Final Design and Rights-of-Way Acquisition – Final roadway and mitigation design and acquisition of lands for rights-of-way and any mitigation, as needed.

- United States Army Corps of Engineers Section 404 Individual Permit – Although the proposed roadway extension will result in direct wetland impacts of 0.09 acres, which is significantly lower then the 1-acre threshold for a Section 404 permit, the U.S. Army Corps of Engineers has previously determined that a Section 404 permit is required given the potential secondary wetland impacts associated with the development of the North Campus.

- CT DEEP Inland Wetland & Watercourses Permit – Required by an action undertaken by a state agency (in this case, UConn) in or affecting inland wetlands or watercourses. The action in this instance is the proposed loss of wetlands associated with the construction of the North Hillside Road Extension, stormwater discharges, and secondary impacts associated with the proposed project.

- CT DEEP 401 Water Quality Certificate – Required for Connecticut Department of Energy and Environmental Protection review of a federal permit application for discharges to navigable waters, including wetlands. A 401 Water Quality Certification is required for the proposed project since coverage under the ACOE Section 404 individual permit is required.

- CT DEEP Flood Management Certification – Required for a State action (in this case, the actions of UConn) in or affecting floodplains or natural or man-made storm

drainage facilities. The actions in this instance are stormwater impacts and wetland loss associated with the extension of North Hillside Road, and subsequent impact of development of the North Campus parcels.

- CT DEEP Water Diversion Permit (Non-consumptive Use) – Required for a State action that results in the alteration of surface water flows, including the collection and discharge of stormwater runoff from a watershed area greater than 100 acres. The proposed North Campus development concept includes a stormwater drainage system that would collect and manage stormwater runoff from a total of approximately 120 acres.

- CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (Construction Stormwater General Permit) – Required for construction projects that disturb more than an acre of land, regardless of project phasing. Greater than 1 acre of disturbance is currently anticipated to occur as part of the proposed project. Because the area of disturbance will be greater than 10 acres, a Stormwater Pollution Control Plan must be prepared and submitted to CT DEEP.

The following permits and approvals are anticipated to be required for the subsequent development of the North Campus parcels:

- CEPA Comparative Evaluation – Approval of the North Campus Master Plan EIE by the Connecticut Office of Policy and Management (OPM) required that site-specific projects proposed for development within the North Campus Master Plan area be reviewed by OPM to ensure that impacts are substantially equivalent to or less than those identified for that site in the Master Plan EIE.

- General Permit for the Discharge of Stormwater Associated with Industrial Activities (Industrial Stormwater General Permit), if applicable – Required for all stormwater discharges directly related to manufacturing, processing or material storage areas at an industrial facility. This permit defines the categories of facility that are required to apply for permit coverage based on Standard Industrial Classification (SIC) code. Facilities that are required to apply for coverage may be constructed on one of the proposed parcels.

- General Permit for the Discharge of Stormwater Associated with Commercial Activities (Commercial Stormwater General Permit), if applicable – Required for stormwater discharges associated with retail, commercial, and/or office services whose facilities occupy five acres or more of contiguous impervious surface. Development of parcels associated with extension of North Hillside Road is anticipated to include office, retail, and research space, including associated pavement for access, parking, and loading, may result in the applicability of this permit.

- State Traffic Commission Certificate of Safe Traffic Operation (STC Certificate) – Required for developments that generate large volumes of traffic on a state highway. The UConn roadway network is currently certified by STC, but the increase in

developed area and available parking facilities that are proposed under the Preferred Alternative will require separate STC approvals.

- Underground Storage Tank Registration (UST Registration), if applicable – Required for the operation of each USTs used for the storage of petroleum or chemicals. A registration would be required for each UST to be installed as part of development of the proposed parcels.

- New Source Review, if applicable – Required for the construction and operation of facilities emissions unit subject to New Source Performance Standards (NSPS) (40 CFR Part 60); National Emission Standards for Hazardous Air Pollutants (NESHAPS) (40 CFR Parts 61 and 63); chemical accident prevention provisions (40 CFR Part 68); or federal acid rain program requirements (40 CFR Parts 72 - 78, inclusive); or that exceed air emissions thresholds. This permit may be required by the construction of equipment installed in buildings constructed on the North Campus parcels.

Depending on the specific activities occurring in facilities constructed on the North Campus, one or more of the following general permits issued by CT DEEP may be required: General Permit for the Discharge of Hydrostatic Pressure Testing Wastewater, General Permit for the Discharge of Minor Boiler Blowdown, General Permit for the Discharge of Minor Non-Contact Cooling and Heat Pump Water, General Permit for the Discharge of Miscellaneous Discharges of Sewer Compatible (MISC) Wastewater. In general, these general permits authorize discharges to the sanitary sewer and establish maximum daily flow limits based on number of gallons per day of discharge and the receiving POTW's design flow.

2.0 PURPOSE AND NEED FOR THE ACTION

The need for the North Hillside Road Extension results from the existing and anticipated traffic in the vicinity of the Storrs Campus and the associated effects on roadway capacity and level of service in the area surrounding the campus, especially U.S. Route 44, Route 195, and Hunting Lodge Road. The new road is also intended to facilitate the development of University-related academic and research buildings and student facilities on the North Campus, consistent with the Outlying Parcels Master Plan (JJR, 2000).

2.1 Project Purpose

The purpose of the project is to construct a new road, by extending the existing North Hillside Road, to provide alternate entrance to the University and to facilitate the development of a North Campus expansion. The New England District of the Army Corps of Engineers (ACOE), for purposes of Section 404, has also adopted this as their "Overall Project Purpose", with the "Basic Project Purpose" being a new roadway.

2.1.1 History of the Project Purpose

In the 1994 EIE, the purpose of the North Hillside Road Extension, called the Spine Roadway in the EIE, was to provide mitigation for traffic and support the development of the research and technology park that was proposed for the North Campus at that time. The EIE found that completion of the roadway to Route 44 would relieve traffic from Route 44 and Hunting Lodge Road by accommodating through-traffic.

The purpose of the North Hillside Road Extension, as stated in the 1994 EIE, was restated in the 2001 North Campus Master Plan EIE, although the development plans for the North Campus were modified from the research and technology park described in the 1994 to the development of UConn-related academic and research buildings, student housing, and recreational facilities as described in the Outlying Parcels Master Plan (JJR, 2000).

2.2 Project Need

2.2.1 North Campus Development

The Outlying Parcels Master Plan identified a campus-wide organizational plan for the University that included land use priorities for the areas of the campus adjacent to the Academic Core campus at Storrs. The 333-acre North Campus was identified in the Outlying Parcels Master Plan as an area for land uses with strategic ties to the Academic Core, specifically housing, academics, academic-related research, commercial/retail, and remote parking (JJR, 2000). The proximity of the North Campus to the Academic Core provides an area for student housing close to the core and offers a location for uses that support both economic development and higher education. These land uses are ones that support the University's continued growth as a top-tier academic and research institution consistent with the University's Academic Plan and the UConn 21st Century initiative.

The Academic Plan (www.academicplan.uconn.edu, 2009) outlines six primary goals to advance the University's standing in five interrelated areas: 1) undergraduate education, 2) graduate and professional education, 3) research, scholarship and creative activity, 4) diversity, and 5) public engagement. The North Campus development is particularly relevant to the goal of advancing research, scholarship, and creative activity and the strategy of moving discoveries to applied outcomes. Areas of the North Campus have been identified in the Master Plan for academic-related research, and space for technology-related public-private partnerships.
In addition, the North Hillside Road Extension supports the goal of public engagement by providing improved physical access to University-housed resources and facilities.

The Academic Plan goals for education and research are also linked to the UConn 21st Century program, successor to the UCONN 2000 program. UCONN 2000 was an initiative to rebuild, restore, and enhance the University's physical infrastructure. It resulted in numerous projects on the Storrs Campus and other UConn campuses and resulted in a significant increase in the size, diversity and academic skill of the student body. It also increased University research activity, which rose from $55.9 million in Fiscal Year 1996 to $91.5 million in Fiscal Year 2005[1] (Board of Trustees, 2006). UConn 21st Century is a 10-year extension of the UCONN 2000 program and will continue to implement improvements to the physical setting of the University including student housing and support facilities, two land uses identified for areas of the North Campus (JJR, 2000).

2.2.2 Need for Traffic Mitigation and Alternate University Entrance

The development projects associated with the UCONN 2000 initiative resulted in increases in traffic on the Storrs Campus as a result of new construction, expanded enrollment, and increased activity on campus. The increased traffic was anticipated and the potential traffic impacts of the UCONN 2000 projects were evaluated through a State Traffic Commission (STC) review in 2000.

A STC Certificate of Operation was required for the UCONN 2000 Campus Master Plan development projects on the Storrs Campus, which included 1,019,419 square feet (SF) of new construction and 2,500 new parking spaces. The STC regulations require a Certificate of Operation for construction or expansion projects which will generate large volumes of traffic, specifically developments that provide 200 or more parking spaces or have a gross floor area of 100,000 square feet or more. Included in the STC application for the Master Plan projects were mitigation measures to improve operating conditions to acceptable levels at the completion of the UCONN 2000 projects identified in the Campus Master Plan (Earth Tech, 2000).

The completion of the North Hillside Road Extension to a signalized intersection with U.S. Route 44 was identified in the STC application as a measure to mitigate traffic impacts from UCONN 2000 development and eliminate the need for additional capacity improvements. Specifically, the extension would attract outbound (northbound) vehicles during the peak PM hour, shifting vehicles from both Hunting Lodge Road and Route 195 north of North Eagleville Road (Earth Tech, 2000).

[1] These figures do not include research activity at the University of Connecticut Health Center.

The current traffic conditions were revisited in 2007 in a CEPA Comparative Evaluation traffic analysis to update the existing (i.e., background) traffic conditions in the vicinity of the campus (Fuss & O'Neill, Inc., 2007). The results of the analysis confirmed the increase in traffic projected in the 2001 EIE and the STC application for the UCONN 2000 projects. This demonstrates that the increases in traffic, and effects on level of service and capacity of surrounding roadways, still necessitate the North Hillside Road Extension as identified in the 2000 STC application.

The North Hillside Road Extension is also necessary to achieve the development identified in the Outlying Parcels Master Plan by providing access to the site. The 1994 and 2001 EIEs examining the North Campus identified the extension as providing both a new gateway entrance to the campus and also mitigating increased traffic from the development on the North Campus by shifting traffic away from local roads. Currently, traffic traveling eastbound on U.S. Route 44 must travel to the intersection of U.S. Route 44 and Route 195 (Storrs Road) to enter the University. The extension of North Hillside Road would provide an alternate entrance to the campus and capture northbound traffic on U.S. Route 44, relieving traffic on U.S. Route 44, as well as Route 195, and Hunting Lodge Road.

3.0 ALTERNATIVES

3.1 Alternatives Selection Process

The construction of North Hillside Road and the development of the area known as the North Campus were studied extensively over the past decade and the area has been identified for the development of a research and technology park since the 1970s. An analysis of alternative roadway alignments and North Campus development scenarios was initially conducted as part of the 1994 Connecticut Environmental Policy Act (CEPA) Environmental Impact Evaluation (Appendix A). The alternatives analysis was revisited in 2001, when a CEPA EIE was prepared for the Master Plan for the development of the North Campus. This section summarizes the alternative sites and roadway alignments considered in the CEPA review process, as well as alternative considered to further minimize adverse environmental effects and to support the selection of a Least Environmentally Damaging Practicable Alternative (LEDPA) in accordance with Section 404(b)(1) of the Clean Water Act and the Section 404(b)(1) Guidelines (40 CFR 230).

3.2 No Action Alternative

The No Action or No Build Alternative assumes that no Federal funds would be expended for the completion of North Hillside Road. In the absence of Federal funding for the roadway extension, it is uncertain what future development, if any, would occur on the North Campus. Due to the uncertainty surrounding other sources of project funding, for the purposes of this FEIS, it is assumed that no further development of the North Campus would occur under the No Action Alternative.

The State Traffic Commission (STC) Certificate of Operation was required for the UCONN 2000 Campus Master Plan development projects on the Storrs Campus, which included 1,019,419 square feet (SF) of new construction and 2,500 new parking spaces. The application for the STC Certificate of Operation identified the North Hillside Road extension as an important measure for mitigating traffic impacts from the UCONN 2000 construction. If the extension is not constructed, an important measure for mitigating increased traffic resulting from the UCONN 2000 development program will not be implemented and outbound (northbound) vehicles will not be shifted from both Hunting Lodge Road and Route 195 north of North Eagleville Road during the peak afternoon traffic hour. Under the No Action Alternative, a new gateway entrance to the campus will not be constructed and no relief will be provided for traffic volume currently utilizing the U.S. Route 44 and Route 195 (Storrs Road) intersection to enter the University.

In addition, in the 1994 EIE and 2000 Outlying Parcels Master Plan the extension of North Hillside Road was considered critical for the successful marketing and long term success of a coherent research park, and there has been an identified need for a research and technology park in close proximity to the campus since the 1970s. Under the No Action Alternative, no further development of the North Campus would occur, and the objectives of the Outlying Parcels Master Plan for the North Campus would not be achieved.

3.3 Alternative Development Sites

Alternative development sites can be considered in terms of (1) feasible alternative roadway locations and (2) feasible alternative locations for the development of a research and technology park such as the one described in the Outlying Parcels Master Plan.

Alternative Roadway Locations

No other sites exist in the vicinity of the North Campus, either east of the North Campus (along Route 195) or west of the North Campus (along local residential streets), that would allow for traffic from the Storrs campus to reach Route 44 and satisfy a key project objective to mitigate traffic impacts from UCONN 2000 developments. Roadway alignment Option A-2, rather than terminating at Route 44, instead terminates at Route 195 south of the intersection with Route 44. This option is not considered to be a practical alternative as it does not address the project goal of redistributing University traffic to an alternative access point along Route 44. This additional access was endorsed by the Connecticut State Traffic Commission in 2002 and is consistent with the 2001 EIE for the North Campus Master Plan.

Option A-2 would retain all existing, background growth, and future development traffic along the Route 195 corridor, with overflow traffic diverting to local residential streets. Under the 2030 full-build condition, this alternative would result in an additional 450 peak hour trips traveling through the intersection of Route 44 and Route 195 as compared with the other alternatives. In order to accommodate the additional traffic at this intersection at a Level of Service (LOS) similar to the proposed preferred alignment (Option A), it would be necessary to construct a third through lane in the southbound direction on Route 195 north and south of Route 44, an additional northbound left turn lane, and an exclusive eastbound right turn lane with a dedicated yield lane. Approximately 2,000 feet of Route 195 and 500 feet of Route 44 would require significant widening. These improvements would result in significant property impacts on several adjacent privately owned properties including the removal of existing buildings. Based on comparable reasoning, Option A-2 was similarly rejected by both the 1994 EIE and the 2001 EIE.

Therefore, there is no other feasible alternative for a new roadway into campus that would divert existing traffic from residential areas near Route 44 (thereby satisfying State Traffic Commission Certificate traffic mitigation commitments) and provide a more direct route and gateway entrance to the University.

Alternative Research and Technology Park Sites

When the 1994 EIE was prepared, UConn had received legislative authorization that allowed only a research park and supportive uses to be constructed on the North Campus land leased to a private developer. The subsequent dissolution of the UCEPI project in the late 1990s allowed UConn to consider other sites for the development of a research park.

The 1994 EIE examined the suitability of the former Mansfield Training School (now called the Depot Campus), the other large tract of land in proximity to the main campus, for potential development of a research park. In the 1994 EIE, the Depot Campus parcel was evaluated

because of its close proximity to the Storrs Campus and because it was underutilized at the time of the EIE. At the time, the evaluation found that a large portion of the land (140 acres) is already planned for development over a 30 to 50 year development timeline by the State for housing and commercial related development. Additionally, the vacant facilities have been designated for use by UConn. The remaining portions of the land have site restrictions including 175 acres of inland wetlands and steep slopes. The largest contiguous parcel available was a 55-acre tract that was divided by an inland wetland. The land is further limited for development because of its close proximity to the UConn water supply wells (0.4 miles away). The Department of Public Health would not allow the extent of development proposed for the North Campus in such close proximity to a public water supply. Finally, the parcels of land available for the research and technology development did not allow for one contiguous development. The conclusion in the 1994 EIE was that the site was not suitable for the technology park that was envisioned at the time.

Redevelopment of the 300 acres of the Depot Campus, which was transferred to UConn in 1993, was revisited in 2000 within the context of long-term planning for the University in the Outlying Parcels Master Plan (JJR, 2000). The Outlying Parcels Master Plan identified ideal land uses for the Depot Campus site to be public/private ventures, business incubators, special academic, recreation, and community outreach facilities, and special short-term housing. Development of the site will require demolition of several buildings remaining from the former state hospital. In addition, the Outlying Parcels Master Plan identified the completion of the North Hillside Road extension as necessary to successful development of this satellite campus in order to upgrade the public road system in the vicinity of the Depot Campus and provide better vehicular access and connectivity.

3.4 Roadway Alignment Alternatives

The 1994 EIE initially examined six alternative layouts, referred to as "Options" in the EIE (Figure 3-1a). Options A-1, A-2, A-3, and A-4 were developed with the goal of utilizing the full length of the existing North Hillside Road. The options varied from 2,400 to 3,600 feet of new roadway construction, and Option A-2 was the only option considered that connected with Route 195, not Route 44. Options B-1 and B-2 did not utilize the full length of the existing North Hillside Road and instead involved constructing roadway that is tangential to the existing road.

Each of these alignments was examined to determine their impact on wetlands, public safety, traffic congestion relief, and value to research park development. Through the EIE process, the roadway alignment alternatives were narrowed to Option A (a composite of the A-1 through A-4 options) and Option B (a modification of Option B-2 which connected to the existing North Hillside Road). The preferred alignment was a combination of a number of these concepts that sought to minimize adverse impacts to the criteria previously mentioned while maximizing the developable area. Ultimately, a 4,000 foot roadway alignment presented in the 1994 EIE as Option B was selected. This Option was 50% designed and submitted for CT DEP permits by the Connecticut Department of Transportation (CTDOT) when the project was abandoned in the late 1990s.

The Outlying Parcels Master Plan presented a roadway alignment for the extension of North Hillside Road consistent with Option A in the 1994 EIE. In the 2001 North Campus Master Plan EIE, the Option A roadway alignment was presented because it was more environmentally sensitive, with fewer impacts on wetlands and farmlands than Option B. This preferred alignment was approved by the State of Connecticut Office of Policy and Management and is the alignment that the current design follows.

For the preparation of the DEIS, the potential wetlands impacts of the Option A and Option B alignments were reviewed in light of the 2006 wetlands delineation. The Option B alignment would result in approximately 0.86 acres of wetland impacts compared to 0.34 acres of wetland impacts for Option A. Consequently, Option A, identified as the preferred alternative alignment in the 2001 EIE, was identified in the DEIS as the most feasible and prudent alternative that balances the need for the roadway extension with avoiding and minimizing environmental impacts. Option A was identified in the DEIS as the preferred roadway alignment (i.e., the DEIS Preferred Alternative).

Based on comments received from the resource agencies on the DEIS and subsequent agency coordination, the roadway alignments that were considered in the previous EIEs (Options A, A-1, A-2, A-3, A-4, B-1, and B-2) were further evaluated based on potential impacts to wetlands and other environmental resources, including vernal pools (and related amphibian migration), which had not yet been identified at the project site when the previous EIEs were prepared. One additional roadway alignment was also evaluated (Option A-5), which is a modification of the A-3 alignment as described below. Figure 3-1b shows each of the alternative roadway alignments in the context of the revised wetland delineations, vernal pools, prime farmland soils, and cultural resources.

- Roadway Alignment Option A: Option A is a composite of Options A-1 through A-4, as described below. This alignment was identified as the preferred alignment in the 2001 EIE and is the alignment that the current design follows.

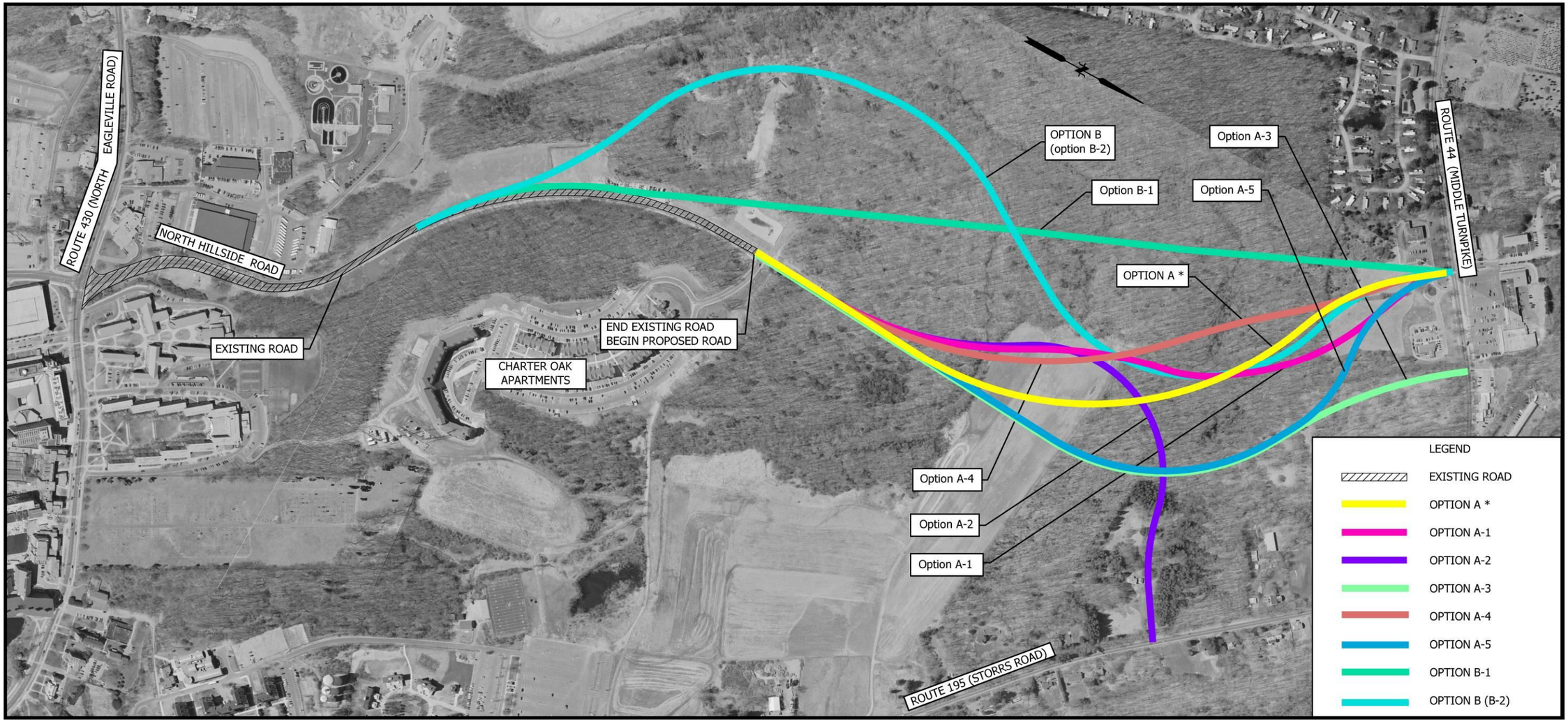
- Roadway Alignment Option A-1: The Option A-1 alignment extends from the existing terminus of North Hillside Road, following a route between Vernal Pool #1 and Vernal Pool #2, and terminating at Route 44.

- Roadway Alignment Option A-2: Option A-2 extends from the existing terminus of North Hillside Road, bending east to terminate on Route 195 rather than Route 44.

- Roadway Alignment Option A-3: The Option A-3 alignment would place the roadway east of Vernal Pool #1 and terminate at a proposed three-way intersection with Route 44.

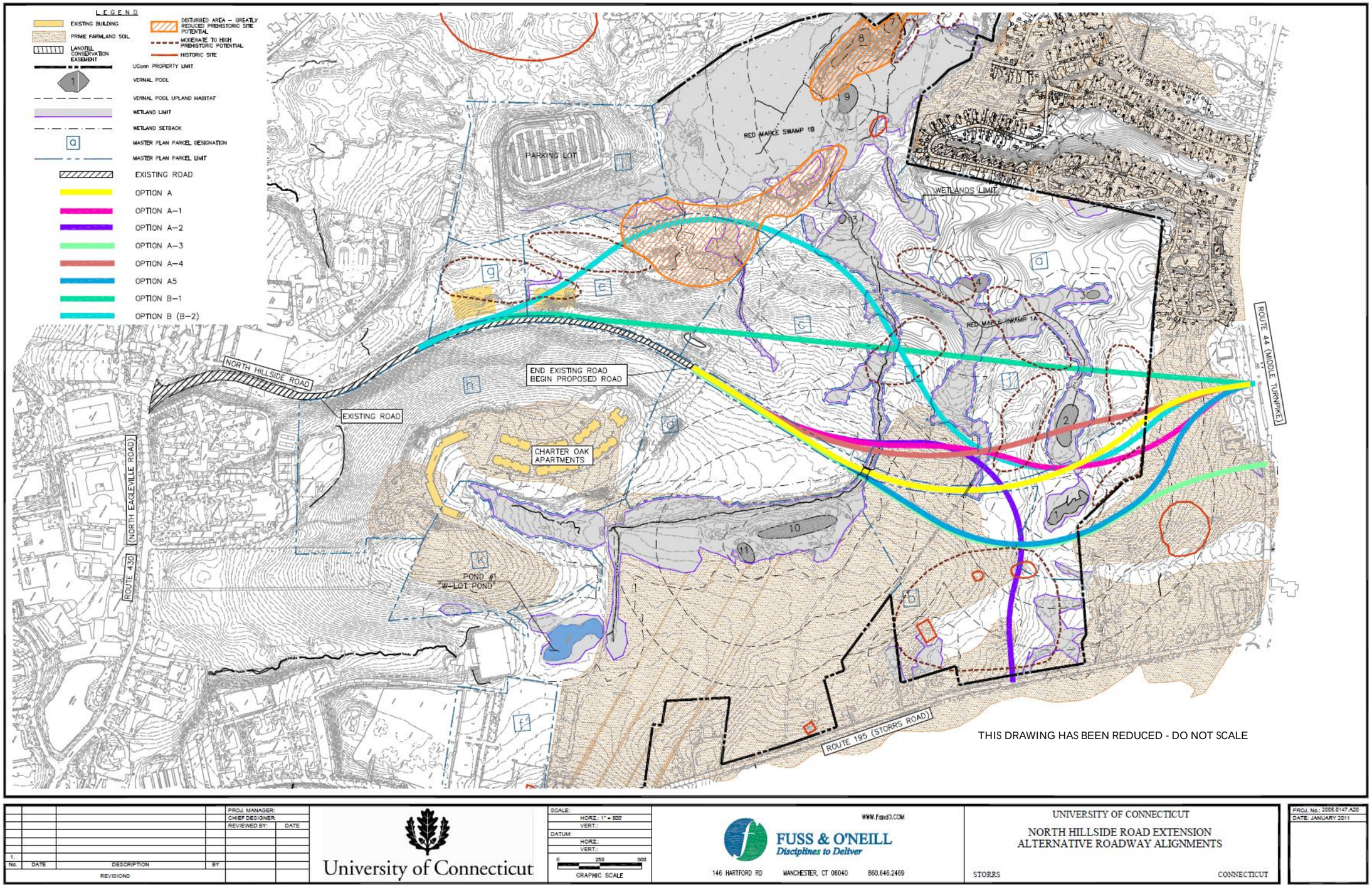
- Roadway Alignment Option A-4: The Option A-4 alignment is similar to the A-1 roadway alignment but would pass directly through Vernal Pool #2.

Figure 3-1a. Alternative Roadway Alignments Considered



Note: Alternative (Option) A (the proposed alternative from the 1994 and 2001 EIEs and the current design alternative) is a composite of Alternatives A-1 through A-4 in the 1994 EIE. Alternative B is a modification of Alternative B-2 in the 1994 EIE.

Figure 3-1b. Alternative Roadway Alignments and Project Resources



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UNIVERSITY OF CONNECTICUT
NORTH HILLSIDE ROAD EXTENSION
ALTERNATIVE ROADWAY ALIGNMENTS
STORRS CONNECTICUT

PROJ. No.: 2005.0147.A20
DATE: JANUARY 2011

- Roadway Alignment Option A-5: Option A-5 is a modification of Option A-3. The A-3 alignment, which was identified in the previous EIEs, terminates at a different location than the other alternatives considered and would impact an additional wetland along Route 44. The A-3 alignment was therefore modified to avoid this wetland and to terminate at the proposed four-way intersection at Route 44, similar to the other alignments, rather than at a proposed three-way intersection closer to Route 195.

- Roadway Alignment Option B-1: The Option B-1 alignment is essentially a straight line tangent to the existing North Hillside Road, extending to a proposed four-way intersection with Route 44

- Roadway Alignment Option B-2: The Option B-2 alignment begins tangential to the existing North Hillside Road and follows the western-most alignment prior to terminating at the proposed four-way intersection at Route 44.

Initial Screening of Alternative Roadway Alignments

The alternative roadway alignments were initially evaluated based on consideration of the following criteria, which include potential impacts to environmental resources and potential benefits relative to the project purpose and need:

- Roadway length and impervious cover.
- Wetland impacts - the acreage of direct wetland impacts and the number of individual wetland systems impacted (i.e., wetland crossings).
- Vernal pools - the acreage of direct impacts to vernal pools, development within the 750-foot critical upland habitat, and impacts on amphibian migration between Vernal Pool #1 and adjacent wetlands.
- Prime farmland soils – the acreage of direct impacts to prime farmland soils on the North Campus and in adjacent off-site areas.
- Cultural resources – potential impacts to documented areas of moderate to high archaeological sensitivity.
- Property acquisition – acreage of required property/right-of-way acquisitions.
- Traffic impacts – does the alternative achieve the traffic mitigation goals consistent with the requirements of the State Traffic Commission Certificate of Operations for the UCONN 2000 campus development projects?
- North Campus Master Plan development goals – maximum yield of new building space (gross square feet) and parking spaces.

Numeric values for each quantifiable factor were estimated based on mapping and resource information presented elsewhere in this FEIS for each of the roadway alignment alternatives (Table 3-1). Qualitative measures were used to describe the potential impacts on the amphibian migration characteristics associated with Vernal Pool #1 based on the previous vernal pool studies. The following sections describe the results of this initial alternatives screening evaluation for each roadway alignment.

Table 3-1. Comparison of Environmental Impacts of Alternative Roadway Alignments[1]

Road Alignment Alternative	Primary Factors					Secondary Factors		
	Direct Wetland Impacts (Acres)*	Number Wetland Crossings	Direct Vernal Pool Impacts (Acres)**	Development within 750-Foot Critical Upland Habitat (Acres)**	Impacts to Vernal Pool Amphibian Migration	Impacts to Areas of Mod-High Prehistoric Potential (Acres)**	New Impervious Cover (Acres)	Prime Farmland Soil Impacts (Acres)**
A	0.34	3	0	10.2	High	0.0	3.4	4.0
A-1	0.37	3	0	9.8	High	0.9	3.3	4.2
A-2	0.14	2	0	8.9	Low	2.5	3.0	4.0
A-3	0.17	2	0	10.6	Medium	0.4	3.5	7.6
A-4	0.74	3	0.35	9.7	High	1.2	3.2	3.9
A-5	0.08	1	0	11.4	Medium	0.5	3.7	8.2
B-1	0.65	4	0	7.8	High	2.6	2.7	1.8
B-2	1.43	4	0	12.5	High	3.2	3.9	2.8

[1]The above table summarizes direct impacts (i.e., those impacts associated with the proposed roadway corridor). Secondary impacts associated with the North Campus parcel development are the same for each roadway alignment alternative for the primary and secondary factors listed in the table.
* Assumes average 100-ft width disturbance, ** Assumes average 150-ft width disturbance

Option A Alternatives:

- *Option A* – The Option A roadway alignment, which was identified in the previous EIEs and in the DEIS as the preferred alignment, ranks among the middle of the alternatives for many of the resource categories. Options A-2, A-3, and A-5 would result in less acreage of direct wetland impacts (0.14, 0.17, and 0.08 acres, respectively). Option A-1 would result in slightly more, but comparable, direct wetland impacts (0.37 acres). Option A would result in 3 wetland crossings. The Option A alignment avoids the on-site vernal pools, but crosses the wetland that connects Vernal Pool #1 and Vernal Pool #2.

  Modifications of the Option A alignment in the vicinity of the middle wetland crossing (Wetland B) were considered to determine if the roadway extension could be reconfigured to avoid this wetland. A concept was considered that extended the horizontal curve in this area outside of Wetland B. To avoid the wetland, the alignment would have to be revised to provide an approximately 640-foot long horizontal curve with a 700-foot radius, which would add 60 linear feet of roadway and an additional 2,400 square feet of impervious cover to the project. It would also bring the roadway closer to the southern limit of Vernal Pool #1, resulting in greater potential impacts to critical upland habitat. Wetland B also has low value for the majority of wetland functions.

  The Option A alignment has undergone extensive archaeological investigation as part of the previous CEPA EIEs and the ongoing design effort. In correspondence dated June 3, 2005, the SHPO determined that no effect to historic/archaeological resources will occur from the roadway extension for the Option A alignment. The Option A roadway alignment ranks among the middle of the alternatives in terms of new impervious cover (3.4 acres) and impacts to prime farmland soil (4.0 acres).

- *Option A-1* – The Option A-1 roadway alignment is similar to the Option A alignment in terms of configuration and wetland resource impacts. The Option A-1 alignment would result in slightly greater direct impacts to wetlands (0.37 acres), an additional wetland crossing, slightly less development within the 750-foot critical upland habitat (9.8 acres), and similar impacts to amphibian migration since it also crosses the wetland that connects Vernal Pools #1 and #2. The Option A-1 alignment would result in 0.9 acres of impacts to areas of moderate to high archaeological sensitivity, thereby requiring further field investigation and potential mitigation for impacts to archaeological resources. Option A-1 is similar to Option A in terms of new impervious cover (3.3 acres) and impacts to prime farmland soil (4.2 acres).

- *Option A-2* – The Option A-2 alignment would avoid bisecting the amphibian corridor associated with Vernal Pool #1 and the Red Maple Swamp to the west, as the alignment extends from the existing terminus of North Hillside Road, bending east to terminate on Route 195. This alignment significantly reduces direct impacts to wetlands and amphibian migration, although still results in 2 wetland crossings and approximately 8.9 acres of development within the 750-foot critical upland habitat associated with the vernal pools. However, the Option A-2 alignment is not considered to be a practicable alternative as it does not address a key project objective of redistributing University traffic to an alternate access point along Route 44 to mitigate traffic impacts from UCONN 2000 developments. This additional access was endorsed by the Connecticut State Traffic Commission in 2002 and is consistent with the 2001 EIE for the North Campus Master Plan.

  Option A-2 would retain all existing, background growth, and future development traffic along the Route 195 corridor, with overflow traffic diverting to local residential streets. Under the 2030 full-build condition, this alternative would result in an additional 450 peak hour trips traveling through the intersection of Route 44 and Route 195 as compared with the other alternatives. In order to accommodate the additional traffic at this intersection at a Level of Service (LOS) similar to the proposed preferred alignment (Option A), it would be necessary to construct a third through lane in the southbound direction on Route 195 north and south of Route 44, an additional northbound left turn lane, and an exclusive eastbound right turn lane with a dedicated yield lane. Approximately 2,000 feet of Route 195 and 500 feet of Route 44 would require significant widening. These improvements would result in significant property impacts on several adjacent privately owned properties including the removal of existing buildings. Based on comparable reasoning, Option A-2 was similarly rejected by both the 1994 EIE and the 2001 EIE.

- *Options A-3 and A-5* – Both of these roadway alignments would place the roadway east of Vernal Pool #1. The A-3 alignment, which was identified in the previous EIEs, terminates at a different location than the other alternatives considered and would impact an additional wetland along Route 44. The A-3 alignment was therefore modified to avoid this wetland and to terminate at the proposed four-way intersection at Route 44, similar to the other alignments, rather than at a proposed three-way intersection closer to Route 195. This new alignment is designated as Option A-5 in the FEIS. While the A-5 alignment would place the roadway east of Vernal Pool #1,

thereby avoiding the primary amphibian migration direction of Vernal Pool #1 (southwest of the pool in the direction of the red maple swamp), the A-5 alignment would still impact amphibian migration corridors on the north and northeast sides of Vernal Pool 1, as observed during the 2004 drift net studies. The A-3 and A-5 alignment also results in the greatest new impervious cover and development within the 750-foot critical upland habitat (other than Option B-2), and the greatest impacts in terms of prime farmland soils and property acquisitions.

The Option A-3 and A-5 alignments would result in comparable, but slightly higher, amounts of new impervious cover (3.5 acres and 3.7 acres, respectively) as compared with Option A (3.4 acres). Both alignments would impact approximately 0.5 acres of land with moderate to high sensitivity for archaeological resources. Additionally, both alignments would result in approximately 8 acres of impacts to prime farmland soils primarily in off-site areas, which is nearly double the prime farmland soil impacts under Option A (4.0 acres). These impacts to prime farmland soils would likely be offset to some extent by a reduction in the required on-site wetland replication area (due to less direct wetland impacts under Options A-3 and A-5), which is located in an area of the site mapped as prime farmland soil. Additionally, in order to construct Options A-3 and A-5, it would be necessary to acquire privately-owned land.

- *Option A-4* – The Option A-4 alignment, while similar to the A-1 roadway alignment, would pass directly through Vernal Pool #2, and was therefore eliminated.

Option B Alternatives:

- *Option B-1* – The Option B-1 alignment, which is essentially a straight line tangent to the existing North Hillside Road to the proposed four-way intersection with Route 44, would result in the least amount of development within the 750-foot vernal pool critical upland habitat area, the second smallest amount of new impervious cover, and the smallest impacts to prime farmland soils. However, of the eight alternative roadway alignments evaluated, the B-1 alignment would result in some of the highest wetland impacts in terms of acreage and the number of individual wetland systems affected. The B-1 alignment would also pass through the amphibian migration corridor west of Vernal Pool #1.

  The Option B-1 alignment reduces new impervious cover (due to a shorter road length) and impacts to prime farmland soils as compared to Option A. However, Option B-1 also passes through several areas with moderate to high archaeological sensitivity, thereby requiring further field investigation and potential mitigation for impacts to archaeological resources. Additionally, Option B-1 does not account for variations in the local topography and would require significantly more grading and earthwork as compared to other alignments that are designed to follow the local topography and minimize site disturbance (i.e., Options A, A-3, and A-5).

- *Option B-2* – The Option B-2 alignment also begins tangential to the existing North Hillside Road and follows the western-most alignment prior to terminating at the proposed four-way intersection at Route 44. While providing nearly the same development potential in terms of building area and parking as the previously identified preferred alignment (Option A), the B-2 alignment has the greatest potential impacts in terms of new impervious cover, wetland impacts, and development within the 750-foot critical upland habitat of the vernal pools. The Option B-2 alignment would result in the greatest impacts to areas with moderate to high archaeological sensitivity (3.2 acres) while impacting slightly less acreage of prime farmland soils (2.8 acres).

Additional Comparison of Option A and Option A-5 Alternative Roadway Alignments

Based on the screening evaluation described in the previous section and coordination with the CT DEP and ACOE, additional information was requested by the resource agencies to support the selection of the LEDPA for the North Hillside Road extension. Specifically, the resource agencies requested additional supporting information to compare the Option A and Option A-5 roadway alignments, which were retained from the initial alternatives screening process. This section summarizes a comparison of these two alternatives, including the potential impacts of the alternatives on the aquatic ecosystem and the overall environment and consideration of the practicability of these alternatives.

Figures 3-1c and 3-1d depict the respective Option A and A-5 alignments and associated concept development envelopes (i.e., potential limits of disturbance under a conceptual North Campus development scenario) for the purpose of evaluating potential impacts of the roadway and parcel development.

Consistent with Section 404(b)(1) of the Clean Water Act and the Section 404(b)(1) Guidelines (40 CFR 230), the two alternative roadway alignments were evaluated based on (1) a comparison of impacts on the aquatic ecosystem and the overall environment, and (2) consideration of practicability.

Potential impacts of the roadway alternatives on the aquatic ecosystem and the environment were compared based on the factors described in the previous section and summarized in Table 3-1. Practicability depends on cost, technical, and logistic factors. To be practicable, an alternative must be "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose." For the North Hillside Road extension, property acquisitions and cost considerations are the major factors that were considered relative to the practicability of the Option A and Option A-5 alternatives.

The Option A-5 alignment would result in slightly less direct wetland impacts, reduce the number of wetland crossings, and have similar but slightly less impacts on vernal pool amphibian migration as compared to the Option A alignment. However, the Option A alignment has advantages over Option A-5 since the Option A alignment would result in less roadway development within the 750-foot vernal pool critical upland habitat, less impervious cover, would avoid potential impacts to archaeological resources and the need for additional archaeological field investigations, and would significantly reduce impacts to prime farmland soils.

The Option A-5 alignment would have slightly less adverse impacts on aquatic resources than the Option A alignment, although in the context of an approximately ½-mile roadway project on a 330-acre site with significant acreage of wetland resources, the difference in impacts is minor. Furthermore, the Option A-5 alignment would result in greater adverse impacts to other environmental resources as compared to the Option A alignment.

Option A-5 would result in 0.08 acres of direct wetland impacts, while Option A would result in 0.34 acres of direct wetland impacts. Approximately 0.10 acres (38%) of the 0.26-acre difference in direct wetland impacts between the Option A and Option A-5 alignments consists of impacts to low-quality wetlands (Wetland B). While the Option A-5 alignment would place the roadway east of Vernal Pool #1, thereby avoiding the amphibian migration corridor south and west of Vernal Pool #1, the Option A-5 alignment would impact comparable levels of amphibian migration on the north and east sides of Vernal Pool #1. Approximately 37% of Wood Frogs, 29% of Spotted Salamanders, and 30% of Redback Salamanders were observed entering Vernal Pool #1 from the general location of the Option A-5 alignment in 2004. These percentages are also slightly lower but comparable to the percentages of Wood Frogs (45%), Spotted Salamanders (46%), and Redback Salamanders (31%) observed entering the vernal pool from the general location of the Option A alignment. Given the significant amphibian migration observed in 2004 on the north and east sides of Vernal Pool #1, an amphibian crossing would also be required for the Option A-5 alignment to accommodate the documented migration north and east of Vernal Pool #1. Furthermore, Option A-5 would result in a longer roadway corridor and more roadway development (an increase of 1.2 acres) within the 750-foot critical upland habitat of the vernal pools as compared to Option A.

In terms of other factors, Option A-5 would result in a longer road, more impervious cover, greater potential impacts to archaeological resources, and loss of significantly more acreage of prime farmland soil.

The additional length of roadway corridor under the Option A-5 alignment, which occurs in an area of the site with sensitive aquatic and other environmental resources, not only would result in more roadway development within the 750-foot critical upland habitat of the vernal pools, but would also result in more impervious cover and associated increases in stormwater runoff and decreases in groundwater recharge, which would have to be mitigated through additional or enhanced stormwater management measures.

The Option A-5 alignment passes through areas with moderate to high archaeological sensitivity, which would require additional field evaluation for archaeological resources, unlike the Option A alignment, which has already received a determination of "no effect" from the SHPO. Therefore, the Option A-5 alignment would incur additional costs for the required archaeological field investigations.

The Option A-5 alignment would result in more than twice the prime farmland soil impacts as compared to Option A, with a difference of 4.2 acres. The additional acreage impacted by Option A-5 would need to be mitigated off-site, potentially at the proposed prime farmland soil mitigation site on the Depot Campus, provided that there is sufficient upland area suitable for conversion to prime farmland.

Figure 3-1c. Roadway Alignment Option A

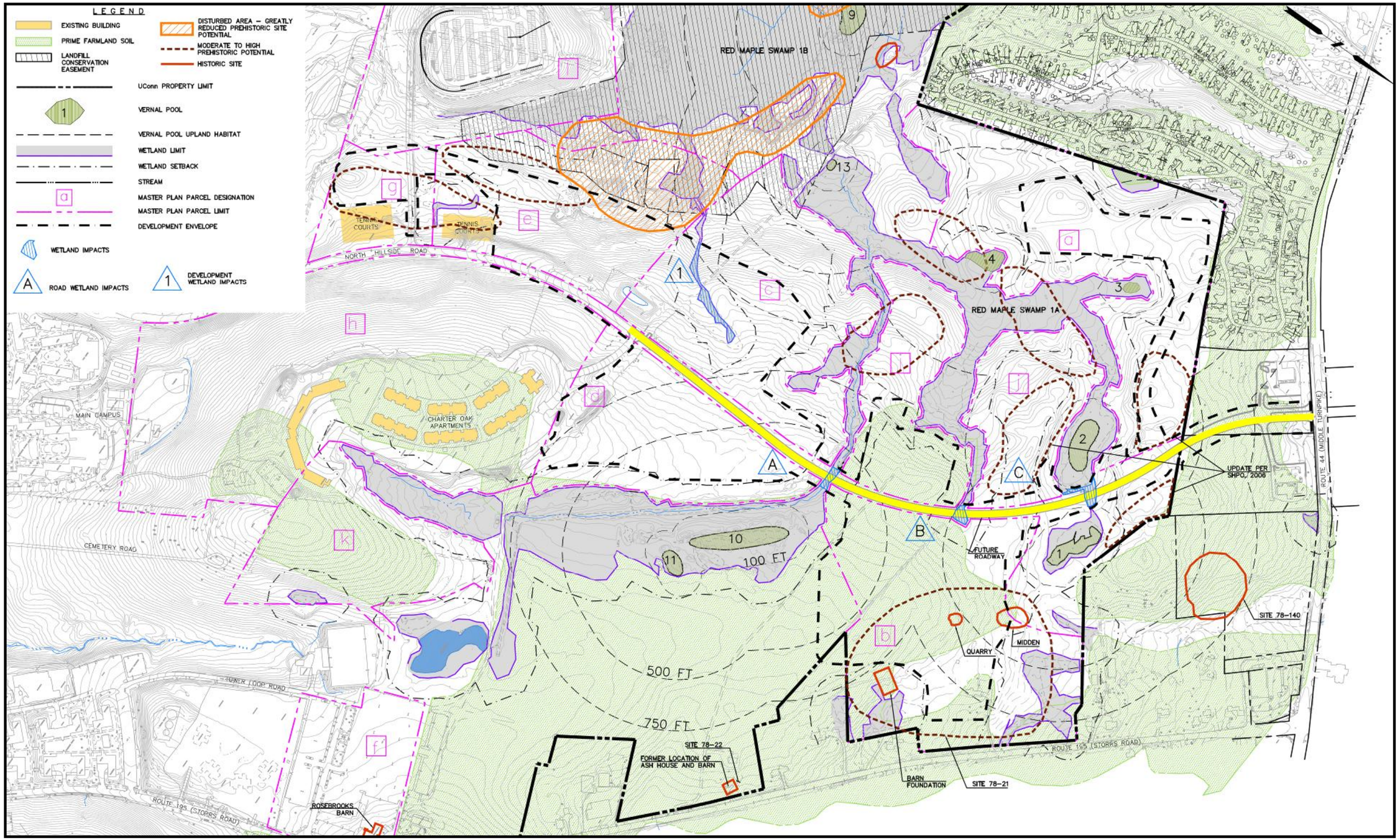
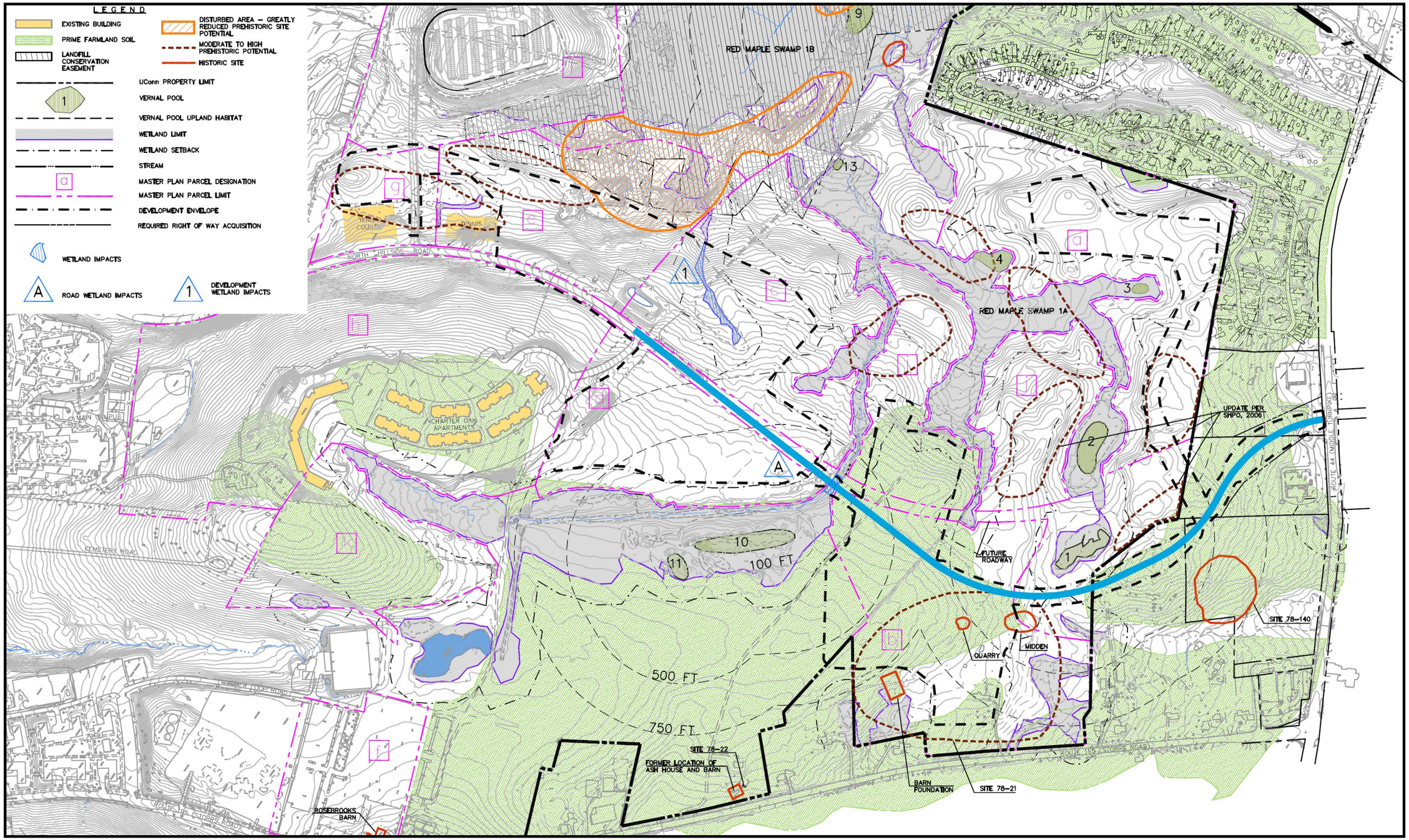


Figure 3-1d. Roadway Alignment Option A-5



In order to construct Option A-5 it would be necessary to acquire privately-owned land totaling 6.2 acres (Figure 3-1f). This is significantly more than the 1.8 acres required for Option A (Figure 3-1e). The cross-hatching in Figures 3-1e and 3-1f depicts the estimated property acquisitions along the roadway corridor for these alternatives, taking into account local topography and minimum design requirements in determining approximate limits of disturbance.

Table 3-2. Comparison of Property Acquisition Impacts

Road Alignment Alternative	Property Acquisition Impacts (Acres) *	Number of Parcels Impacted	Total Acquisition Required	Estimated Cost of Land Acquisition**	Building Demolition Required
A	1.8	2	No	$405,000	No
A-5	6.2	4	Possible	$1,395,000***	No

* Assumes minimum 120-ft Right-of-Way and includes any remnants.
** Assumes a land acquisition cost of $225,000 per acre of commercial-zoned property.
*** Assumes partial take only.

As shown in Figure 3-1f and summarized in Table 3-2, Option A-5 would require land from 4 individual parcels and 3 owners, including over 50% of the land from one of the parcels. It is possible that this could result in a total take of this parcel. Partial takes of varying size would be required from the other three parcels. Such takings, which are otherwise avoidable with the Option A alignment, are likely to involve opposition by a private homeowner, possibly resulting in a longer, adversarial legal process. In contrast, Option A would involve land acquisition from 2 parcels and a single land owner.

Assuming a land acquisition cost of $225,000 per acre of commercial-zoned property, the land acquisition associated with the Option A-5 alignment is estimated to cost approximately $1.4 million, or approximately $1 million more than the cost of land acquisition for the Option A alignment, assuming that only a partial take of the western bank property is required and not a complete take.

Table 3-3 presents a comparison of overall estimated project costs for both roadway alignments. As shown in Table 3-3, the engineering and construction costs associated with the Option A-5 alignment are approximately $1.4 million higher than Option A due to the greater length of road under the Option A-5 alignment (3,993 feet as compared to 3,659 feet for Option A). Considering the difference in land acquisition costs discussed previously, the total estimated project cost of the Option A-5 alignment is approximately $2.5 million higher than the Option A alignment.

Table 3-3. Comparison of Estimated Project Costs ($ million)

Road Alignment Alternative	Engineering Cost*	Land Acquisition Cost**	Construction Cost***	Total Cost
A	$1.02	$0.4	$14.2	$15.62
A-5	$1.20	$1.4	$15.5	$18.10

* Engineering cost for Option A-5 includes cost associated with re-design of the roadway.
** See Table 3-2
*** Does not include cost escalation due to delay in construction start date for Option A-5. Construction and engineering costs are based on length of roadway for each alignment (3659 feet for Option A and 3993 feet for Option A-5) and also reflect 3 wetland crossings for Option A and 2 wetland crossings for Option A-5 (an amphibian crossing is assumed necessary for Option A-5 to accommodate documented amphibian migration on the northeast side of Vernal Pool #1).

The $2.5 million difference represents approximately 16% of the overall $15 million cost of the roadway project. In addition to these cost considerations, the Option A-5 alignment could potentially result in greater land takings, which are otherwise avoidable with the Option A alignment and are likely to involve opposition by a private homeowner. Such takings could result in a longer, adversarial legal process.

The cost difference of $2.5 million between Options A and A-5 for a $15 million project is believed to be unreasonable, given the marginal benefits of Option A-5 relative to aquatic resources and greater impacts to other environmental resources, particularly given the scale of the proposed project (a ½-mile roadway extension and development of a 330-acre site with significant environmental resources). Based on consideration of practicability under Section 404(b)(1) of the Clean Water Act and the Section 404(b)(1) Guidelines (40 CFR 230), the Option A-5 alignment is unreasonably expensive and therefore neither prudent nor practicable on the basis of cost, land acquisition impacts, and impacts to secondary environmental concerns including anticipated impacts to archaeological resources. Therefore, it was recommended that Option A-5 be eliminated from consideration as the LEDPA.

Final Selection of Preferred Roadway Alignment Alternative

Further coordination with the CT DEP and ACOE in January and February 2010 resulted in several key project modifications of the Option A alignment to address the remaining concerns regarding wetland impacts and habitat connectivity for aquatic resources. The two wetland crossings of greatest concern to the resource agencies (Crossings A and C) have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife.

Crossing C will be a 76-foot clear span bridge designed to completely avoid wetland impacts and maintain vernal pool habitat connectivity for semi-aquatic resources and terrestrial wildlife.

Crossing A will be a 40-foot precast concrete rigid frame with open bottom. The structure will have a width greater than 1.2 times the normal bank full flow width and will provide a bank on both sides with sufficient clearance to provide dry passage for semi-aquatic and terrestrial

Figure 3-1e. Property Acquisition Impacts for Roadway Alignment Option A

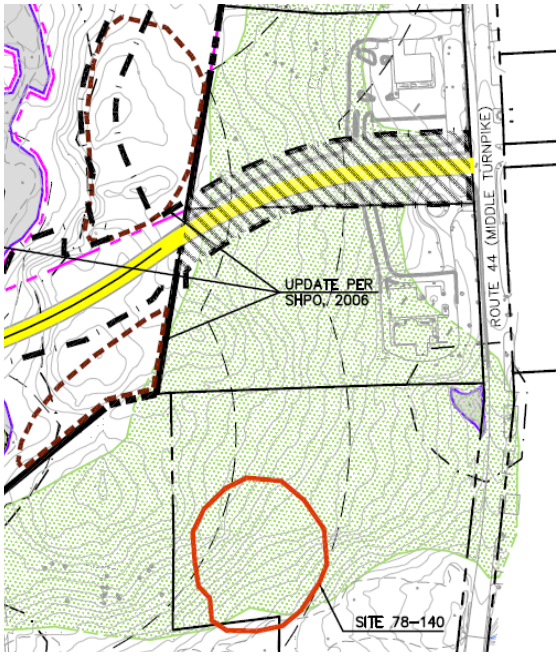
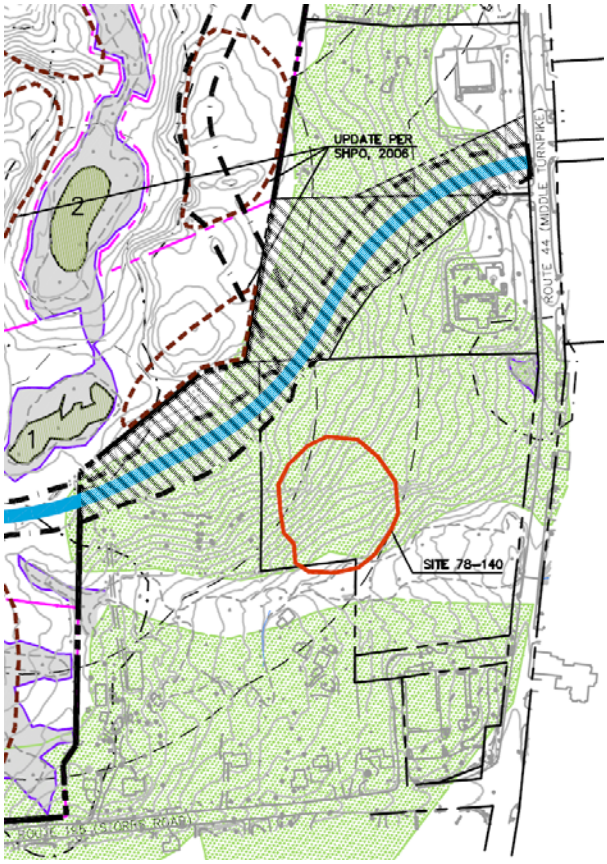


Figure 3-1f. Property Acquisition Impacts for Roadway Alignment Option A-5



wildlife. The substrate within the structure will approximate the range of variability found in the natural stream channel at the time of construction, including a variety of flow conditions, and will be designed to resist displacement during flood events and to maintain appropriate channel characteristics through natural bed load transport. The crossing will have a minimum height of 6 feet (also to accommodate CTDOT inspection requirements) and a minimum openness ratio of 0.5. The proposed design will result in approximately 100 square feet of wetland impacts, which will be mitigated in an on-site wetland creation area.

An 8-foot by 4-foot concrete box culvert is proposed for Crossing B. The bottom of the culvert will be embedded by 1 foot, creating a natural substrate (following guidance contained in the CT DEEP Stream Crossing Guidelines). The box culvert crossing design will also accommodate design flows.

With these design modifications, in addition to the proposed conservation easement and reduction of the development envelope as described in Section 3.5, the Option A alignment is the preferred alignment in this FEIS and recommended as the LEDPA.

3.5 North Campus Development Alternatives

Alternatives for the development of the North Campus have been analyzed in the 1994 EIE (Frederic R. Harris, 1994), the Outlying Parcels Master Plan (JJR, 2000) and associated North Campus Master Plan EIE (Frederic R. Harris, 2001), and again as part of the EIS and wetlands permitting (Section 404) process.

In the 1994 EIE, the development alternatives were driven by the roadway alignment and the goal of avoiding both inland wetlands and associated wetland buffer areas. The alignments, shown in Figures 6 through 11 of the 1994 EIE (Appendix A), include 6 to 9 development sites and achieve the same degree of development, approximately 1.2 million square feet. All included at least one wetland crossing. The options were then narrowed to Option A and Option B (Figure 3 and Figure 4 of the 1994 EIE (Appendix A)). Both options included five primary building sites. The major difference between the options was that Option B located the roadway extension to the west, placing most development on the eastern side of the roadway. Both alternatives were presented as possible designs for the technology park development.

The 2000 Outlying Parcel Master Plan revisited the development concepts for the North Campus in terms of the University's long-term master planning, with an emphasis on optimal resource utilization and efficient development that incorporates sustainable design principles. This approach inherently reduces indirect impacts from the roadway extension. The Master Plan identified 12 potential development parcels located on both sides of a proposed North Hillside Road extension that followed the alignment of Option A presented in the 1994 EIE (Figure 3 in the 2001 EIE in Appendix A). The 2001 EIE for the North Campus Master Plan reduced the development sites to 10, while still achieving the total maximum building space of approximately 1.2 million square feet. Unlike the 1994 EIE, which identified conceptual building footprints, the 2000 Outlying Parcels Master Plan and 2001 EIE only identified parcel locations, net buildable area for the parcels and proposed total site coverage and building floor area, without identifying possible building footprints.

As part of the Section 404 wetlands permitting and the preparation of the DEIS and FEIS, the North Campus development alternatives were revisited. Five conceptual North Campus development alternatives (Alternative 1, 2, 2A, 2B, and 2C) were evaluated, including consideration of development area, impervious cover, and wetland impacts. The proposed roadway alignment is the same for all five development scenarios (Option A as discussed in the previous section). Alternatives 1 through 2B reflect the box culvert wetland crossing design that was presented in the DEIS Preferred Alternative. Alternative 2C reflects the modified crossing designs at Crossings A and C. All five alternative development concepts reflect the most recent wetland delineation for the entire North Campus project area performed in 2006 and the 2008 updated wetland delineation for Parcel C[2].

The FEIS incorporates a "development envelope" approach to reflect a realistic worst-case development scenario for the North Campus parcels. Rather than specifying assumed development configurations or layouts for each parcel, as were presented in the DEIS and previous CEPA documents, the concept development plan in the FEIS delineates the maximum limits of development (i.e., any development-related land disturbance activities) based on resource protection goals that were previously stated in the DEIS (preservation of wetland buffers, vernal pool upland habitat, and vernal pool habitat and wetland connectivity) and Master Plan development objectives. The exact configuration of development within the overall development envelope will vary depending on future uses for each site and other site-specific factors.

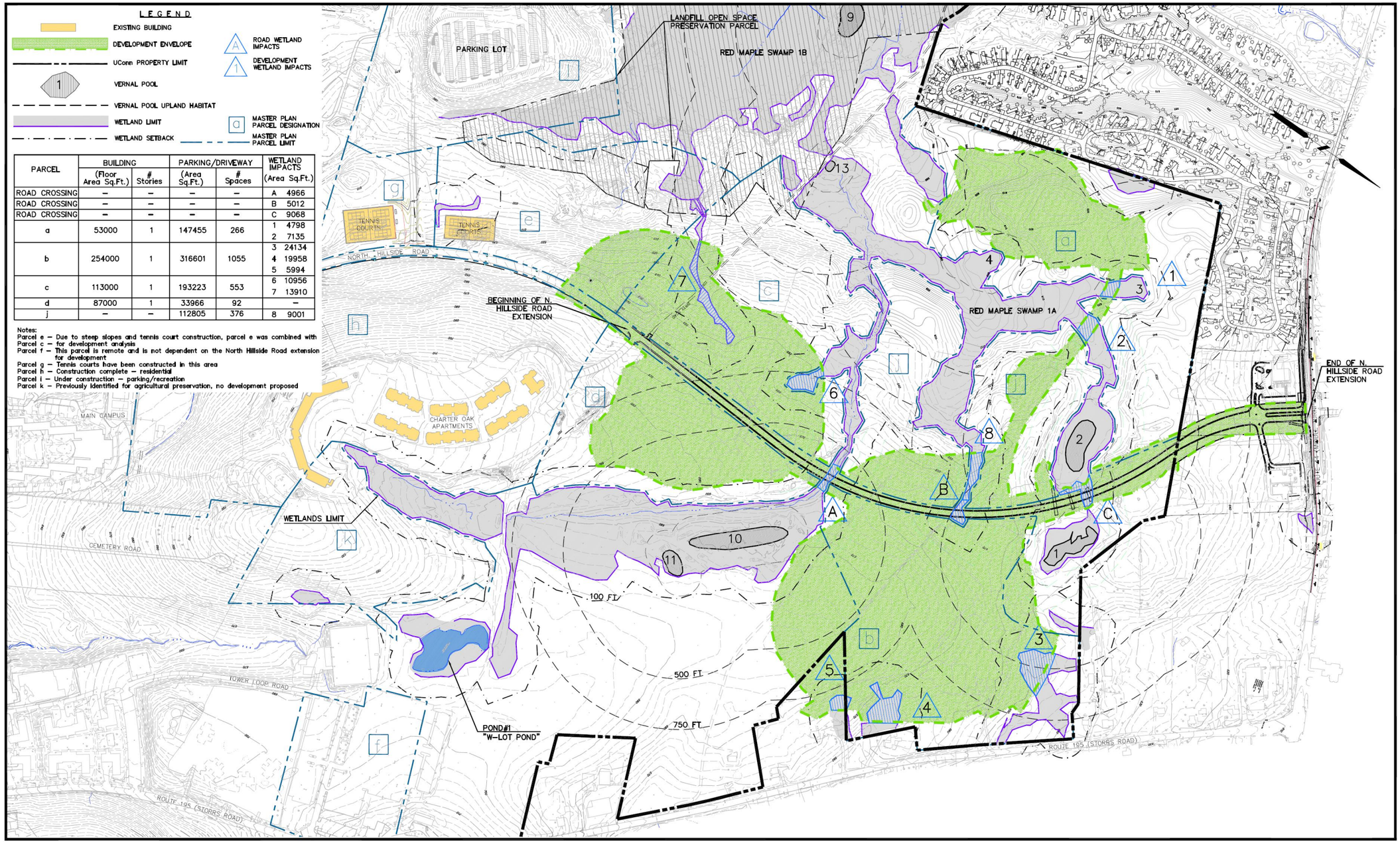
For the purposes of evaluating potential secondary and cumulative impacts of the future North Campus development in the FEIS, areas associated with buildings, parking, and access drives were assumed for each development parcel to meet the building floor area objectives and parking requirements outlined in the Outlying Parcels Master Plan for the North Campus. Impervious cover, stormwater flows, and other factors that could potentially impact aquatic resources with the future build-out of the North Campus were estimated based upon this realistic worst-case development scenario. Table 3-4 compares the five North Campus development alternatives

Alternative 1 (Figure 3-2) was based on the Option A layout presented in the 1994 EIE. This alternative results in eight areas of wetland impacts on four development parcels and three areas of wetland impacts along the roadway, totaling approximately 2.64 acres and numerous encroachments into the 100-foot upland envelope surrounding the wetlands. Based on these impacts, Alternative 1 was found to be environmentally unacceptable and was dismissed.

Alternative 2 (Figure 3-3) was developed based upon the planning principles and recommended land uses contained in the Outlying Parcels Master Plan and the associated 2001 EIE. This alternative reduces wetland impacts but includes some development within the 100-foot upland envelope. This alternative results in two areas of wetland impacts isolated to Parcel C and three areas of wetland impacts along the roadway, totaling approximately 1.23 acres, and several encroachments into the 100-foot upland envelope.

[2] The wetland associated with Parcel C was re-classified as a regulated watercourse based on discussions with the agency representatives during a March 6, 2008 site walk. This wetland area is the headwaters of an intermittent watercourse that flows in a southwesterly direction.

Figure 3-2. North Campus Development Alternative 1



PARCEL	BUILDING (Floor Area Sq.Ft.)	BUILDING # Stories	PARKING/DRIVEWAY (Area Sq.Ft.)	PARKING/DRIVEWAY # Spaces	WETLAND IMPACTS (Area Sq.Ft.)
ROAD CROSSING	–	–	–	–	A 4966
ROAD CROSSING	–	–	–	–	B 5012
ROAD CROSSING	–	–	–	–	C 9068
a	53000	1	147455	266	1 4798 2 7135
b	254000	1	316601	1055	3 24134 4 19958 5 5994
c	113000	1	193223	553	6 10956 7 13910
d	87000	1	33966	92	–
j	–	–	112805	376	8 9001

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STORRS CONNECTICUT

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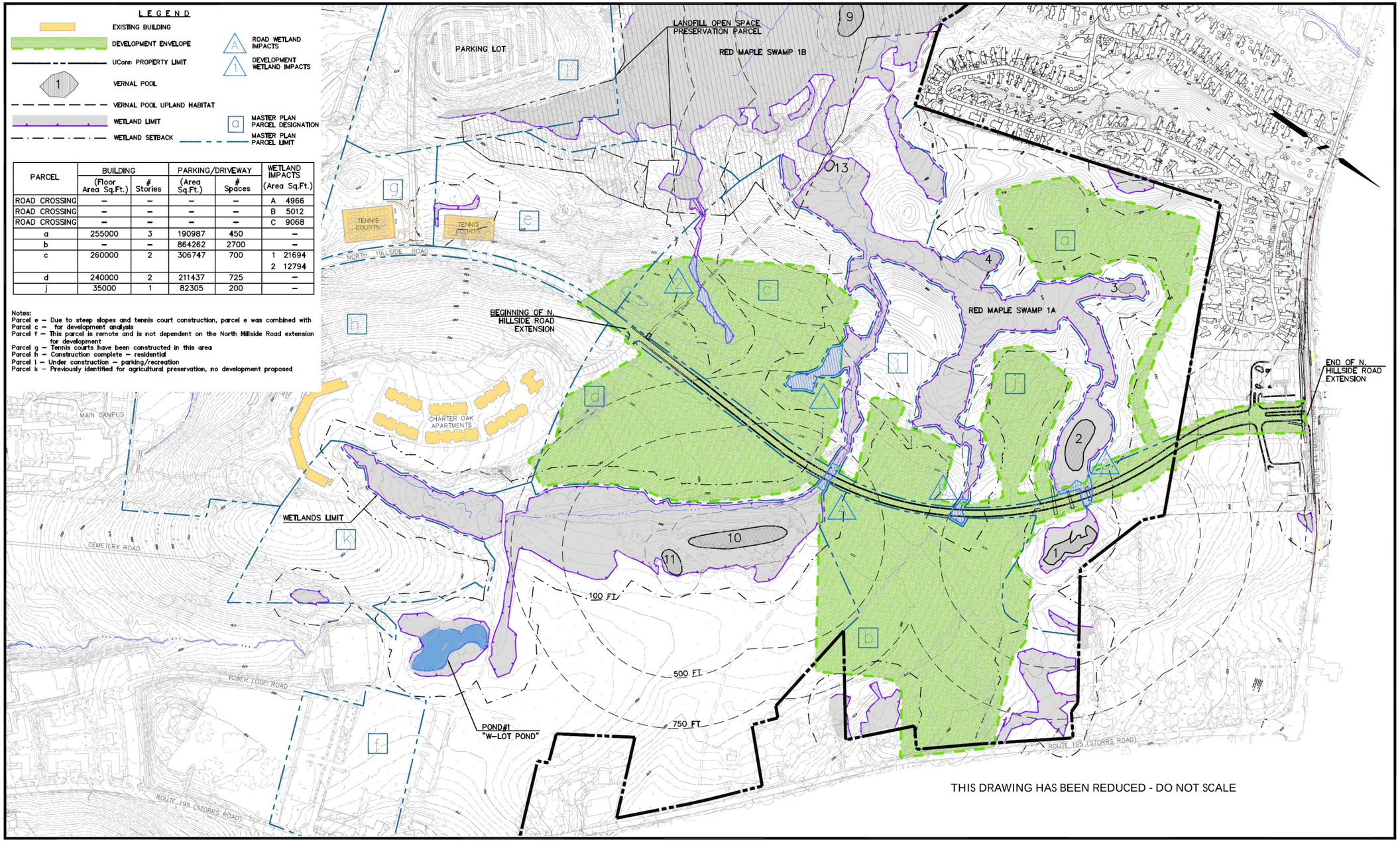
Figure 3-3. North Campus Development Alternative 2



PARCEL	BUILDING (Floor Area Sq.Ft.)	BUILDING # Stories	PARKING/DRIVEWAY (Area Sq.Ft.)	PARKING/DRIVEWAY # Spaces	WETLAND IMPACTS (Area Sq.Ft.)
ROAD CROSSING	–	–	–	–	A 4966
ROAD CROSSING	–	–	–	–	B 5012
ROAD CROSSING	–	–	–	–	C 9068
a	255000	3	190987	450	–
b	–	–	864262	2700	–
c	260000	2	306747	700	1 21694 2 12794
d	240000	2	211437	725	–
j	35000	1	82305	200	–

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Table 3-4. Comparison of North Campus Development Alternatives

North Campus Development Alternative	Development Envelope (acres)	New Impervious Cover[1] (acres)	Building Floor Area[2] (million square feet)	New Parking Spaces[3]	Wetland Impacts (acres)
Alternative 1	73.86	30.1	0.82	2,342	2.64
Alternative 2	77.90	46.5	1.10	4,775	1.23
Alternative 2A	71.32	35.1	1.28	3,075	0.77
Alternative 2B	65.96	35.1	1.28	3,075	0.56
Alternative 2C	76.02	35.1	1.28	3,075	0.31

[1]Includes North Campus development parcels a, b, c, d, e, g, and j, and the roadway. Excludes landfill parking lot and Charter Oak residences.
[2]Includes existing Charter Oak residences.
[3]Excludes existing parking at landfill parking lot and Charter Oak residences.

A third alternative was developed (Alternative 2A) in an effort to further reduce wetland impacts and development within the 100-foot upland envelope, while still meeting the building floor area, parking, and land use program requirements outlined in the Outlying Parcels Master Plan and the 2001 EIE and EIE Record of Decision (ROD). Specific criteria included:

- Maximum building space for North Campus of approximately 1.2 million square feet,
- Maintain minimum 30-foot buffer from adjacent properties,
- Maintain a minimum 100-foot buffer around wetlands and at least a 50-foot buffer where a 100-foot buffer is not feasible.

Alternative 2A (Figure 3-4) results in additional reductions in wetland impacts and only minimal encroachment into the 100-foot upland envelope. This alternative results in one area of wetland impacts on Parcel C and three areas of wetland impacts along the roadway, totaling approximately 0.77 acres.

The North Campus development concept was further refined (referred to as Alternative 2B) based upon issues and concerns raised by the Connecticut Department of Environmental Protection, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service during an agency coordination meeting and site walk held at the UConn Storrs Campus on March 6, 2008. The proposed development on the northern portion of Parcel J was re-located to the former agricultural field between wetlands A and B to preserve an undisturbed wetland and amphibian migration corridor on the northern portion of the site. Proposed development on Parcel C was also reconfigured to limit site disturbance to the northern side of the existing dirt access road. Alternative 2B (Figure 3-5) was identified as the preferred North Campus development alternative in the DEIS, resulting in further reduced wetland impacts (0.56 acres) and improved habitat connectivity on the northern portion of the site.

Additional coordination with the CT DEP and ACOE in January and February 2010 resulted in several modifications to the North Campus concept development plan to address the remaining concerns regarding wetland impacts and habitat connectivity for aquatic resources. The North Campus concept development plan was modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. The revised North Campus development concept is referred to as "Alternative 2C" in this FEIS.

Alternative 2C (Figure 3-6) provides approximately 1.2 million square feet of total building area and 4,475 parking spaces, including existing parking on Parcel F (W-Lot), Parcel L (landfill parking lot), and Parcel H (Charter Oak residential units), while limiting total wetland disturbance from the roadway extension and North Campus development to 0.31 acres. Development that was previously proposed for Parcel A under Alternative 2B has been re-allocated by increasing the density of development on Parcel B to maintain a maximum building space for the North Campus of approximately 1.2 million square feet.

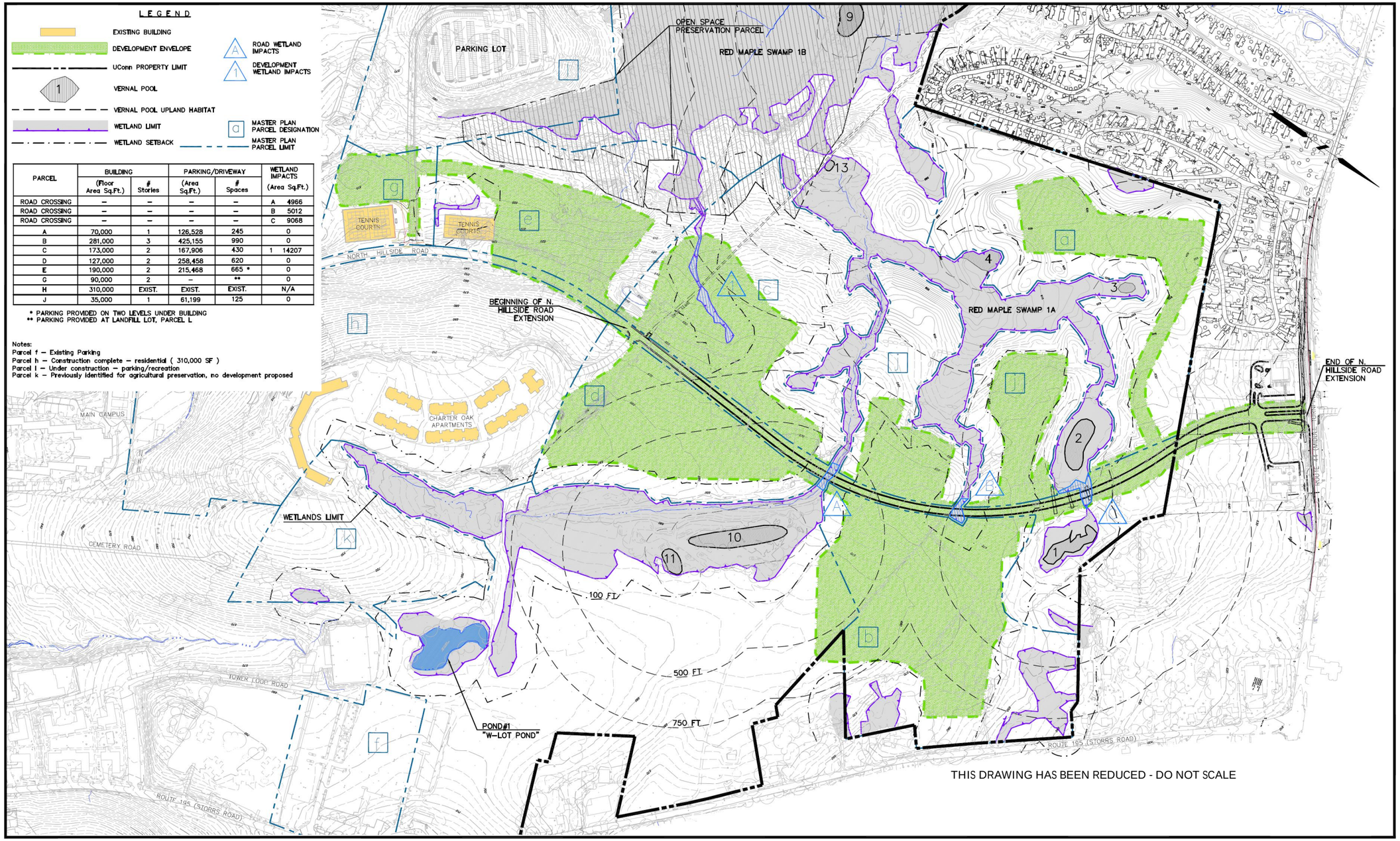
The number of parking spaces necessary for the North Campus development was determined using a parking ratio of 3.5 spaces per 1,000 square feet of building floor space. Parking ratios are typically determined based on local zoning and represent the minimum number of spaces needed to accommodate the highest hourly parking rate at a site. Most local minimum parking requirements exceed actual parking demand and are therefore conservatively high. The Town of Mansfield requires a minimum parking ratio of 4 spaces per 1,000 square feet of building floor space for the types of uses proposed for the North Campus. A lower parking ratio of 3.5 was selected to reduce the development footprint and amount of impervious cover associated with the North Campus concept development.

Structured parking is also proposed to reduce the overall development footprint, impervious cover, and stormwater runoff. Of the 3,075 new parking spaces proposed for the North Campus at full buildout, 665 of these spaces (approximately 22%) would be provided in structured parking below the proposed building on Parcel E, resulting in no additional impervious cover for these spaces beyond the building footprint. The parking needs of the North Campus development will be partially met (1,400 spaces) through the use of existing parking lots (W-Lot, Charter Oak residential units, and the landfill parking lot). Additionally, the North Campus development will be served by the existing campus shuttle system. The proposed roadway design includes accommodations for pedestrians (bituminous sidewalk on one side of the road) and bicycles (combination shoulder/bike lanes in both directions).

The major assumptions associated with each of the development parcels under Alternative 2B are summarized as follows:

- Parcel A – The North Campus concept development plan has been modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. Figure 3-7 depicts the proposed conservation easement area. Additional areas of the North Campus surrounding wetlands and vernal pools are designated as "non-development areas," indicating that no future development is anticipated although a formal conservation easement is not proposed

Figure 3-4. North Campus Development Alternative 2A



PARCEL	BUILDING (Floor Area Sq.Ft.)	BUILDING # Stories	PARKING/DRIVEWAY (Area Sq.Ft.)	PARKING/DRIVEWAY # Spaces	WETLAND IMPACTS (Area Sq.Ft.)
ROAD CROSSING	–	–	–	–	A 4966
ROAD CROSSING	–	–	–	–	B 5012
ROAD CROSSING	–	–	–	–	C 9068
A	70,000	1	126,528	245	0
B	281,000	3	425,155	990	0
C	173,000	2	167,906	430	1 14207
D	127,000	2	258,458	620	0
E	190,000	2	215,468	665 *	0
G	90,000	2	–	**	0
H	310,000	EXIST.	EXIST.	EXIST.	N/A
J	35,000	1	61,199	125	0

* PARKING PROVIDED ON TWO LEVELS UNDER BUILDING
** PARKING PROVIDED AT LANDFILL LOT, PARCEL L

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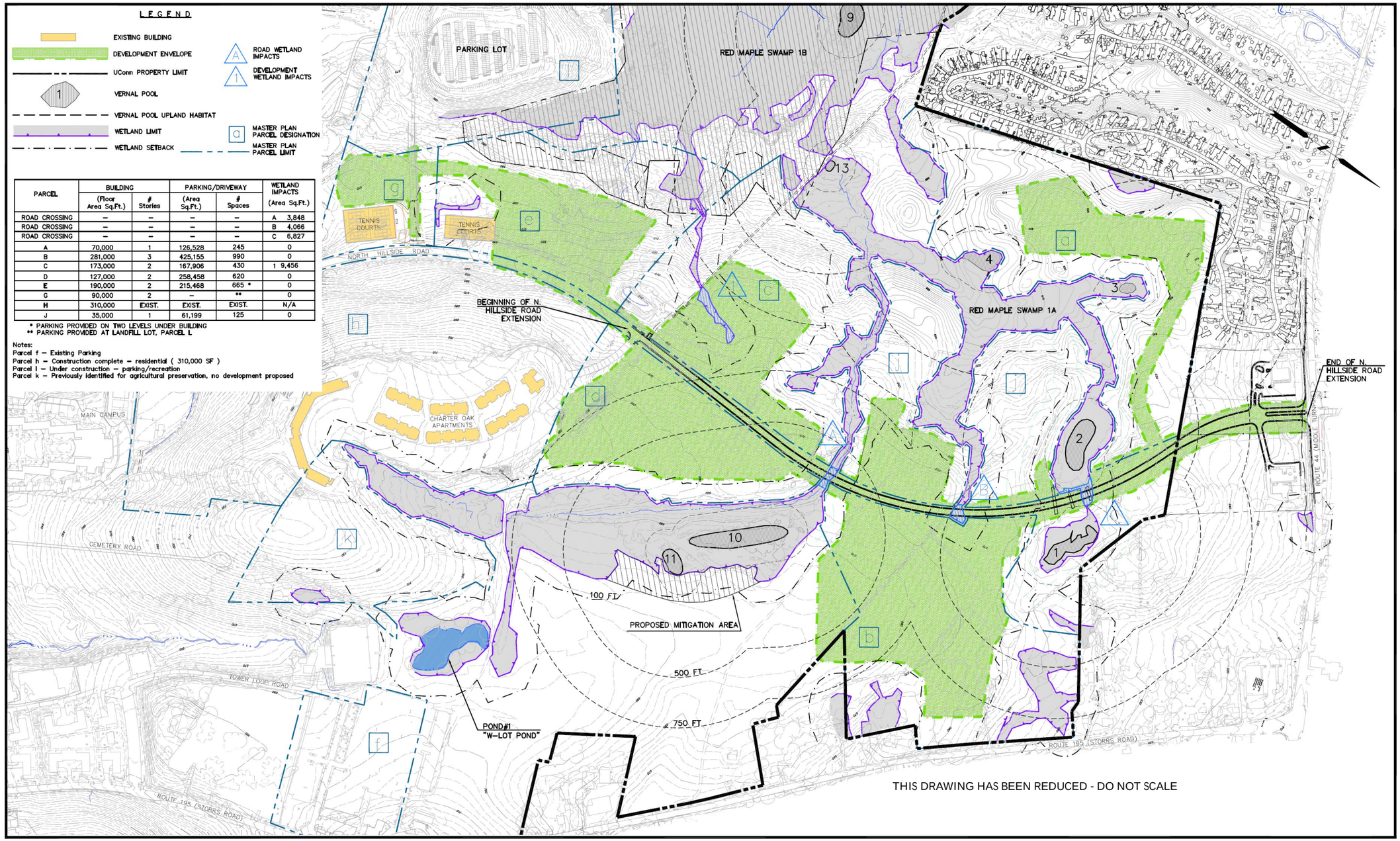
Figure 3-5. North Campus Development Alternative 2B



PARCEL	BUILDING (Floor Area Sq.Ft.)	BUILDING # Stories	PARKING/DRIVEWAY (Area Sq.Ft.)	PARKING/DRIVEWAY # Spaces	WETLAND IMPACTS (Area Sq.Ft.)
ROAD CROSSING	–	–	–	–	A 3,848
ROAD CROSSING	–	–	–	–	B 4,066
ROAD CROSSING	–	–	–	–	C 5,827
A	70,000	1	126,528	245	0
B	281,000	3	425,155	990	0
C	173,000	2	167,906	430	1 9,456
D	127,000	2	258,458	620	0
E	190,000	2	215,468	665 *	0
G	90,000	2	–	**	0
H	310,000	EXIST.	EXIST.	EXIST.	N/A
J	35,000	1	61,199	125	0

* PARKING PROVIDED ON TWO LEVELS UNDER BUILDING
** PARKING PROVIDED AT LANDFILL LOT, PARCEL L

Notes:
Parcel f – Existing Parking
Parcel h – Construction complete – residential (310,000 SF)
Parcel I – Under construction – parking/recreation
Parcel k – Previously identified for agricultural preservation, no development proposed

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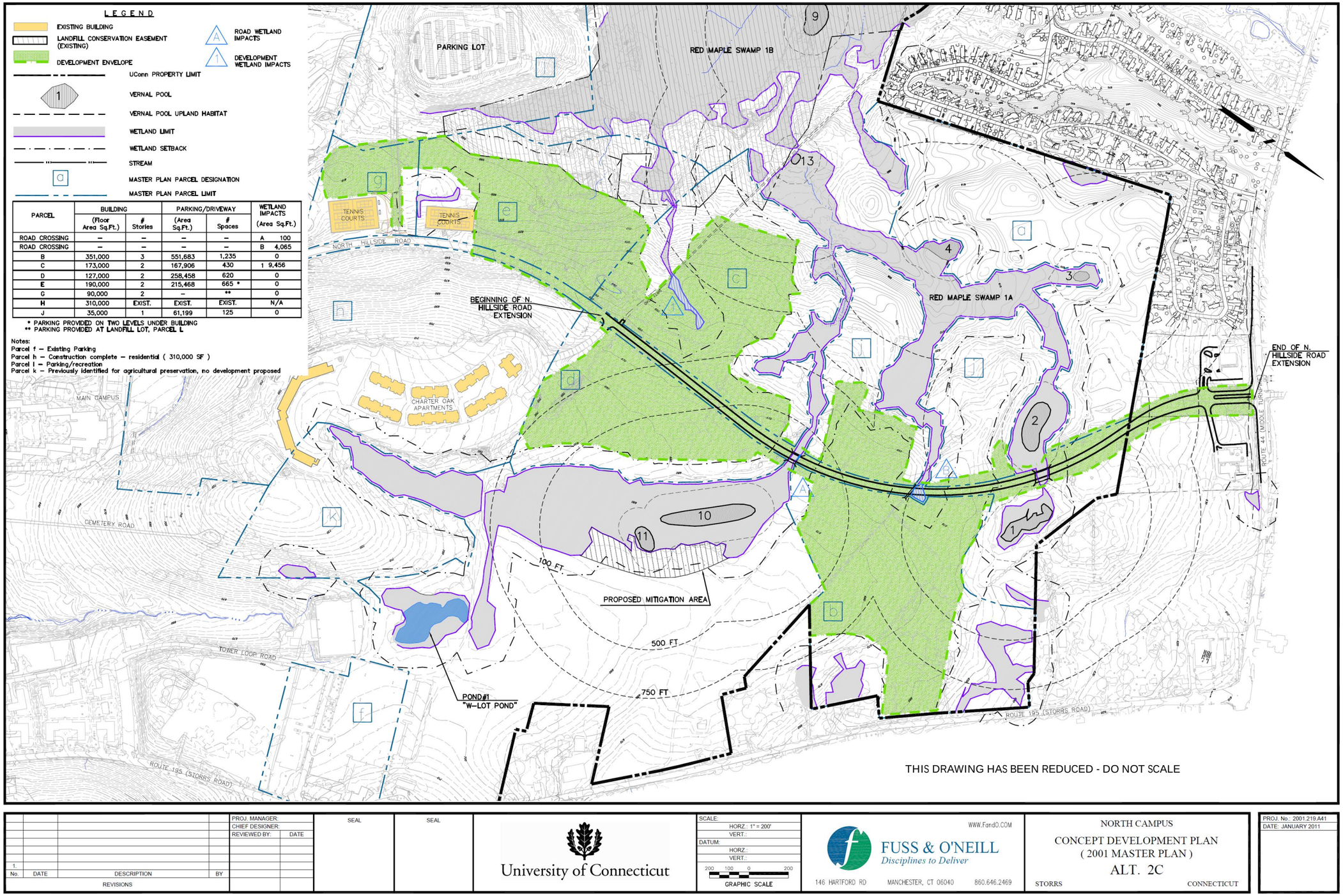
Figure 3-6. North Campus Development Alternative 2C



PARCEL	BUILDING (Floor Area Sq.Ft.)	BUILDING # Stories	PARKING/DRIVEWAY (Area Sq.Ft.)	PARKING/DRIVEWAY # Spaces	WETLAND IMPACTS (Area Sq.Ft.)
ROAD CROSSING	–	–	–	–	A 100
ROAD CROSSING	–	–	–	–	B 4,065
B	351,000	3	551,683	1,235	0
C	173,000	2	167,906	430	1 9,456
D	127,000	2	258,458	620	0
E	190,000	2	215,468	665 *	0
G	90,000	2	–	**	0
H	310,000	EXIST.	EXIST.	EXIST.	N/A
J	35,000	1	61,199	125	0

* PARKING PROVIDED ON TWO LEVELS UNDER BUILDING
** PARKING PROVIDED AT LANDFILL LOT, PARCEL L

Notes:
Parcel f – Existing Parking
Parcel h – Construction complete – residential (310,000 SF)
Parcel l – Parking/recreation
Parcel k – Previously identified for agricultural preservation, no development proposed

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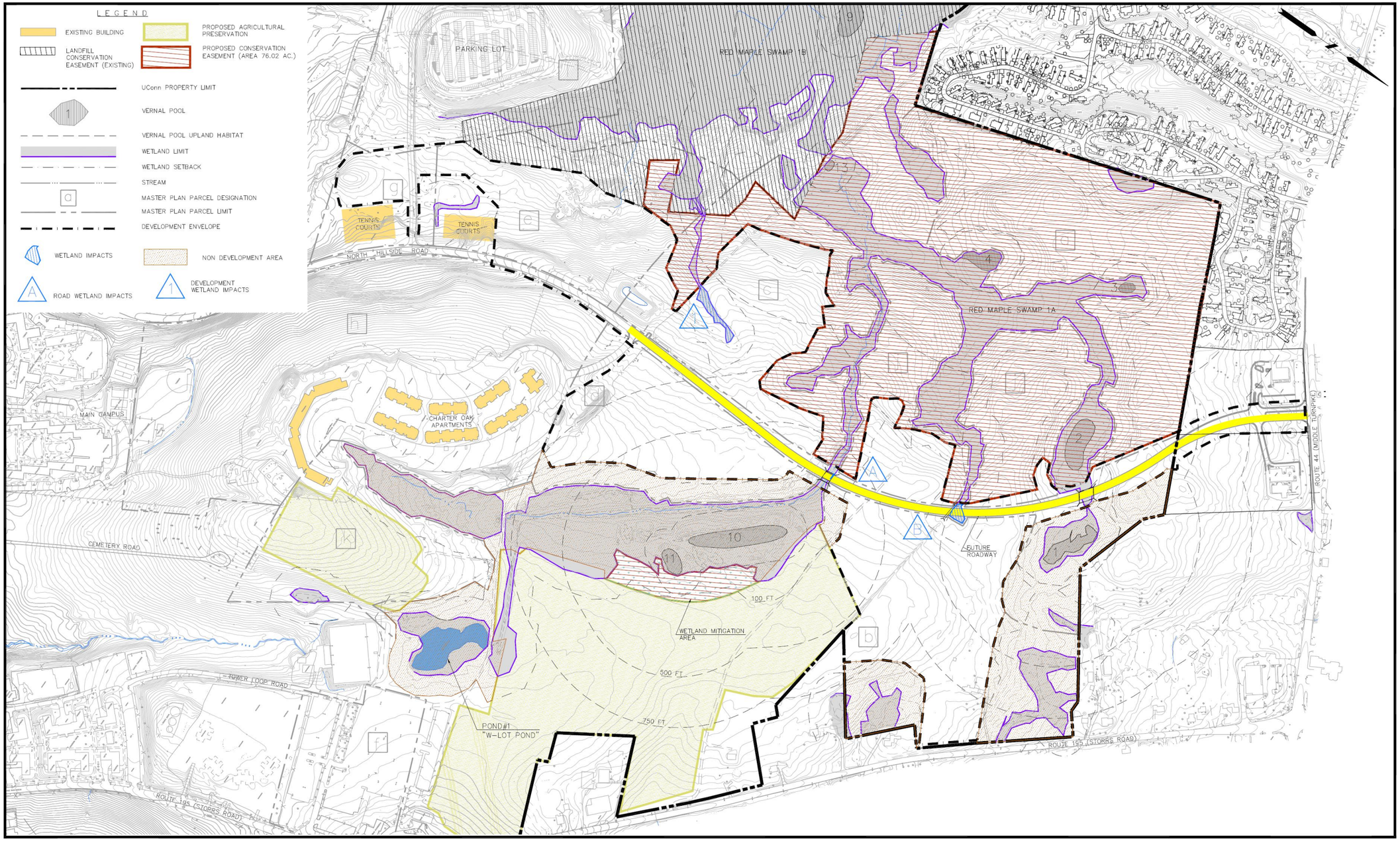
Figure 3-7. Proposed Conservation Easement



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NORTH HILLSIDE ROAD EXTENSION
PROPOSED CONSERVATION EASEMENT
NORTH HILLSIDE ROAD EXTENSION ALT A
STORRS CONNECTICUT

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for these areas, which generally include the upland area within 100 feet of wetlands and vernal pools.

- Parcel B – The 2001 ROD allows substitution of 351,000 square feet of building for the approved 2,700 spaces of surface parking in lieu of full development of 265,000 square feet on Parcel A. The proposed building is therefore sized at 351,000 square feet. 1,235 parking spaces are provided (3.5 spaces per 1000 square feet). 100-foot buffers are provided around the adjacent wetlands. Development is proposed within the farmland preservation area previously proposed in the 2001 EIE and ROD. A farmland preservation area and mitigation plan is proposed (see Section 4.2).

- Parcel C – Proposed development includes 173,000 square feet of building space, a 2-story building, 430 parking spaces (2.5 spaces per 1,000 square feet) with an additional 175 spaces allotted on Parcel D. Approximately 0.22 acres of disturbance of an isolated, low-quality wetland is necessary for the proposed building and surface parking, thereby allowing preservation of a 100-foot buffer to the larger wetland system on the parcel. Wetland mitigation (i.e., wetland creation) is proposed to compensate for the lost wetland functions and values, as described in Section 4.13.

- Parcel D – Proposed development includes 127,000 square feet of building space, a 2-story building, 620 parking spaces (4.88 spaces per 1,000 square feet), 175 parking spaces allocated for Parcel C (combined 3.5 spaces per 1,000 square feet for both parcels,) and 100-foot buffers to adjacent wetlands.

- Parcel E – Portions of the existing tennis courts are located on Parcel E. Proposed development includes an additional 190,000 square feet of building space in a 2-story building with 2 levels of underground parking (665 parking spaces). Parcel E would be access via a driveway off of the Parcel L (landfill parking lot) access road.

- Parcel F – The existing surface parking lot is proposed to remain. The 100,000 square feet of building space identified in the Outlying Parcels Master Plan is proposed to be redistributed to Parcel G for a proposed student recreation center.

- Parcel G – Portions of the existing tennis courts are located on Parcel G. The proposed development would add 90,000 square feet of building space for a student recreation center. The parking needs for this development would be served by Parcel L (landfill parking lot). Pedestrian access to the site would be provided along the Parcel L access road. No additional parking is proposed on Parcel G.

- Parcel H – Parcel H contains the existing Charter Oak residential units and associated parking. No additional development is proposed for this parcel.

- Parcel J – Proposed development includes 35,000 square feet of building space in a 1-story building and 125 parking spaces (3.5 spaces per 1,000 square feet) located in a former agricultural field between wetlands A and B. The proposed building and parking area were re-located from an upland area on the northern portion of Parcel J to preserve an undisturbed wetland and amphibian migration corridor. Consequently, some development is necessary within the 100-foot buffer to the wetlands adjacent to the former agricultural field to make development of Parcel J feasible, while maintaining the undisturbed wetland and amphibian migration corridor.

- Parcel K – This parcel is proposed to remain as farmland (within the proposed farmland preservation area), consistent with the previous farmland preservation commitment in the 2001 EIE and ROD.

- Parcel L – A 600-space surface parking lot on the former UConn landfill.

Final Selection of Preferred North Campus Development Alternative

The North Campus development Alternative 2C, combined with the modified wetland crossings for roadway alignment Option A, reflects the overall roadway and parcel development scenario that best addresses the University's goals for development of the North Campus while minimizing impacts to the on-site wetlands and maintaining habitat connectivity. This alternative is referred to hereafter as the "FEIS Preferred Alternative" and is recommended as the LEDPA. The FEIS Preferred Alternative also satisfies the development objectives that are contained in the Outlying Parcels Master Plan and the 2001 EIE ROD.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes existing conditions, potential environmental impacts, and proposed mitigation measures for each of the resource topics addressed in this FEIS. Potential environmental impacts are presented for the Preferred Alternative. Other Build Alternatives are evaluated for those resource topics where alternatives were considered in detail in the 1994 and 2001 EIEs and where impacts are anticipated to differ based on the alternatives under consideration (e.g., wetlands).

4.1 Land Use Impacts

4.1.1 Methodology

To analyze the impact of the proposed project on land use, applicable local, regional, and statewide planning documents were reviewed and the project evaluated relative to the goals, principles, and policies presented in those documents. General guidance (e.g. goals, principles, policies etc. intended for areas similar to the study area) as well as specific guidance for the study area were compared to existing and proposed land use on the project site and surrounding area. Planning documents that were examined include:

- 2006 Mansfield Plan of Conservation and Development (Mansfield, 2006),
- Windham Region Land Use Plan 2010 (WINCOG, 2010),
- Conservation and Development Policies Plan for Connecticut, 2005 – 2010 (CTOPM, 2005).

In general, these documents were internally consistent with regard to land use planning for the project site.

The evaluation of land use impacts in this section is based upon the parcel-specific land uses presented in the UConn Outlying Parcels Master Plan (JJR, 2000) and the proposed conceptual North Campus development plan. Potential impacts would be similar under any of the alternative roadway alignments and North Campus development scenarios presented in Section 3. It is assumed that land use would remain unchanged under the No Action Alternative.

4.1.2 Existing Conditions

The North Campus consists of approximately 330 acres of hardwood forest, rolling topography, stream corridors, wetland areas, and agricultural land. The wetlands and prime farmland areas comprise approximately one-half of the North Campus. Although now primarily undeveloped, campus-wide utilities (e.g., electricity, telecommunications, steam, gas, water and sewer) serve the Charter Oak residential units and are available on the adjacent academic core campus.

The UConn College of Agriculture and Natural Resources (CANR) maintains approximately 43.5 acres on the North Campus in agricultural production (Section 4.2). The agricultural lands in the proposed project area are jointly managed by the Department of Animal Science and

Department of Farm Services at UConn. Current use consists of hay production and tillable land (CANR, 2006).

According to the Town of Mansfield Zoning Regulations (Hirsch, pers comm., 2004), the southern portion of the project site is currently zoned for Institutional uses, and the northern portion is zoned for Research and Development Limited Industrial Zone. To the east and far west of the site, the land is zoned for Rural Residence and Agriculture. The area surrounding the proposed intersection of Route 44 and the North Hillside Road Extension, as well as a small area adjacent to the UConn campus to the south, are zoned for Planned Business Uses.

Although state activities on state-owned land are exempt from local zoning regulations, the Town of Mansfield Institutional zoning requires that the land be owned or operated by the State of Connecticut or the Federal Government, and that activities are not proprietary in nature and do not involve the transportation of hazardous material without the appropriate permitting. This zoning also combines many of the regulations and permitted uses of the other zones, to allow for different types of student housing, places of worship, professional offices, etc. The Research and Development Limited Industrial zone was established to provide economic opportunities for research and development and limited industrial uses in areas specifically designated in the Town's Plan of Development. The permitted uses in this zone are oriented toward research and development and high technology operations, as well as other uses which would be compatible with research/technology park and associated land uses (e.g., hotels, conference centers, accessory commercial uses, business/professional offices, educational facilities and childcare facilities, recreational facilities, parking garages, communication facilities).

4.1.3 Potential Impacts

The state, regional, and local plans discussed above each contain goals, principles, and policies relative to preservation of agricultural and scenic areas, wetlands, and open space. Therefore, the No Action Alternative would be consistent with the open space and agricultural preservation goals of these plans because it would maintain the existing land use (agriculture and undeveloped) on the North Campus. However, the planning documents also recognize the necessity to concentrate development in areas where there is appropriate infrastructure to support development. The proposed project is located in an area to which public water and sewer service is accessible, which makes development of the site generally favorable as presented in each of the three land use planning documents discussed above. Consequently, the North Campus is highlighted as one of the few targeted growth areas in the region. This area is generally targeted for medium-to-high density growth to take advantage of the available infrastructure, and to relieve development pressures from areas where infrastructure is not available. Examples of statements from the land use plans that acknowledge or support construction of the North Hillside Road extension include:

2006 Mansfield Plan for Conservation and Development

- "Upon completion, the North Hillside Road connection between Route 44 and North Eagleville Road which is being designed and is expected to be completed in 2007, also will serve as an arterial street" (p. 24)

- Recommendation: "Encourage appropriate extensions of existing sewer and public water supply systems to help reduce residential development pressure in areas classified low-density residential. (In association with expanded opportunities for higher-density development in areas with public infrastructure, consideration should be given to a transfer of development rights program, to enhance the protection of natural, agricultural and scenic resources.)" (p. 35)

Windham Region Land Use Plan 2010

- Intensive development should be "concentrated in areas where there is public water and sewer, public transportation service facilities, sidewalks, schools, and other community infrastructure." (p. 6)
- The UConn Storrs main campus, Depot Campus, and Storrs downtown are called-out as a distinct Regional Center which has the "highest priority for all forms of redevelopment and development." (p. 10).
- Specific policies for development at UConn and the Storrs downtown are that development should be sensitive to water resources and water supply recharge areas and that "public transportation and multi-modal transportation improvements should be supported to relieve road congestion and to provide better access to the university without increasing the need for parking spaces." (p. 12).

Conservation and Development Policies Plan for Connecticut, 2005 – 2010

- Locational guide map for Mansfield calls out the proposed project area as a "Growth Area," although a portion of the existing agricultural field is called out as a "Preservation Area." The preservation area approximately corresponds to the area that will remain as prime farmland.
- A policy of the Plan is to promote an urban economy through the "expanded use of the state's higher education institutions." (p. 33)
- A policy of the Plan is to "target... state resources to support infrastructure improvements and development in areas where the infrastructure is already in-place" (p. 21)

Each of the proposed alternatives, other than the No Action Alternative, includes extension of North Hillside Road and development of adjacent areas. The conceptual development plan for the North Campus under the Preferred Alternative is shown in Figure 3-6. It is based on the Outlying Parcels Master Plan (JJR, 2000) and the 2001 North Campus Master Plan EIE and the Record of Decision. Overall, the development includes a maximum total building area of approximately 1.2 million square feet and 4,475 parking spaces (including the existing Charter Oak residential units and shared parking with the existing Landfill Parking Lot and W-Lot). Approximately 65% of the total North Campus building area is intended for research and technology uses (Parcels B though E) with recreational facilities (Parcel G), special academic facilities (Parcel J), and the existing Charter Oak residential units (Parcel H) comprising the balance of the building space. As discussed in Section 6.2, approximately 41.5 acres of existing agricultural land will remain undeveloped and be preserved as agricultural land on the North Campus. Parcel A and the proposed wetland mitigation area, comprising a total of approximately 76 acres of land, area will be preserved through a conservation easement.

All alternative alignments considered for the roadway corridor will have a relatively limited direct impact in terms of land use conversion. The alternative roadway alignments will have similar indirect land use impacts in terms of conversion of woodland and agricultural land to developed areas. However, since the area of the proposed project has access to sufficient infrastructure to support development, includes the expansion of higher education within Connecticut, and since the proposed project is specifically identified as a development area in each of the relevant land use plans, the indirect land uses change resulting from the North Hillside Road extension is consistent with overall land use planning on the local, regional, and state level.

It should also be noted that the development of state-owned facilities on the North Campus is exempt from local zoning. However, private development would be subject to the requirements of the local zoning district in which it is located. The land use outlined in the Outlying Parcels Master Plan (JJR, 2000), the 2001 North Campus Master Plan EIE and the Record of Decision, and the proposed conceptual North Campus development plan is consistent with the underlying Town of Mansfield zoning districts on the North Campus. Therefore, no impact to underlying or adjacent zoning districts will occur.

4.1.4 Mitigation

While the proposed project will result in land use change that is overall consistent with local, regional, and state land use plans, conversion of agricultural land and wetland resource areas will occur. Negative land use impacts include the loss of approximately 34.1 of prime farmland soils, some of which are actively used for agriculture, and impacts to approximately 0.31 acres of wetland resources located on the project site. Proposed measures to mitigate these impacts include farmland preservation and replication, wetland creation to replace wetland functions and values that will be affected by the project, modified wetland crossing designs to minimize wetland impacts and maintain habitat connectivity, and preservation of additional undeveloped land through a conservation easement. Detailed discussions of these impacts and mitigation measures are presented elsewhere in this document.

4.2 Farmland Impacts

4.2.1 Methodology

The project was evaluated relative to both Federal and State farmland protection policies and requirements. The following documents and resources were reviewed:

- The 1994 and 2001 EIEs and their Records of Decision,
- The 2000 Outlying Parcels Master Plan,
- The 2006 Land Use Task Force Report prepared by the College of Agriculture and Natural Resources (CANR),
- U.S. Department of Agriculture (USDA) National Resource Conservation Service (NRCS) mapping of farmland soils within and in the vicinity of the Storrs Campus.

In addition, discussions with faculty and staff of CANR were held during winter and spring 2007 to discuss current agricultural use on the North Campus, anticipated future needs for agricultural lands, and viable mitigation options for farmland soils converted to non-agricultural

use directly or indirectly as a result of the North Hillside Road Extension. Also, discussions with NRCS were held in November 2007 and January 2008 and NRCS staff conducted field work to evaluate potential mitigation sites in January 2008, as documented in February 4, 2008 correspondence from NRCS (Appendix C).

The Federal Farmland Protection Policy Act (FPPA) (Public Law 97-98, 7 U.S.C. 420) and implementing regulations (7 CFR 658) apply to projects undertaken by a Federal agency or that receive assistance from a Federal agency and that may irreversibly directly or indirectly convert farmland to nonagricultural use. Farmland is defined as prime farmland, unique farmland, and land of statewide or local importance and need not be in crop production to be subject to the FPPA. The FPPA does not apply to projects that were in active development or construction on August 4, 1984, (e.g., land acquisition and engineering design under contract of underway). As described in Section 1.3, planning for the construction of a roadway and the development of the North Campus began in 1983. The project was recently reviewed by NRCS and was determined to be exempt from FPPA because project inception was prior to August 4, 1984 (Wallace, 2008; Appendix C.)

Although NRCS has determined that the project is exempt from the FPPA, under Title 22 Chapter 466 of the Connecticut General Statutes, Section 22-6, the Commissioner of the Connecticut Department of Agriculture is responsible for the review of any proposed state-funded project that would result in the conversion of 25 or more acres of prime farmland to non-agricultural use. If the Commissioner finds that the proposed project promotes agriculture or the goal of agricultural land preservation or if there is no reasonable alternative site for the project then s/he shall file a statement with the Bond Commission so indicating. The extension of North Hillside Road and development of the North Campus was previously reviewed by the Department of Agriculture under the 1994 and 2001 CEPA EIEs.

The remainder of this section includes a description of the existing farmland resources and the impacts associated with the roadway construction and development of the North Campus, and a summary of the mitigation proposed by the University of Connecticut.

4.2.2 Existing Conditions

NRCS soils mapping identifies areas of prime farmland within the North Campus project area consistent with the Outlying Parcels Master Plan (JJR, 2000) (Figure 4-1). Prime farmland is defined by NRCS as land that had the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and it also available for these uses. These lands have the soil quality, growing season and moisture supply needed to produce sustained high yields of crops. NRCS also defines additional land of statewide importance which includes areas that are nearly prime farmland and that can economically produce high yields of crops. Within the area of prime farmland soils on the North Campus, approximately 43.5 acres were in agricultural production as of April 2007 (Figure 4-1). Currently, all agricultural activities are occurring on areas identified by NRCS as prime farmland soils.

The agricultural lands in the proposed project area are jointly managed by the Department of Animal Science and Department of Farm Services at UConn. Current use consists of hay production and tillable land (CANR, 2006).

It should be noted that the mapping of prime farmland soils by the USDA changed between the 1994 and 2001 EIEs and 2007. In both prior EIEs, approximately 94 acres of prime farmland soils and approximately 5 acres of farmland of additional statewide importance were identified as being within the area of the North Campus. As a result of the updated mapping, the areas of prime farmland soil on the North Campus identified in this document are different than the acreage values previously identified in the prior EIEs.

4.2.3 Potential Impacts

Direct impacts to farmland soils from the proposed North Hillside Road Extension are limited to the roadway corridor. The preferred roadway alignment under the Preferred Alternative has a total direct impact of 2.3 acres of prime farmland soils, including 0.9 acres between Parcels B and J and an additional 1.4 acres near the proposed intersection of North Hillside Road and Route 44. (Note that the DEIS did not account for direct impacts to offsite prime farmland soils along the roadway corridor. Approximately 1.5 acres of offsite prime farmland soils near the proposed intersection of North Hillside Road and Route 44 would be impacted by the roadway construction under the preferred alignment. Therefore, the total acreage of direct impacts to prime farmland soils under the Preferred Alternative is 2.3 acres, rather than 0.9 acres as reported in the DEIS.)

Indirect impacts to farmland soils are associated with the development the North Campus parcels, including portions of Parcels B, H, J, and K (29.6 acres) and the creation of a wetland mitigation area adjacent to existing wetlands located east of Parcel D (approximately 2.2 acres). (See Section 4.13 for a description of the wetland mitigation area.) Table 4-1 details the direct and indirect impacts associated with the proposed project. Impacts to prime farmland soils are depicted in Figure 4-2. Note that 14.0 acres of farmland have already been converted to non-agricultural use through the construction of the Charter Oak Residential Units.

Table 4-1. Summary of Prime Farmland Impacts

Location/Source	Acres of Prime Farmland Soil Impacted
Roadway Corridor	2.3
Parcels B, H, J, K	29.6*
Wetland Mitigation Area	2.2
Total Impact	34.1

*Excludes mapped prime farmland soil that is also wetland soil. Includes 14.0 acres of farmland in Parcels H and K converted as part of the Charter Oak Residential Units.

The 1994 EIE identified impacts to 27 acres of prime farmland soil and to 2 acres of additional farmland of statewide importance, a total of 29 acres of impact to farmland soil. The 2001 EIE identified 29 acres of prime farmland soils impacted by the development of the North Campus; 1 acre associated with roadway development and 28 acres resulting from development of the parcels. Because of the changes in NRCS mapping from 1994 to 2007, there has been an increase in the area mapped as prime farmland soil and a subsequent increase in the area that would be impacted by the development of the parcels.

Figure 4-1. Farmland Resources – Existing Conditions

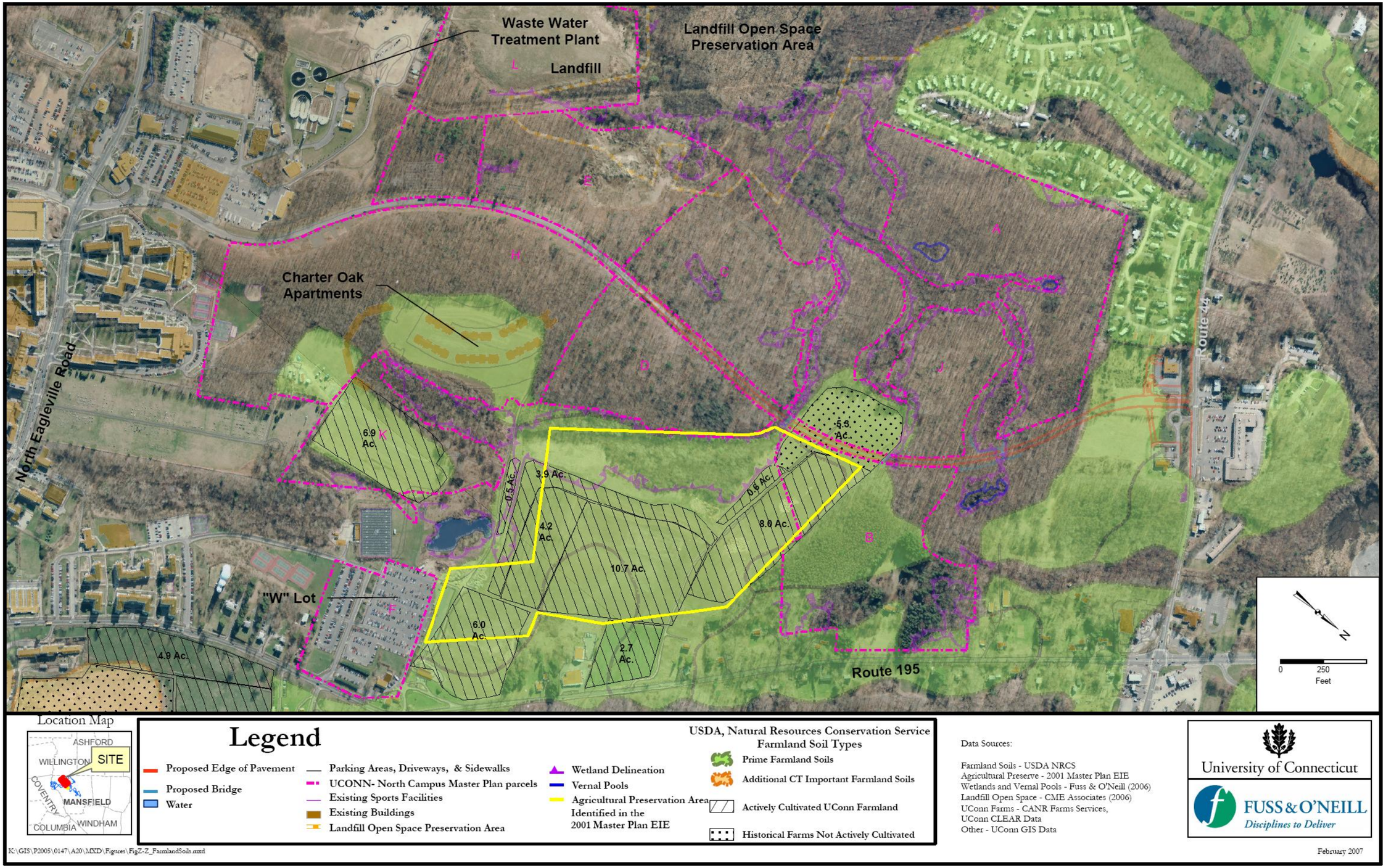
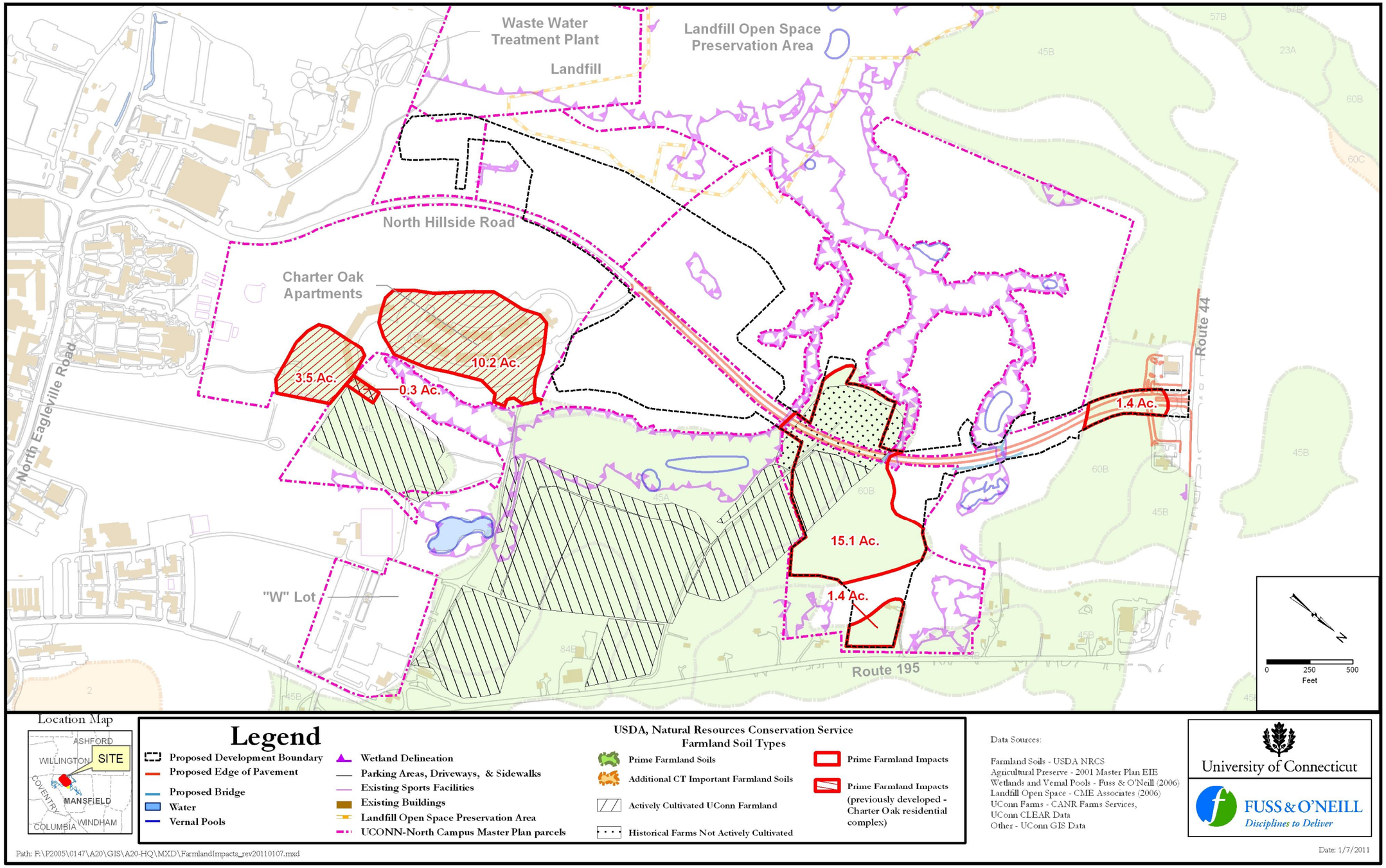


Figure 4-2. Farmland Impacts



4.2.4 Mitigation

Due to the 2.3 acres of direct impact associated with the roadway construction, the discussion of farmland mitigation in this section is primarily in the context of the overall development of the North Campus, as this has been the case since farmland mitigation was first considered in 1985.

In 1985, a land lease agreement between the State of Connecticut and University of Connecticut Educational Properties, Inc. (UCEPI) was developed which outlined preservation, replacement, easement and access issues associated with prime farmland on the North Campus. The 1994 EIE for the UCEPI project incorporated this agreement as an appendix entitled "Prime Farmland Preservation Supplement" and identified both farmland preservation and farmland replication actions to compensate for impacts associated with the development. As discussed in Section 1.3, UCEPI was unsuccessful at completing the development and was subsequently dissolved. However, a similar discussion regarding farmland was contained in the 2001 EIE for the North Campus Master Plan. Both documents identified areas of prime farmland soil on the North Campus that would be placed in preservation and an area of off-site mitigation that would provide equivalent acreage for agricultural production to mitigate for the loss of land used for hay or other crop production.

The University acknowledges its responsibility to comply with the acre-for-acre farmland mitigation terms prescribed by the Office of Policy and Management (OPM) in the 1994 EIE for *State Actions Associated with a Research and Technology Park* (pages ES-4, 3-16), and 2001 *North Campus Master Plan Environmental Impact Evaluation* (pages ES-3, 3-2). The University's Chief Operating Officer will work with the Dean of the College of Agriculture and Natural Resources (CANR) to replace a total of 34.1 acres of prime farmland, some of which has already been converted to non-agricultural use as a result of the construction of Charter Oak Residential Units and the remainder of which would be converted during the development of the North Campus, as enabled by the completion of North Hillside Road.

Farmland Preservation

Both the 1994 and 2001 EIEs identified 47 acres of on-site preservation consisting of 33 acres of field, 8 acres of wooded wetland area, and 6 acres of rear-yard agricultural easements to ensure access to preserved lands. Both documents indicated that the 8 acres of wooded prime farmland soils, classified as wetland soils, would be cleared and converted to tillable land. However, the Connecticut Department of Environmental Protection (CT DEP) discouraged this conversion in their comments on the 2001 EIE because of the presence of wetlands and the subsequent impacts associated with clearing of 8 acres of wetland area. Consequently, although the 8 acres of soil would be left undisturbed, and hence preserved, it is unlikely that acreage would be converted to tillable land. As a result the 47 acres of prime farmland identified in the 1994 and 2001 EIEs would realistically have consisted of 33 acres of field and 6 acres of rear-yard agricultural easements (39 acres of tillable land) and 8 acres of wooded wetland containing prime farmland soils, but not in agricultural production.

The preservation area proposed in the prior EIEs was revisited in light of the updated NRCS mapping, the lack of feasibility for clearing and conversion of wetland area to agricultural use, the proposed development plan for the North Campus, and coordination with CANR faculty

and staff regarding current usage and needs. Of the preservation areas previously identified, approximately 2.2 acres are now proposed for use in wetland mitigation. However, two parcels totaling 8.7 acres, which are adjacent to Route 195 and currently in cultivation but not previously identified for preservation, are now proposed to be included within the preservation area. The University proposes to preserve 41.5 acres of prime farmland for cultivation by CANR on University-owned property located on or adjacent to the North Campus, all of which is currently in agricultural use (Figure 4-3).

Farmland Replication

Replacement of acreage lost from agricultural production was identified in the 1994 EIE as 23 acres with equivalent production to offset the lost of agricultural fields on the North Campus. A 36-acre area within the former Mansfield Training School site, now called the Depot Campus, was identified as a replication site in the 1994 EIE. In 1988, staff from the NRCS (then called the Soil Conservation Service) conducted a field assessment of a 65-acre parcel in that area and determined that approximately 43 acres of land would qualify as prime farmland and could be successfully converted to prime farmland after clearing it of stones and stumps. The 2001 EIE also identified this replication site and the commitment to an acre-for-acre exchange, totaling 29 acres, was identified in the Record of Decision for the North Campus Master Plan EIE.

Some of the previously identified replication area contains wetland soils and clearing of these areas and conversion to agricultural use is likely unfeasible. Consequently, the suitability of this replication site was revisited in 2006-2007 in light of updated NRCS soils mapping, current UConn agricultural activities and anticipated needs for agricultural production expressed by CANR faculty and staff. In addition, NRCS staff conducted field review of potential replication areas in January 2008 (Appendix C) and delineated 48.1 acres suitable for conversion to Prime Farmland and 5.8 acres suitable for conversion to Statewide Important Farmland on University-owned property located near UConn's Depot Campus and Spring Manor Farm. Spring Manor Farm is an approximately 221 acre farm in the vicinity of the proposed replication site. It is currently used to support livestock through nutrient management, forage production, and pasture and contains storage facilities for corn silage (CANR, 2006). The University proposes using a portion of one or both of these parcels to achieve the acre-for-acre farmland mitigation identified in previous CEPA documents (Figure 4-4). This would allow the acre-for-acre replication identified in the 1994 and 2001 EIEs to be achieved, avoid impacts to wetland soils, and provide for more contiguous acres of farmed land. Replication would require clearing the land, removal of stumps and stones, and addition of appropriate soil amendments to support agricultural production.

Based on NRCS soils mapping, reconnaissance of the site by UConn staff, and wetland delineations performed along the southern portion of the proposed farmland replication area for the adjacent (and recently constructed) UConn compost facility, a majority of the proposed farmland replication area is believed to consist of upland soils. A certified soil scientist will perform a field reconnaissance of the proposed farmland mitigation sites at the Depot Campus prior to finalizing the farmland conversion plans to assess the presence of wetlands and watercourses. The farmland conversion plan would avoid conversion of wetlands or watercourses on the farmland replication site.

Figure 4-3. Proposed Prime Farmland Preservation Area

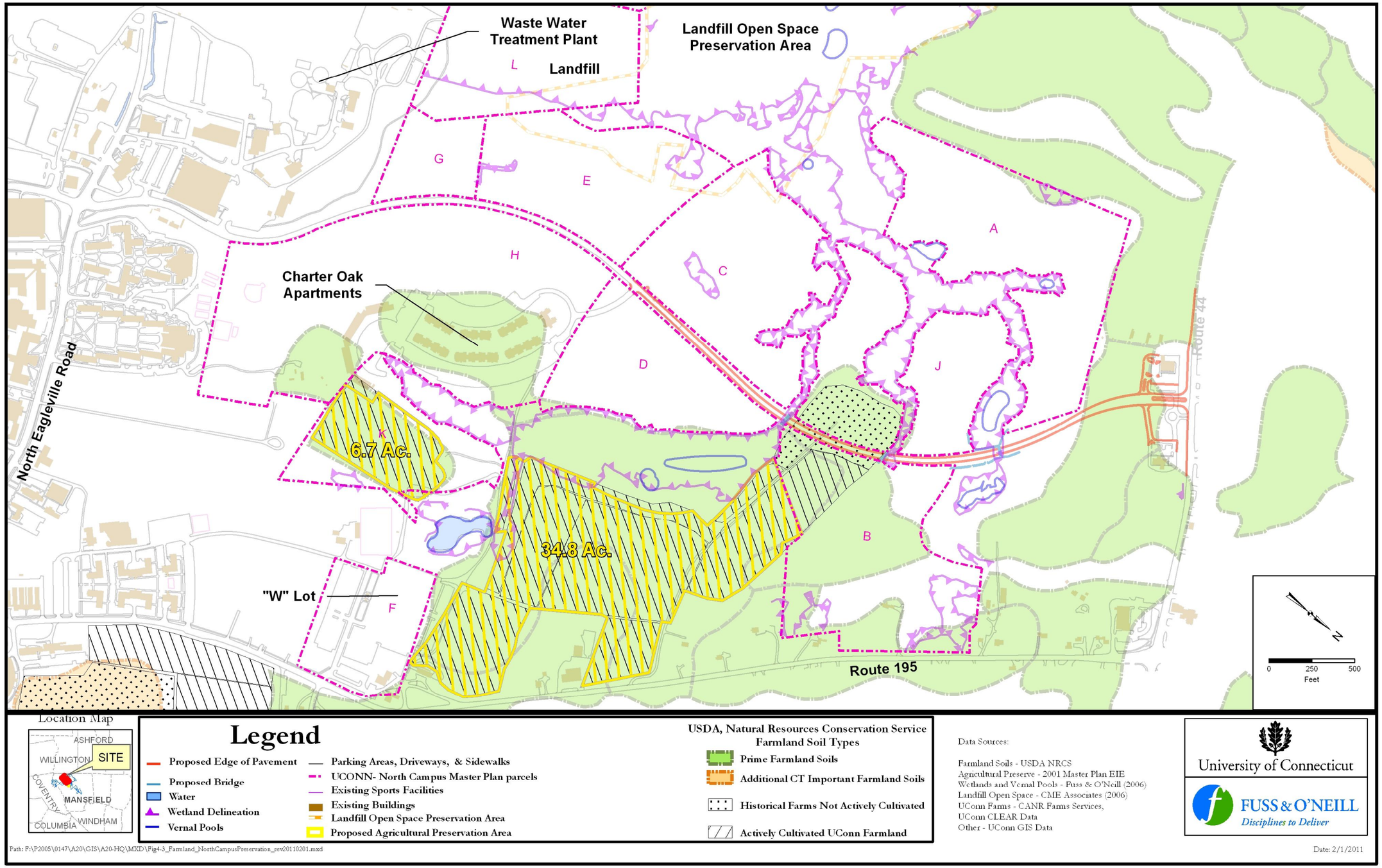
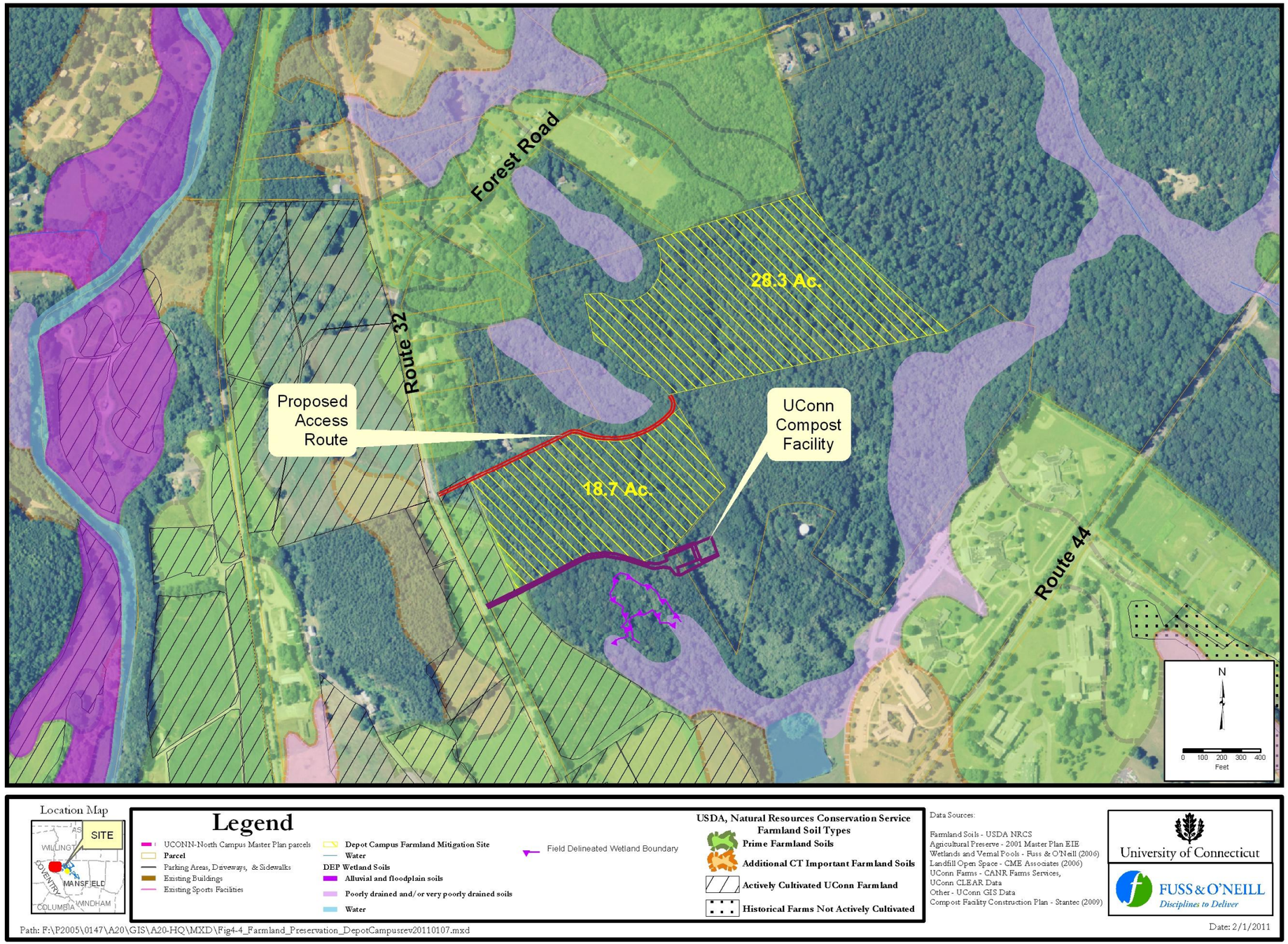


Figure 4-4. Proposed Prime Farmland Replication Area



The CT DEEP Natural Diversity Database will also be consulted regarding listed species for these areas prior to finalizing the farmland conversion plans. Management recommendations of the NDDB Program and CT DEEP Wildlife Division would be followed.

As discussed in the water resources section of this FEIS, the proposed farmland replication site is located within a Level A Aquifer Protection Area associated with the Willimantic Wellfield. Agricultural activities regulated pursuant to section 22a-354m(d) of the Connecticut General Statutes are exempt from the statutory requirements of the CT DEEP Aquifer Protection Area Program and associated land use regulatory controls. UConn will operate and maintain these agricultural fields in accordance with campus-wide agricultural best management practices.

4.3 Social Impacts

Social impacts include changes in neighborhood or community cohesion for various social groups as a result of the proposed project; changes in travel patterns and accessibility (e.g., vehicular, commuter, bicycle, or pedestrian), impacts on recreation areas, businesses, and emergency services; impacts on public safety; and impacts on social groups that are specially benefited or harmed by the proposed project.

4.3.1 Methodology

Relevant information about neighborhoods, community resources, public safety, and travel patterns and accessibility in the project area was collected from the following sources:

- The 1994 and 2001 EIEs and their Records of Decision,
- The Town of Mansfield Website (http://www.mansfieldct.org),
- The University of Connecticut Website (http://www.uconn.edu).

Potential impacts of the alternatives under consideration, including the No Action Alternative, were considered compared to these conditions to determine the potential impacts of the project relative to neighborhoods, community resources, public safety, and travel patterns and accessibility.

4.3.2 Existing Conditions

4.3.2.1 Neighborhoods

With the exception of the Charter Oak residential units, there are no existing neighborhoods within the North Campus. Neighborhoods exist on the periphery of the North Campus and include the UConn academic core campus to the south, residential development to the east and west, and an area of commercial development along Route 44 north of the North Campus. Demographics in the area surrounding the North Campus are further discussed in Section 4.5 of this document.

4.3.2.2 Community Resources

Community resources consist of schools, recreational areas, cultural and arts centers, places of worship, and businesses that are used by the community at large. The University itself provides a significant community resource to UConn students, faculty and staff, as well as residents of

the surrounding area. In addition to academic opportunities, the campus contains four libraries, three museums, several performing arts venues, several religious communities, and multiple recreational areas.

In the surrounding Town of Mansfield, there are business districts located along Route 44, north of the project site, and southeast of the campus at Storrs Center along Route 195. Several religious communities are represented in the area, and Mansfield has an active community center which hosts a variety of recreational, educational, and cultural programs. Mansfield also contains several outdoor recreational areas. There are three elementary schools and one middle school in Mansfield. The town is part of the Regional School District #19, and the regional E.O. Smith High School is located in Mansfield.

4.3.2.3 Public Safety

Police service to the Town of Mansfield includes five resident Connecticut State Police troopers and seven Town of Mansfield Police Officers. Fire protection and emergency services are provided by two local volunteer fire stations that have cooperative assistance agreements with neighboring towns, as well as the UConn fire department. Mansfield also includes an Office of Emergency Management for emergency and disaster preparedness.

The UConn Police Department consists of 51 officers in addition to support personnel. The Police Department, as well as the Fire Department is located at the UConn Public Safety Complex on North Eagleville Road, which is near the project site. The UConn Police patrol the campus 24 hours a day, 7 days a week and have the same statutory authority as a Connecticut municipal police force. The UConn Fire Department operates two fire trucks, one ladder truck, two mobile intensive care ambulances, a special hazard truck for chemical and biohazard incidents and confined space rescue. The UConn Fire Department also has mutual aid agreements with Mansfield and neighboring towns. The UConn Police and Fire Department can be accessed via approximately 175 on-campus emergency phones or via cellular phone.

Medical services that are available to UConn students, faculty, and staff include:

- *UConn Student Health Services:* Student Health Services is located on-campus and provides numerous basic health services for UConn students, including clinic, advice nurse, community response, mental health, laboratory, radiology, orthopedic, allergy, nutrition, pharmacy, and physical activity counseling services.

- *Windham Community Memorial Hospital*: This facility, located on Mansfield Avenue in Windham, has 130 available beds and handles 5,000 in-patient, 20,000 emergency, and 100,000 out-patient visits annually.

- *Natchaug Hospital*: This facility provides adult and adolescent psychiatric and substance abuse treatment services.

- *Rockville General Hospital*: UConn is located approximately 15 miles from this facility.

- *Manchester Memorial Hospital*: UConn is located approximately 18 miles from this facility, which offers emergency services, inpatient and outpatient care, and other services.

4.3.2.4 Traffic Patterns

The current roadway network in the vicinity of the UConn campus includes several principal and minor arterial roadways and local roads. The project site contains North Hillside Road to its existing terminus, and access to the existing Charter Oak residential area. The roadway network in the vicinity of the project site is described further in Section 4.6 of this document. The major roadways surrounding the project site consist of the following.

- *State Route 195 (Storrs Road)* has a posted speed limit of 30 miles per hour and is classified by the Connecticut Department of Transportation (CTDOT) as a minor arterial roadway. This roadway begins at Route 6 to the south of the site and continues north along the northeastern portion of the University of Connecticut campus to its intersection with Route 44, where it becomes the Tolland Turnpike. State Route 195 provides one travel lane in each direction with sidewalks on both sides of the roadway.

- *Hillside Road* is a campus roadway with a posted speed limit of 25 miles per hour. This roadway begins north of South Eagleville Road at Hillside circle and continues to North Eagleville Road. Due to heavy pedestrian traffic, sidewalks are provided on both sides of the roadway with multiple crosswalks along its length.

- *North Hillside Road* is a campus roadway with a posted speed limit of 25 miles per hour. This roadway begins at North Eagleville Road and extends approximately 4,000 feet to the north terminating just north of the Charter Oak Housing Drive.

- *Route 44 (Middle Turnpike)* is classified by CTDOT as a principal arterial and has a posted speed limit of 40 miles per hour in the vicinity of the campus. This roadway provides a single travel lane in each direction in the vicinity of the campus. In Connecticut, Route 44 begins in Massachusetts to the east and continues west to the state of New York. Route 44 provides access to the town of Ashford to the east and Coventry to the west.

- *Route 275 (South Eagleville Road)* has a posted speed limit of 40 miles per hour and is classified by CTDOT as a collector roadway. South Eagleville Road begins at Route 32 and continues northeast to Route 195. Land use along the road is primarily residential, including several apartment complexes.

- *Route 430 (North Eagleville Road)* has a single travel lane in each direction and a posted speed limit of 25 miles per hour. This roadway is classified by CTDOT as an urban minor arterial. North Eagleville Road begins at Route 32 and continues northeast to Route 195, where it terminates. The road serves as a main access roadway for the UConn campus, with multiple internal campus roadways and parking lot driveways intersecting it along its length.

Public transit is also available in the project area. Currently, the UConn North Campus is served by on-campus bus lines, including the Green Line, which serves the Charter Oak residential units (Parcel H), the Central Warehouse, and F Lot. Other bus routes and shuttles provide transit service to other locations on and off campus. The existing site is also pedestrian friendly. Sidewalks are included on most roads near the project site, including the southern portion of the existing North Hillside Road and North Eagleville Road. Walkways are also provided between existing buildings.

4.3.3 Potential Impacts

The No Action Alternative would result in no change to existing conditions relative to neighborhoods, community resources, public safety, or traffic patterns in the project area. Potential direct and secondary impacts associated with the North Hillside Road extension would be similar for all alternative roadway alignments and North Campus development scenarios considered and are discussed below.

4.3.3.1 Neighborhoods

The surrounding residential neighborhoods are not anticipated to be impacted by the proposed project given the location of the roadway extension intersection with existing roads and the location of the proposed North Campus development relative to the existing surrounding residential areas. Intersection of the North Hillside Road Extension with Route 44 would strengthen the commercial neighborhood in that area by placing a new University access point near the commercial properties and increasing the traffic flow through that area.

4.3.3.2 Community Resources

The roadway extension will not result in impacts on existing community resources. The North Campus Master Plan includes the construction of a student recreational center on the North Campus, which would provide an additional resource to the UConn community.

4.3.3.3 Public Safety

Although the project area is currently within the campus and therefore is served by UConn public safety personnel, the roadway extension and subsequent North Campus development will add roadway, parking, and building areas on campus. Therefore, there is the potential for increased police and/or fire service calls to buildings or parking area on the North Campus. It is also anticipated that the campus-wide network of emergency phones will be expanded into the North Campus area.

Given the type of development proposed for the North Campus, no increased need for medical services is anticipated to result.

4.3.3.4 Traffic Patterns

The roadway extension will alter traffic patterns in the area surrounding the North Campus by attracting outbound (northbound) vehicles from the campus during the peak afternoon hour, shifting vehicles from both Hunting Lodge Road and Route 195 north of North Eagleville

Road. A more detailed description of changes in traffic resulting from the roadway extension and subsequent development of the North Campus is provided in Section 4.6.

4.3.3.5 Off-Campus Housing and Services

The proposed North Campus development will provide significant new and expanded high-technology employment opportunities in Mansfield and the region. The North Campus development is anticipated to generate approximately 2,800 new jobs at full buildout over a 10 to 20 year period. Some of these new jobs are expected to be filled by the existing population residing in an approximately 30 to 40 mile radius of the Storrs campus. Others, particularly those associated with management level and high-technology positions, will likely be filled by new professionals moving into the area. Graduates of UConn and other local colleges and universities choosing to live in the region are also expected to be part of the employment pool at the North Campus facilities.

The new jobs created by the proposed action will create an increased demand for existing and new housing, which will create a gradual increased demand for housing and services in the local community and in the region. According to 2009 demographic data compiled by the University, approximately 25% of University employees at the UConn Storrs campus reside in the Town of Mansfield, and approximately 85% of University employees live within a 30 to 40 mile radius of the Storrs campus. Assuming similar percentages for the projected 2,800 employees of the North Campus development at full buildout, the project could require housing and services (educational facilities, emergency services, health care, waste management, public recreational facilities, businesses, etc.) to accommodate several hundred employees that may reside in Mansfield and the surrounding communities.

The increased demand for housing could induce the sale of some existing housing units, and the private sector would likely respond to an increased housing demand by constructing more housing, as authorized by local land use boards and commissions. Construction of new housing has the potential for secondary and cumulative impacts to wetlands, water quality, farmland, traffic, air quality, utilities, and other environmental resources.

4.3.4 Mitigation

Given the lack of anticipated adverse direct impacts, no specific mitigation is proposed relative to neighborhoods and community resources.

The UConn Police and Fire Departments have not expressed any concern about increased demand on services resulting from the proposed North Campus Master Plan development. In addition, all buildings constructed on the North Campus will meet applicable fire protection code requirements.

Specific mitigation measures associated with traffic are discussed in Section 4.6. In general, these measures are intended to maintain or increase roadway level of service (LOS), maintaining or improving traffic flow on surrounding roadways.

In terms of new housing demand induced by new employment opportunities on the North Campus, all such new housing developments would need to comply with local zoning and be subject to their own environmental reviews on a case by case basis. Mitigation measures, as necessary, for this new housing will be implemented as a condition of local project approval, as well as applicable state and federal permit requirements.

4.4 Relocation Impacts and Rights-of-Way Acquisitions

4.4.1 Methodology

The locations of existing buildings in the vicinity of the project site were reviewed relative to the alternative roadway alignments of the proposed North Hillside Road extension and subsequent North Campus development. The purpose of the review was to identify areas of overlap and potential need for relocation of residences or businesses.

4.4.2 Existing Conditions

Currently, existing structures in the vicinity of the project site are located along Routes 44 and 195. The majority of the North Campus project site consists of woodlands and fields, with the exception of the Charter Oak residential units and existing tennis courts along North Hillside Road. Two adjacent commercial buildings are located near the proposed intersection of the North Hillside Road extension and Route 44.

4.4.3 Potential Impacts

UConn expects to acquire a Right-of-Way (ROW) along areas of the existing driveway that would need to be widened for the proposed intersection of North Hillside Road and Route 44. There are no residential properties in this area and the ROW would not require, nor is UConn proposing, relocation of the two existing businesses at this intersection. UConn has requested CTDOT to act as its agent for ROW acquisition and is currently developing a Memorandum of Understanding with CTDOT to formalize this arrangement.

Changes to existing infrastructure under most of the proposed alternatives will be limited to the reconfiguration of access to the two existing bank buildings. One of the alternative roadway alignments considered in the previous EIEs (Option A-2) would result in the intersection of North Hillside Road and Route 195 instead of Route 44 and could require the demolition of existing buildings on Parcel B. These buildings are outside the development envelope under the preferred North Campus development scenario. Relocation of some agricultural activities on the North Campus will be required under all of the build alternatives considered. This issue is discussed in detail in Section 4.2. The No Action Alternative does not include relocation of residences, businesses, or existing agricultural operations.

4.4.4 Mitigation

If needed, UConn will determine the extent of mitigation required, if any, at a later point in the roadway design process. The University will take into account existing land use and underlying zoning during the ROW acquisition process in order to avoid or minimize effects on parking and ensure consistency with local zoning.

4.5 Economic Impacts

4.5.1 Methodology

The 1994 and 2001 EIEs did not contain sections focused on the assessment of economic impacts. The 2001 EIE for the North Campus Master Plan did contain a brief general discussion of local employment, estimated construction costs, and potential tax revenues. In 2007, UConn contracted George Henry George Partners and Dilks Consulting to prepare a feasibility analysis on the development of a research technology park housing commercial and related academic ventures in Storrs, Connecticut (George Henry George Partners, May 2008). This study assessed the current and future demand for research including technical needs in Connecticut and nationally relative to UConn capabilities, evaluated the financial viability of developing and sustaining a research park in Storrs, identified possible models to finance such a venture, and identified suitable organizational and management models for a research park. However, much of the discussion in the 2001 EIE remains valid since it is general in nature and, as of the preparation of this FEIS, specific projects have not been identified for development on the North Campus parcels. This FEIS summarizes and updates the information contained in the 2001 EIE and the results of the 2008 feasibility analysis.

4.5.1 Existing Conditions

Employment and Income

May 2010 data from the Connecticut Department of Labor lists the Mansfield, Hartford Labor Market Area (LMA) and statewide unemployment rates at 7.3%, 8.9% and 8.8% (CT DOL, 2010. The Mansfield labor force as of May 2010 is 13,209. The 2005 business profile in the Mansfield CERC Town Profile lists 53.4% of the employment in the services sector and 17.3% in the trade sector. All other sectors are less than 10%.

The most recent Mansfield CERC Town Profile lists the following as the top five major employers: University of Connecticut, Mansfield Public Schools, Regional School District #19, Bergin Correctional Institute, Natchaug Hospital, Inc.(CERC, 2010). The influence of the University of Connecticut on the employment profile in Mansfield is illustrated by 2009 data on Mansfield employment by NAICS code sector. It lists the greatest number of jobs in state government (7,144 out of 11,092 for all sectors, with an average annual wage of $59,287), followed by heath care and social assistance (1082 out of 11,092) with an average annual wage of $39,779 and accommodation and food services (1,048 out of 11,092 for all sectors, with an average annual wage of $18,645). Based on the 2009 data, the average annual wage for all sectors was $49,867, and the top wage earning sectors in Mansfield are wholesale trade with an average annual wage of $90,023 and professional, scientific and technical services with an average annual wage of $72,374, and state government with an average annual wage of $61,965. Construction and federal government were sectors with average annual wages less than $50,000 but above the average for all sectors in Mansfield.

Per capital and average household income and for Mansfield, Tolland County and Connecticut is listed in Table 4-2.

Table 4-2. 2000 Per Capita and Average Household Income (CTDOL, 2007)

Area	Per Capita Income	Average Household Income
Mansfield	$19,165	$66,702
Tolland County	$25,422	$69,396
Connecticut	$31,816	$82,601

Taxation

State land and property used for state purposes is exempt from local taxation. However, this property is still subject to valuation assessment and the local community may apply for payment in lieu of taxes local property taxes (PILOT). The PILOT grant program, administered by the Connecticut Office of Policy and Management, provides a payment equal to a percentage of the amount of taxes that would be paid if the property were not exempt from taxation. The payment percentage for University of Connecticut property is 45%. Property used for highway purposes is not eligible for the program. The existing state-owned land on the North Campus is eligible for the PILOT program.

4.5.2 Potential Impacts

Employment and Income

The construction of the North Hillside Road Extension will result in direct short-term economic benefits from construction-related employment and expenditures, as well as indirect long-term economic benefits resulting from the build-out of the North Campus. Development of the North Campus is anticipated to consist of approximately 966,000 square feet of building (new construction) floor area. Of that, the majority (841,000 square feet) is research and technology space with the remaining 125,000 square feet allotted to recreational and special academic facilities.

The potential economic benefits to employment identified in the 2001 EIE for the North Campus Master Plan are still valid. Specifically, the following benefits to employment and income are anticipated:

- New Employment Opportunities: The facilities constructed on the North Campus will result in new opportunities for employment. The University of Connecticut is already one of the major employers in Mansfield and the North Campus development is anticipated to not only generate new jobs in the area but also jobs that fall in the NAICS sector of professional, scientific and technical services, which has the highest average annual wage of all NAICS sectors represented in Mansfield. The North Campus development is anticipated to attract such employers by providing state-of-the-art facilities, close proximity to a leading research and development university and access to a highly educated work force. The 2001 EIE estimated that each 300 square feet of research/technology space would result in 1 employee. Using the same formula, the 841,000 square feet of research/technology space would potentially result in

approximately 2,800 jobs. Additional jobs are also likely to be generated from the recreational and special academic facilities to be located on the North Campus.

- Benefits to the University: The construction of research and technology facilities on the North Campus is anticipated to benefit the amount and quality of research performed at the University, which is turn is expected to increase research grant funding, and help to attract and retain high quality faculty, staff and graduate students. Given the role of UConn in the local economy and its contribution to the state, strengthening the University's position as a research and technology center will result in benefits on both the local and regional level.

Under the No Action Alternative, the potential direct and indirect economic benefits to employment and income described above would not occur. UConn would also not receive the benefits that a North Campus research and technology park would provide relative to strengthening the University's position as a leading research and technology center.

Taxation

The 2001 EIE noted that the town of Mansfield will benefit from either direct payment of taxes on privately-owned and/or operated facilities on the North Campus or facilities owned and operated by the state-owned property will be eligible for the PILOT program, which could provide payment of up to 45% of the assessed value of state-owned property. The actual taxation will vary based on the mix of public and privately owned development. However, the assessed value of development on the North Campus will be higher than the assessed value of the undeveloped North Campus land.

Under the No Action Alternative, the Town of Mansfield would not receive potential increased tax revenues associated with North Campus development from either public or private sources.

4.5.3 Mitigation

Given that the proposed project is anticipated to result in direct and indirect economic developments with a positive economic impact, no mitigation measures are currently proposed.

4.6 Traffic

4.6.1 Methodology

An analysis of the existing traffic conditions as well as the traffic conditions under the future No Build and Build conditions was prepared in order to document the potential impacts of the North Hillside Road extension and North Campus development on the safety and efficiency of traffic operations in the vicinity of the UConn Campus.

Traffic conditions were previously analyzed for the North Campus development as part of EIEs prepared in 1994 and 2001. An update to the background conditions for the 2010 build year was prepared in December 2006 (Fuss & O'Neill, 2006) as a CEPA Comparative Evaluation to compare the traffic impacts of the proposed project against those originally identified in the 2001 EIE. To further evaluate potential traffic impacts of the proposed project

under NEPA, an updated traffic analysis was performed for the proposed 2030 build year (i.e., using a standard FHWA 20-year planning window) based on the latest development program for the North Campus, described in Section 3 of this document. The updated 2007 traffic analysis evaluates traffic conditions with the extension of North Hillside Road to a signalized intersection with U.S. Route 44, which was identified in the STC application for the UCONN 2000 Campus Master Plan as a measure to mitigate traffic impacts from UCONN 2000 development and eliminate the need for additional capacity improvements.

Traffic counts were taken at key intersections and roadways within the study area (Figure 4-5). Those volumes were projected to future 2010 and 2030 volumes without the development (No Build), with the road only, and with the full build-out of the North Campus. The traffic conditions were then analyzed to determine the efficiency of the roadways and intersections within the study area using the methods described in the subsections below. Mitigation options were identified for locations where traffic delays exceed desirable levels in order to allow the roadways and intersections to continue to operate efficiently.

4.6.1.1 Traffic Volumes, Speeds and Counts

In order to determine the existing traffic conditions, representatives of Fuss & O'Neill, Inc. conducted AM and PM peak period manual turning movement counts in November and December, 2006, at the thirteen intersections in the study area. The traffic count data collected indicates that the AM peak hour of traffic is 8:00 to 9:00 AM, while the PM peak hour is 4:30 to 5:30 PM. These peak hours were subsequently analyzed for comparison purposes. The existing traffic volumes for these peak hours are shown in Figures 1 and 2 of Appendix D.

Automatic traffic recorders were also placed on each of the major roadways within the study area network in order to determine 24 hour traffic volumes. Copies of the ATR traffic data have been included in Appendix D of this report.

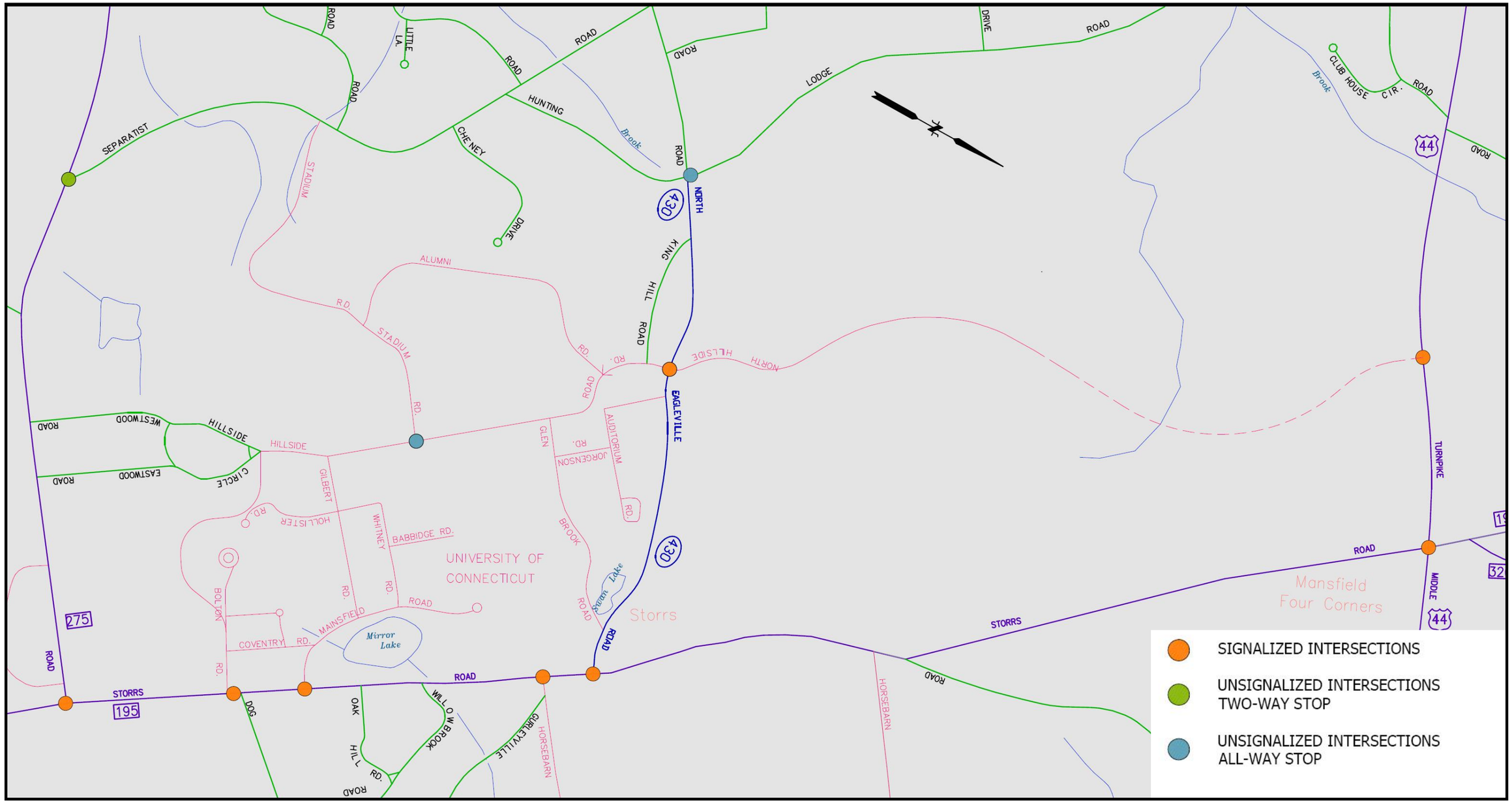
4.6.1.2 No Build Traffic Volumes

The State Traffic Commission (STC) as well as the planning departments from the Towns of Mansfield and Tolland were contacted in order to identify any pending developments in the region which could impact traffic volumes within the study area. Three developments were identified:

- The Mansfield Downtown Partnership plans to develop Storrs Center into a mixed use, pedestrian friendly development that will include retail, office, and residential land uses. The development will be located on the west side of Route 195, between South Eagleville Road and Dog Lane.
- A new apartment complex on Hunting Lodge Road is currently under design.
- An addition to the existing Celeron Square apartments, also on Hunting Lodge Road, is currently under design.

As of January 2008, no applications had been submitted to either the Town of Mansfield or the STC for these developments.

Figure 4-5. Study Area Roadways and Intersections



This information was provided to the Connecticut Department of Transportation (CTDOT) Bureau of Planning along with the existing 2006 traffic volumes. The 2006 existing traffic volumes were entered into the CTDOT Regional Traffic Model, to project 2010 and 2030 No Build volumes within the study area. These volumes were then provided to Fuss & O'Neill by CTDOT. The projected 2010 No Build traffic volumes are shown in Figures 3 and 4 of Appendix D, while the 2030 No Build traffic volumes are shown in Figures 7 and 8 of Appendix D.

4.6.1.3 Build Traffic Volumes

Prior to any of the proposed development, North Hillside Road will be extended as part of the required STC mitigation for the UCONN 2000 campus expansion program. The road currently begins at North Eagleville Road at a signalized intersection, and opposes Hillside Road to the south. The road terminates at the Charter Oak Apartments on the north side of campus. North Hillside Road will be extended north to US Route 44, where a new signalized intersection will be provided. This new connection will result in some redistributed trips to and from campus, which are accounted for in the Build – Road Only conditions. The volumes for the 2010 Build – Road Only condition are shown in Figures 5 and 6 of Appendix D, while the 2030 Build – Road Only volumes are shown in Figures 9 and 10 of Appendix D.

Several different roadway alignments were considered as part of the 2001 EIE. While the current traffic analysis considers the Preferred Alternative, it is not expected that the results would be different for any of the other roadway alignments, as the alignment would not affect the distribution of traffic through the study area roadway network.

Access to the North Campus will be provided via the North Hillside Road Extension. The new North Campus development sites will be constructed along the roadway, with driveways and parking as necessary. Note that alternative North Campus development scenarios are not explicitly considered in this traffic analysis, but have been addressed in the prior EIEs. For the purposes of this analysis the volumes generated are based on building type and square footage. Specifically, trips for the North Campus development program were generated using the Institute of Transportation Engineers (ITE) publication *Trip Generation*, 7th edition, 2003. This publication is an industry-accepted resource for determining trip generation.

For the purposes of this analysis, the new trips were distributed through the network using a fixed distribution from the CTDOT regional model. The site generated traffic volumes are shown in Figures 11 and 12 of Appendix D. Those volumes were then added to the 2030 Build – Road Only traffic volumes in order to obtain the 2030 Build traffic volumes, as shown in Figures 13 and 14 of Appendix D.

4.6.1.4 Intersection Capacity Analyses

Capacity analyses for both signalized and unsignalized intersections were conducted using Synchro Professional Software, version 7.0.

In discussing intersection capacity analyses results, Level of Service (LOS) is typically used to describe the operating condition of the intersection. LOS is a measure of the delay experienced by stopped vehicles at an intersection. LOS is rated on a scale from A to F, with A describing a

condition of very low delay (less than 10 seconds per vehicle), and F describing a condition where delays will exceed 50 seconds per vehicle for unsignalized intersections and 80 seconds per vehicle for signalized intersections. Delay is described as a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Therefore, intersections with longer delay times are less acceptable to most drivers.

This definition for LOS, as well as the methodology for conducting signalized and unsignalized intersection capacity analyses, is taken from the *2000 Highway Capacity Manual* published by the Transportation Research Board.

In discussing two-way stop controlled intersection capacity analyses, the term "level of service" (LOS) is used to provide a description of the delay and operational characteristics of the turns from the minor street (stop sign controlled) to the major street, and turns from the major street to the minor street. Through vehicles are not delayed by the minor street and do not experience delay, therefore they are not rated with a level of service. For all-way stop controlled intersections, LOS describes the average delay experienced by all vehicles entering the intersection. CTDOT typically considers LOS D to be the minimum acceptable LOS for both signalized and unsignalized intersections.

Using the above referenced methodologies, AM and PM peak hour capacity analyses were conducted at the following signalized intersections:

- US Route 44 proposed North Hillside Road intersection,
- US Route 44 at Route 195,
- Route 195 at Moulton Road/Tower Loop Road,
- Route 195 at North Eagleville Road,
- Route 195 at Gurleyville Road,
- Route 195 at Mansfield Road,
- Route 195 at Dog Lane/Bolton Road,
- Route 195 at South Eagleville Road,
- North Eagleville Road at Hillside Road/North Hillside Road.

AM and PM peak hour capacity analyses were also conducted at the following unsignalized intersections:

- US Route 44 at Bank/Professional Park Drives,
- North Eagleville Road at Hunting Lodge Road,
- Hillside Road at Stadium Road,
- South Eagleville Road at Separatist Road/Sycamore Drive.

Tables 4-3 through 4-5 present a LOS summary at the unsignalized and signalized intersections for the following conditions:

- 2006 Existing Conditions,
- 2010 No Build Conditions,
- 2010 Build Conditions – Road Only,
- 2030 No Build Conditions,
- 2030 Build Conditions – Road Only,

- 2030 Full Build Conditions.

Table 4-3. Signalized Intersection Level of Service Summary – AM Peak Hour

Signalized Intersections*	2006 Existing	2010 No Build	2010 Build Road Only	2030 No Build	2030 Build Road Only	2030 Full Build
Route 44 at North Hillside Road	-	-	A	-	A	B
Route 44 at Route 195	C	C	C	F	F(D)	F
With Mitigation						D
Route 195 at Moulton Road	A	A	A	B	A	A
Route 195 at North Eagleville Road	C	D	D	E	E	F(E)*
With Mitigation						D
Route 195 at Gurleyville Road	B	C	C	C	C	E(D)
With Mitigation						D
Route 195 at Mansfield Road	B	B	B	B	B	C
Route 195 at Dog Lane	B	B	B	B	B	D(B)
Route 195 at Bolton Road	B	B	B	E	E	F(C)
Route 195 at South Eagleville Road	C	C	C	C	C	D
North Eagleville Road at Hillside Road	C	C	F(C)	C	F(D)	F
With Mitigation						D

* LOS (LOS) indicates level of service without timing optimization (with timing optimization)

Table 4-4. Signalized Intersection Level of Service Summary – PM Peak Hour

Signalized Intersections*	2006 Existing	2010 No Build	2010 Build Road Only	2030 No Build	2030 Build Road Only	2030 Full Build
Route 44 at North Hillside Road	-	-	B	-	B	D
Route 44 at Route 195	C	D	D	E	E(D)	F
With Mitigation						D
Route 195 at Moulton Road	A	B	A	C	B	B
Route 195 at North Eagleville Road	E	F	D	F	F	F
With Mitigation						D
Route 195 at Gurleyville Road	F	F	F	F	F	F
With Mitigation						D
Route 195 at Mansfield Road	C	D	D	E	E	F(D)
Route 195 at Dog Lane	D	D	D	F	F	F(D)
Route 195 at Bolton Road	C	B	B	C	C	D(B)
Route 195 at South Eagleville Road	B	B	B	C	C	C
North Eagleville Road at Hillside Road	C	C	C	C	C	D
With Mitigation						D

* LOS (LOS) indicates level of service without timing optimization (with timing optimization

Table 4-5. Two-Way Stop Controlled Intersection Level of Service Summary – AM Peak Hour

Two-Way Stop Controlled Intersections	2006 Existing	2010 No Build	2010 Build Road Only	2030 No Build	2030 Build Road Only	2030 Full Build
Route 44 at North Hillside Road						
Bank Drives Northbound	B	B	-	B	-	-
Professional Park Drive Southbound	B	B	-	C	-	-
Route 44 Eastbound Left Turn	A	A	-	A	-	-
Route 44 Westbound Left Turn	A	A	-	A	-	-
South Eagleville Road at Separatist Road						
Sycamore Drive Northbound	B	B	B	B	B	B
Separatist Road Southbound	C	C	C	D	D	D
South Eagleville Road Eastbound Left Turn	A	A	A	A	A	A
South Eagleville Road Westbound Left Turn	A	A	A	A	A	A

4.6.2 Existing Conditions

4.6.2.1 Adjacent Roadway Network

The adjacent roadway network includes the following roads:

- Route 195 (Storrs Road),
- Hillside Road/North Hillside Road,
- US Route 44 (Middle Turnpike),
- Route 275 (South Eagleville Road),
- Route 430 (North Eagleville Road),
- Moulton Road,
- Gurleyville Road,
- Dog Lane,
- Mansfield Road,
- Stadium Road,
- Separatist Road,
- Hunting Lodge Road.

Route 195 (Storrs Road) has a posted speed limit of 30 miles per hour and is classified by CTDOT as a minor arterial roadway. This roadway begins at Route 6 to the south of the site and continues north along the northeastern portion of the University of Connecticut campus to its intersection with US Route 44, where it becomes the Tolland Turnpike. Route 195 provides one travel lane in each direction with sidewalks on both sides of the roadway. The 2005 ADT on Route 195 is 12,400 vehicles per day south of US Route 44.

US Route 44 (Middle Turnpike) is classified by CTDOT as a principal arterial and has a posted speed limit of 40 miles per hour in the vicinity of the campus. This roadway provides a single travel lane in each direction in the vicinity of the campus. US Route 44 begins in Massachusetts in the east and continues west to the state of New York. US Route 44 provides access to the town of Ashford to the east and Coventry to the west. The 2005 ADT on US Route 44 is 9,200 vehicles per day west of Route 195.

Route 275 (South Eagleville Road) has a posted speed limit of 40 miles per hour and is classified by CTDOT as a collector roadway. South Eagleville Road begins at Route 32 and continues northeast to Route 195. Land use along the road is primarily residential, including several apartment complexes. The 2005 ADT on South Eagleville Road is 5,300 vehicles per day west of Route 195.

Route 430 (North Eagleville Road) has a single travel lane in each direction and a posted speed limit of 25 miles per hour. This roadway is classified by CTDOT as an urban minor arterial. North Eagleville Road begins at Route 32 and continues northeast to Route 195, where it terminates. The road serves as a main access roadway for the UConn campus, with multiple internal campus roadways and parking lot driveways intersecting it along its length. The 2005 ADT on North Eagleville Road is 13,100 vehicles per day west of Route 195.

Hillside Road is a campus roadway with a posted speed limit of 25 miles per hour. This roadway begins north of South Eagleville Road at Hillside circle and continues to North Eagleville Road. Due to heavy pedestrian traffic, sidewalks are provided on both sides of the roadway with multiple crosswalks along its length. Fuss & O'Neill counts indicate that the daily traffic volume on Hillside Road is 6,600 vehicles per day.

North Hillside Road is a campus roadway with a posted speed limit of 25 miles per hour. This roadway begins at North Eagleville Road and extends approximately 4,000 feet to the north terminating just north of the Charter Oak Housing Drive. Fuss & O'Neill counts indicate that the daily traffic volume on North Hillside Road is 5,800 vehicles per day.

Moulton Road is classified by CTDOT as a local road. It has a single travel lane in each direction and has a north-south orientation, beginning at Route 195 and continuing northeast to US Route 44. The majority of the land along Moulton Road is undeveloped. Fuss & O'Neill counts indicate that the daily traffic volume on the road is 1,200 vehicles per day.
Gurleyville Road is classified by CTDOT as a local road, providing a single travel lane in each direction. Gurleyville Road begins at Route 195 and continues approximately 3 miles east, where it terminates at Woodland Road. Land use along Gurleyville Road is primarily residential.

Dog Lane is classified by CTDOT as a local road and has a posted speed limit of 25 miles per hour. Land use along Dog Lane is commercial in the immediate vicinity of 195. Further east, land use along the road is residential. Dog Lane terminates in a dead end approximately one mile east of Route 195, just east of Bundy Lane.

Mansfield Road has a posted speed limit of 25 miles per hour and is classified by CTDOT as a state institution road as it is located on the University of Connecticut campus. Mansfield Road provides access to the internal campus roadways and parking lots.

Stadium Road begins at Separatist Road on the western side of campus and continues east to Hillside Road in the center of campus, where it terminates. It has a posted speed limit of 25 miles per hour and is classified by CTDOT as a state institution road. Fuss & O'Neill counts indicate that the daily traffic volume on Stadium Road is 4,700 vehicles per day.

Separatist Road is classified by CTDOT as a collector and has a posted speed limit of 30 miles per hour. It has a single travel lane in each direction and serves as a connection between North Eagleville Road and South Eagleville Road. Land use along Separatist Road is residential. Fuss & O'Neill counts indicate that the daily traffic volume on the road is 2,700 vehicles per day.

Hunting Lodge Road is classified by CTDOT as a local road and has a posted speed limit of 30 miles per hour. This roadway provides a single lane in each direction and serves as a connection from Separatist Road in the south to Birch Road in the north. Land use along Hunting Lodge Road is residential, including several apartment complexes.

4.6.2.2 Study Area Intersections

The adjacent roadway network includes the following intersections:

- US Route 44 at Bank/Professional Park Drive (proposed North Hillside Road intersection),
- US Route 44 at Route 195,
- Route 195 at Moulton Road/Tower Loop Road,
- Route 195 at North Eagleville Road,
- Route 195 at Gurleyville Road,
- Route 195 at Mansfield Road,
- Route 195 at Dog Lane/Bolton Road,
- Route 195 at South Eagleville Road,
- North Eagleville Road at Hillside Road/North Hillside Road,
- North Eagleville Road at Hunting Lodge Road,
- Hillside Road at Stadium Road,
- South Eagleville Road at Separatist Road/Sycamore Drive.

North Hillside Road will be extended from its current terminus north of North Eagleville Road to US Route 44. A new four-way intersection will be constructed at the intersection of North Hillside Road at US Route 44, at the current location of the bank driveway intersection, opposite the Professional Park driveway. As part of the mitigation proposed in the 2001 EIE,

this intersection will be signalized and will provide two lanes on the northbound approach. US Route 44 will be widened in order to provide exclusive left and right turn storage lanes in the westbound and eastbound directions, respectively.

At the signalized intersection of Route 195 at US Route 44, the northbound and southbound Route 195 approaches each have an exclusive left turn lane, a through lane, and a through/right turn lane. An exclusive left turn lane and a shared through/right turn lane are provided at the eastbound and westbound US Route 44 approaches. Protected left turn phasing is provided on the Route 195 approaches, while protected plus permitted left turn phasing is provided on the US Route 44 approaches. An exclusive pedestrian phase is also provided.

Route 195 at Moulton Road/Tower Loop Road is a signalized intersection and provides a single approach lane from each direction. The eastbound Tower Loop Road approach is one-way, providing egress from UConn parking lot "W." Just north of this intersection is a one-way entry drive that provides access to Tower Loop Road from Storrs Road.

The signalized intersections of Route 195 at Gurleyville Road and Route 195 at North Eagleville Road both form "T" intersections, and operate on a single controller due to their proximity to each other. There is approximately 250 feet of vehicle storage between the two intersections. The eastbound North Eagleville Road approach and the westbound Gurleyville Road approach each provide a left turn lane and a right turn lane. Exclusive left turn lanes are provided on Route 195 at each of the intersections. The northbound left turn lane at North Eagleville Road extends beyond the intersection with Gurleyville Road, where it is marked as a through lane. A southbound right turn lane is also provided on Route 195 at North Eagleville Road. This intersection has an exclusive pedestrian phase due to heavy pedestrian traffic from the University.

At the signalized intersection of Route 195 (Storrs Road) at Mansfield Road, the eastbound and westbound approaches at Mansfield Road and Bishop Circle each provide a single lane. The northbound and southbound Storrs Road approaches each provide one through lane and an exclusive left turn lane. An exclusive pedestrian phase is provided at this location due to the high volume of pedestrian traffic crossing Route 195. The University is improving the intersection of Route 195 and Mansfield Road. The road improvement consists of aligning Mansfield Road with Bishop Circle at the entrance to the Bishop Hall parking area.

The intersections of Route 195 (Storrs Road) with Dog Lane and Bolton Road are offset "T" intersections, and are controlled by a single signal controller, as they are located less than 100 feet apart. Approximately 30 feet of storage is provided on Route 195 between the two intersections. Left turn lanes are provided on the Route 195 approaches to both intersections. The Dog Lane approach provides a single lane, while the Bolton Road approach provides both a left and right turn lane. The signal provides separate phases for the Bolton Road and Dog Lane approaches, including clearance phases on Route 195, enabling vehicles to safely clear the intersection. The signal also provides an exclusive pedestrian phase.

The signalized intersection of Route 195 at South Eagleville Road has four approaches. The southbound approach at Storrs Road has a left turn lane, a through lane, and a shared through/right turn lane. On the northbound approach at Storrs Road, one left turn lane and one through/right turn lane are provided. A left turn lane and a through/right turn lane are

provided at the Eastbound South Eagleville Road approach, and the Post Office Drive has a single approach lane. Signal phasing at this intersection includes dual left overlap phasing on Storrs Road, a South Eagleville/Post Office phase and an exclusive pedestrian phase.

The intersection of North Eagleville Road at Hillside Road is signalized. The southbound North Hillside Road approach and the northbound Hillside Road approach each provide an exclusive left turn lane and a shared through/right turn lane. A left turn lane, a through lane and a right turn lane are provided at the eastbound North Eagleville Road approach, while the westbound approach has an exclusive left turn lane and a shared through/right turn lane. Left turn advance phases are provided on all approaches with the exception of the eastbound approach. An exclusive pedestrian phase is also provided.

Hunting Lodge Road at Route 430 (North Eagleville Road) is an unsignalized intersection with stop control at all four approaches. The northbound and southbound Hunting Lodge Road approaches and the eastbound North Eagleville Road approach have a single approach lane, while the westbound North Eagleville Road approach has a right turn lane and a shared through/left turn lane. The eastbound North Eagleville Road approach at this location is wide enough to accommodate a second lane.

The all-way stop-controlled intersection of Hillside Road at Stadium Road provides a single lane on each of the four approaches. Hillside Road forms the northbound and southbound approaches, Stadium Road forms the eastbound approach, and a UConn parking lot driveway forms the westbound approach.

The intersection of South Eagleville Road at Separatist Road and Sycamore Drive provides two-way stop control. The northbound Sycamore Drive and southbound Separatist Road approaches are controlled by stop signs, and each provide a single approach lane to South Eagleville Road. South Eagleville Road provides a single travel lane in each direction at this location.

4.6.2.3 Analysis

Each of the signalized intersections operates at LOS D or better under the existing condition with two exceptions. During the PM peak hour, the intersection of North Eagleville Road at Route 195 operates at LOS E, while the intersection of Gurleyville Road with Route 195 operates at LOS F. The delay is primarily due to high pedestrian volumes crossing Route 195, along with high left turning volumes on the eastbound North Eagleville Road approach.

Each of the unsignalized intersections operates acceptably under the existing conditions.

4.6.3 Potential Impacts

Consistent with the analysis of existing conditions, the analysis of impacts focuses on the LOS at the intersections of interest in the study area under the various build conditions described above. These results are discussed below.

4.6.3.1 2010 No Build Conditions

Under the 2010 No Build Conditions, the intersection of Route 195 at North Eagleville Road is expected to decrease to LOS F during the PM peak hour, while the intersection of Route 195 at Gurleyville Road will continue to operate at LOS F. The remaining signalized intersections will continue to operate at LOS D or better.

The southbound stop controlled approach of Separatist Road at South Eagleville Road is expected to operate at LOS F, compared to LOS D in the 2006 Existing Condition during the PM peak hour. The delay at this location is primarily due to the lack in gaps in the through volumes on South Eagleville Road.

4.6.3.2 2010 Build Conditions – Road Only

The construction of the North Hillside Road Extension is not expected to negatively impact LOS at any of the intersections within the study area network, with one exception. The intersection of North Eagleville Road with Hillside Road is expected to decrease to operate at LOS F, compared to LOS C in the No Build condition. However operations may be restored to LOS C via signal timing optimizations.

The new roadway will provide an additional access point to the campus, and will therefore improve operations at two intersections within the study area. The intersection of Route 195 at North Eagleville Road will operate at LOS D during the PM peak hour, compared to LOS F under the 2010 No Build conditions. The all-way stop controlled intersection of North Eagleville Road at Hunting Lodge Road will also improve from LOS E to LOS C during the AM peak hour as a result of the new roadway connection.

The proposed signalized intersection of US Route 44 and North Hillside Road is expected to operate at LOS B or better during both peak hours.

4.6.3.3 2030 No Build Conditions

The intersection of Route 195 at U.S. Route 44 is expected to decrease to LOS F during the AM peak hour and LOS E during the PM peak hour. The intersections of Route 195 at Mansfield Road and Route 195 at Bolton Road will decrease to LOS E during the PM peak hour, while Route 195 at Dog Lane will decrease to LOS F.

The all-way stop controlled intersection of North Eagleville Road at Hunting Lodge Road will decrease to LOS F during the AM peak hour. The majority of the delay will be limited to the southbound approach, which will operate at LOS F. The other three approaches to the intersection are expected to operate at LOS D or better.

4.6.3.4 2030 Build Conditions – Road Only

The construction of the North Hillside Road Extension in 2030 will only negatively impact the intersection of North Eagleville Road at Hillside Road, which will decrease from LOS C to LOS F during the PM peak hour. LOS D operations may be restored at this intersection by optimizing the signal timing.

As previously discussed, the construction in the road will result in decreased delay at some intersections within the study area. The unsignalized intersection of North Eagleville Road at Hunting Lodge is also expected to improve from LOS F to LOS E. With signal timing optimizations, the intersection of U.S. Route 44 at Route 195 will operate at LOS D during both peak hours, compared to LOS F and LOS E during the 2030 No Build AM and PM peak hours, respectively.

The proposed signalized intersection of US Route 44 and North Hillside Road is expected to operate efficiently at LOS B or better during both peak hours.

4.6.3.5 2030 Full Build Conditions

The intersections of Route 195 with Mansfield Road, Dog Lane, and Bolton Road are each expected to operate at LOS E or F under the Full Build Conditions. Each of the intersections will operate at LOS D or better during both peak hours with modifications to the timing splits.

The intersection of Route 195 at US Route 44 is expected to operate at LOS F during both peak hours under the 2030 Build Condition. In order to improve operations during both peak hours, geometric improvements to the roadways will be required. Route 195 will need to be widened for an exclusive right turn lane on the southbound approach, with a channelized right turn movement at the intersection. US Route 44 would also require widening on the eastbound approach, in order to provide a second left turn lane. This will also require a revision to the signal phasing to provide protected left turn only phasing on the eastbound and westbound approaches. These improvements will allow the intersection to operate at LOS D during both peak hours.

The intersection of Route 195 at North Eagleville Road is expected to decrease to LOS E from LOS D under the 2030 Full Build Condition during the AM peak hour. The intersection will continue to operate at LOS F during the PM peak hour, as will the intersection of Gurleyville Road at Route 195. In order to restore LOS D operations at this intersection, North Eagleville Road should be widened to provide a second eastbound left turn lane at the intersection. This improvement along with signal timing optimization will allow both intersections to operate at LOS D during both peak hours.

The intersection of North Eagleville Road at Hillside Road is expected to operate at LOS F during the AM peak hour under the Build Condition. In order to restore LOS D operations, North Eagleville Road will require widening in order to provide a westbound exclusive right turn lane. Additionally, the signal phasing should be modified in order to provide an eastbound left turn phase and a westbound right turn phase overlapping the southbound left turn phase.

The two-way stop controlled intersection of South Eagleville Road with Separatist Road and Sycamore Drive is expected to operate at LOS F for vehicles on the Separatist Road approach during the PM peak hour. Geometric improvements at this location are not expected to provide a significant reduction in delay, as the delay is caused by the lack of gaps in the through traffic volumes on South Eagleville Road. It should be noted that this approach operates at LOS F under the 2010 and 2030 No Build conditions.

Under the existing condition, the intersection of South Eagleville Road with Separatist Road meets the four-hour and peak-hour signal warrants set forth in the *Manual on Uniform Traffic Control Devices*, 2003 Edition (MUTCD), but does not meet the eight-hour warrant, which is typically required by CTDOT prior to installing a new signal. Under the 2030 No Build condition, all three signal warrants are met. A signal would allow the intersection to operate at LOS A during the AM peak hour and LOS B during the PM peak hour, and therefore may be considered for mitigating delays on the Separatist Road approach.

The all-way stop controlled intersection of North Eagleville Road at Hunting Lodge Road is expected to operate at LOS F during the AM peak hour under the 2030 Full Build Condition. The intersection does not meet the MUTCD peak-hour signal warrant under the existing condition. It does meet the peak hour warrant under the 2030 Full Build Condition, but it is not expected that the eight-hour signal warrant would be met. Sufficient data does not exist to perform a full warrant analysis at this time. It is recommended that a full warrant analysis be performed in the future, closer to the completion of the north campus build out, as the installation of either a signal or roundabout would allow the intersection to operate much more efficiently.

4.6.4 Mitigation

Under the 2010 Build – Road Only condition, no mitigation will be required. Mitigation described in this FEIS is associated with the development of the North Campus, i.e., the 2030 Full Build condition. Under the 2030 Full Build condition, optimizing the signal timing at each intersection within the network will allow most of the signalized intersections to continue to operate acceptably during both peak hours. The following geometric improvements are recommended at full build out of the North Campus development in order to maintain acceptable levels of service at all of the signalized intersections within the study area:

Route 195 at US Route 44

- Widen southbound approach in order to provide exclusive right turn lane with channelized movement.
- Widen eastbound approach in order to provide second exclusive left turn lane.
- Revise signal phasing to provide protected only left turns on the eastbound and westbound approaches.

Route 195 at North Eagleville Road and Route 195 at Gurleyville Road

- Widen eastbound approach to provide a second left turn lane.
- Optimize signal timing for updated roadway configuration.

North Eagleville Road at Hillside Road

- Widen westbound approach to provide an exclusive right turn lane.
- Revise signal phasing to include a right turn overlap phase with the southbound left turn phase.

South Eagleville Road at Separatist Road

- Install a new traffic signal.

The extent of the future development of this region is still uncertain. Changes in zoning or construction of public sewers and other utilities along the US Route 44 corridor may drive a need for additional capacity within the study area network. It is recommended that mitigation be performed on a schedule to coincide with the demands of the development as each phase is implemented. Ultimately these improvements may be part of a larger State initiative in this region. The public may be best served by such a comprehensive approach.

The unsignalized intersection of North Eagleville Road at Hunting Lodge Road is expected to operate poorly under the 2030 Full Build Condition. Geometric improvements will not result in improved operations at this intersection. A roundabout or a traffic signal may be warranted at this intersection at the full build out of the North Campus, and would improve operations. A warrant analysis should be performed on this intersection in the future based on MUTCD standards in order to determine if a roundabout or a traffic signal may be installed.

These improvements are above and beyond what was previously recommended in the 2001 EIE. Each of the improvements outlined in that document have been constructed as of this time, with the exception of the North Hillside Road Extension. The additional mitigation is a result of several factors, including the additional background growth for the later build year.

4.7 Joint Development

4.7.1 Methodology

In the context of this FEIS, joint development consists of projects that may be developed jointly with the proposed action (i.e., the North Hillside Road Extension), but by project proponents other than FHWA. Given that the roadway will facilitate the development of UConn-related academic and research buildings, recreational facilities, and possible private and/or UConn-private ventures, joint development is unlikely to be concurrent with the roadway alignment, but will be facilitated by the proposed action.

4.7.2 Existing Conditions

The proposed project area is essentially undeveloped and portions of it are being used by the College of Agriculture and Natural Resources to support research and teaching activities at the University.

4.7.3 Potential Impacts

As described in the Outlying Parcels Master Plan (JJR, 2000), the proposed development of the North Campus will consist of three general categories: University-related student facilities, academic/research facilities, and private or public-private joint ventures. The first two categories will result in direct positive impacts to the University community by providing state-of-the-art facilities for residential life, research and teaching. This in turn has secondary positive impacts for the local community, for which UConn is a major employer, and general benefits to the State by continuing to have a vibrant and productive flagship University. UConn will be the primary proponent for projects of these types.

Private and public-private ventures located on the North Campus will result in expanded employment and economic opportunities for the region (see Section 4.5). The potential type and size of private or public-private ventures is currently unknown, but the Outlying Parcels Master Plan (JJR, 2000) identifies technology and research as the primary non-University land use for most parcels. An economic feasibility study for a research and technology park on the UConn North Campus identified advanced manufacturing, aerospace and defense, and bioscience/biotechnology as the technology sectors with the highest potential for relocation and collaboration with the University and technology companies in the area (George-Henry-George-Partners, May 2008).

Potential impacts to the natural or built environment that may result from the development of the North Campus are considered within the discussion of secondary or indirect impacts for individual sectors of the affected environment addressed in this FEIS. Under the No Action Alternative, no joint development is anticipated.

4.7.4 Mitigation

Potential mitigation measures required for development projects on the North Campus that are facilitated by the proposed project are considered within the discussion of mitigation for secondary or indirect impacts for individual sectors of the affected environment addressed in this FEIS.

4.8 Considerations Relating to Pedestrians & Bicyclists

4.8.1 Methodology

The 1994 and 2001 EIEs were reviewed relative to pedestrian and bicyclist considerations. The design of the North Hillside Road Extension, as described in the 1994 EIE, included a 32-foot wide paved roadway offering two 12-foot wide travel lanes with 4-foot shoulders, and a 10-foot bikeway/sidewalk along the roadway edge. The 2001 EIE did not explicitly address pedestrian and bicyclist considerations. The discussion in this section is based on the pedestrian and bicyclist facilities associated with the current proposed design of the North Hillside Road Extension.

4.8.2 Existing Conditions

Shared-use paths for pedestrians, bicyclists, and other users are currently located along Route 44 in the vicinity of the proposed intersection with the North Hillside Road Extension and along the existing segment of North Hillside Road.

4.8.3 Potential Impacts

Pedestrian and bicycle facilities will be constructed as part of the North Hillside Road Extension. Options that were considered include a shared use path similar to existing facilities in the area or providing a conventional sidewalk with a separate bike lane striped along North Hillside Road. Both options would follow the roadway alignment, beginning with a connection to the existing multi-use path along Route 44 and connecting to the existing path along the

existing segment of North Hillside Road. The required widening of Route 44 at the intersection with North Hillside Road will be designed to maintain pedestrian access along Route 44 and between Route 44 and North Hillside Road.

In following the University's trend toward separate bicycle and pedestrian facilities, the current design of the North Hillside Road Extension includes a bituminous pedestrian sidewalk on the east side of the roadway and a separate bicycle lane within the curb line in each direction. This will provide a direct connection for pedestrians and bicyclists between Route 44 and the UConn campus, thereby encouraging alternative modes of transportation and contributing to a reduction in vehicular traffic. The sidewalk ramps will be designed in accordance with Americans with Disabilities Act requirements. Inclusion of bicycle lanes within the roadway curb line minimizes the roadway width and associated wetland impacts at the wetland crossings. Additionally, once the roadway is completed, existing transit service on the UConn campus will be extended to include the new section of North Hillside Road.

4.8.4 Mitigation

Mitigation for wetland impacts associated with the proposed roadway crossings, including the proposed pedestrian and bicycle facilities which are contained within the overall roadway corridor, is described in Section 4.13. No other mitigation is required for the proposed pedestrian and bicycle facilities.

4.9 Air Quality Impacts

Under the authority of the U.S. Clean Air Act, as amended, the U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) for concentrations of six air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter ten microns or smaller in diameter (PM_{10}), particulate matter two and a half microns or smaller in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). On September 21, 2006, the EPA revised the daily $PM_{2.5}$ NAAQS from 65 $\mu g/m^3$ to 35 $\mu g/m^3$.

Connecticut adopted the national standards, listed in Table 4-6, and subsequently developed a State Implementation Plan (SIP) to attain and maintain these standards. Primary standards are established to protect public health; secondary standards are established to protect plants and animals and to prevent economic damage. The CT DEEP has 26 permanent pollutant monitoring stations. Monitoring data is a crucial component of regulation used to determine compliance with the EPA primary and secondary air quality standards and to evaluate the effectiveness of pollution control and abatement strategies.

The State of Connecticut is divided into two air quality districts: the Greater Connecticut district that includes Hartford, New London, Tolland, Windham and Litchfield counties and the New York-Northern New Jersey-Long Island, NY-NJ-CT district that includes Fairfield, New Haven and Middlesex counties in southwestern Connecticut. Each district is assigned an attainment or non-attainment status with respect to the NAAQS. When the State has been designated as attainment for an air pollutant, all districts of the State are in compliance with all of the standards (i.e., short-term and long-term; primary and secondary) for the particular pollutant. The entire state is currently in attainment for CO, NO_2, Pb, SO_2 and PM_{10} (CT DEP, 2007).

Non-attainment for an air pollutant is assigned when one or more of the standards for the pollutant have been violated in one or more regions of Connecticut. The non-attainment designation that is subsequently applied to a region can reflect the "degree" of non-attainment depending upon a number of factors including the air pollution history in the region, previous designation of the region as either attainment or non-attainment, lack of air pollutant monitoring in the region, and inferences made based on pollutant monitoring done in adjacent or similar regions (CT DEP, 2007). Both air quality districts in Connecticut are designated as moderate non-attainment for ozone and the New York-Northern New Jersey-Long Island, NY-NJ-CT district is designated as non-attainment for $PM_{2.5}$.

Stationary and mobile sources are generators of air pollutants. Greater vehicle volume or increases in the vehicle congestion, especially at intersections, have the potential to lead to increased emissions. Stationary sources, i.e., fuel-burning equipment, also generate emissions of criteria pollutants.

Table 4-6. National Ambient Air Quality Standards

Pollutant	Standard	Averaging Period	National Standard [a,b]
Sulfur Dioxide	Primary	Annual Arithmetic Mean	80 μg/m³ (0.03 ppm)
	Primary	24 Hour Average	365 μg/m³ (0.14 ppm)
	Secondary	3 Hour Average	1300 μg/m³ (0.5 ppm)
Inhalable Particulates (PM2.5)	Primary	Annual Arithmetic Mean	15.0 μg/m³
	Primary	24 Hour Average [d]	35 μg/m³
Inhalable Particulates (PM10)[g]	Primary	24 Hour Average [c]	150 μg/m³
Carbon Monoxide	Primary	8 Hour Average	10 mg/m³ (9 ppm)
	Primary	1 Hour Average	40 mg/m³ (35 ppm)
Ozone	Primary	8 Hour Average [e,g]	0.075 ppm
	Primary	1 Hour Average [f] (applies in limited areas)	0.12 ppm
Nitrogen Dioxide	Primary	Annual Arithmetic Mean	100 μg/m³ (0.053 ppm)
Lead	Primary	Quarterly Average	1.5 μg/m³

a) Units: milligrams per cubic meter (mg/m³), parts per million (ppm), and micrograms per cubic meter (μg/m³).
b) National standards are block averages rather than moving averages
c) Not to be exceeded more than once per year on average over 3 years
d) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m³ (effective December 17, 2006)
e) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone

Table 4-6. National Ambient Air Quality Standards

Pollutant	Standard	Averaging Period	National Standard [a,b]
concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm. f) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤1, as determined by Appendix H of National Ambient Air Quality Standards. As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas. g) Standard implemented in May 2008. h) Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the Annual Arithmetic Average PM_{10} standard in 2006 (effective December 17, 2006).			
Source: EPA 40 CFR part 50			

4.9.1 Microscale Analysis

4.9.1.1 Existing Conditions

Mobile Sources

Potential air quality impacts are associated with additional traffic generation in the area as a result of the proposed project. Of the six criteria pollutants, only CO warrants microscale consideration when studying the effects of a potential increase in traffic due to a given project. Analysis of SO_2 and NO_2 is not warranted, since transportation sources emit a very small percentage of the total emitted SO_2 (due to the relatively small percentage of sulfur in gasoline and diesel fuels) and particulate emissions (compared with the combustion of fossil fuels for space heating and power generation, incineration, industrial processes and construction activities). While NO_2 is emitted by motor vehicles, it is of primary concern due to its role in the formation of photochemical oxidant smog as measured by O_3. As discussed in the previous section, ozone formation is a regional problem, not unique to Connecticut. Microscale Pb analysis for traffic-related projects is not required as metal processing plants are generally responsible for most of the lead in the air.

The University discourages the use by students of motor vehicles within the campus areas. Student parking is placed at peripheral locations. Alternative modes of transportation are practiced including shuttle buses and use of pedestrian pathways via walking or with bicycles. The proposed North Hillside Road extension will include a pedestrian sidewalk and bicycle lanes extending between North Eagleville Road and Route 44. These elements will contribute to a reduction in potential air quality impacts from vehicular traffic.

Stationary Sources

Because the project site is primarily undeveloped, there are no significant stationary sources of air pollution at the project site. However, on a campus-wide basis, the Storrs campus is considered a major source because it has the potential to emit pollutants in excess of thresholds established for regulated air pollutants. Under the Clean Air Act Amendments of 1990, major sources of air pollution are required to obtain a Title V operating permit, which is administered in Connecticut by the CT DEEP Bureau of Air Management. Primary sources of emissions at

the campus are associated with the Central Utility Plant, which provides steam, chilled water, and emergency power to the campus.

4.9.1.2 Evaluation Methodology

Mobile Sources

Traffic impact analyses performed as part of this FEIS identified several roadway intersections that are anticipated to experience a drop in Level of Service (LOS) during peak morning or afternoon hours as a result of the proposed North Hillside Road extension. A microscale air quality analysis was performed at selected intersections with the greatest potential for air quality impacts to further evaluate the potential need for traffic mitigation measures at these intersections based on air quality considerations.

The analysis consisted of a microscale or local-area dispersion modeling analysis to estimate ambient concentrations of CO at selected receptor locations in the vicinity of the three intersections with the greatest potential for microscale air quality impacts (Table 4-7). The intersections used were determined based upon EPA and CT DEEP modeling guidance, as well as LOS and volume to capacity (v/c) ratios for 2010 No Build and 2030 unmitigated Full Build conditions. Unmitigated conditions assumed no changes in signal timing or roadway configuration that would improve LOS. Both morning and afternoon peak hour conditions were assessed. In the case of each intersection, the worst peak condition (AM or PM) was chosen for modeling.

Table 4-7. Microscale Air Quality Modeling Scenarios

Intersection		Modeling Time of Day	
		2010 No Build	**2030 Full Build (without mitigation)**
1	Intersection of Storrs Road (SR 195) and South Eagleville Road	AM	AM
2	Intersection of Storrs Road (SR 195) and Middle Turnpike (SR 44)	AM	AM
3	Intersection of Middle Turnpike (SR 44) and North Hillside Road	PM	PM

Ambient CO concentrations are typically at their highest near street intersections where motor vehicles are idling in a queue or moving at low speeds. EPA's CAL3QHC (Version 2.0, 1995), a line source dispersion model and traffic algorithm for estimating vehicular queue lengths at signalized intersections, was used to estimate the maximum ambient CO concentrations at the subject intersections. The CO assessment examined the year 2030 Full Build scenario during morning and afternoon peak traffic conditions. The modeled maximum CO concentrations, including an estimated background ambient CO concentration, were compared to the NAAQS for CO.

Consistent with EPA's guidelines (November 1992) and CT DEEP guidance, eight-hour peak CO concentrations were estimated from the calculated one-hour peak CO concentrations by the use of a conservative scale factor of 0.7.

Concentrations were estimated at selected locations in the vicinity of the subject intersections. These locations, referred to as receptors, are typically selected where the maximum total project concentrations are likely to occur and where the general public is likely to have access. Receptor locations are generally located where traffic is likely to be the heaviest and most congested, such as on either side of a traffic queue. Based on EPA guidance (USEPA, 1992), receptor locations were selected at the subject intersections as shown on the schematic diagrams (Appendix E). Receptors were generally located along sidewalks, driveways, or at the property line adjacent to the subject intersections and associated traffic queues, outside of the mixing zone of the free flow and queue links.

CAL3QHC requires various meteorological, site, and traffic information as model inputs. EPA-recommended values were used for meteorological parameters including wind speed, stability class, and mixing height. A 360-degree range of wind directions was considered in 10 degree increments. In the absence of site-specific background CO measurements, a CT DEEP-recommended 8-hour background CO concentration of 3.0 ppm, which is typical of suburban areas in the northeast, was used in the analysis. Values of meteorological variables used in the modeling analysis are provided in Appendix E.

The lane configurations and site layout of the subject intersections under the project build alternative were used to obtain free-flow and queue link coordinates and other site-specific input parameters. The existing intersection geometry was used to represent the proposed conditions. Signal timing (average red time and signal cycle length), traffic volumes, and other traffic parameters for the No Build (2010) and project completion year (2030 Full Build) were estimated from traffic counts and peak hour capacity analyses performed as part of this study. Values of traffic and site variables used in the analysis are provided in Appendix E.

CO emission factors for idling and moving vehicles, which are required as inputs to CAL3QHC, were calculated using the EPA mobile source emission factor model MOBILE6.2 (2003). Emission factors for the subject intersections were calculated for both 2010 and 2030. The MOBILE6.2 model runs were performed using input parameter values typically used by the CT DEEP, interpolated for the project completion year, as well as site specific information for each intersection (see Appendix E). A range of vehicle speeds consistent with the speeds observed at the intersections were considered. The emission factors associated with the 30 mph and 40 mph scenarios were selected for use in CAL3QHC as a conservative estimate of the emissions from moving vehicles. The emission factors associated with the 2.5 mph speed were used to calculate emissions from idling vehicles. The following emission factors were used as input to CAL3QHC.

Table 4-8. Calculated MOBILE6 CO Emission Factors

Scenario	Emission Factor			
	Free-Flow (g/mi)		Idle (g/hr)	
	2010	2030	2010	2030
Arterial Free-Flow (30 mph)	11.85	9.00	65.65	47.33
Arterial Free-Flow (40 mph)	12.25	9.30	65.65	47.33

Notes: Input and output files from the MOBILE6 runs are provided in Appendix E.

4.9.1.3 Potential Impacts

Mobile Sources

Results of the CO modeling analysis for the subject intersections are summarized in Table 4-9. The table shows the estimated maximum one-hour and eight-hour CO concentrations for both the 2010 No Build and 2030 Full Build conditions. Modeled CO concentrations at each receptor location are also provided in the model output in Appendix E.

Table 4-9. Estimated Maximum CO Concentrations for 2010 No Build and 2030 Full Build Conditions

Year	Maximum CO Concentration (ppm)[1,2]			
	1-Hour		8-Hour	
	2010 No Build	2030 Full Build	2010 No Build	2030 Full Build
CT and Federal Standard[3]	35		9	
Intersection				
Intersection of Storrs Road (SR 195) and South Eagleville Road	5.40	5.80	3.78	4.06
Intersection of Storrs Road (SR 195) and Middle Turnpike (SR 44)	5.40	5.60	3.78	3.92
Intersection of Middle Turnpike (SR 44) and North Hillside Road	NA[4]	5.10	NA	3.57

Notes:
[1]Maximum of CO concentrations calculated at all receptor locations.
[2]CT DEEP recommended 8-hour background CO concentration of 3ppm was included in the analysis.
[3]Connecticut and National Ambient Air Quality Standards (NAAQS).
[4]Under the 2010 No Build scenario, the extension of North Hillside Road does not take place, and is therefore not modeled.

As shown in Table 4-9, the estimated maximum one-hour and eight-hour CO concentrations are well below the Connecticut and Federal CO standards for the 2010 No Build and the 2030 Full Build scenarios at all three intersections. Estimated maximum 8-hour CO concentrations are generally within 1 to 2 ppm of the assumed ambient 8-hour background CO concentration of 3.0 ppm.

Stationary Sources

New stationary sources of air pollution may result from the development of the North Campus. Buildings that tie-into the University's central utility system are unlikely to result in significant change to campus-wide emissions, and subsequent ambient air quality, since they will account for a relatively small percentage of the existing overall campus-wide building square footage. Within individual facilities, installation of new fuel burning equipment (i.e., a boiler) or other possible sources of emission that exceed specified thresholds will be subject to New Source Review or other review and approval by the CT DEEP Bureau of Air Management. Facilities controlled by the University would be added to the University's existing emissions inventory under their current Title V permit. Privately-owned facilities would be responsible for appropriate air quality permitting and compliance.

4.9.1.4 Mitigation

Although the study area intersections are impacted by increased traffic, maximum one-hour and eight-hour CO concentrations at the subject intersections are estimated to be well below the Connecticut and Federal CO standard of 35 and 9 ppm, respectively. The highest 8-hour average concentration of CO would occur at the intersection of Storrs Road (SR 195) and South Eagleville Road under the 2030 Full Build scenario. This 8-hour average CO concentration is 4.06 ppm for the 2030 Full Build scenario, nearly 5 ppm less than the NAAQS. Although the predicted traffic volumes under the 2030 Full Build scenarios are greater than those under 2010 No Build conditions, the predicted concentrations of CO in 2030 are only slightly greater than those of 2010 No Build emissions. This small increase over time is largely due to newer vehicles with lower emission rates replacing older vehicles. In addition, this analysis assumed no traffic mitigation measures under 2030 Full Build conditions. However, proposed traffic mitigation measures (see Section 4.6) are anticipated to maintain or improve the 2030 Full Build condition LOS. Therefore, consistent with EPA and CT DEEP guidance, no further mitigation measures to address microscale air quality are recommended at this time.

4.9.2 Mesoscale Analysis

On a mesoscale or regional level, ozone concentrations are the primary air quality concern. Ozone concentrations are strongly influenced by emissions and weather patterns in multi-state regions rather than local emissions. The ambient ozone concentrations at a given location are less dependent on the amount of local emissions than on meteorological conditions, especially wind direction, temperature, and the amount of sunlight.

4.9.2.1 Methodology

As mentioned previously, the Greater Connecticut air quality district is located in a non-attainment area for ozone. Ozone is a pollutant that forms photochemically (i.e., a reaction

caused by sunlight) in the troposphere (lowest portion of the atmosphere) due to the presence of the precursor compounds such as nitrogen oxides (NO_x) and hydrocarbons or volatile organic compounds (VOCs), and carbon monoxide (CO). The formation of ambient levels of ozone is highest during the summer months, i.e., the "ozone season". The intensity of sunlight necessary for the photochemically initiated reactions is highest during this time period (US EPA, 2007).

The Connecticut Department of Transportation conducts mesoscale analysis to determine conformity of the Fiscal Year 2009-2013 Statewide Transportation Improvement Program (STIP) with the State Implementation Plan (SIP). The proposed project was included in the STIP and therefore a NO_x and VOC emissions analysis was conducted for summer conditions for the 2009 baseline condition and future conditions (2012, 2020, 2030, and 2035).

The mesoscale analysis uses the MOBILE6.2 emissions model. Emissions are calculated as a function of the emissions factors, which depend upon meteorological, vehicle fleet, fuel, and roadway characteristics, and the vehicle miles traveled (VMT) in the region. The VMT estimates were developed from the CTDOT statewide network-based travel model for the baseline and future conditions. Details of the modeling approach can be found in the Connecticut Department of Transportation Ozone Air Quality Conformity Determination – September 2009 (CTDOT, 2009).

4.9.2.2 Existing Conditions

The CT DEEP operates ozone monitoring stations at 11 locations throughout Connecticut. The stations closest to the proposed project area are in East Hartford (approximately 30 miles to the west) and Stafford (approximately 20 miles to the northeast). In 2008 the last year for which data is available (EPA, 2009), the 8-hour ozone NAAQS was exceeded four times at the East Hartford station and seven times at the Stafford station.

4.9.2.3 Potential Impacts

Mesoscale analysis of the 2009 year estimates the 8-hour summertime emissions in the Greater Connecticut air quality district as 24.67 tons/day for VOC and 45.33 tons/day for NO_x for a regional VMT of 47,043,284. For 2035, the final year modeled, regional VMTs are estimated to increase to 59,915,504 with emissions decreasing to 13.12 tons/day for VOC and 11.17 tons/day for NO_x. The anticipated decline in ozone precursor compound emissions, even with an increase in total VMTs, is expected as the result of more stringent national emissions control programs.

Due to only minor changes in alignment, all of the build alternatives are anticipated to result in similar VMTs, and therefore similar emissions are anticipated regardless of the build alternative considered. Under the no-build alternative, vehicle trips would be eliminated if the roadway extension and subsequent North Campus development are not constructed. However, given the relatively limited nature of this project compared to the total VMTs in the region, it is unlikely that the build alternatives for this project would result in a substantial change in emissions.

4.9.2.4 Mitigation

Because an overall decrease in emissions of VOCs and NO_x by 2035 is anticipated in the air quality district in which the project is located, and the projected emissions are below those required to maintain compliance with the State Implementation Plan and the NAAQS for ozone, no specific mitigation measures are proposed.

4.9.3 Mobile Source Air Toxics

4.9.3.1 Methodology

In addition to the criteria air pollutants for which there are NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued their latest rule on Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol 72, No. 37, page 8430, February 26, 2007). In this rule, EPA identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/ncea/iris/index.html). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050, as shown in Figure 4-6.

4.9.3.2 Existing Conditions

MSATs are not currently monitored in the project area. However, CT DEP conducted a Toxic Air Study in Connecticut (TASC) from 1999-2003 to provide data on ambient levels of toxic air pollutants, also called hazardous air pollutants (HAPs), in Connecticut. This monitoring was conducted in the immediate vicinity of six stationary sources of HAPs, and one background site. The closest monitoring location to the project area was approximately 20 miles to the west in Manchester, Connecticut.

The monitoring data showed that for the majority of the air toxics, the levels appear low when compared against Connecticut Department of Public Health proposed annual hazard limiting values (HLVs). For three chemicals, formaldehyde, acetaldehyde and manganese, the ambient levels may be of concern, but were at concentrations similar to those found in other parts of the United States. The study concluded that the carbonyl concentrations (i.e., formaldehyde and acetaldehyde) are likely dominated by motor vehicles, and the same may be true of manganese (NESCAUM, 2005).

4.9.3.3 Potential Impacts

This FEIS includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable the prediction of project-specific health impacts of the emission changes associated with the alternatives in this FEIS. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

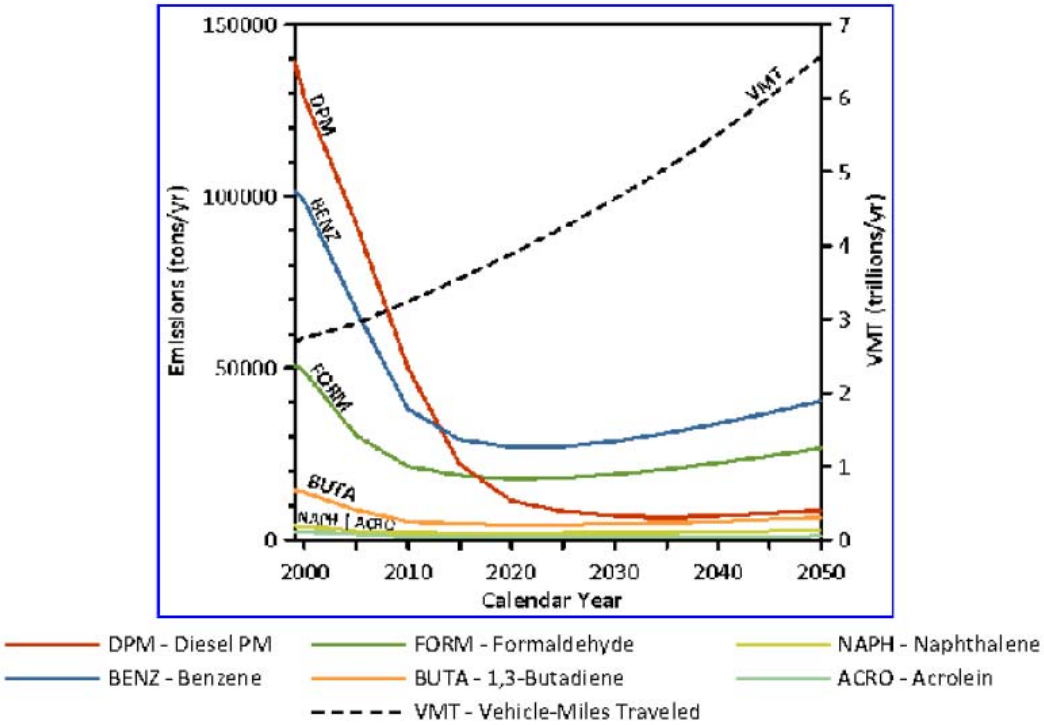
Unavailable Information for Project-Specific MSAT Impact Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Figure 4-6. Mobile Source Air Toxics Emissions

U.S. Annual Vehicle Miles Traveled (VMT) vs. Mobile Source Air Toxics Emissions, 1999-2050



Notes: Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 yons/yr for 2050. Trends for specific locations may be different, depending on locally derived information representing vehicle-miles traveled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable. The results produced by the EPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the EPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm #hyroad), which documents poor model performance at ten sites across the country - three where intensive monitoring was conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (http://www.epa.gov/risk/ basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings. There is also the lack of a national consensus on an acceptable level of risk. The current context

is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries.

The decision framework is a two-step process. The first step requires EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

This document provides a qualitative assessment of MSAT emissions relative to the various alternatives and acknowledges that the project build alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

Project Specific MSAT Impact Analysis

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project.

Even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, a qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, found at:
www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

For each alternative in this FEIS, the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. The amount of VMTs under any of the build alternatives is expected to be greater than under the no build alternative due to the increased number of average daily trips

(ADTs) generated due to development of the North Campus. Because VMTs under any of the build alternatives are not expected to vary significantly given the minor differences in roadway alignment, it is expected that there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 72 percent from 1999 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

In summary, under all Build Alternatives in the design year (2030) it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs. In comparing various project alternatives, there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore, it is possible that localized increases and decreases in MSAT emissions may occur. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

4.9.3.4 Mitigation

No specific mitigation for MSATs is proposed since under all Build Alternatives in the design year (2030) it is expected there would be reduced MSAT emissions in the immediate area of the project due to EPA's MSAT reduction programs. On a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

4.9.4 Conformity Determination

The 1990 Clean Air Act Amendments (CAAA) require State Implementation Plans (SIPs) to demonstrate how states with non-attainment and maintenance areas will meet federal air quality standards. The U.S. Environmental Protection Agency (EPA) issued final rules on transportation conformity (amended as 40 CFR 93 in 1999) which describe the methods required to demonstrate SIP compliance for transportation projects. The Conformity process ensures that transportation projects contained in Long Range Plans and State Transportation Improvement Programs (STIPs) meet the goals of the NAAQS by means of each state's Statewide Implementation Plan (SIP).

The proposed project is included in the 2010 Statewide Transportation Improvement Program (STIP) dated December 2009 and is within the Greater Connecticut Air Quality District, which includes Hartford, Tolland, Litchfield, Windham, and New London counties. As mentioned above, the entire state, including the Greater Connecticut Air Quality District, is in moderate non-attainment for ozone and the Conformity process dictates that the following conditions must be met:

- Mobile-source emissions for years 2009 to 2011 must be less than the 2009 transportation emission budgets approved in June 27, 2008;

- Mobile-source emissions for years 2012 and beyond must be less than the 2012 transportation emission budgets approved in June 27, 2008.

The Connecticut Department of Transportation performed an ozone air quality conformity analysis (CTDOT, 2009) and found that both conditions for conformity were met in the Greater Connecticut Air Quality District.

4.9.4.1 Project Level Conformity Determination

Federal regulations concerning the conformity of transportation projects developed, funded or approved by the USDOT and by metropolitan planning organizations (MPOs) are contained in 40 CFR 93. The Proposed Action (project) is not located within the boundary of an MPO, but as described above is located within a "donut area" inside the boundary of the Greater Connecticut Air Quality District, a moderate non-attainment area for ozone, which encompasses the following MPOs and their respective Regional Transportation Plans and Transportation Improvement Program :

- Capitol Region Council of Governments (CRCOG) – Long Range Transportation Plan adopted April 25, 2007 and FFY2010-2013 Transportation Improvement Program adopted October 21, 2009;
- Central Connecticut Regional Planning Agency (CCRPA) – Long Range Transportation Plan adopted May 3, 2007, amended September 2008 and FFY2010-2013 Transportation Improvement Program adopted November 5, 2009;
- Southeastern Connecticut Council of Governments (SCCOG) – Long Range Transportation Plan adopted April 18, 2007 and FFY2010-2013 Transportation Improvement Program adopted October 21, 2009;
- Connecticut River Estuary Regional Planning Agency (CRERPA) – Long Range Transportation Plan adopted May 9, 2007 and FFY2010-2013 Transportation Improvement Program.

As mentioned above, this project is included in the 2010 Statewide Transportation Improvement Program (STIP) dated December 2009 which incorporates projects from the above cited MPO Regional Transportation Plans and their respective Transportation Improvement Programs (TIP).

In accordance with 40 CFR 93.115(a), the applicable criteria and procedures for determining the conformity of a project which is not from a conforming Transportation Plan and TIP are listed in Table 1 of 40 CFR 93.109(b). All of these criteria have been determined to be satisfied for the Proposed Action as follows:

- **Transportation Control Measures (TCMs)** – This project does not interfere with the implementation of any TCM in the current State Implementation Plan (SIP) as there are none.

- **Currently Conforming Plan and TIP** – The above cited Long Range Transportation Plans were determined to be in conformity by FHWA and FTA on June 30, 2007. The

FFY 2010-2013 Statewide Transportation Improvement Program (STIP), which incorporates the above cited Transportation Improvement Programs, was determined to be in conformity by FHWA and FTA on November 30, 2009. .

- **CO, PM_{10} and $PM_{2.5}$ Hot Spots** – This project is not located in a CO, PM_{10} or $PM_{2.5}$ non-attainment or maintenance area, therefore CO, PM_{10} and $PM_{2.5}$ hot spot analyses were not required.

- **PM_{10} and $PM_{2.5}$ Control Measures** – There are no PM_{10} or $PM_{2.5}$ control measures in the current State Implementation Plan (SIP).

- **Emissions Budget and/or Interim Emissions** – This project is included in the current statewide transportation network model and has been demonstrated to be consistent with the motor vehicle emissions budgets in the State Implementation Plan as evidenced by (1) Connecticut Department of Transportation Ozone Air Quality Conformity Determination Report for the 2007 Regional Transportation Plans and the FFY 2010-2013 Transportation Improvement Programs, dated September 2009; and (2) Connecticut Department of Transportation PM 2.5 Air Quality Conformity Determination Report for the 2007 Regional Transportation Plans and the FFY 2010-2013 Transportation Improvement Programs, dated September 2009.

In summary, the Proposed Action has *tentatively* been determined to be in conformity with the Clean Air Act, as amended, pursuant to all applicable U.S. EPA regulations currently in effect as of the date of approval of this FEIS.

4.9.5 Greenhouse Gases and Global Climate Change

4.9.5.1 Existing Conditions

The issue of global climate change is an important national and global concern that is being addressed in several ways by the Federal government. The Transportation sector is the second largest source of total greenhouse gases in the U.S., and the greatest source of carbon dioxide (CO_2) emissions – the predominant GHG. In 2006 the transportation sector was responsible for 28 percent of all U.S. GHG emissions. Nearly 97 percent of transportation GHG emissions came through direct combustion of fossil fuels, with the remainder due to carbon dioxide (CO_2) from electricity (for rail) and Hydrofluorocarbons (HFCs) emitted from vehicle air conditioners and refrigerated transport. Transportation is the largest end-use sector emitting CO_2, the most prevalent greenhouse gas. Recognizing this concern, FHWA is working with other modal administrations through the DOT Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases - particularly CO_2 emissions - and to assess the risks to transportation systems and services from climate changes.

There are also several programs underway in Connecticut and at UConn to address GHG emissions. In 2008, Connecticut enacted legislation (Connecticut General Statutes Section 22a-200) that sets a statewide GHG emissions reduction target of 10 percent below 1990 levels by 2020. Additionally, barring intervention at the federal level or through the Regional Greenhouse Gas Initiative (RGGI), the act requires an 80 percent GHG reduction below 2001

levels by 2050. The act also presents a timetable for achieving the 2020 reductions, including a statewide GHG inventory that was published in January 2010, modeling scenario results by July 2010, and recommended GHG reduction strategies by July 2011. The latest statewide GHG emissions inventory for Connecticut indicates that gross GHG emissions in Connecticut have shown a slight decline from 2001 to 2007. CO_2 emissions constitute the majority of Connecticut's total gross GHG emissions. Nearly 92 percent of the total state GHG emissions per year are the result of fossil fuel combustion. Transportation (44%) is shown to be the leading source of GHG, followed by electric utilities (22%), and residential combustion (21%).

Connecticut adopted a Climate Change Action Plan in 2005, making it one of the first states to address climate change in such a significant and comprehensive manner. The plan contains 55 recommended actions, grouped into five main sectors, which addressed goals for reduction of GHG emissions from all significant sources in the state. Examples of recommended actions in each of the five main sectors include:

- Transportation & Land Use: Raising emission standards for new cars; reducing black carbon from diesel engines through the use of low sulfur diesel, engine improvements and tailpipe controls; investing in a hydrogen infrastructure and R&D program.
- Residential, Commercial, Industrial: Upgrading building codes and using energy efficient materials and design concepts in the construction of new state buildings and schools (LEED standard); promoting the purchase of environmentally preferable products and services by state agencies; testing biodiesel for heating.
- Agriculture, Forestry, Waste: Adopting actions to increase recycling and source reductions to 40%; encouraging consumers to buy local produce; supporting landfill gas-to-energy projects.
- Electricity Generation: Increasing the amount of renewable energy supplied to the electricity grid; implementing a program for Connecticut ratepayers to choose to purchase electricity derived from clean energy; state government purchase of clean energy; developing a regional program to cap CO_2 emissions from large power plants.
- Education: Increasing awareness among the general public, policymakers, community leaders, and others of climate change issues and solutions; integrating into curricula and outreach programming.

Working committees at both the agency head and staff level continue to develop, implement and track progress on each recommended action.

The *Connecticut on the Move, Strategic Long-Range Transportation Plan (2009-2035)* (2009 LRP), incorporates strategies and recommendations from the Connecticut Climate Change Action Plan 2005, the Connecticut Clean Diesel Plan (January 2006), and the Governor's Energy Plan (September 2006). Some of the recommended measures identified in the LRP by CTDOT include:

- Implement energy performance standards for State transportation facilities, promote green building design on major capital projects, purchase environmentally preferable products, and use electronic media.
- Complete the installation of new light-emitting diode (LED) traffic signals statewide to reduce electrical consumption, increase reliability, and reduce maintenance needs.

- Develop and use transportation demand management tools to encourage commuters to use alternative rideshare options such as carpooling, vanpooling, telecommuting, compressed work weeks, and flextime.
- Continue to investigate the potential for improvements to the state's transportation system that will reduce greenhouse gas emissions.
- Support programs and efforts that focus on minimizing fuel consumption, black carbon emissions, and single-occupancy vehicle trips as well as address the environmental and health costs associated with nonrenewable fuel emissions

UConn also recognizes its impact on the climate and the need for action. On March 25, 2008, UConn signed the American College and University Presidents Climate Commitment (PCC), committing the University to developing an action plan to achieve carbon neutrality by 2050. To provide oversight for the process, an eight-member Climate Action Task Force (CATF) was appointed following the PCC signing. The Task Force coordinated the efforts of the five related workgroups and areas of focus, including:

- Energy Workgroup: Efficiency, Conservation, Installations & Retrofits; Renewable Energies; Supply & Infrastructure.
- Environmental Literacy Workgroup: Environmental Learning Community establishment; Environmental Studies Program efforts; Development of the University's Climate Action Plan's environmental literacy goals.
- Recycling & Waste Reduction Workgroup: Recycling; Food Waste Reduction & Composting; Electronics Recycling; Green Chemistry.
- Sustainable Development Workgroup: Planning & Land Use; Low Impact Design (LID); Green Building.
- Transportation Workgroup: Land Use and Transportation Planning and Design; Transportation Demand Management and Multimodal Travel; Fleet Fuel Type & Efficiency.

In August 2009, the Climate Action Plan (CAP) was released. The CAP is intended for use as a tool to identify ways to achieve GHG reduction strategies, set timelines for implementation, quantify the costs and benefits of the proposed projects, and prioritize actions.

The implementation timeline includes immediate (< 1 year), short-term (2-3 year), and long-term (5-7 year) actions. The overall approach to implementation is a "2% solution" which is an average annual target of an additional 2% below 2007 GHG emission levels, which results in the following interim milestones: 26% below 2007 levels by 2020, 50% below 2007 levels by 2032, 86% below 2007 levels by 2050. The CAP will be updated at 5-7 year intervals, similar to campus master plans.

UConn has conducted GHG inventories for 2004-2007 for the Storrs campus. The goal of the inventory process is to assess and identify major sources of emissions on campus, to identify actions that can be taken to reduce such emissions, and to monitor the University's progress on an annual basis. According to the most recent inventory for 2007, energy (89%) accounts for the overwhelming majority of GHG emissions for the campus, with transportation the next highest component. The UConn co-generation facility accounts for 64% of the energy output, stationary energy sources account for 34%, while off-campus energy sources account for 2%.

4.9.5.2 Potential Impacts

Construction of the proposed road extension and North Campus facilities will result in increased indirect GHG emissions primarily from fuel usage by vehicles traveling to and from the facilities, direct stationary emissions from fuel usage in the on-site buildings, and indirect stationary emissions from energy consumption (co-generation and off-site energy sources). GHG emissions would be similar under each of the roadway alignments considered.

Because climate change is a global issue, and the emissions changes due to project alternatives are very small compared to global totals, this FEIS does not include a detailed quantitative analysis of projected GHG emissions for the Proposed Action. Rather, GHG (CO_2) emissions are estimated for (1) transportation sources and (2) direct and indirect energy consumption for the North Campus under the full-build scenario as a percentage of global, statewide, and campus-wide GHG emissions.

The relationship of current and projected Connecticut transportation-related CO_2 emissions to total global CO_2 emissions is presented in the Table 4-10. As shown in Table 4-10, Connecticut transportation-related CO_2 emissions are approximately 0.05% of the global total CO_2 emissions. Motor vehicle GHG emissions are primarily a function of the amount of carbon in the vehicle's fuel and the amount of fuel consumed by the vehicle. The amount of fuel consumed is a function of average vehicle efficiency and vehicle utilization, referred to as vehicle miles traveled (VMT). Table 4-10 also illustrates the anticipated project-related VMTs relative to total Connecticut travel activity, which provides an estimate of the transportation-related GHG emissions associated with the North Campus buildout. The North Campus buildout is projected to increase state-wide transportation CO_2 emissions by 0.1%.

The GHG emissions increase associated with energy use of the North Campus facilities is estimated as a percentage of the campus-wide energy-related GHG emissions presented in UConn's latest GHG inventory (2007). For this analysis, the percentage is based on the relative building area of the existing Storrs campus (10.7 million GSF) and the additional buildout of the North Campus (0.84 million GSF; excludes the existing North Campus development, which is accounted for in the latest UConn GHG inventory), assuming that the average energy consumption of the future North Campus facilities is similar to the average energy consumption of the existing campus facilities. Average energy demand of the proposed research facilities may be larger than other types of campus facilities, while the North Campus facilities are anticipated to be more energy efficient than the existing campus buildings.

As shown in Table 4-10, the North Campus buildout is projected to increase campus CO2 emissions from energy consumption by approximately 7-8%. Additional campus-wide CO2 emissions reductions will be realized through on-going building retrofits and other measures including UConn's sustainable energy initiatives and LEED Silver Policy, as well as the Climate Action Plan emissions reduction targets.

Table 4-10. Current and Projected Annual CO_2 Emissions

1. Transportation Sources	
Global CO_2 emissions, 2005 (MMT)[1]	28,100
Connecticut Transportation CO_2 Emissions, 2002 (MMT)[2]	15.1
Projected Connecticut 2020 Transportation CO_2 Emissions (MMT)[3]	11.8
Connecticut Transportation CO_2 Emissions, % of Global Total	0.05%
Connecticut Statewide VMT, 2002 (million)[2]	31,100
North Campus Buildout VMT (million)	38.7
North Campus Buildout VMT, % of Statewide VMT	0.1%
North Campus CO_2 Emissions at Buildout (MMT)	0.01
2. Energy Consumption	
Campus-Wide Building Area (GSF)	10.7 million
Additional North Campus Building Area at Buildout (GSF)[4]	0.84 million
Campus-Wide CO_2 Emissions, 2007 (MMT)[5]	0.17
North Campus CO_2 Emissions at Buildout (MMT)	0.01

[1]EIA, International Energy Outlook 2008 (MMT = million metric tons)
[2]Motor Vehicle Related Greenhouse Gas Emissions in Connecticut, A Report Pursuant to Public Act 06-161.
[3]Conservatively assume statutory requirement of 10% below 1990 levels by 2020
[4]Excludes the existing North Campus development, which is accounted for in the latest UConn GHG inventory.
[5]2007 GHG Inventory for the UConn Storrs campus including the Depot Campus.

4.9.5.3 Mitigation

As discussed in Section 4.23 (Energy), the North Campus facilities will be developed following the University's Sustainable Design & Construction Policy, which has provisions requiring any new building construction or renovation project entering the pre-design planning phase to establish the Leadership in Energy & Environmental Design (LEED) Silver rating as a minimum performance requirement. Comprehensive approaches to energy efficiency in the design of the new buildings will help to offset increased energy consumption and reduce potential increases in GHG emissions. UConn, through its Environmental Policy Advisory Council and related workgroups, will continue to update and implement the recommendations of its Climate Action Plan, which will also guide the design of the North Campus facilities.

The Proposed Action includes a number of design elements and mitigation measures that will reduce potential increases in GHG emissions associated with the roadway extension and the North Campus facilities. These include LEED Silver performance standards for building design and operation, sustainable site design measures and Low Impact Development approaches for stormwater management, and alternative transportation measures such as accommodations for pedestrians and bicycles as well as use of the existing campus shuttle system to reduce VMT's.

UConn will also consider other measures for the design, construction, and operation of the North Campus facilities to further reduce energy consumption and GHG emissions:

- Additional Transportation Demand Management measures:
  - Support extension/expansion of existing bus service connecting the campus with surrounding communities,

- Develop a parking management program to minimize parking requirements,
- Develop and implement a Marketing/Information Program that includes posting and distribution of ridesharing/transit information,
- Reduce employee trips during peak periods through alternative work schedules, telecommuting and/or flex-time,

- Small-scale on-site renewable energy generation (fuel cell technology, solar hot water, and solar electric) to augment the power demand on the campus-wide co-generation facility and off-site power sources.

4.10 Noise Impacts

4.10.1 Methodology

The Federal Highway Administration (FHWA) has established noise criteria, particularly for highway and traffic noise sources. Adverse impacts from highway or traffic noise sources occur when the estimated sound levels approach (within one decibel), meet, or exceed the Noise Abatement Criteria (NAC) set forth by the FHWA. The FHWA NAC represent exterior sound levels corresponding to various land use activities and are summarized in Table 4-11. When highway traffic associated with a proposed project is predicted to cause sound levels that approach, meet, or exceed the NAC as described above, noise mitigation measures must be considered.

The FHWA NAC Category A includes outdoor areas where quiet is an essential element in their intended purpose. Category B includes residences, schools, and libraries. The UConn campus is considered a Category B land use, and therefore receptors on the campus, as well as residential receptors off-campus, are also considered as Category B receptors.

Roadway noise is dependent on many factors: vehicle type and speed, number of vehicles, roadway surface and gradient, distance from the roadway to the receiver, ground surface (whether hard or soft), and shielding due to structures, sound walls, hills, the edge of a roadway, and earth berms between a receiver and the road. For example, increases in vehicle speed and/or traffic will increase noise levels.

Table 4-11. FHWA Noise Abatement Criteria

Activity Category	Leq(h) (dBA)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.

The unit typically used to describe sound levels perceptible to humans is the A-weighted decibel (dBA). The A-weighting attempts to approximate the human ear's sensitivity to sounds of varying frequencies and pitch. The

decibel is a logarithmic unit of measure. For instance, a 10-decibel change in noise level is perceived as a doubling or halving of loudness. A 3-dBA change would be barely perceivable for most people.

The Leq, or Equivalent Level, is the steady-state noise level for a given time period that has the same acoustic energy as the fluctuating noise levels observed during that time period. The Leq can be evaluated over different time periods including one hour (expressed as a one-hour Leq or Leq(h)) or 24 hours (expressed as a 24-hour Leq or Leq(24)).

Roadway surface and gradient will also affect traffic noise. Noise from rough and potholed surfaces can be three to four dBA higher than smooth seal-coated surfaces. A steeper road gradient will primarily affect the level of truck traffic noise. The North Hillside Road extension is not expected to generate higher noise levels than a typical roadway. Noise impacts from operation of a roadway are usually assessed by evaluating the total predicted noise level and evaluating differences between the existing and future noise levels. When evaluating operational noise increases in the environment, the following criteria are used as a basis for assessing impacts:

- Except during carefully controlled laboratory conditions, a change of 1 dBA is very difficult to perceive;
- In the outside environment, a 3 dBA change is considered barely noticeable;
- An increase of 5 dBA is readily perceived as "louder" and is generally required before a change in community response would be expected;
- A 10 dBA increase is perceived as a doubling of noise; and
- CTDOT defines an increase of 15 dBA as a "substantial increase."

The 1994 EIE reported noise levels at residential areas along the property boundary and analyzed traffic-related noise impacts using the then current FHWA Highway Traffic Noise Prediction Model for the no build and full build conditions at representative sites along the property boundary. The analysis showed that noise levels under full build conditions would remain below the applicable FHWA NAC. Due to the changes in background traffic growth and in the changes in the recommended FHWA noise prediction model since the 1994 EIE, updated noise modeling was performed for this FEIS.

4.10.2 Existing Conditions

The existing noise environment of the project area is dominated by traffic noise from Route 44 to the north, Route 195 to the east, North Eagleville Road to the south, and Hunting Lodge Road to the west. Other existing noise sources include aircraft flying overhead, cultivation of agricultural fields, and activities associated with the existing North Hillside Road (including traffic to and from the Charter Oak residential units and tennis courts).

Noise levels were measured in 1993 (Frederic R. Harris, 1994) at four locations considered to be representative of the most noise-sensitive abutting residences located to the north, east, and west of North Hillside Road. Results of the 1993 monitoring are shown in Table 4-12. Noise levels in the area would be expected to have increased since 1993 due to increased development and activity on the campus and surrounding area. Therefore, use of the measurements in Table 4-12 sets a conservative baseline for assessing changes over existing conditions (i.e., relative increase) to determine if future noise levels will significantly exceed existing levels.

Table 4-12. Measured Peak Hour Noise Levels

Location	Noise Levels (Leq(dBA))	
	Daytime	Nighttime
1 - Property line adjacent to cemetery	48[1]	46
2 - Eastern property line near Barlow residence on Route 195	56	52
3 - Property line near Rolling Hills Mobile Home Park	54[1]	48
4 - Property line near Celeron Square Apartments on Hunting Lodge Road	50	44

Source: Frederic R. Harris, 1994.
[1]Excludes measurements taken during tractor plowing and high wind gusts.

4.10.3 Potential Impacts

Potential noise impacts may occur as secondary impacts from project-generated vehicular traffic resulting from the development of the North Campus as well as direct noise impacts from traffic that will be rerouted as a result of the roadway extension. As discussed above, traffic noise impacts occur when noise levels due to the project approach or exceed the noise abatement criteria (NAC) identified in Table 4-11, or when future noise levels significantly exceed existing levels.

Future peak-hour noise levels were predicted using the Traffic Noise Model 2.5 (TNM). The model uses FHWA Vehicle Noise Emission Levels and was used to determine noise impacts associated with the proposed project. The software allows for a variety of modeling elements including traffic lanes, flow control devices, ground cover, topography, noise barriers, and traffic volume and speed information. Traffic data used in the model was based on volume and speed scenarios that would create the loudest hourly peak noise levels.

Projected peak hour traffic volumes of the proposed roadway extension and subsequent North Campus development were based on vehicle counts and traffic projections for Route 44 and North Hillside Road described in Section 4.6. The TNM noise model classifies vehicles into three categories - automobiles, medium trucks, and heavy trucks. Medium trucks are defined as cargo vehicles with two axles and six wheels, and heavy trucks are defined as cargo vehicles having three or more axles. Vehicle model input data are included in Appendix F.

A number of locations that may be affected by potential increase in traffic noise, termed receivers, were modeled. The modeled receiver locations, as well as other model input parameters for TNM, are provided in Appendix F. The receivers are the 1993 noise measurement locations along the property boundary. Note that traffic generation, and therefore traffic-generated noise impacts, would be similar under all the alternative roadway alignments and North Campus development scenarios considered.

Modeled noise levels for the 2030 Full Build scenarios are shown in Table 4-13. Noise levels associated with site-generated traffic in the 2030 Build scenario increase by approximately 0.3 to 2.2 dBA over existing conditions, with the location closest to the Rolling Hills Mobile Home Park (location #3) predicted to have the largest increase. These results are consistent with the findings of the 1994 EIE. All predicted 2030 Full Build noise levels are well below the 67 dBA noise abatement criteria for the Category B land use activity used by FHWA, even if existing noise levels have increased substantially since the 1993 noise measurements. For example, if the existing noise level at Receiver #3 has increased by 10 dBA since 1993, which would be a perceived doubling of noise, noise levels under the 2030 Full Build scenario would still remain below the FHWA noise abatement criteria for Category B land use activities.

Table 4-13. Predicted Peak Hour Noise Levels

Receiver Number	Location	Existing Conditions* (dBA)	2030 Full Build (dBA)	dBA increase	dBA Over Impact Level
1	Property line adjacent to cemetery	48	48.3	0.3	--
2	Eastern property line near Barlow residence on Route 195	56	56	--	--
3	Property line near Rolling Hills Mobile Home Park	54	56.2	2.2	--
4	Property line near Celeron Square Apartments on Hunting Lodge Road	50	50.5	0.5	--

* Daytime measured peak hour noise level.

Other than traffic-related noise, the primary potential noise sources associated with the North Campus development are equipment such as power transformers, HVAC units, and elevator banks. The equipment will be housed inside the proposed buildings and will not create a significant noise impact. Construction-related noise impacts are addressed in Section 4.24 of this document.

Under the No Action Alternative, increases in noise levels may accompany background traffic growth in the area. Additional residential development or community-support facilities may result in an increase in sensitive receptors.

4.10.4 Mitigation

No noise-related impacts that exceed the NAC values are anticipated. Therefore, no mitigation measures are proposed. It is the policy of the Connecticut Department of Transportation that no traffic noise barrier walls will be constructed along non-access roadways. Traffic noise barrier walls will only be considered along limited access highways.

4.11 Surface Water and Groundwater Resources

4.11.1 Methodology

Potential surface water and groundwater impacts were evaluated based upon information contained in the 1994 and 2001 EIEs, the UConn Water and Wastewater Master Plan (June 2007), recent studies conducted for Eagleville Brook and the Fenton River, information provided by the Connecticut Department of Public Health (DPH) regarding public drinking water supply wells in the vicinity of the study area, and information regarding public drinking water supply wells provided by the Eastern Highlands Health District (EHHD).

4.11.2 Existing Conditions

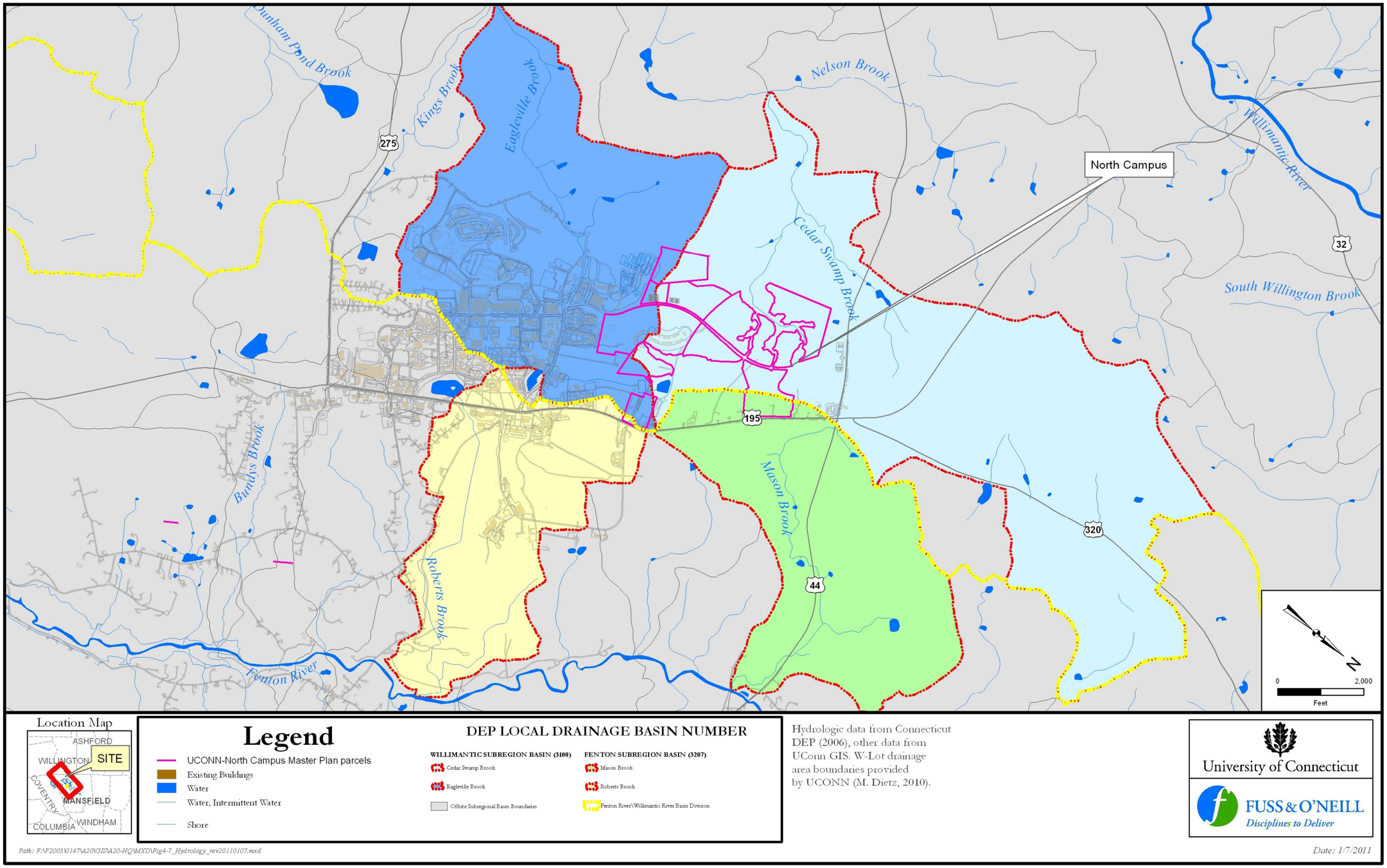
Surface Water

The North Campus study area is located near the watershed divide of two major river systems – the Fenton River to the east and the Willimantic River to the west (Figure 4-7). The North Hillside Road extension and the majority of the North Campus development parcels are located within the Cedar Swamp Brook drainage basin of the Willimantic River watershed. An unnamed intermittent tributary of Cedar Swamp Brook flows through the northern portion of the North Campus development parcels. Portions of Parcels F, K, H, G, and L are located within the Eagleville Brook drainage basin, which also ultimately drains to Eagleville Pond, an impoundment of the Willimantic River. Only a small portion of Parcel F (the W-Lot parcel along Route 195) and approximately the eastern half of Parcel B, also located along Route 195, lie within the Fenton River watershed. These two small areas drain to Roberts Brook and Mason Brook, respectively, both of which ultimately flow to the Fenton River.

Cedar Swamp Brook upstream of its confluence with the unnamed intermittent tributary that flows through the North Campus area is classified by the State of Connecticut as Class A (CT DEP, 2002). The unnamed tributary upstream of the former UConn landfill is also classified as Class A. Class A surface waters are presumed to be suitable for the following designated uses: habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture. Downstream of the former landfill, the unnamed tributary is classified as Class B/A, which indicates that the water body may not be meeting water quality standards or one or more of the designated uses, presumably due to impacts from the nearby former landfill. The CT DEEP goal for such inland surface waters is attainment of Class A water quality criteria and attainment of Class A designated uses (CT DEP, 2002). The CT DEEP's most recent assessment results contained in the *2011 State of Connecticut Integrated Water Quality Report* indicates that Cedar Swamp Brook has not been assessed for aquatic life or recreation uses.

Eagleville Brook, from its headwaters near the North Campus to its confluence with Eagleville Pond and the Willimantic River, has a surface water classification of B/A, which means that Eagleville Brook is not meeting the goal of Class A water quality criteria and attainment of Class A designated uses. It has been determined through biological monitoring by the CT DEP that aquatic life use goals are not being met in Eagleville Brook. The CT DEP has also conducted fish population surveys and macroinvertebrate surveys in Eagleville Brook and has observed low fish densities, large amounts of habitat unoccupied by fish, stretches of Eagleville

Figure 4-7. Drainage Basins and Surface Water Resources



Brook upstream of Separatist Road almost devoid of fish, sediment deposition from stormwater runoff impacting in-stream fish habitat, and impacts to benthic communities. As a result, Eagleville Brook was listed as an impaired water body by the CT DEP and was identified for development of a Total Maximum Daily Load (TMDL).

A TMDL study report was issued by the CT DEP in February 2007. The report identified the most probable cause of the aquatic life impairment in Eagleville Brook as a complex array of pollutants transported by stormwater. Since the impairment cannot be attributed to a specific pollutant, impervious cover (IC) was used as a surrogate measure of the complex array of pollutants transported by stormwater. A small portion of the North Campus development area is located within the Eagleville Brook watershed (Figure 4-7). For the segment of Eagleville Brook on the UConn campus, the TMDL study identified a goal of 59% reduction in impervious cover (compared to current conditions), accomplished by improved stormwater management within the watershed (CT DEP, 2007). This TMDL goal does not preclude new development, but instead means that new development should implement stormwater management controls to maintain current site hydrology, resulting in effectively no net increase in impervious cover since runoff volume, peak flows, and groundwater recharge will remain the same post-development.

Mason Brook and Roberts Brook, which are tributaries to the Fenton River, both have surface water classifications of AA. Class AA surface waters are designated for existing or proposed drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, and water supply for industry and agriculture (CT DEP, 2002). The Fenton River near the confluence with Mason Brook and Roberts Brook is classified as Class B/AA, which means that the Fenton River may not be meeting Class AA water quality criteria or associated designated uses. The water quality goal of such inland surface waters is attainment of Class AA water quality criteria and attainment of Class AA designated uses.

UConn withdraws water using water supply wells placed in a stratified drift aquifer located along a one-mile section of the Fenton River between Mason Brook and Roberts Brook. The State of Connecticut Office of Policy and Management (OPM), in their approval of the 2001 EIE, required a study to determine whether and how water withdrawals from the University's Fenton River water supply wells affect the fisheries habitat of the Fenton River adjacent to the well field.

A study was conducted between 2003 and 2006 to investigate the relationships between fish habitat and in-stream flow for a section of the Fenton River in the vicinity of the UConn well field. The study of the fish habitat revealed several habitat impact thresholds related to in-stream flows during well field pumping. For flows greater than approximately ten cubic feet per second (cfs) as measured at Old Turnpike Road, there was no discernable effect of well field pumping on the quantity of fish habitat in the vicinity of the well field. The habitat starts to become noticeably reduced when the Fenton River flow is somewhat less than seven cfs as measured at Old Turnpike Road. The degree of habitat reduction increases as flows decrease further to four cfs as measured at Old Turnpike Road. When the flow in the Fenton River decreases to three cfs, habitat is quite significantly reduced by pumping of the well field (Warner *et al.*, March 2006). The study recommends various management measures for operation of the Fenton River well field to preserve fish habitat during times of low flow in the Fenton River.

The Fenton River also feeds the Willimantic Reservoir, which is a community water supply that provides drinking water to approximately 23,000 people in the Town of Windham/Willimantic. Sections 8-3i and 22a-42f of the State Statutes require applicants to provide to all water companies written notice of an application, petition, request or plan if the proposed project is located within the watershed of their public drinking supply.

Groundwater

The quality of groundwater beneath a majority of the North Campus study area is classified by the CT DEEP as GA (Figure 4-8). Class GA groundwater is groundwater within the area of existing private water supply wells or an area with the potential to provide water to public or private water supply wells. Class GA groundwater is presumed suitable for drinking or other domestic uses without treatment (CT DEP, 1996). The entire roadway corridor for the North Hillside Roadway extension and the North Campus development parcels C, D, E, G, H, J, and K are located entirely within areas having a GA groundwater quality classification.

Portions of North Campus development parcels A, B, and F are within areas classified as GAA. Class GAA groundwater is groundwater used or which may be used for public supplies of water suitable for drinking without treatment; groundwater in the area that contributes to a public drinking water supply well; and groundwater in areas that have been designated as a future water supply by a water utility. The eastern portion of Parcel B and the far southeast corner of Parcel F are within the Fenton River watershed, which is a public water supply watershed. The western portion of Parcel A lies within the area of contribution to the supply wells that serve the Rolling Hills Mobile Home Park.

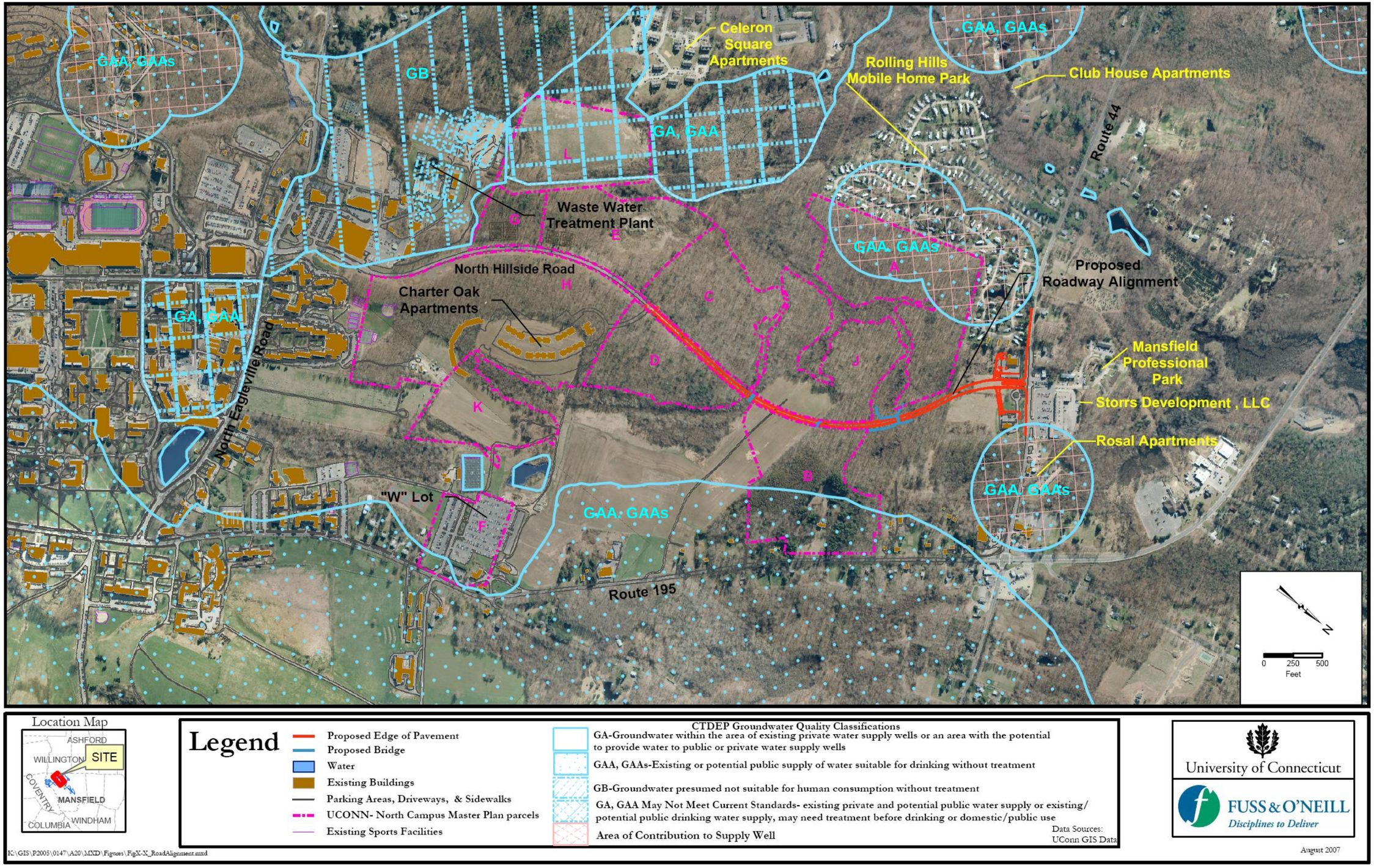
Groundwater beneath Parcel L, which contains the former UConn solid waste landfill and former chemical pits, and downgradient areas are classified by the CT DEEP as "Class GA, GAA – May Not Meet Current Standards." Such groundwater may not meet the GA or GAA water quality standards, which presume that groundwater is suitable for drinking without treatment. However, CT DEEP's goal is to restore groundwater in this area to background quality.

Groundwater beneath areas south of the former UConn landfill is classified as Class GB. Class GB groundwater is groundwater within historically highly urbanized areas or areas of intense industrial activity and where public water supply service is available. Such groundwater may not be suitable for human consumption without treatment due to waste discharges, spills or leaks of chemicals or land use impacts. These areas include the UConn wastewater treatment plant and other UConn facilities located north of North Eagleville Road.

Drinking Water Supplies

UConn operates a drinking water supply system that serves the Storrs campus and some adjacent areas. Source waters for this system include the Willimantic River Wellfield in northwest Mansfield and the Fenton River Wellfield in northeast Mansfield. Water from the Willimantic Wellfield supplies water to both the Depot Campus and the Main Campus, while the Fenton River Wellfield supplies water to the Main Campus. The average daily demand on the water system for the two campuses is 1.36 millions gallons per day (mgd) with a peak demand of 2.2 mgd. Current registered water diversions include 2.3077 mgd from the

Figure 4-8. Groundwater Resources



Willimantic River Wellfield and 0.844 mgd from the Fenton River Wellfield, for a total available supply of 3.1517 mgd. Water quality of the Willimantic and Fenton River Wellfields currently meet all state and federal standards for public drinking water supplies. The system has been operated since 2006 by New England Water Utility Services, Inc. (Milone & MacBroom, 2007).

The University is estimated to consume 85% of daily production. The remaining water is consumed as domestic use by others. The Town of Mansfield does not operate a drinking water supply system, nor is it part of a regional water system. As such, the UConn drinking water system includes service connections to adjacent group residences, Town of Mansfield municipal buildings, and single-family residences near campus.

The majority of off-campus facilities and dwellings in the vicinity of the proposed project that are not supplied by the UConn water system are supplied by private, community, non-community transient, and non-community non-transient well systems. These systems are defined by CT DPH as follows:

- Community Water System is a public water system that serves at least 25 residents throughout the year.
- Non-Community Water System is a public water system that serves at least 25 residents for at least 60 days f the year and is not a community water system or seasonal water system.
- Non-Transient Non-Community Water System is a public water system that is not a community system and that regularly serves at least 25 of the same persons for six months per year.
- Seasonal Water System is a public water system that operates on a seasonal basis for six months or less per calendar year.
- Transient Non-Community Water System is a non-community water system that does not meet the definition of a non-transient non-community water system.

Table 4-14 presents a summary of the small public water supply systems located in the vicinity of the proposed project. Figure 4-8 also depicts the locations of several of these systems relative to the project site.

Table 4-14. Summary of Community, Non-Community Transient, and Non-Community Non-Transient Wells Near the North Campus (Source: CT DPH)

Well Name/Location	Type	Estimated Population Served	Service Connections
Carriage House Apartments	Community	196	64
Club House Apartments	Community	115	44
Hunting Lodge Apartments	Community	115	40
Rolling Hills Mobile Home Park	Community	300	189
Renwood Condominiums	Community	190	76
Holiday Mall	Transient non-community	25	1

Well Name/Location	Type	Estimated Population Served	Service Connections
Husky Extra Mart	Transient non-community	25	1
Kathy-John's Ice Cream	Transient non-community	25	1
The Fanatic Sports Bar (NY Pizza Company)	Transient non-community	25	1
Zenny's Restaurant	Transient non-community	25	1
Goodwin Elementary School	Non-transient non-community	340	1
Mansfield Professional Park	Non-transient non-community	100	4
Storrs Development LLC	Non-transient non-community	30	1
Rosal Apartments (Four Corners)	Community	25 or 40*	Unknown

*Values reported in 2004 Organics Report (CT DPH 2005) and the 1994 EIE, respectively.

4.11.3 Potential Impacts

The proposed extension of North Hillside Road will create additional impervious surfaces, which has the potential to affect the surface and groundwater hydrology within the study area and receiving water bodies, including increased surface runoff, reduced groundwater recharge, and increased stormwater and nonpoint source pollutant loadings. Additionally, the associated development of the North Campus has the potential for similar water quantity and quality impacts, as well as increased water demand on the UConn water supply system. The following sections describe the anticipated impacts on surface water and groundwater resources as a result of the proposed project. Stormwater impacts and a proposed conceptual stormwater management system for the North Campus are further described in Section 4.12.

Under the No-Build alternative, no additional development would occur on the North Campus, and impervious cover on the North Campus would remain unchanged. The surface and groundwater hydrology of the project site would also remain unchanged from existing conditions.

4.11.3.1 Water Quantity and Future Projected Water Demand

The proposed development of the North Campus includes technology/research, recreational, and academic land uses that will impose a water demand on the UConn water supply system. The increased water demand associated with these land uses is estimated to be approximately 90,000 gallons per day, in addition to approximately 45,000 gallons per day consumed by the existing Charter Oak residential units[3]. The projected North Campus water demand is accounted for in the "committed service" in the 2007 Water and Wastewater Master Plan

[3] From 2007 Water and Wastewater Master Plan. Charter Oak Consumption based on 2004 metered consumption.

(Milone & MacBroom, 2007). These projects include the development of North Campus that is the subject of this FEIS, development projects at Downtown Storrs, a planned business area along North Eagleville Road/King Hill Road, new development at the Depot Campus, and proposed student housing known as Keystone Development. The total current committed demand estimate for UConn is 404,600 gpd.

The 2007 Water and Wastewater Master Plan also includes future water demand estimates for areas identified in the Mansfield Water Supply Plan and additional areas identified in Mansfield's Plan of Conservation and Development (uncommitted service). These areas consist of proposed and existing development projects, a number of which are existing uses that currently include small public well systems, including the Mansfield Four Corners planned business area, Rosal Apartments, Carriage House Apartments, Club House Apartments, Hunting Lodge Apartments, Rolling Hills Mobile Home Park, and residential parcels off Hunting Lodge Road and portions of South Eagleville Road and Separatist Road. The total estimated uncommitted water demand identified in the 2007 UConn Water and Wastewater Master Plan is 170,600 gpd.

The 2007 Water and Wastewater Master Plan also references areas that are called out for future development in the Mansfield Plan of Conservation and Development but were not assigned demands in the Mansfield Water Supply Plan. These areas include Orchard Acres Apartments off Separatist Road, Knollwood Acres Apartments, an area of proposed medium- to high-density age-restricted residential housing, parcels north of the Rolling Hills Mobile Home Park, and parcels near Hunting Lodge Apartments. The plan also assumed the expansion of existing residential areas, including the Hunting Lodge Apartments, Carriage House apartments, and Celeron Square Apartments. The 2007 Water and Wastewater Master Plan estimates total demand from these areas to be 118,900 gallons per day.

Table 4-15, from the 2007 Water and Wastewater Master Plan, summarizes existing and future potential water demands for the University. This data indicates that the University system currently has an available margin of water for average day and peak day monthly conditions using its registered diversion withdrawals at the Fenton and Willimantic River wellfields. This amount is above and beyond what is needed to serve existing and future projected on-campus demands, committed off-campus water demands, and uncommitted off-campus water demands, while maintaining an adequate margin of safety. However, intermittent seasonal low flow conditions have the potential to cause voluntary limits on withdrawals to rates that are less than the registered diversions as described below (Milone & MacBroom, 2007).

Table 4-15. Existing and Potential Future Water Demand vs. Supply

Parameter	Existing Conditions	Existing Plus Future Committed Demands	Existing Plus Future Committed & Uncommitted Demands
Average Day Demand	1.36 mgd	1.76 mgd	2.05 mgd
Average Day Demand + 15% Margin of Safety	1.56 mgd	2.02 mgd	2.36 mgd
Peak Month Demand	1.55 mgd	2.15 mgd	2.50 mgd
Peak Month Demand + 15% Margin of Safety	1.91 mgd	2.47 mgd	2.88 mgd
Registered Diversion	3.15 mgd	3.15 mgd	3.15 mgd

Source: 2007 Water and Wastewater Master Plan, Milone & MacBroom, 2007

The University has modified withdrawal protocols at the Fenton River wellfield to incorporate recommendations of the Fenton River study. These are presented in Table 4-16, as summarized from the Fenton River study report and expanded upon in the 2007 Water and Wastewater Master Plan. UConn has committed to meeting these constraints.

Table 4-16. Fenton River Withdrawal Constraints

Flow at Old Turnpike Road	Reduced Withdrawal	Months that Flow May Drop Below Threshold
5-6 cfs	0.633 mgd	May-June
4-5 cfs	0.422 mgd	June-July
3-4 cfs	0.211 mgd	July-September
<3 cfs	0 mgd	August-September

Source: 2007 Water and Wastewater Master Plan, Milone & MacBroom, 2007

In July 2007 and July 2010, flow in the Fenton River dropped below 3 cfs and withdrawals from the Fenton wellfield voluntarily ceased in accordance with the recommendations of the Fenton River study report. The 2007 decline in streamflow was the result of a typical seasonal decline exacerbated by a regional drought (NEWUS, 2008). In July 2010, streamflow in the Willimantic River had also reached thresholds for voluntary conservation measures as outlined in the *Report of the Willimantic River Study* (Milone & MacBroom, 2010). In response to these reduced streamflow levels, the University implemented Water Conservation Alerts on August 6, 2007 and July 6, 2010, which involves requests for voluntary water conservation measures.

In response to ongoing drought conditions and increased demand associated with the start of the semester, a Drought Watch and associated mandatory conservation measures were implemented on September 5, 2007. The Drought Watch was lifted on October 29, 2007 after a period of increasing precipitation and cooler temperatures. This response was consistent with the 2007 Water and Wastewater Master Plan. Water usage in August and September 2007 was down approximately 11% and 5%, respectively, compared with 2006. Since late August through October is typically the peak demand period for the University water system, the usage reductions enabled the University to safely meet on and off-campus demand needs (NEWUS, 2008).

The 2007 Water and Wastewater Master Plan also describes a discrepancy in the safe yield of the Willimantic River Wellfield. Modeled, sustainable yield at the Willimantic River wellfield is 1,400 gpm (2.016 mgd), whereas the current total authorized diversion at this wellfield is 1,600 gpm (2.3077 mgd). An analysis of the impact of the UConn Willimantic River wellfield on instream flows and subsequent fisheries habitat was completed in June 2010. Goals of the analysis includes determining the relationship between the magnitude and timing of groundwater withdrawals on instream flows in the river and modeling selected water-management scenarios to optimize water withdrawals while minimizing impacts on river flow and instream habitat. The study found that at the maximum legal withdrawal of 2.3077 mgd, the withdrawal from the Willimantic wellfield is approximately 60% of the lowest instream flows believed to have occurred at the wellfield. The relationship between wellfield withdrawals and reduced groundwater discharge/induced infiltration is relatively immediate and direct. Due to the shape of the aquifer, relocation of wells would result in minimal benefit to instream flow. Consequently, additional water conservation measures appear to be more cost effective than moving or replacing infrastructure to reduce effects on instream flow (Milone & MacBroom, 2010).

Under normal flow conditions with all demands realized, including the proposed development of the North Campus, the University would have an adequate amount of water under both average and peak month conditions with the full registered withdrawals from the Fenton and Willimantic River wellfields. Should all future demands be realized and assuming no further efficiency gains from the University's water conservation efforts, supply deficits could coincide with annually-occurring low seasonal stream flows and could require additional water supply sources. One viable option for additional water is the reuse of reclaimed effluent from the University's wastewater treatment plant. The plant effluent provides a single central location of a substantial flow of water that can be further treated to produce water for non-potable uses on campus. An engineering feasibility study was completed, and design is in progress. Current plans consist of a reclaimed water treatment plant capable of treating up to 1.0 million gallons per day (mgd) to supply the processing needs of the UConn Central Utilities Plant (CUP) and to irrigate campus grounds and athletic fields. The reclaimed water facility is expected to be operational by March 2012. The use of non-potable reclaimed water to address the utility plant and irrigation water demands is expected to off-set the amount of potable water that would have otherwise been used in those applications.

4.11.3.2 Water Quality

Surface Water

The proposed extension of North Hillside Road and development of the North Campus will increase the amount of impervious area at the project site. If unmitigated, this increase in impervious area could result in a number of hydrologic changes at the site that could impact the water quality of the receiving water bodies. Development of the project site will also introduce nonpoint source pollutants and stressors. Potential sources include stormwater runoff from the new roadway segment, driveways and parking lots, and loading/unloading operations associated with the proposed land uses.

While stormwater quality impacts and specific stormwater management measures for the project are described further in Section 4.12 of this document, the proposed project was also reviewed in the context of impervious cover and associated stream water quality and aquatic life impacts.

Impervious cover (IC) is a description of land cover such as roads, parking lots, and building rooftops that changes the natural dynamics of the hydrologic cycle, and has become a variable of great interest as a measurement of human disturbance as it relates to aquatic communities in streams. Studies from many areas of the country have documented that streams become degraded and are unable to support sensitive taxa of fish and aquatic macroinvertebrates at higher IC levels. A recent review of IC by the Center for Watershed Protection (http://www.cwp.org) noted that several stream quality indicators decrease as IC levels increase. In general, this trend becomes pronounced within the 10-25% IC range and impairment is almost inevitable when the watershed IC exceeds 25%. These research findings have been integrated into a general watershed planning model known as the impervious cover model (ICM) (CWP, 2003).

The proposed extension of North Hillside Road and development of the North Campus will result in approximately 35 acres of new impervious cover on the North Campus relative to current conditions. This translates to an approximately 2% increase in IC of the Cedar Swamp Brook subwatershed and an approximately 1% increase in IC of the Mason Brook subwatershed. Existing IC in the Cedar Swamp Brook and Mason Brook subwatersheds has been estimated at 5-10% and 0-5%, respectively, based on 2002 land cover data for the subwatersheds (UConn Center for Landuse Education and Research, http://clear.uconn.edu/projects/landscape/analysis/calcap.htm). IC of 10% or less is generally indicative of healthy stream systems that have been minimally impacted by human activity. Potential impacts associated with increases in IC as a result of the proposed project will be mitigated by the project design, including the preservation of wetland/watercourse buffers and the proposed stormwater management system, as described elsewhere in this document.

The number of parking spaces necessary for the North Campus development was determined using a parking ratio of 3.5 spaces per 1,000 square feet of building floor space. Parking ratios are typically determined based on local zoning and represent the minimum number of spaces needed to accommodate the highest hourly parking rate at a site. The Town of Mansfield requires a minimum parking ratio of 4 spaces per 1,000 square feet of building floor space for the types of uses proposed for the North Campus. A lower parking ratio of 3.5 was selected to reduce the development footprint and amount of IC associated with the North Campus concept development.

Only a small portion of the proposed North Campus development (less than 1/2 acre on Parcel G) is located within the Eagleville Brook subwatershed. As described in Section 4.1.2, the proposed stormwater management system for the Parcel G development will maintain existing peak rates of runoff, as well as runoff volume and groundwater recharge through infiltration of roof runoff. Therefore, the potential impacts of new impervious cover on Parcel G, as well as the remainder of the North Campus, will be effectively mitigated by implementing new stormwater management controls for the North Campus development sites, which is consistent with the Eagleville Brook IC TMDL objectives discussed in Section 4.11.

Groundwater

The western portion of Parcel A lies within the area of contribution to the supply wells that serve the Rolling Hills Mobile Home Park. Under the preferred North Campus concept development scenario, the previously proposed development on Parcel A has been eliminated, preserving the parcel through a conservation easement. The eastern portion of Parcel B is located within the Fenton River watershed, which is a public water supply watershed. Under any of the project alternatives, the proposed development in this area could potentially impact groundwater quality resulting from infiltration of untreated stormwater runoff or release of chemicals or other hazardous materials to the environment.

No further development is proposed on Parcel F, a portion of which is also located within the Fenton River watershed. Therefore, no groundwater impacts associated with Parcel F are anticipated.

The proposed farmland replication site at the Depot Campus is located within a Level A Aquifer Protection Area associated with the Willimantic Wellfield. Agricultural activities regulated pursuant to section 22a-354m(d) of the Connecticut General Statutes are exempt from the statutory requirements of the CTDEP Aquifer Protection Area Program and associated land use regulatory controls. UConn will operate and maintain these agricultural fields in accordance with campus-wide agricultural best management practices.

4.11.4 Mitigation

Water Quantity and Demand

UConn will continue to follow the Fenton River wellfield withdrawal protocol recommendations outlined in the Fenton River study and the 2007 Water and Wastewater Master Plan, as dictated by stream flow conditions. The *Report of the Willimantic River Study* (Milone & MacBroom, 2010) also recommended demand-based water conservation recommedations that incorporate Willimantic River streamflow values that trigger voluntary or mandatory water conservation actions under the drought response plan. The following factors are expected to mitigate the current and potential withdrawal reductions:

- The build-out of parcels along North Hillside Road, or any other campus developments with potential impacts to water demand, will not happen all at once and is likely to occur over a 20-30 year time frame. Each new development along North Hillside Road will require at least a CEPA Comparative Evaluation. The Comparative Evaluation will include a refined analysis of parcel-specific water demand with respect to available supply at the time of the proposed development.

- Any new facilities built along North Hillside Road (and anywhere else on-campus) will be held to a high standard of water conservation through the use of high-efficiency fixtures and other features consistent with UConn's Sustainable Design & Construction Policy.

- The average daily demand for University water has steadily declined due to infrastructure and operational improvements, as well as an increased awareness among the water users of the importance of conservation. Average annual daily demand dropped by more than 218,000 gpd from 2005 to 2008. The average daily demand for the peak month (September) for the same period also dropped by more than 350,000 gpd. It should be noted that neither the most recent UConn Water Supply Plan nor the UConn Water and Wastewater Master Plan account for the upgrades that have resulted in the decrease in water consumption. In fact, the Water Supply Plan anticipated that the demand for University water would increase by 400,000 gpd from 2003 to 2008.

- Both the University and the Town of Mansfield are actively pursuing additional sources of supply to meet the Storrs area's long term water supply requirements. The University is currently assessing reclaimed wastewater for non-potable uses to help off-set the demand for potable water. The reclaimed water initiative is being pursued aggressively and, if permitted and financed, will essentially provide even greater capacity and operational flexibility for meeting future water supply needs.

UConn is developing a comprehensive wellfield management plan as part of its water supply plan update, which is anticipated to be completed by May 2011. This wellfield management plan will be based on the recommendations of the Fenton and Willimantic River Instream Flow studies. When completed, the comprehensive wellfield management plan protocols will be followed.

Water Quality

The proposed stormwater management design for the North Hillside Road extension and the North Campus development is consistent with the recommended strategies for implementation of the Eagleville Brook impervious cover TMDL, which include (CT DEP, 2007):

1) *Reducing impervious cover where practical* – the project design includes a reduced parking ratio, use of structured and shared parking, reduced sidewalk width and sidewalks on only one side of the street, and combination shoulder and bike lane to reduce the width of the roadway

2) *Disconnecting impervious cover from the surface waterbody* – the project design includes the use of a variety of practices to infiltrate runoff from impervious surfaces such as bioretention, water quality swales, infiltration of roof runoff, and level spreaders. As indicated above, pervious pavement will also be evaluated for use at the individual North Campus development sites and the bituminous pedestrian sidewalk based on technical feasibility, maintenance, and cost.

3) *Minimizing additional disturbance to maintain existing natural buffering capacity* – the preferred development concept preserves significant undisturbed, natural buffers to the on-site wetlands.

4) *Installing engineered BMPs to reduce the impact of impervious cover on receiving water hydrology and water quality* – the project design includes a combination of centralized and LID

stormwater management measures using a "treatment train" approach to maintain pre-development site hydrology and water quality.

Design measures to address stormwater quality for the roadway extension and subsequent development of the North Campus (described in Section 4.12) will be reviewed as part of the state and federal wetland permitting process, the CT DEEP Flood Management Certification and 401 Water Quality Certification permit programs, and the CT DEEP Construction Stormwater General Permit.

Construction-phase best management practices will also be implemented to reduce the potential for impacts on nearby public drinking water supply wells and surface water supplies. UConn will follow the requirements of Section 19-13-B51(d) of the Regulations of Connecticut State Agencies for well and sewer line separating distances. Additionally, UConn will implement appropriate construction site best management practices prior to the initiation of activities that could impact public water systems, as required by applicable CT DPH and CT DEEP regulations.

4.12 Stormwater Management

4.12.1 Methodology

Potential impacts from stormwater runoff associated with the construction and operation of the North Hillside Road Extension and the associated North Campus development were evaluated based on information contained in the 1994 and 2001 EIEs, which has been updated to reflect the current proposed conceptual design of the roadway and North Campus development as well as current stormwater management design guidance that reflects an integrated approach to stormwater quality and quantity management. This section includes a conceptual stormwater management plan for the roadway and North Campus development to show potential secondary stormwater impacts of the North Campus at full-build out and an overall management strategy to satisfy stormwater quantity and quality objectives. A copy of the conceptual stormwater management plan for the North Campus is included in Appendix G of this document.

4.12.2 Existing Conditions

The project site currently consists of seven distinct drainage areas within the proposed North Campus development parcel boundaries and four major drainage areas along the proposed roadway corridor. The majority of these drainage areas ultimately discharge to the large wetland complex west of the proposed development sites. A portion of the easternmost development parcel discharges to a wetland in the northeastern portion of the project site. In addition, the southernmost drainage area discharges to the southwest as overland flow, as depicted on the existing conditions drainage plan in Appendix G. The existing conditions watershed analysis for the project site is conceptual in nature and includes the following assumptions:

- Times of concentration were estimated between 0.24 hours and 0.4 hours based on site topography.

- Type C soils were assumed for the entire site, based on current soil mapping available from the USDA Natural resources Conservation Service, and were considered a woods/grass combination in fair condition for the purpose of the analysis.

The stormwater drainage system for the existing portion of North Hillside Road consists of a traditional collection system of catch basins, manholes, stone lined drainage swales on the upgradient side of the road, and a drainage pipe network that discharges to the adjacent wetlands. A dry detention basin located along the west side of North Hillside Road, near its terminus, serves the Charter Oak residential units. An additional stormwater basin near the tennis courts on the west side of North Hillside Road serves the tennis courts and surrounding area and ties into the drainage swale that receives discharge from a portion of North Hillside Road.

The University's Sustainable Design & Construction Policy, which was adopted in 2007, requires new building construction or renovation projects entering the pre-design planning phase to meet the Leadership in Energy & Environmental Design (LEED) Silver rating as a minimum performance standard. Key objectives of the Sustainable Design & Construction Policy are to reduce development stormwater runoff impacts on the quantity and quality of the area's water resources, prevent any increase in the rate of stormwater flow leaving the site, and provide for infiltration of stormwater runoff on both greenfield and previously disturbed sites by implementing the following strategies:

- Promoting permeable paving technologies in lieu of the conventional impervious surfaces for drives and parking lots. Perform a life-cycle cost analysis that recognizes the long-term maintenance costs with the resulting benefits when choosing the appropriate system.
- Collecting rainwater from project roofs, where feasible, and storing it for reuse or slow release.
- Implement landscaping that has a higher rate of absorption than conventional turf grass.
- Reduce the need for stormwater utilities and detention basins. Introduce stormwater bio-retention basins, swales, or rain gardens within the project site or within the adjacent campus or clusters of buildings.
- Using a vegetated roof for flat or low sloping roofs.
- Incorporate on-site stormwater treatment and infiltration to meet the guidelines of the Connecticut Department of Environmental Protection *Connecticut Stormwater Quality Manual*. Strategies for consideration, in order of preference, for implementing this goal include:
    - Incorporating bio-retention areas, rain gardens, vegetated basins, vegetated swales, constructed wetlands, etc. on site to treat stormwater.
    - Including on-site mechanical filtration systems to treat stormwater to meet the standards as defined in the manual.

4.12.3 Potential Impacts

The stormwater management system for the roadway extension was previously analyzed and designed to accommodate runoff from the roadway corridor, as described in the Preliminary Design Report, University of Connecticut, North Hillside Road Extension, State Project 77-

H049 (Fuss & O'Neill, January 2006). Consistent with the previous design, the proposed stormwater management system for the roadway corridor consists of combined water quality swales/stormwater management basins along the western side of the roadway. The water quality swales/stormwater management basins are depicted on the proposed conceptual stormwater management plan (Figure 4-9).

Along the North Hillside Road extension are proposed development sites with various buildings, driveways, and parking areas. The proposed sites vary in size from 1.8 to 24.8 acres. Inland wetlands are located sporadically throughout the development sites as described in Section 4.13 of this document. The assumptions made for the proposed conditions analysis are as follows:

- Type C soils were assumed for the entire site, as described previously. The denoted slope limits on the conceptual North Campus development plan were assumed to be the extent of clearing limits and replanting or reseeding (i.e., limit of disturbance). The remaining portions of the development sites were assumed to remain in their current condition.

- Times of concentration were estimated at 5 minutes for all development sites. A time of concentration of 5 minutes is a conservative approach to analyzing the stormwater runoff. While some of the proposed sites are larger, the drainage areas have been limited to pavement and pipe systems, while undeveloped portions are considered overland flow and time of concentrations are adjusted accordingly.

4.12.3.1 Drainage Areas and Proposed Controls

The proposed condition drainage areas are denoted on the proposed conceptual stormwater management plan in Figure 4-9 as Areas A through G. For the purposes of this evaluation and based on the existing topography, areas A, B, and part of C are considered separate drainage areas with distinct design points. Drainage areas D and E are combined into a single design point. Drainage areas F and G are also combined into a single design point. Stormwater runoff from nearly all of the proposed North Campus development will discharge to the Willimantic River subwatersheds, with the exception of less than ½ acre of building roof area on Parcel G, which will discharge to the Eagleville Brook subwatershed.

The stormwater management systems for the proposed build-out of the North Campus will consist of a combination of centralized and lot-based (also referred to as distributed or Low Impact Development controls) stormwater management approaches including stormwater basins and sediment forebays, underground detention systems, swirl concentrators, level spreaders, water quality swales/biofilters, bioretention/rain gardens, vegetated roof systems, permeable pavement, and infiltration systems. The new development in each drainage area will be served by primary treatment measures or a combination of primary and secondary treatment measures, consistent with the guidelines contained in the *Connecticut Stormwater Quality Manual*. Non-structural source controls and pollution prevention measures (street and parking lot sweeping, catch basin cleaning, drainage system and stormwater treatment system operation and maintenance, etc.) will also be implemented at the proposed development sites during their operation.

Treatment of roof runoff will be considered using vegetated roof systems, and roof runoff will be considered for infiltration via permeable pavement, bioretention, or underground infiltration systems where soil and groundwater conditions permit. Additional information is required to determine the suitability of the soils in these areas. In the event that infiltration is not suitable for these locations, roof runoff will be directed to water quality swales and level spreaders or filtration bioretention systems (bioretention/rain gardens with underdrains), both of which are considered primary treatment measures.

For North Campus developments that are considered hot spot land uses (land uses with higher potential pollutant loads such as research and development facilities with hazardous chemical storage), the stormwater management design shall consider source controls, pollution prevention, pretreatment, and appropriate spill containment measures such as shut-off valves in the event of a hazardous material spill or release.

Stormwater basins will be lined if there is less than a 2-foot separation between the bottom of the basin and seasonally high groundwater (SHGW). Although the proposed stormwater basins are not specifically designed as infiltration systems, some amount of infiltration that would occur through the bottom of the basins is beneficial in terms of groundwater recharge, runoff volume reduction, and pollutant reduction provided that adequate separation/treatment exists between the bottom of the basin and SHGW and appropriate pretreatment measures are used.

Drainage Area A

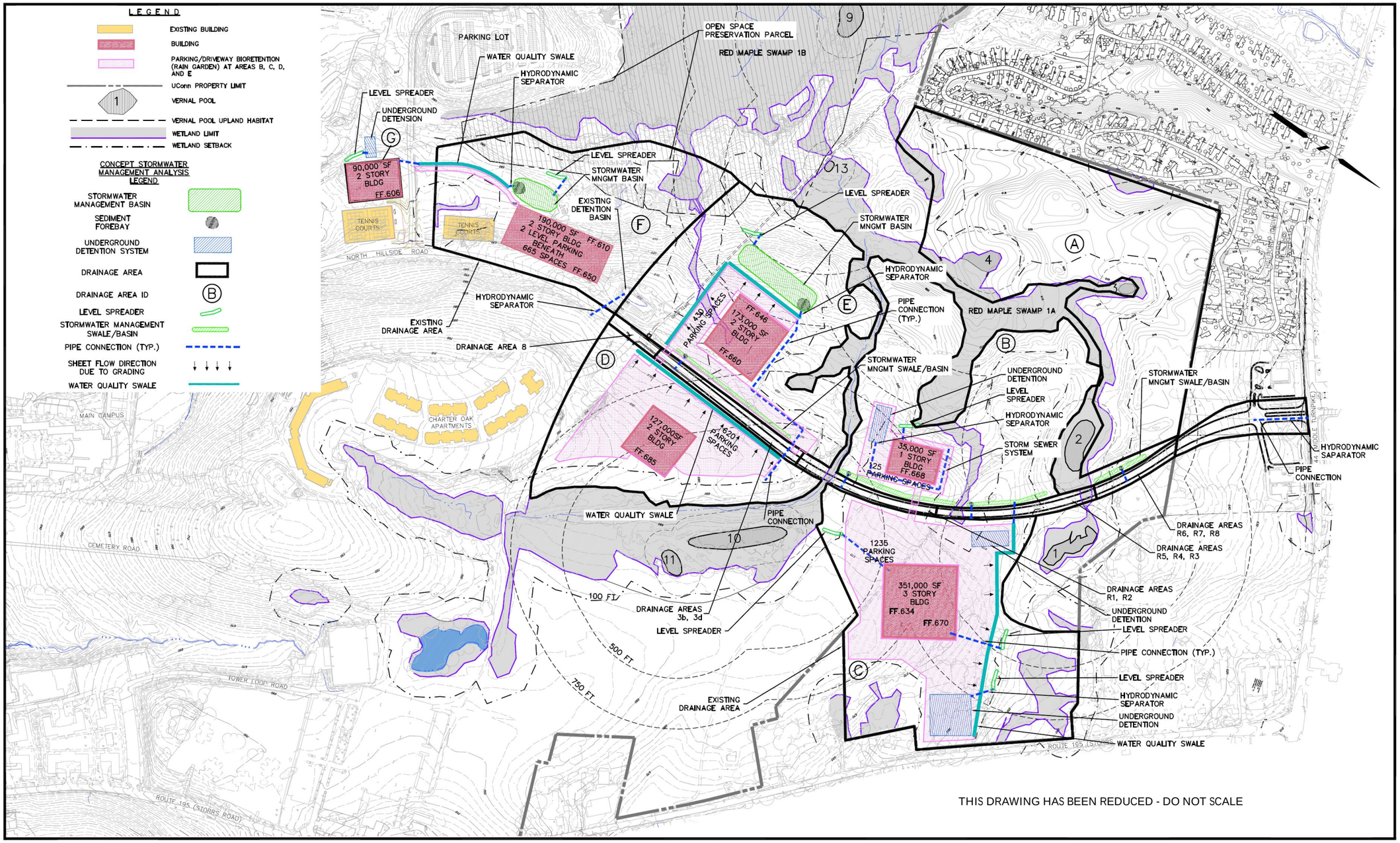
Drainage Area A corresponds to Parcel A, which will remain undeveloped through a conservation easement.

Drainage Area B

Drainage Area B corresponds to Parcel J and is approximately 20.9 acres. The proposed 35,000 square foot building within this drainage area has an associated parking area of 125 parking spaces. The development site is located in a former agricultural field and is flanked by two fingers of the adjacent wetland complex. The stormwater in this area would be collected in catch basins and conveyed through a hydrodynamic separator to an underground detention system. The system discharge would be released to a level spreader. Water quality swales are not practical in this drainage area since the available land area is small. Bioretention areas would be included in the parking lot design to the extent feasible given the limited land area in this portion of the development site. If soil conditions permit, the bioretention areas may be designed with infiltration to further reduce runoff volume, peak flows, and pollutant loadings.

The stormwater management system proposed for this drainage area consists of primary (bioretention) and secondary (hydrodynamic separator, underground detention, level spreader) stormwater treatment practices, consistent with the guidelines contained in the *Connecticut Stormwater Quality Manual.*

Figure 4-9. Proposed Conceptual Stormwater Management Plan



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Drainage Area C

Drainage Area C, which corresponds to Parcel B, is approximately 24.9 acres. The proposed building footprint in this drainage area is 117,000 square feet with 1,235 associated parking spaces. The drainage area associated with this development site is subdivided into two sub-drainage areas, each with distinct outfalls. Approximately two thirds of the area of this development site discharges to a wetland located northeast of the parcel. Runoff from the other third of development site discharges to the large wetland complex associated with Drainage Areas A and B.

A water quality swale (primary treatment practice) is proposed along the parking lot on the southern edge of the site. The swale would discharge into an underground detention system (secondary practice) and be released to a level spreader (secondary practice) where it would discharge to the adjacent wetland system.

The northern portion of the development site would include parking lot bioretention (primary practice) and an underground detention system (secondary practice). Two level spreaders (secondary practice) would be located in the northeast portion of the site to attenuate excess roof runoff (i.e., following treatment via bioretention or infiltration overflow) and the discharge of the underground detention system, which would ultimately discharge to the wetland northeast of the development parcel.

Drainage Area D

Drainage Area D, which corresponds to Parcel D, is approximately 14.5 acres. The proposed building footprint in this drainage area is 63,000 square feet with 620 associated parking spaces. The proposed stormwater management system for this drainage area consists of parking lot bioretention (primary practice) and a water quality swale (primary practice) between the west side of the parking area and North Hillside Road. Stormwater runoff from the parking lot in Drainage Area D would be collected and conveyed under North Hillside Road and combined with stormwater from Drainage Area E.

Drainage Area E

Drainage Area E, which corresponds to Parcel C, is approximately 18.8 acres. The proposed building footprint on this development site is approximately 86,000 square feet with 430 proposed parking spaces associated around the building. A water quality swale (primary practice) is proposed on the southern and western edges of the parking area as the initial stormwater management method. Based on the proposed layout, only a portion of the parking lot can be graded to the swale. The other portion of the parking lot would be diverted to catch basins and a rain garden/bioretention system (primary practice). The drainage from Area D would be combined with Area E and ultimately discharge to the proposed stormwater management basin (primary practice) at the western edge of the development site. The basin would discharge via a hydrodynamic separator and level spreader.

The proposed stormwater management basin is designed as a wet extended detention pond with a sediment forebay and permanent pool with wetland plantings and microtopography. The outlet of the basin would include a level spreader to release water in a diffuse manner to

the adjacent wetland system. This type of basin design is considered a primary treatment practice in the *Connecticut Stormwater Quality Manual* and is typical of the stormwater basins proposed throughout the project site.

Stormwater basins located within 750 feet of a vernal pool will be designed with a smaller permanent pool (e.g., micropool extended detention) or as dry basins combined with other water quality controls targeted at pollutant removal (bioretention or water quality swales) to reduce the potential for the stormwater basins to function as "decoy wetlands" and disrupt amphibian migration patterns.

Drainage Area F

Drainage Area F (Parcel E) is approximately 18.8 acres. The building footprint proposed for this development site is 95,000 square feet with two levels of underground parking. The majority of the stormwater runoff from this building is roof runoff. The roof runoff would be discharged to permeable pavement, bioretention, or underground infiltration (primary practices) with overflow via a level spreader (secondary practice). The driveway to the underground parking area would have a water quality swale (primary practice) on the western edge to attenuate and treat stormwater runoff.

In addition, some stormwater management will be required for the building area and the parking garage. For the garage, DEP typically allows runoff from the upper exposed level of a parking garage to the storm drainage system, and the rest of the levels need to discharge to the sanitary sewer under the DEP Vehicle Maintenance Wastewater General Permit with an oil/water separator that meets the General Permit requirements. A stormwater management basin (primary practice) is proposed for Drainage Areas F and G to maintain existing stormwater flows and further improve stormwater quality.

Drainage Area G

Drainage Area G (Parcel G) is approximately 1.8 acres. The proposed building footprint on this development site is approximately 45,000 square feet. This site has no associated parking, since parking will be provided by the nearby landfill parking lot. Runoff from a majority of the building roof and areas around the building would discharge to an adjacent water quality swale (primary practice) along the western edge of the drive in Drainage Area F and ultimately discharge to the stormwater basin (primary practice) proposed for Drainage Area F. Re-routing of this runoff to the Drainage Area F stormwater basin is required to maintain existing stormwater peak flows and quality. Runoff from the remaining portion of the building roof would discharge to a bioretention area for treatment (primary practice) and an underground detention system (secondary practice) for peak flow attenuation. The discharge from this detention system would be conveyed to a level spreader (secondary practice) and ultimately to Eagleville Brook.

Roadway Stomrwater Management

Consistent with the previous design, the proposed stormwater management system for the roadway corridor consists of combined water quality swales/stormwater management basins (primary practice) along the western side of the roadway. The basins will be vegetated and store

water for no more than 48 hours. Additionally, a sediment forebay will be provided at each basin for pre-treatment. The swales/basins increase the stormwater runoff time of concentration to mitigate potential increases in peak flow rates, as well as maintain existing runoff volumes. The proposed roadway extension was also aligned parallel to the existing topographic contours to minimize overall environmental disturbance.

4.12.3.2 Evaluation Results

Table 4-17 summarizes the predicted peak discharge at the various design points under existing and post-development conditions. Note that these results do not account for infiltration of roof runoff via the proposed level spreaders, bioretention, permeable pavement, or underground infiltration systems, which would further reduce peak flows and runoff volumes. The results demonstrate that the proposed conceptual stormwater management system can effectively maintain peak rates of runoff at or below existing condition levels under the proposed North Campus full build scenario.

4.12.4 Mitigation

As described in the previous section, the proposed extension of North Hillside Road and development of the North Campus will incorporate a combination of centralized and Low Impact Development (LID) stormwater management measures using a "treatment train" approach, which is consistent with the Sustainable Design & Construction Policy and the *Connecticut Stormwater Quality Manual*.

Roadway runoff will be managed using roadside water quality swales/basins, which will provide infiltration, water quality treatment, and attenuation of peak flows. The North Campus development sites will incorporate a variety of stormwater BMPs depending on the suitability of the individual sites for stormwater infiltration, including bioretention/rain gardens, infiltration of roof runoff, water quality swales, stormwater ponds, hydrodynamic separators, and underground detention. While stormwater infiltration and bioretention are the preferred approaches for the North Campus development sites, actual subsurface conditions at each site (soil conditions, depth to high groundwater, depth to bedrock, etc.) will dictate the feasibility of infiltration and other subsurface approaches, in which case stormwater ponds, swales, and other surface practices may also be necessary. The proposed conceptual stormwater management plan will be refined during subsequent design and permitting phases for the roadway and individual development parcels, including site-specific investigation of soils and subsurface conditions to further assess the feasibility of stormwater infiltration and other types of stormwater BMPs.

UConn will also consider the use of pervious pavement for the proposed parking lots associated with the North Campus development sites and the bituminous pedestrian sidewalk along the roadway. UConn currently evaluates the use of pervious pavement (pervious asphalt and concrete) for all campus development projects and will continue to do so for the proposed parking lots at the North Campus development sites, which could significantly reduce the quantity of stormwater runoff generated on the North Campus. The decision to use pervious pavement for a given project is based on consideration of technical feasibility (soil and subsurface conditions, anticipated sediment load, anticipated traffic, etc.), maintenance, and cost. Due to maintenance concerns and cost, pervious pavement is not currently being considered for the roadway extension.

Non-structural source controls and pollution prevention measures (street and parking lot sweeping, catch basin cleaning, drainage system and stormwater treatment system operation and maintenance, etc.) will be implemented at the proposed development sites during their operation.

Roof runoff will be considered for infiltration via dry wells, infiltration trenches, or infiltration bioretention systems where soil and groundwater conditions permit. Additional site-specific testing is required to determine the suitability of the soils in these areas. In the event that infiltration is not suitable for these locations, roof runoff will be directed to water quality swales and level spreaders or filtration bioretention systems (with underdrains) for water quality treatment. The moderate slopes, which are typical of this area, may require a meandering swale and/or splash pools along the swale to maintain an appropriate velocity. Rip rap and other erosion control measures will be incorporated into the specific design of the swales and level spreaders as appropriate, based on consideration of site-specific factors.

The proposed stormwater management system for the Parcel G development will maintain existing peak rates of runoff, as well as runoff volume and groundwater recharge through infiltration of roof runoff as described above. Therefore, the potential impacts of new impervious cover on Parcel G (and the other North Campus development sites) will be effectively mitigated by implementing new stormwater management controls, which is consistent with the Eagleville Brook Impervious Cover TMDL objectives discussed in Section 4.11.

Table 4-17. Modeled Existing and Proposed Peak Stormwater Discharge

Design Point	Frequency (years)	Existing Discharge (cfs)	Proposed Discharge (cfs)
Drainage Area A – Parcel A (No proposed development)	2	24.2	24.2
	10	51.8	51.8
	25	64.7	64.7
	100	91.2	91.2
Drainage Area B – Parcel J	2	20.1	20.0
	10	42.4	41.3
	25	52.8	52.2
	100	74.2	71.3
Drainage Area C – Parcel B (Northeast Wetlands, Fenton River Watershed)	2	16.6	16.3
	10	35.3	23.8
	25	44.1	29.1
	100	62.4	44.2
Drainage Area C – Parcel B (Red Maple Swamp, Willimantic River Watershed)	2	5.8	5.8
	10	12.4	8.6
	25	15.4	10.4
	100	21.6	14.7
Drainage Areas D & E – Parcels D & C	2	27.2	27.1
	10	57.8	50.9
	25	72.3	61.9
	100	102.1	86.9
Drainage Area F – Parcel E	2	15.7	15.7
	10	33.6	31.2

Table 4-17. Modeled Existing and Proposed Peak Stormwater Discharge

Design Point	Frequency (years)	Existing Discharge (cfs)	Proposed Discharge (cfs)
	25	42.0	38.3
	100	59.2	53.3
Drainage Area G – Parcel G	2	1.8	1.8
	10	3.7	2.6
	25	4.6	2.9
	100	6.5	3.5
Swale/Basin 1 (Sub-Areas: R6, R7, and R8)	2	0.7	0
	10	1.6	0.1
	25	2.0	0.5
	100	2.8	2.0
Swale/Basin 2 (Sub-Areas: R3, R4, and R5)	2	0.8	0.5
	10	1.6	0.7
	25	2.0	0.8
	100	2.8	2.5
Swale/Basin 3 (Sub-Areas: R1 and R2)	2	0.5	0
	10	1.1	0.6
	25	1.4	1.0
	100	1.9	1.7
Swale/Basin 4 (Sub-Areas: 3b and 3d)	2	1.0	0
	10	2.2	1.1
	25	2.8	2.0
	100	3.9	3.8

The proposed extension of North Hillside Road and subsequent development of the North Campus is subject to Flood Management Certification requirements pursuant to Sections 25-68(b)-(h) of the Connecticut General Statutes and CT DEEP construction stormwater permitting. As described previously, the CT DEEP *Connecticut Stormwater Quality Manual* requires new development projects to meet stormwater performance criteria for runoff volume reduction and groundwater recharge, peak flow control and stream channel protection, and pollutant reduction. The performance requirements contained in the manual will apply to the roadway extension and subsequent North Campus development projects. Additionally, any facilities that are developed on the North Campus that meet the definition of "industrial activity" may also be subject to the CT DEEP industrial stormwater permitting program, requiring registration under the CT DEEP General Permit for the Discharge of Stormwater Associated with Industrial Activity and development and implementation of a site-specific Stormwater Pollution Prevention Plan.

The proposed stormwater management system for the roadway extension and the conceptual stormwater management system for the North Campus development are consistent with the requirements for CT DEEP Flood Management Certification, the University policy regarding no net increases in peak runoff for projects not included in the UConn Campus-wide Stormwater Management Study, and the peak flow control criteria in the *Connecticut Stormwater Quality Manual*. The project will not result in increases in peak runoff over existing conditions for storms up to and including the 100-year storm for any of the drainage areas analyzed within

the project area. In addition, the proposed stormwater management system for the project site is designed to preserve the existing hydrologic conditions to the extent possible, including drainage patterns, runoff volume, groundwater recharge, and runoff quality.

Furthermore, an operation and maintenance (O&M) plan will be developed for the stormwater management system as required by the CT DEEP Flood Management Certification process and consistent with guidance provided in the *Connecticut Stormwater Quality Manual*. The O&M Plan will include requirements for street sweeping and stormwater system inspections and maintenance. O&M Plans will be prepared for individual North Campus development projects and will identify the parties responsible for inspecting and maintaining the stormwater controls. The nature of the specific developments (UConn-led development, private development, or developments involving public-private partnerships) will dictate post-construction operation and maintenance responsibilities.

Construction of the roadway extension and North Campus developments has the potential for stormwater and water quality impacts from soil erosion and sedimentation. Construction activities will be subject to the CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewater Associated with Construction Activity. An erosion and sedimentation control plan will be implemented for the construction phase of the project. Erosion and sediment control measures will be consistent with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* (2001).

4.13 Wetland Impacts

4.13.1 Methodology

The 1994 and 2001 EIEs identified wetlands on the North Campus project site that were originally delineated in 1994. Subsequent wetland delineations were performed in the spring of 2004, in the summer and fall of 2006, and in the spring of 2008 in accordance with the State of Connecticut and Army Corps of Engineers criteria. In the spring of 2004, wetlands were delineated along the proposed roadway corridor. In 2006, the wetland delineation was updated for the entire North Campus project area to adequately address potential secondary impacts associated with the development of the North Campus. In the spring of 2008, the wetland associated with Parcel C was re-classified as a regulated watercourse based on a March 6, 2008 site walk with representatives from the Army Corps of Engineers (ACOE), the U.S. Fish and Wildlife Service, U.S. EPA Region 1, and the Connecticut Department of Environmental Protection.

In 2005, the CT DEP and the ACOE issued permits for the construction of the former UConn solid waste landfill and chemical pits closure, which included a dedicated conservation easement at the western limit of the project area. (The landfill conservation easement was approved by the Connecticut Attorney General's Office in July 2008.) The landfill preservation area includes portions of several of the North Campus development parcels. The ACOE Section 404 permit issued for the landfill closure project also included wetland creation areas adjacent to the northeast and southwest limits of the former landfill as wetland mitigation measures for the project.

A vernal pool study was performed in the spring of 2004 by Fuss & O'Neill, New England Environmental Services, and UConn. The study was performed to determine the environmental significance of a potential vernal pool noted during a site walk. The study included a drift fence survey and aquatic larval sampling, and resulted in the confirmation of a vernal pool (referred to in the following discussion as Vernal Pool #1) located east of the proposed alignment of North Hillside Road. A copy of this vernal pool study report is included in Appendix H.

Fuss & O'Neill and New England Environmental Services identified several additional potential vernal pools at the project site in January 2007. These potential vernal pools are located in the northern portion of the site and appeared to be of sufficient depth to support egg masses of breeding amphibians. A vernal pool inventory was conducted at the project site in the spring and summer of 2007 to confirm and further evaluate the characteristics of the potential vernal pools. The 2007 vernal pool inventory identified several vernal pools on the North Campus project site. A copy of the vernal pool investigation report, which was subsequently revised in 2008 to include an evaluation of the upland habitat associated with the vernal pools based on the March 6, 2008 agency meeting, is included in Appendix H.

The 1994 and 2001 EIEs documented wildlife habitat conditions on the project site. Subsequent coordination with the CT DEP and ACOE resulted in the vernal pool studies performed in 2004 and 2007, a general bird survey along the proposed corridor of the roadway extension, and a federally- and state-listed threatened and endangered species survey of the North Campus project area. These related investigations are summarized in other sections of this document and further described in the study reports that are contained in the appendices to this document.

The CT DEP and ACOE permit applications for the North Hillside Road extension were submitted to the agencies in 2004 prior to involvement by FHWA. Although the proposed roadway extension will result in direct wetland impacts of significantly less than 1 acre, which would typically be eligible for coverage under the General Permit as a Category II activity, the ACOE has previously determined that an individual Section 404 permit is required given the potential secondary impacts associated with the development of the North Campus. The ACOE application underwent Section 404 regulatory review and coordination with the federal and state resource agencies. The CT DEP also performed an initial review of the state wetland permit application for the project and issued Notice of Insufficiency letters dated May 12, 2005 and November 14, 2005 requesting an updated wetland delineation of the entire 330-acre project site and further review of mitigation options. The CT DEP permit application was subsequently withdrawn in December 2005, and the ACOE agreed to keep the original 404 application open pending the updated wetland delineation and other revisions to the project design resulting from the NEPA process.

Consequently, a new CT DEP wetlands permit application and an amended ACOE Section 404 permit application were submitted in December 2008 for concurrent review with the NEPA process. In May 2009, the CT DEP and ACOE raised additional concerns regarding the project design based upon the December 2008 permit applications. The resource agencies requested consideration and analysis of additional alternative road alignments, wetland crossing designs, and the proposed North Campus development envelope to further reduce impacts to aquatic resources as compared to the DEIS Preferred Alternative. The ACOE also requested additional

information and analysis of alternatives to substantiate the selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) in compliance with the Federal Clean Water Act.

The permit applications were subsequently withdrawn, and a series of meetings were held with the CT DEP and the ACOE between May 2009 and February 2010 to further evaluate roadway alignment alternatives and wetland crossing designs that would minimize impacts to aquatic resources and maintain vernal pool habitat connectivity. Notes from these meetings are provided in Appendix M. Several alternative roadway alignments were considered and evaluated during this process. However, the resource agencies primarily requested additional supporting information to compare the Option A (DEIS Preferred Alternative) roadway alignment with an alignment that would place the roadway east of Vernal Pool #1 (Option A-5). Modified wetland crossing designs were also considered for the Option A alignment to further reduce impacts to aquatic resources and to maintain vernal pool habitat connectivity. Reductions in the proposed development envelope were also considered for portions of the North Campus parcels.

The additional agency coordination and expanded alternatives evaluation resulted in the selection of a preferred alternative roadway alignment and North Campus development scenario. The Option A roadway alignment, which is the recommended alignment under the DEIS Preferred Alternative, remains the preferred roadway alignment in this FEIS. However, the two wetland crossings of greatest concern, as expressed by the resource agencies, have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Additionally, the North Campus concept development plan has been modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. The revised North Campus development concept is referred to as "Alternative 2C" in this FEIS.

4.13.2 Existing Conditions

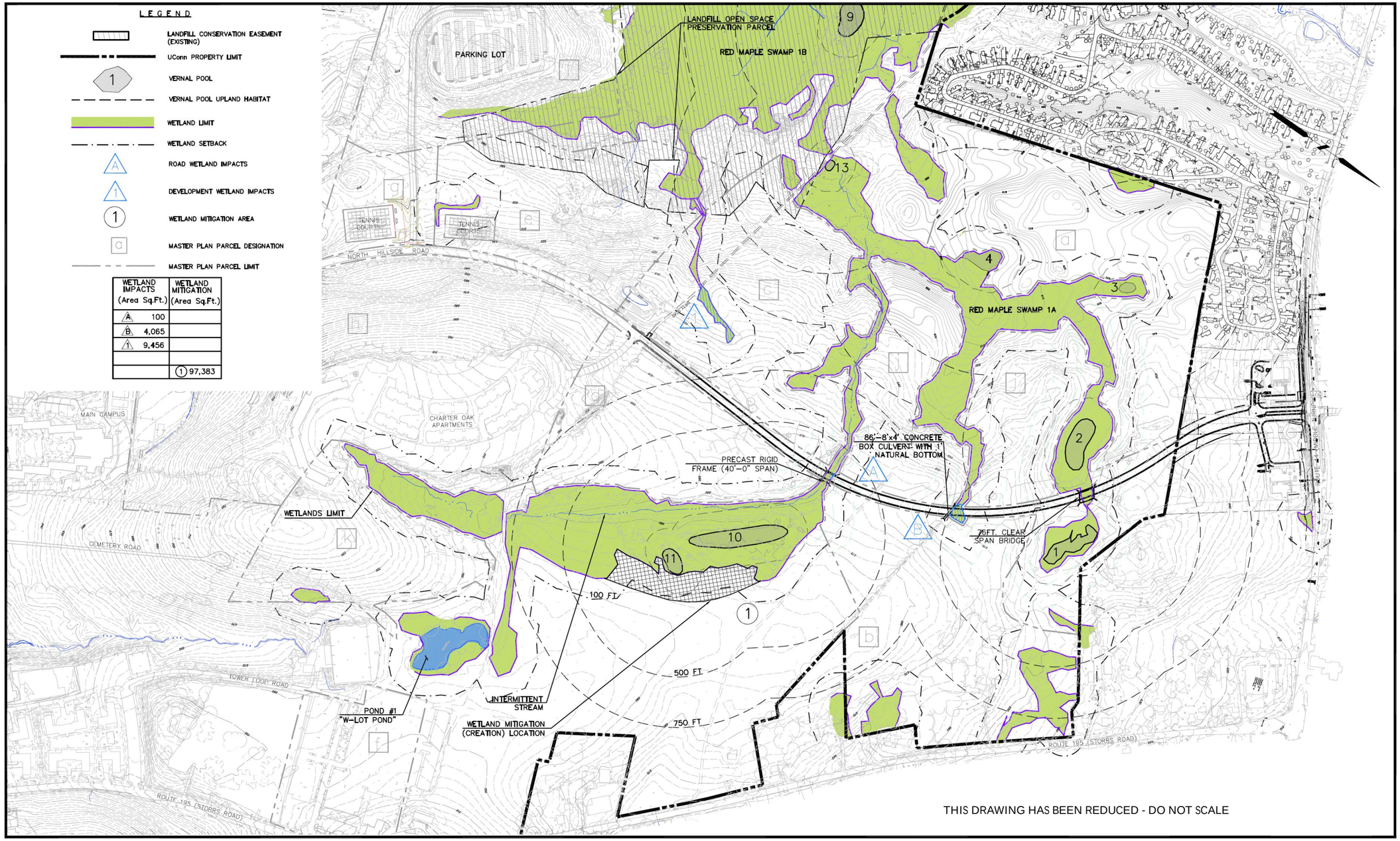
The information provided in this section is based on the wetland descriptions contained in the 2001 EIE, the updated 2004 and 2006 wetland delineations of the roadway corridor and the remainder of the North Campus project area, an updated 2008 wetland delineation for Parcel C, and the 2004 and 2007 vernal pool investigations. Figure 4-10 depicts the existing wetlands in the project area, as well as wetland impacts and proposed mitigation areas for the FEIS Preferred Alternative.

Wetlands Along Proposed Roadway Corridor

The proposed roadway corridor crosses three wetland areas as depicted in Figure 4-10, consistent with the 2001 EIE. The following descriptions are based on field delineation performed in the spring of 2004 and subsequent confirmation in 2006.

> Wetland A: Wetland A occurs at the southernmost crossing, where the proposed roadway crosses an intermittent stream. The stream was historically altered to improve the adjacent farmland to the north. The wetlands in this area are relatively uniform in width (approximately 40 feet) and are parallel with the stream. The wetland has been previously excavated, as spoil piles are evident on the bank, and the excavation appears

Figure 4-10. Wetland Resources, Impacts, and Proposed Mitigation



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to have occurred approximately 30 years ago based on the size of the trees. During the June 2004 delineation, the width of the stream was between 4 and 6 feet in the area of the proposed road crossing. The stream bed has a sand and stone substrate. The soil type in Wetland A is Aquents, which are poorly or very poorly drained soils in which two or more feet of the original soil profile has been removed. The dominant vegetation in the wetland in the vicinity of the proposed crossing is red maple, cottonwood, multiflora rose[4], winterberry, asiatic bittersweet, cinnamon fern, wood fern, sensitive fern, golden rod, field horsetail, jack-in-the-pulpit and Virginia creeper.

The wetland provides habitat for amphibians and small mammals. Green frogs were observed in the stream. This wetland area likely serves as a wildlife corridor to the large wetland areas north and south of the proposed crossing. The eastern side of the wetland is bordered by a cultivated field. The main hydraulic function of the wetland in the area of the proposed road crossing is surface water transport. There is also a groundwater discharge component in this section of the wetland. The flood storage capacity and pollutant renovation capacity is low due to the slope and previous excavation within the wetland.

1. Wetland B: Wetland B occurs at the middle crossing along the proposed roadway corridor, north of the adjacent farmland and at the headwaters of a larger wetland complex to the west. This wetland area is a small lobe of low-quality wetland that has formed in a depression between the field to the south and a knoll to the north. The width of the wetland crossing is approximately 70 feet. The crossing alignment was selected to minimize the wetland impacts by shifting it toward the eastern edge of the wetland boundary.

   The soil type in the wetland is Leicester, and the dominant vegetation is red maple, ash, winterberry, skunk cabbage, jewelweed, multiflora rose, Virginia creeper, goldenrod, asiatic bittersweet and Christmas fern. Wetland B contains 2-3 inches of standing water during the wet season. No amphibian egg masses were present in the wetland during the 2004 delineation. The wetland was inspected for egg masses twice during the amphibian breeding season when the 2004 vernal pool study was conducted. No standing water was present in the wetland on June 8, 2004.

   The wetland is a groundwater discharge wetland. The wetland extends into the cultivated field and drains in the southerly direction. The wetland has a low functional value for wildlife habitat, flood storage, pollutant renovation and groundwater recharge.

2. Wetland C: Wetland C occurs at the northernmost crossing along the proposed roadway corridor. A high-quality vernal pool is located within the field delineated wetlands located approximately 100 feet east of the proposed crossing (Vernal Pool #1). This vernal pool is further described later in this section and in Appendix H. A large wetland system which possesses greater function and value is located to the west of the proposed crossing (Red Maple Swamp 1A). The wetlands to the east and west of this proposed crossing are connected by a narrow 50-foot strip of wetlands. The proposed

[4] Common non-native (invasive) species observed at the site include multiflora rose, oriental bittersweet, Russian olive, reed canary grass and common reed. All other species specified in Section 4.13 are implied to be native.

roadway alignment was selected to cross the wetlands at the narrowest point, while maintaining at least a 100-foot separation distance from the vernal pool. Water flows through Wetland C during very wet periods, and there is no defined watercourse channel. Surface water exits the vernal pool as sheet flow. The soil type in Wetland C is Leicester, which is a poorly drained soil formed in glacial till. The solum (A & B Horizon) has a fine sandy loam texture. The substratum (un-weathered glacial till) has a gravelly sandy loam texture.

The dominant vegetation in Wetland C, in the area of the proposed crossing, is red maple, spicebush, American elm, red oak, mayflower and jack-in-the-pulpit. The dominant vegetation around the vernal pool is red maple and pepperbush. Other species include winterberry, highbush, blueberry, New York fern and spicebush. The wetland complex west of the proposed crossing is a red maple swamp. In addition to red maple, other plant species in this wetland include spicebush, pepperbush, winterberry, highbush blueberry, swamp azalea, ash, arrowwood, Japanese barberry, New York fern, skunk cabbage, marsh fern, violet, Virginia creeper, jewelweed and tussock sedge along with several other sedge species which could not be identified at the time of year the field delineations occurred.

Other North Campus Wetlands

The forested wetlands across the remainder of the North Campus project area are typical of those found throughout Connecticut associated with perennial streams and formed over glacial till. The common plant species growing in these wetlands include red maple, pin oak, green ash, spicebush, sweet pepperbush, winterberry, highbush blueberry, swamp azalea, arrowwood, Japanese barberry, New York fern, marsh fern, sensitive fern, skunk cabbage, false nettle, violet, Virginia creeper, jewelweed, and tussock sedge. Various compositions of these and other less abundant species were observed within the wetlands bordering the perennial stream as well as within the potential vernal pools during the 2007 vernal pool study.

The red maple swamp occurring on the western portion of the project area is divided into two portions, 1A and 1B, based on its physical separation by a constructed dirt access roadway, which includes the placement of utilities for a trailer park on Route 44. Red Maple Swamp 1A is situated on the north side of the access road, while Red Maple Swamp 1B is located south of the access road.

Red Maple Swamp 1A is part of a larger wetland complex that exhibits pit and mound topography along slope wetlands. This topography is the result of past excavation and construction activity from the access road construction and the historic agricultural use of the land. At the north, south, east, and west ends of the swamp, springtime (2007) maximum water depth ranged from approximately 8 to 24 inches. Amphibians were found breeding in fragmented wetland pockets (not defined depressions) holding water that ultimately drains to the larger central wetland. Dominant vegetation in this swamp included: skunk cabbage, red oak, spicebush, meadowsweet, red maple, cinnamon fern, and jack-in-the-pulpit.

Red Maple Swamp 1B is also part of a larger wetland complex that exhibits pit and mound topography along slope wetlands. This topography is the result of past excavation and construction activity located on the eastern portion of the site and within or immediately

adjacent to the landfill conservation area. At the north, south, east, and west ends of the swamp, springtime (2007) maximum water depth ranged from approximately 12 to 48 inches. Amphibians were found breeding in fragmented wetland pockets (not defined depressions) holding water that ultimately drains to the larger central wetland. Dominant vegetation in this swamp included: skunk cabbage, red oak, spicebush, meadowsweet, red maple, cinnamon fern, and jack-in-the-pulpit.

A pond and associated wetlands are located southeast of the project corridor near Route 195 and the University "W" parking lot. The pond/wetland system is a small pond and emergent marsh located south of the agricultural field and west of Lot W. This pond supports larger amphibians, (e.g., green and bullfrogs), and may support fish as well. The maximum water depth observed in this pool during the 2007 vernal pool study was approximately six feet. The frog population of this pond has been the focus of study by UConn researchers for years. This pond/wetland system is hydraulically connected to Wetland A. No development is proposed in the vicinity of this wetland system, which had been considered as a potential wetland mitigation area. Due to its proximity to the adjacent parking lot and impacts from parking lot stormwater runoff, other potential wetland mitigation areas were considered.

One wetland area would be impacted under the proposed North Campus concept development plan. This wetland is referred to as Wetland 1, as described below:

1. Wetland 1: Wetland Area 1 is located on the North Campus development Parcel C, approximately 300 feet west of the existing terminus of North Hillside Road. This wetland area is, in fact, a regulated watercourse and is the headwaters of an intermittent watercourse that flows in a southwesterly direction. Slopes across this wetland area are approximately 3.5 percent.

   The solum (A & B Horizon) in this area is consists of gravelly, fine sandy loam underlain by unweathered glacial till consisting of massive gravelly sandy loam. These soils are consistent with moderately well drained Woodbridge soil series. Woodbridge soils (Aquic Dystrudepts) are not hydric and, as such, the wetland area does not meet the criteria to be considered a Federal jurisdictional wetland. Ponding or flooding was not observed in this area in July and October 2006 but was observed in March 2008. Flow is restricted at the outlet by a dirt access road. The seasonal nature of the standing water, the presence of hydrophytic vegetation, and the lack of hydric soils indicates that this area is a jurisdictional watercourse.

   Wetland 1 is a groundwater discharge wetland. Flow out of this wetland is restricted at the dirt access road to the south, allowing a period of extended retention of water as expressed in the vegetation assemblage. Common vegetation in this area includes red maple, green ash, spicebush, Japanese barberry, sensitive fern, New York fern and marsh fern. The constriction at the southern end of the wetland also provides limited flood flow retention. The hydroperiod of this wetland is not sufficient to provide breeding habitat for amphibians or other vernal pool species. The functions and values of this wetland, which include nutrient, sediment, and toxicant retention, production export, and wildlife habitat, are moderate to low.

Vernal Pools

A vernal pool determination and habitat study was performed by Fuss & O'Neill and New England Environmental Services between March 6 and April 20, 2004 to determine the environmental significance of a potential vernal pool noted during a site walk with the CT DEP on January 13, 2004. The subject vernal pool (Vernal Pool #1) is located approximately 100 feet east of the proposed North Hillside Roadway extension near the Wetland C roadway crossing. This vernal pool receives drainage from the south, and discharges to a wetland to the west. A drift fence was installed to trap and monitor the presence and migration of amphibians including Wood Frogs, Spotted Salamanders, Redback Salamanders, and Marbled Salamanders. The study enlisted the assistance of UConn students to conduct field monitoring on a daily basis during the field data collection effort.

The 2004 drift net study resulted in the confirmation of Vernal Pool #1 as a high-quality vernal pool with high ecological value. This vernal pool receives drainage from the south, and discharges into a wetland to the west. During the six weeks of the study Wood Frogs, Spotted Salamanders, Redback Salamanders, and Marbled Salamanders were collected and released. A majority of the Wood Frogs and Spotted Salamanders were captured in the southwest traps, indicating travel from this direction. The Wood Frogs also had another area of concentration entering from the northeast quadrant of the pool. The Redback Salamanders had a concentration that entered from the north side of the pool. Once the amphibian migration ceased, a larvae study was performed within the pool to measure the amount of activity in the pool. The larvae study identified a total of 414 Wood Frog egg masses and 13 Spotted Salamander egg masses. Marbled salamander larvae, whose eggs would have been deposited in the fall, were also found in the pool. Fairy shrimp, another species commonly found in vernal pools, were not found.

Fuss & O'Neill and New England Environmental Services identified several additional potential vernal pools at the project site in January 2007. These potential vernal pools are located in the northern portion of the site and appeared to be of sufficient depth to support egg masses of breeding amphibians. A vernal pool inventory was conducted at the project site in the spring and summer of 2007 to confirm and further evaluate the characteristics of these potential vernal pools.

The vernal pool inventory conducted in the spring and summer of 2007 confirmed the presence of Spotted Salamanders, Wood Frogs, and Marbled Salamanders in Vernal Pool #1. The 2007 vernal pool inventory also identified 11 other amphibian breeding areas that met the former ACOE Connecticut Programmatic General Permit (PGP) definition of a vernal pool. For characterization purposes, these additional vernal pools were categorized into three groups:

- Vernal Pool Complex 1A (Vernal Pools #2-4, and #13) – these vernal pools are associated with Red Maple Swamp 1A. During wet periods, when these areas fill with water, amphibians such as spotted salamander and wood frog breed in varying numbers at different ends of the swamp. In April-May 2007, an overall total of both spotted salamander (140) and wood frog (82) eggs masses were found at the north, south, east, and west ends of the swamp. No marbled salamander larvae were found, however a few fairy shrimp were observed in the eastern end of the swamp nearby Vernal Pool #1.

This wetland complex meets the definition of a vernal pool based on the presence of three indicator species: wood frog, spotted frog, and fairy shrimp. Vernal Pool Complex 1A experiences varying hydrology within the wetland, has a prominence of egg mass abundance in VP #2, which is adjacent to VP #1, and exhibits disturbances caused by past excavation/construction activities (e.g., separation by a dirt road). This vernal pool complex is of moderate ecological value.

- Vernal Pool Complex 1B (Vernal Pools #5-9) - This portion of the red maple swamp occurs across from Vernal Pool Complex 1A. In April-May 2007, both spotted salamander (221) and wood frog (189) eggs masses were found. The egg masses found in the southern and eastern portions of the red maple swamp account for the high number of salamanders and frogs observed. This number of clusters would likely be the result of several mating episodes over a series of days between adults. The low number of egg masses occurring in the western portion would likely be the result of single mating episodes perhaps of a single day between adults. No marbled salamander larvae or fairy shrimp were found. This wetland complex meets the ACOE Connecticut PGP definition of a vernal pool based on the presence of two indicator species: wood frogs and spotted salamanders. Vernal Pool Complex 1B experiences varying hydrology within the wetland, has a prominence of egg mass abundance in VPs #8 and #9, and exhibits disturbances caused by past excavation/construction activities (e.g., separation by a dirt road). This vernal pool complex is of moderate ecological value.

- Vernal Pools #10 & 11 – these vernal pools consist of two man-made depressions/excavations located immediately west of the active agricultural fields. During observations in January, April and May 2007, both depressions were enriched with nutrients from runoff from a large manure pile less than 50 feet east of the pools[5]. Consequently, excessive algal growth and turbidity within these pools made observation of vernal pool species difficult. The maximum water depth in these pools ranged from approximately 2 to 4 feet. These pools contain the remains of numerous tree saplings that cover a loam substrate, which is dominated by stained leaf-litter that includes red oak and red maple. The depressions of the pools contain numerous rocks and are isolated from adjacent forest by local topography, which was modified through excavation cutting and berm construction. These vernal pools meet the ACOE Connecticut PGP definition of a vernal pool based on the presence of two indicator species, wood frog and spotted salamander, breeding. This vernal pool complex is man-made and has a history of past and current disturbance. This vernal pool complex is of high ecological value.

Further details of the 2007 vernal pool inventory are provided in the report in Appendix H.

4.13.3 Potential Impacts

Under the No Action Alternative, wetland resources on the project site would remain similar to existing conditions and future conditions in the absence of the roadway extension and North Campus development.

[5] The manure pile was removed and spread in April 2008 and was reseeded. Manure will no longer be piled near the pool as part of agricultural operations.

Two wetland areas (Wetland A and B) will be impacted by the proposed roadway construction under the FEIS Preferred Alternative roadway alignment (Option A with modified crossing designs at Wetlands A and C). The total area of wetland impacts associated with the roadway is approximately 0.09 acres. Crossings A and C have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Crossing A is a 40-foot precast concrete rigid frame with open bottom, resulting in 100 square feet of wetland impacts. Crossing C is a 76-foot clear span bridge designed to completely avoid wetland impacts and maintain vernal pool habitat connectivity for semi-aquatic resources and terrestrial wildlife. The previous 8-foot by 4-foot concrete box culvert is proposed for Crossing B.

One wetland area (Wetland 1) will be impacted by the proposed development of the North Campus parcels under the FEIS Preferred Alternative (Alternative 2C). The total area of wetland impacts associated with the proposed North Campus development plan is 0.22 acres. As described in the previous section, the wetlands to be disturbed are primarily broad-leaf deciduous forested areas. The total area of proposed wetland impacts for the roadway extension and associated North Campus development is 0.31 acres. Table 4-18 summarizes the acreage and function & value assessment for the wetland impact areas. The functions and values of the wetlands proposed to be impacted are described in the previous section.

Table 4-18. Summary of Functions & Values of Wetland Impact Areas

Wetland Impact Area	Area (acres)	Wetland Type	Wetland Functions & Values												
			GWR	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	ES
A	0.002	PFO1	X	X		X	X			X					
B	0.09	PFO1/PEM2	X												
1	0.22	UPL/PFO1	X	X		X	X	X		X					
Total:	0.31														

Note: GWR = Groundwater Recharge/Discharge
FFA = Floodflow Alteration
F&SH = Fish and Shellfish Habitat
S&TR = Sediment and Toxicant Retention
NR&T = Nutrient Retention and Treatment
PE = Production Export
S&S = Sediment & Shoreline Stabilization
WLH = Wildlife Habitat
REC = Recreational Value
ED/S = Educational/Scientific Value
U/H = Uniqueness/Heritage
VQ/A = Visual Quality/Aesthetics
ES = Endangered Species
PFO1 = Palustrine, Forested, Deciduous
PEM2 = Palustrine, Emergent, Non-persistent
PEM2C = Palustrine, Emergent, Non-persistent, Seasonally Flooded
UPL = Upland

In their scoping comments for preparation of this DEIS, the ACOE indicated that the project is a non-water dependent activity and, consequently, alternatives which do not involve impacts to Waters of the U.S. are presumed to be available. The EIS and ACOE 404 permit application must clearly refute the regulatory presumption that a less environmentally damaging practicable alternative (LEDPA) exists. Additionally, because the preferred roadway alignment results in some impacts to wetlands, an "Only Practicable Alternative Finding" is required to demonstrate that there are no practicable alternatives to construction in wetlands pursuant to the Environmental Protection Agency (EPA) Guidelines (40 CFR 230 et seq.) and the Army Corps of Engineers regulatory guidelines (33 CFR 320 et seq.). These determinations are pending.

As described in Section 3 of this FEIS, the North Campus development Alternative 2C, combined with the modified wetland crossings for roadway alignment Option A (the FEIS Preferred Alternative), reflects the overall roadway and parcel development scenario that best addresses the University's goals for development of the North Campus while minimizing impacts to the on-site wetlands and maintaining habitat connectivity. The FEIS Preferred Alternative is recommended as the LEDPA.

The following paragraphs discuss the potential wetland impacts associated with the concept design under the Preferred Alternative and various design alternatives considered for the roadway extension and development of the North Campus.

Roadway Alignment

Six unique alignments for the roadway extension were developed in the 1994 EIE. Each of these alignments was examined to determine their impact on wetlands and other factors including public safety, traffic congestion relief, and value to research park development. The preferred alignment was a combination of a number of these concepts that sought to satisfy the evaluation criteria, including minimizing wetland impacts, while maximizing the developable area of the North Campus. The B-2 roadway option presented in the 1994 EIE was selected. The 2001 EIE for the Outlying Parcels Master Plan subsequently recommended roadway Option A due to its greater environmental sensitivity and consistency with the environmental preservation planning principles contained in the Master Plan. This alignment was approved by the State of Connecticut Office of Policy and Management under CEPA and is the alignment that the current design follows.

Based on comments received from the resource agencies on the DEIS and subsequent agency coordination, the roadway alignments that were considered in the previous EIEs (Options A, A-1, A-2, A-3, A-4, B-1, and B-2) were further evaluated based on potential impacts to wetlands and other environmental resources, including vernal pools (and related amphibian migration), which had not yet been identified at the project site when the previous EIEs were prepared. One additional roadway alignment was also evaluated (Option A-5), which is a modification of the A-3 alignment as described below.

- Roadway Alignment Option A: Option A is a composite of Options A-1 through A-4, as described below. This alignment was identified as the preferred alignment in the 2001 EIE and is the alignment that the current design follows.

- Roadway Alignment Option A-1: The Option A-1 alignment extends from the existing terminus of North Hillside Road, following a route between Vernal Pool #1 and Vernal Pool #2, and terminating at Route 44.

- Roadway Alignment Option A-2: Option A-2 extends from the existing terminus of North Hillside Road, bending east to terminate on Route 195 rather than Route 44.

- Roadway Alignment Option A-3: The Option A-3 alignment would place the roadway east of Vernal Pool #1 and terminate at a proposed three-way intersection with Route 44.

- Roadway Alignment Option A-4: The Option A-4 alignment is similar to the A-1 roadway alignment but would pass directly through Vernal Pool #2.

Each of these roadway alignments was evaluated based on wetland impacts, habitat connectivity, and other environmental factors. The screening evaluation is described in Section 3 of this FEIS. Based on the results of the evaluation, the CT DEP and ACOE requested additional information to support the selection of the LEDPA for the North Hillside Road extension. Specifically, the resource agencies requested additional supporting information to compare the Option A and Option A-5 roadway alignments, which were retained from the initial alternatives screening process.

The Option A-5 alignment would result in slightly less direct wetland impacts, reduce the number of wetland crossings, and have similar but slightly less impacts on vernal pool amphibian migration as compared to the Option A alignment. However, the Option A alignment has advantages over Option A-5 since the Option A alignment would result in less roadway development within the 750-foot vernal pool critical upland habitat, less impervious cover, would avoid potential impacts to archaeological resources and the need for additional archaeological field investigations, and would significantly reduce impacts to prime farmland soils.

Further coordination with the CT DEP and ACOE in January and February 2010 resulted in several key project modifications of the Option A alignment to address the remaining concerns regarding wetland impacts and habitat connectivity for aquatic resources. The two wetland crossings of greatest concern to the resource agencies (Crossings A and C) have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife.

Crossing C will be a 76-foot clear span bridge designed to completely avoid wetland impacts and maintain vernal pool habitat connectivity for semi-aquatic resources and terrestrial wildlife.

Crossing A will be a 40-foot precast concrete rigid frame with open bottom. The structure will have a width greater than 1.2 times the normal bank full flow width and will provide a bank on both sides with sufficient clearance to provide dry passage for semi-aquatic and terrestrial wildlife. The substrate within the structure will approximate the range of variability found in the natural stream channel at the time of construction, including a variety of flow conditions, and will be designed to resist displacement during flood events and to maintain appropriate channel

characteristics through natural bed load transport. The crossing will have a minimum height of 6 feet (also to accommodate CTDOT inspection requirements) and a minimum openness ratio of 0.5. The proposed design will result in approximately 100 square feet of wetland impacts, which will be mitigated in an on-site wetland creation area.

An 8-foot by 4-foot concrete box culvert is proposed for Crossing B. The bottom of the culvert will be embedded by 1 foot, creating a natural substrate (following guidance contained in the CT DEEP Stream Crossing Guidelines). The box culvert crossing design will also accommodate design flows.

With these design modifications, in addition to the proposed conservation easement and reduction of the development envelope as described in Section 3.5, the Option A alignment is the preferred alignment in this FEIS and recommended as the LEDPA.

North Campus Development

As described in Section 3 of this document, five conceptual North Campus development alternatives were evaluated, including consideration of potential wetland impacts. Table 4-19 summarizes the wetland impacts associated with each of the North Campus development alternatives considered. The wetland impacts shown in Table 4-19 and the following discussion are based on the updated (2006 and 2008) wetland delineations.

Table 4-19. Comparison of Wetland Impacts Associated with North Campus Development Alternatives

North Campus Development Parcel	Wetland Impacts (acres) North Campus Development Alternative				
	Alternative 1 (1994 EIE)	Alternative 2 (2001 EIE)	Alternative 2A	Alternative 2B (DEIS)	Alternative 2C (FEIS Preferred)
A	0.27	0	0	0	0
B	1.15	0	0	0	0
C	0.57	0.79	0.32	0.22	0.22
D	0	0	0	0	0
E	0	0	0	0	0
G	0	0	0	0	0
H	0	0	0	0	0
J	0.21	0	0	0	0
Road	0.44	0.44	0.44	0.34	0.09
Total	2.64	1.23	0.77	0.56	0.31

Alternative 1 (Figure 3-2) was based on the Option A layout presented in the 1994 EIE. This alternative results in eight areas of wetland impacts on four development parcels and three areas of wetland impacts along the roadway, totaling approximately 2.64 acres and numerous encroachments into the 100-foot upland envelope surrounding the wetlands. Based on these impacts, Alternative 1 was found to be environmentally unacceptable and was dismissed.

Alternative 2 (Figure 3-3) was developed based upon the planning principles and recommended land uses contained in the Outlying Parcels Master Plan and the associated 2001 EIE. This alternative reduces wetland impacts but includes some development within the 100-foot upland envelope. This alternative results in two areas of wetland impacts isolated to Parcel C and three areas of wetland impacts along the roadway, totaling approximately 1.23 acres, and several encroachments into the 100-foot upland envelope.

A third alternative was developed (Alternative 2A) in an effort to further reduce wetland impacts and development within the 100-foot upland envelope, while still meeting the building floor area, parking, and land use program requirements outlined in the Outlying Parcels Master Plan and the 2001 EIE. Alternative 2A (Figure 3-4) results in further reductions in wetland impacts and only minimal encroachment into the 100-foot upland envelope. This alternative results in one area of wetland impacts on Parcel C and three areas of wetland impacts along the roadway, totaling approximately 0.77 acres.

The North Campus development concept was further refined (referred to as Alternative 2B) based upon concerns raised by the Connecticut Department of Environmental Protection, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service during an agency coordination meeting and site walk held at the UConn Storrs Campus on March 6, 2008. The proposed development on the northern portion of Parcel J was re-located to the former agricultural field between wetlands A and B to preserve an undisturbed wetland and amphibian migration corridor on the northern portion of the site. Proposed development on Parcel C was also reconfigured to limit site disturbance to the northern side of the existing dirt access road. Alternative 2B (Figure 3-5) was identified as the preferred North Campus development alternative in the DEIS, resulting in further reduced wetland impacts (0.56 acres) and improved habitat connectivity on the northern portion of the site.

Additional coordination with the CT DEP and ACOE in January and February 2010 resulted in several modifications to the North Campus concept development plan to address the remaining concerns regarding wetland impacts and habitat connectivity for aquatic resources. The North Campus concept development plan was modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement. The revised North Campus development concept is referred to as "Alternative 2C" in this FEIS.

Alternative 2C (Figure 3-6) provides approximately 1.2 million square feet of total building area and 4,475 parking spaces, including existing parking on Parcel F (W-Lot), Parcel L (landfill parking lot), and Parcel H (Charter Oak residential units), while limiting total wetland disturbance from the roadway extension and North Campus development to 0.31 acres. Development that was previously proposed for Parcel A under Alternative 2B has been re-allocated by increasing the density of development on Parcel B to maintain a maximum building space for the North Campus of approximately 1.2 million square feet.

The North Campus development Alternative 2C, combined with the modified wetland crossings for roadway alignment Option A, reflects the overall roadway and parcel development scenario that best addresses the University's goals for development of the North Campus while minimizing impacts to the on-site wetlands and maintaining habitat connectivity. Alternative 2C is the preferred North Campus development scenario in this FEIS and is recommended as the LEDPA.

Vernal Pools

As described in the 2007 vernal pool inventory report (Appendix H), the proposed roadway extension and North Campus development was evaluated for potential impacts to the upland habitat on the project site that may support vernal pool species. The project site was divided into various cover types or land uses for existing and proposed development conditions. The area and percent cover of each cover type were calculated for the 1) 100-foot vernal pool envelope, 2) 500-foot ACOE Review Area, and 3) 750-foot critical upland habitat based on the guidance contained in Calhoun and Klemens (2002). The vernal pool upland habitat analysis was updated in July 2010 to reflect the FEIS Preferred Alternative (Alternative 2C).

The results of this analysis indicate that:

- The proposed extension of North Hillside Road will not directly impact any of the identified vernal pools, as no development activity is proposed within the 100-foot vernal pool envelope.

- 85% or more of the upland habitat will be maintained with the proposed development within the 500-foot review area formerly specified in the ACOE Connecticut Programmatic General Permit, which has been replaced by the 2011 ACOE Connecticut General Permit.

- Adopting a more conservative approach than the 500-foot review area, the proposed concept development plan preserves 75% or more of the 750-foot critical upland habitat area defined by Calhoun and Klemens (2002), which establishes quantitative management guidance for high-quality (Tier I) vernal pools. This guidance recommends that a minimum of 75% of the critical upland habitat be maintained in contiguous (i.e., unfragmented) forest with undisturbed ground cover. In addition, the undisturbed upland areas will also be consistent with other desired management actions outlined by Calhoun and Klemens (2002) that emphasize minimizing disturbance and maintaining a native understory on the forest floor, maintaining forested corridors connecting wetlands or vernal pools, and maintaining or encouraging at least a partially closed-canopy stand to provide shade, deep-litter, and woody debris.

- The proposed North Campus development concept is designed to protect the vernal pools with the highest rating and ecological value, with an emphasis on maintaining wetland connectivity following the recommendations of Calhoun (2008). This is achieved by preserving the undisturbed wetland and amphibian migration corridor, including the vernal pools that are part of the red maple swamp vernal pool complex.

Based on the results of the vernal pool survey, upland habitat analysis, and the proposed conceptual development plan, the proposed project is not anticipated to directly impact the ability of the existing vernal pools to support amphibian breeding and development.

Construction, operation, and maintenance of the new road and new campus facilities could have potential indirect effects on vernal pools and aquatic resources by decreasing the health or ecological integrity of the vernal pool habitat, disturbing the behavior of resident species, introducing pollutants, altering natural processes, and introducing invasive species. Such indirect effects could potentially result from roadway lighting in the vicinity of the vernal pools, the use of deicers on the new road and North Campus facility parking lots, and the introduction of invasive species through land disturbance. Proposed mitigation for these potential indirect effects are described in Section 4.13.4.

4.13.4 Mitigation

The following sections describe the evolution of wetland mitigation for the proposed project as a result of ongoing coordination between UConn, the ACOE, and the CT DEEP, including wetland mitigation alternatives considered and the proposed wetland mitigation plan.

4.13.4.1 Mitigation Alternatives

Six potential mitigation areas in and around the North Campus were identified and evaluated for wetland creation or enhancement. Four wetland creation sites were considered due to their connectivity to the wetland system associated with Wetland A. Two enhancement sites were considered to improve the functions and values of existing wetlands on the Storrs campus.

Wetland Creation Option 1: Adjacent to Borrow Pit

The area adjacent to the borrow pit on the North Campus was thought to be feasible because it had been previously identified as the area to mitigate wetland impacts from the research and technology park proposed in the 1994 EIE. The area was previously disturbed as a result of the borrow pit operations, and it is adjacent to a large wetland system with hydrologic stability.

This area is located within the conservation area associated with the UConn landfill closure project. A substantial amount of clearing, regrading, and wetland restoration/creation has occurred in this area. The remaining areas adjacent to the extensive wetland tract consist of steep slopes and established second-growth forests. Consequently, this area has low potential for additional wetland mitigation and was eliminated from further consideration.

Wetland Creation Option 2: Pocket Areas along Intermittent Stream of Wetland A

Pocket areas adjacent to the intermittent stream connecting the University Pond to the Wetland A road crossing were considered because of their close proximity to the project and the current limited function of the stream corridor. The forested area to the south of the watercourse was found unsuitable for wetland creation and was determined to be valuable upland habitat to the surrounding wetlands. Therefore, this area was eliminated from further consideration.

Wetland Creation Option 3: Adjacent to University Pond near W-Lot

The area adjacent to the University Pond, located southeast of the project corridor near Route 195 and the University "W" parking lot, was identified as a feasible location for wetland creation. Vegetation in the area adjacent to the pond is a mixture of scrub brush with abundant invasive plants and meadow. The area is accessible and would provide a multifunctional wetland with deep water, shallow water, and a wooded wetland. The land is also fairly level and would require a minimal amount of grading. This alternative has been discussed with the CT DEP and ACOE representatives, viewed during joint field visits, and had been tentatively agreed upon as a feasible wetland mitigation alternative.

This alternative was proposed as the primary wetland mitigation area in a draft compensatory mitigation plan dated December 2004, revised September 2005, which was submitted to the agencies as part of the previously submitted state and federal wetland permit applications for the roadway extension project. In 2005, UConn was notified by the ACOE that this mitigation area is not expected to adequately replace lost wildlife and water quality functions because of its proximity to existing development, including a parking lot and utility corridor. This mitigation area does not fully compensate for impacted wetland functions and values at a replacement ratio that includes consideration of temporal losses.

Wetland Creation Option 4: Cultivated Field East of Wetland A

The area immediately west of the Wetland A and Vernal Pool #2 and adjacent to the agricultural fields was identified as a feasible location for wetland creation. Portions of this approximately 2.2-acre area are currently in active cultivation but would be mitigated through the proposed prime farmland replication plan as described in Section 4.2 of this document.

The soils in the existing wetland were identified as a moderately well drained Woodbridge (Aquic Dystrudept) series. Two geographically associated soils include the well drained Paxton (Oxyaquic Dystrudept) and poorly drained Ridgebury (Aeric Endoaquept) series. Both the Paxton and Ridgebury series were identified on the upland and wetland areas, respectively, adjacent to the proposed mitigation area. All three soil series are typical in this glaciated region and are formed in till.

Portions of the proposed mitigation area are actively farmed with corn. The dominant vegetation within the adjoining wetland area, downgradient of this proposed mitigation site, includes weeping willow, silky willow, red maple, cotton wood, speckled alder, and red-osier dogwood. Invasive and/or noxious species of vegetation have also become established within or on the edges the perimeter wetland forest. These species include Russian olive common reed, oriental bittersweet, and reed canary grass. Evidence of wildlife was observed including white-tail deer, grey squirrel, American robin, grey catbird, northern mockingbird.

This area provides convenient access and low potential for resource impacts during mitigation construction. The area also has a high water table, is presently cleared, and would not require alteration of wooded upland habitat. Expansion of the adjacent wooded wetland and establishment of a vegetated upland buffer between the wetland creation area and the adjacent farm field would also provide a larger vernal pool envelope and additional protection for Vernal Pool #11. This area is considered the most suitable and feasible location for wetland creation.

Wetland Enhancement Option 1: Wetland Areas East of Horsebarn Hill

Two areas east of Horsebarn Hill were initially identified by the CT DEP as potential wetland enhancement sites. Both are located on the eastern toe of slope of Horsebarn Hill. The first site (0.3 acres) is located north of the Cattle Resource Unit. The second site (0.4 acres) is located southeast of the Horsebarn Hill Science Complex. Both sites were initially identified as potential enhancement sites because of the extensive coverage of the common reed (*Phragmites australis*) and reed canary grass (*Phalaris arundinacea*). Both common reed and reed canary grass, which form dense monocultures, readily exclude other species and reduce the vegetative diversity of a wetland. In addition, both species offer little wildlife value and can often be too dense to serve as cover for water fowl and small mammals.

The existing hydrology at these sites makes them viable candidates for enhancement; no earthwork or excavation is required. However, the process of eradicating common reed and reed canary grass and establishing a diverse vegetative community requires a long-term commitment. Management methods have been developed to effectively cull local stands of common reed. These methods include a regimen of herbicide treatment, mowing and removal. This regimen, however, requires two or three replications over a period of three to five years to effectively control once-dominant stands of common reed. In addition, regular monitoring and hand removal of stems and rhizome increases the potential for success. Reed canary grass is more difficult to control than common reed. Reed canary grass annually produces abundant seeds and, as such, establishes as dense seed bank on-site. Efforts to control reed canary grass would be difficult and require a long-term commitment and level of effort, with high potential for re-vegetation by invasive species and minimal improvements to wildlife habitat. Given the limited size of the enhancement areas, the effort required to successfully control the invasive species in these areas, and the low potential for success, this option was eliminated from further consideration as a viable wetland mitigation alternative.

Wetland Enhancement Option 2: Wetland Area Northeast of Hunting Lodge Road

Similar to the areas east of Horsebarn Hill, wetland areas on the northeast side of Hunting Lodge Road have become dominated by common reed. Hydrologically, these wetland areas are fed by a perennial stream originating at the extensive marsh located to the southeast (part of the landfill conservation area). The existing hydrology makes this site a viable candidate for enhancement. Unlike the wetland areas east of Horsebarn Hill, reed canary grass has not established itself in this area. However, similar to the potential wetland enhancement areas east of Horsebarn Hill, the process of eradicating common reed and establishing a diverse vegetative community is difficult with low potential for success. This option was also eliminated from further consideration.

4.13.4.2 Proposed Mitigation

A proposed mitigation plan was developed based on consideration of potential direct and indirect wetland impacts anticipated from the proposed project under the Preferred Alternative. The proposed wetland mitigation is designed to adequately replace the lost functions and values of the wetlands impacted by the proposed action, as well as protection of wetlands and vernal pools to avoid or minimize impacts to these resources, including habitat connectivity. The mitigation plan includes wetland creation and design measures that address potential impacts of

the roadway extension and development of the North Campus parcels. The proposed wetland mitigation plan includes the following elements:

- *Wetland Creation* – An approximately 2.2-acre wetland creation area adjacent to the farm field and forested wetland associated with Wetland A and Vernal Pools #10 and #11 (Wetland Creation Option 4 described in Section 4.13.4.1). The 2.2-acre wetland creation area provides a replication ratio of approximately 7 to 1 based on 0.31 acres of wetland impacts associated with the roadway extension and the North Campus development concept. The created wetlands are intended to replicate the existing forested wetland contiguous with the creation area. The wetland plantings will include mature trees removed from the development areas. The creation area will also include an earthen berm and evergreen vegetation to demarcate the wetland creation area from the adjacent farm field and a vegetated buffer between the wetland creation area and the adjacent farm field. A detailed wetland mitigation plan will be included in the ACOE and CT DEEP wetland permit applications. The wetland creation area will also be included in the proposed conservation easement.

- *Wetland Crossing Design* – Two of the three wetland crossings (Crossings A and C) have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife.

  Crossing C will be a 76-foot clear span bridge designed to completely avoid wetland impacts and maintain vernal pool habitat connectivity for semi-aquatic resources and terrestrial wildlife.

  Crossing A will be a 40-foot precast concrete rigid frame with open bottom. The structure will have a width greater than 1.2 times the normal bank full flow width and will provide a bank on both sides with sufficient clearance to provide dry passage for semi-aquatic and terrestrial wildlife. The substrate within the structure will approximate the range of variability found in the natural stream channel at the time of construction, including a variety of flow conditions, and will be designed to resist displacement during flood events and to maintain appropriate channel characteristics through natural bed load transport. The crossing will have a minimum height of 6 feet (also to accommodate CTDOT inspection requirements) and a minimum openness ratio of 0.5. The proposed design will result in approximately 100 square feet of wetland impacts, which will be mitigated in an on-site wetland creation area.

  An 8-foot by 4-foot concrete box culvert is proposed for Crossing B. The bottom of the culvert will be embedded by 1 foot, creating a natural substrate (following guidance contained in the CT DEEP Stream Crossing Guidelines). The box culvert crossing design will also accommodate design flows.

  The roadway design will also incorporate vertical barriers to discourage amphibian crossing over the road, and sloped curbing to reduce the potential for retention of amphibians on the road. The grading at each of the wetland crossings will be 2:1 or steeper to minimize wetlands disturbances. The sidewalk width has been reduced to 8 feet to reduce impervious cover.

- *Proposed Conservation Easement* – The North Campus concept development plan has been modified to eliminate the previously proposed development on Parcel A and preserve an additional 76 acres on the North Campus (including Parcel A and the proposed wetland creation area) through a conservation easement. The proposed conservation easement area includes most of the northwest portion of the site, thereby preserving habitat connectivity along the red maple swamp wetland complex. The proposed conservation easement area on the west side of the road is contiguous with the existing landfill conservation easement area, which will significantly enhance the conservation land on the North Campus.

- *Stormwater Management* – A variety of stormwater management methods will be implemented for the North Campus development to achieve stormwater quantity and quality objectives consistent with the stormwater management standards and design guidelines in the CT DEEP *Connecticut Stormwater Quality Manual*. The proposed stormwater management system will address potential impacts to receiving waters and wetlands as a result of changes to site hydrology. Methods to mitigate stormwater runoff from the proposed build-out of the North Campus will include a combination of centralized and LID stormwater management facilities including pervious pavement, stormwater management ponds, underground detention systems, sediment forebays, swirl concentrator units, level spreaders, water quality swales/biofilters, bioretention and rain gardens, and infiltration units. Non-structural source controls and pollution prevention measures (street and parking lot sweeping, catch basin cleaning, drainage system and stormwater treatment system operation and maintenance, etc.) will be implemented at the proposed development sites during their operation.

- *Vernal Pool Mitigation Measures* – Mitigation measures to address potential impacts to vernal pools in the project area include avoiding construction within the vernal pools and within the 100-foot envelope of the vernal pools, preservation of 85% or more of the upland habitat within the 500-foot former ACOE Programmatic General Permit review area, and minimizing development within the 750-foot critical upland area to less than 25%, which is consistent with the guidance provided in Calhoun and Klemens (2002). An undeveloped forested habitat will be maintained around the vernal pools, including the canopy and understory. The 2004 vernal pool study determined that a major concentration of Wood Frogs enter Vernal Pool #1 from the southwest and northeast, while a major concentration of Spotted Salamanders and Red Back Salamanders originate from the southwest and north, respectively. The proposed crossing designs will allow for amphibian passage to and from the wetland complex located to the west. The concept development plan under the Preferred Alternative is designed to protect the vernal pools with the highest rating and ecological value, with an emphasis on maintaining wetland connectivity following the recommendations of Calhoun (2008). This is achieved by preserving (through a conservation easement) the undisturbed wetland and amphibian migration corridor, which includes the red maple swamp vernal pool complex.

  As described in Section 4.12, the proposed stormwater management system for the North Campus development includes stormwater management basins and other controls using a treatment train approach. Consistent with the CT DEEP *Connecticut*

Stormwater Quality Manual, stormwater basins located within 750 feet of a vernal pool will be designed with a smaller permanent pool (e.g., micropool extended detention) or as dry basins combined with other controls targeted at pollutant removal (bioretention or water quality swales) to reduce the potential for the stormwater basins to function as "decoy wetlands" and disrupt amphibian migration patterns.

- *Deicing and Anti-Icing* - While deicing and anti-icing activities on North Hillside Road will be necessary to maintain safe travel conditions during the winter season, measures will be implemented in both the roadway design and maintenance to mitigate potential impacts. These include:
    - Creation of an area of reduced salt application in the vicinity of the wetland crossings, where appropriate as dictated by safety considerations. This requires appropriate roadway signage to inform drivers, must be approved by UConn Public Safety, and may require the Attorney General's approval. For the proposed crossing structures that are more susceptible to freezing, the feasibility of reduced salt application will depend primarily on safety considerations.
    - Placement of catch basins up-gradient of the wetland crossings to collect runoff containing de-icing and anti-icing materials.
    - Improving the efficiency of de-icing and anti-icing practices to minimize application, which is part of the University's on-going planning for more efficient winter roadway maintenance, as described in more detail below.

In order to reduce environmental impacts from deicing activities yet ensure public safety, the University developed a plan to reduce the use of sand and increase the efficiency of salt applications. The University is developing a winter roadway maintenance plan that involves a reduction in the ratio of sand to salt from the current 4:1 ratio to a 3:1 ratio and a gradual conversion from the winter roadway deicing/anti-icing strategy from sand and salt to primarily brine and salt. In the 1970s the Connecticut Department of Transportation investigated the use of pressurized salt brine jets to enhance deicing performance. Although field results were promising, technical difficulties with application hindered the implementation of this technology. Recent advances in high-pressure jetting technology suggest that the use of high-pressure jets in conjunction with improved chemical agents for pavement deicing may now be practical (Taggart et al., 2002). A 2006 report on case studies of winter roadway maintenance by the Connecticut Academy of Science and Engineering (CASE) for the Connecticut Department of Transportation found that a shift from deicing to anti-icing can result in almost complete elimination of sand (which has its own environmental concerns associated with sedimentation and turbidity). While the CASE study reported that some increase in the use of salt may result, other research suggests that a reduction in salt application may occur because salt prewetted with a liquid (i.e., a brine) (1) is effective as an anti-icer or deicer because prewetted salt clings to the road rather than bouncing off and 25-65% more salt remains on the roadway (New Hampshire Technology Transfer Center, 1996), and (2) reduce the overall volume of conventional salts used in winter maintenance (Transportation Research Board, 2009).

- *Lighting* - provide measures to mitigate impacts of lighting while still providing the level of lighting necessary for pedestrian and motor vehicle safety. The University's Sustainable Design Guidelines articulate clear goals related to the environmental impact of exterior lighting. The guidelines, which will be followed for this project, state that projects should provide site lighting that is sensitive to light pollution of the night sky and minimize impacts on nocturnal environments. Strategies for achieving this goal include:
    - Meeting the light levels and uniformity ratios recommended by the Illuminating
    - Engineering Society of North America (IESNA) Recommended Practice Manual:
    - Lighting for Exterior Environments.
    - Designing exterior light fixtures with shielding to prevent light spillage to the night sky
    - per the following standards:
        - Requiring that exterior fixtures with output greater than 3,500 lumens (the light produced by a 350 watt incandescent bulb) shall be Full Cutoff.
        - Requiring that exterior fixtures with output less than 3,500 lumens shall be Cutoff or Full Cutoff.
        - Locating, aiming, and shielding all exterior light fixtures to minimize light trespass across campus boundaries.

  In addition to compliance with the relevant state laws ("Dark Skies Laws" pursuant to Connecticut Public Act 01-134 and Connecticut Public Act 06-86) and the University's Sustainable Guidelines, potential impacts to amphibians from roadway lighting will be reduced by:
    - Strategic placement of lighting fixtures to minimize light in the wetland crossing areas to the extent practicable while still maintaining public safety, and
    - Control of lighting directionality to minimize light in the wetland crossing areas to the extent practicable while still maintaining public safety and complying with the requirements for full cutoff lighting.

  While vehicle light use will be required when traveling on North Hillside Road after dusk and before dawn, given the type of development anticipated in the North Campus, the majority of trips are anticipated to occur during daytime hours. Nighttime traffic will not provide a constant source of illumination and is anticipated to be a relatively minor light source compared to roadway lighting.

- *Invasive Species* - The wetland mitigation plan for the North Hillside Road extension project includes provisions for monitoring and control of invasive or noxious plants. The area planned for wetland replication is under moderate risk for the establishment of invasive or noxious plant species. Species identified that pose risk include: Russian olive (Elaeagnus spp.), common reed (Phragmites australis), multiflora rose (Rosamultiflora), oriental bittersweet (Celastrus orbiculatus) and poison ivy (Toxicodendron radicans). The "Invasive and Other Unacceptable Plant Species" list in Table 4 of the ACOE New England District Mitigation Plan Guidance will be used as a broader reference for

potential invasive species in the replication area and other potentially affected wetland areas at the project site.

To minimize the potential for invasive species colonization, a regular monitoring program will be implemented consistent with the wetland mitigation plan that will be approved by the ACOE and CT DEEP as part of the federal and state wetland permitting process. Field surveys for the presence of the invasive species of concern will be performed concurrently by a wetland scientist responsible for conducting regularly scheduled monitoring inspections. Observed invasive or noxious species will be removed by various control methods. Control methods to be used include a combination of mechanical and/or chemical techniques utilizing grubbing, pulling, cutting, and herbicide. The selected control and removal methods will be specific to the vegetation species observed to eradicate the identified species during construction and minimize the re-introduction and propagation of these species. The invasive species management plan will be used for both the proposed wetland replication area as well as the areas of proposed disturbance.

- *Construction Phase Mitigation Measures* – Site clearing or grading within 750 feet of a vernal pool will be performed outside of the spring amphibian migration period (mid-March to the end of May), to the extent practicable. Construction should be staggered and silt fence should be minimized within 750 feet of the vernal pools. Silt fence should be used to exclude amphibians from active construction areas. Construction of the wetland crossings will also be limited to between November and March, to the extent practicable, to avoid potential impacts to the Northern Spring Salamander.

- *Stream Restoration* – Stream bank restoration is proposed along an approximately 200-foot reach of the intermittent stream, located downstream and east of the proposed roadway crossing. Significant bank erosion has occurred along this reach of the intermittent stream, reflecting erosive flow velocity and flashiness of the stream. The objective of the stream restoration project is to stabilize the stream banks, improve instream aquatic habitat, and reduce the likelihood of future erosion and associated sediment transport to downstream wetland areas.

4.14 Water Body Modification and Wildlife Impacts

4.14.1 Methodology

The 1994 EIE documented wildlife habitat conditions on the proposed UCEPI site, including the North Hillside Road corridor. The EIE determined that the various vegetative communities (farmland, forested area, open field, etc.) ranged from low to moderate wildlife value and found that only the large lowland swamp in the west-central portion of the project area had a high wildlife habitat value due to its hydrologic and plant conditions sufficient to support considerable species diversity. The 1994 EIE concluded that minimal decreases in overall species populations would occur if the forested wetland areas remain undisturbed, due to the high functional value of those areas in terms of ecological habitat. The 2001 EIE found little change in the vegetation conditions and potential for impacts to wildlife habitat based on the development proposed in the Outlying Parcels Master Plan. The 2001 EIE recommended that a field survey for protected grassland avian species be conducted.

Investigations into the potential for water body and wildlife impacts for the proposed extension of North Hillside Road have resulted from coordination with the Army Corps of Engineers, the Connecticut Department of Environmental Protection, and the U.S. Fish and Wildlife Service. Coordination between these agencies, UConn, and Fuss & O'Neill resulted in two vernal pool studies performed in 2004 and 2007 (Appendix H), a general bird survey (Appendix I) along the proposed corridor of the roadway extension, and a federally- and state-listed threatened and endangered species survey (Appendix J) of the North Campus project area. Details of the field survey methodologies can be found in the respective appendices to this document.

4.14.2 Existing Conditions

Bird Survey and Wildlife Habitat

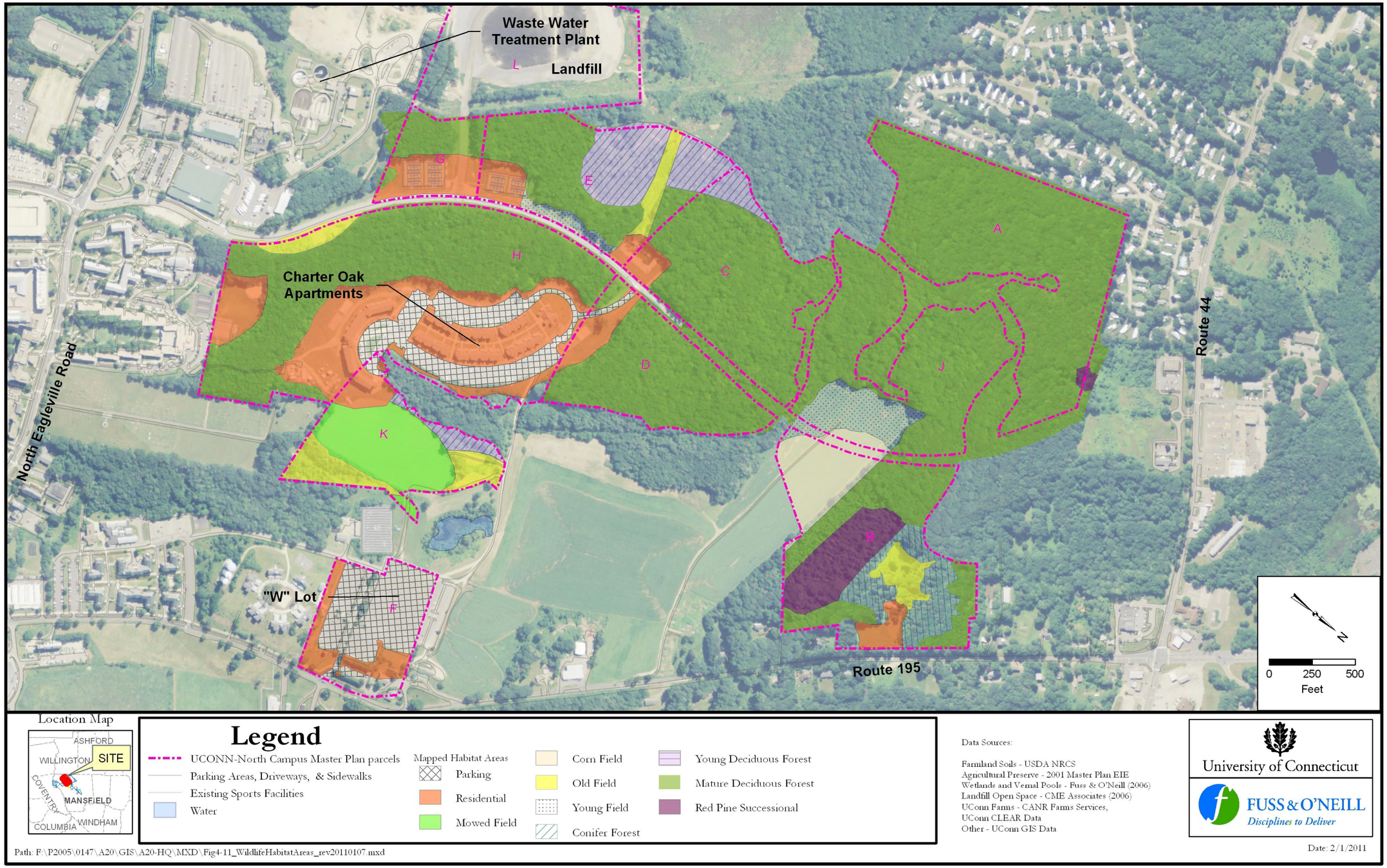
Eleven habitats were identified on the site of the proposed project (Craig, 2007). These habitats (Figure 4-11), which are generally consistent with the vegetation habitat types documented in the 1994 and 2001 EIEs, include:

- Mature Deciduous Forest: forest composed of greater than 70% cover by deciduous trees with a prevailing diameter at breast height (dbh) of greater than 20 centimeters (cm).
- Young Deciduous Forest: forest composed of >70% cover by deciduous trees that had a prevailing dbh of <20 cm.
- Mature Conifer Forest: forest composed of >70% cover by evergreen coniferous trees that had a prevailing diameters at breast height of >20 cm.
- Red Pine Successional Forest: forest once comprised of primarily planted red pines (Pinus resinosa) that are presently mostly dead, and being replaced by deciduous trees.
- Open Woodland: woodland characterized by scattered mature trees and a dense understory of perennial herbs and shrubs.
- Old Field: abandoned fields in the process of reverting to forest, with perennial herbs, sapling trees and shrubs characteristic of successional environments.
- Young Field: recently abandoned fields or periodically disturbed sites that are vegetated by annual and perennial forbs and grasses.
- Mowed Field: regularly mowed fields vegetated by perennial forbs and grasses.
- Cornfield: agricultural land planted annually to field corn.
- Residential: areas with buildings, lawns, and ornamental plantings, or other managed spots associated with intensive human land use.
- Parking: existing parking lots.

The North Campus is dominated by forested areas generally populated with mature deciduous trees. Vegetative species observed within the various habitat types are documented in Appendix J.

Wildlife observed during the study consists of species typically associated with forest and open habitats, including the mammals White-tailed Deer, Woodchuck, Gray and Red Squirrel, Eastern Chipmunk, and Eastern Cottontail; the herpetiles Redback Salamander, Spring Peeper, Green Frog, and Eastern Garter Snake. The listed species survey report (Appendix J) provides

Figure 4-11. North Campus Wildlife Habitat Areas



details regarding additional herpetiles and mammals that have previously been observed in the vicinity of the project site. Craig (2007) identified six state-listed species that could potentially be present at the project site. These species include five grassland birds and one salamander. Of these species, only the grassland bird Bobolink has been located on the project site. A more detailed discussion of listed species is presented in Section 4.19.

Based on the results of the bird survey, the bird community present at the proposed site generally consists of species associated with forest and edge openings. These species include the Mourning Dove, Northern Flicker, Eastern Kingbird, Yellow-throated Vireo, American Robin, American Crow, Gray Catbird, Common Yellowthroat, Song Sparrow, Northern Cardinal, Rose-breasted Grosbeak, Baltimore Oriole, Indigo Bunting, and American Goldfinch. Eight of these species are likely to be present in population densities above the range found by Craig (2007) in more extensive forests in eastern Connecticut.

Avian species typical of contiguous forest interiors were also present, including Eastern Wood Pewee, Red-eyed Vireo, Veery, Wood Thrush, Ovenbird, and Scarlet Tanager. Three of these species (Eastern Wood Pewee, Red-eyed Vireo, and Wood Thrush) were present in higher densities than more extensive forests sampled by Craig (2007). Other species present included the Downy Woodpecker, Black-capped Chickadee, Tufted Titmouse, and White-breasted Nuthatch, all of which were present in higher densities than typical, and the Red-breasted Nuthatch. Additional species observed in previous studies by Craig (2007) are presented in Appendix I. Figure 1 in Appendix I shows the sampling stations used for observation of bird species.

In general, the bird community on the North Campus cannot be characterized as a high-value interior forest community as a result of the comparatively fragmentary nature of the habitat (Craig, 2006). However, the habitat itself has large trees in a proportion above that of most regional forests. Therefore, preservation of large trees in this area is desirable.

Vernal Pool Studies

Studies of suspected vernal pools on the North Campus were conducted in 2004 and 2007. The 2004 drift net study resulted in the confirmation of a vernal pool (designated Vernal Pool #1) located east of the proposed alignment of North Hillside Road. This vernal pool receives drainage from the south, and discharges into a wetland to the west. During the six weeks of the study Wood Frogs, Spotted Salamanders, Redback Salamanders, and Marbled Salamanders were collected and released. A majority of the Wood Frogs and Spotted Salamanders were captured in the southwest traps, indicating travel from this direction. The Redback Salamanders were generally captured in the north traps.

A vernal pool inventory conducted in the spring and summer of 2007 confirmed the presence of Spotted Salamanders, Wood Frogs, and Marbled Salamanders in Vernal Pool #1. The 2007 vernal pool inventory also identified 11 other amphibian breeding areas that met the ACOE Connecticut Programmatic General Permit (PGP) definition of a vernal pool. Wood Frogs,

Spotted Salamander, and Fairy Shrimp were observed at various locations within these vernal pools. Further details of the 2004 and 2007 vernal pool studies are provided in Section 4.13 and in the appendices to this document.

4.14.3 Potential Impacts

The No Action Alternative would maintain woodland, grassland, and wetland habitats in their current conditions. As a result, water body modifications and wildlife habitat would only be affected by future off-site changes (e.g., introduction of invasive species, pests, air pollutants, etc.) resulting from transport onto the project site.

The proposed project does not include impoundment, relocation, channel-deepening, filling, or other modifications to water bodies or watercourses as a primary goal of the project. Each of the build alternatives will result in the alteration of some wetlands, which is discussed in Section 4.13.

Direct and indirect impacts of the roadway extension include loss of existing woodland, grassland/field, and wetland habitat. The amount of habitat types impacted is a function of the roadway corridor alignment and the conceptual design for development of the North Campus. The roadway alignment identified in the Outlying Parcels Master Plan and as the Preferred Alternative in this document is intended to reduce wetland impacts by crossing wetlands in areas where the wetlands are narrow while still providing a safe and efficient alignment and through the use of designs that span the wetlands in the most sensitive areas. Potential direct and indirect impacts in this alternative result in greater loss of woodland habitat and field areas, both as a result of the proposed roadway alignment and the resulting development. Indirect impacts resulting from the development of the North Campus will result in partial loss of the woodland that is located between the proposed road, the Charter Oak residential area, and the existing agricultural field (except for wooded wetlands located in this area that will be preserved). Woodlands to the west of this area, as well as other areas on the northwest portion of the project site, are proposed for development under each of the North Campus development alternatives.

The anticipated impacts of the development alternatives will result in the loss of forest habitat for bird and terrestrial species. Craig (2007) determined that the bird population in the project area is dominated by species associated with forest edges, since the existing forest is a relatively small fragment, and that the bird population is not high value. However, the mature nature of the forest, especially a number of large, mature trees, is of notable value. Given the higher habitat value of the wetland areas, loss of woodlands will likely result in less overall wildlife impact compared to wetland disturbance of similar magnitude.

Less significant impacts include loss of field habitat that may be used by grassland bird species. Craig (2006) suggests that the species may use the agricultural fields as migratory and staging habitat but likely prefer hayfields for breeding. No hayfields are present on the project site.

The proposed project will not result in direct impacts to vernal pools, and no development activity is proposed within a 100-foot envelope surrounding the pools. 85% or more of the upland habitat will be maintained with the proposed development within the 500-foot review area specified in the former ACOE Connecticut Programmatic General Permit. Adopting a

more conservative approach, the proposed concept development plan preserves 75% or more of the 750-foot critical upland habitat area defined by Calhoun and Klemens (2002) for best development practices to conserve pool-breeding amphibians. The undisturbed upland areas will also be consistent with other desired management actions outlined by Calhoun and Klemens (2002) that emphasize minimizing disturbance and maintaining a native understory on the forest floor, maintaining forested corridors connecting wetlands or vernal pools, and maintaining or encouraging at least a partially closed-canopy stand to provide shade, deep-litter, and woody debris. The proposed North Campus development concept is designed to protect the vernal pools with the highest rating and ecological value, with an emphasis on maintaining wetland connectivity following the recommendations of Calhoun (2008). This is achieved by preserving the undisturbed wetland and amphibian migration corridor, including the vernal pools that are part of the red maple swamp vernal pool complex. Based on the results of the vernal pool surveys and the upland habitat analysis, the proposed North Hillside extension and the subsequent development of the North Campus under the Preferred Alternative are not anticipated to impact the ability of the existing vernal pools to support amphibian breeding and development. A more detailed discussion of the vernal pools, including direct and indirect effects, is presented in Section 4.13.

4.14.4 Mitigation

Mitigation of the potential impacts to water bodies and wildlife include avoidance and minimization of impacts to wetland areas, mitigation for wetlands to be lost, preservation of wetland buffers on the project site, a significant proposed conservation easement that includes most of the red maple swamp vernal pool complex, mitigation of losses to field habitat through agricultural preservation and replication of converted farmland, wetland crossing designs that maintain habitat connectivity, and locating development to reduce woodland impacts where practicable. Site clearing or grading within 750 feet of a vernal pool will be performed outside of the spring amphibian migration period (mid-March to the end of May), to the extent practicable. Construction should be staggered and silt fence should be minimized within 750 feet of the vernal pools. Silt fence should be used to exclude amphibians from active construction areas.

Minimization of wetland impacts through selection of a roadway alignment that minimizes wetland crossings and conversion of wetland resource areas will also minimize habitat impacts. Buildings, parking, and other development are oriented to reduce direct wetland impacts and work within the 100-foot envelope of the wetlands. Wetland disturbance and mitigation measures are discussed in Section 4.13.

Impacts to field habitat will be mitigated through the proposed farmland mitigation measures, since the field habitat that is proposed to be converted at the project site consists of agricultural field. Habitat equal to that lost will be provided for migration and staging of the state-listed grassland bird species, to the extent that these species use cornfields for these purposes. However, as stated previously, the fields are not breeding habitat for these species. Prior to development activity on existing agricultural fields on the North Campus between late April and July, UConn will perform a field survey of these fields to verify a lack of nesting state-listed grassland birds.

Mitigation of impacts to the vernal pools in the project area include avoiding construction within the vernal pools and within the 100-foot envelope of the vernal pools, preservation of 85% or more of the upland habitat within the 500-foot former ACOE Programmatic General Permit review area, and minimizing development within the 750-foot critical upland area to less than 25%, which is consistent with the guidance provided in Calhoun and Klemens (2002). An undeveloped forested habitat will be maintained around the vernal pools, including the canopy and understory. The design of the roadway extension wetland crossings will maintain habitat connectivity for aquatic and semi-aquatic organisms and terrestrial wildlife. The roadway design will also incorporate vertical barriers to discourage amphibian crossing over the road, and sloped curbing to reduce the potential for retention of amphibians on the road. The proposed concept development plan is designed to protect the vernal pools with the highest rating and ecological value, with an emphasis on maintaining wetland connectivity following the recommendations of Calhoun (2008). This is achieved by preserving the undisturbed wetland and amphibian migration corridor, including the vernal pools that are part of the red maple swamp vernal pool complex.

The project has been designed to preserve woodlands at the site where practicable. However, recognizing that other resources (i.e., wetlands and vernal pools) are of more significant importance to wildlife and ecology, the majority of development is proposed for wooded upland areas. Providing mitigation for woodland habitat will not restore the areas lost since the most significant aspect of the woodlands on the project site is the predominance of mature, large-diameter trees. Furthermore, since the bird population in the project area "cannot be characterized as a high value interior forest community… because of the comparatively fragmentary nature of the habitat" (Craig, 2006), woodland areas are preferred for development over other resources. However, to the extent practicable, large-diameter trees will be preserved due to the mature nature of the forest and the number of large mature trees that were noted in the bird survey (Craig, 2007; Appendix I).

4.15 Floodplain Impacts

4.15.1 Methodology

Discussions of potential floodplain impacts in the 2001 North Campus Master Plan EIE and the 1994 Research and Technology Park EIE were reviewed. The most recent Flood Insurance Rate Map (FIRM) from the Federal Emergency Management Agency was also reviewed for potential changes in the floodplain mapping since the previous EIEs.

4.15.2 Existing Conditions

The 100-year floodplain refers to the area adjoining a river, stream, or watercourse covered by water in the event of a flood having a one percent chance of being equaled or exceeded in magnitude in any given year. No changes have occurred to floodplain mapping in the project area since the 1994 and 2001 EIEs.

Cedar Swamp Brook flows in a north-south direction and is located west of the project site. The unnamed stream that drains the majority of the project site is tributary to Cedar Swamp Brook. This stream has not been assigned a 100-year floodplain.

The 100-year floodplain associated with Eagleville Brook (Figure 4-12) was not identified in the 2001 or 1994 EIEs. Eagleville Brook is located on the southwesterly portion of the project site and flows south to North Eagleville Road, then west, generally south of North Eagleville Road.

4.15.3 Potential Impacts

Neither the North Hillside Road extension nor any previous or future development on the North Campus is located within a regulatory floodplain. Therefore, no direct floodplain impacts are anticipated for the proposed action or the No Action Alternative. Construction of the proposed roadway and subsequent development of the North Campus will result in the discharge of stormwater to the watercourses and wetlands associated with the adjacent floodplain areas. Wetland, stormwater, and water quality impacts are addressed in other sections of this document.

4.15.4 Mitigation

No mitigation is necessary since no floodplain impacts are anticipated to occur. Mitigation measures to address potential wetland, stormwater, and water quality impacts are addressed in other sections of this document.

4.16 Wild and Scenic Rivers

4.16.1 Methodology

Wild and Scenic Rivers Act of 1968 protects designated free-flowing river reaches that are characterized by exceptional natural, recreational, or cultural value. The 1994 and 2001 EIEs were reviewed for discussion of federally-designated Wild and Scenic Rivers near the project site. The National Fish and Wildlife Service list of Wild and Scenic Rivers was also examined to determine if any such waterbodies are located near the project site.

4.16.2 Existing Conditions

Wild and Scenic River segments located in Connecticut are on the West Branch of the Farmington River, which is located west of the Connecticut River, and the Eightmile River, which is located in the lower Connecticut River valley. The UConn campus is not located near, nor discharges to, either river reach.

4.16.3 Potential Impacts

The proposed extension of North Hillside Road and development of the North Campus will not impact any Wild and Scenic Rivers.

4.16.4 Mitigation

No mitigation is necessary since no impacts are anticipated to occur.

4.17 Coastal Barriers

4.17.1 Methodology

The Coastal Barriers Resource Act, Public Law 97-348 (CBRA, enacted October 18, 1982) prohibits direct and indirect federal funding for projects that could result in development of undeveloped coastal barrier islands. The 1994 and 2001 EIEs were reviewed relative to CBRA.

4.17.2 Existing Conditions

The proposed project is not located near the coast or any designated coastal barrier island.

4.17.3 Potential Impacts

The proposed project will not impact an area subject to the CBRA.

4.17.4 Mitigation

No mitigation is necessary as no impacts are anticipated.

4.18 Coastal Zone Impacts

4.18.1 Methodology

The proposed project must describe impacts to coastal resources that are under the jurisdiction of any Coastal Zone Management Program (CZMP) plans approved by the United States Department of Commerce. The 1994 and 2001 EIEs were reviewed relative to coastal zone impacts.

4.18.2 Existing Conditions

The proposed project is not near the coast and will not impact land subject to a CZMP plan.

4.18.3 Potential Impacts

The proposed project will not impact an area subject to a CZMP plan.

4.18.4 Mitigation

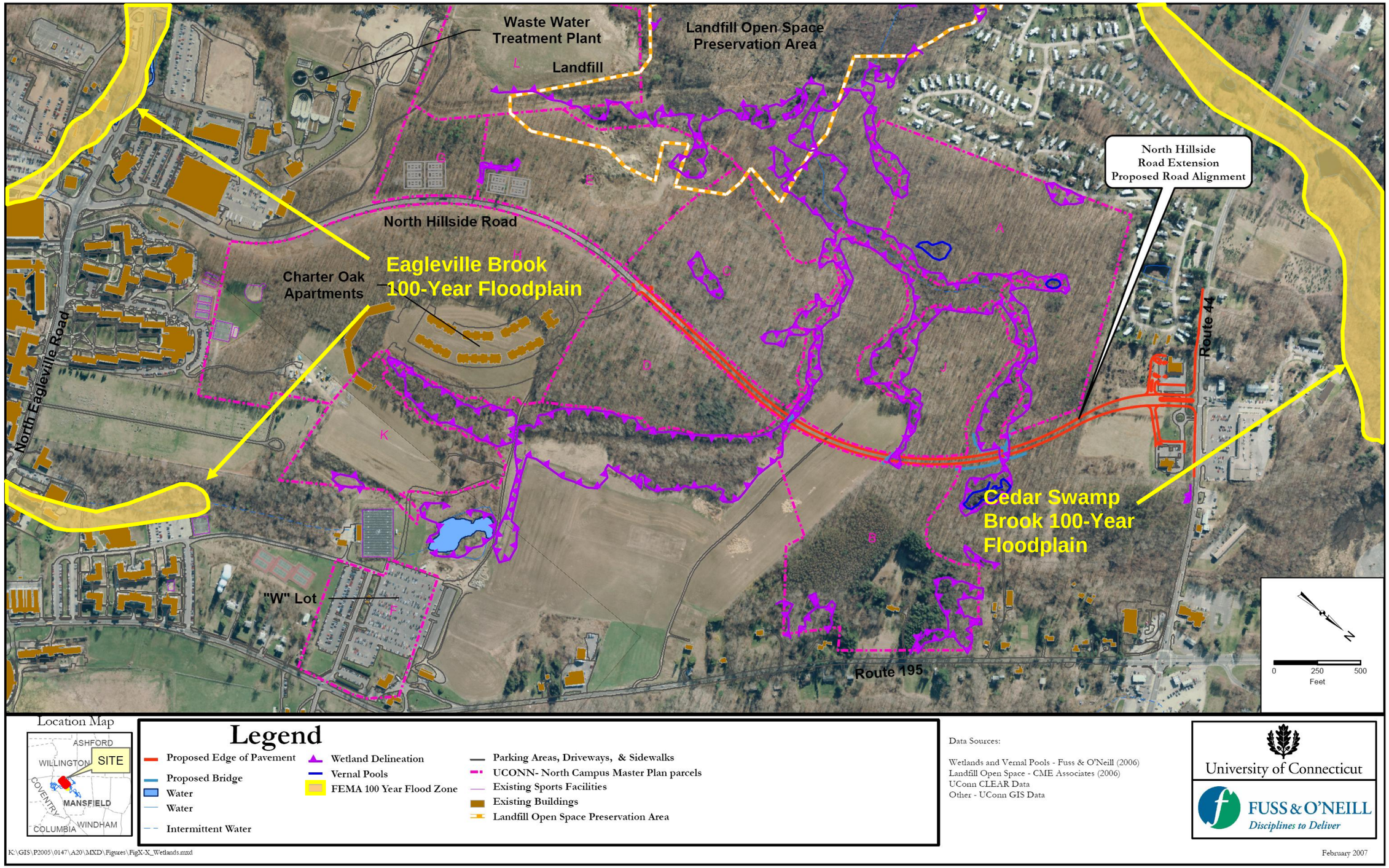
No mitigation is necessary as no impacts are anticipated.

4.19 Threatened or Endangered Species

4.19.1 Methodology

The U.S. Fish and Wildlife Service maintains a listing of federally-recognized threatened and endangered plant and animal species. An "endangered" species is one that is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered in the foreseeable future. In Connecticut, the Department of Environmental Protection Natural Diversity Database (NDDB) contains a listing of

Figure 4-12. FEMA Flood Zones



endangered, threatened and special concern species in Connecticut. In Connecticut, the following definitions apply:

- *"Endangered Species"* means any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an "endangered species" pursuant to the federal Endangered Species Act.

- *"Threatened Species"* means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the federal Endangered Species Act, except for such species determined to be endangered by the Commissioner in accordance with section 4 of this act.

- *"Species of Special Concern"* means any native plant species or any native non-harvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population or has been extirpated from the state.

The 2001 EIE stated that no Federally-listed threatened and endangered species were known to occur in the project area, with the exception of occasional transient species of bald eagles and peregrine falcons. Note that the bald eagle (*Haliaeetus leucocephalus*) has since been delisted in the lower 48 states except for the Sonoran Desert and the American and Arctic peregrine falcon species (*Falco peregrinus anatum* and *Falco peregrinus tundrius)* were delisted in 1994 and 1999, respectively. The 2001 EIE identified State-listed species potentially present in the project area: the savannah sparrow (special concern), grasshopper sparrow (endangered), and vesper sparrow (endangered). While none of these species were observed during an October 12, 2000 field walk for the 2001 EIE, the 1994 EIE stated that these species were observed on the project site but have not been found breeding. The 2001 EIE concluded that a field investigation for protected grassland avian species be completed during the migrating (early May) and nesting (early to mid June) periods to determine possible presence on the project site. Subsequent comments from CT DEP during the DEIS scoping process (Fox, 2006) recommended a general bird survey be undertaken along the path of the proposed roadway and a survey of the entire development area for listed species to further investigate potential indirect impacts of the project.

Additional correspondence with CT DEP prior to the scoping process for the DEIS also identified three state-listed species that occur in the vicinity of the proposed project: savannah sparrow (special concern), the northern spring salamander (threatened), and the horned lark (endangered) (McKay, 2006). Subsequent correspondence with CT DEP (Fox, pers. comm., 2006) determined that since the report of the horned lark was longer that 50 years ago, the presence of the species was unlikely given the landscape changes in the intervening years, and the horned hark was not a concern for the project area.

Updated investigation of the project site relative to threatened and endangered species was performed in July and August, 2006 by Bird Conservation Research, Inc. (Craig, 2007). In addition, a general bird survey was performed in July 2006 (Craig, 2006). Reports describing the field methods used and the findings of these surveys are included in Appendix J and Appendix I, respectively.

4.19.2 Existing Conditions

The Bobolink was observed during the July/August 2006 listed species survey, which is state-listed special concern avian species. Other state-listed birds that are potentially present in the project area are the Grasshopper Sparrow (endangered), Vesper Sparrow (endangered), Savannah Sparrow (special concern), and Eastern Meadowlark (special concern). The listing of these species, each of which is a grassland species, refers to breeding populations. The 2006 field investigations indicate that grassland bird species do not appear to use the small grasslands present at the site as breeding habitat. Although cornfields are present at the North Campus, these areas serve principally as staging and migratory habitat for grassland-associated bird species.

The project area is also a potential habitat for the Northern Spring Salamander, which is state-listed in Connecticut. This finding is based on a historic collection by the Town of Mansfield. The presence of this species is unusual in northeastern Connecticut, which is at the southern limit of its range. Streams within the study area provide possible but unlikely habitat. The salamander was not observed during this survey, and "present evidence does not support the presence of the species in the project area" (Craig 2007). If this species was present, it is likely to inhabit primarily subterranean areas. Common stream salamanders were not observed during the survey either, likely as a result of the season. The Northern Spring Salamander was not observed during the vernal pool drift net study performed in the spring of 2004 (See Section 4.13) or during the vernal pool investigations performed in the spring and summer of 2007.

Based on CT DEP comments on the DEIS and subsequent coordination with the CT DEP wildlife Division, a record found in 2008 two miles away from the project site suggests that the Northern Spring Salamander could exist on the North Campus.

The July/August 2006 field survey did not detect the presence of any federally-listed species, and none are known to exist in the project area.

4.19.3 Potential Impacts

Under the No Action Alternative, use of the project area by state listed species is likely to remain relatively low, and it is assumed that federally-listed species will not migrate to the area. Craig (2007) identified other areas on and near the UConn campus that these species appear to prefer as compared to the project site (areas include the Horse Barn Hill area, east of the project site, where Bobolink, Eastern Meadowlark, and Savannah Sparrow breed regularly). These species may utilize cornfields in the project area as staging and migratory habitat, but prefer hayfields for breeding. The wetland areas and streams will remain available to the state-listed salamander.

Under scenarios that include construction of the North Hillside Road Extension and related developments, impacts to these species are anticipated to be relatively few. The loss of staging and migratory habitat for the listed grassland bird species is a potential concern. Unmitigated loss of woodlands is not expected to affect listed species. Wetland impacts for the build alternatives could result in loss of available habitat to the Northern Spring Salamander.

4.19.4 Mitigation

Measures that will mitigate potential loss of listed species habitat will result from mitigation for farmland impacts and wetland impacts (see Section 4.2 and Section 4.13, respectively). The farmland mitigation will include acre-for-acre replacement of lost prime farmland through preparation of additional farmland for active use. These measures will result in fields which will provide staging and migratory habitat for the state-listed grassland bird species similar to that which currently exists, and in similar quantities.

In addition, the 1994 and 2001 EIEs identified use of low-relief (buildings less than 4 stories in height) development as a mitigation measure to limit impact to grassland species that may continue to use open grassy and weedy fields that remain undeveloped after build out of the North Campus. In the EIEs, tall buildings were identified as a potential hazard to migrant birds that could accidentally strike such buildings. The current concept development plan does not include new construction of buildings over 4 stories.

Wetland mitigation will include preservation of wetland buffers on the project site, stormwater management measures, a significant proposed conservation easement that includes most of the red maple swamp vernal pool complex, wetland crossing designs that maintain habitat connectivity, and creation of wetland resources of similar functions and values to those which will be lost, in a quantity greater than that which will be lost. These measures will mitigate any impact to potential habitat for the Northern Spring Salamander. Although field surveys to date on the project site do not support the presence of this species in the project area (Craig, 2007), a CT DEP record found in 2008 two miles away from the project site suggests that the Northern Spring Salamander could potentially exist on the North Campus. Site clearing or grading within 750 feet of a vernal pool will be performed outside of the spring amphibian migration period (mid-March to the end of May), to the extent practicable. Construction should be staggered and silt fence should be minimized within 750 feet of the vernal pools. Silt fence should be used to exclude amphibians from active construction areas. The construction timeframe to cross the intermittent stream will be between November and March. Significant forest canopy around the intermittent stream will remain intact, and road runoff to the intermittent stream will be reduced to the extent possible during and after construction.

4.20 Historic and Archaeological Resources, Section 4(f) and Section 6(f)

4.20.1 Methodology

Cultural, archaeological, and historical resources were evaluated for the 390-acre UCEPI property through a Phase 1A Archaeological Assessment Survey performed by the Public Archaeological Survey Team, Inc. (PAST) in 1987. This study is described in the 1994 and 2001 EIEs. As part of the North Hillside Road extension preliminary design, American Cultural Specialists, LLC (AMCS) was retained to perform Phase 1B and Phase 2 archaeological

surveys (Lavin and Banks, 2005; Lavin, 2006) of the roadway corridor that was identified as the recommended alignment in the 2001 North Campus Master EIE. Both the Phase 1B and Phase 2 archaeological surveys were undertaken in accordance with the State Historic Preservation Office (SHPO) Environmental Review Primer for Connecticut's Archaeological Resources (Poirier, 1987). Copies of the 2005 Phase 1B and Phase 2 archaeological survey reports are included in Appendix K.

The 1987 Phase 1A included background research regarding known prehistoric and historic sites within or adjacent to the area of the project as proposed at that time. A visual inspection was then completed of the ground surface in the proposed project area to identify potential areas of sensitivity, and limited subsurface testing was completed to verify the results of the visual inspection. Identified materials were cleaned and processed, and findings were placed in the context of a brief history of Mansfield that was compiled.

The 2005 Phase 1B and Phase 2 archaeological surveys were conducted for the roadway corridor only. The Phase 1B assessment was performed by establishing five transects along the proposed roadway alignment, spaced by approximately 10 meters. Test pits were then hand-excavated at intervals of 15 meters along each transect, resulting in the excavation of 377 pits with a surface area of 50 square centimeters (sq.cm). The removed soil was examined for artifacts. The Phase 2 intensive archaeological survey then focused on two areas of interest that were identified in the Phase 1B survey as having potential to be significant cultural resources. This investigation included the hand-digging of 87 test pits of 50 sq.cm and three one-meter square test units.

4.20.2 Existing Conditions

Prehistoric

As presented in the 1994 EIE, 20 prehistoric and 91 historic period archaeological sites were located within the Town of Mansfield, but none were located directly in the project area. In addition, the National Register of Historic Places did not list any historic or prehistoric sites in the project area. Two structures, Ash House and Barn, listed on the Connecticut Historical Commission's inventory of historically and archaeologically important standing structures were located on the North Campus. As documented in the 2001 EIE, this house and barn, which were located along Route 195, have since been sold and relocated to a neighborhood of historic homes approximately one-half mile from their original site.

The 1994 EIE stated that areas with the greatest potential for including a prehistoric site coincide with land disturbance surrounding the UConn landfill, which has likely reduced or eliminated the potential for intact prehistoric sites. The 1994 EIE concluded that undisturbed lands in the northern and western sections of the project area within 200 meters of a water source were likely to have moderate to high potential for prehistoric sites and future full Phase 1 surveys were recommended prior to development on specific parcels. The 2001 EIE noted that Parcels F, L, and a portion of H extend beyond the area of the UCEPI project boundaries that was the subject of the Phase 1A survey in 1987 and therefore, assessments will be needed to evaluate the potential for cultural resources for further development of these parcels. The design and permitting of the UConn landfill closure project (Parcel L) resulted in a finding by

the SHPO's Office (May 7, 2004 letter), indicating that the landfill closure project would have no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places. No development or alteration is proposed for Parcel F under the proposed North Campus conceptual development plan.

The 2005 Phase 1B identified a Native American archaeological site along the proposed road alignment, extending the entire width of the proposed roadway and likely extending beyond this impact area. Findings included 194 artifacts and 5 ecofacts of Native American origin. The majority of this material included flakes, chips, and shatter that result from stone tool manufacture or maintenance, as well as split and battered quartz cobbles and core fragments. Tools recovered include four scrapers, a possible sandstone abrading tool, several flakes for cutting or scraping, and two preforms (one possibly an unfinished projectile point) (Lavin and Banks 2005).

Following completion of the Phase 1B survey, a Phase 2 intensive archaeological survey was performed in two areas within the Native American archaeological site identified in the Phase 1B Survey. These areas are located along the proposed roadway corridor approximately 600 and 900 feet from the intersection of the proposed roadway and Route 44. The Phase 2 investigation yielded no cultural features. The scattered nature of the artifacts found, lack of cultural features, and the lack of a variety of functional artifact types suggests short-term, diffuse occupations of the landscape. The Phase 2 survey concluded that the site has low research potential and is not a significant cultural resource. Therefore, the roadway extension will have no adverse effect on cultural resources (Lavin, 2006). This finding is consistent with correspondence from the SHPO (Loether, 2005).

Historic

The 1994 EIE reported that the Ash House (Site 78-22), a cluster of foundations (likely to be outbuildings), and a midden deposit (Site 78-21) are potential historic resources near the site. Limited subsurface investigations at the Ash House yielded ceramics, glass, hand-wrought nails, iron nails, and metal fragments. Test pits at Site 78-21 yielded no artifacts. These investigations are discussed in more detail in the 1994 EIE. The Ash House has since been relocated, as described previously.

The 2001 EIE reports that three structures (not including small sheds) are present on Parcel F, two of which are listed on the State Register of Historic Places. Details regarding these structures are presented in Table 4-20.

Table 4-20. Existing Historic Buildings Within the Project Area

Building Name	UConn Building No.	Address	Year Constructed	Historic Places Status
Rosebrooks Barn	0051	1499 Storrs Road	1918	State Listed
Rosebrooks House	0049	1501 Storrs Road	1850	State Listed
Mink Barn	0028	1503 Storrs Road	1920	(None)

Source: Frederic R. Harris, 2001

Along the proposed roadway alignment, the Phase 1B archaeological assessment identified 85 historical objects related to Anglo-American activities. These artifacts include ceramics, glass, non-building metal, and miscellaneous items, which include unidentifiable plastic objects. The distribution of these artifacts is consistent with trash discarded during the 18th through late 20th centuries. No evidence of historic cultural features was encountered, except stone walls (Lavin and Banks 2005).

Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 protects public and private historical sites, as well as publicly owned parks, recreation areas and wildlife and waterfowl refuges, from use by transportation projects unless there is no feasible and prudent avoidance alternative and all possible planning has taken place to minimize harm to such lands.

Changes to the 4(f) regulations (23 CFR Part 774) for projects that will have a de minimis impact on property protected by Section 4(f) occurred in 2005 as provided by Section 6009 of the Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU). A de minimis impact is defined in Section 774.17 as an impact that does not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f).

Section 4(f) properties associated with this project would include historic sites associated with the roadway or on parcels identified for the North Campus development.

Section 6(f)

Section 6(f) of the Land and Water Conservation Fund Act (LWCFA) applies to transportation projects that propose impacts, or the permanent conversion, of outdoor recreation property that was acquired or developed with LWCFA grant assistance. Neither the proposed roadway corridor, nor the land identified for the North Campus development were acquired or developed using LWCFA grant assistance.

4.20.3 Potential Impacts

Under the No Build alternative, there would be no disturbance to existing historical or archaeological resources in the project area. The results of the Phase 1B and Phase 2 surveys indicate that construction of the North Hillside Road extension along the proposed alignment will not result in significant impacts to historical and archaeological resources (Lavin and Banks, 2005; Loether, 2005; Lavin, 2006). In correspondence dated June 3, 2005, the SHPO determined that no effect to historic/archaeological resources will occur from the roadway extension (Appendix K). Although detailed investigations were not conducted along the other alternative roadway alignments considered, the majority of areas identified in the Phase 1A with moderate to high cultural sensitivity are located west of the preferred roadway alignment (see Figure 28 in the 1994 EIE and Figure 15 in the 2001 EIE).

In May 2011, UConn initiated coordination with the Tribal Historic Preservation Officers (THPOs) of the Mashantucket Pequot and Mohegan Tribes regarding the proposed project. The Mashantucket Pequot Tribe reviewed the Phase 1B and Phase 2 surveys and the preferred

roadway alignment and concurred with the survey findings. The Mohegan THPO requested a site walk of the northern limits of the project site in the vicinity of the previous Phase 2 survey. A site walk was subsequently held on June 9, 2011 and was attended by representatives of the Mohegan THPO, SHPO, FHWA, CTDOT, UConn, and Fuss & O'Neill. The purpose of the site walk was to allow the Mohegan THPO to assess the site for potential significant cultural resources that could be adversely affected by the project. Following the site walk and review of additional project mapping provided by UConn, the Mohegan THPO offered no further concerns with the proposed project. Tribal coordination correspondence is included in Appendix K.

The 1994 and 2001 EIEs present figures showing areas of moderate to high cultural sensitivity in parcels that are proposed for development. The 2001 EIE Record of Decision indicates that Parcels A, C, J, E, and G contain potential areas of prehistoric value, and that Parcel B contains an area of potential historic value. The development of these parcels (with the exception of Parcel A, which will remain undeveloped through a conservation easement) will require additional archaeological surveys prior to development to determine if development activities could impact cultural resources. Further archaeological assessment may also be required prior to development of Parcel H since the limits of previous archaeological studies did not fully encompass the boundaries of this parcel. Parcel F contains two state-listed historic structures. The conceptual North Campus development plan calls for those structures to remain, so no impact to historic resources is anticipated.

As discussed above, the SHPO and THPOs determined that were will be no effect to historic or archaeological resources within the footprint of the proposed roadway. Therefore, no direct impacts to Section 4(f) historic resources are anticipated. Furthermore, the North Hillside Road extension will not impact publicly owned parks, recreational areas, and wildlife and waterfowl refuges. As described in the 1994 and 2001 EIEs, there is the potential for the presence of archaeological resources subject to protection under Section 4(f) within the North Campus development parcels. However, these are considered potential secondary or indirect impacts under NEPA and Section 106. Therefore, a Section 4(f) De Minimis finding is unnecessary since the roadway extension project will result in no direct impacts to Section 4(f) resources. The University will be responsible for coordinating with the SHPO and the appropriate THPOs regarding the future development of the North Campus area.

4.20.4 Mitigation

When sufficiently detailed information regarding specific development on the North Campus parcels is available, UConn will coordinate with the SHPO and the appropriate THPOs to ensure that historic, archaeological, and cultural resource requirements are met prior to development. Presence of an archaeological, historical, or cultural resource does not necessarily preclude development. Archaeologists may recommend avoidance of disturbance or redesign, but if this is infeasible, intensive excavation can be performed prior to development (Lavin and Banks, 2005; Lavin, 2006). This type of mitigation would be considered for significant sites where artifacts are present.

4.21 Hazardous Waste Sites

4.21.1 Methodology

Relevant sections of the 1994 and 2001 EIEs were reviewed for their discussions of hazardous waste generation and any hazardous waste sites. In order to update this information, current UConn Department of Environmental Health and Safety (DEHS) procedures for the handling, storage, and disposal of hazardous waste were reviewed and are summarized below.

Both EIEs contained descriptions of the former UConn landfill and chemical pits. Since 2001, a remedial action plan (RAP) was developed for the closure of the UConn landfill, former chemical pits, and F lot disposal site, permitting for RAP implementation was approved, and closure activities have begun. This document summarizes the information in prior EIEs and updates it with information on activities since 2001. It should be noted that these areas are adjacent to, but not within the area of development for the North Campus (see Figure 4-13).

However, given the discussion of these issues in the previous EIEs and their proximity to the North Campus, updated information is included in this document.

4.21.2 Existing Conditions

Hazardous Waste Handling, Storage, and Disposal

The University of Connecticut is classified as a large-quantity generator of hazardous waste. However, no hazardous wastes are currently generated on the undeveloped portions of the North Campus site.

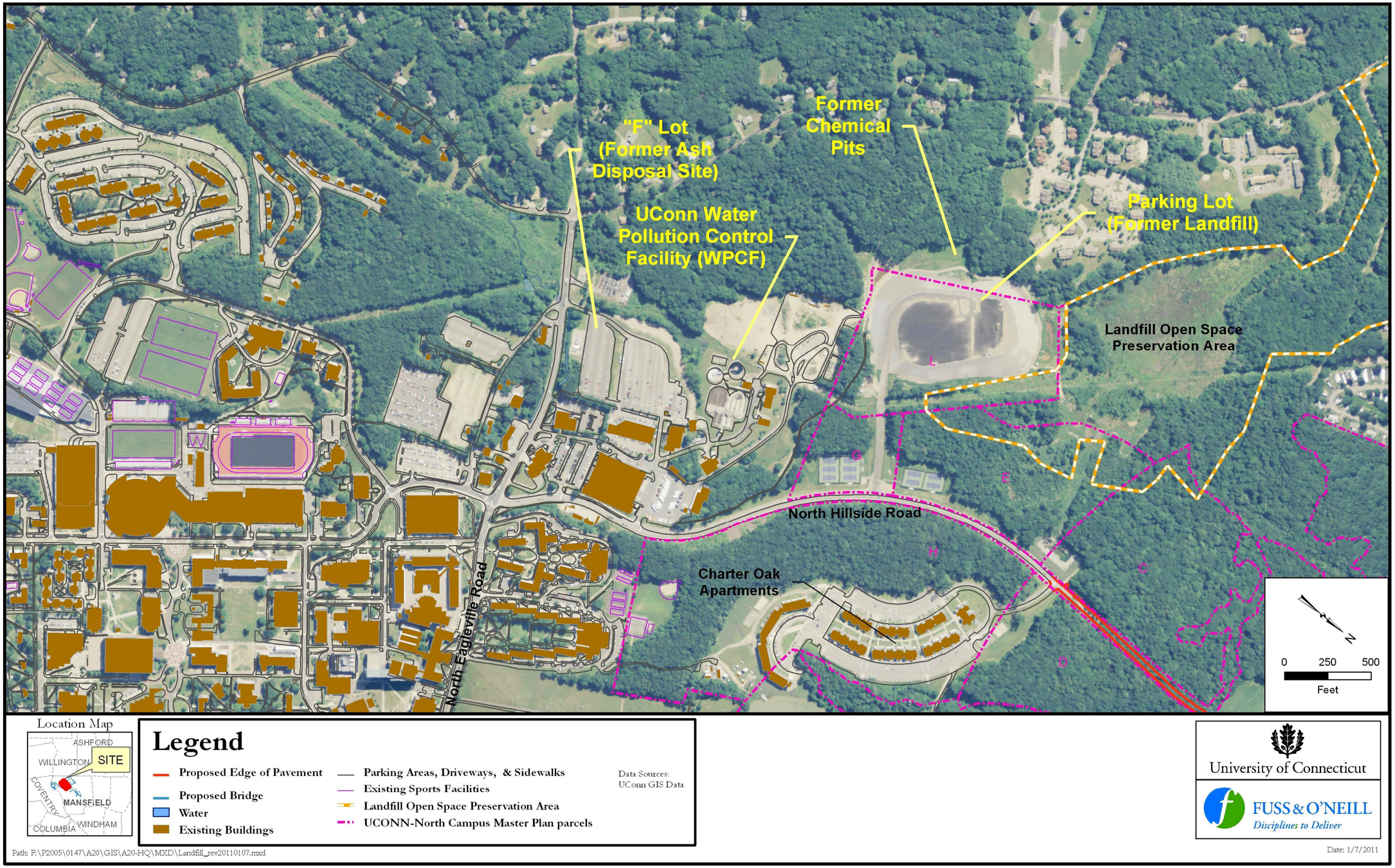
The 1994 and 2001 EIEs described the routine handling, storage, and disposal of regulated wastes that may be generated in facilities located on the North Campus. It is anticipated that hazardous waste generated in UConn-owned facilities on the North Campus will be handled as are hazardous wastes generated on other parts of the Storrs Campus. The current hazardous waste management policy requires that hazardous waste generated be labeled with respective hazard warning and content and stored by hazard category and segregated as necessary off the floor in a secure location (UConn DEHS, July 2001; 2004). The UConn Department of Environmental Health and Safety (DEHS) provides pick up of the waste on a weekly or as needed basis and transports it to the University's Hazardous Waste Storage Facility (HWSF). These wastes are held at this interim facility until disposed of through a commercial hazardous waste disposal company.

Hazardous wastes generated in facilities not owned by UConn are anticipated to be the responsibility of the individual generators.

Landfill, Chemical Pits and Lot F Disposal Site Closure

The 1994 EIE provides an extensive discussion of the chemical pits, which began with a 1982 consent order issued by the Connecticut Department of Environmental Protection (CT DEP), subsequent investigation and development of a closure plan in 1986, and removal of soil at the

Figure 4-13. Former Landfill, Chemical Pits and Lot F Disposal Site



chemical pit site in 1987. The 1994 EIE provides little discussion of the former solid waste landfill (UConn landfill) and the former ash disposal sites at the parking lot area designated Lot F.

In 1998, the CT DEP issued a Consent Order to UConn requiring the University to thoroughly evaluate the nature and extent of soil, surface water, and groundwater pollution emanating from the former landfill, the chemical pits and the Lot F disposal site. The Consent Order further requires UConn to develop and implement any remedial actions necessary to abate pollution from these sites.

At the time of the 2001 EIE for the North Campus Master Plan, preliminary hydrogeologic investigations summarized in the EIE found that:

- Landfill leachate was affecting groundwater, surface water, and sediment,
- Gases and volatile contaminants, such as methane, were affecting soils in the immediate vicinity of the landfill,
- Further investigation was needed to determine the migration of pollutants from the former chemical pits to fractured bedrock, and
- The former ash landfill at Lot F was no longer seen as a significant source of contamination.

The Final Draft Comprehensive Hydrogeologic Investigation Report and Remedial Action Plan, issued in 2003 (Haley & Aldrich, Inc., 2003), confirmed the preliminary investigations and found that a continuing source of contamination remained in the bedrock in the vicinity of the former chemical pits.

The Remedial Action Plan (RAP) received conditional approval from CT DEP on June 5, 2003. The plan included the following elements: landfill regrading, installation of a final cover over the former landfill and chemical pits, elimination of leachate seeps, regrading and capping of the chemical pit area, establishment of a vegetative cover, a plan for post-closure maintenance, a long-term program for monitoring surface water and groundwater quality, and an implementation schedule. Additional investigations were also conducted to assess potential remedial alternatives for addressing groundwater flow from the east, which contributes to saturating waste within the landfill site. Based on data analysis and modeling it was determined that interception or diversion of this groundwater flow was unlikely to be successful in eliminating saturated waste. Therefore, the University installed leachate interception trenches (LITs) to capture leachate for subsequent treatment at the UConn Water Pollution Control Facility.

In July 2005, the CT DEP and the U.S. Army Corps of Engineers (ACOE) approved the permits necessary to perform construction of the remediation project. Remedial activities began in July 2006 and were completed in Fall 2008. The former landfill site was converted to a parking lot as part of the final capping of the landfill. The Long-Term Monitoring Plan (LTMP) involves semi-annual monitoring of groundwater, soil gas, and surface water near the landfill and former chemical pits, as well as semi-annual sampling of eight domestic water supply wells at residences on Meadowood, Separatist, North Eagleville and Hunting Lodge Roads (UConn Landfill Website, June 2007).

4.21.3 Potential Impacts

No direct impacts associated with hazardous waste sites will result from the extension of North Hillside Road, under any of the alternative roadway alignments considered in this FEIS or the No Action Alternative. The roadway construction corridor does not intersect the former UConn landfill, chemical pits, or Lot F ash disposal sites. It will be the responsibility of the contractors to handle, store and dispose of waste generated by construction of the roadway and associated utilities in accordance with applicable regulations.

The proposed stormwater management system for the roadway and North Campus development is designed to maintain pre-development hydrology to the extent possible (see Section 4.12). Therefore, no significant changes are anticipated to groundwater flow in the vicinity of the former UConn landfill, chemical pits and Lot F ash disposal sites.

Hazardous waste may be generated as a result of operational activities in buildings constructed as part of the North Campus development, for example in laboratory research space. However, the development of the North Campus as described in any of the parcel development alternatives presented in this FEIS, does not involve construction on any existing hazardous waste sites.

4.21.4 Mitigation

Given the lack of impacts to hazardous waste sites, no mitigation actions are necessary. However, in order to minimize the generation of hazardous waste and ensure its proper handling, storage and disposal, future UConn facilities on the North Campus will be subject to relevant DEHS policies and procedures described above including the Laboratory Waste Management Policy (UConn DEHS, 2004), the Chemical Waste Disposal Manual (UConn DEHS, July 2001), and the Minimizing Hazardous Waste fact sheet (UConn DEHS, September 2001). Privately developed/operated facilities will be subject to State and Federal hazardous waste regulations and associated management requirements.

4.22 Visual Impacts

4.22.1 Methodology

The visual impact assessments described in the 1994 and 2001 EIEs were reviewed relative to existing conditions at the site and the proposed project. Mitigation measures proposed in the Outlying Parcels Master Plan and the 2001 EIE were reviewed for applicability in the context of the proposed project.

4.22.2 Existing Conditions

The project site currently includes woodlands, wetlands, streams, agricultural lands, and other areas of significant aesthetic value, as described in the 1994 and 2001 EIEs. Like the majority of the UConn campus, the North Campus is identified in the Town of Mansfield Scenic Resources and Classifications Map (Town of Mansfield, 2006) as a Viewshed-Class-II , which defines portions of the site as highly sensitive areas with hilltops that offer dramatic vantage points or lines of vantage to the surrounding landscape. A small area of drumlin (defined as

highly sensitive geological formations of specific origin that form vantage areas or become focal points from other vantage areas) straddles Route 195 into the project area near Parcel F. Another area, located near parcel K and the radio towers, is identified in the Town of Mansfield Scenic Resources and Classifications Map as 'Other Hills,' defined as sensitive prominent hills not classified as drumlins or ridges, but important as vantage or focal areas.

The existing segment of North Hillside Road cuts deeply into the hillside, leaving a bare-rock stabilized slope with little aesthetic quality. Although the roadway is in good condition, the existing roadway lacks rural flavor and does not include roadside plantings or other landscape features.

4.22.3 Potential Impacts

While the No Build alternative would result in no impact to visual resources, the construction of the roadway extension and development of the North Campus will inevitably have an impact upon the aesthetic character of the site. As discussed in the 1994 and 2001 EIEs, the proposed North Hillside Road extension is designed to meet standard highway design requirements, which are intended for the safety of the user. Consequently, like the existing segment of North Hillside Road, the extension will not have a rural flavor. The roadway extension itself, while located within a viewshed as defined by the Town of Mansfield, will not directly impact the drumlin or other hill areas identified in the Town of Mansfield Scenic Resources and Classifications Map

Secondary impacts resulting from development of the proposed parcels are likely to include the partial disruption of vistas from Route 195 and the Charter Oak residential units, as well as some disruption of vistas from Route 44. These changes in the visual and aesthetic character of the North Campus will be similar for all of the alternatives considered, although the roadway alignment under the Preferred Alternative minimizes impacts to wetlands and their associated visual character. The preservation of Parcel A through a conservation easement will maintain an undisturbed visual buffer between the Rolling Hills Mobile Home Park and the proposed North Campus development.

4.22.4 Mitigation

The Outlying Parcels Master Plan and 2001 EIE recommend measures to reduce the visual impacts upon the aesthetic character of the project site and the surrounding area. Consistent with the 2001 EIE Record of Decision, the North Hillside Road extension will include roadside plantings as appropriate along roadside cut slopes. Site designs for the North Campus development parcels will include vegetated buffers between proposed development areas and adjacent property lines (30-foot width minimum). Buffer widths in excess of 30 feet will be determined on a case-by-case basis. Design criteria for exterior lighting will include minimizing unnecessary light spillage.

Other measures to mitigate potential visual impacts will include preservation of prime farmland as described in Section 4.2, limiting development on steep slopes, and providing pedestrian and bicycle facilities. Under the proposed North Campus conceptual development plan, new buildings will be less than 4 stories, with at-grade or below-grade structured parking to reduce building footprints and associated environmental and aesthetic impacts.

4.23 Energy

4.23.1 Methodology

The 1994 and 2001 EIEs provide brief descriptions of the existing utility infrastructure in the proposed project area and contain limited information on utility and energy usage for the proposed North Campus development. Information on energy supply to the campus and campus-wide criteria for sustainable design was updated using information obtained from the University.

4.23.2 Existing Conditions

Energy consumption in the proposed project area is currently limited to fuel consumed by agricultural equipment operating on the farm fields. Energy consumption also occurs at the existing buildings in the project area, including the Charter Oak residential units (Parcel H) and Rosebrooks House, Rosebrooks Barn, and Mink Barn (on Parcel F, along Route 195), as a result of building heating and cooling, and electrical usage associated with lighting and equipment operations.

The Central Utility Plant (CUP), located at 189 Auditorium Road, provides steam, chilled water, fire protection and emergency electrical backup power to the Storrs Campus. A second chilled water plant is also located on the southern portion of the campus. A cogeneration facility was recently constructed at the CUP. The cogeneration facility, which opened in 2006, has a peak generation capacity of 25 megawatts (MW) of electricity, 200,000 pounds per hour of steam, and 6,000 refrigeration tons of chilled water for cooling. The cogeneration plant control and operation is integrated with the existing CUP and distribution grids. The CUP is fueled by natural gas that is provided by Connecticut Natural Gas (CNG), with fuel oil as a back-up fuel source for the CUP. The campus is still connected to the electrical transmission system of Connecticut Light and Power (CL&P), which also provides electricity supply for the campus. Natural gas is available in the vicinity of the proposed project through a 6-inch main provided by CNG.

The existing utility infrastructure in the project area includes primary electrical and natural gas which is located beneath the existing North Hillside Road and along Routes 195 and 44.

4.23.3 Potential Impacts

Potential energy consumption impacts from the proposed project are likely to be similar under each proposed alternative, other than the No Action Alternative, under which energy consumption will remain similar to existing conditions. Additionally, no recent estimates of energy consumption have been completed since details regarding the build-out of the alternatives are not known.

In addition to the roadway extension, the extension of gas, water, sewer, electric, and telecommunication utility lines will occur. Direct impacts to energy consumption from the roadway extension are not anticipated. However, the North Campus development will result in secondary impacts in the form of increased energy consumption to heat, cool and provide power to the approximately 1.2 million square feet of new construction.

The 1994 EIE included a projected peak electrical demand of approximately 17,600 kVA and an estimated natural gas consumption under the full-build alternative of 92,155 cubic feet per hour. No estimate regarding steam consumption of the proposed project was given in the 1994 EIE. The 2001 EIE provided no updated information regarding energy usage.

These 1994 estimates were based on 1.2 million square feet of building area and the proposed land uses at the time, and are likely to be conservative given increased energy efficiency of equipment and building design. Actual energy consumption will be a function of the mechanical and electrical equipment within individual buildings as well as the programmatic function of those facilities. A building with more demanding operational requirements for heating, cooling, ventilation, and equipment, such as a laboratory building, typically has more energy usage than other buildings of the same size. Both the 1994 and 2001 EIEs indicated that energy demands could be met for the North Campus development.

4.23.4 Mitigation

The Outlying Parcels Master Plan (JJR, 2000) recommends the use of environmentally friendly technologies for energy efficiency for development on the North Campus. In addition, UConn has established Campus Sustainable Design Guidelines (JJR and SmithGroup, 2004), which include specific measures for reduction of energy consumption on new construction projects on campus, and more recently has adopted the Sustainable Design & Construction Policy in March 2007, which has provisions requiring any new building construction or renovation project entering the pre-design planning phase to establish the Leadership in Energy & Environmental Design (LEED) Silver rating as a minimum performance requirement. Comprehensive approaches to energy efficiency in the design of the new buildings will help to offset increased energy consumption. In addition, the new cogeneration plant for campus-wide utilities has resulted in increased energy efficiency in heating and cooling on campus.

4.24 Construction Impacts

4.24.1 Methodology

Construction impacts are temporary impacts that only occur during the construction phase of the project. This section describes the type of short-term impacts that potentially may occur during project construction, which is estimated to be two construction seasons.

4.24.2 Existing Conditions

A discussion of existing conditions is not applicable for construction impacts.

4.24.3 Potential Impacts

The construction impacts associated with each of the build alternatives are relatively similar and result primarily from the noise, fugitive dust, construction equipment exhaust, erosion and sedimentation, traffic and pedestrian relocation, and visual impacts that occur with roadway construction and subsequent site development activity and do not extend in duration past the construction period.

Economic Impacts

Construction-related employment would result from the construction of the build alternatives. These opportunities would be short-term in nature, but would include both direct (on-site) and indirect (off-site construction-related) employment opportunities, as well as induced employment (i.e., jobs created by income, obtained from direct and indirect employment, spent in the local economy).

Traffic

Construction of the build alternatives will potentially result in additional construction-related truck traffic on roadways leading to the existing North Hillside Road. Given that the project will be an extension of an existing dead-end road, relatively little disruption to existing traffic is expected during the roadway construction. The existing drives to the banks will be maintained during construction. Two-way traffic will be maintained on Route 44 while it is being widened and the new traffic signal is installed. Should construction-related traffic delays result during construction, they would be short-term and localized in nature.

Air Quality

Construction activities may result in temporary adverse air quality impacts from construction equipment emissions and fugitive dust. Diesel and gas-powered construction equipment emits NOx, CO, VOC, and particulate matter and short-term elevated ambient concentrations of such air pollutants may result in the immediate vicinity of construction activities.

Particulate matter (fugitive dust) would be generated as a result of typical construction operations including grubbing, grading, excavating, and hauling operations. Fugitive dust is most likely to be a concern during periods of intense activity and would be accentuated by windy and/or dry weather conditions.

Noise

It is difficult to reliably predict the sound levels that may occur at a particular receptor or group of receptors as a result of construction activity. Heavy construction equipment is the principal source of noise during construction activity, and the pattern of heavy equipment use is constantly changing as a construction project progresses. For the most part, construction activity occurs during daytime hours when higher sound levels are generally more tolerable at nearby receptors. In addition, any adverse noise impacts due to construction activities would be temporary in nature, and no one receptor is expected to be exposed to high sound levels due to construction for an extended period of time.

The site preparation phase of the construction schedule may produce sound levels that are higher than those levels produced by most other forms of construction activity. The construction equipment used has typical noise emission levels in the mid-80s to upper-90s dBA range at a 50-foot distance. Although these levels are greater than the FHWA Category B Leq NAC of 67 dBA, the sound energy is expected to be intermittent and attenuated over hundreds of feet before reaching an applicable receptor. Therefore, the average Leq is not expected to

exceed the NAC of 67 dBA. As mentioned previously, construction noise is exempt from CT DEEP regulations; however, CTDOT standard specifications limit construction noise levels at the residence or occupied building nearest to the project to no more than 90 dBA .

As this project enters the final design and construction phases, provisions should be made in the plans and specifications that the construction contractors make every reasonable effort to limit the impacts that construction noise may have on sensitive receptors. These efforts could include restriction of work to daytime hours, proper maintenance of equipment, and advance notification of nearby receptors of any activities that may produce excessive sound levels.

Water Quality and Wetlands

Construction of the build alternatives will require land clearing and grading, resulting in reworking and/or removal of both surficial and subsoils along the roadway corridor. Whenever there is exposure of previously vegetated areas, there is potential for erosion and sedimentation into nearby water bodies or wetlands.

The proposed wetland crossings will be consistent with the requirements of the U.S. Army Corps of Engineers 404 Permit and the CT DEEP Inland Wetlands & Watercourses Permit when they are issued for the project, as well as follow guidance contained in the CT DEEP Stream Crossing Guidelines. Appropriate soil erosion and sediment controls will be used and maintained during construction to minimize construction-phase impacts to the streams and wetlands that will be crossed by the proposed roadway and North Campus development. Construction of the road crossing and associated work within the streams and on-site wetlands will be performed during periods of low-flow or no-flow, and no in-stream work will be performed during predicted periods of high flow. The bottom elevations of the box culverts will be installed below existing grade to provide passage for aquatic life that may exist naturally in the vicinity of the crossings.

Portions of the project site are located in close proximity to several public drinking water supply wells and within the Willimantic Reservoir watershed. Construction activities could potentially result in spills, leaks, or release of hazardous materials that could impact public water supplies. Development of the North Campus could also potentially affect water availability by altering local hydrology, including groundwater recharge and surface water flows.

Wildlife

Construction activity along the roadway corridor may displace some species of wildlife from the edge of the corridor. Existing farming operations and equipment in this area currently generate noise in portions of the project corridor.

Visual

Project construction will result in some short-term visual impacts from land-clearing and earth-moving prior to project completion and land stabilization.

4.24.4 Mitigation

Mitigation measures would be provided during construction to reduce impacts on natural resources and communities. Most mitigation measure are incorporated into the construction specifications as requirements or best management practices (BMPs).

Traffic

If necessary during the construction period, appropriate measures for the maintenance and protection of traffic will be coordinated with campus public safety and Mansfield public safety officials to avoid or minimize inconvenience. Such measures could include appropriate construction signage, uniformed officers, and prohibition of construction traffic on designated local roads. The preferred construction access will be from Route 44 to avoid use of campus roadways.

Air Quality

Emissions from project-related construction equipment and trucks will be much less than the total emissions from other industrial and transportation sources in the region, and therefore, are expected to be insignificant with respect to compliance with the NAAQS. Direct emissions from construction equipment are not expected to produce adverse effects on air quality, provided that equipment is properly operated and maintained. Appropriate mitigation requirements could consist of assurance of proper operation and maintenance, and prohibition of excessive idling of engines. Section 22a-174-18(b)(3)(C) of the Regulations of Connecticut State Agencies (RCSA) prohibits excessive idling. UConn also encourages the use of construction equipment with air pollution control devices where practicable. The use of control devices such as oxidation catalysts and particulate filters for diesel-powered equipment is typically only necessary in circumstances where the site is located immediately adjacent to residential areas or in confined spaces. UConn will require the use of such air pollution control devices and clean fuels for the project construction, as well as require construction vehicle emission controls in the contract specifications, where appropriate.

Fugitive dust impacts will be mitigated through good "housekeeping" practices such as watering exposed earth areas, covering dust-producing materials during transport, limiting dust-producing construction activities during high wind conditions, and providing street sweeping or tire washes for trucks leaving the site. RCSA Section 22a-174-18(c) requires mitigation of fugitive dust emissions.

Roadway traffic disruption due to lane closures, detours, and construction vehicles accessing the site can cause congestion which can increase motor vehicle exhaust emissions. These impacts will be mitigated by implementing appropriate traffic management techniques during the construction period. Construction access to and from the project site will be incorporated into the final project plans and specifications. Existing traffic patterns will be maintained to the extent feasible during peak traffic hours. The necessity of any mitigation involving prohibition of construction traffic on designated local and campus roads will be determined during the design phase.

Noise

Noise impacts can be minimized by ensuring that mufflers have been installed and are being properly maintained on construction equipment. Restricting the hours of operation to daylight hours will also minimize noise impacts to receptors in the project area. In addition, the CTDOT standard noise provisions will be included in the construction contract, as follows:

> "1.10.05 – Noise Pollution: the Contractor shall take measures to control the noise caused by its construction operations, including but not limited to noise generated by equipment used for drilling, pile driving, blasting, excavation or hauling."
>
> "All methods and devices employed to minimize noise shall be subject to the continuing approval of the Engineer. The maximum allowable level of noise at the residence or occupied building nearest to the Project site shall be 90 decibels on the "A" weighted scale (dBA). The Contractor shall halt any Project operation that violates this standard until the Contractor develops and implements a methodology that enables it to conduct its Project operations within the 90-dBA limit."

Water Quality and Wetlands

Potential water quality impacts during construction will be minimized through proper implementation of soil erosion and sediment control measures. Construction of the roadway and subsequent site development will require preparation of a Stormwater Pollution Control Plan and registration under the CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activity. Construction-phase soil erosion and sediment control measures will conform to CTDOT standard soil erosion control provisions (Section 2.10 of *Form 816, Standard Specifications for Roads, Bridges, and Incidental Construction)*. Soil erosion and sediment controls, such as silt fences, hay bales, mulch, and soil stabilization measures will be installed and maintained in accordance with the *Connecticut Department of Transportation On-Site Mitigation for Construction Activities* (1994) and the *Connecticut Guidelines for Soil Erosion and Sediment Control* (Connecticut Council on Soil and Water Conservation, 2002).

Construction site Best Management Practices (BMPs) will be incorporated into the Stormwater Pollution Control Plans for the roadway construction and subsequent North Campus developments and implemented prior to the initiation of activities that could impact public water systems. These include provisions for emergency spill response during construction, hazardous material storage and disposal to prevent vandalism and undetected releases, construction vehicle fueling and maintenance procedures, notification of affected public water systems and CT DPH of the construction start date, and procedures for notification of CT DPH and CT DEEP in the event of a chemical/fuel spill at the construction site.

Wildlife

Temporary disturbance of wildlife from construction noise and human activity along the project corridor is largely unavoidable and no specific mitigation is proposed other than overall mitigation for potential wildlife impacts as discussed in other sections of this FEIS. The proposed project will result in some temporary and permanent impacts to wildlife resources,

which are typical of almost any construction project on undeveloped land. Temporary impacts will occur during construction. Wildlife may be temporarily displaced during construction and will likely move to adjacent habitats for refuge during construction activities. Due to the clustered nature of the North Campus development and high percentage of remaining undisturbed land, there is comparable habitat available for wildlife species adjacent to the proposed area of development. Wildlife will gradually reinhabit areas that are temporarily disturbed during construction as the development is completed in phases.

Due to the presence of vernal pools on the project site, to the extent feasible, construction in the vicinity of the vernal pools should take place outside amphibian movement periods in early spring and fall. Construction should be staggered and silt fence should be minimized within 750 feet of the vernal pools. Silt fencing should be used to exclude amphibians from active construction areas.

Visual Impacts

Temporary visual impacts are largely unavoidable and no mitigation is proposed.

4.25 Title VI and Environmental Justice

4.25.1 Methodology

Title VI of the 1964 Civil Rights Act (42 U.S.C. 2000d-1)states that "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." Title VI prohibits intentional discrimination as well as policies or practices that are neutral in nature, but result in a disparate impact on a protected group.

The President's Executive Order on Environmental Justice (E.O. 12898) directs federal agencies to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high adverse human health or environmental effects of its activities on minority and low-income populations.

In 1997, the U.S. Department of Transportation (DOT) issued the *DOT Order to Address Environmental Justice in Minority Populations and Low-Income* Populations. The order described the process for DOT Operating Administrations, including the Federal highway Administration, to incorporate environmental justice principles (as embodied in E.O. 12898) into existing programs, policies, and activities.

Although the 1994 and 2001 EIEs addressed demographics, they did not specifically address issues related to environmental justice (EJ) or Title VI. In order to update relevant information on potential low-income and minority populations, data was collected from the Mansfield Town Profile (CERC, 2010) and the U.S. EPA Environmental Justice Geographic Assessment Tool (http://www.epa.gov/enviro/html/em/index.html). The latter source uses data from the 2000 U.S. Census Bureau Population and Housing Summary File (SF3).

4.25.2 Existing Conditions

The Mansfield Town Profile contains demographic information current through 2009 and identifies 16.2% of the 23,992 residents as minority, a slightly lower percentage than the statewide minority population of 22%. The U.S. EPA Environmental Justice Geographic Assessment Tool shows the minority percentage of population by census block. Figure 4-14 shows that the project area is contained within a census block with 10-20% minority population and the area immediately east of the project site on the eastern side of Route 195 is also mapped as 10-20% minority. To the west and southwest of the project site, the percentage of minority population ranges from 10-40%, with 30-40% in the area west of Hunting Lodge Road and also south of North Eagleville Road. It should be noted that these are areas containing on-campus and off-campus student housing, which may explain the higher percentage of minorities relative to the general area surrounding the campus. To the northwest and north of Route 44, there are areas of 20-30% minority population.

The Mansfield Town Profile lists the 1999 poverty rate at 14.2% for the town. These results likely reflect the large number of students, who would be expected to have lower annual income compared to the non-student population. This assumption is also supported by the breakdown of the population by age which shows that 43% of the town population is between the ages of 18 and 24, whereas only 9% of the statewide population is in that age range. The U.S. EPA Environmental Justice Geographic Assessment Tool shows the census block containing the North Campus area, which has a low population density, has 30-40% of the population below the poverty level. The rest of the Storrs campus south of North Eagleville Road is within census blocks having 10-20% below the poverty level. The area immediately west of Hunting Lodge Road is within a census block having 30-40% below the poverty level (Figure 4-15).

4.25.3 Potential Impacts

No direct impacts to minority or low-income populations will result from the extension of North Hillside Road. Given that the roadway extension will improve traffic conditions on roadways surrounding the campus, especially along Hunting Lodge Road (see Section 4.6), minority and low-income population may benefit from the roadway extension.

The area of the North Campus proposed for development does not contain, nor is it directly adjacent to, areas of EJ populations and therefore, no disproportionately high impacts to protected groups will occur due to the construction or operation of the facilities identified for the North Campus development. In fact, minority and low-income populations within the Storrs campus student population, as well as the overall student body, will ultimately benefit from the expanded facilities constructed as part of the North Campus development.

4.25.4 Mitigation

Given the lack of impacts to EJ populations, no specific mitigation to address disparate or disproportionately high impacts on a protected group or groups is necessary. All individuals in the project area, regardless of EJ standing, will benefit from mitigation measures identified elsewhere in this document.

4.26 Secondary and Cumulative Impacts

4.26.1 Secondary Impacts

Secondary impacts, also referred to as indirect impacts, are defined as effects of an action that are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable" (40 CFR 1508.8). The baseline for evaluating potential secondary impacts is the existing and reasonably foreseeable expected environment under the No Action Alternative. Construction of the proposed North Hillside Road extension will facilitate the development of the North Campus as described in the Outlying Parcels Master Plan and the 2001 North Campus Master Plan EIE and Record of Decision. The North Campus development is a distinct, but connected, action. Consequently, the majority of secondary impacts result from the construction and operation of facilities on the North Campus parcels. Because the secondary impacts are associated with the North Campus development, the impacts are similar in nature and magnitude for all roadway alignments considered.

Secondary impacts have been analyzed within individual sections of this FEIS that address different sectors of the affected environment. Table 4-21 summarizes the potential secondary impacts by environmental sector. Detailed analysis of these impacts is presented within the sections of this document listed in Table 4-21.

4.26.2 Cumulative Impacts

A cumulative impact is defined as an impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). In considering cumulative impacts, resources affected by the project were identified; the relevant geographic area for a particular resource affected by the project was identified; other relevant past, present, and reasonably foreseeable future actions were considered; and the overall cumulative effect of the proposed action and these other actions were analyzed. Table 4-21 provides a summary of the potential cumulative impacts by applicable environmental sector.

4.27 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

The North Hillside Road extension is part of larger transportation and land use planning efforts for the UConn campus and surrounding area that considered the need for future mobility within the context of present and future land use development plans. The local short-term impacts and use of resources by the proposed action are consistent with the maintenance and enhancement of long-term productivity. All roadway projects require the investment or commitment of some resources found in the existing environment. Short-term refers to the immediate consequences of the project (i.e., roadway construction); long-term relates to its direct or secondary effects (i.e., North Campus development) on future generations.

Figure 4-14. Minority Percentage of Population by Census Block

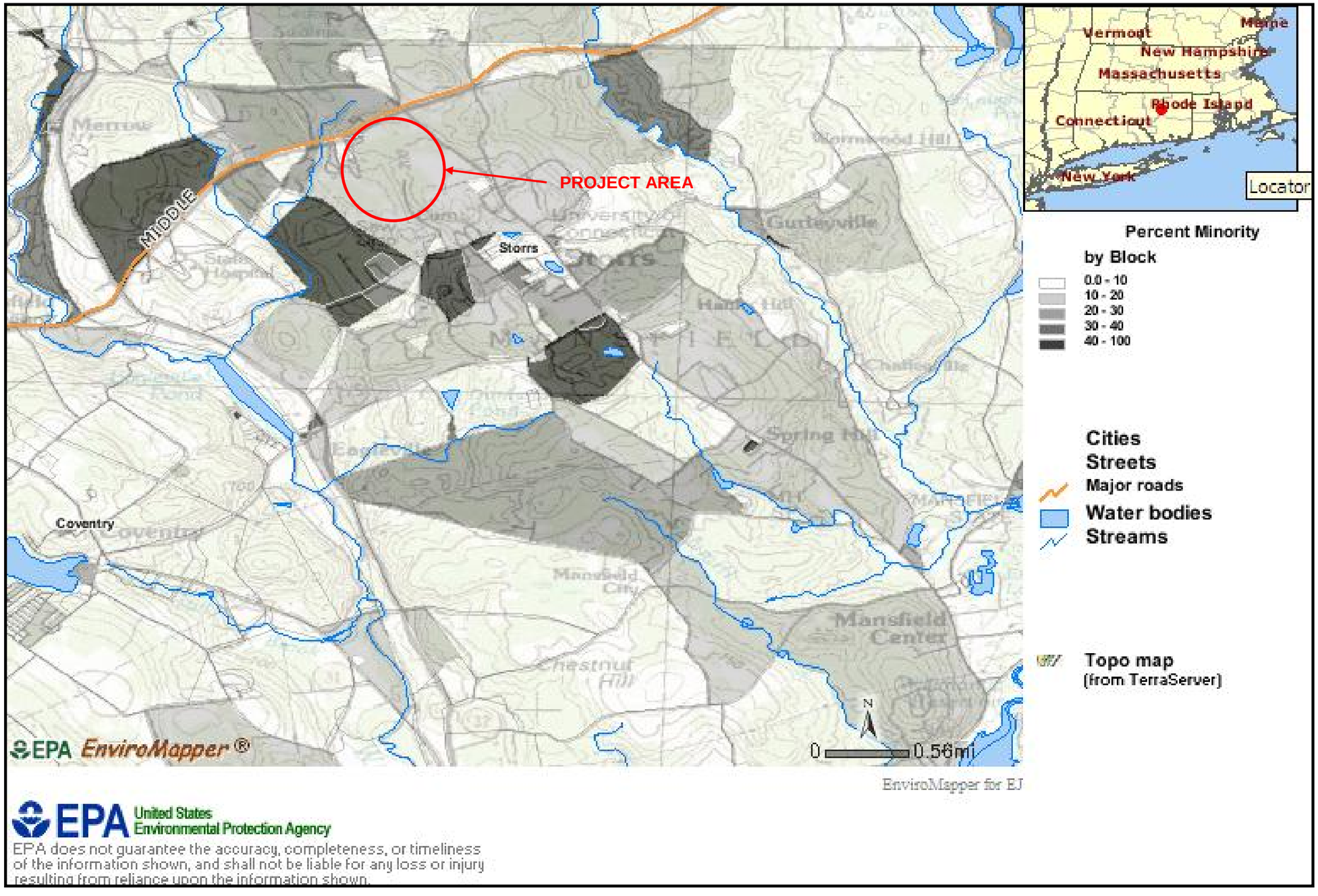


Figure 4-15. Population Below the Poverty Level

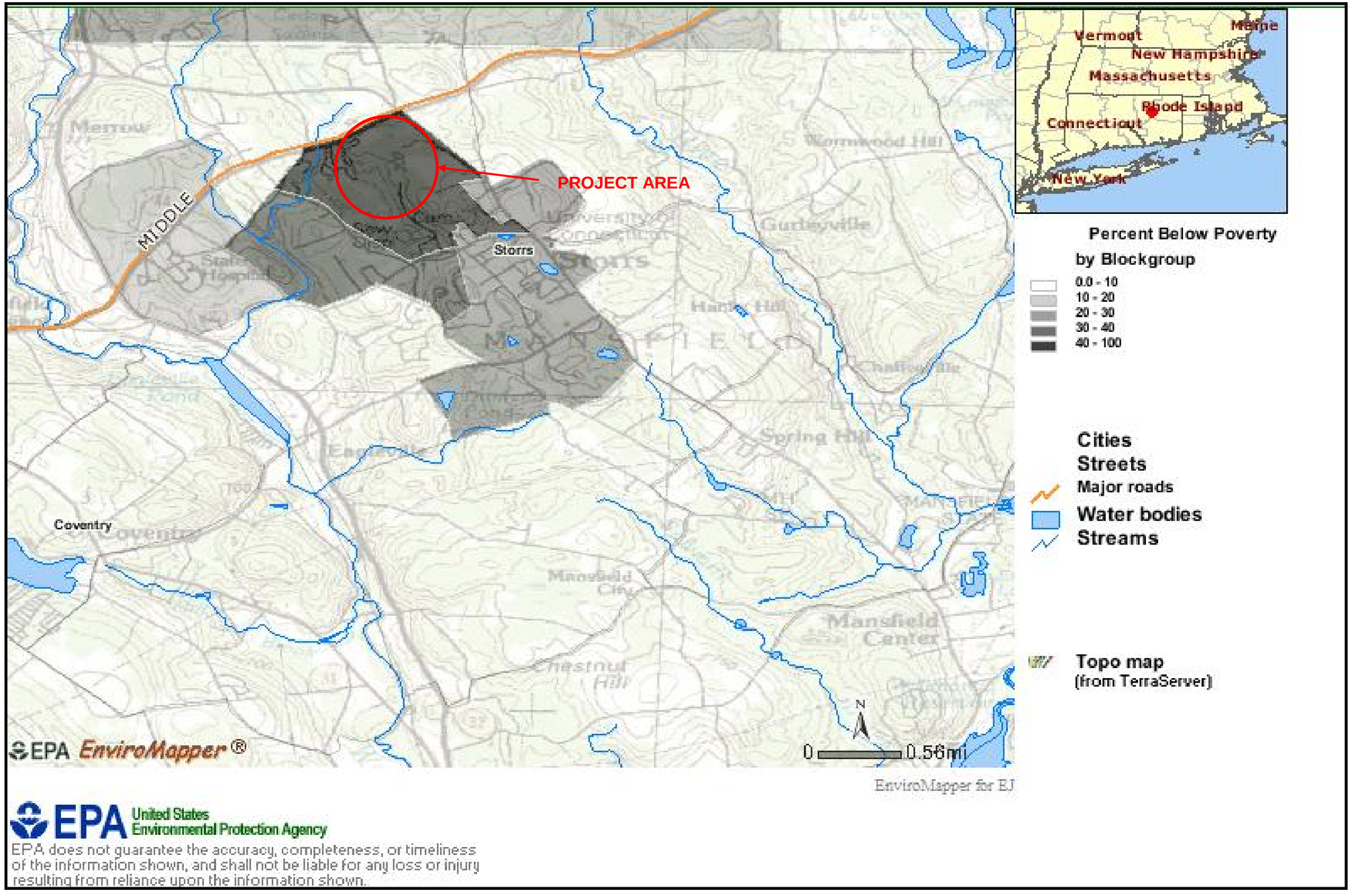


Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
Land Use (Section 4.1)	There has been limited development on the North Campus, consistent with the North Campus Master Plan, including the current North Hillside Road, the Charter Oak residential area and the tennis courts.	The No Action Alternative would maintain the existing land use (agriculture and undeveloped) on the North Campus.	The extension will result in approximately 4 acres of land conversion along the roadway corridor.	The project will facilitate the development of the North Campus, which will result in the conversion of approximately 40 acres of farmland and open space to institutional, professional, and commercial development. This is consistent with the campus, local, and regional land use plans that call for development where supporting infrastructure exists.	Within the region there is likely to be continued growth and consumption of vacant and underutilized, unprotected land. Direct and indirect impacts of the build alternative are unlikely to alter this broader trend.
Farmland Impacts (Section 4.2)	21% of Connecticut's farmland has been converted to non-agricultural use in the past 20 years, an average of 8,000 acres per year. Development of the Charter Oak residential area resulted in a loss of approximately 14 acres on the North Campus.	There is no foreseeable loss of farmland under the No Action Alternative.	The roadway corridor will result in the conversion of 2.3 acres of prime farmland soils.	Development on the North Campus will result in the conversion of 31.8 acres of prime farmland soil.	On a regional scale, the economic challenges of farming combined with the demand for farmland for development will likely lead to continued conversion of farmland to non-agricultural use, resulting in cumulative impacts.

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
					Mitigation consisting of preservation of 41.5 acres prime farmland soils and off-site acre-for-acre replication will offset the direct and indirect effects of the project, and therefore will not contribute substantially to the state-wide trend.
Social Impacts (Section 4.3)	Community resources are currently able to meet the needs of local residents.	Population growth will require corresponding increases in community services (i.e., educational facilities, emergency services, health care, waste management, public recreational facilities, businesses,).	The project is not expected to result in any direct impacts on community resources.	The additional building and parking areas on the North Campus could potential increase the demand on public safety services on the UConn campus. The 2,800 new jobs created by the North Campus development at full buildout will create an increased demand for existing and new housing, which will create a gradual increased demand for housing and services in	Because of Master Planning for the core campus and outlying campus parcels, the University is aware of and able to provide for the expansion of public safety services to meet the demands of campus-wide development. The indirect impacts of the Build Alternatives are not expected to adversely impact the provision of services.

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
				the local community and in the region.	Construction of new housing has the potential for secondary and cumulative impacts to wetlands, water quality, farmland, traffic, air quality, utilities, and other environmental resources. Mitigation measures, as necessary, for this new housing will be implemented as a condition of local project approval, as well as applicable state and federal permit requirements.
Economic Impacts (Section 4.5)	The University is a major local employer, provides an educated and skilled workforce to the region, and research and development activities has positive impacts statewide.	The revitalization of business districts in the Mansfield area will likely result in expanded local economic opportunity. Given the on-going implementation of the 21st Century	The construction of the roadway extension will provide short-term construction employment.	The development of the North Campus will result in expanded employment opportunities. Additional economic benefits are also likely to result from the build-out of research and technology	The direct and indirect impacts of the project are expected to contribute positively to the growth and expansion of the regional and local economy.

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
		UConn program, the University will continue to provide employment opportunities and contribute to statewide research and development, while providing education and training for a skilled workforce.		development space on the North Campus.	
Traffic (Section 4.6)	Expansion of the University student and staff population and population growth in the area has resulted in increased traffic volume and delays at peak hours on roadways surrounding the campus.	Increased traffic is anticipated as a result of 21st Century UConn projects, as well as development projects in Mansfield. Levels of Service at intersections in the project area are anticipated to remain constant or worsen slightly under the No Action Alternative.	The roadway extension will provide some improvement in LOS at Route 195 and Moulton Road and North Eagleville and Hunting Lodge Roads under future (2030) conditions compared to the No Build Alternative.	Additional traffic will be generated from the North Campus development. However, the indirect impacts will result in little change in LOS at most intersections in the project area and the LOS at most locations will improve over the No Build Alternative when mitigation (signal timing, widening, etc) is incorporated.	While the cumulative effect of growth and development in the project area will result in a decline in LOS at many intersections, the mitigation measures associated with the proposed project will offset these effects, lessening the cumulative effects at many intersections in the project area.
Air Quality (Section 4.9)	Despite an increase in stationary and mobile sources of pollutants,	Attainment of the NAAQS and continued reductions	Attainment of the NAAQS and continued	Attainment of the NAAQS and continued reductions in MSATs is	Attainment of the NAAQS and continued reductions

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
	air quality in Connecticut has generally stayed constant or improved since the mid-1980s. All NAAQS are met with the exception of ozone, which is in non-attainment at the regional level. GHG emissions have shown an increasing trend over the period of 1990 through 2001, and are expected to increase in the near-term.	in MSATs is anticipated. Regulatory approaches, greater availability of mass transit, and transit-oriented development may help flatten or slowly reverse the increasing trend in GHG emissions.	reductions in MSATs is anticipated. Minor increase in GHG emissions during construction of the roadway extension.	anticipated. Modeling shows no microscale impacts due to mobile sources. Increased indirect GHG emissions primarily from fuel usage by vehicles traveling to and from the North Campus facilities, direct stationary emissions from fuel usage in the on-site buildings, and indirect stationary emissions from energy consumption (co-generation and off-site energy sources).	in MSATs is anticipated due to pollution reduction measures at the state and federal level. Increase in GHG emissions anticipated to be negligible on a global and state-wide scale. Design elements and mitigation measures that will reduce potential increases in GHG emissions include LEED Silver performance standards for building design and operation, sustainable site design and LID stormwater management, and alternative transportation measures.
Noise (Section 4.10)	Increases in noise levels have occurred due to increased traffic	Increases in noise levels may accompany	Any of the build alternatives are likely to have similar	Additional traffic associated with the North Campus	Increases in noise levels at sensitive receptors in high

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
	in the area. Due to the land use in the surrounding area, the type and amount of sensitive receptors has not changed significantly.	background traffic growth in the area. Additional residential development or community-support facilities may result in an increase in sensitive receptors.	minor increases in noise levels.	development will result in minor increases in traffic noise. With the exception of academic support facilities, development is not anticipated to result in additional sensitive receptors. The maximum anticipated increase is 2.2 dBA, with no exceedances of the NAC expected.	traffic areas are likely. The direct and indirect impacts of the Build Alternatives are unlikely to alter this trend.
Surface Water and Groundwater Resources (Section 4.11)	Development in the region has resulted in water quality impacts to Eagleville Brook and the downstream reaches of Cedar Swamp Brook. The Fenton River habitat may be impacted by groundwater withdrawals under low flow conditions. Groundwater quality beneath the UConn landfill area has historically been impacted by the landfill	The University water supply system has adequate capacity to meet water demands. Supply deficits could coincide with annually-occurring low seasonal streamflow. Future off-campus development within the Cedar Swamp Brook and Mason Brook watersheds could impact surface and groundwater	No impact to water supply Increases in impervious cover (approximately 10% of new impervious cover is associated with the roadway) could impact site hydrology and water quality. Project design elements, including stormwater management, will reduce potential	Increased water demand of approximately 90,000 gpd under any of the build alternatives. Increases in impervious cover (approximately 90% of new impervious cover is associated with the parcel development) could impact site hydrology and water quality. Project design elements, including stormwater management, will reduce potential impacts	Supply deficits could coincide with annually-occurring low seasonal streamflow. UConn will continue to follow Fenton River and Willimantic River withdrawal protocols, and pursue reuse of treated wastewater effluent to mitigate potential impacts. Impervious cover levels in the local subwatersheds

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
	and former chemical pits. Development on campus and in the surrounding area has increased the demand for potable water.	quality to the extent allowable under local zoning and land use regulations.	impacts of stormwater runoff and increased impervious cover.	of stormwater runoff and increased impervious cover.	anticipated to remain at or below levels indicative of healthy stream systems. Increases in IC on the North Campus will be mitigated by project design elements.
Stormwater Management (Section 4.12)	Increase in impervious area has resulted in increased stormwater runoff to waterbodies in the Fenton and Willimantic River Watersheds, which likely resulted in water quality impacts related to sediment, nutrients, and bacteria concentrations in receiving waters.	The potential impact of new development is reduced by the more prevalent use of stormwater management practices that emphasize reduced runoff and improved water quality.	See water quality impacts described above. Potential stormwater impacts will be mitigated through the use of centralized and lot-level stormwater management practices and construction-phase erosion and sediment controls.	See water quality impacts described above. Potential stormwater impacts will be mitigated through the use of centralized and Low Impact Development (LID) stormwater management practices and construction-phase erosion and sediment controls.	Impervious cover levels in the local subwatersheds anticipated to remain at or below levels indicative of healthy stream systems. Increases in IC on the North Campus will be mitigated by project design elements.
Wetland Impacts (Section 4.13)	The National Marine Fisheries Program reports that by the mid-1980's, Connecticut lost approximately 74% of its estimated original	Future development in the local and regional area may result in the additional loss of wetlands or degradation of	Two wetland areas, totaling 0.09 acres, will be impacted by the proposed roadway construction. Proposed mitigation	Indirect impacts to wetlands resulting from the development of the North Campus parcels are estimated at 0.22 acres. Proposed mitigation consists of	Impacts to wetlands may occur as a result of new induced residential development in the local area and region resulting from new

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			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
	wetlands base, a higher rate of wetland loss than any other New England state.	existing wetland functions and values. Local, state, and federal wetland protection regulations restrict loss of wetlands through wetland mitigation requirements for development projects.	consists of wetland creation, stream crossing design that maintains habitat connectivity, stormwater management, stream bank restoration, preservation of an undisturbed wetland and amphibian migration corridor through a conservation easement, avoidance of 100-foot upland envelope, and limited development within the vernal pool critical upland habitat.	wetland creation, stormwater management, stream bank restoration, preservation of an undisturbed wetland and amphibian migration corridor through a conservation easement, avoidance of 100-foot upland envelope, and limited development within the vernal pool critical upland habitat. Mitigation for secondary effects of construction and operation of new road and new North Campus facilities related to roadway deicing and anti-icing, artificial light, and invasive species.	employees of the North Campus facilities. Mitigation would be provided through the local land use review process and applicable state and federal permt requirements.
Water Body Modification and Wildlife Impacts	Wildlife habitat function and integrity has been affected by natural forest	Future development in the local and regional area may result in the	Moderate value woodland habitat will be lost, as well as smaller areas of	Woodlands of generally moderate habitat value will be the habitat type most affected by	The woodland areas of the North Campus are currently fragmented, so the

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

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			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
(Section 4.14)	succession, loss of farmlands, development, and the absence of fire, which has resulted in the loss and/or fragmentation of habitat.	additional loss of habitat through land use conversion or fragmentation of existing habitat. This is most likely in forested areas, which are most common in Connecticut, and field/farmland areas, which experience high development pressure. Natural forest succession will also alter the available habitat in some areas	field and higher value wetland habitat areas.	development of the North Campus.	build alternatives are not expected to cause a substantial cumulative adverse impact to wildlife habitat. Avoidance of and mitigation of impacts to the more critical wetland habitat will not result in a substantial adverse cumulative impact to wildlife species that utilize wetland habitat.
Threatened or Endangered Species (Section 4.19)	Loss of habitat areas due to development and natural succession has impacted species throughout Connecticut.	Continued development in the region and natural succession of forested lands may result in loss of habitat for some species, although this will be limited by regulatory protection for federal- and state-listed species.	The roadway extension will not result in a loss of breeding habitat for state-listed avian species, although staging and migratory areas could be impacted. The loss of wetlands associated with the roadway crossing will reduce	The development of the North Campus will not result in a loss of breeding habitat for state-listed avian species, although staging and migratory areas could be impacted by farmland conversion. The loss of wetlands will reduce potential habitat for the state-listed Northern spring	Outside of natural succession resulting in loss of grassland habitat, the potential for substantial cumulative impacts to threatened and endangered species is low due to regulatory protection for the species as well as selected habitat types (i.e., wetland

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
			potential habitat for the state-listed Northern Spring Salamander, but a construction time window for crossing the intermittent stream to the extent practicable, wetland crossing designs that maintain habitat connectivity, stormwater controls and preserving forest canopy will minimize this.	Salamander, however, the habitat function of vernal pools on the North Campus are not anticipated to be impacted.	resources).
Historic and Archaeological Preservation (Section 4.20)	Prior private development may have had adverse effects on unprotected historic and archaeological sites. Development on the UConn campus conducted under the Connecticut Environmental Policy	Continued development in the region may place pressure on unprotected cultural resources, but development on the UConn campus will be subject to review by the State Historic	The SHPO and THPOs (Mashantucket Pequot and Mohegan Tribes) have determined no effect will occur.	Due to the presence of areas of moderate to high sensitivity on the North Campus, additional investigation and coordination with the SHPO and the appropriate THPOs will be required as development proceeds	While impacts to unprotected cultural resources may occur as a result of private development in the region, the proposed project will not contribute to such impacts.

Table 4-21. Summary of Direct, Indirect, and Cumulative Impacts

Environmental Sector	Existing Conditions and Trends (Effect of Past and Present Actions)	Impacts from Other Foreseeable Future Actions (No Action Alternative)	Impacts of the Build Alternatives (Incremental Effects of Proposed Action)		Potential for Cumulative Impacts
			Direct Impacts (Roadway)	Indirect (Secondary) Impacts (North Campus)	
	Act has required consideration of these resources, thereby limiting impacts.	Preservation Office (SHPO) and appropriate Tribal Historic Preservation Officers (THPOs).		to adequately identify and protect cultural resources.	
Visual Impacts (Section 4.22)	Development has altered the visual landscape of numerous parts of Connecticut.	Private and university development projects have the potential to alter the rural character of region surrounding the University.	The roadway will alter the visual setting of the North Campus, placing a linear feature with it associated grading in what is currently an essentially rural landscape.	Secondary impacts resulting from development of the proposed parcels are likely to include partial changes in the vistas from Route 195 and the Charter Oak residential area, as well as some changes in vistas from Route 44	The Outlying Parcels Master Plan lists comprehensive measures to be included for each parcel to reduce the effect of the project on aesthetics in the area. Consequently, the project will not result in a substantial adverse cumulative impact to visual resources.

Short-term consequences of the No-Action Alternative include continued traffic congestion and delays at intersections and along roadways in the campus area. Long-term productivity would suffer since the No Action Alternative would result in no further development of the North Campus which has significant economic and educational benefits for UConn, the region, and the state, as described in the Purpose and Need section of this document (Section 2).

Any of the Build Alternatives considered would have similar short-term consequences, including:

- Conversion of existing farmland, wetland, and open space to transportation and other developed land uses,
- Changes in site hydrology due to increased impervious surfaces, and
- Potential construction-related impacts to noise levels, air quality, and water quality.

Several long-term productivity enhancements may be realized from the project, including:

- An efficient transportation network in an area identified for concentrated development in local and regional planning,
- More convenient motorist access to the UConn campus,
- Potential for new tax base in the project area from private development on the North Campus and Route 44 commercial area,
- Enhanced employment growth for the region,
- Enhanced opportunities for research, education, and student life at UConn.

4.28 Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action

Under the No Action Alternative there would be no commitment of natural, physical, human, or fiscal resources.

Implementation of any of the build alternatives considered would involve the commitment of a range of natural, physical, human, and fiscal resources. Land used in the construction of the proposed facility is considered an irreversible commitment during the time period that the land is used for a roadway facility. However, if a greater need arises for use of the land or if the roadway facility is no longer needed, the land could be converted to another use. At present, there is no reason to believe such a conversion will ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and roadway construction materials such as cement, aggregate, and bituminous material would be expended to construct the roadway extension. Additionally labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, they are not in short supply, and their use would not have an adverse effect on continued availability of these resources. Any construction would also require a substantial one-time expenditure of both state and federal funds which are not retrievable.

The commitment of these resources is based on the concept that residents in the immediate area, state, and region would benefit by the improved quality of the transportation system. These benefits consist of improved accessibility and safety, time savings, as well as secondary benefits associated with greater economic development and educational opportunities, which are anticipated to outweigh the commitment of these resources.

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7.0 COMMENTS AND COORDINATION

7.1 Early Coordination Process and Scoping

Because the proposed extension of North Hillside Road was previously subject to the Connecticut Environmental Policy Act (CEPA), there was significant public participation and agency coordination as part of the CEPA review process which generated the 1994 and 2001 EIEs (Appendix A), as well as through the development of the Outlying Parcels Master Plan (JJR, 2000).

Preparation of this DEIS and FEIS has involved additional public participation and agency coordination consistent with the requirements of the National Environmental Policy Act (NEPA). These include:

- A Notice of Intent to prepare an EIS, dated April 13, 2006, was published in the Federal Register on April 21, 2006. The notice, included in Appendix B, initiated the NEPA process, inviting federal, state, and local agencies to attend the public and agency scoping meetings and public hearing, and to review the DEIS when complete and submit comments regarding the project.

- An invitation to federal and state agencies to become involved in the NEPA process for the project as Cooperating Agencies or Participating Agencies in letters from FHWA, dated May 10, 2006, and from UConn, dated May 16, 2006. As a result of these letters, the U.S. Army Corps of Engineers (ACOE) accepted the invitation to be a Participating and Cooperating Agency; the Connecticut Department of Environmental Protection (CT DEP), and Connecticut Department of Public Health (CT DPH) are Participating Agencies; the Connecticut State Traffic Commission Environmental Planning Office has responded that they will be active in the process; and the Connecticut Department of Public Works and Council on Environmental Quality have declined the invitation. Copies of relevant correspondence are included in Appendix B.

- A public scoping meeting was held on June 15, 2006 at the UConn Storrs campus. The public scoping meeting was attended by nine members of the public, including a representative of the Willimantic River Alliance. The scoping meeting was facilitated by representatives of FHWA, UConn, and Fuss & O'Neill. Verbal comments were received from the public during this meeting. A legal notice of the meeting was published in the Willimantic Chronicle on May 24, May 31, and June 7, 2007 and in the Hartford Courant on May 25, June 1, and June 8, 2007. A copy of the legal notices and meeting minutes are included in Appendix B. Abutters of the North Campus study area were also notified of the scoping meetings in advance of the meetings.

- An agency scoping meeting was held on June 15, 2006 at the UConn Storrs campus. The agency scoping meeting was attended by representatives of the U.S. Army Corps of Engineers, the Connecticut Department of Environmental Protection, UConn, the Windham Council of Governments, and the Town of Mansfield. The scoping meeting

was facilitated by representatives of FHWA, UConn, and Fuss & O'Neill. Verbal comments were received from the agencies during these meetings. A copy of the meeting minutes is included in Appendix B.

- The scoping comment period ended on June 29, 2006. Written comments were received from the U.S. Army Corps of Engineers and the Connecticut Department of Environmental Protection. Written comments were also received on the related CEPA comparative evaluation from the Connecticut Department of Public Health, the Connecticut Department of Transportation, and the Town of Mansfield. These comments are included in Appendix B.

- An agency coordination meeting was subsequently held on December 13, 2006 to review the progress of the DEIS, obtain input from the regulatory agencies on the coordinated wetlands permitting and NEPA process (i.e., the Highway Method), and review the project schedule. The meeting was attended by representatives from FHWA, the Connecticut Department of Transportation (CTDOT), UConn, CT DEP, ACOE, the U.S. Environmental Protection Agency (EPA) Region I, the Connecticut Department of Economic and Community Development (DECD), and Fuss & O'Neill, Inc. A copy of the meeting minutes is included in Appendix B.

- An agency coordination meeting and site walk was held at the UConn Storrs Campus on March 6, 2008. The purpose of the meeting was to review the status of the DEIS and obtain input from the regulatory agencies on the proposed wetland mitigation for the project, including potential secondary impacts related to development of the North Campus. The meeting was attended by representatives from CTDOT, UConn, CT DEP, ACOE, EPA Region I, the U.S. Fish and Wildlife Service (USFWS), and Fuss & O'Neill, Inc. A copy of the meeting minutes is included in Appendix B.

- Additional coordination was conducted as part of the CEPA comparative review for the project. As mentioned above, the potential environmental effects of the proposed extension of North Hillside Road and the associated development of the North Campus area were previously evaluated in CEPA EIEs prepared in 1994 (Environmental Impact Evaluation for State Actions Associated with a Research and Technology Park, Frederic R. Harris, Inc.) and 2001 (Environmental Impact Statement, North Campus Master Plan, Frederic R. Harris, Inc.). The Connecticut Office of Policy and Management (OPM) had originally determined that the project would not require additional CEPA review provided that the road alignment is generally the same as the alignment approved in the 2001 North Campus Master Plan EIE.

  However, when the NEPA process was initiated, OPM raised concerns regarding potential differences in background traffic growth anticipated by the previous EIEs and current traffic projections. OPM has determined that a new CEPA EIE will not be required for the project if it is found that the proposed impacts have not significantly changed since the approval of the 2001 EIE, which is consistent with the CEPA regulations. A comparative evaluation intended to compare the traffic impacts of the proposed project against those originally identified in the 2001 EIE was submitted to OPM in January 2007. OPM issued a decision letter dated October 1, 2007, indicating

that, based on their review of the submitted documentation, the 2001 EIE is still valid relative to the impacts associated with the North Hillside Road extension project (Appendix L).

7.2 DEIS Circulation and Review

- On December 29, 2008, the FHWA, in cooperation with UConn and CTDOT, released for circulation and review by federal, state, and local agencies and other interested parties, a DEIS for the extension of North Hillside Road. A Notice of Availability of the DEIS was published in the Federal Register on December 29, 2008. The DEIS was prepared and circulated pursuant to NEPA.

- A joint environmental and design public hearing was held on January 29, 2009 to solicit public and agency comment on the DEIS. A legal notice of the hearing was published in the Willimantic Chronicle on January 20 and 27, 2009 and in the Hartford Courant on January 19 and 27, 2009. Copies of the legal notices are included in Appendix B. A copy of the public hearing transcript is included in the DEIS Comments and Responses in Appendix N.

- The public comment period for the DEIS closed on February 13, 2009.Comments received from local officials and the public during the comment period supported the extension of North Hillside Road and subsequent development of the North Campus under the preferred development concept identified in the DEIS (referred to as the "DEIS Preferred Alternative") and requested adequate opportunity to review and comment on permit applications and construction plans prior to their approval and implementation. The regulatory agencies also identified several substantive issues, among other minor comments, including:

    - Clarification of the definition of the No Action Alternative.
    - Consideration of alternative roadway alignments that would further reduce wetland and vernal pool impacts compared to the DEIS Preferred Alternative.
    - Potential secondary and cumulative impacts on wetlands and vernal pools from application of roadway deicers, roadway and parking lot lighting, and introduction of invasive species during construction.
    - Incorporation of permeable pavement in proposed parking lots and other paved areas as an element of the project's stormwater management system.
    - Consideration of additional reductions in the amount of proposed parking for the North Campus development parcels and the feasibility of a reduced travel lane width.
    - Evaluation of potential cumulative off-campus impacts on housing and services as a result of the North Campus development.
    - Consideration of greenhouse gas emissions resulting from construction and operation of the roadway extension and the North Campus development.
    - Consideration of the feasibility of a 150-foot wetland buffer for the Red Maple Swamp 1A.

- In May 2009, the CT DEP and ACOE raised additional concerns regarding the project design based upon revised state and federal permit applications, which were submitted to the agencies in December 2008. The resource agencies requested consideration and analysis of additional alternative road alignments, wetland crossing designs, and the proposed North Campus development envelope to further reduce impacts to aquatic resources as compared to the DEIS Preferred Alternative. The ACOE also requested additional information and analysis of alternatives to substantiate the selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) in compliance with the Federal Clean Water Act.

  The permit applications were subsequently withdrawn, and a series of meetings were held with the CT DEP and ACOE between May 2009 and February 2010 to further evaluate roadway alignment alternatives and wetland crossing designs that would minimize impacts to aquatic resources and maintain vernal pool habitat connectivity. Notes from these meetings are provided in Appendix M. Several alternative roadway alignments were considered and evaluated during this process. However, the resource agencies primarily requested additional supporting information to compare the Option A (DEIS Preferred Alternative) roadway alignment with an alignment that would place the roadway east of Vernal Pool #1 (Option A-5). Modified wetland crossing designs were also considered for the Option A alignment to further reduce impacts to aquatic resources and to maintain vernal pool habitat connectivity. Reductions in the proposed development envelope were also considered for portions of the North Campus parcels.

  The additional agency coordination and expanded alternatives evaluation resulted in the selection of a preferred alternative roadway alignment and North Campus development scenario. The Option A roadway alignment, which is the recommended alignment under the DEIS Preferred Alternative, remains the preferred roadway alignment in this FEIS. However, the two wetland crossings of greatest concern, as expressed by the resource agencies, have been re-designed to essentially eliminate wetland impacts and maintain habitat connectivity for aquatic resources and other wildlife. Additionally, the North Campus concept development plan was modified to eliminate the previously proposed development on Parcel A and preserve additional acreage on the North Campus (including Parcel A and a proposed wetland mitigation area) through a conservation easement.

7.3 Key Issues and Pertinent Information

The following key issues were identified as a result of public and agency comments and the agency coordination process (the commentor is indicated prior to the listed issue, and the section of the FEIS where the issue is addressed is indicated in parentheses after the issue). Comments received on the DEIS and associated responses are included in Appendix N of this FEIS.

Wetlands and Watercourses

- ACOE - An ACOE Individual Permit is being required even though the direct area of wetland impacts is less than 1 acre. The ACOE made a collective decision with the EPA, the CT DEP, and the U.S. Fish and Wildlife Service (USFWS) to require an Individual ACOE 404 Permit for the project due to the potential secondary impacts associated with development of the North Campus in addition to the anticipated direct wetland impacts associated with the roadway. (Section 4.13)
- ACOE - Potential indirect impact of development on the critical upland habitat surrounding vernal pools should be addressed. (Section 4.13.3)
- ACOE - Potential for reconfiguring the roadway alignment to reduce wetland impact at Wetland "A" should be discussed. (Sections 3.4 and 4.13.3)
- ACOE - Selection of appropriate wetland compensatory mitigation site(s) should consider physical and chemical characteristics, habitat diversity and connectivity, compatibility with adjacent land uses, development trends and local/regional goals. (Section 4.13.4.1)
- ACOE - Identification of a buildable envelope of development and associated federal wetland delineation for each parcel would help in evaluating the direct and indirect impacts of development. (Sections 3.5 and 4.13)
- ACOE - Potential impacts from the North Campus development to Cedar Swamp Brook and Eagleville Brook are anticipated. (Sections 4.11 and 4.12)
- ACOE and CT DEP – Alternative roadway alignments and wetland crossing designs that would minimize wetland impacts and maintain habitat connectivity for aquatic and semi-aquatic resources (Section 3).
- ACOE – Additional information to substantiate the selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) and why a roadway alignment which does not sever Vernal Pool 1 from Red Maple Swamp 1A is not practical or feasible (Section 3 and Section 4.13).
- CT DEP - Wetland mitigation areas other than enhancement of the Lot W Pond should be considered, including other areas on the North Campus and the northwest corner of Horse Barn Hill. (Section 4.13.4)
- Meg Reich, Willimantic River Alliance - The impact of the project on the Willimantic River watershed and the Willimantic River well field should be addressed in the DEIS. (Section 4.11)

Wildlife and Listed Species

- CT DEP - A general bird survey should be undertaken along the path of the proposed roadway and a survey of the entire North Campus should be undertaken for listed species. (Sections 4.14 and 4.19)
- ACOE - Further coordination with CT DEP should be undertaken to identify what surveys are necessary for wildlife and listed species. (Sections 4.14 and 4.19)

Traffic

- Meg Reich, Willimantic River Alliance - The traffic impact on Route 44 should be addressed. (Section 4.6)
- Meg Reich, Willimantic River Alliance - The impact of the bank entrances on the North Hillside Road and Route 44 intersection should be addressed. (Sections 4.6 and 4.4)
- Meg Reich, Willimantic River Alliance - The impact of the Route 44 widening on pedestrian access should be addressed. (Section 4.8.3)
- Meg Reich, Willimantic River Alliance - The signalized intersection of Route 195 and Moulton Road should be included in the DEIS. (Section 4.6.2.2)

Alternatives Analysis

- ACOE - The Section 404 Permit requires that it be demonstrated that the proposed project is the least environmentally damaging practicable alternative (LEDPA). [Additionally, an "Only Practicable Alternative Finding" is required to demonstrate that there are no practicable alternatives to construction in wetlands pursuant to the Environmental Protection Agency (EPA) Guidelines (40 CFR 230 et seq.) and the Army Corps of Engineers regulatory guidelines (33 CFR 320 et seq.).] (Section 4.13.3)
- ACOE – Additional information to substantiate the selection of the LEDPA and why a roadway alignment which does not sever Vernal Pool 1 from Red Maple Swamp 1A is not practical or feasible (Section 3 and Section 4.13).

Air Quality

- CT DEP - If significant increases in traffic are discovered at relevant intersections, updated air quality modeling should be performed. (Section 4.9.1)

Land Use

- ACOE - The status of the dedicated conservation easement area of land preservation associated with a recently issued Section 404 permit for the former UConn solid waste landfill should be clarified. (Section 4.13)

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9.0 REFERENCES

Calhoun, A.J.K. (2008). *Community Based Conservation of Vernal Pools in Maine.* Vernal Pool Symposium, Northeast Natural History Conference, April 2008, Albany, New York.

Calhoun, A.J.K. and M.W. Klemens (2002). *Best Development Practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States.* MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Center for Watershed Protection (2003). *Impacts of Impervious Cover on Aquatic Systems.* Ellicott City, Maryland. March 2003.

CERC (2006a). *Mansfield, Connecticut CERC Town Profile 2006*. Connecticut Economic Research Center, Inc. Accessed at http://products.cerc.com/pdf/tp/mansfield.pdf on February 19, 2006.

CERC (2006b). *Tolland County CERC Regional Profile 2005*. Connecticut Economic Research Center, Inc. Accessed at http://www.cerc.com/pdfs/cntytolland.pdf on February 18, 2006.

Connecticut Council on Soil and Water Conservation (2001). *2002 Connecticut Guidelines for Soil Erosion and Sediment Control.* DEP Bulletin 34. Hartford, Connecticut.

Connecticut Economic Resource Center, Inc. (CERC) (2006). *Mansfield, Connecticut CERC Town Profile 2006*. September 2006.

Connecticut Income information, DECD
http://www.ct.gov/ecd/cwp/view.asp?A=1106&Q=250654

Covered Wages and Employment by Industry
http://www.ctdol.state.ct.us/lmi/ces/emp_by_town_2005_K-N.htm#M

Craig, Robert J. (2006). *Consulting Report; North Hillside Road Extension Bird Survey Results and Analysis.* Bird Conservation Research, Inc. Putman, CT.

Craig, Robert J. (2007). *Consulting Report; North Hillside Road Extension Habitat and Listed Animal Species Survey.* Bird Conservation Research, Inc. Putnam, CT.

CT DEP (2004). *2004 Connecticut Stormwater Quality Manual*. Hartford, Connecticut.

CT DEP (2007). Annual Summary Information for Ozone, available at
http://www.ct.gov/dep/cwp/view.asp?a=2684&q=321802&depNav_GID=1619, accessed August 2, 2007.

CT DEP (2007). Attainment and Non-Attainment of the National Ambient Air Quality Standards in Connecticut, available at
http://www.ct.gov/dep/cwp/view.asp?a=2684&q=321762&depNav_GID=1744

CT DPH (2005) *2004 Organics Report.* Report per Section 25-39a of the Connecticut General Statutes regarding Monitoring, Health Risks, and Treatment Costs for Organic Chemicals in Public Drinking Water for the Year 2004. February 2005.

CTDOT (2004). *State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction. Form 816.*

CTDOT (2004). Long Range Transportation Plan for the State of Connecticut: 2004 – 2030. July 2004.

CTDOT (Draft). Strategic Long-Range Transportation Plan: 2009 – 2035.

CTDOT (2006). Connecticut Department of Transportation Ozone Air Quality Conformity Determination – June 2006.

CTDOT (2007). Statewide Transportation Improvement Program. Available at http://www.ct.gov/dotinfo/lib/dotinfo/stip/2007STIPDOCUMENT.pdf

CTOPM (2005). *Conservation and Development Policies Plan for Connecticut 2005 – 2010.* Connecticut Office of Policy and Management. Accessed at http://www.opm.state.ct.us/IGP/cdplan/cdplan2.htm on January 29, 2007

Energy Information Administration (EIA) (2008). International Energy Outlook 2008. Report #DOE/EIA-0484(2008). June 2008.

FEMA (1981). *Flood Insurance Rate Map. Town of Mansfield, Connecticut. Tolland Country. Panel 5 of 20.* Community-Panel Number 090128 0005 C. Federal Emergency Management Agency and Federal Insurance Administration. Effective Date January 2, 1981.

Fox, David J. (2006). "Re: UConn North Hillside Road EIS." Email to Erik V. Mas. November 21, 2006."

Fuss & O'Neill, Inc. (2004). "*Burton Family Football Complex and Intramural, Recreational, and Intercollegiate Athletic Facility. Draft Environmental Impact Evaluation."* Submitted May 4, 2004.

Fuss & O'Neill, Inc. (2006). *Preliminary Design Report, University of Connecticut, North Hillside Road Extension, State Project 77-H049.* January 2006.

George-Henry-George-Partners (2008). *Feasibility Study For a Research and Technology Park at The University of Connecticut.* May 2008.

Governor's Steering Committee on Climate Change and Climate Change Coordinating Committee (2005). Connecticut Climate Change Action Plan. January 2005.

Haley & Aldrich, Inc. (2003), *Final Draft Comprehensive Hydrogeologic Investigation Report and Remedial Action Plan.*

JJR (2000). *Outlying Parcels Master Plan Final Report.* Produced by the JJR, Ann Armor, Michigan for the University of Connecticut

JJR and SmithGroup (2004). Campus Sustainabile Design Guidelines. Accessed at http://www.masterplan.uconn.edu/images/SDG.pdf, September 4, 2007.

Lavin, Lucianne and Marc Banks (2006). *Phase 2 Intensive Archaeological Survey of the North Hillside Road Extension Property in Storrs/Mansfield, Connecticut; The North Hillside Road Site 78-187.* Final Report. American Cultural Specialists, LLC, February 2006. Seymour, CT.

Lavin, Lucianne and Marc Banks (2005). *Phase 1B Archaeological Reconnaissance Survey of the North Hillside Road Extension Property in Storrs, Connecticut: The North Hillside Road Site 78-187, Project #2001219a19.* American Cultural Specialists, LLC, unpublished report.

Lavin, Lucianne (2005). North Hillside Phase 2 End of Fieldwork Letter to Ted DeSantos dated May 25, 2005.

Local Area Unemployment Statistics http://www.ctdol.state.ct.us/lmi/laus/lmlaus.htm

Loether, J. Paul (2005). Letter to Dr. Lucianne Lavin, dated June 3, 2005.

Loether, J.Paul (2005). Letter to Dr. Lucianne Lavin, dated February 8, 2005.

Milcone & MacBroom, Tighe & Bond (2007).*University of Connecticut Water and Wastewater Master Plan.* June 2007. Accessed at http://www.facilities.uconn.edu/wtr-swr.html August 2, 2007.

Motor Vehicle Related Greenhouse Gas Emissions in Connecticut, A Report Pursuant to Public Act 06-161 (undated). http://www.ctclimatechange.com/documents/TransportationRelatedGreenhouseGasEmissionstudy.pdf.

NESCUAM (2006). Connecticut Greenhouse Gas Inventory: 1990 – 2001, Northeast States for Coordinated Air Use Management, Connecticut Department of Environmental Protection, Connecticut Clean Energy Fund. July 2006.

NESCAUM (2005) Data Analysis of Air Toxics in Connecticut. Available at: http://www.nescaum.org/documents/2005-03-ct-final-**toxic**s-report.pdf

New Hampshire Technology Transfer Center (1996). *Deicing, Anti-Icing, and Chemical Alternatives Emerging Technologies to Consider for Particular Snow or Ice Control Situations.* Available at: http://www.t2.unh.edu/fall96/pg6.html

Poirier, David A (1987). Environmental Review Primer for Connecticut's Archaeological Resources. Connecticut Historical Commission/State Historic Preservation Office, Hartford.

Taggart, D.G., O. Ibrahim, M. Huston (2002). *Application of Jetting Technology to Pavement Deicing,* Transportation Research Record, No. 1794, pp. 77-83.

Town of Mansfield (2006). *Mansfield Plan of Conservation and Development.* Town of Mansfield Town Council and Planning and Zoning Commission. Accessed at www.mansfieldct.org/town/departments/pnz/pocd/index.php on January 29, 2007

Transportaiton Reasearch Board (2009). *Research in Progress: Potential for Natural Brine for Anti-Icing and De-Icing.* Available at: http://rip.trb.org/browse/dproject.asp?n=21509

Trombulak, S.C. and C.A. Frissell (2000). Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. *Conservation Biology*, 14(1), pp. 18-30.

U.S. EPA Enviromapper Website (accessed June 26, 2007). http://www.epa.gov/enviro/html/em/index.html

U.S. EPA (1992), *Guideline for Modeling Carbon Monoxide from Roadway Intersections,* Office of Air Quality Planning and Standards, U.S. Environmental protection Agency, Research Triangle Park, North Carolina, 1992.

U.S. EPA (1995), *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections,* Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, September 1995.

U.S. EPA (2003), *User's Guide to MOBILE6 (Mobile Source Emission Factor Model),* U.S. Environmental Protection Agency, Office of Mobile Sources, Emission Planning and Strategies Division, Air Quality Analysis Branch, Ann Arbor, Michigan, November 2003.

U.S. EPA (2007). *Module 6: Air Pollutants and Control Techniques, Ozone Formation Mechanisms,* available at http://www.epa.gov/eogapti1/module6/ozone/ formation/formation.htm, accessed August 2, 2008.

UConn (2007). "Academic Programs and Degrees." University of Connecticut. Accessed at http://www.uconn.edu/about/programs.php on 01/19/07

UConn (2007). 2007 UConn GHG Inventory. http://www.ecohusky.uconn.edu/pcc/emissionresults.html.

UConn Center for Landuse Education and Research (CLEAR), 2002 Estimate of Percent Impervious Surface, Connecticut, http://clear.uconn.edu/projects/landscape/analysis/calcap.htm

UConn DEHS (2004). *Laboratory Hazardous Waste Policy*, available at http://ehs.uconn.edu/

UConn DEHS (2001). Chemical *Waste Disposal Manual*, available at http://ehs.uconn.edu/. July 2001.

UConn DEHS (2001). *Packaging and Labeling of Chemical Waste*, available at http://ehs.uconn.edu/. September 2001.

UConn Landfill Website, (accessed June 18, 2010). http://landfillproject.uconn.edu

WINCOG (2002). *Windham Region Land Use Plan 2002*. Windham Region Council of Governments. Accessed at http://www.wincog.org/publications/plan.doc on January, 29, 2007.