Buckland Area Transportation Study

Technical Memorandum No. 2

Future Conditions Report – Roadway Alternatives

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List of Acronyms

ADT	Average Daily Traffic
APA	Aquifer Protection Areas
BATS	Buckland Area Transportation Study
BRT	Bus Rapid Transit
CEPA	Connecticut Environmental Policy Act
CERC	Connecticut Economic Resource Center
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CO	Carbon Monoxide
ConnDOT	Connecticut Department of Transportation
CRCOG	Capitol Region Council of Governments
CTDEP	Connecticut Department of Environmental Protection
CT Transit	Connecticut Transit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
EJ	Environmental Justice
EPA	Environmental Protection Agency
GIS	Geographic Information Systems
GPS	Global Positioning System
HCM	Highway Capacity Manual
HCS+	Highway Capacity Software
LOS	Level of Service
LWCFA	Land and Water Conservation Funding Act of 1965
MEV	Million Entering Vehicles
mp	Mile Post
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NDDB	Natural Diversity Database
NEPA	National Environmental Policy Act
NO_2	Nitrogen Dioxide
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory

List of Acronyms (cont.)

PAH	Polyaromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
pc/mi/ln	Passenger cars per mile per lane
PM	Particulate Matter
RTS	Regional Transit Strategy
SCEL	Stream Channel Encroachment Lines
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SPUI	Single Point Urban Interchange
SSA	Sole Source Aquifer
STIP	State Transportation Improvement Program
SUBOG	Student Union Board of Governors
UConn	University of Connecticut
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1 – Preliminary Roadway Alternatives

1.1 Overview of Alternatives Development Process

Technical Memorandum No. 1 – Existing and Future Conditions Report, documented the level of traffic congestion that is anticipated to occur within the study corridor by the year 2030 assuming no significant infrastructure improvement or expansion. Furthermore, this report clearly stated that doing nothing in the way of transportation infrastructure improvement and/or expansion will result in gridlock and further decline in quality of life for the residents of the study corridor.

1.1.1 Study Goals and Objectives

At the outset of the alternatives development process, the following goals and objectives were communicated to the study team, the Advisory Committee, corridor Stakeholder groups and interested parties:

- Formulate transportation improvement plans that will markedly improved safety, mobility, and air quality
- Promote planning for future change and development, and redevelopment
- Encourage transportation mode equity and balance between single occupant vehicles, high occupancy vehicles, mass transit systems and pedestrian modes

For ease of review and documentation of the alternatives to be considered, alternatives have been grouped under major headings including: roadway alternatives, transportation system management/transportation demand management (TSM/TDM), transit, and bicycle and pedestrian alternatives. The focus of this memorandum is roadway alternatives. Technical Memorandum No. 3 focuses on the remaining TSM/TDM, transit, and bicycle and pedestrian alternatives.

Interstate highways, highway interchanges and state and local town roads are all considered "roadway" in the context of this memorandum.

The alternatives development process is meant to capture all potential solutions to address the needs and deficiencies of the study corridor. The alternatives development process employed by the study team includes the following steps:

1. Identification and understanding of the corridors needs and deficiencies
2. Brainstorming of ideas (with the understanding that there are no bad ideas)
3. Identification of alternatives
4. Screening of alternatives (reduction of the total number of alternatives)
5. Evaluation of preferred alternatives
6. Alternatives refinement
7. Recommendation of alternative(s) to be considered

1.1.2 Needs and Deficiencies Identification

Identification of various needs and deficiencies within the corridor was achieved by plan review, field investigation, stakeholder meetings, advisory committee input and public outreach via public meetings and public comments documented on the project website.

1.1.3 Brainstorming of Ideas

The initial brainstorming of ideas was achieved through an advisory committee workshop where the attendees (composed of Connecticut Department of Transportation (ConnDOT) transportation specialists, corridor town engineers and advisors, the Capitol Region Council of Governments (CRCOG), local, state and federal agency specialists and specialists from the consultant team) broke up into four groups and rotated through four stations; highways, local roads, transit and bike/ped.

Each brainstorming station had aerial images of the corridor, a listing of the needs and deficiencies that pertained to the subject station and colored markers to be used for concept sketches and notation of ideas to be considered. Each person in the group signed their name to the plans and ideas they came up with.

After the initial brainstorming workshop, the ideas captured on the plan sets were reviewed, clarified and documented by the study team for further consideration. At subsequent meetings some new ideas and refinements to previous ideas were communicated.

1.1.4 Alternatives Identification

As part of the alternatives identification phase, ideas that focused on local road, state route, ramps and interstate highway modifications were mixed and matched to create comprehensive roadway concepts.

The evolution of these preliminary roadway concepts is discussed below in Section 1.2 – Preliminary Alternatives.

1.1.5 Screening of Alternatives

Subsequent chapters in this memorandum discuss the process of alternatives screening and identification of the highest performing, lowest impact alternatives.

The alternatives refinement phase and final recommendation of a preferred alternative(s) will be documented in the Final Report. The Final Report will summarize the findings of the technical memorandums, document final alternative refinements, consider multi-modal transportation infrastructure construction, operation and maintenance costs, identify a tentative implementation plan, and propose a financial funding approach.

1.2 Preliminary Alternatives

The aforementioned alternatives development process was used as a basis for developing ten (10) preliminary highway concepts for improving traffic capacity, highway and local road connectivity and overall system performance. Preliminary alternatives included a wide range of improvements, from the simple addition of an "operational lane" between Exits 60/62 and 63 on Interstate 84, to adding/extending frontage roads and reconfiguring interchanges. In addition, preliminary alternatives also considered the relocation of existing high occupancy vehicle (HOV) lanes and ramp connections as well as a new local road connection between Redstone Road and Buckland Hills Drive.

Key concerns to be addressed while developing these alternatives included the need for more access points to different parts of the overall study area, and frontage roads or operational lanes on the I-84 mainline to reduce weaving conflicts, thereby improving traffic flow on the interstate arterial.

Within this document it should be recognized that the words "alternative", "concept" and "option" are interchangeable and have a similar connotation.

Refer to Appendix A for a schematic depiction of the preliminary roadway concepts considered.

The ten (10) preliminary concepts were grouped as an iteration of either Concept 1 or Concept 2. Concept 1 iterations all share a common Tolland Turnpike/Rte 30/Exit 63 interchange modification. The common elements in this interchange modification are that the proposed eastbound frontage road would join Tolland Turnpike near to Exit 63 and a new on-ramp would be proposed opposite Tolland Turnpike at the intersection of Tolland Turnpike and Rte. 30. Concept 2 iterations all share a common Tolland Turnpike/Rte 30/Exit 63 interchange modification also. The common configuration for Concept 2 depicts the proposed eastbound frontage extending under and beyond Rte. 30, ultimately tying into a new operational lane planned between exits 63 and 64. The Department's planned operational lane project between exits 63 and 64 is in the early phases of design and is expected to go to construction prior to any of the study proposals herein.

1.2.1 Modification of Concepts

During the initial fatal flaw analysis, the concepts were repackaged and the most beneficial elements were mixed and matched to create modifications on the theme including Concept 1 – Mod and Concept 2B – Mod. The permutations were envisioned to improve upon the strengths of the early alternates and eliminate elements that were believed to provide minimal traffic benefit, cause unwarranted environmental impact and be geometrically infeasible. Even though the concepts are depicted as line diagrams, it is understood that ultimately, the alignment will have design dimension (for example: a new

one lane ramp will likely require a minimum width of 26 ft. and a maximum gradient of 5 feet in 100 feet). Refer to Appendix B for a matrix description of the modified preliminary roadway concepts considered.

In the spirit of brainstorming, some concepts were envisioned with lines simply connecting point A to point B to bring attention to a potential improvement for further study. After further review by the study team's traffic engineers and highway design specialists it was sometimes proved that the desired connections were not reasonable from a geometric standpoint or in some cases they were not physically possible. Efforts were made to re-think geometrically infeasible or physically impossible connections to see if there was a similar but more realistic way to meet the need or correct the deficiency.

Conceptual ideas that proved to be geometrically infeasible, environmentally irresponsible or physically impossible include:

- Concept 1 – Eastbound Frontage Road merge with Tolland Turnpike
- Concept 1A/2C – New I-84 eastbound interchange with Tolland Turnpike west of Slater Street
- Concept 1B – New ramp from Rte 44 to I-291 northbound
- Concept 1C – New eastbound frontage road, flyover ramp connection to Pleasant Valley Road
- Concept 2D – New turning roadway from I-291 to the existing eastbound frontage road

1.2.2 Additional Modification of Concepts

As review and evaluation progressed two (2) additional concept series were considered, Concept 3 and Concept 4. The Concept 3 series (3A and 3B) focused on HOV ramp modifications and the Concept 4 series (4A thru 4F) focused on local road modifications.

Concept 3A (similar to Concept 1C) focused on the relocation of the HOV ramps from Buckland Street to the Pleasant Valley Road interchange via flyover ramps from the median of I-84 just west of Exit 62. Concept 3A eliminates the signalized intersection on Buckland Street and provides more direct access to the park and ride lot located adjacent to the Pleasant Valley Road ramps. A modification to Concept 3A considered new flyover HOV ramps to and from the east. Today there are no HOV ramps connecting to Buckland Street, to and from the east.

Concept 3B proposed the relocation of Buckland Street HOV ramps to the Redstone Road Extension overpass (overpass depicted in Concept 2E). Similar to the Concept 3A modification, Concept 3B also considered a modification where HOV ramps would intersect the new Redstone Road Extension overpass providing new access to and from the east.

The study team later dropped the new easterly HOV ramp concepts from further consideration based on lack of travel demand. Concept 3B was also dropped from further consideration by the study team due to anticipated traffic conflicts between HOV and single occupancy vehicles (SOV) on the new Redstone Road Extension overpass.

As noted, the Concept 4 series (4A thru 4F) focused on local road modifications. Refer to Appendix C for a schematic depiction of the preliminary local roadway concepts considered. The basic premise for each of the local road modifications was to provide alternate access to and from the core study area.

Concept 4E survived study team scrutiny with regards to traffic benefit versus social and environmental impact. This new connector road will reduce traffic on Buckland Road by providing alternate access to the Evergreen Walk shopping center via Pleasant Valley Road. Concept 4D was recognized to be a duplication of the current rear circulator roadway within the Evergreen Walk complex and was not progressed further.

Concept 4A, a new connector road between Pleasant Valley Road and the I-291 interchange, was dropped from further study due to unavoidable environmental and social impact. Concept 4B and 4F were dropped due to unavoidable impacts with established and thriving businesses. Concept 4C, the reconnection of Slater Street at the town line, was recognized to have a strong travel demand benefit, but public opposition to this concept remains intense. Therefore, Concept 4C was dropped as well.

The Concept 1 and 2, alternate A, B, or C, Mod nomenclature was later simplified to Option 1 through Option 10. The line schematic drawings were refined and mapped over an aerial image so that impacts could be more readily assessed. For simplicity also, the study corridor was divided into three (3) zones with Zone 1 being in the area of the I-84/ I-291 interchange, Zone 2 being in the area of I-84, Exit 62 – Buckland Street and Zone 3 being in the area of I-84, Exit 63 – Route 30. Refer to Appendix D for plans depicting Options 1 thru 10. For continuity in process and documentation the early "concept" designations were retained along with the simplified "option" designation.

1.3 Interchange Studies at Pleasant Valley Road

The intersections along Pleasant Valley Road with the I-84 ramps and Buckland Street were the subject of several study team workshops. Today, these existing intersections struggle to provide adequate capacity for through and left turning traffic volumes. Future traffic projections are expected to compound the issues. A number of alternate ramp and intersection configurations were envisioned by the study team. Refer to Appendix E for plans depicting the various configurations considered.

1.4 Redstone Road Extension Studies

Early in the study process, the concept of a Redstone Road Extension spanning across the I-84 corridor was considered highly desirable as an alternate to the overly congested Buckland Street. A number of early concepts included the extension of the existing frontage road system that tied in directly with the proposed Redstone Road Extension thereby reducing the number of left turning vehicles on the I-84 EB, Buckland Street exit.

A number of alternate roadway and ramp configurations were envisioned by the study team. On the east side of the highway, all options tied directly into the end of the existing Redstone Road. However, on the west side of the highway, a number of touch-down points were considered including Pavilions Drive, the Buckland Mall ring roadway, and Buckland Hills Drive. After considerable study it was determined that concepts with a direct connection between Redstone Road on the east and Buckland Hills Drive on the west were the most feasible alternatives. Refer to Appendix F for plans depicting the various configurations considered.

2 – Alternatives Screening Process

2.1 Evaluation of Preliminary Alternatives

As described in Chapter 1, the process of brainstorming of ideas, identifying initial concepts, and mixing and matching the best attributes of various concepts has resulted in a refined group of options. From this point forward, a more detailed analysis is required to reduce further the number of options to a shortlist of preferred options. This more detailed analysis is referred to as the screening process.

The screening process includes the following steps intended to result in a clear division of:

- Peak hour traffic modeling and assessment
- Assessment of performance related to study goals and objectives, and
- Review and comment by the Advisory Committee, stakeholders and the public

2.1.1 Peak Hour Volumes of Preliminary Alternatives

Using the traffic volumes predicted for the year 2030, ConnDOT's traffic forecasting unit, together with input from the study team, modeled peak hour traffic volumes for each of the 10 options. Peak hour traffic volumes were computed for the Friday afternoon peak, reflecting the combination of commuter, weekend, and shopping traffic. The modeled volumes were reviewed critically to determine whether the benefit-to-cost ratio of any alternatives warranted their exclusion from further study. Option 1, for example, showed a peak hour volume of 190 vehicles on the new ramp intended to provide access to I-291 from the Pleasant Valley Road highway on-ramp. With an estimated construction cost in millions of dollars, the study team concluded that the nominal traffic benefit did not warrant the cost, and the option was eliminated from further study.

A number of matrices were developed to assess of performance of the alternatives based on factors such as access, congestion reduction, safety, and intermodal connectivity.

Refer to Appendix G for matrices used to evaluate study alternatives.

2.1.2 Technical Working Group and Advisory Committee Input

The preliminary options were presented for review and comment at a number of meetings with the studies Technical Working Group. The Technical Working Group is composed of ConnDOT and other state agency specialists, CRCOG advisors, and area town representatives from their respective planning and engineering offices. These meetings were very constructive in providing important details to the study team. Some weaknesses and flaws were also identified which led to further refinement of the

proposals. In some cases, the points raised at these meetings provided guidance on the dismissal of options, thereby assisting with the screening process.

An Advisory Committee meeting was held to gain further input and recommendation of the screening of options. All AC meetings are advertised well in advance and are also open to public participation.

Though comments and ideas from these groups were sometimes less quantifiable than pure traffic performance, they contributed to elimination of alternatives with little or minimal positive impact, and aided in refining the alternatives that appeared to have the greatest potential in achieving the study goals. Local preferences, right-of-way conflicts, and economic development objectives became apparent and aided in determining options that appeared to provide the most benefit to the towns as well as commuters, shoppers and the general public at large.

Refer to Appendix H for various AC and Technical Work Group meeting minutes.

A comment period was continued beyond the close of the AC meeting to allow for AC members and the public who may not have been in attendance to submit their input. Comments received from all of the meetings were referenced and all remaining options were repackaged in preparation for a Public Information Meeting.

2.1.3 Public Input

Once the AC and Technical Working Group comments had been incorporated into the various options, a Public Information Meeting was held to present all options to the general public. Following a short introduction that summarized the study, the public was invited to comment and ask questions. Large scale drawings of the various options were displayed and aerial images were also provided for the public to sketch their ideas on. Residents and commuters who frequently use the transportation system in the study area are a valuable source of information. They have an intimate knowledge of where and when traffic problems regularly occur, and in many instances they understand the basic cause of the problems.

Refer to Appendix I for Public Information Meeting minutes.

2.2 Screening of Alternatives

Through the process described above, ten (10) roadway options were reduced to four (4) roadway options believed to have the greatest potential to meet the studies goals and objectives. Just as before, the most beneficial elements of various options were retained and recombined with other options to result in stronger, more effective proposals.

The concept of adding a connection from the Pleasant Valley Road Ramps to northbound Interstate I-291, for example, proved beneficial based on the traffic volume computations, and also received very positive reviews from the AC, Technical Working Group and the public. Therefore, this concept was appended to all options under further consideration.

Options that did not prove beneficial were omitted from further study. The reasons for omission may have included one or more of the following; low impact on improving traffic capacity or safety, prohibitive construction costs (based on engineering judgment), and unwarranted social or environmental impact.

Refer to Appendix J for Screening Matrices.

3 – Future Performance of Preferred Alternatives

3.1 Refined Peak Hour Volumes

From the screening process, four (4) preferred roadway options have been documented. In some cases, these four options have been altered in the process from their original configurations. For instance, as noted previously, the concept of adding a direct frontage road connection from the Pleasant Valley Road ramps to I-291 proved beneficial. It was recognized that this ramp would add value to all four (4) options.

Reconfiguration of the various options necessitated the reassignment of peak hour volumes modeled previously. ConnDOT's traffic forecasting unit, together with input from the study team, reassigned peak hour traffic volumes for three (3) of the four (4) options for use in performing more detailed traffic assessment processes. Refer to the SYNCHRO analysis section below.

3.2 SYNCHRO Analysis

3.2.1 Introduction

This section summarizes future year 2030 transportation operating conditions at specific locations within the Buckland study area for the Build condition. Three preferred Build Alternatives were identified for evaluation utilizing the reassigned peak hour traffic volumes provided by ConnDOT. The fourth Build alternative, the proposal to construct new flyover ramps from the median HOV lanes to a new multi-modal transportation center at the current Park and Ride Lot, was not evaluated, since peak hour traffic volumes for this alternative were not available. More study is needed as part of the transit system assessment to appropriately model the peak hour volumes on these ramps. This analysis will be completed and included in the final report.

The Build condition alternatives were compared with the No Build transportation conditions, and each other to determine which to identify as the best performing improvement measures. The Build scenario represents a condition with traffic volumes projected to year 2030 for a typical Friday evening peak hour. The specific improvements in the study area under each alternative are described below.

3.2.2 Preferred Alternatives

The three evaluated Build Alternatives and the specific features of each are as follows:

3.2.2.1 Option 2 (Concept 2D Mod)

1. Ramp from westbound Frontage Road to I-291;
2. Red Stone Road Overpass;
3. Half Frontage Roads along I-84 (between Buckland Street and Red Stone Overpass);
4. Single Point Urban Interchange (SPUI) at the intersection of Buckland Hills Drive/Pleasant Valley Road/Buckland Street;
5. Roundabout at the intersection of Pleasant Valley Road/I-84 Westbound Ramps;
6. Second exit ramp for I-84 westbound at Exit 63.

3.2.2.2 Option 3 (Concept 1 Mod)

1. Ramp from westbound Frontage Road to I-291;
2. Full Frontage Roads along I-84 (between Buckland Street and Exit 63);
3. Single Point Urban Interchange (SPUI) at the intersection of Buckland Hills Drive/Pleasant Valley Road/Buckland Street;
4. Second exit ramp for I-84 westbound at Exit 63.

3.2.2.3 Option 10 (Concept 2 Mod)

1. Ramp from westbound Frontage Road to I-291
2. Auxiliary Lanes along I-84 (between Buckland Street and Exit 63);
3. Single Point Urban Interchange (SPUI) at the intersection of Buckland Hills Drive/Pleasant Valley Road/Buckland Street;
4. A signalized ‘T’ Intersection at the intersection of Pleasant Valley Road/I-84 Westbound Ramps;
5. Second exit ramp for I-84 westbound at Exit 63.

Refer to Appendices K and L for SYNCHRO Outputs and LOS for Optimized Preferred Alternatives, respectively.

3.2.3 Methodology

ConnDOT developed the Friday evening peak hour year 2030 volume projections for the study roadways, ramps and intersections for the three preferred alternatives described above. The traffic model using SYNCHRO software that was developed for this study and previously used to evaluate the 2030 No Build and 2005 Existing conditions was modified to incorporate the proposed improvements for each alternative. The 2030 peak

hour volumes for the different improvement features were also included in the SYNCHRO traffic model.

Freeway segments, ramp sections and weave segments were also evaluated based on the proposed improvements. The Highway Capacity Software (HCS+) was utilized to analyze these areas.

3.2.4 Build Capacity Analysis

The tables and figures below summarize the capacity results for the intersections, roadway segments, ramp sections and weave segments modified by the proposed improvements identified for each Build Alternative.

Table 1 below shows the results of various intersections based on the proposed improvements for each Build Alternative compared to the No Build. The proposed SPUI at the intersection of Buckland Hills Drive/Pleasant Valley Road/Buckland Street improves the operations from Level of Service (LOS) F to LOS D/E (no pedestrian phasing/with pedestrian phasing) under each Build Alternative. The capacity required to achieve this LOS is as follows:

- Buckland Street NB – 2 Thru Lanes, and 2 Left Turning Lanes with 500' of storage
- Buckland Street NB – 2 Thru Lanes, and 2 Left Turning Lanes with 200' of storage
- Pleasant Valley Road EB – 2 Left Turning Lanes
- Buckland Hills Drive WB – 2 Left Turning Lanes

At the intersection of Pleasant Valley Road/I-84 Westbound Ramps, the signalized 'T' intersection, proposed under Option 10 reveals the best operations with LOS C, compared with the LOS F under the No Build. The capacity required to improve the LOS are as follows:

- I-84 WB Off Ramps – 2 Thru Lanes, and a Left Turning Lane with 300' of storage.
- Pleasant Valley Road SB – 2 Thru Lanes, and a Channelized Right Turning Lane.

The Roundabout proposed under Option 2 will operate at LOS F regardless of the capacity. The intersection of Deming Street (Route 30)/I-84 Exit 63 WB Ramps/Avery Street will improve from LOS F to LOS D under all three alternatives based on the proposed second off ramp at this location. Travel demand model results show that over 500 vehicles will be shifted during a Friday PM peak hour from the existing I-84 westbound off-ramp at Exit 63 to the proposed second off-ramp. The proposed second off-ramp eliminates the existing left-turn movement at the intersection of Deming Street (Route 30)/I-84 Exit 63 WB Ramps/Avery Street, and redistributes this traffic to the westbound approach of Deming Street.

TABLE 3-1
BUILD ALTERNATIVES INTERSECTION CAPACITY ANALYSIS
2030 FRIDAY PM PEAK HOUR

I.D. #	Location	No Build		Option 2			Option 3			Option 10		
		Volume	Level of Service	Volume	Level of Service w/o Ped Phase[1]	Level of Service w/ Ped Phase[2]	Volume	Level of Service w/o Ped Phase[1]	Level of Service w/ Ped Phase[2]	Volume	Level of Service w/o Ped Phase[1]	Level of Service w/ Ped Phase[2]
8	Buckland Hills Dr. at Pleasant Valley Rd/Buckland St	7350	F									
	SPUI Signalized Intersection			4050	D	E	4170	D	E	4170	D	E
	SPUI Eastbound Merge (Unsignalized)			1640	E	N/A	1820	F	N/A	1820	F	N/A
	SPUI Westbound Merge (Unsignalized)			3000	F	N/A	3400	F	N/A	3400	F	N/A
9	Pleasant Valley Rd at I-84 Westbound Ramps (Signalized)	4200	F				4420	F	F			
	Roundabout (Unsignalized)			4020	F	N/A						
	T-Intersection (Signalized)									4420	C	C
	Redstone Overpass at EB Frontage Rd (Unsignalized)	N/A		1559	D	N/A	N/A			N/A		
13	Buckland St at I-84 Eastbound Ramps/Exit 62 (Signalized)	6565	F	5415	E	N/A	Same as No Build			Same as No Build		
14	Buckland St at Red Stone Rd (Signalized)	4060	D	3890	N/A	C	3930	N/A	C	3930	N/A	C
23	Deming St (Route 30) at I-84 Exit 63 WB Ramps/Avery St (Signalized)	5570	F	5570	D	N/A	5570	D	N/A	5570	D	N/A

Notes
1. With concurrent pedestrian phasing
2. With exclusive pedestrian phasing
3. Year 2030 volumes provided by ConnDOT
4. Intersections 13, 14 and 23 were only study intersections where LOS changes occurred between No Build and Build Options.

Table 2 below shows the results of the Ramp Analysis for various ramp sections impacted by the Build Alternatives. Based on the results of the ramp analysis, the proposed second off ramp at Exit 63 will improve the capacity by 10% for this traffic under all three alternatives.

TABLE 3-2
RAMP CAPACITY ANALYSIS
2030 FRIDAY PM PEAK HOUR

Location	Ramp Type	No Build Condition	Build Condition					
			Option 2		Option 3		Option 10	
		Level of Service	Level of Service	Capacity Improvement	Level of Service	Capacity Improvement	Level of Service	Capacity Improvement
I-84 EB Exit 60/62 (Buckland St)	Merge On-Ramp	F	Same as No Build		F	37%	Same as No Build	
I-84 EB Exit 63 (Route 83)	Diverge Off_Ramp	F			F	28%		
I-84 WB Exit 63 (Route 30 NB)	Diverge Off_Ramp	D	D	10%	D	10%	D	10%
I-84 WB Exit 63 (Route 30 SB)	Diverge Off_Ramp		C		C		C	

Notes:
1. Year 2030 volumes provided by ConnDOT

The freeway segment analysis reveals that each alternative improves operations along I-84 eastbound at different locations depending on the alternative. Options 2 and 10 show improvements over the No Build scenario along different segments, but still operate at LOS F between I-291 and Exit 63. Option 3 reveals the only LOS improvement for a segment of I-84, which occurs between the proposed frontage road's exit and on ramps.

Table 3 below summarizes these results.

TABLE 3-3
INTERSTATE SEGMENT CAPACITY ANALYSIS
2030 FRIDAY PM PEAK HOUR

Location	Scenario	Volume	Level of Service	Volume Change from No Build
I-84 EB between Exit 60/62 and Exit 63	No Build	8000	F	
	Build Option 2			
	Between Exit 60/62 & EB Frontage Rd On Ramp	6920	F	-1080
	Between EB Frontage Rd On Ramp & Exit 63	8000	F	None
	Build Option 3			
	Between Exit 60/62 & EB Frontage Rd Off Ramp	6920	F	-1080
	Between EB Frontage Rd Off Ramp & On Ramp	5190	D	-2810
	Between EB Frontage Rd On Ramp & Exit 63	6270	F	-1730
	Build Option 10			
	Between Exit 60/62 & On Ramp from Auxiliary Lane	6920	F	-1080
	Between Auxiliary Lane On Ramp & Off Ramp	8000	F	None
	Between Off Ramp onto Auxiliary Lane & Exit 63	6270	F	-1730
I-84 WB between Exit 60/62 and Exit 61	No Build	4590	D	
	Build Option 2	3490	C	-1100
	Build Option 3	3890	C	-700
	Build Option 10	3890	C	-700
I-84 WB between Exit 63 and Exit 60/62	No Build	5590	E	
	Build Option 2	3490	C	-2100
	Build Option 3	3890	C	-1700
	Build Option 10	3890	C	-1700

Notes:

1. Year 2030 volumes provided by ConnDOT

Refer to Appendices K and L for SYNCHRO Outputs and LOS for Optimized Preferred Alternatives, respectively.

3.3 Optimization of Lane Configuration

Since the beginning of the study, all conceptual ideas were communicated by schematic line diagrams. In the screening process, the line diagrams were replaced with drawings that represented lines with a more appropriate dimension. Still, no true lane arrangement was communicated. Prior to the start of the SYNCHRO evaluation, the four (4) preferred options were refined to greater detail using MicroStation CAD design techniques. Actual lane arrangements were developed with the expectation that initial lane arrangements would need to be refined.

Throughout the traffic assessment process of evaluating ramp-to-ramp weaving analyses, intersection queuing analyses and signalized intersection analyses, lane configurations were re-evaluated and reconfigured to improve the overall performance of the options.

The final SYNCHRO analysis outputs described herein reflect optimized lane configurations. The challenges that still exist with regard to lane arrangement will play a role in the further screening and refinement of these preferred options. (These findings will be outlined in the final report.)

3.4 Environmental Evaluation

3.4.1 Introduction

This report summarizes potential natural, cultural, and community/social impacts associated with three transportation improvement options (Options 2, 3, and 10) developed for the Buckland Area Transportation Study (BATS). These options are described in detail in Section 2 of Technical Memorandum #2. To assess potential impacts, each of the proposed improvement option concepts were superimposed onto Geographic Information Systems (GIS) base mapping depicting existing environmental conditions in the study area. The GIS base mapping was developed in September 2006 and was included in Technical Memorandum No. 1. Data used to develop the GIS base mapping was provided by the Connecticut Department of Environmental Protection (CTDEP), CRCOG, Town of South Windsor, and Town of Manchester GIS. Limited field reconnaissance was conducted during the summer of 2006 to verify the location and accuracy of the GIS information. In addition to GIS mapped data, U.S. Census 2000 data and municipal land use, conservation, and development plans were consulted as part of the analysis.

Results of the environmental impacts screening are presented in a matrix (Table 1), which is supplemented by descriptive text. The information presented in this report will be considered by transportation and community planners during the process of further developing transportation system safety and improvement plans for the Buckland area. The ultimate transportation improvement implementation plan will be developed with the

goal of providing for future community growth and development while minimizing environmental impacts and ensuring transportation equity and balance within the study area. The selected transportation improvement options will be subject to more detailed environmental analysis and review under both the National Environmental Policy Act (NEPA) and Connecticut Environmental Policy Act (CEPA). This NEPA/CEPA review will occur at a later time once the proposed improvements are programmed into the State Transportation Improvement Program (STIP) and funding is secured.

3.4.2 Summary of Anticipated Impacts

Table 1 is a matrix depicting the results of the preliminary screening of anticipated environmental impacts associated with each of the three transportation improvement options (Options 2, 3, and 10). The purpose of this matrix is to compare the three options with respect to potential impacts to existing natural, cultural, and community/social resources located within the BATS study area. It is important to note that the information presented in the matrix is based predominantly on mapped GIS resources and represents a planning level analysis only. More formal and detailed environmental impact analyses would occur at later project stages. For this planning level analysis, a simple high, medium, and low ranking is used to compare alternatives for each resource category. A high ranking signifies a greater adverse impact whereas a low ranking equates to minimal impact. Where impacts are not anticipated for a particular resource category, "No Adverse Impacts Anticipated" is reported in the matrix.

TABLE 3-4
SUMMARY COMPARISON OF ANTICIPATED ENVIRONMENTAL IMPACTS ASSOCIATED WITH PROPOSED TRANSPORTATION IMPROVEMENT OPTIONS

RESOURCES	TRANSPORTATON IMPROVEMENT OPTIONS		
	Option 2	Option 3	Option 10
Land Use and Zoning	Medium	Low/Medium	Medium
Surface Water Resources	Low	Medium	Medium
Wild and Scenic Rivers	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Groundwater Resources	Low	Low	Low
Wetlands	Low/Medium	Medium	Medium
Floodplains and Stream Channel Encroachment Lines	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Threatened and Endangered Species/Critical Wildlife Habitat	Medium	Medium/High	Medium/High
Farmlands	Low	Low	Low
Air Quality	Low	Low	Low
Hazardous Waste Sites	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Noise Sensitive Areas	Medium	Medium	Medium
Community Resources	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Cultural Resources	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Section 4(f) Resources	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Section 6(f) Resources	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated
Environmental Justice	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated	No Adverse Impacts Anticipated

3.4.3 Land Use and Zoning

Impacts to land use were evaluated based on the effect that the project may have on the following factors:

- Land acquisitions and use displacements,
- Encroachments on existing land use,
- Access to land,
- Changes to land use patterns,
- Compatibility of land uses, and
- Zoning consistency

As the plans for improving the roadway system in the Buckland study area are conceptual only at this time, this analysis takes a strictly qualitative look at what impacts could potentially occur with each of three transportation improvement concepts, Option 2, Option 3 and Option 10.

3.4.3.1 Option 2:

Option 2 has the potential to require the acquisition of up to three (3) properties and to encroach on at least ten (10) other properties with partial parcel acquisitions. The property acquisitions could displace an apartment building and one business.

Access to both vacant and developed land would be improved with Option 2 and new access to some currently vacant, developable land could be created. In addition, improvements to intersections on Pleasant Valley Road will improve traffic flow, enhancing access to local businesses. These results can be considered beneficial effects. In particular, the completion of an alternate access road ultimately connecting to the Evergreen Walk complex could open up opportunities for new development along the new roadway. This alternative access to Evergreen Walk is included in Options 3 and 10 as well.

It is expected that market forces and ongoing development trends in the Buckland area will continue. As such, enhancements to roadways would be considered consistent and compatible with existing land use trends. The potential new roadways or roadway segments would not conflict with the overall mix or arrangement of land uses existing today. Nonetheless, the construction of new roads across currently vacant parcels can be expected to alter localized land use patterns. Where new access is available, intensified development may result, enabling change in land use patterns in small areas over time. This change may be beneficial in terms of economic development but uncertain in terms of community or neighborhood character.

State projects are not required to meet local zoning regulations. However, ConnDOT strives to design projects to be sensitive to local zoning objectives and avoid conflicts with local zoning designations. The Buckland area is zoned for a diverse mix of uses. In those locations where the zoning designations are non-residential, new roadway elements would generally not conflict with zoning. However, where new roadway elements would cross and bisect residentially zoned properties, they could be considered inconsistent with the intended uses for homes and residential neighborhoods.

3.4.3.2 Option 3:

Option 3 would generally have the same potential impacts as Option 2. As Option 3 does not include a new connector road at Redstone Road, no impacts would occur there as with Option 2. Option 3 would have fewer property acquisitions and property encroachments than Option 2 as well as no displacements. In addition, no new access to the undeveloped lands between the

interstate and Tolland Turnpike would be provided and no indirect effects on development patterns would be generated in that locale.

Like Option 2, Option 3 includes an alternate access to Evergreen Walk from Pleasant Valley Road. Land use and zoning impacts associated with this access, as described above under Option 2, will be identical for Option 3.

3.4.3.3 Option 10:

Option 10 would generally have the same potential impacts as Option 3. As with Option 3, it does not include a new connector road at Redstone Road, and no impacts would occur there. Option 10 includes a reconfigured access pattern and roadways at Pleasant Valley Road and the egress ramps to I-84. This new access road may require one property taking with one business displacement and encroachment or partial taking of a second property.

Like Option 2, Option 10 includes an alternate access to Evergreen Walk from Pleasant Valley Road. Land use and zoning impacts associated with this access, as described above under Option 2, will be identical for Option 10.

3.4.4 Surface Water Resources

Impacts to surface water resources (streams, rivers, ponds and lakes) were evaluated based on the number of times the footprint of a proposed transportation improvement option crosses and/or encroaches upon these surface water resources within the BATS study area.

3.4.4.1 Option 2:

The alternative access to Evergreen Walk that is proposed to extend from Pleasant Valley Road across Smith Street also crosses an unnamed stream that flows northwest into Plum Gulley. It is unknown at this conceptual planning stage whether or not the unnamed stream would be crossed with a clear span bridge or if it would flow through a culvert. The potential impact to this unnamed stream is the same for all three options as each includes this proposed alternative access to Evergreen Walk. There are no other impacts to surface water resources from Option 2.

3.4.4.2 Option 3:

In addition to the potential impact to the unnamed stream located just north of Smith Street (refer to the Evergreen Walk Alternative Access Road discussion under Option 2), Option 3 also crosses an unnamed stream that flows along the west side of Slater Street. The stream flows to the south and discharges into the Hockanum River. Both the eastbound and westbound frontage roads along I-84 associated with Option 3 will cross this unnamed watercourse. It is unknown at

this conceptual planning stage whether or not the unnamed stream would be crossed with clear span bridges or if it would flow through culverts. Overall, Option 3 will cross a total of three (3) surface water resources.

3.4.4.3 Option 10:

Similar to Option 3, Option 10 will cross the unnamed stream that parallels Slater Road on the west, and it will also cross the unnamed stream located north of Smith Street (refer to the Evergreen Walk Alternative Access Road discussion under Option 2). Option 10 includes eastbound and westbound auxiliary lanes along I-84 between Buckland Street and Deming Road. The lanes will each cross the unnamed stream paralleling Slater Street. It is unknown at this conceptual planning stage whether or not the unnamed stream would be crossed with clear span bridges or if it would flow through culverts. Overall, Option 10 will cross a total of three (3) surface water resources.

3.4.5 Wild and Scenic Rivers

There are no rivers designated by the National Park Service as Wild and Scenic Rivers in the study area. Thus, Options 2, 3, and 10 will have no impact on Wild and Scenic Rivers.

3.4.6 Groundwater Resources

Impacts to groundwater resources were evaluated based on the potential for a transportation improvement option to affect wellfields, Aquifer Protection Areas (APAs), water company lands, drinking water resources/wells, and Sole Source Aquifers (SSAs).

Proposed roadway improvements for all three options will occur within an APA associated with an extensive wellfield known as the New State Road Wellfield. This wellfield is owned and operated by the Manchester Water Department. A proposed I-291 westbound connection from the I-84/1-384 on-ramp near the East Hartford Town Line (an element included with all three options) is located within this APA. Additionally, improvements to the lengthy I-84 eastbound Buckland Street off-ramp proposed under Option 2 will also occur within this APA. Overall, potential impacts to groundwater resources from all three options are anticipated to be minimal.

3.4.7 Wetlands

Wetlands within the study area were identified using a combination of Natural Resource Conservation Service (NRCS) soils data (1996) and National Wetland Inventory (NWI) mapping. Wetland locations and sizes were mapped based on the NRCS soils mapping (GIS coverage) for poorly drained, very poorly drained, alluvial and floodplain soil types within the study area. These soil types correspond to the Connecticut state wetland definition. A windshield survey was then conducted to verify wetland locations in the

field. No delineation, function and value assessments, or vegetation mapping were conducted for this planning level study. Thus, the assessment of potential wetland impacts associated with each of the transportation improvement options for this memorandum is solely based on comparing GIS mapped resource information with the footprint of each proposed option. A more detailed assessment of potential wetland impacts will occur during subsequent project planning and design stages as part of the NEPA/CEPA and permitting process. At that time, wetland resources will be field delineated, function and value assessments will be conducted, and detailed vegetation mapping will be prepared for each impacted wetland system.

3.4.7.1 Option 2:

It appears from the conceptual drawings that the only potential wetland impact associated with Option 2 occurs north of Smith Street. The proposed footprint of alternative access to Evergreen Walk from Pleasant Valley Road, which is an element of all three transportation improvement options, will directly impact approximately 0.5 acres of the western end of a broad wetland (approximately 6.4 acres in size) that is underlain by alluvial and floodplain soils. This wetland pocket is associated with an unnamed stream that originates north of the Toys-R-Us plaza along Pleasant Valley Road and flows into Plum Gulley from the southeast. Based on the available GIS wetland mapping, there are no other wetland impacts evident at this early planning stage associated with Option 2.

3.4.7.2 Option 3:

In addition to the potential wetland impact associated with the proposed alternative access to Evergreen Walk from Pleasant Valley Road as described above for Option 2, it appears that Option 3 may also have a limited impact to wetlands associated with the unnamed stream that parallels Slater Street on the west. This impact will occur with the construction of the eastbound and westbound frontage roads that parallel I-84 between Buckland Street and Deming Street. It does not appear from the conceptual drawings that the frontage roads actually cross wetlands in this area, but they are directly adjacent to GIS mapped wetlands. Thus, the potential exists for fill slopes and construction activities to encroach upon the wetlands in this area.

Based on the available GIS wetland mapping, there are no other wetland impacts evident at this early planning stage associated with Option 3.

3.4.7.3 Option 10:

Potential wetland impacts associated with Option 10 are virtually the same as those described above for Option 3.

3.4.8 Floodplains and Stream Channel Encroachment Lines

The overlay analysis conducted to identify potential environmental impacts associated with each of the three transportation improvement options (Options 2, 3 and 10) determined that there will be no impacts to 100-year or 500-year Federal Emergency Management Agency (FEMA) designated floodplains from any of the improvement options. All floodplain resources in the study area are either associated with Plum Gulley and the Podunk River on the north or with the Hockanum River to the south. The proposed options do not impact these surface water resources.

There will also be no impacts to Stream Channel Encroachment Lines (SCEL) associated with any of the proposed transportation improvement options.

3.4.9 Threatened and Endangered Species/Critical Wildlife Habitat

A review of the 2006 CTDEP GIS Natural Diversity Database (NDDB) of State and Federal Listed Species and Significant Natural Communities identified a total of nine areas within the study area where state threatened and endangered species and/or significant natural communities potentially exist. The sites include two along the I-291 corridor in the western part of the study area, two to the north of the JC Penney Logistics Center near the Manchester/South Windsor town line, one near the Shoppes at Buckland Hills, two sites in the vicinity of the Buckland Street/Tolland Turnpike intersection in Manchester, one along the East Hartford/Manchester town line in the vicinity of Wickham Park, and one site located to the north of Union Pond.

A database information request was completed and submitted to the CTDEP NDDB for the BATS study on July 31, 2006. According to the CTDEP NDDB response letter dated August 17, 2006, there are state-listed wildlife species that occur within the BATS study area. The NDDB program botanist has determined that there are no state-listed plants in the BATS study area.

3.4.9.1 Option 2:

> The proposed alternative access to Evergreen Walk that extends from Pleasant Valley Road across Smith Street (an element of all three transportation improvement options) bisects two CTDEP NDDB areas. Improvements in the vicinity of the Buckland Hills Mall under this option also impact a third CTDEP NDDB area.

3.4.9.2 Option 3:

> In addition to the two NDDB areas impacted by the proposed alternative access to Evergreen Walk, Option 3 also includes roadway improvements that will encroach upon the NDDB site located in the vicinity of Buckland Hills Mall as well as a fourth NDDB site located in the vicinity of I-84 at Wetherell Pond.

3.4.9.3 Option 10:

This transportation improvement option encroaches upon the same four NDDB areas as Option 3.

Overall, regardless of which transportation improvement option is advanced for design and implementation, there will be a need for further consultation with a CTDEP NDDB program wildlife specialist. This consultation may result in the need for site specific wildlife surveys to be conducted in the project area by a qualified biologist in order to determine the presence and/or absence of protected species.

3.4.10 Farmlands

All three transportation improvement options will result in some loss of prime and statewide important farmland soils. However, none of the impacted farmland soil areas currently support active farms and most of them have already been disturbed by other existing land uses including residential and commercial developments.

The proposed alternative access to Evergreen Walk from Pleasant Valley Road (an element of all three transportation improvement options), crosses an area of statewide important farmland soils that is located along Smith Street. These soils have already been developed for residential land use and are not actively farmed.

Options 3 and 10 both encroach upon areas of prime farmland soils located south of I-84 in the vicinity of the Waterford Commons condominium development. These transportation improvement options also cross areas of prime farmland soils located north and south of I-84 in the vicinity of Slater Street. None of the aforementioned prime farmland soils areas support active farms and have been developed for residential, commercial, and transportation purposes.

Overall, the three proposed BATS transportation improvement options have minimal impacts to prime and statewide important farmland soils and no adverse impacts to active farmland.

3.4.11 Air Quality

For transportation projects, the criteria pollutants of primary concern are mobile sources of carbon monoxide, ozone, and particulate matter. The impacts of a particular project on regional air quality are assessed when the Metropolitan Planning Organization (in this case CRCOG) develops an air quality conformity determination of the region's transportation plans The conformity determination must demonstrate that transportation plans will not contribute to exceedences of air quality standards.

Impacts from each of the proposed options would be similar, in that they could result in increased automobile traffic in the vicinity. However, the project is also intended to

relieve congestion and idling in the study area. Thresholds for Level of Service and intersection usage would need to be assessed at the project level to determine if additional air quality analysis would be required.

During construction, potential short- term air quality impacts could include airborne dust and emissions from construction vehicles.

3.4.12 Hazardous Waste Sites

Potential hazardous waste sites in the study area were identified using the United States Environmental Protection Agency (EPA) Envirofacts Data Warehouse. In addition, the CTDEP GIS data for *Landfill Leachate and Wastewater Discharges* was consulted to characterize the potential for hazardous materials or contamination in the study area. No field verification or visual inspection of these locations has been conducted for the BATS.

Based on the mapped GIS information, the proposed transportation improvement options developed for the BATS will have no direct or indirect impacts on known hazardous waste sites. A more detailed investigation of potential hazardous wastes/materials will need to be conducted later in the project planning process during the NEPA/CEPA phase, especially for properties that will need to be acquired for the transportation improvement option selected for implementation.

3.4.13 Noise Sensitive Areas

The Federal Highway Administration's Noise Abatement Criteria (NAC) documented in 23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* is based on Land Use Activity Categories. Land uses considered most sensitive to highway noise are designated as either Land Use Activity Category A or B. Land Use Activity Category A includes 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. Such uses include outdoor amphitheatres, outdoor concert pavilions, and National Historic Landmarks with significant outdoor use. Land Use Activity Category B areas include picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals. All land uses except residences listed as Activity Category B are often treated as special use facilities due to the difficulty in determining the number of receiver units. Each State DOT should adopt a standard practice for analyzing these special use facilities that is consistent and uniformly applied statewide.

The three transportation improvement options were evaluated in terms of their physical relationship to identified Category A and B land uses in order to determine the potential for future noise impacts associated with each option.

3.4.13.1 Option 2:

The proposed alternative access to Evergreen Walk that extends from Pleasant Valley Road (an element of all three transportation improvement options) crosses a residential neighborhood defined by Smith Street. It is not known at this conceptual phase whether the crossing of Smith Street will be at-grade or grade separated. Regardless, the homes immediately adjacent to the new roadway may experience noise levels above existing levels due to the increased volume of traffic anticipated to pass by the area to access the Evergreen Walk retail area.

The proposed new access from I-84 leading directly into the Buckland Hills Mall and the Redstone Road area will bring traffic closer to the northwestern corner of the Waterford Commons condominium complex located south of I-84. The new roadway configuration will also outlet traffic onto Buckland Hills Drive directly opposite the Buckland Hills Apartments. Waterford Commons condominium units directly adjacent to the new roadway or Buckland Hills apartments closest to the intersection with Buckland Hills Drive may experience noise levels above existing levels due to potential increased traffic volumes in the area.

3.4.13.2 Options 3:

In addition to the potential increased noise levels in the Smith Street neighborhood from the proposed alternate access to Evergreen Walk as described above under Option 2, the proposed eastbound frontage road under Option 3 will bring a lane of traffic closer to the Waterford Commons condominium complex as well as to the northern-most residences in the Lisa Drive neighborhood. These residential areas may therefore experience noise levels above existing levels due to this element of Option 3. There are no other noise issues associated with Option 3.

3.4.13.3 Option 10:

Potential noise impacts associated with Option 10 will be similar to those described for Option 3 as the Smith Street neighborhood, Waterford Commons condominium complex, and the Lisa Drive neighborhood may all experience noise levels above existing levels.

As design of the selected transportation improvement option advances into the NEPA/CEPA phase, potentially impacted noise sensitive land uses will be identified and future noise levels will be modeled to determine the potential for noise impacts associated with the project.

3.4.14 Community Resources

There are many community resources, including schools, parks, libraries, and emergency services, that add to the quality of life and public health and safety in the towns of

Manchester, South Windsor, and East Hartford. The proposed BATS transportation improvement options will not directly impact any of these community resources. The options will benefit study area towns by improving traffic flow and circulation within and through the project area. They will also improve provision of emergency response services through improved transportation connections and additional access points to I-84 and various locations around the Buckland Hills Mall.

3.4.15 Cultural Resources

Documentary research at the Connecticut Historical Commission (SHPO) and a review of the National Register of Historic Places (NRHP) database revealed that numerous historic resources are located within the BATS study area. There are also several tobacco barns located throughout the study area which are a vital part of this area's past and are cherished by the local citizenry. Known cultural resources are thoroughly documented in Technical Memorandum #1 that was completed for the BATS study in September 2006.

Based on the mapped cultural resource GIS information, the proposed transportation improvement options developed for the BATS will have no direct or indirect impacts on known historic resources listed on or eligible for listing on the NRHP. It is unknown at this early planning stage whether or not the proposed options will have an impact on as yet to be identified archaeological resources that may exist in the study area. Due to the presence of numerous documented Native American settlements through the area, it is likely that there are concentrations of moderate to high archaeological sensitivity found within the study area.

As transportation improvement alternatives are defined and advanced to the design stage and NEPA/CEPA compliance stage, SHPO will require additional project details in order to provide further technical assistance and guidance to ensure the protection of significant cultural resources. A determination of effect on historic and archaeological resources would be issued at that time, and mitigation measures would be developed as necessary if any adverse effects were expected.

3.4.16 Section 4(f) Resources

Section 4(f) of the Department of Transportation Act of 1966 protects historic resources listed on or eligible for listing on the National Register of Historic Places, as well as public parks, recreation areas, and wildlife/waterfowl refuges from adverse impacts. A review of the mapped Section 4(f) resources within the BATS study area determined that the proposed transportation improvement options will have no direct or indirect impacts on identified Section 4(f) resources.

3.4.17 Section 6(f) Resources

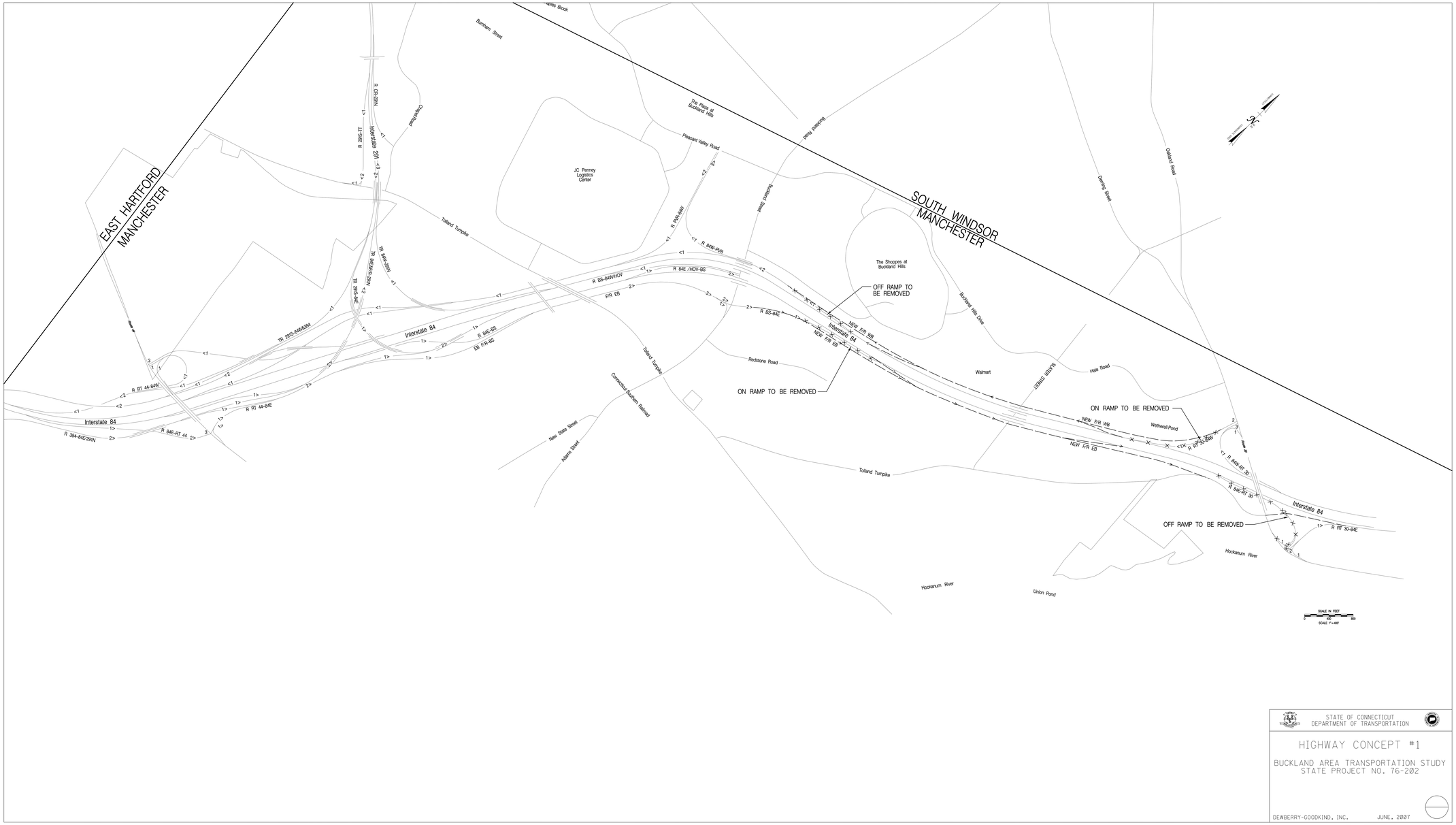
Section 6(f) of the Land and Water Conservation Funding Act of 1965 (LWCFA) states that any lands purchased or improved with Federal LWCFA funding may not be

"converted" to another use without being replaced in kind by land of like size and value. A search of the National Park Services website: http://waso-lwcf.ncrc.nps.gov/public/index.cfm revealed that there are no Section 6(f) properties within the study area. Thus, none of the transportation improvement options proposed for the BATS will result in any impacts to Section 6(f) resources.

3.4.18 Environmental Justice

The data on demographics indicate there are no concentrations of low-income or minority populations within the Buckland study area. Consequently, no impact to any environmental justice population is anticipated with the roadway improvement concepts.

Appendix A
Preliminary Roadway Alternatives

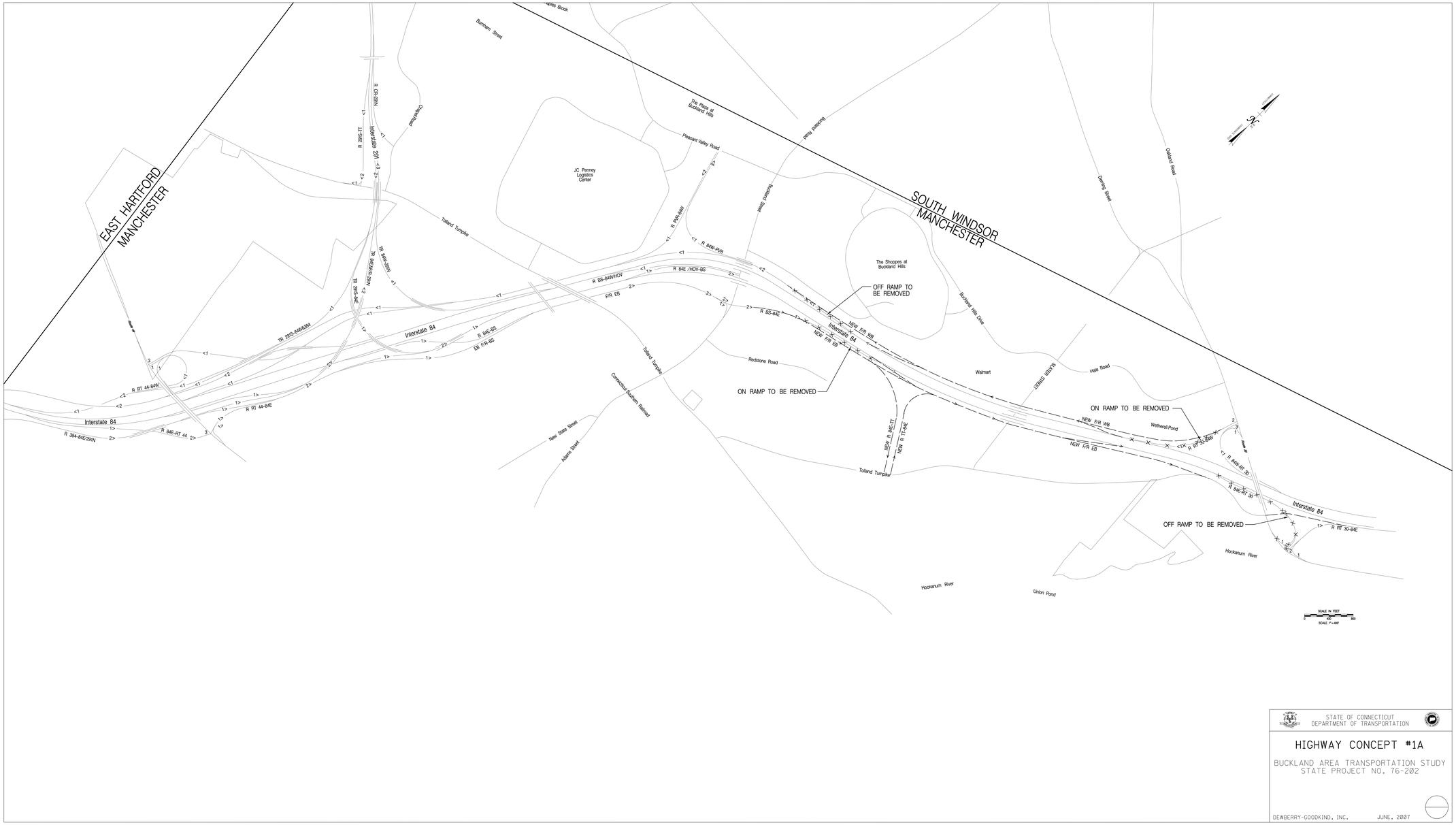


STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

HIGHWAY CONCEPT #1

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. JUNE, 2007

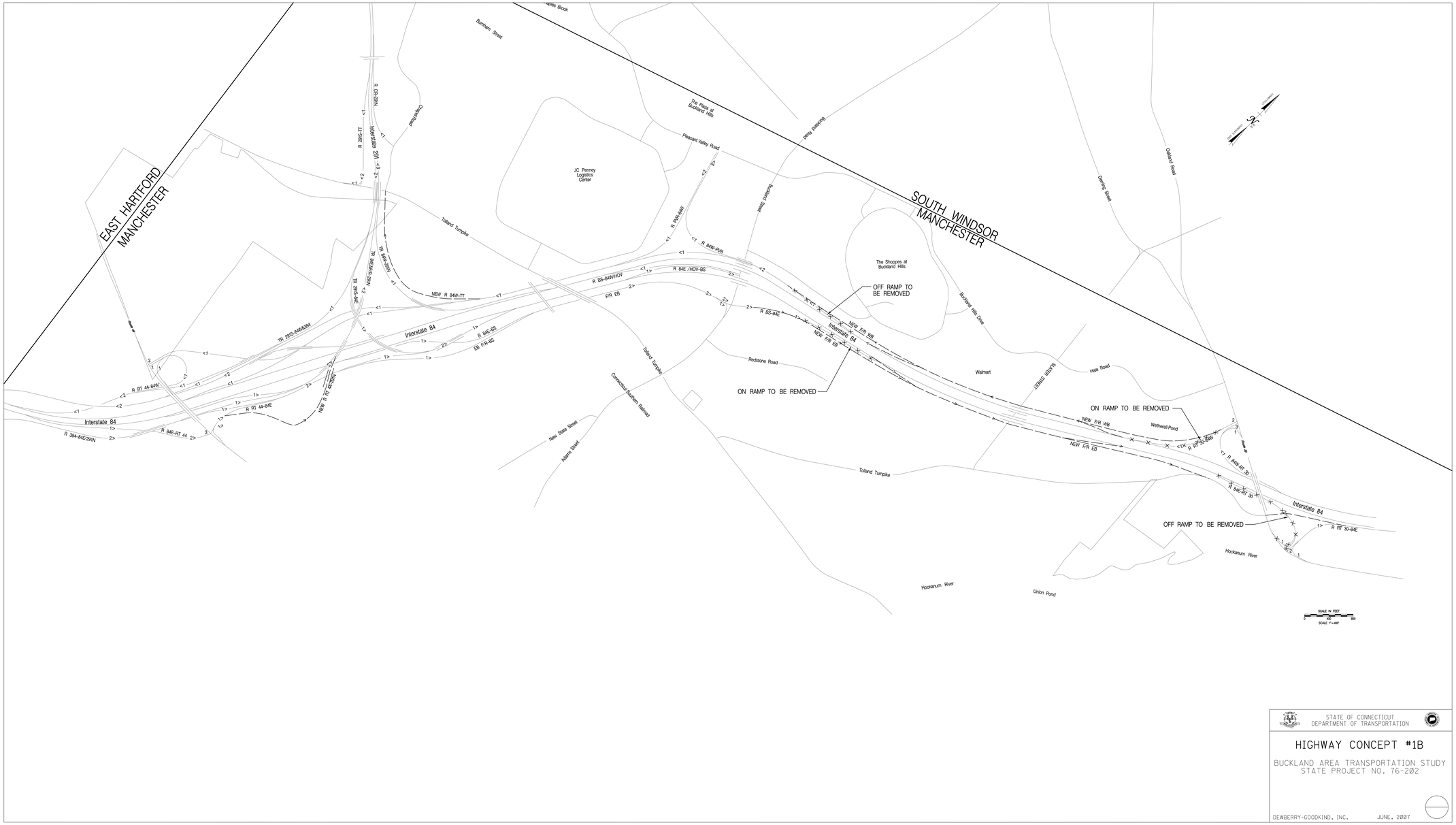


STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

HIGHWAY CONCEPT #1A

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. JUNE, 2007

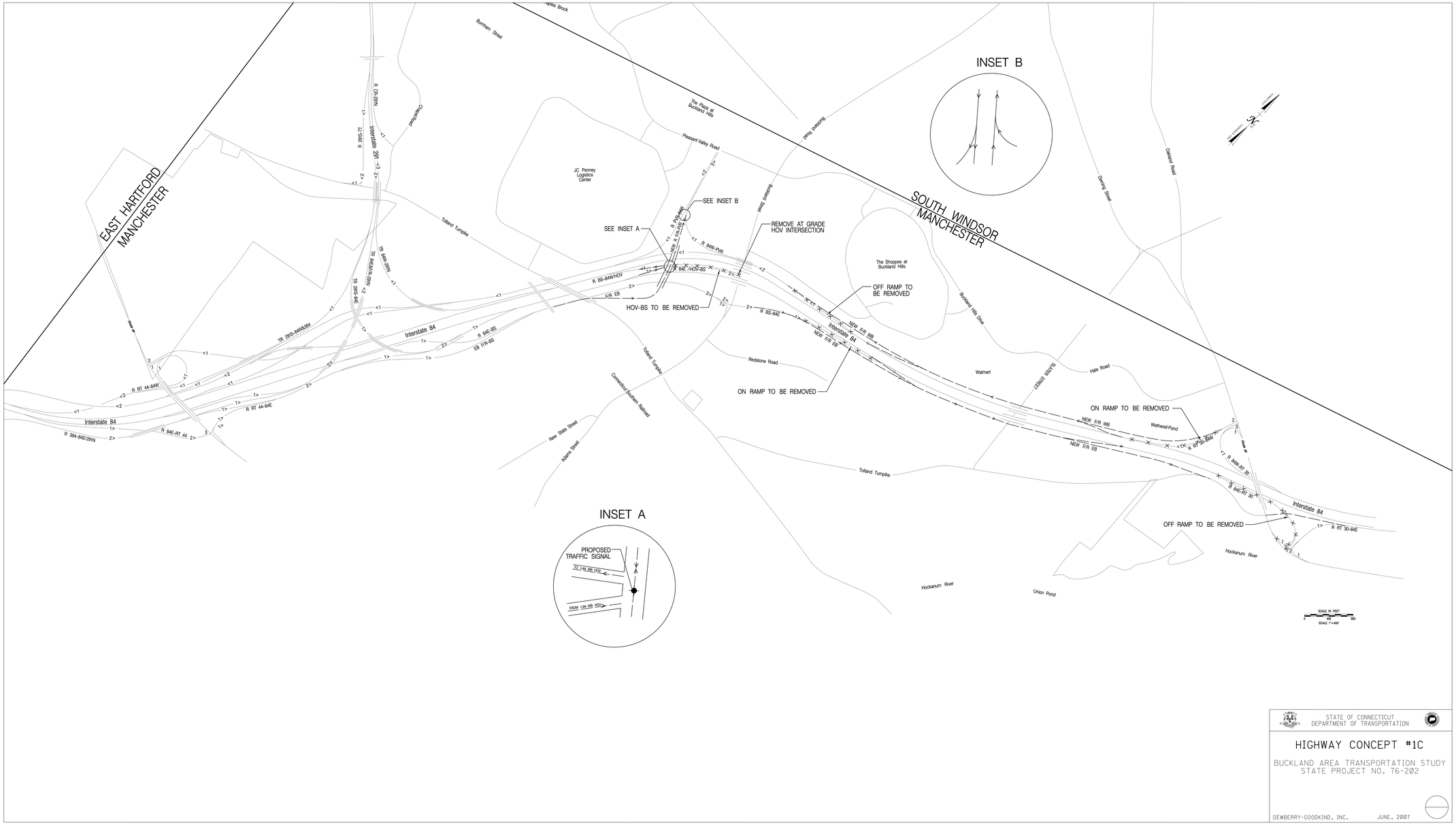


STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

HIGHWAY CONCEPT #1B

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. JUNE, 2007



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

HIGHWAY CONCEPT #1C

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. JUNE, 2007

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

HIGHWAY CONCEPT #2

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. JUNE, 2007

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

HIGHWAY CONCEPT #2A

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

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HIGHWAY CONCEPT #2B

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

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HIGHWAY CONCEPT #2C

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HIGHWAY CONCEPT #2D

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STATE OF CONNECTICUT
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HIGHWAY CONCEPT #2E

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

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Appendix B
Matrix Description of Modified Concepts

Buckland Transportation Study
Matrix Description of Modified Concepts[1]

Corridor/ Area	Goals	BUILD ALTERNATIVES								
		1	1A	1B	1C	2	2A	2B	2C	2D
I-291 at I-84 Interchange	Additional Access to I-291	At I-291, No change in access or volumes	At I-291, No change in access or volumes	a new ramp from Rt 44 to I-291 Northbd adds 60 vph	At I-291, No change in access or volumes	At I-291, No change in access or volumes	At I-291, No change in access or volumes	At I-291, No change in access or volumes	At I-291, No change in access or volumes	New ramp provides direct access from I-291 southbound to Buckland St and Redstone Rd Ext flyover. New ramp provides direct access from PVR and Redstone Ext flyover to I-291 Northbound
	Safety									
	Interstate Capacity									
	Intermodal									
Tolland Turnpike between Burr Plaza and North Main Street	Reduce Congestion	Relocates Exit 63 EB Ramps from Oakland St To Tolland Turnpike; increases traffic on Tolland Turnpike, nthbd left: 990 vs 250 NoBuild; nthbd rt: 1190 vs 440 NoBuild	Relocates Exit 63 EB Ramps from Oakland St To Tolland Turnpike; increases traffic on Tolland Turnpike, nthbd left: 990 vs 250 NoBuild; nthbd rt: 1190 vs 440 NoBuild	Relocates Exit 63 EB Ramps from Oakland St To Tolland Turnpike; increases traffic on Tolland Turnpike, nthbd left: 990 vs 250 NoBuild; nthbd rt: 1320 vs 440 NoBuild	Relocates Exit 63 EB Ramps from Oakland St To Tolland Turnpike; increases traffic on Tolland Turnpike, nthbd left: 990 vs 250 NoBuild; nthbd rt: 1190 vs 440 NoBuild	Volumes along Tolland Tpk same as No Build	Volumes along Tolland Tpk same as No Build	Volumes along Tolland Tpk same as No Build	slightly reduces volumes at TT/Adams St;TT WB 860 vs 920 No Build	Volume reduced EB near Burr Corner: 1270 vs 1600 NoBuild (-21%)
	Support Local Access	new ramp from I-84 EB frontage road to Tolland Tpk near Route 30 used by 1730 vph	new ramp from I-84 EB frontage road to Tolland Tpk near Route 30 used by 1700 vph	A new ramp from I-84 WB frontage rd to Tolland Tpk/Chapel Rd near I-291 used by 190 vph; new ramp from I-84 EB frontage road to Tolland Tpk near Route 30 used by 1730 vph	new ramp from I-84 EB frontage road to Tolland Tpk near Route 30 used by 1730 vph				new ramp to/from I-84 EB frontage road to Tolland Tpk near Slater St: 340 off from I-84 to TT, 220 from TT onto I-84	
	Safety									
	Intermodal									
Buckland Street between Sullivan Avenue and Redstone Road	Reduce Congestion	Does not reduce volumes on Buckland Street	At Exit 62 EB Off Ramps to Buckland Street, reduces volume Nthbd L=1670 vs 1850 in NoBuild; Nthbd R= 500 vs 630 in NoBuild	slight decrease in southbound volumes on Buckland St: 2090 vs 2220 NoBuild	At Exit 62 EB Off Ramps to Buckland Street, reduces volume Nthbd L=1310 vs 1850 in NoBuild	Volumes along Buckland Street same as No Build	Reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1050 vs 1850 No Build	Increase volume on Buckland St due to new HOV off ramps; nrtbd 3800 vs 3720 in NoBuild	slight decrease in volume on Buckland St : Exit 62 EB off ramp: rts 500 vs 630; lefts 1670 vs 1850	Reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1180 vs 1850 No Build
	Optimize Access to Developments				Buckland St/HOV ramps are eliminated		North of ramps, nthbd 2920 vs 3720 No Build			
	Safety						Direct access to Mall Rd from I-84 reduces volume on Buckland St			
	Intermodal									
Pleasant Valley Road between JC Penny and Buckland Street	Reduce Congestion	Does not reduce volumes at PVR/West Ramps	Volume on PVR same as No Build	Increase in Volume on PVR westbd; 2580 WB thru vs 2450 in NoBuild (+5%)	Shift of HOV ramps to PVR Ramps increases volume at PVR at WB Ramp; 1800 vs 1650 NoBuild; 1430 vs 600 NoBuild	Volumes along Pleasant Valley Road same as No Build	slight decrease in volume at PVR & WB ramp :nrthbound left: 440 vs 600 No Build (-27%); PVR westbd: 2100 vs 2450 No Build (-14%)	slight decrease in volume at PVR & WB ramp :nrthbound left: 500 vs 600 No Build	Volumes along Pleasant Valley Road same as No Build	New ramp provides direct access from PVR and Redstone Ext flyover to I-291 Northbound; Volumes reduced on PVR near WB Ramps: 350 vs 600 nthbd rights (-42%)
	Improve Circulation to Adjacent SW and Planned Development									
	Safety									
	Intermodal									
Route 30	Reduce Congestion	Volumes on Route 30 increase near Relocated Exit 63/Tolland Turnpike but remain same as No Build further away from relocated ramp	Volumes on Route 30 increase near Relocated Exit 63/Tolland Turnpike but remain same as No Build further away from relocated ramp	Volumes on Route 30 increase near Relocated Exit 63/Tolland Turnpike but remain same as No Build further away from relocated ramp	Volumes on Route 30 increase near Relocated Exit 63/Tolland Turnpike but remain same as No Build further away from relocated ramp	Volumes along Route 30 same as No Build	Decrease in volume on Route 30; Rte 30 WB west of WB ramps 1260 vs 1710 No Build (-26%); Rte 30 EB west of WB ramps 1690 vs 1910 NoBuild (-12%)	Volumes along Route 30 same as No Build	slight decrease in volumes along Route 30 near Exit 63 EB: 1870 vs 1930 No Build eastbd; 2380 vs 2410 No Build westbd	Reduced volume along Route 30 near Exit 63 EB: 1710 vs 1930 No Build eastbd; Near Exit 63 westbd 1260 vs 1710 No Build
	Safety									

Buckland Transportation Study

Matrix Description of Modified Concepts[1]

Corridor/ Area	Goals	BUILD ALTERNATIVES								
		1	1A	1B	1C	2	2A	2B	2C	2D
I-84 Corridor Between Exits 59 and 63	Capacity									
	Land Access Support						Creates a flyover between Exits 62 and 63 to provide direct acces to Mall from EB and WB frontage roads			Creates a flyover between Exits 62 and 63 to provide direct acces to Mall from EB and WB frontage roads
	Safety	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline
	Through Traffic									
						Combining Exit 62 EB on at Exit 63 EB results in large volume entering I-84 EB at Exit 63 (2170 vs 1090 No Build)	Segregates Mall traffic from non-mall traffis. Removes majority of I-84 mall/retail traffic from the Buckland St WB off ramp	Combining Exit 62 EB on at Exit 63 EB results in large volume entering I-84 EB at Exit 63 (2040 vs 1090 No Build)		Segregates Mall traffic from non-mall traffis. Removes majority of I-84 mall/retail traffic from the Buckland St WB off ramp
	FOR I-84									
	Land Access = H	This Alt has direct access from I-84 to Mall and/or Redstone Road								
	Through Traffic = L	This Alt has Exit 62 EB on-ramp merging with Mainline at Exit 63 on-ramp								
	Safety = H	This Alt has frontage roads between Exit 62 and Exit 63								
	Safety = L	This Alt has no frontage roads								

Buckland Transportation Study
Matrix Description of Modified Concepts[1]

Corridor/ Area	BUILD ALTERNATIVES								
	1MOD	2BMOD	2CMOD	2DMOD	3A	3B	3BMOD	4ABC	4ABCD
I-291 at I-84 Interchange	At I-291, No change in access or volumes	At I-291, No change in access or volumes	At I-291, No change in access or volumes	New ramp provides direct access from I-291 southbound to Buckland St and Redstone Rd Ext flyover. New ramp provides direct access from PVR and Mall Svc Rd flyover to I-291 Northbound	At I-291, No change in access or volumes	New ramp provides direct access from I-291 southbound to Buckland St and Redstone Rd Ext flyover. New ramp provides direct access from PVR and Redstone Ext flyover to I-291 Northbound	New ramp provides direct access from I-291 southbound to Buckland St and Redstone Rd Ext flyover. New ramp provides direct access from PVR and Redstone Ext flyover to I-291 Northbound	At I-291, No change in access or volumes	At I-291, No change in access or volumes
		A new ramp from I-84 WB frontage rd to Tolland Tpk/Chapel Rd near I-291 used by 190 vph							
Tolland Turnpike between Burr Plaza and North Main Street	Volumes along Tolland Tpk same as No Build	Volumes along Tolland Tpk same as No Build	slightly reduces volumes at TT/Adams St;TT WB 860 vs 920 No Build	Volume reduced EB near Burr Corner: 1270 vs 1600 NoBuild	Volumes along Tolland Tpk same as No Build	Volume reduced EB near Burr Corner: 1270 vs 1600 NoBuild	Volume reduced EB near Burr Corner: 1270 vs 1600 NoBuild	Volume slightly reduced near Burr Corner: eastbd 1510 vs 1600 NoBuild; wstbd 970 vs 1050 NoBuild	Volume slightly reduced near Burr Corner: eastbd 1510 vs 1600 NoBuild; wstbd 970 vs 1050 NoBuild
		A new ramp from I-84 WB frontage rd to Tolland Tpk/Chapel Rd near I-291 used by 190 vph	new ramp from I-84 EB frontage road to Tolland Tpk near Slater St used by 430 vph off / 220 vph on					new ramp from I-84 EB frontage road to Tolland Tpk near Slater St used by 430 vph off / 220 vph on	new ramp from I-84 EB frontage road to Tolland Tpk near Slater St used by 430 vph off / 220 vph on
Buckland Street between Sullivan Avenue and Redstone Road	Volumes along Buckland Street same as No Build	Slightly reduced volume along Buckland St southbound: 1660 vs 1790 NoBuild near Pavillion Dr	At Exit 62 EB Off Ramps to Buckland Street, reduces volume Nthbd L=1670 vs 1850 in NoBuild; Nthbd R= 500 vs 630 in NoBuild	Reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1180 vs 1850 No Build	Reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1310 vs 1850 No Build	Reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1180 vs 1850 No Build	Reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1180 vs 1850 No Build	Slightly reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1670 vs 1850 No Build	Slightly reduces volume on Buckland St in area of I-84 ramps; northbd left at EB off ramps: 1670 vs 1850 No Build
				North of ramps, nthbd 2570 vs 3720 No Build	Buckland St/HOV ramps are eliminated; north of ramps, nthbd 2890 vs 3720 No Build	Buckland St/HOV ramps are eliminated; north of ramps, nthbd 2230 vs 3720 No Build	Buckland St/HOV ramps are eliminated; north of ramps, nthbd 2230 vs 3720 No Build	Slight reduction north of ramps, nthbd 3450 vs 3720 No Build	Slight reduction north of ramps, nthbd 3450 vs 3720 No Build
				Direct access to Mall Rd from I-84 reduces volume on Buckland St		Direct access to Mall Rd from I-84 reduces volume on Buckland St	Direct access to Mall Rd from I-84 reduces volume on Buckland St		
Pleasant Valley Road between JC Penny and Buckland Street	Volumes along Pleasant Valley Road same as No Build	Slightly higher volumes along Pleasant Valley Road at WB ramps: 1000 vs 940 No Build eastbd; 2580 vs 2450 NoBuild westbd	Volumes along Pleasant Valley Road same as No Build	Slightly lower volumes along Pleasant Valley Road at WB ramps: 2210 vs 2450 NoBuild westbd	Increases volume on PVR at WB ramps: nthbd right 1430 vs 600 No Build	Decrease in volume at PVR & WB ramp :nrthbound left: 350 vs 600 No Build; westbd thru 2210 vs 2450 No Build	Decrease in volume at PVR & WB ramp: nrthbd left 290 vs 600 No Build; westbd thru 2210 vs 2450 No Build	Slightly lower volumes along Pleasant Valley Road at WB ramps: 2290 vs 2450 NoBuild westbd; 830 vs 940 eastbd	Slightly lower volumes along Pleasant Valley Road at WB ramps: 2180 vs 2450 NoBuild westbd; 830 vs 940 eastbd
Route 30	Volumes along Route 30 same as No Build	Volumes along Route 30 same as No Build	slight decrease in volumes along Route 30 near Exit 63 EB: 1870 vs 1930 No Build eastbd; 2290 vs 2410 No Build westbd	Volumes along Route 30 same as No Build	Volumes along Route 30 same as No Build	Volumes along Route 30 are reduced: near I-84 westbd ramp, 1260 vs 1710 No Build westbd; 1690 vs 1910 NoBuild eastbd	Volumes along Route 30 are reduced: near I-84 westbd ramp, 1260 vs 1710 No Build westbd; 1690 vs 1910 NoBuild eastbd	Volumes along Route 30 are reduced: near I-84 eastbd ramp, 2290 vs 2410 No Build westbd; 1870 vs 1930 NoBuild eastbd	Volumes along Route 30 are reduced: near I-84 eastbd ramp, 2290 vs 2410 No Build westbd; 1870 vs 1930 NoBuild eastbd

Buckland Transportation Study
Matrix Description of Modified Concepts[1]

Corridor/ Area	BUILD ALTERNATIVES								
	1MOD	2BMOD	2CMOD	2DMOD	3A	3B	3BMOD	4ABC	4ABCD
I-84 Corridor Between Exits 59 and 63									
	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	No frontage roads	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	No Frontage Roads	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline	Frontage Roads eliminate merge/diverge conflicts between Exits 62 and 63 from I-84 mainline
	Combining Exit 62 EB on at Exit 63 EB results in large volume entering I-84 EB at Exit 63 (2170 vs 1090 No Build)		Combining Exit 62 EB on at Exit 63 EB results in large volume entering I-84 EB at Exit 63 (2170 vs 1090 No Build)	Direct access to Mall Rd from I-84 reduces volume on Buckland St		Direct access to Mall Rd from I-84 reduces volume on Buckland St		Combining Exit 62 EB on at Exit 63 EB results in large volume entering I-84 EB at Exit 63 (2170 vs 1090 No Build)	Combining Exit 62 EB on at Exit 63 EB results in large volume entering I-84 EB at Exit 63 (2170 vs 1090 No Build)

Buckland Transportation Study
Matrix Description of Modified Concepts[1]

Corridor/Area	Corridor Goals	BUILD ALTERNATIVES																	
		1	1A	1B	1C	2	2A	2B	2C	2D	1MOD	2BMOD	2CMOD	2DMOD	3A	3B[2]	3BMOD[2]	4ABC	4ABCD
I-291																			
	Additional Access to I-291	NI	NI	M	NI	NI	NI	NI	NI	H	NI	M	NI	H	NI	H	H	NI	NI
	Safety	NI	NI	L	NI	NI	NI	NI	NI	L	NI	L	NI	L	NI	L	L	NI	NI
	Interstate Capacity	NI	NI	L	NI	NI	NI	NI	NI	L	NI	L	NI	L	NI	L	L	NI	NI
	Intermodal	NI	NI	NI	NI	NI	NI	NI	NI	L	NI	NI	NI	L	NI	L	L	NI	NI
Tolland Turnpike																			
	Reduce Congestion	NEG	NEG	NEG	NEG	NI	NI	NI	NEG	M	NI	NI	L	M	NI	M	M	L	L
	Support Local Access	M	H	M	M	NI	NI	NI	M	L	NI	M	H	L	NI	M	M	H	H
	Safety	NI	NI	NI	NI	NI	NI	NI	NI	M	NI	L	L	L	NI	L	L	L	L
	Intermodal	NI	NI	NI	NI	NI	NI	NI	NI	L	NI	NI	NI	L	NI	H	H	NI	NI
Buckland Street																			
	Reduce Congestion	NI	L	L	M	NI	H	L	L	H	NI	L	L	H	H	H	H	L	L
	Optimize Access to Developments	NI	L	L	M	NI	H	M	L	H	NI	NI	L	H	L	M	H	L	L
	Safety	NI	NI	NI	M	NI	M	L	L	L	NI	L	L	L	L	M	M	L	L
	Intermodal	NI	NI	NI	M	NI	L	M	L	L	NI	NI	NI	L	M	H	L	L	L
Pleasant Valley Road																			
	Reduce Congestion	NI	NI	NEG	NEG	NI	M	L	NI	M	NI	NI	NI	L	NEG	M	M	L	L
	Improve Circulation to Adjacent and Planned Development	NI	M	M	M	NI	L	L	NI	M	NI	NI	NI	L	M	L	L	M	H
	Safety	NI	NI	NI	L	NI	M	L	NI	M	NI	NI	NI	L	NI	L	L	L	L
	Intermodal	NI	NI	NI	M	NI	L	M	NI	L	NI	NI	NI	L	M	H	H	L	L
Route 30																			
	Reduce Congestion	L	L	L	L	NI	M	NI	L	M	NI	NI	L	NI	NI	M	M	L	L
	Safety	NI	NI	NI	NI	NI	M	NI	L	M	NI	NI	L	NI	NI	M	M	L	L
	Minimizes Impacts to Neighborhood	L	L	L	L	NI	H	NI	M	M	NI	NI	L	NI	NI	M	M	L	L
I-84 Corridor																			
	Capacity	L	L	L	L	L	L	L	L	L	L	NI	L	L	NI	L	L	L	L
	Land Access Support	L	M	M	M	L	H	L	M	H	L	M	L	H	L	H	H	H	H
	Safety	H	H	H	H	M	H	H	H	H	H	L	H	H	L	H	H	M	M
	Through Traffic	L	L	L	M	L	L	M	L	L	L	NI	L	L	M	H	H	L	L
	TOTALS	3	6	6	11	1	15	6	5	18	2	3	4	11	6	24	23	6	7

KEY

SCREENING CRITERIA

H	High Positive Impact, Greatly Supports Goals of Area
M	Medium Positive Impact, Moderately Supports Goals of Area
L	Low Positive Impact, Minimal Support of Goals of Area
NI	No Impact / No Change
NEG	Negative Impact, Does Not Support Goals

CONGESTION REDUCTION CRITERIA

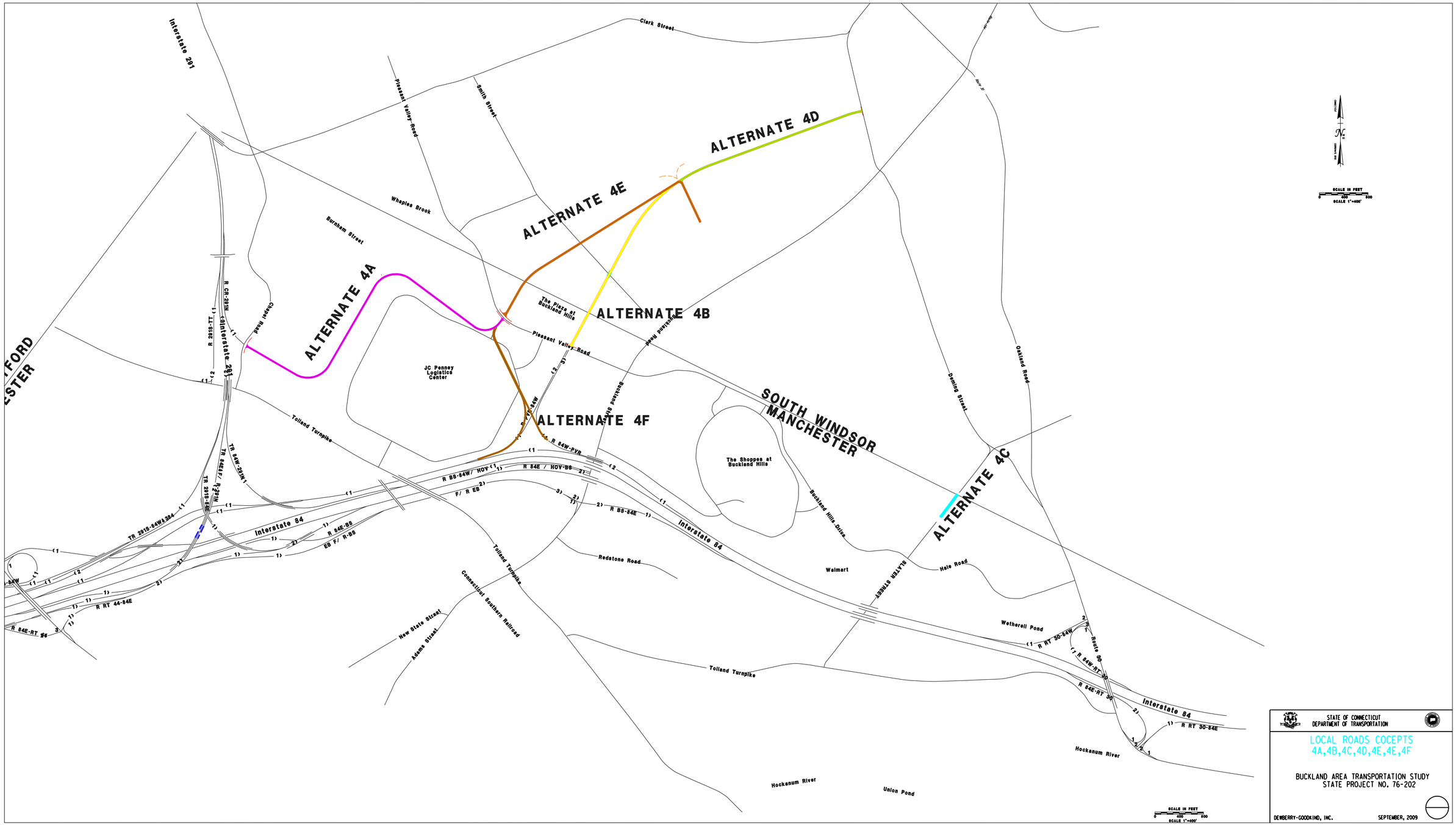
	Percent Reduction	or	Volume Reduction
H	50 - 100		>500
M	16 - 50		N/A
L	0 - 15		N/A
NI	No change		
NEG	Increase		

WEIGHTING

H = 2
M = 1
L, NI = 0
NEG = 0

1 - Evaluation Based on Comparison of ConnDOT 2030 PM Peak Hour traffic volumes with No-Build volumes.
2 - Proposed Transportation Center with connection to Red Stone Road extension south of I-84. Assumed travel benefits to Buckland St, Pleasant Vallet Rd, Tolland Tnpk, and I-84.

Appendix C
Local Road Concepts



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

LOCAL ROADS COCEPTS
4A,4B,4C,4D,4E,4E,4F

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. SEPTEMBER, 2009

Appendix D
Screened Roadway Alternatives

NOTES:

1. 5 FOOT CONTOURS GENERATED FROM 2004 STATE OVERFLIGHT 20' LIDAR DATA.
2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 1 – OPTION 1

BUCKLAND TRANSPORTATION STUDY

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October 2008

CONNECTICUT DEPARTMENT OF TRANSPORTATION

crcog

U.S. Department of Transportation
Federal Highway Administration

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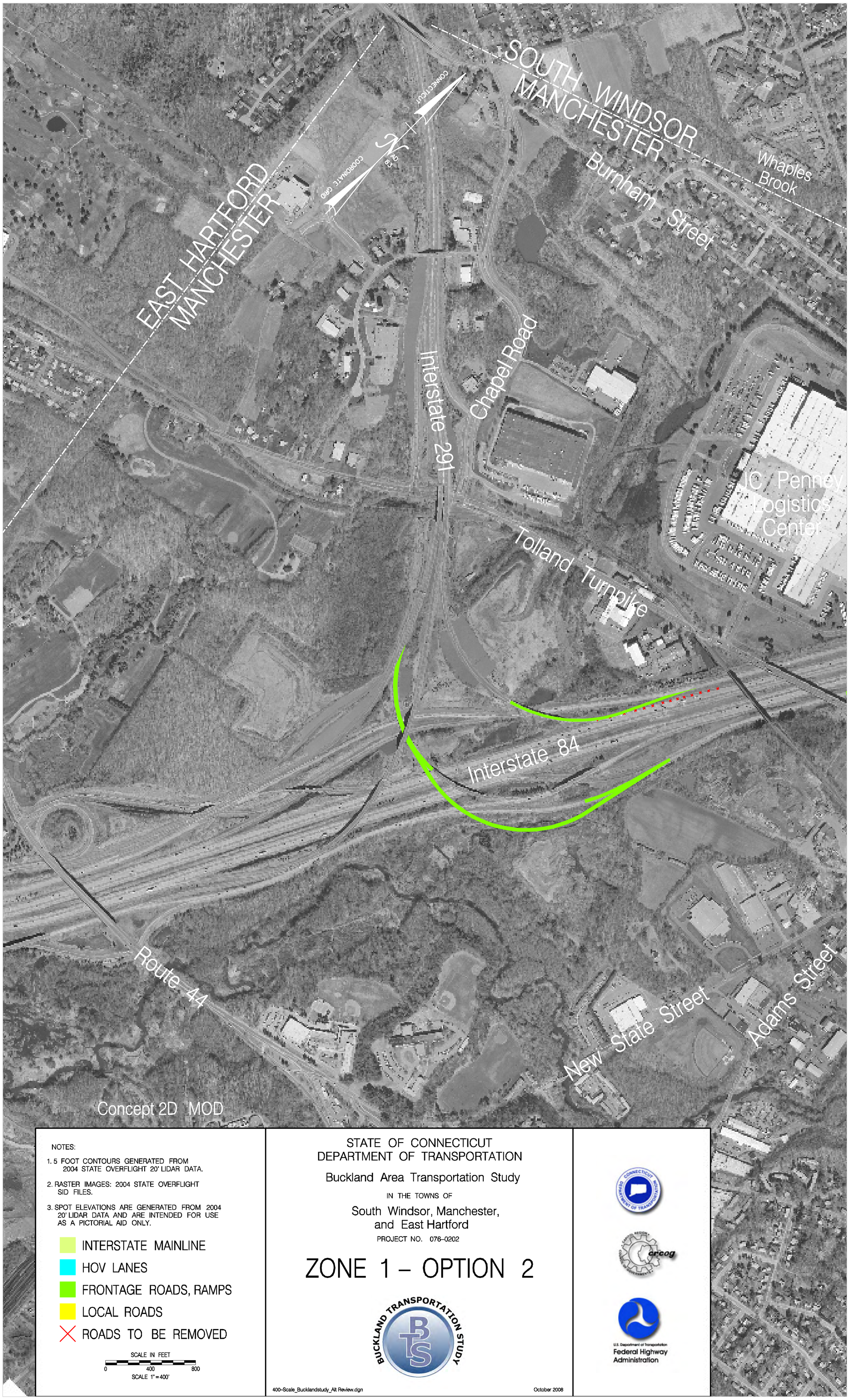

NOTES:

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INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 1 – OPTION 2

BUCKLAND TRANSPORTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

crcog

U.S. Department of Transportation
Federal Highway Administration

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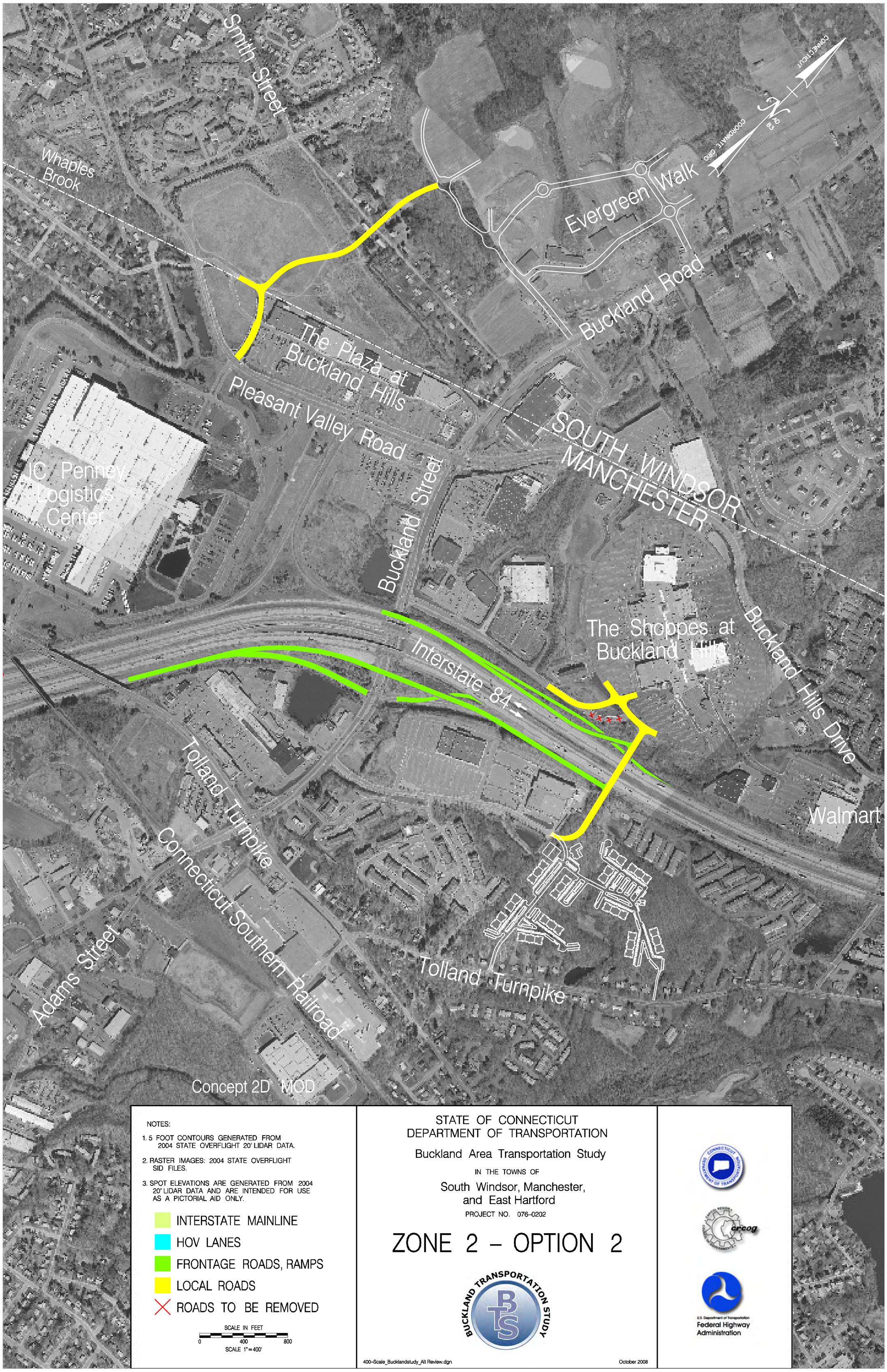

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INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 2

BUCKLAND TRANSPORTATION STUDY

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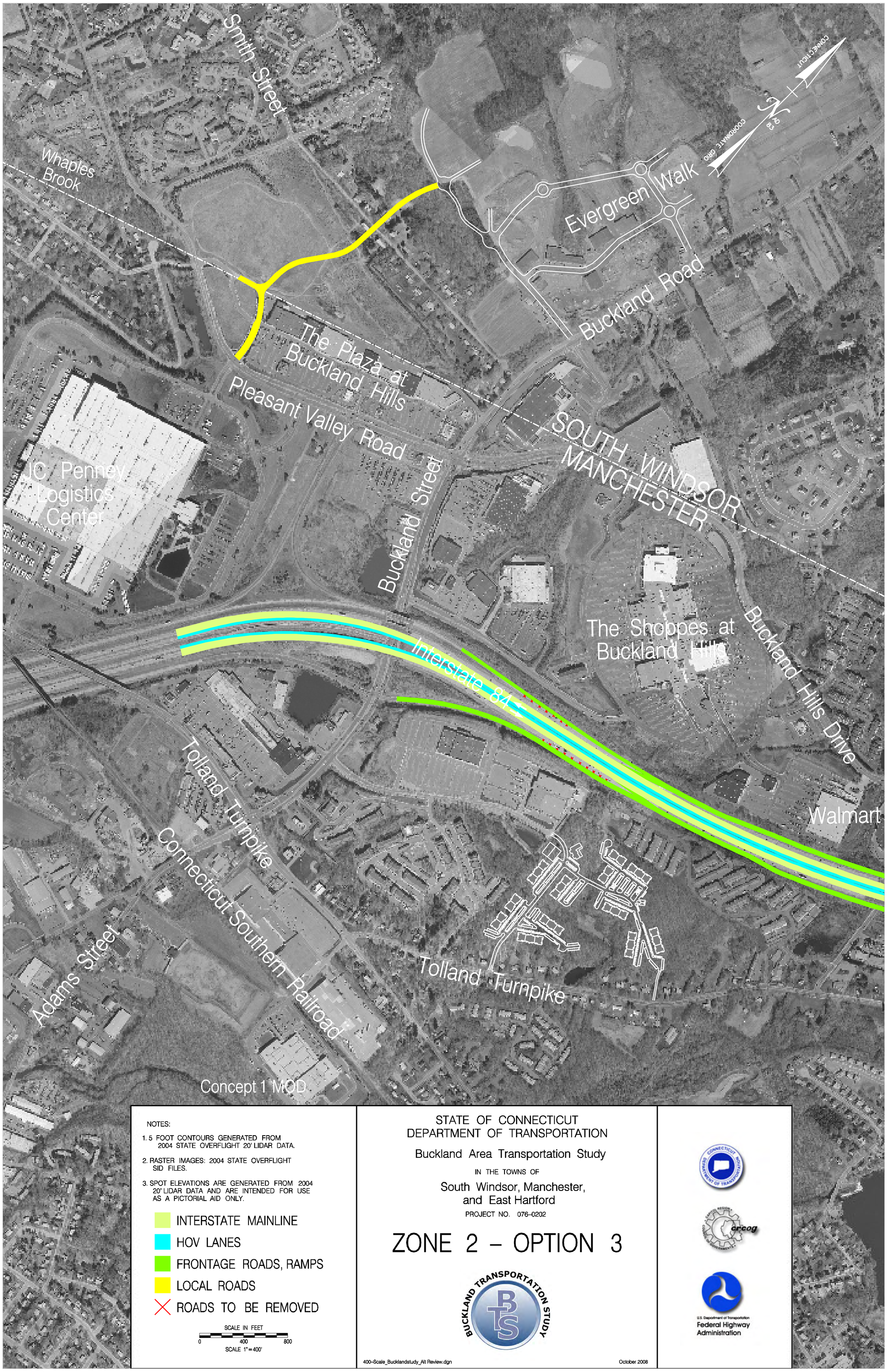

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- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 3

BUCKLAND TRANSPORTATION STUDY

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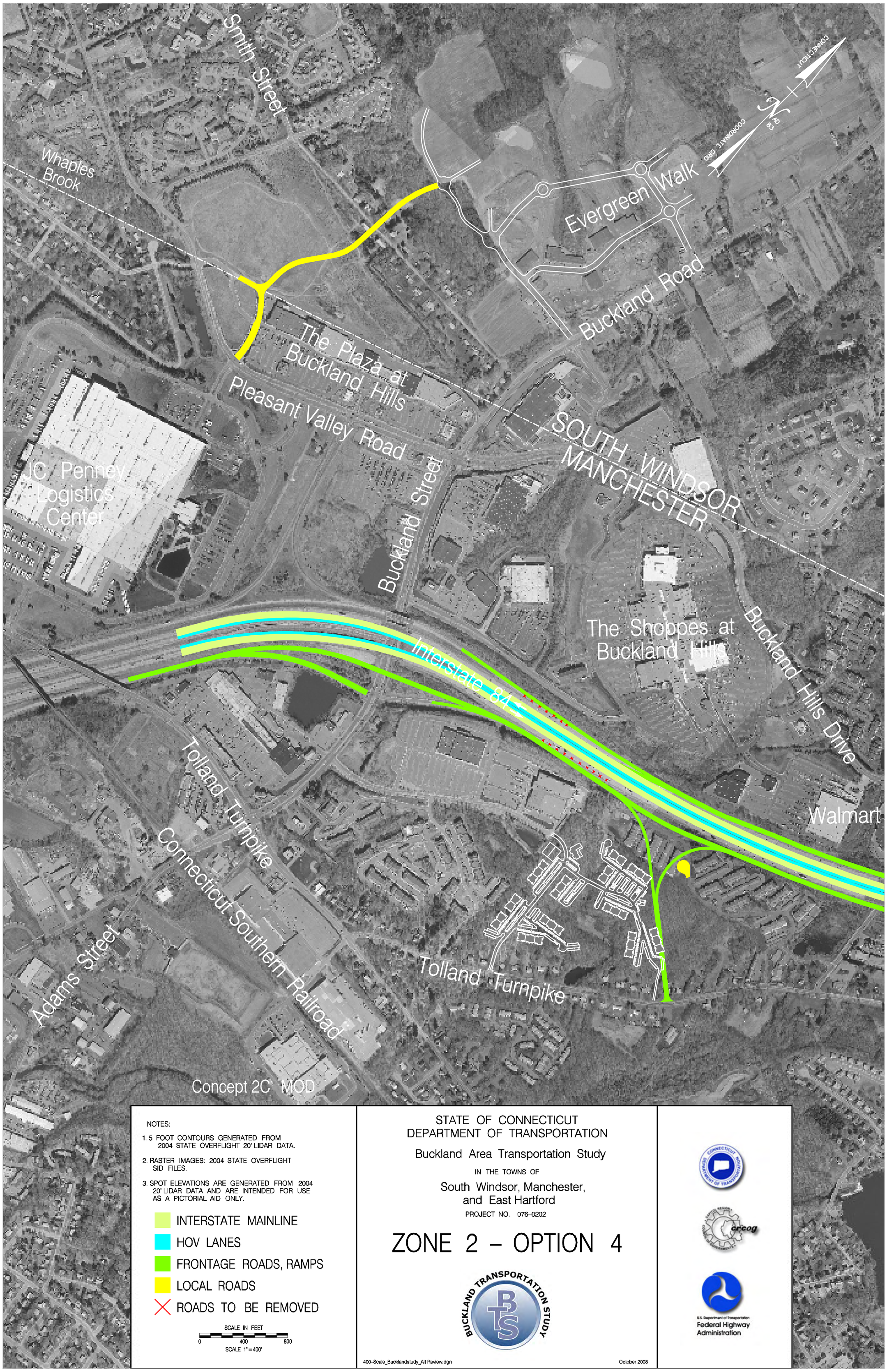

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- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 4

BUCKLAND TRANSPORTATION STUDY

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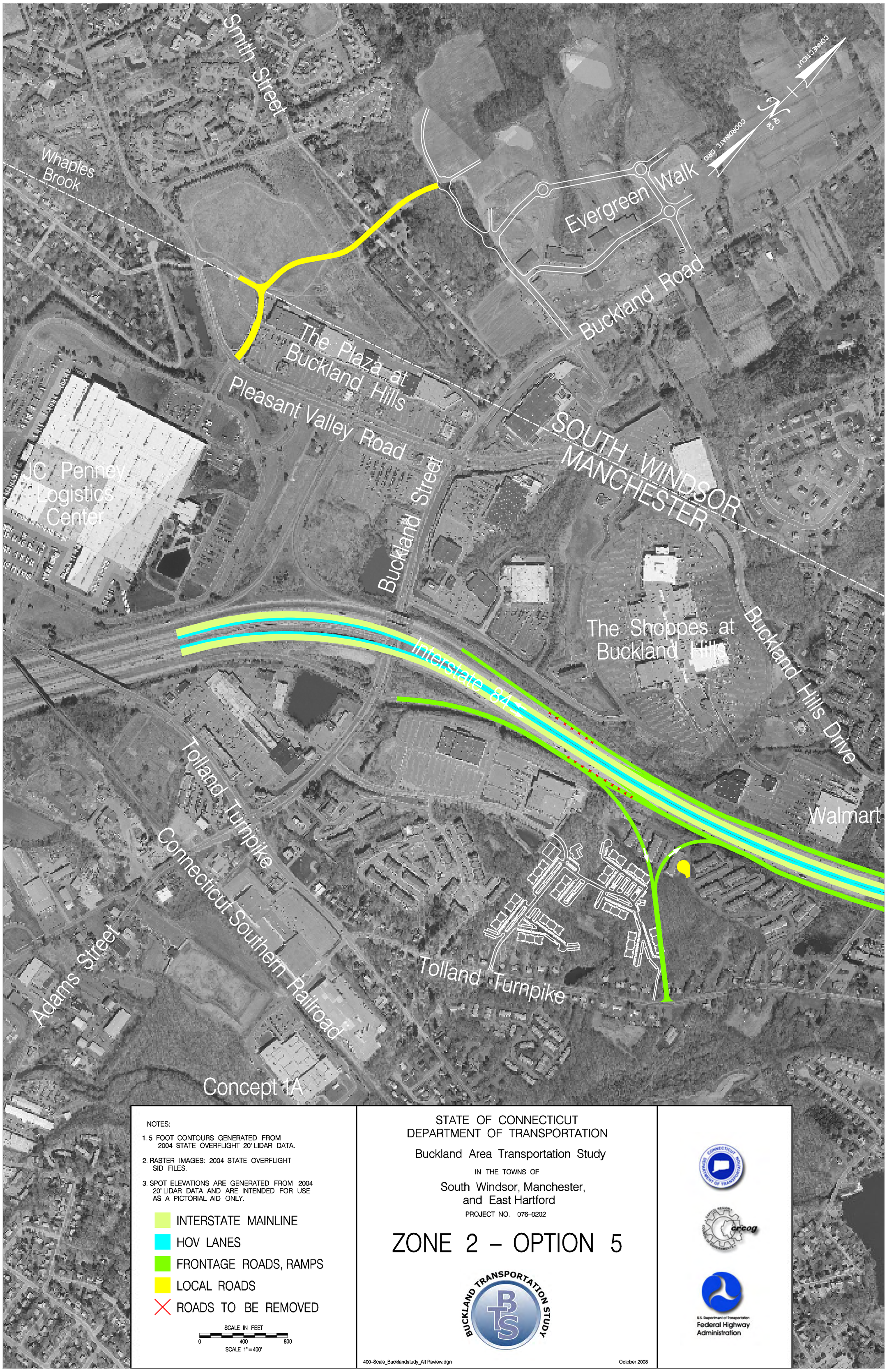

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3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 5

BUCKLAND TRANSPORTATION STUDY

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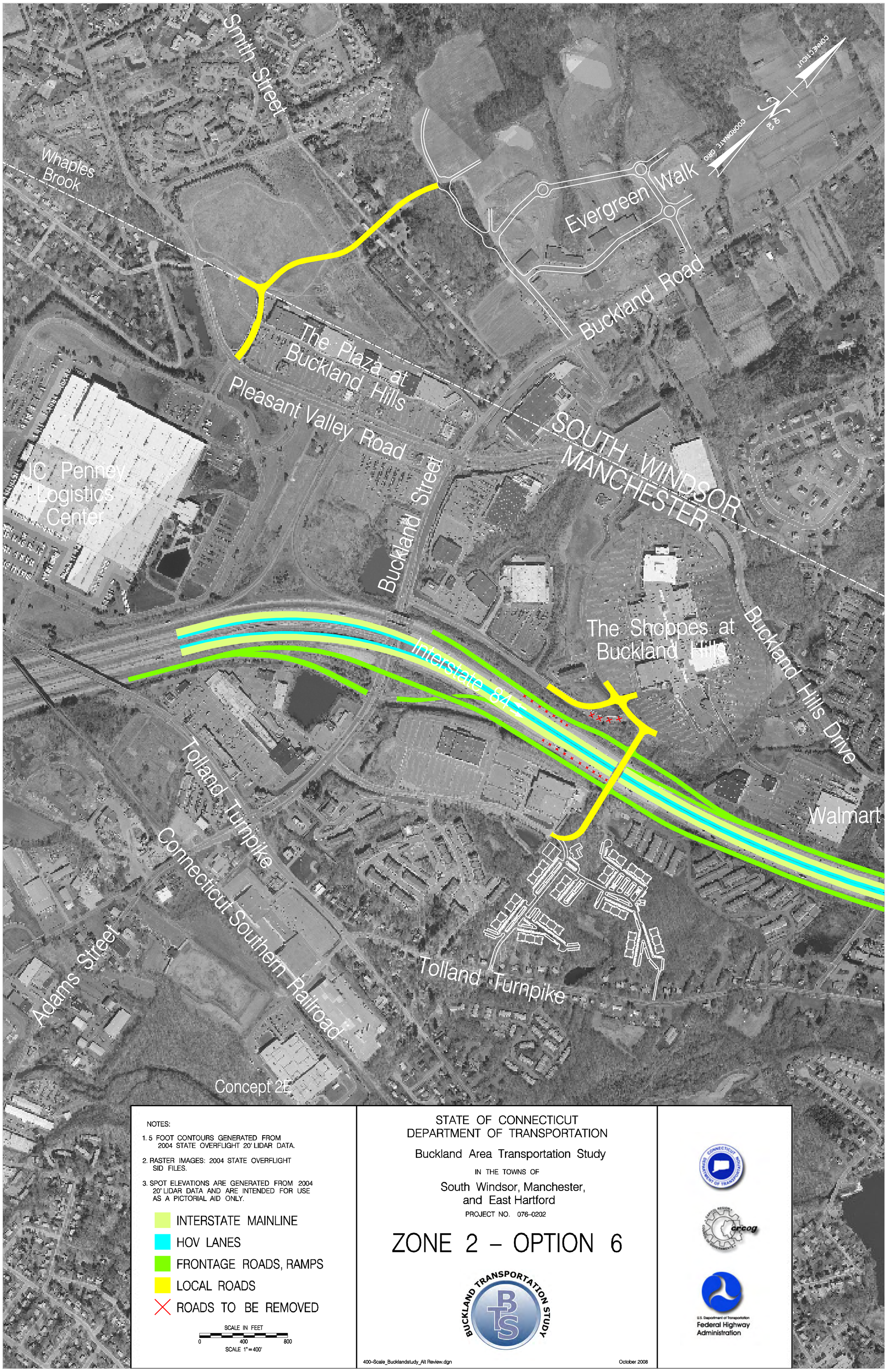

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3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

INTERSTATE MAINLINE

HOV LANES

FRONTAGE ROADS, RAMPS

LOCAL ROADS

ROADS TO BE REMOVED

SCALE IN FEET

0 400 800

SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 6

BUCKLAND TRANSPORTATION STUDY

U.S. Department of Transportation
Federal Highway Administration

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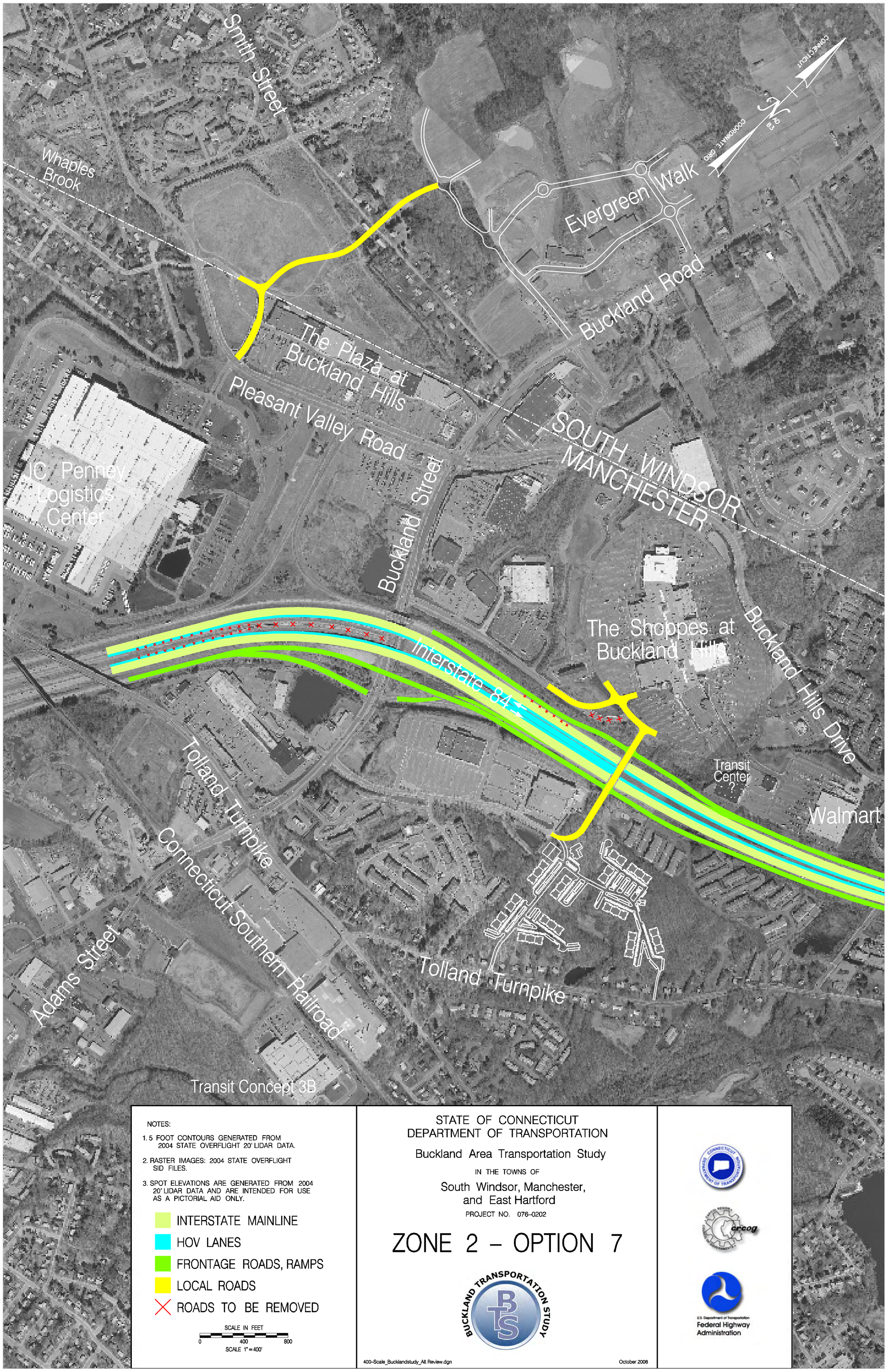

NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 7

BUCKLAND TRANSPORTATION STUDY

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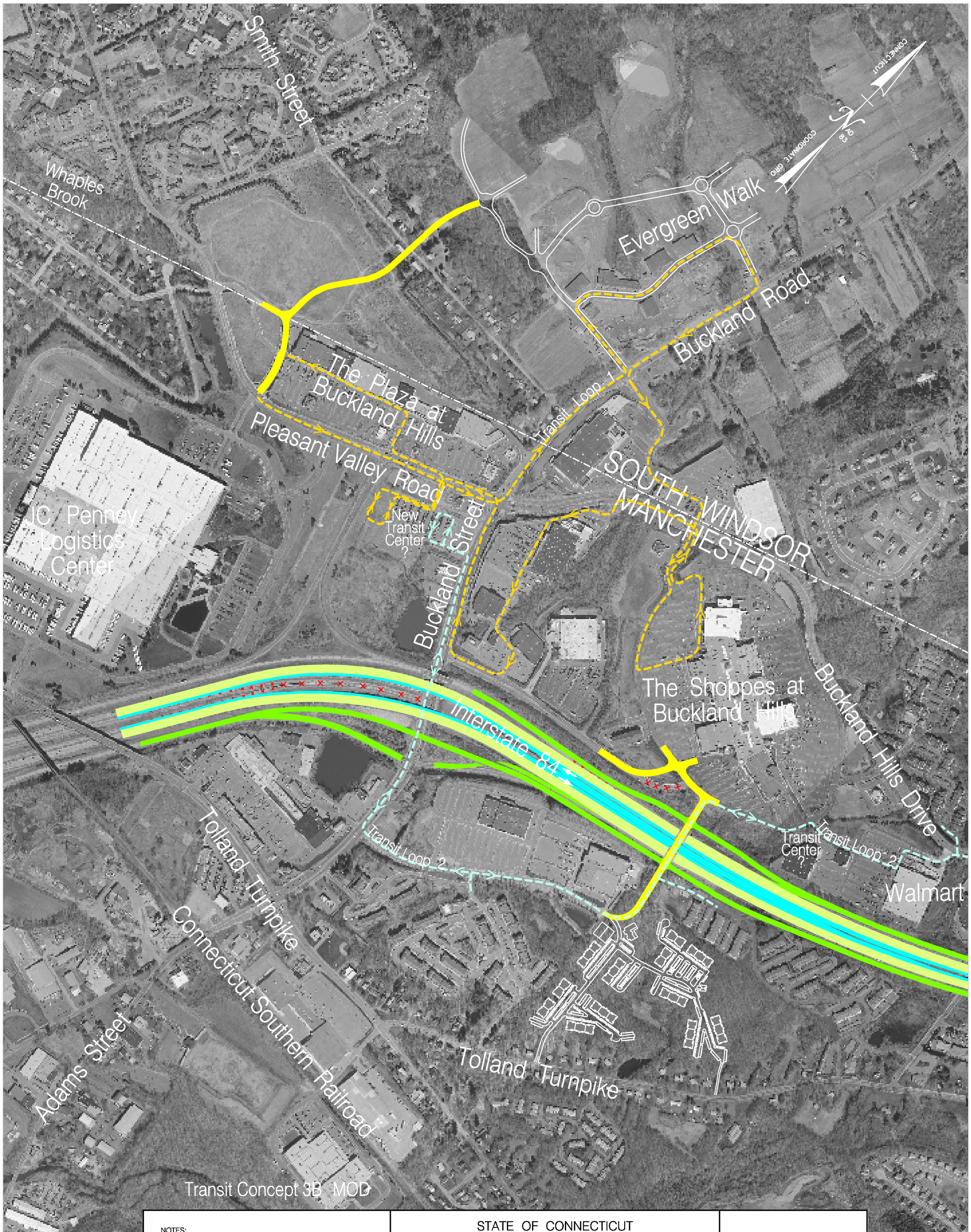

NOTES:

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- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 8

BUCKLAND TRANSPORTATION STUDY

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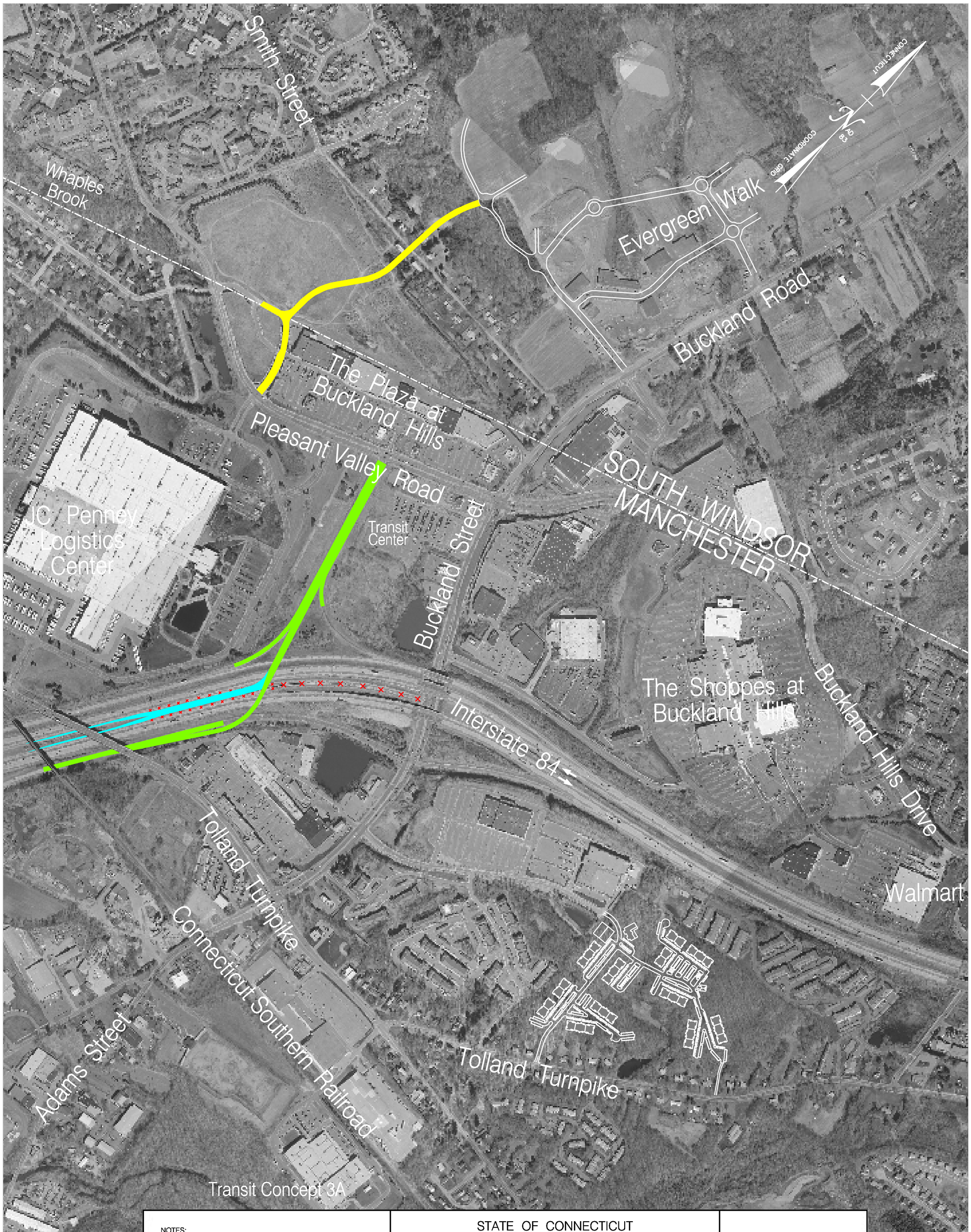
Federal Highway Administration

400-Scale_Bucklandstudy_Alt Review.dgn October 2008



NOTES:

1. 5 FOOT CONTOURS GENERATED FROM 2004 STATE OVERFLIGHT 20' LIDAR DATA.
2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

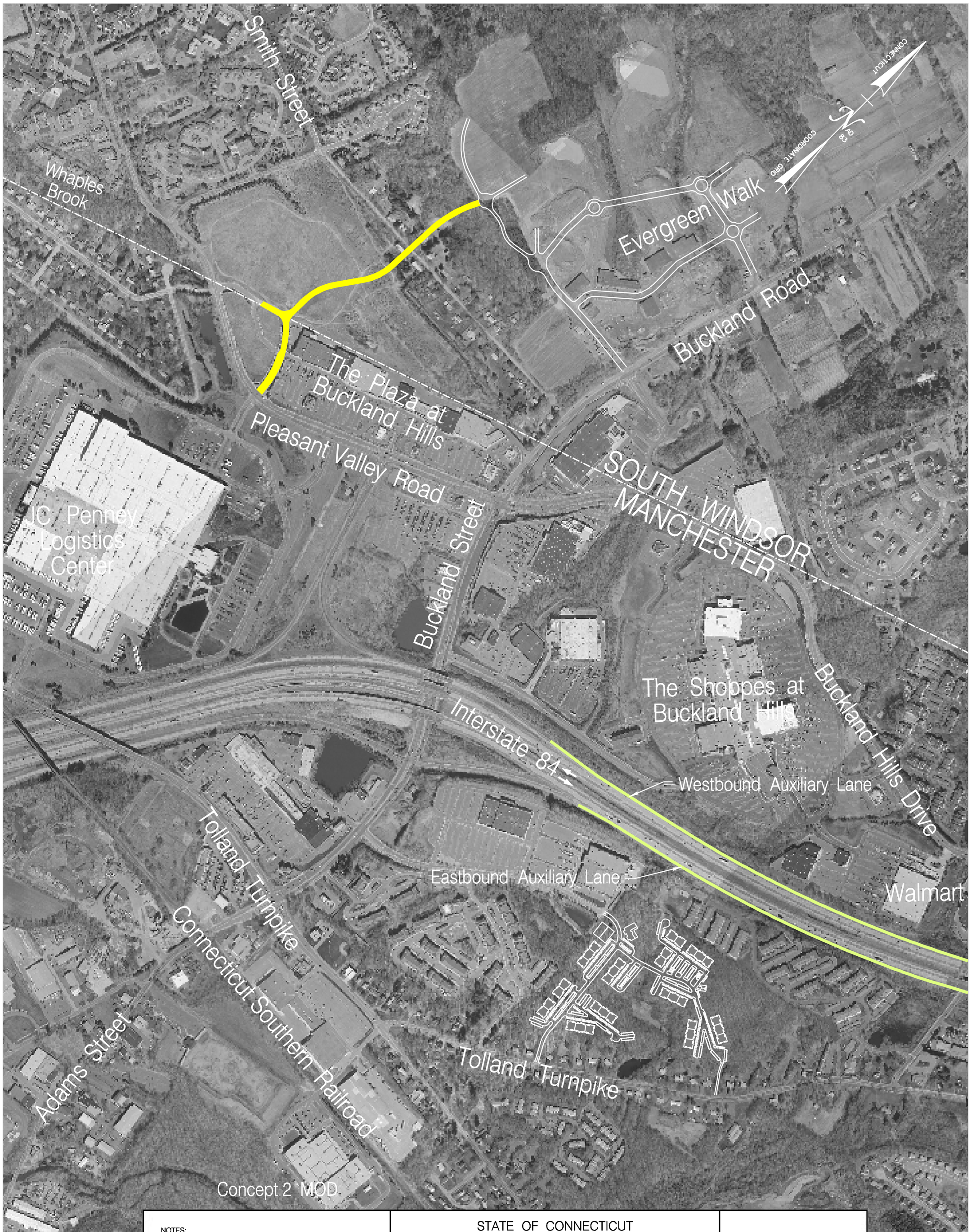
PROJECT NO. 076-0202

ZONE 2 – OPTION 9

BUCKLAND TRANSPORTATION STUDY

U.S. Department of Transportation
Federal Highway Administration

400-Scale_Bucklandstudy_Alt Review.dgn October 2008



NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

INTERSTATE MAINLINE

HOV LANES

FRONTAGE ROADS, RAMPS

LOCAL ROADS

ROADS TO BE REMOVED

SCALE IN FEET

0 400 800

SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 2 – OPTION 10

BUCKLAND TRANSPORTATION STUDY

U.S. Department of Transportation
Federal Highway Administration

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NOTES:

1. 5 FOOT CONTOURS GENERATED FROM 2004 STATE OVERFLIGHT 20' LIDAR DATA.
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3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester,
and East Hartford

PROJECT NO. 076-0202

ZONE 3 – OPTION 3

BUCKLAND TRANSPORTATION STUDY

400-Scale_Bucklandstudy_Alt Review.dgn

October 2008

U.S. Department of Transportation
Federal Highway Administration

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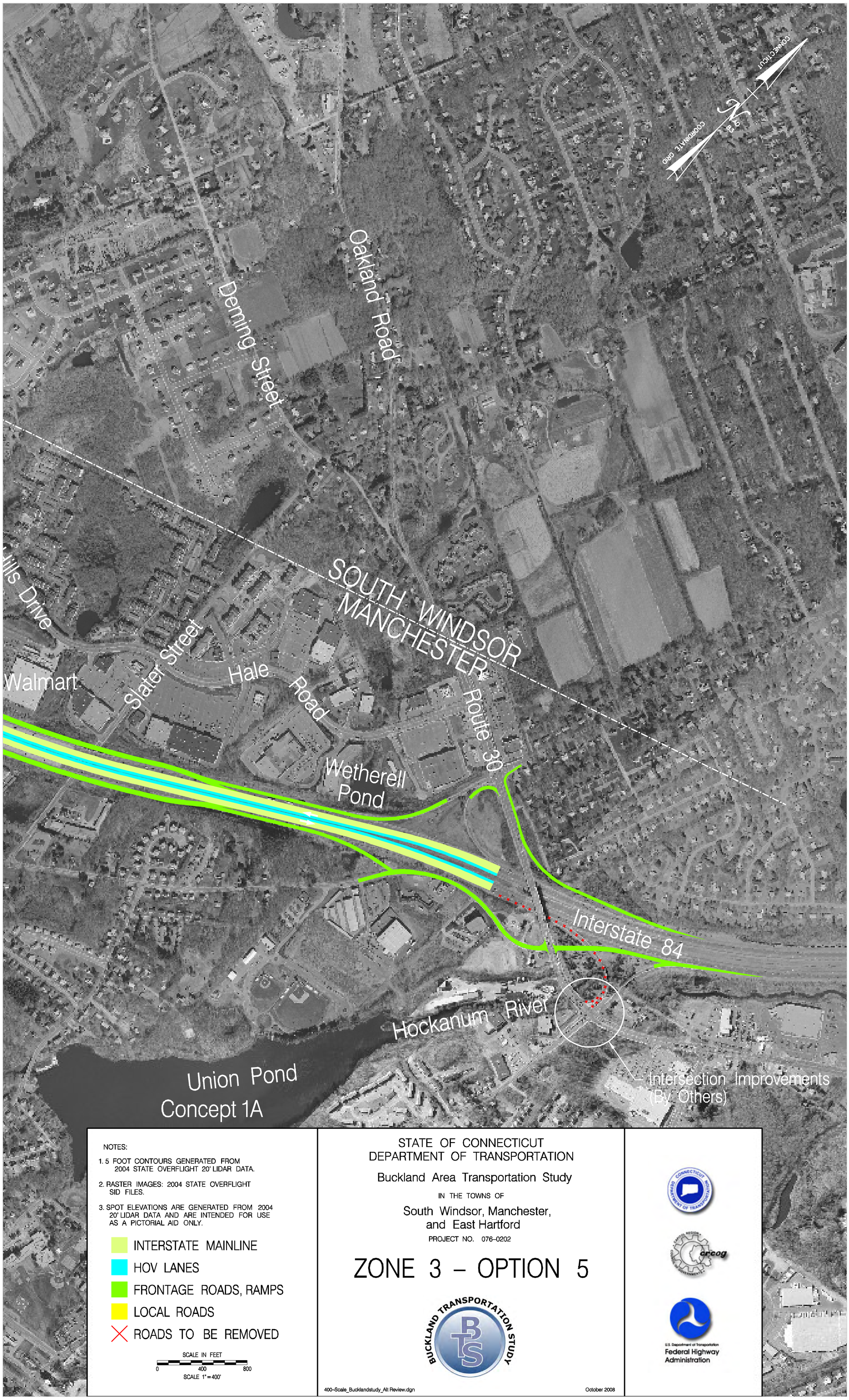

NOTES:

1. 5 FOOT CONTOURS GENERATED FROM 2004 STATE OVERFLIGHT 20' LIDAR DATA.
2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester,
and East Hartford

PROJECT NO. 076-0202

ZONE 3 – OPTION 5

BUCKLAND TRANSPORTATION STUDY

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October 2008

U.S. Department of Transportation
Federal Highway Administration

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3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 3 – OPTION 6

BUCKLAND TRANSPORTATION STUDY

400-Scale_Bucklandstudy_Alt Review.dgn

October 2008

U.S. Department of Transportation
Federal Highway Administration

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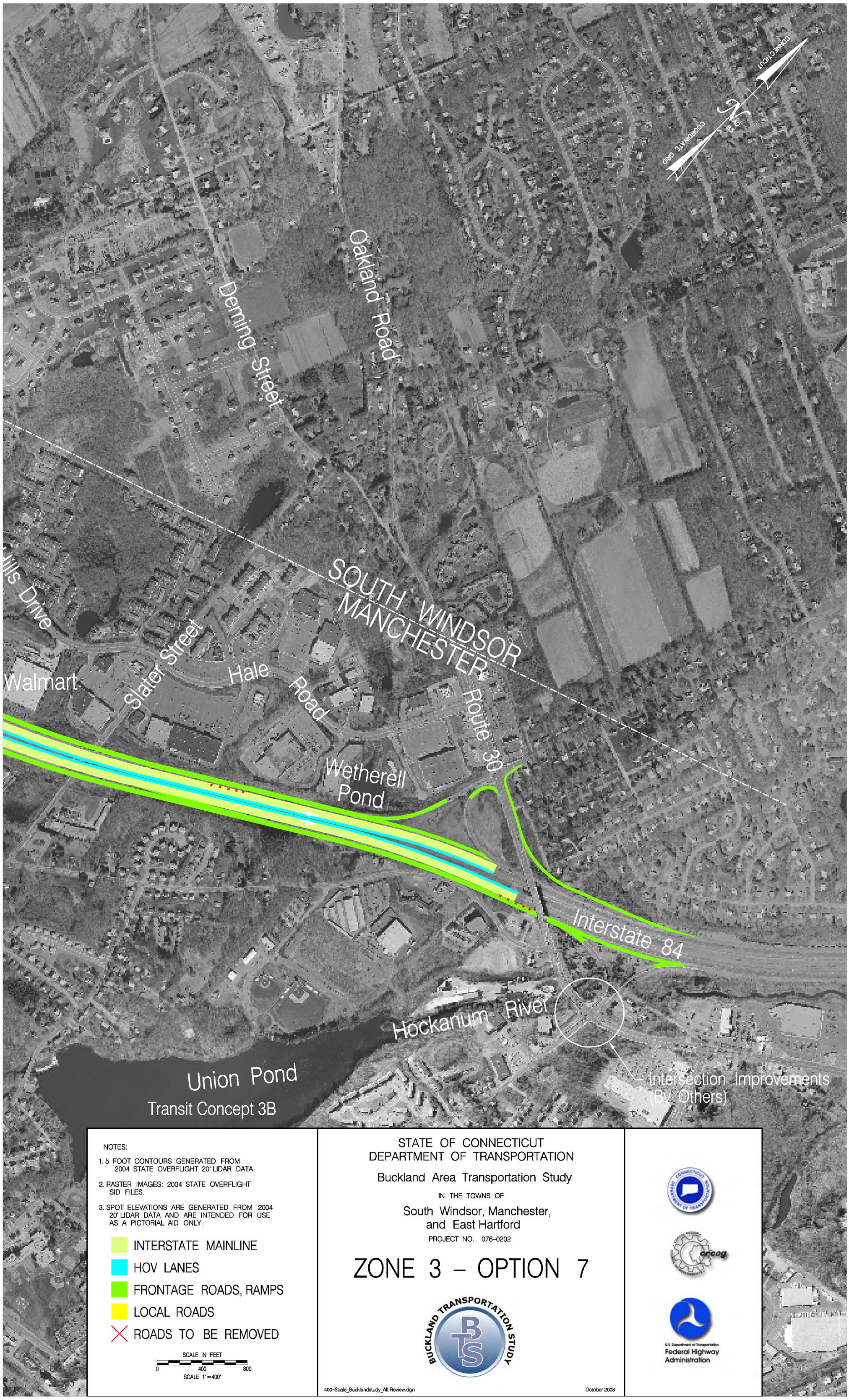

NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

INTERSTATE MAINLINE

HOV LANES

FRONTAGE ROADS, RAMPS

LOCAL ROADS

ROADS TO BE REMOVED

SCALE IN FEET

0 400 800

SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 3 – OPTION 7

BUCKLAND TRANSPORTATION STUDY

400-Scale_Bucklandstudy_Alt Review.dgn

October 2008

U.S. Department of Transportation
Federal Highway Administration

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 3 – OPTION 8

BUCKLAND TRANSPORTATION STUDY

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October 2008

U.S. Department of Transportation
Federal Highway Administration

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3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF

South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

ZONE 3 – OPTION 10

BUCKLAND TRANSPORTATION STUDY

400-Scale_Bucklandstudy_Alt Review.dgn

October 2008

U.S. Department of Transportation
Federal Highway Administration

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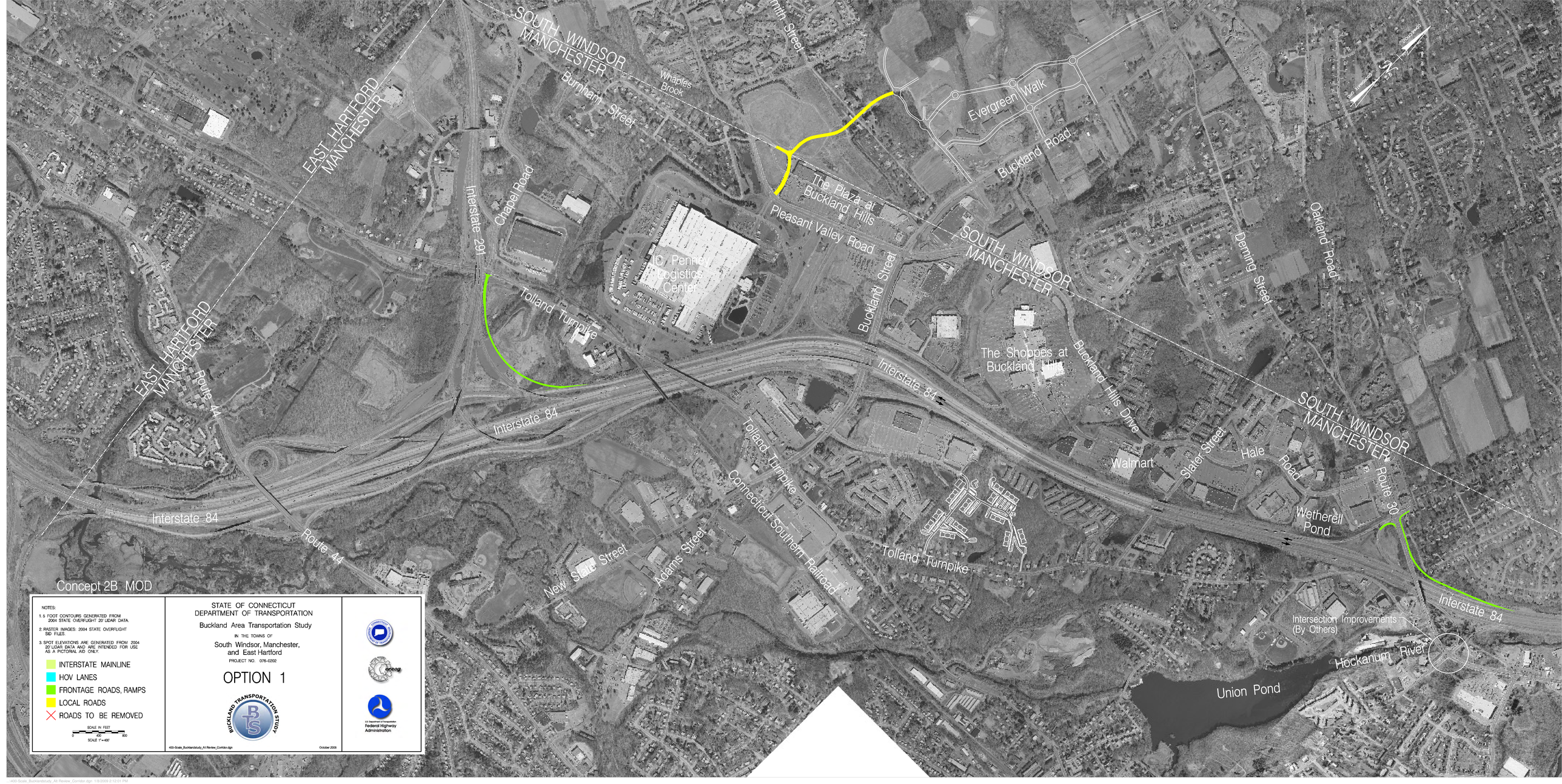

NOTES:

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- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

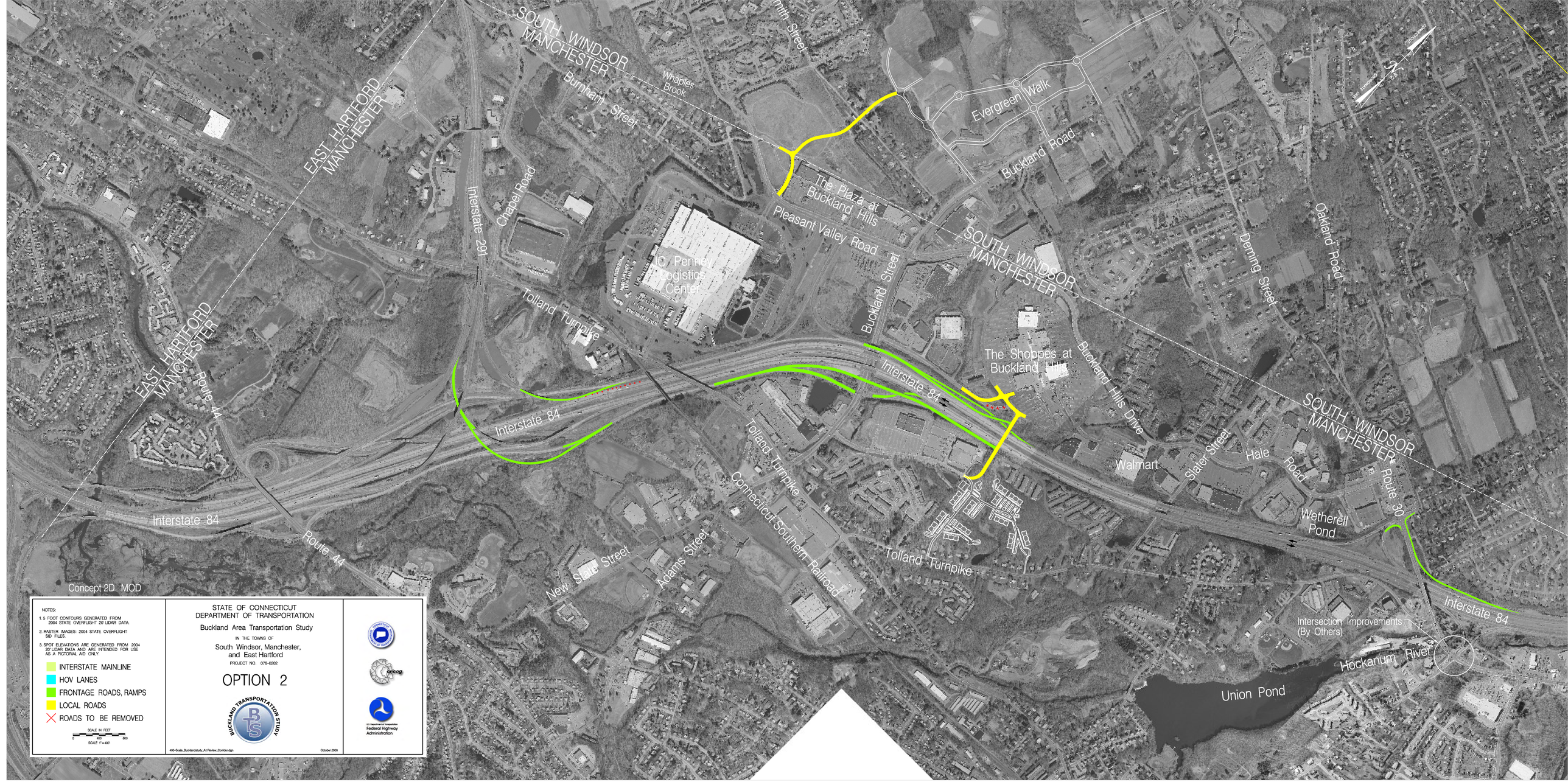
PROJECT NO. 076-0202

OPTION 1

BUCKLAND TRANSPORTATION STUDY

U.S. Department of Transportation
Federal Highway Administration

400-Scale_BucklandStudy_Alt Review_Corridor.dgn October 2008



NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

OPTION 2

BUCKLAND TRANSPORTATION STUDY

400-Scale_BucklandStudy_Alt Review_Corridor.dgn October 2008

U.S. Department of Transportation
Federal Highway Administration

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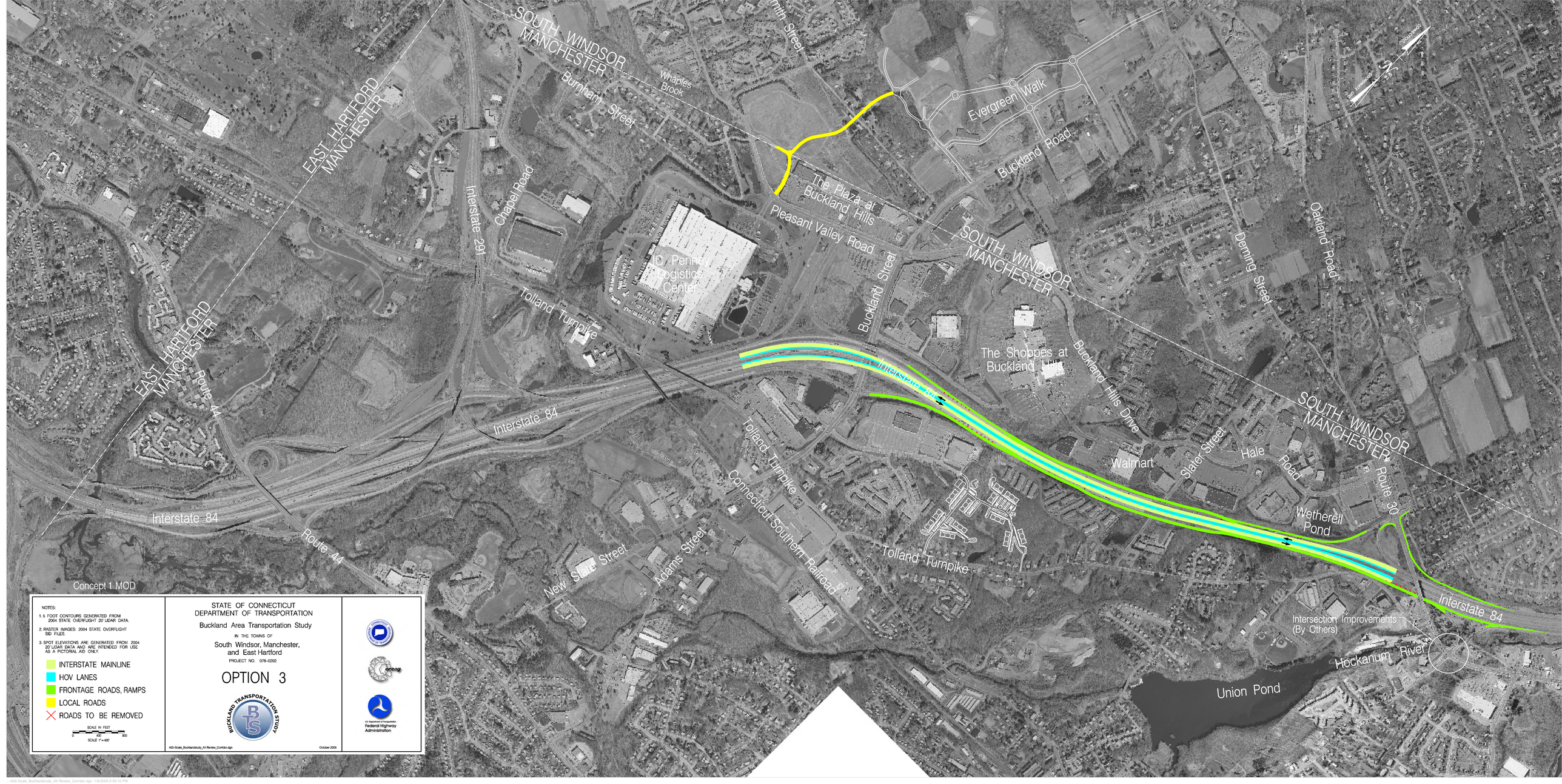

NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
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- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

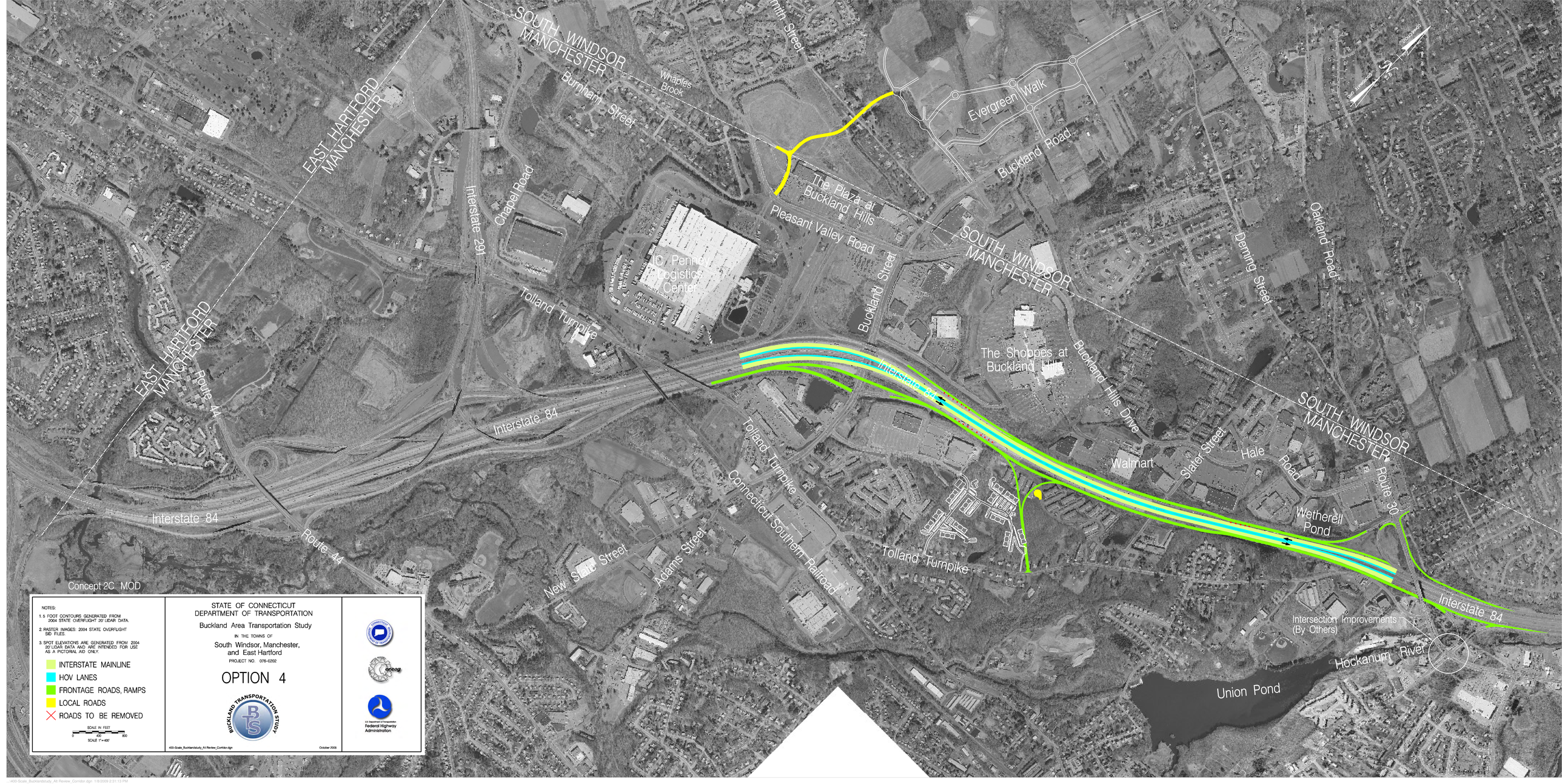
OPTION 3

BUCKLAND TRANSPORTATION STUDY

U.S. Department of Transportation
Federal Highway Administration

400-Scale_BucklandStudy_Alt Review_Corridor.dgn

October 2008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MANCHESTER
EAST HARTFORD
MANCHESTER
Burnham Street
Whaples Brook
Interstate 291
Chapel Road
Tolland Turnpike
Pleasant Valley Road
The Plaza at Buckland Hills
JC Penney Logistics Center
Buckland Street
Evergreen Walk
Buckland Road
Oakland Road
Deming Street
Route 44
Interstate 84
The Shoppes at Buckland Hills
Buckland Hills Drive
Walmart
Slater Street
Hale Road
Route 30
Wetherell Pond
Connecticut Southern Railroad
Adams Street
New State Street
Intersection Improvements (By Others)
Hockanum River
Union Pond
Concept 2C MOD
NOTES:
1. 5 FOOT CONTOURS GENERATED FROM 2004 STATE OVERFLIGHT 20' LIDAR DATA.
2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
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INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED
SCALE IN FEET
0 400 800
SCALE 1"=400'
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
Buckland Area Transportation Study
IN THE TOWNS OF
South Windsor, Manchester, and East Hartford
PROJECT NO. 076-0202
OPTION 4
BUCKLAND TRANSPORTATION STUDY
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U.S. Department of Transportation
Federal Highway Administration
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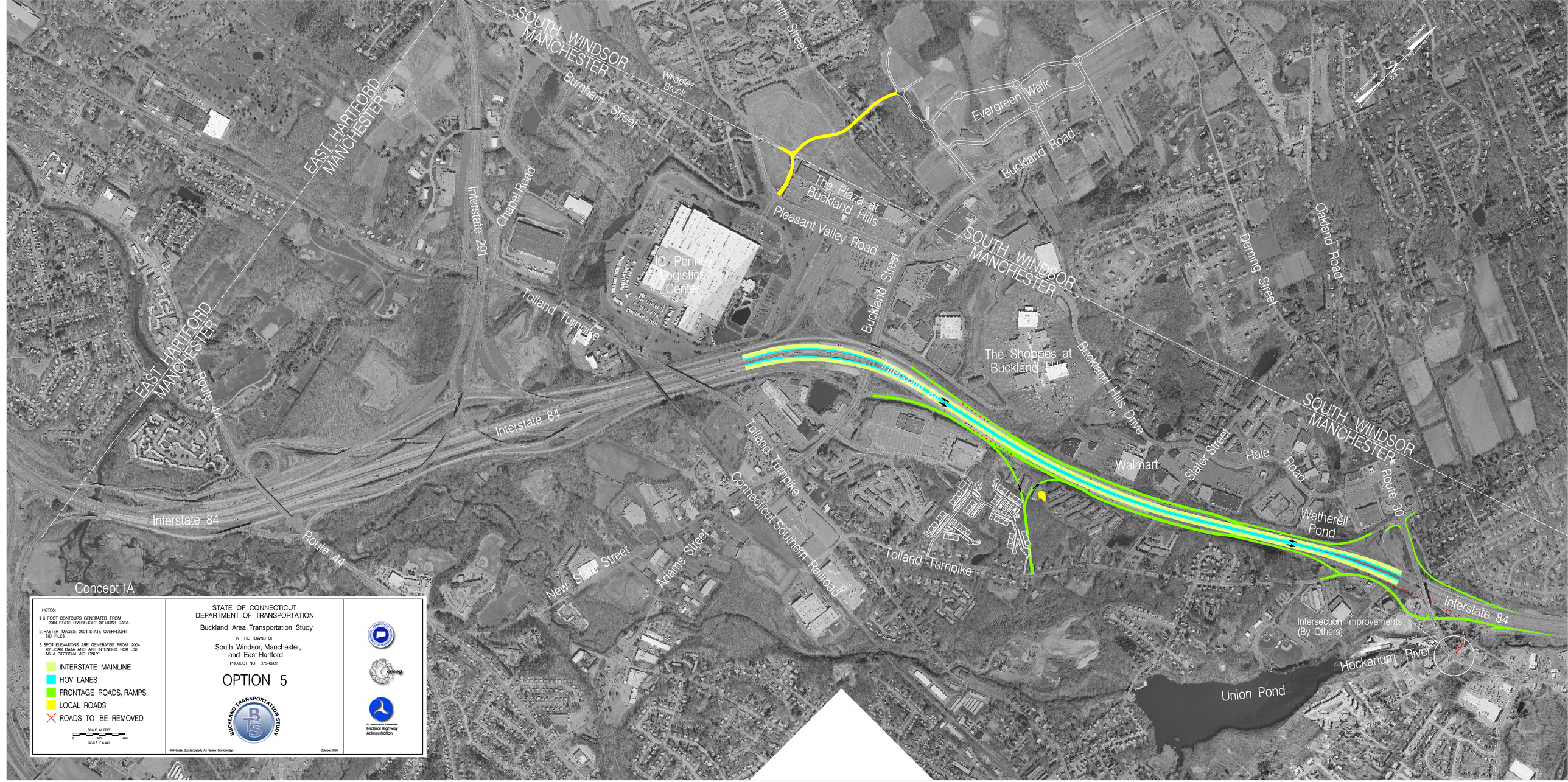

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

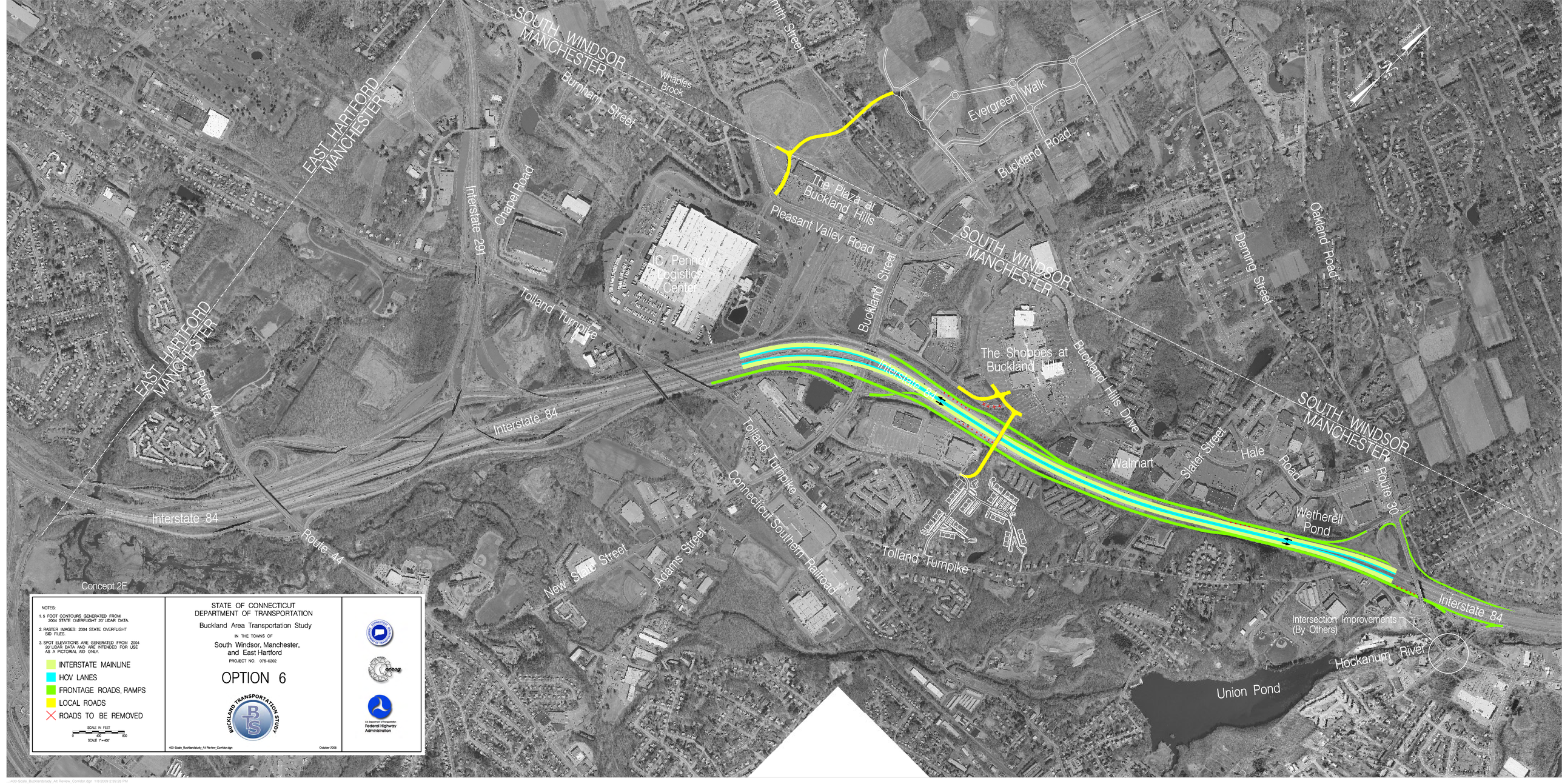
OPTION 5

BUCKLAND TRANSPORTATION STUDY

U.S. Department of Transportation
Federal Highway Administration

400-Scale_BucklandStudy_Alt Review_Corridor.dgn

October 2008



NOTES:

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- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1"=400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

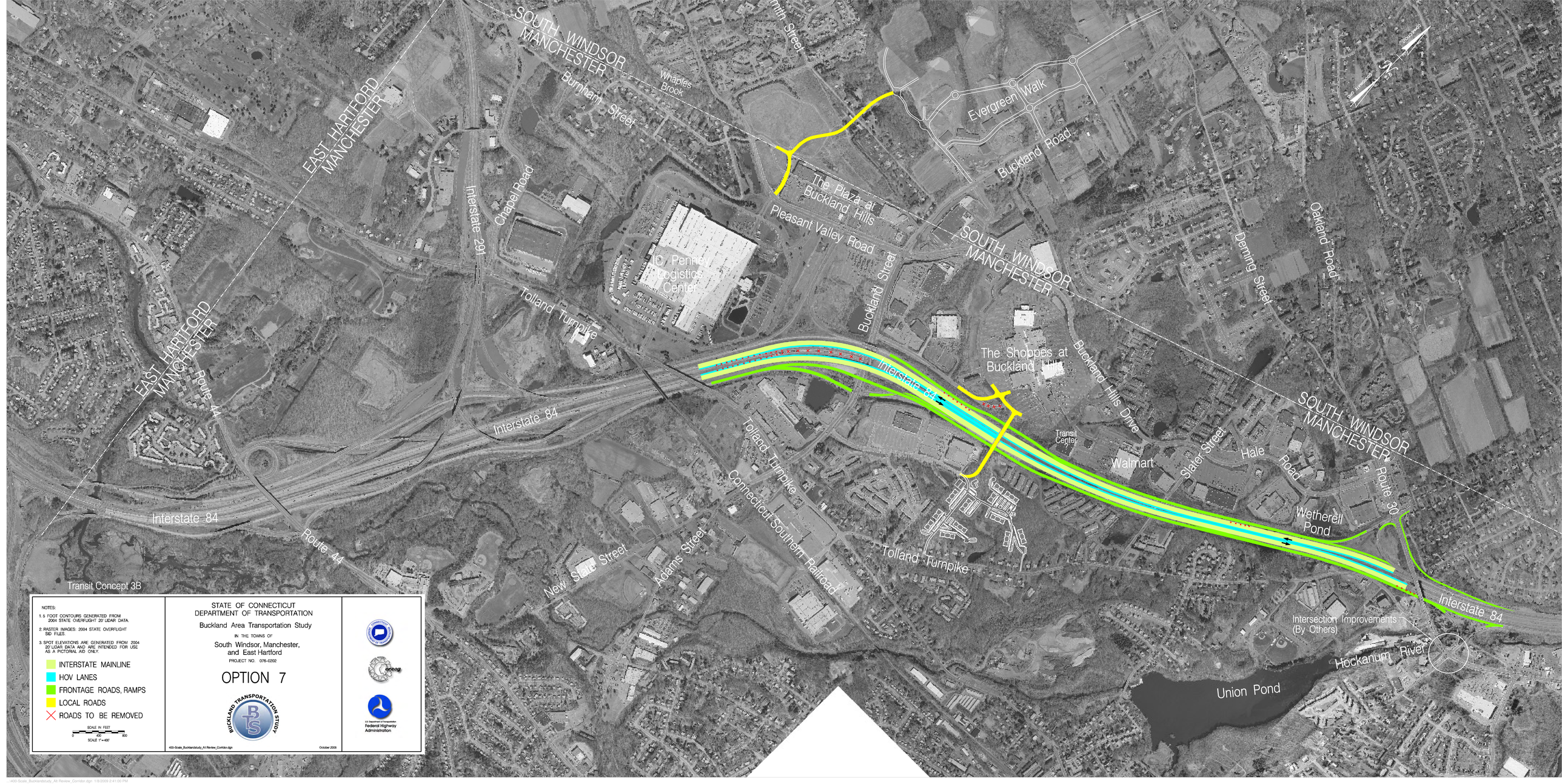
PROJECT NO. 076-0202

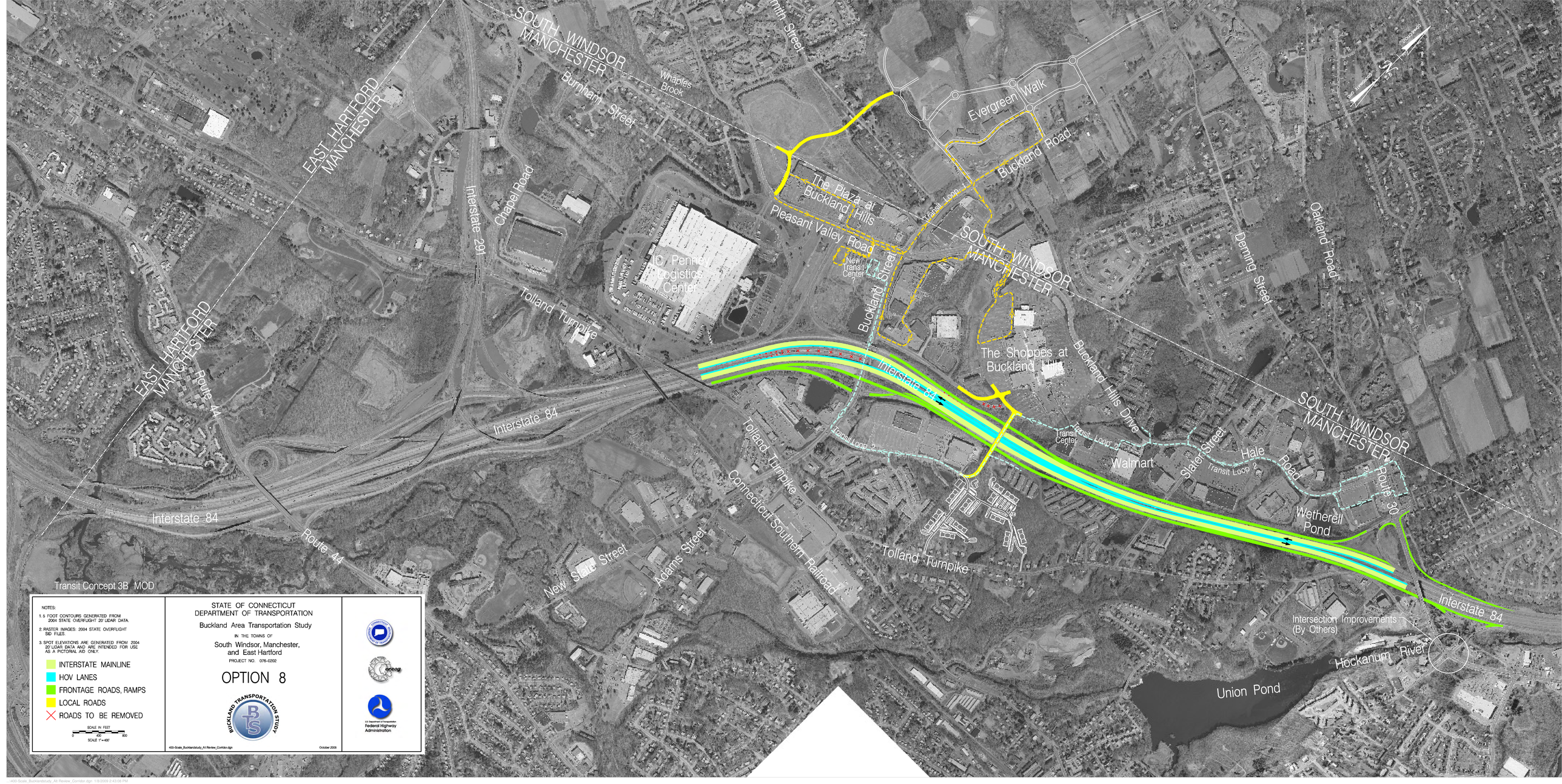
OPTION 6

BUCKLAND TRANSPORTATION STUDY

400-Scale_BucklandStudy_Alt Review_Corridor.dgn October 2008

U.S. Department of Transportation
Federal Highway Administration


SOUTH WINDSOR
MANCHESTER
EAST HARTFORD
MANCHESTER
Burnham Street
Whaples Brook
nnth Street
Evergreen Walk
Buckland Road
Chapel Road
Interstate 291
The Plaza at Buckland Hills
Pleasant Valley Road
Buckland Street
JC Penney Logistics Center
Tolland Turnpike
Oakland Road
Deming Street
Route 44
Interstate 84
The Shoppes at Buckland Hills
Buckland Hills Drive
Transit Center
Walmart
Slater Street
Hale Road
Route 30
Wetherell Pond
Connecticut Southern Railroad
New State Street
Adams Street
Intersection Improvements (By Others)
Hockanum River
Union Pond
Transit Concept 3B
NOTES:
1. 5 FOOT CONTOURS GENERATED FROM 2004 STATE OVERFLIGHT 20' LIDAR DATA.
2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.
INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED
SCALE IN FEET
0 400 800
SCALE 1" = 400'
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
Buckland Area Transportation Study
IN THE TOWNS OF
South Windsor, Manchester, and East Hartford
PROJECT NO. 076-0202
OPTION 7
BUCKLAND TRANSPORTATION STUDY
400-Scale_BucklandStudy_Alt Review_Corridor.dgn
October 2008
U.S. Department of Transportation
Federal Highway Administration



NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

OPTION 8

BUCKLAND TRANSPORTATION STUDY

400-Scale_BucklandStudy_Alt Review_Corridor.dgn October 2008

U.S. Department of Transportation
Federal Highway Administration

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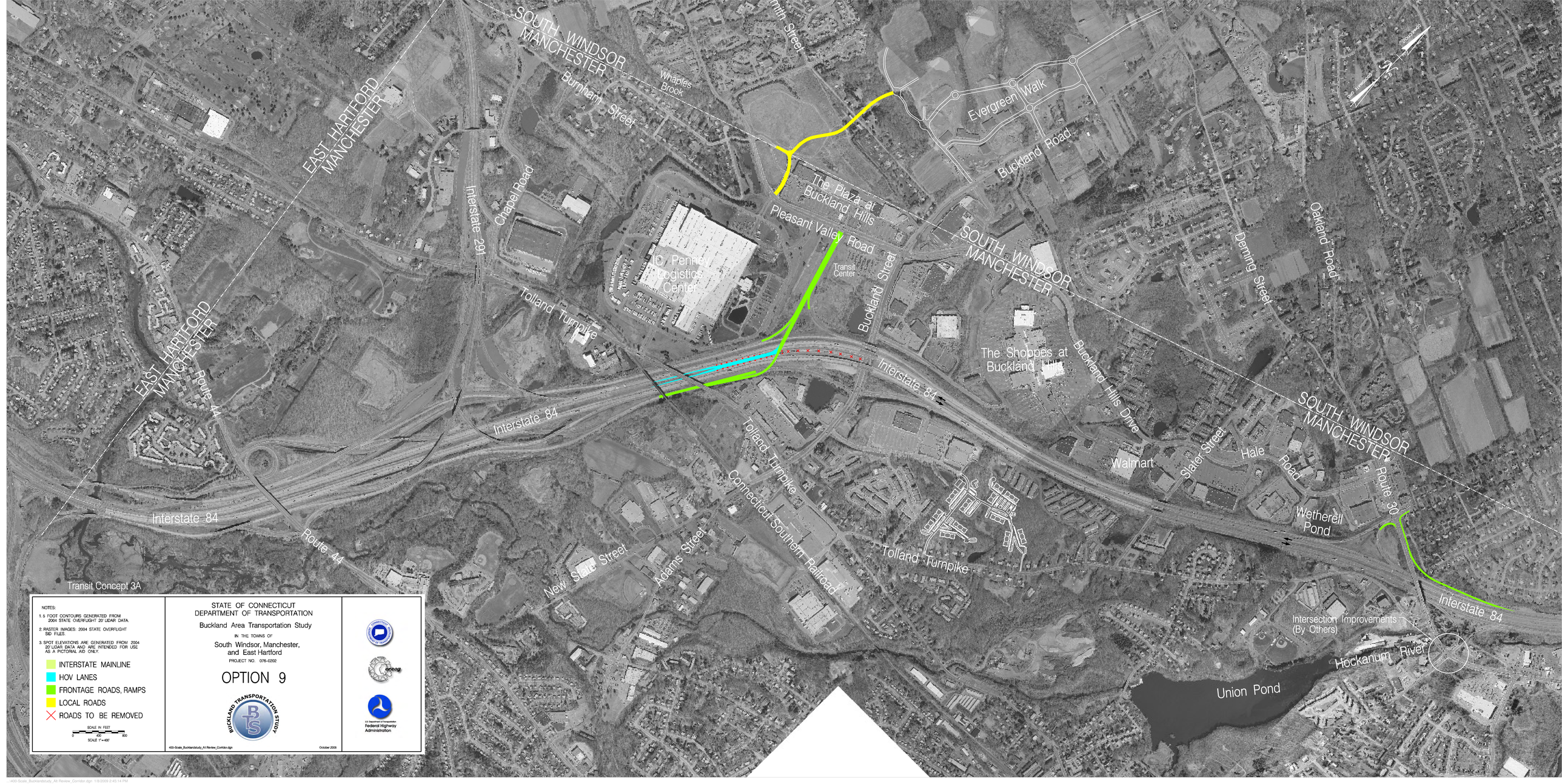

NOTES:

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2. RASTER IMAGES: 2004 STATE OVERFLIGHT SID FILES.
3. SPOT ELEVATIONS ARE GENERATED FROM 2004 20' LIDAR DATA AND ARE INTENDED FOR USE AS A PICTORIAL AID ONLY.

- INTERSTATE MAINLINE
- HOV LANES
- FRONTAGE ROADS, RAMPS
- LOCAL ROADS
- ROADS TO BE REMOVED

SCALE IN FEET
0 400 800
SCALE 1" = 400'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Buckland Area Transportation Study

IN THE TOWNS OF
South Windsor, Manchester, and East Hartford

PROJECT NO. 076-0202

OPTION 9

BUCKLAND TRANSPORTATION STUDY

400-Scale_BucklandStudy_Alt Review_Corridor.dgn

October 2008

U.S. Department of Transportation
Federal Highway Administration

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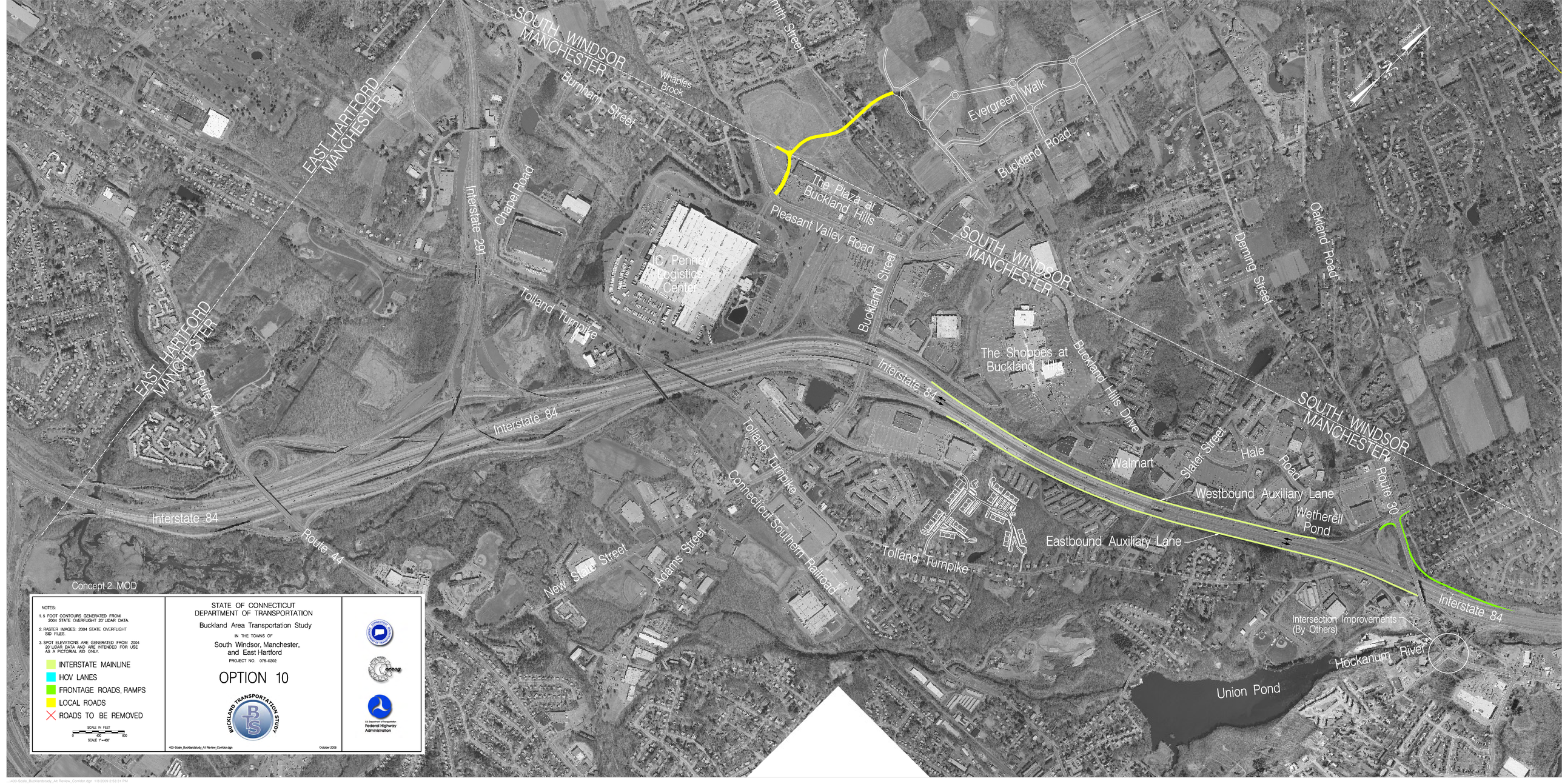
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MANCHESTER
EAST HARTFORD
MANCHESTER
Burnham Street
Whaples Brook
Interstate 291
Chapel Road
Tolland Turnpike
Pleasant Valley Road
The Plaza at Buckland Hills
Evergreen Walk
Buckland Road
JC Penney Logistics Center
Buckland Street
Interstate 84
Route 44
The Shoppes at Buckland Hills
Buckland Hills Drive
Denning Street
Oakland Road
Slater Street
Hale Road
Walmart
Westbound Auxiliary Lane
Eastbound Auxiliary Lane
Wetherell Pond
Route 30
Connecticut Southern Railroad
New State Street
Adams Street
Intersection Improvements
(By Others)
Hockanum River
Union Pond
Concept 2 MOD
NOTES:
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INTERSTATE MAINLINE
HOV LANES
FRONTAGE ROADS, RAMPS
LOCAL ROADS
ROADS TO BE REMOVED
SCALE IN FEET
0 400 800
SCALE 1" = 400'
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
Buckland Area Transportation Study
IN THE TOWNS OF
South Windsor, Manchester, and East Hartford
PROJECT NO. 076-0202
OPTION 10
BUCKLAND TRANSPORTATION STUDY
400-Scale_BucklandStudy_Alt Review_Corridor.dgn
October 2008
Federal Highway Administration
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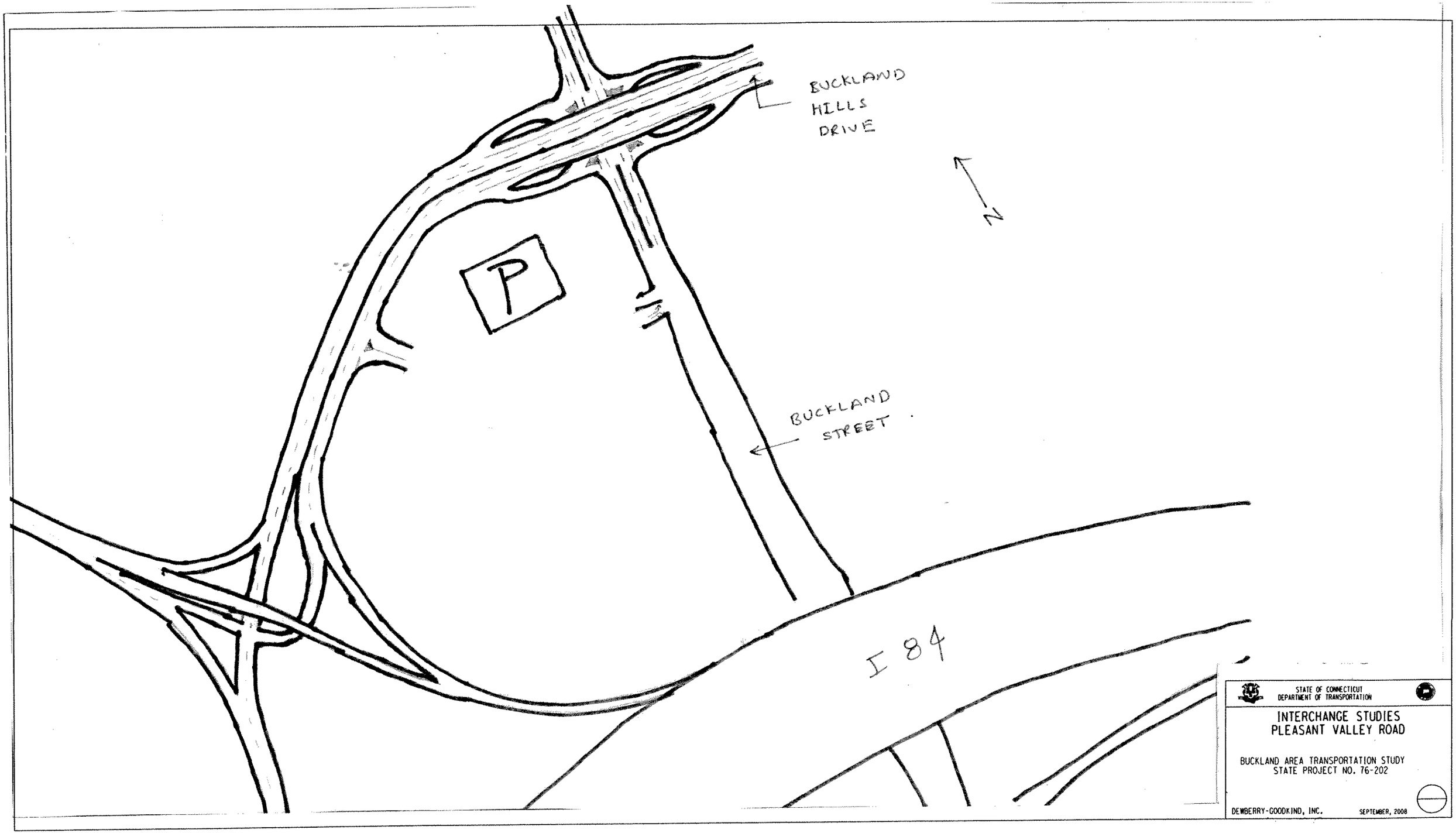
Appendix E
Interchange Studies at Pleasant Valley Road

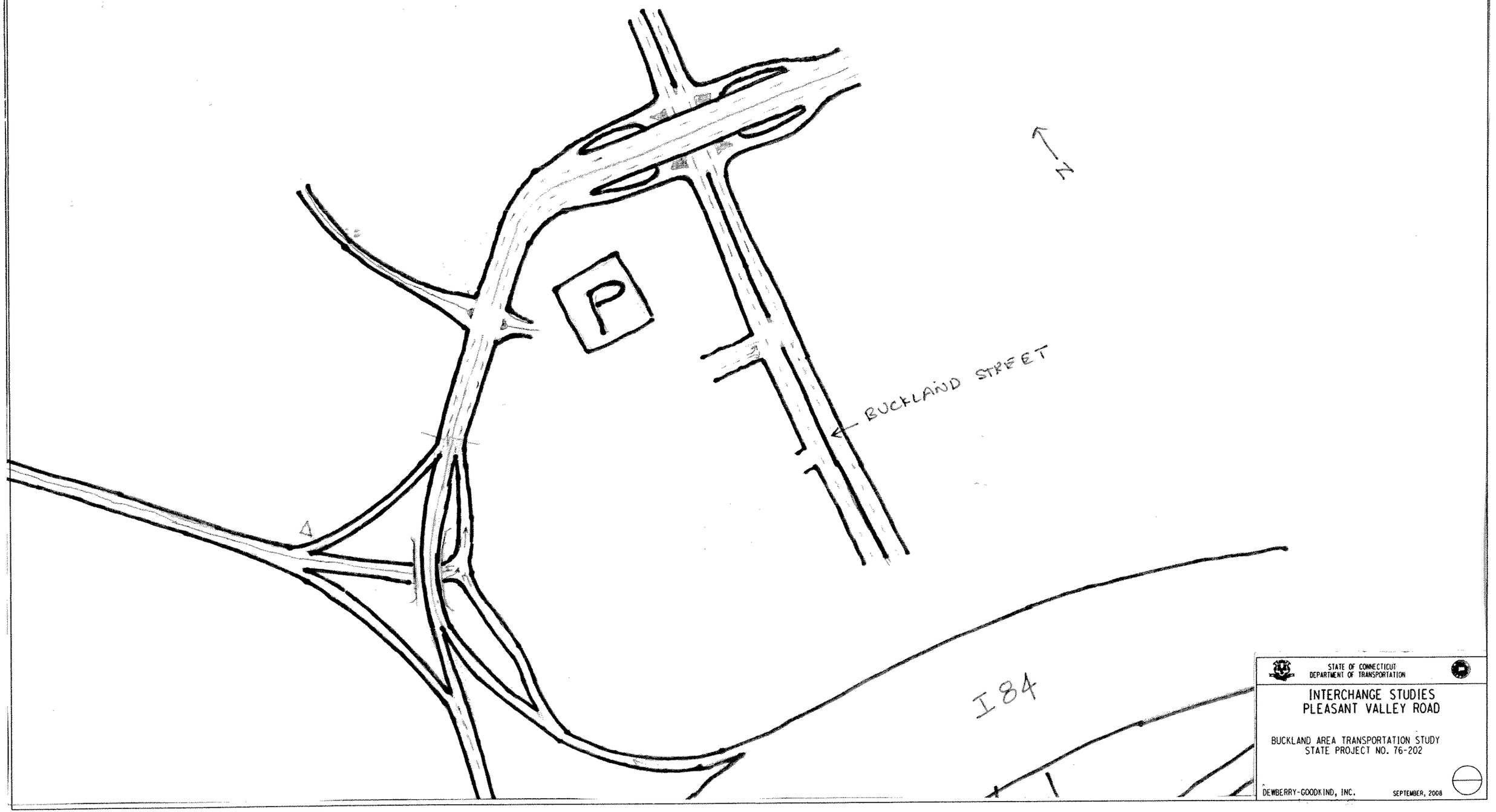


STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
PLEASANT VALLEY ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. SEPTEMBER, 2008



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
PLEASANT VALLEY ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. SEPTEMBER, 2008

PLAZA

N

P

BUCKLAND STREET

PAVILIONS DRIVE

300'

I-84 WB

I-84 EB

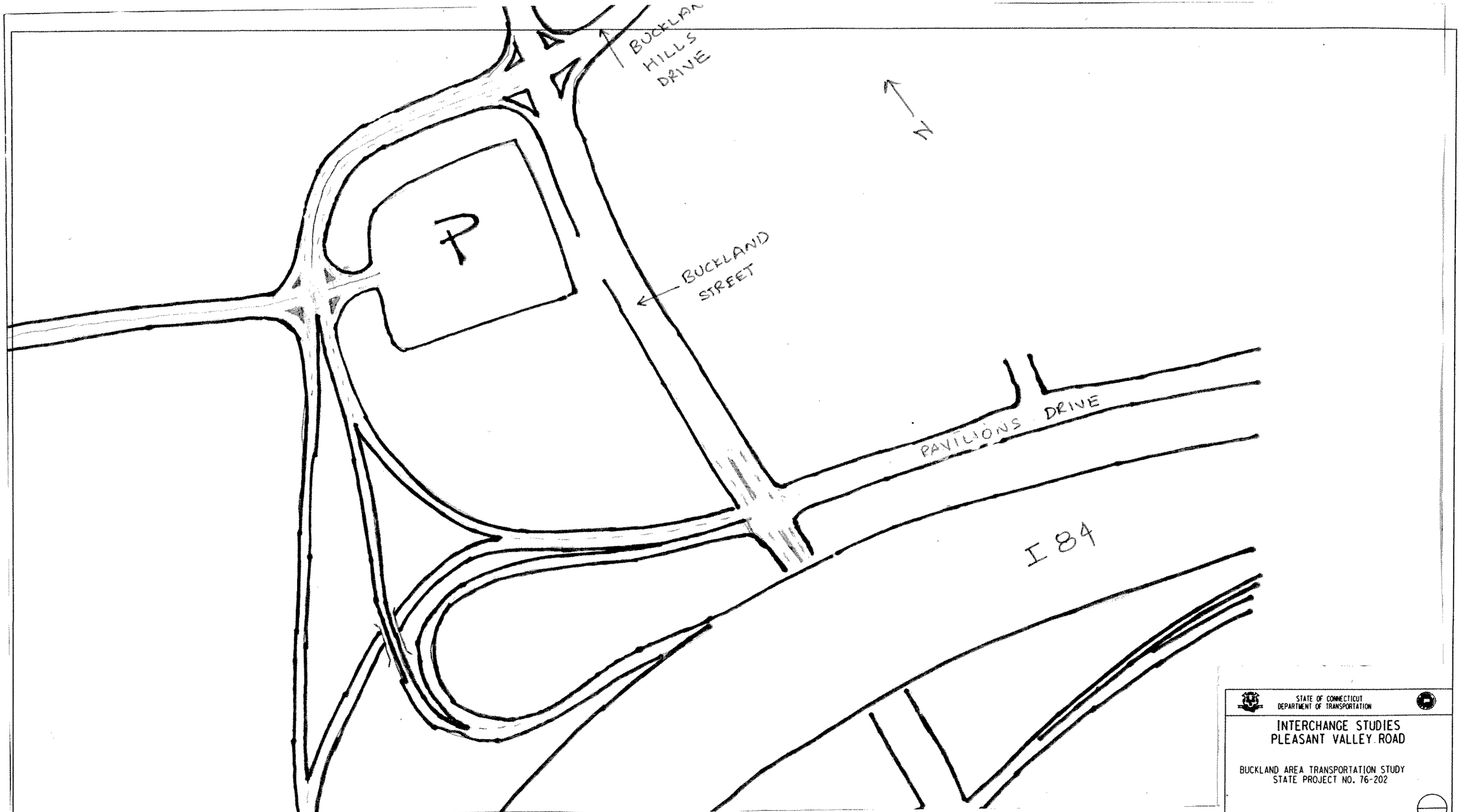
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
PLEASANT VALLEY ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC.

SEPTEMBER, 2008

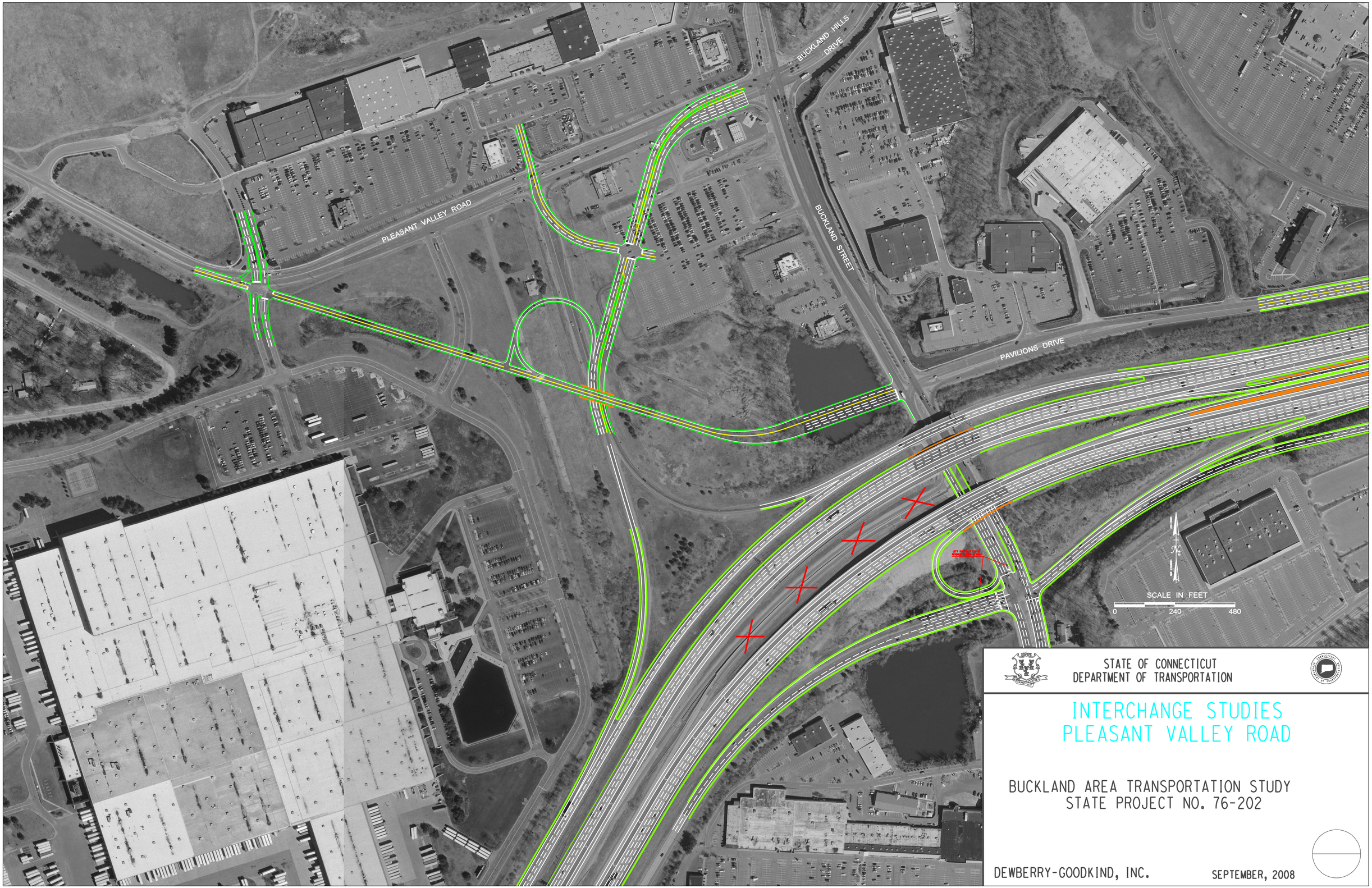


STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
PLEASANT VALLEY ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. SEPTEMBER, 2008



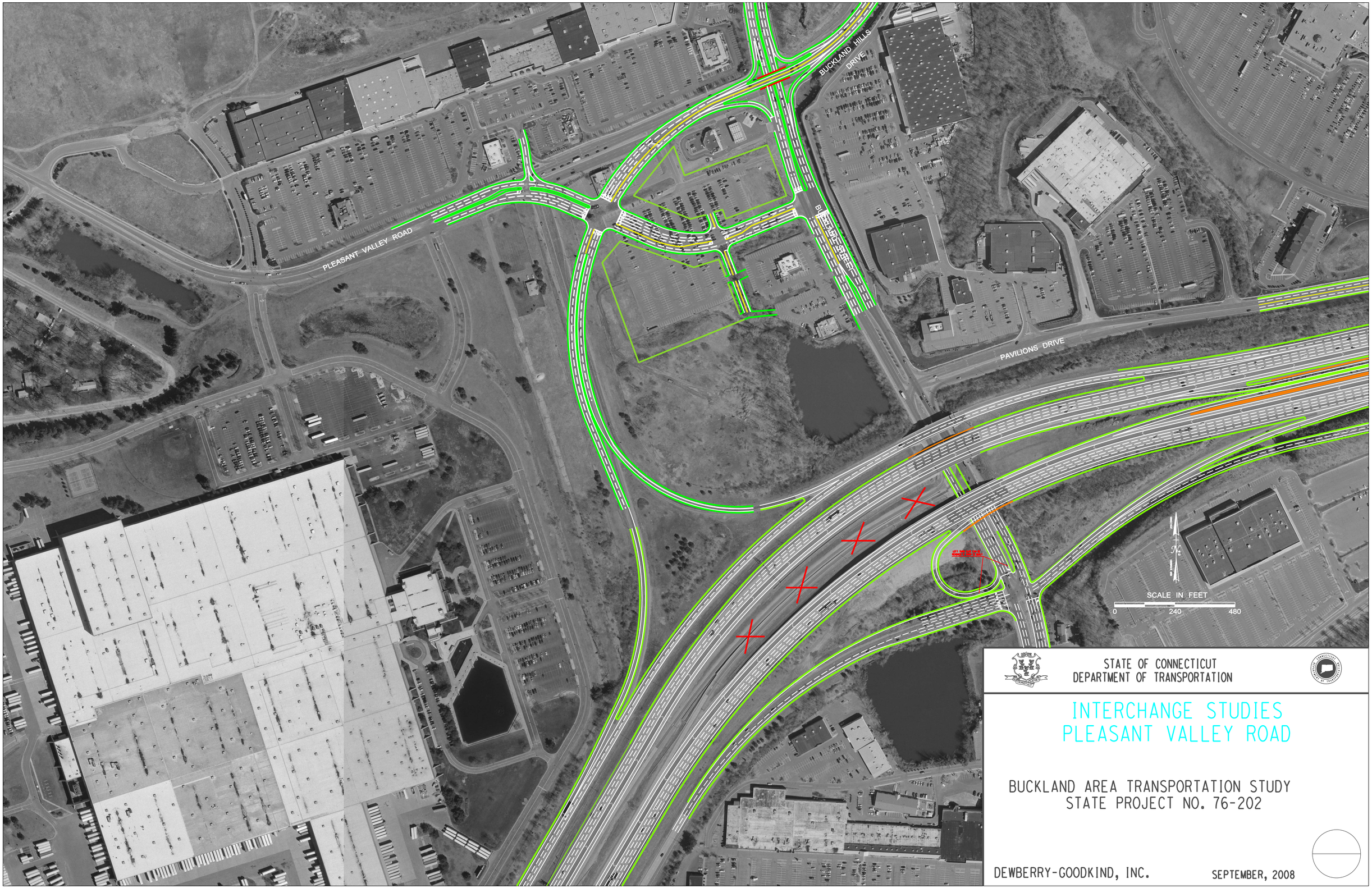
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
PLEASANT VALLEY ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC.

SEPTEMBER, 2008



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

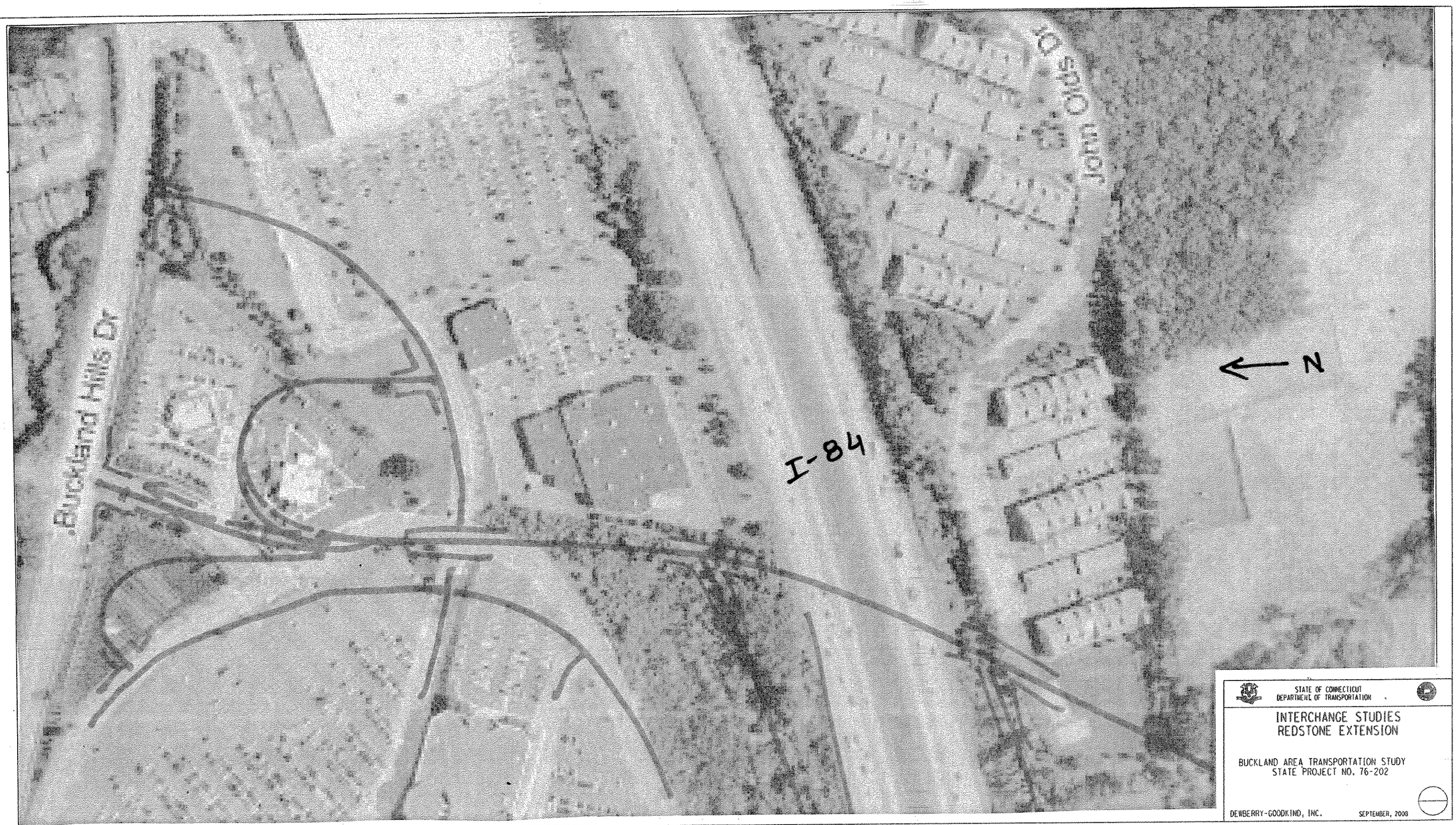
INTERCHANGE STUDIES
PLEASANT VALLEY ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC.

SEPTEMBER, 2008

Appendix F
Redstone Road Extension Studies



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
REDSTONE EXTENSION

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC. SEPTEMBER, 2008

BUCKLAND HILLS DRIVE

MALL RING ROAD

PAVILIONS DRIVE

I-84 WB

I-84 EB

REDSTONE ROAD

SCALE IN FEET

0 250 500

SCALE 1"=500'

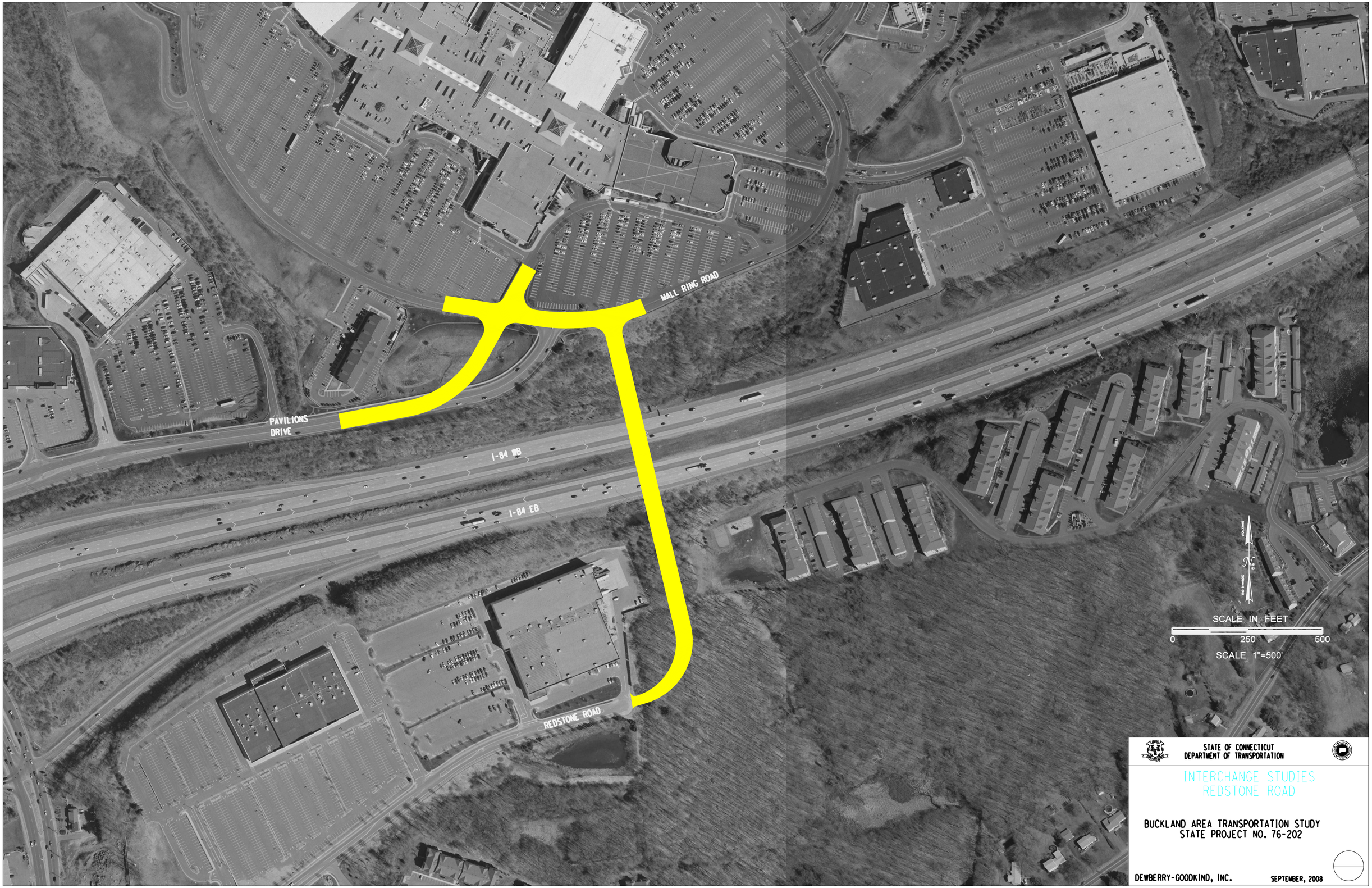
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
REDSTONE ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC.

SEPTEMBER, 2008



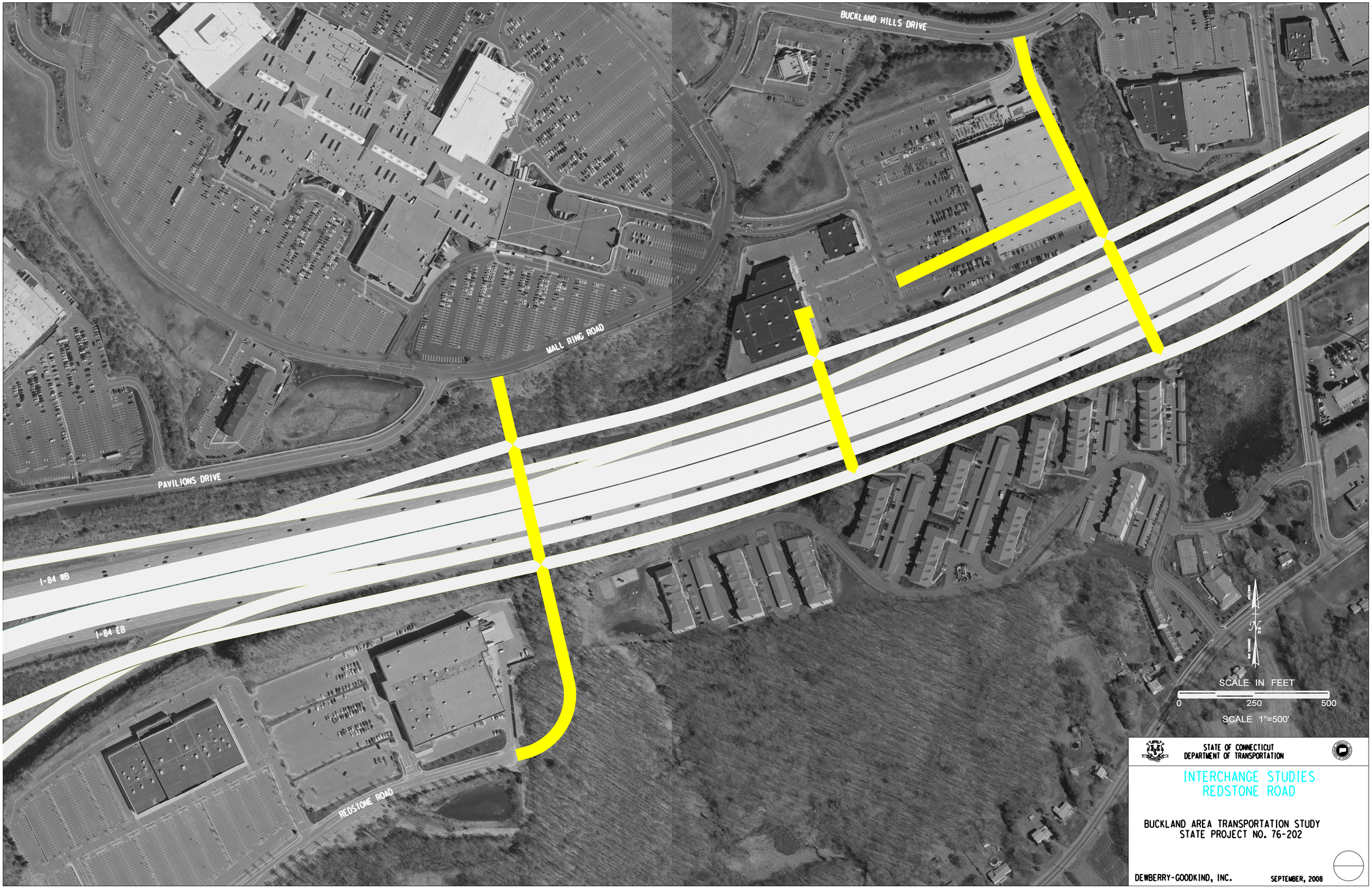
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
REDSTONE ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC.

SEPTEMBER, 2008



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

INTERCHANGE STUDIES
REDSTONE ROAD

BUCKLAND AREA TRANSPORTATION STUDY
STATE PROJECT NO. 76-202

DEWBERRY-GOODKIND, INC.

SEPTEMBER, 2008

Appendix G
Preliminary Alternatives Evaluation Matrix

Buckland Transportation Study
Alternatives Screening Matrix[1]

Corridor/Area	Corridor Goals	BUILD ALTERNATIVES									
		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7[2]	Option 8[2]	Option 9	Option 10
I-291											
	Additional Access to I-291	M	H				H	H	H		
	Safety										
	Interstate Capacity										
	Intermodal										
Tolland Turnpike											
	Reduce Congestion		M				M	M	M		
	Support Local Access	M			H	H		M	M		
	Safety						M				
	Intermodal							H	H		
Buckland Street											
	Reduce Congestion		H				H	H	H	H	
	Optimize Access to Developments		H				H	M	H		
	Safety							M	M		
	Intermodal							H		M	
Pleasant Valley Road											
	Reduce Congestion						M	M	M		
	Improve Circulation to Adjacent and Planned Development					M	M			M	
	Safety						M				
	Intermodal							H	H	M	
Route 30											
	Reduce Congestion						M	M	M		
	Safety						M	M	M		
	Minimizes Impacts to Neighborhood						M	M	M		
I-84 Corridor											
	Capacity										M
	Land Access Support	M	H			M	H	H	H		
	Safety		H	H	H	H	H	H	H		M
	Through Traffic							H	H	M	M

KEY

SCREENING CRITERIA

H	High Positive Impact, Greatly Supports Goals of Area
M	Medium Positive Impact, Moderately Supports Goals of Area

CONGESTION REDUCTION CRITERIA

	Percent Reduction		Volume Reduction
H	50 - 100	or	>500
M	16 - 50		N/A

1 - Evaluation Based on Comparison of ConnDOT 2030 PM Peak Hour traffic volumes with No-Build volumes.
2 - Proposed Transportation Center with connection to Red Stone Road extension south of I-84. Assumed travel benefits to Buckland St, Pleasant Vallet Rd, Tolland Tnpk, and I-84.

BUCKLAND AREA TRANSPORTATION STUDY
COMPARISON OF 2030 NO BUILD WITH 2030 BUILD ALTERNATIVES CAPACITY ANALYSIS
SIGNALIZED INTERSECTIONS–FRIDAY PM PEAK HOUR

Alternative *Description of Modification*		*8. Buckland Hills Dr at Pleasant Valley Rd/Buckland St*	*9. Pleasant Valley Rd at I-84 Westbound Ramps*	*11. Buckland Street at Pavilions Drive*	*12. Buckland Street at I-84 HOV Lane Ramp*	*13. Buckland St at I-84 EB Ramp*	*14. Buckland St at Red Stone Road*	*15. Tolland Tpk at Buckland Street*
2030 No Build[1]	*Level of Service* *Delay (sec)*	E 61	F 105	B 16	D 49	F 143	C 24	D 55
Build Alternative 1C I-84 HOV Ramps/Buckland St intersection removed, and new ramp provided for I-84 EB traffic to Pleasant Valley Rd. Shifts HOV Ramps traffic and some I-84 EB Ramp traffic to Pleasant Valley Rd ramps. Frontage roads created between exists 62 and 63.	*Changed Volume* *Level of Service* *Delay*	EB Left +330 EB Thru +440 F 88	NB Right +830 F 215[6]	NB Thru -690 B 12	Eliminated	EB Left -540 F 90	No change C 21	No change E 56
Build Alternative 2A[2] Shifts traffic to new "flyover" created over Buckland St from the I-84 EB Ramps to new EB frontage road. New "flyover" created over I-84 to provide access to the Mall from new EB and WB frontage roads.	*Changed Volume* *Level of Service* *Delay*	EB Thru -160 WB Thru -280 E 62	NB Right -160 WB Left -350 E 78	NB Thru -180 NB Right -620 B 12	NB Thru -800 SB Thru -210 C 23	EB Lefts -800 SB Lefts -210 D 54	No change C 21	No change E 56
Build Alternative 2B MOD[2] I-84 WB off Ramps for exits 62 and 63 combined at exit 63. I-84 EB on Ramps for exits 62 and 63 combined at exit 63. Shifts traffic off of Buckland Street SB.	*Changed Volume* *Level of Service* *Delay*	SB Thru -70 WB Left -60 E 63	WB Left +130 F 158	SB Thru -130 B 16	SB Thru -130 D 41	SB Thru -130 F 146	SB Thru -130 C 21	SB Right -130 E 57
Build Alternative 2C MOD[2] Shifts traffic to new "flyover" created over Buckland St from I-84 EB Ramps to new EB frontage road. Ramps from new EB frontage road provided for direct access to Tolland Turnpike.	*Changed Volume* *Level of Service* *Delay*	No change E 60	No change F 106	NB Right -180 C 21	NB Thru -180 D 39	NB Right -110 EB Left -180 EB Right -130 F 123	NB Thru -110 SB Thru -130 C 25	SB Left -130 D 48
Build Alternative 2D MOD[2] Shifts traffic to new "flyover" created over Buckland St from the I-84 EB Ramps to new EB frontage road. New "flyover" created over I-84 to provide access to the Mall from new EB and WB frontage roads. Red Stone Rd extended over I-84 to provide direct access to the mall.	*Changed Volume* *Level of Service* *Delay*	WB Thru -250 NB Right -180 E 61	WB Left -240 EB Right +60 F 92	SB Thru -70 NB Right -970 B 16	NB Thru -1150 SB Thru -160 C 25	NB Thru -480 EB Left -670 D 49	NB Thru -480 SB Thru -160 NB Right +150 C 21	EB Left -330 SB Right -160 D 45

BUCKLAND AREA TRANSPORTATION STUDY (CONT'D)
COMPARISON OF 2030 NO BUILD WITH 2030 BUILD ALTERNATIVES CAPACITY ANALYSIS
SIGNALIZED INTERSECTIONS–FRIDAY PM PEAK HOUR

Alternative *Description of Modification*		*8. Buckland Hills Dr at Pleasant Valley Rd/Buckland St*	*9. Pleasant Valley Rd at I-84 Westbound Ramps*	*11. Buckland Street at Pavilions Drive*	*12. Buckland Street at I-84 HOV Lane Ramp*	*13. Buckland St at I-84 EB Ramp*	*14. Buckland St at Red Stone Road*	*15. Tolland Tpk at Buckland Street*
2030 No Build[1]	*Level of Service* *Delay (sec)*	E 61	F 105	B 16	D 49	F 143	C 24	D 55
Build Alternative 3A[3] Same as 1C without new EB and WB frontage roads.	*Changed Volume* *Level of Service* *Delay*	EB Thru +440 EB Left +330 F 88	NB Right +830 WB Left +150 F 215[6]	NB Thru -690 NB Right -140 B 12	Eliminated	EB Left -540 F 90	No change C 21	No change E 56
Build Alternative 3B[3] Shifts traffic to new "flyover" created over Buckland St from the I-84 EB Ramps to new EB frontage road to provide access to the Mall. Red Stone Rd extended to provide direct access to the mall. I-84 HOV Ramps/Buckland St intersection removed and replaced with I-84 HOV Ramps intersection at new Mall Service Rd.	*Changed Volume* *Level of Service* *Delay*	NB Right -280 WB Thru -250 EB Thru -160 D 47	NB Right -250 WB Left -240 F 88	WB Left -340 NB Right -1110 NB Thru -380 B 11	Eliminated	EB Left -670 NB Thru -530 SB Thru -310 D 40	NB Thru -530 SB Thru -310 WB Left +150 NB Right +200 C 33	EB Left -330 SB Right -160 D 46
Build Alternative 4ABC[4] Shifts traffic to new "flyover" created over Buckland St from the I-84 EB Ramps to new EB frontage road to provide direct access to Tolland Turnpike. New connector road from Chapel Rd to Pleasant Valley Rd created.	*Changed Volume* *Level of Service* *Delay*	EB Left -100 SB Right -190 D 55	WB Left -170 EB Thru -90 E 76	NB Right -180 NB Thru -90 B 19	NB Thru -270 SB Thru -70 C 33	EB Left -180 EB Right -130 NB Right -90 F 116	SB Thru -200 NB Thru -200 C 23	EB Left -140 SB Left -130 D 45

NOTES:

1. No Build operations have been optimized.
2. Alternative 2 volumes at these intersections are the same as No Build.
3. Alternative 3B MOD volumes are very similar to Concept 3B for these intersections.
4. Alternative 4ABCD volumes are very similar to Concept 4ABC .
5. Intersection operations based upon coordinated system operations within a corridor; not the individual intersection.
6. Installation of an additional NB right turning lane will allow intersection of operate similar to No Build condition.

LEGEND

Color	Description
	Intersection LOS/Delay is Generally Maintained
	Intersection LOS/Delay Improves
	Intersection LOS/Delay Degrades to F
	Intersection Delay Improves, but still LOS F
	Intersection is eliminated from analysis alternative

Appendix H
Technical Work Group and AC Meeting Minutes

Report of Meeting

BUCKLAND AREA TRANSPORTATION STUDY
Advisory Committee Meeting #1

Date: January 18, 2007
6:00 PM

Subjects: Buckland Area Transportation Study
Advisory Committee Meeting #1

Location: Lincoln Center Hearing Room
Manchester, Connecticut

Advisory Committee Members and Public who signed in:

Tom Maziarz	CRCOG	860-522-2217
Chet Camarata	CTDECP	860-270-8140
Robert W. Turner	FHWA	860-659-6703 ext 3011
Philip Fry	CTTRANSIT	860-522-8101 ext 222
Charlie Carson	CTTRANSIT	860-522-8101 ext 216
Jason Newman	FHWA	860-659-6703
Josh Howroyd	Town of Manchester	860-647-3130
Aileen Seypura	Town of Manchester	860-432-1774
Billy Taylor	Town of East Hartford	860-291-7365
Mark Carlino	Town of Manchester	860-647-3067
Bob Hammersley	Transportation Strategy Board	860-418-6595
Sue O'Connor	Greater Manchester Chamber of Commerce	860-646-2223
Dave Fox	CTDEP	860-424-4111
Mark Pellegrini	Town of Manchester Planning Department	860-647-3043
Marcia Banach	Town of South Windsor	860-644-2511 ext 253
Jeff Doolittle	Town of South Windsor	860-644-2511 ext 245
Rick Lourie	Resident – Town of Manchester	860-645-6018
Matt Streeter	Town of South Windsor	860-644-6323
Jim Mayer	Town of Manchester	860-647-3151
Chris Smith	Shipman & Goodwin	
Hon. Gary D. LeBeau	3rd Senate District	860-528-5818
Hon. Marianne Handley	State Senator	
Nancy Murray	Shoppes at Buckland Hills	
Jill Barrett	Fitzgerald & Halliday, Inc.	860-247-7200

Connecticut Department of Transportation Staff:

Carmine Trotta	ConnDOT	860-594-2134
Jim Andrini	ConnDOT	860-594-2148
Jeff Hunter	ConnDOT	860-594-2139
Jim Morrin	ConnDOT	860-594-2197
Adam LeBlanc	ConnDOT	860-594-2598

Consultant Team:

George Jacobs	Dewberry	203-776-2277
Mark Witek	Dewberry	203-776-2277
Jim Ford	Earth Tech	860-657-1200
Paul Stanton	Fitzgerald & Halliday	860-247-7200
Leslie Black	Fitzgerald & Halliday	860-247-7200

Report of Meeting

Welcome and Opening Comments:

Ms. Leslie Black welcomed everyone to the first Buckland Area Transportation Study Advisory Committee (AC) meeting and introduced elected officials, the study team, and AC members in attendance. She acknowledged that the meeting was the first of seven AC meetings planned for the study and then briefly discussed the ground rules for the meeting. She emphasized that it is a business meeting of the AC and will follow an established agenda and timeframe; however it is open to the public, with the public being afforded the opportunity to comment upon completion of the agenda.

Ms. Black then introduced Tom Maziarz of the Capitol Region Council of Governments (CRCOG), who provided a brief background of the process and events leading up to the study, including funding. Mr. Maziarz touched on some of the transportation issues facing the area and stressed that the study is not just a highway improvement initiative but rather a comprehensive assessment of the transportation system in the Buckland Area. The assessment will include a look at freeway, arterial, transit, pedestrian and bicycle elements and their ability to meet existing and future travel demand. An important part of the study will be consideration of land use and future plans of development.

Formal Presentation:

A formal MS PowerPoint presentation followed Mr. Maziarz's introductory comments. Mr. George Jacobs of Dewberry, the consultant team Project Manager, was the first to speak. Mr. Jacobs' presentation essentially covered the study goals and objectives, scope, schedule, the mission of the AC, and provided a brief synopsis of stakeholder coordination and input to date. Mr. Jacobs discussed the tasks that had been completed since study initiation, including an extensive data collection effort and the analysis of existing and future (No Build) conditions. He explained that the results of the analysis are documented in a draft Technical Memorandum #1, which was distributed to all AC members prior to the meeting. He turned the presentation over to Mr. Jim Ford of Earth Tech who gave a more detailed summary of the traffic analysis and results contained in the draft Technical Memorandum #1.

Mr. Ford discussed the types of transportation data that were collected for the study area including roadway and intersection volumes, geometric and traffic control data, vehicle travel speeds, transit service data, and bicycle/pedestrian facilities among other information. He then explained how the traffic analyses were performed for both the existing and future (No-Build) conditions. Mr. Ford then concluded by summarizing the results of the analyses in three succinct statements as follows:

- There will be an estimated 25% increase in traffic volume by the year 2030
- Traffic operations are anticipated to deteriorate due to traffic volume increases
- Intersection and signal improvements alone will not be enough to fix the problem

Mr. Ford then turned the presentation over to Mr. Paul Stanton of Fitzgerald & Halliday, Inc. for a discussion on environmental resources within the study area. Mr. Stanton explained the types and sources of environmental data that were collected for the study area in order to establish baseline mapping. Mr. Stanton highlighted some of the more notable natural, cultural, and community resources in the study area and stated that the purpose of the baseline environmental mapping is for it to be used as a planning tool throughout the study process to help guide the development of transportation improvement alternatives. He stated that once transportation alternatives are developed, potential impacts to environmental resource will be assessed. Mr. Stanton then turned the presentation back over to Mr. Jacobs for concluding remarks.

Mr. Jacobs highlighted some of the key issues uncovered in the analyses and emphasized the next steps in the study process. In his closing remarks Mr. Jacobs prompted those in attendance to think about what is needed to resolve some of the transportation problems facing the study area. Upon completion of the formal presentation, an open discussion ensued.

Report of Meeting

Open Discussion:

The following topics/issues were raised and briefly discussed at the meeting:

- Future AC meeting times – overall preference was for the evening.
- Existing versus Future (No Build) condition was further explained: A future no-build scenario would exist if no changes other than normal maintenance, or projects already programmed occurred in the transportation area other than planned maintenance. As part of the analysis, traffic conditions would consider any planned future development currently identified.
- Are failed future intersections of similar type (i.e., are they just left turn problems?). It was explained that 25% projected increase in traffic is a high number and simply more than some intersections can handle.
- The intersection of Avery Street and Route 30 is not really covered extensively in the draft Technical Memorandum #1. Attention is needed at this location as well as at Oakland Road and Deming Street.
- Use arrows above roadway to designate travel lanes.
- Website survey link was highlighted: www.bucklandstudy.org .
- Incentives by employers to encourage employees to ride bikes to work should be considered.
- Make better use of the existing railroad tracks that connect Hartford to Manchester. Once had a historic use for commuters, can this be re-instituted? Present poor condition and an existing speed restriction of 10 mph. There could even be stops in East Hartford if this corridor were improved. Is the rail corridor part of the Manchester to Hartford Busway proposal?
- Use of smaller buses – more agile and will be effectively utilized as opposed the larger buses that only have a few passengers.
- New ramp at Tolland Turnpike to get to mall and theaters.
- Public safety is an issue at Christmas time and heavy travel times. How does rescue equipment get to a location if the routes are all clogged?
- Will Technical Memorandum #1 be uploaded to the website? Answer – Yes – it is a draft now but will be uploaded when finalized.
- Will the AC team be involved in alternatives development? Answer – Yes it will be a collaborative process.
- Increased population/visitors created the problem. How did it become so big? Piecemeal land use reviews and development?
- Form a pedestrian and bicycle advisory committee between the study area towns. Include bike racks on buses and add bike lanes throughout the study area.
- There is a gap in the existing bikeway system near J.C. Penney and Chapel Road.
- Expansion of the Silver Lane interchanges.

Meeting participants were encouraged to submit feedback to the study team by phone, mail, or email. The website www.bucklandstudy.org will provide updates of study documents and future meeting dates. There will be six additional Advisory Committee meetings and three public meetings with ample opportunity to get information and provide comments about issues in the study area as well as potential solutions. People were encouraged to complete the "Survey" found on the website to provide specific feedback for analysis.

Meeting adjourned at 7:40 PM

Prepared by: *Paul Stanton*
Paul Stanton

Approved by: James Andrini
James Andrini

Report of Meeting

BUCKLAND AREA TRANSPORTATION STUDY
Advisory Committee Meeting #3

Date: November 15, 2007
6:00 PM

Subjects: Buckland Area Transportation Study
Advisory Committee Meeting #3

Location: South Windsor Public Library Friends Room
South Windsor, Connecticut

Advisory Committee Members and Public who signed in:

Philip Fry	CTTRANSIT	860-522-8101
Jason Newman	FHWA	860-659-6703
Billy Taylor	Town of East Hartford	860-291-7365
Mark Carlino	Town of Manchester	860-647-3067
Sue O'Connor	Greater Manchester Chamber of Commerce	860-646-2223
David Fox	CTDEP	860-424-4111
Mark Pellegrini	Town of Manchester Planning Department	860-647-3043
Marcia Banach	Town of South Windsor	860-644-2511
Jim Mayer	Town of Manchester	860-647-3151
Beth Caron	Shipman & Goodwin	860-251-5636
Hon. Gary D. LeBeau	3rd Senate District	860-528-5818
Bill Aman	South Windsor Representative	860-528-3564
Nancy Murray	Shoppes at Buckland Hills	860-644-6369
Cate Evans	S. Windsor Chamber of Commerce	860-644-9442
Scott Shanley	Town of Manchester	860-647-3123
Joan Shapiro	Resident	860-644-2311
Annamae Davis	Resident, S. Windsor	860-644-8868
Bill Davis	Resident, S. Windsor	860-644-8868
James Macdonald	Resident, S. Windsor	860-644-0013
Roselle Macdonald	Resident, S. Windsor	860-644-0013
Ginny Hale	Resident, Bike Path Committee	860-289-1427

Connecticut Department of Transportation Staff:

James Morrin	ConnDOT	860-594-2197
Edgar Hurle	ConnDOT	860-594-2005
Kate Driscoll	ConnDOT	860-594-2146
Mike Connors	ConnDOT	860-594-2137
Grayson Wright	ConnDOT	860-594-2154

Consultant Team:

George Jacobs	Dewberry	203-776-2277
Peter Schirmer	Dewberry	203-776-2277
Jim Ford	Earth Tech	860-657-1200
Paul Stanton	Fitzgerald & Halliday	860-247-7200
Leslie Black	Fitzgerald & Halliday	860-247-7200

Report of Meeting

Welcome and Opening Comments:

Ms. Leslie Black welcomed everyone to the third Buckland Area Transportation Study Advisory Committee (AC) meeting and introduced elected officials, the study team, and AC members in attendance. She reviewed the agenda for the meeting and emphasized that it is a business meeting of the AC and would follow an established agenda and timeframe; however it is open to the public, with the public being afforded the opportunity to comment upon completion of the agenda.

Ms. Black then introduced Mr. James Morrin with the Connecticut Department of Transportation, who provided a brief update regarding the current status of the study and the meetings held to date looking at the transportation issues facing the area. He stressed that the study is not just a highway improvement initiative but rather a comprehensive assessment of the transportation system in the Buckland Area including highway, roadway, transit, pedestrian and bicycle elements and their ability to meet existing and future travel demand. An important part of the study will be consideration of land use and future plans of development, and a land use workshop has been conducted to explore best practices in other parts of the country.

A PowerPoint presentation was made by Mr. George Jacobs of Dewberry, followed by a question and answer session. The PowerPoint presentation is available for viewing on the study website, www.bucklandstudy.org. The following is a summary of comments and questions raised by meeting attendees. Responses are in italics.

Question/Answer Period:

What is a frontage road? ***Mr. Jacobs responded that a frontage road is a service road that parallels the highway and collects people off the highway (I-84) and distributes them to their destination, the Buckland area.***

Concern was expressed about the new access road alternative (Redstone Road bridge over I-84) that leads directly to the Shoppes at Buckland Hills parking lot. This is shown under several alternatives and there is a concern about the traffic impact on the ring road etc. ***Mr. Jacobs responded that different configurations could be explored that would not impact the Shoppes at Buckland Hills parking lot traffic negatively. The Redstone Road connection provides the greatest traffic benefit for the cost in terms of pulling traffic away from Buckland Road to a more direct destination.***

Would the transit loop that is shown with one alternative being considered for more than just that one alternative? ***Mr. Jacobs stated that yes, the transit loop would be a potential component of any alternative that is taken forward for further study. The final option will be a combination of meaningful options including highway, intersection, local roadway, bike/pedestrian, and transit options.***

What about the I-291 ramp connection that was once proposed at the East Hartford/Manchester/South Windsor Town Line and that is partially designed? ***Mr. Jacobs commented that ConnDOT is looking into pulling those files from many years ago when I-291 was built and will be considering this potential design in conjunction with the alternatives shown tonight.***

Have any transit ridership numbers been projected for the circulator component depicted in several of the alternatives? This would be especially useful data for Alternative 9 since it would be good to know just exactly how many vehicles would actually divert to the transit center and ultimately use the circulator - otherwise the traffic just gets dumped right onto Pleasant Valley Road, ultimately compromising the Buckland Road/Pleasant Valley Road intersection even more. ***No numbers have been modeled as yet. Mr. Jacobs discussed that future ridership would be calculated based on a variety of factors including employment and travel destination data. (This was a question posed by Senator LeBeau).***

Report of Meeting

Is the Evergreen Walk future full build-out traffic being considered in our planning work? ***– Mr. Connors from ConnDOT explained that the State model includes all development permitted by STC - and Evergreen Full Build-Out traffic is included.***

What about Exit 63 improvements? What is planned there? ***Mr. Jacobs responded that ConnDOT has a project in design currently that will widen existing eastbound ramps and the adjacent intersection with Rte 30. Additionally, the ConnDOT project will propose a new operational lane (one lane highway widening) eastbound from exit 63 to exit 64. The BTS project will propose improvements such as near term operational lanes from exit 62 to exit 63 or long term frontage roads between exit 62 and exit 63 that will interface with the DOT's planned improvements.***

Concern was expressed about the date of aerials and the fact that two of the alternatives that involve a new interchange with Tolland Turnpike actually intersect a large area of brand new condominiums which are not shown on the aerials being used and he asked that the Advisory Committee consider voting down these alternatives as they are not credible and really should not be part of public info meeting. ***Mr. Jacobs responded that new aerials are being prepared and that the study team is aware of the condominium structures. The alternative was feasible from an engineering standpoint, but not optimal considering the proximity of the residential condominium structures.***

What about a local road option that is located behind (west of) Evergreen Walk as a connector to I-291? ***Mr. Jacobs responded that option is part of Local Road alternatives and will be presented, analyzed and discussed at a subsequent Advisory Committee meeting.***

What about the possibility of resurrecting the old rail spur from Hartford as cost of gas is increasing and other modes of transportation must be considered? ***Mr. Morrin from ConnDOT responded about the BRT study that was done (Hartford to Manchester) and the cost of improving the rail etc is cost prohibitive.***

What are the next steps? ***Comments on highway system alternatives will be forwarded to the study team by Dec. 2007. A public information meeting will be held on November 29th at 6 p.m. at Manchester Community College Culinary Arts Center Room (Lowe Building). The Advisory Committee will conduct a screening of highway alternatives in December. Advisory Committee Meeting #4, a review of local road and bike/pedestrian options will be conducted in February 2008.***

When will these improvements take place? ***Mr. Hurle from ConnDOT explained the planning process and funding involved and stated that completion of improvements will not occur for many years down the road as many steps need to take place. We are at the beginning planning stages.***

A member of the public stated that Slater Road cannot become a through road as it is too dangerous and requested that Slater Road not be reopened. ***Mr. Jacobs responded that all public comments will be taken into consideration as the study process moves forward.***

Mr. Jacobs concluded the meeting with the Advisory Committee in a discussion of future meeting dates and locations.

Meeting adjourned at 8:05 PM.

Prepared by: *Leslie Black*
Leslie Black

Approved by: *James Morrin*
James Morrin

Report of Meeting

BUCKLAND AREA TRANSPORTATION STUDY
Planning Workshop #1

Date: March 7, 2007
8:30 AM – 12:00 PM

Subjects: Buckland Area Transportation Study
Planning Workshop #1

Location: ConnDOT, Room G328, 2800 Berlin Turnpike
Newington, Connecticut

Advisory Committee Members and Public who signed in:

Tom Maziarz	CRCOG	860-522-2217
Chet Camarata	CTDECD	860-270-8140
Jason Newman	FHWA	860-659-6703 ext 3022
Philip Fry	CTTRANSIT	860-522-8101 ext 222
Charlie Carson	CTTRANSIT	860-522-8101 ext 216
Mark Carlino	Town of Manchester	860-647-3067
Bob Hammersley	Transportation Strategy Board	860-418-6292
Sue O'Connor	Greater Manchester Chamber of Commerce	860-646-2223
Mark Pellegrini	Town of Manchester Planning Department	860-647-3043
Jim Mayer	Town of Manchester	860-647-3151
Howard Beeler	Manchester Police Department	860-643-3325
Steve Mitchell	F.A. Hesketh & Associates	860-653-8000

Connecticut Department of Transportation Staff:

Carmine Trotta	ConnDOT	860-594-2134
Jim Andrini	ConnDOT	860-594-2148
Jeff Hunter	ConnDOT	860-594-2139
Jim Morrin	ConnDOT	860-594-2197
Adam LeBlanc	ConnDOT	860-594-2598
Leonard Lapsis	ConnDOT	860-594-2143
Richard Gray	ConnDOT	860-594-2841
Gary Sojka	ConnDOT	860-594-2025
Mike Connors	ConnDOT	860-594-2037
Jennifer Babowicz	ConnDOT	860-594-2778
Daniel Gladowski	ConnDOT	860-594-3280
David Balzer	ConnDOT	860-594-2031

Consultant Team:

George Jacobs	Dewberry	203-776-2277
Mark Witek	Dewberry	203-776-2277
Jeff Maxtutis	Earth Tech	860-657-1200
Paul Stanton	Fitzgerald & Halliday	860-247-7200
Leslie Black	Fitzgerald & Halliday	860-247-7200

Report of Meeting

Welcome and Opening Comments:

Mr. George Jacobs of Dewberry, the consultant team Project Manager, welcomed the group to the first planning workshop for the Buckland Area Transportation Study and outlined the agenda for the meeting that included a brief PowerPoint presentation followed by break-out sessions to brainstorm and identify potential study alternatives in four different areas: highways, local roadways/intersections, bicycle/pedestrian services, and transit services. A PowerPoint presentation covered the study goals and objectives, scope, and schedule. Mr. Jacobs discussed the tasks that had been completed since study initiation, including an extensive data collection effort and the analysis of existing and future (No Build) conditions. He explained that the results of the analysis are documented in a draft Technical Memorandum #1, which has been distributed to all Advisory Committee and Technical Working Group members prior to the meeting. Mr. Jacobs summarized the results of the analysis in three succinct statements as follows:

- There will be an estimated 25% increase in traffic volume by the year 2030
- Traffic operations are anticipated to deteriorate due to traffic volume increases
- Intersection and signal improvements alone will not be enough to fix the problem

The participants then proceeded to the break-out sessions. The following alternatives summarize comments obtained as the participants regrouped for discussion:

Highways Alternatives:

- Add operational lane between Exit 63 and Exit 62.
- Extend existing HOV lanes to include a bridge over Buckland Street and add flyover ramp that will connect to an extended Pavilions Drive with a Transit Center as destination southeast of the mall. Extended Pavilions Drive would ultimately connect to Buckland Hills Drive.
- Additional access off I-291 in East Hartford – half interchange at Burnham Street where the right-of-way is reserved.
- Extend new frontage roads parallel to I-84 in the EB and WB directions east of exit 62 to just west of exit 63. Modify entrance and exit ramps at exit 62 and 63 to take advantage of the off-mainline weaving areas along a reduced speed roadway.
- Extend a new ramp off of existing EB frontage road (just east of I-291 I/C) that will fly over I-84 and connect with Pleasant Valley Road.
- The wetlands on the south side of I-84 (in the vicinity of Slater Road) and residential areas (namely Waterford Commons) may make the frontage road alternative (discussed in the fifth bullet above) not feasible (M. Carlino)
- T. Maziarz asked if another point of access down to Slater Road has been looked at by Manchester – M. Carlino and M. Pellegrini replied no - and added that the area is very narrow bounded by wetlands and an existing overpass structure.
- There was some mention by Mr. Mitchell of Hesketh of a new off ramp from I-291 that would connect to a roadway that would fit between Burnham Road neighborhood and JC Penney that would ultimately connect to Pleasant Valley Road.

Local Roadways/Intersections Alternatives:

- J. Maxtutis from Earth Tech commented that alternatives for roadways/intersections should be directed towards the goal of dispersing traffic and improving circulation in the area.
- Have a different entry to Evergreen Walk on the west side of the mall. Extend a roadway from Pleasant Valley Road that would go to the north along the western side of the Plaza at Buckland Hills – cross Smith Street and a wetland area north of Smith Street. This road could provide access to Evergreen Walk from the west as well as to other businesses in that area. The roadway could terminate at Deming or Route 30.
- Widen Adams Street to the south from two lanes to four lanes.

- Add new connection between Best Buy and Walmart and onto Pavilion Drive.
- Eliminate access to Circuit City from Slater Road – Many people try to shoot across Slater Road to access Circuit City plaza from Best Buy Plaza. Accidents have occurred.
- Slater Road/Buckland Hill Drive Intersection was noted by City of Manchester as having a high amount of accidents so redirecting traffic away from this intersection may be helpful.
- Add new access to the Mall that will form a T-intersection with the La-Z-Boy driveway. Eliminate existing Mall access that is located slightly west of the Water Tower and La-Z-Boy on Buckland Hills Drive. (Detailed graphic plan provided by City of Manchester)
- Avery Street is recognized as a problem area and needs further analysis.
- Create a ring road with a public connection around J.C. Penney's eastern side – this will connect Tolland Turnpike with Pleasant Valley Road.
- Create a triple left at eastbound off-ramp from I-84 onto Buckland Street.
- Create grade separation between Pleasant Valley Road and Buckland Street.
- Create commuter lot connection to westbound on-ramp.
- Add double-left turn at Route 30.
- Create new connection with I-291 access.
- Diverging diamond concept for Buckland Street between Pleasant Valley Road and I-84 off-ramp at Exit 62 (detailed graphic plan provided by City of Manchester)
- Signage is a major issue and must be addressed.
- Buckland Hills Drive access management issue with signage, driveways, and sight lines must be addressed.
- Parallel route to Buckland Street that connects the Plaza at Buckland Hills with Evergreen Walk over Smith Street, over wetlands, and into west side of Evergreen Walk with potential continuation over Route 30 and tie to Sullivan Avenue.
- Sgt. Beeler of the Manchester Police Department noted that emergency services require access and that restricted entry lanes and signal overrides would be beneficial.

Bicycle/Pedestrian Alternatives:

- The area has several established bike paths (e.g. Buckland Street)
- The Charter Oak Greenway must be considered in the analysis even though much of it is located to the southeast and beyond the limits of the study area.
- New State Road with 100 feet of right-of-way could be a pathway to Route 6 and Route 44, which have a plan underway for bike/pedestrian access to the Charter Oak Greenway. This will improve connectivity between mall area and Charter Oak Greenway.
- The study needs a better inventory of sidewalks.
- The "Walkability Study" by Dan Burden, Bicycle/Pedestrian advocate, should be included in the analysis. The contact for further information is Sandy Fry with CRCOG.
- Pedestrian traffic around the mall consists predominantly of transit users or local residents walking between shopping destinations. The focus of sidewalk development should be analyzed with its users in mind.
- Close sidewalk gaps.
- Add lighting particularly to intersections for better pedestrian visibility.
- Create center islands in large intersections as refuge for pedestrians.
- Make connections between existing and new developments with pathways.
- Include "Closed Loop Study" from Manchester in analysis – nineteen intersections will have pedestrian phasing added in the summer of 2007. It was noted that pedestrian phasing cycles do add to vehicular traffic issues as they lengthen the traffic light cycle.
- Part of the "Walkability Study" identifies that pedestrian traffic prefers to be near buildings versus traffic. Design standards should be investigated that put buildings closer to streets and increase comfort level of pedestrians.

Transit Alternatives:

Report of Meeting

- There is a need for shuttle service in the region between retail facilities.
- More frequent transit service on current route should be considered.
- Incentives for transit use should be investigated (e.g. subsidies for mall employees)
- Transit amenities should be increased (e.g. Transit Center, bus shelters, safe locations for pull-overs)
- Plaza at Buckland Hills is not served well by transit at this point in time.
- Look at I-384 Exit 1 access to HOV lanes into Hartford.
- Bus Rapid Transit Plan
- If the existing commuter lot along Buckland Road is considered as a Transit Center, the in and out traffic movements must be analyzed. Concern raised over bringing more traffic to this lot as the surrounding intersections are at LOS F and already built out.
- Shuttle buses for retail and residents from a Transit Center. Buses would circulate between retail locations and major condo and elderly housing complexes
- Move the Park n' Ride lot to S. Windsor away from the traffic congestion
- Peak holiday traffic could be diverted to the Rentschler site with complimentary VIP shuttle service operating between Rentschler and the retail Buckland area at no charge.
- Buses will soon have bike racks, improving the bicycle/transit connection
- Preferential treatment for transit and rideshare commuters should be investigated.
- Consider putting a Transit Center up by the mall with extension of Pavilions Road and combine with circulator to shopping and perimeter circulator for residential riders
- Look at ability and willingness of private entities that benefit from increased ridership to assist with funding of transit shuttle service
- Three municipalities could facilitate additional sales/property tax to capture revenue from the area benefiting from the service to offset cost of service – this could be achieved through the creation of a special tax district.
- Mention was made to the fact that there is no westbound HOV land in the area.

Next Steps:

- The alternatives identification process will be summarized and reviewed by the technical working group to add any further ideas for consideration.
- The stratification of alternatives for the four disciplines (highway, local roadway, transit, bicycle/pedestrian elements) will create a menu of selections.
- Cohesive plans with four to five approaches will be then drawn up including traffic benefit analysis, environmental impact assessment, and engineering feasibility with the understanding that recommended actions are a multi-tiered program that will tap into multi-modal funding sources.
- These plans will be presented to the Advisory Committee for review and analysis.
- The next planning workshop will have CAD drawings that participants will further analyze and modify.
- Meeting participants were encouraged to submit additional comments to the study team by phone, mail, or email. The website www.bucklandstudy.org will provide updates of study documents and future meeting dates.
- There will be seven additional planning workshops, six further Advisory Committee meetings, and three public meetings with ample opportunity to get information and provide comments about issues in the study area as well as potential solutions.

The planning workshop adjourned at 11:50 AM

Prepared by: Leslie Black
Leslie Black

Approved by: James Andrini
James Andrini

Pedestrian Station

Group 1

Attendees:
Adam LeBlanc (ConnDOT)
Tom Maziarz (CRCOG)
Steve Mitchell (F.A. Hesketh Associates)
Jason Newman (FHWA)

Comments:
1. Inventory of facilities
2. Walkability Report – Make reference to which town.
   George to ask Sandy Fry CRGOG for copy. (528-2217)
3. Consult Evergreen concept for pedestrian ideas & incorporate at Buckland
4. Bike Lockers / Bike Parking at mall

Group 2

Attendees:
Gary Sojka (ConnDOT Planning)
Sue O'Connor (President, Greater Manchester Chamber of Commerce)
Mark Pellegrini (Town of Manchester / Planning Department)
Leonard Lapsis (ConnDOT Intermodal Planning)

Comments:
1. Issues – Mobility is difficult but safety is most urgent, eliminate safety hazards
2. Consider center island at difficult congested large intersection for refuse
3. Sidewalk to be continuous and complete
4. Consider shuttle service to get pedestrians to/from various complexes
5. Lighting to be evaluated to be sure it meets pedestrian/bike design standards, it was recognized that much of what exists is related to highway function not pedestrian/bike
6. Complete inventory
7. Slater Street near Best Buy / Circuit City (problem area)

Group 3

Attendees:
George Jacobs (Dewberry)
Kate Discoll (ConnDOT Intermodal Planning)
Mike Connors (ConnDOT Planning)
Chet Camarata (CTDECP)
Jim Morrin (ConnDOT Intermodal Planning)
Carmine Trotta (ConnDOT Planning)

Comments:
1. Bike access reasonably good today
2. Area developed piece meal with no continuity
3. Highlight walks and path in Microstation file.
4. 3 – 4% begins to be a issue of comfort & safety

Group 4

Attendees:
Jennifer Babowicz (ConnDOT Traffic)
Jim Andrini (ConnDOT Location Planning)
Jeff Hunter (ConnDOT Intermodal Planning)
Mark Carlino (Town of Manchester / Public Works & Engineering)
Robert Hamersley (Transportation Strategy Board)

Comments:
1. Safety especially for pedestrians
2. Closed loop study will treat 19 intersections
3. Good bike access along Tolland Turnpike and Chapel Road
4. Gap in sidewalk Tolland Turnpike East
5. No sidewalks in certain locations
6. Buckland Street has sidewalks and bike paths
7. Walmart

Comments on plans:
1. 200' gap in sidewalks along Buckland Street at I-84 on Ramp
2. Need better pedestrian access to Walmart
3. Need sidewalks for apartments
4. DOT Proj. 76-199 – review project scope and assess impact to bike/pedestrian.
5. Improve bike access on Tolland Turnpike or use route along new state street to Route 44
6. Pavement markings for bike lane at Center Street / Route 44 intersection
7. Need sidewalk along Tolland Turnpike & new state street
8. Need bike connection along new state street

Highway Station

Group 1

Attendees:
Jim Andrini (ConnDOT Location Planning)
Mark Carlino (Town of Manchester / Public Works & Engineering)
Charlie Carson (CTTransit)
Robert Hamersley (Transportation Strategy Board)
Jen Babowicz (ConnDOT Traffic)
Jeff Hunter (ConnDOT Intermodal Planning)

Comments on plan:
Third signal to the mall
Connection to 291
Fly over with a connector to Buckland Hills Drive
One way Frontage Road to Route 30 with connection to Tolland Turnpike.
Diverging Diamond for Buckland Street

Group 2

Attendees:
Adam LeBlanc (ConnDOT)
Jim Andrini (ConnDOT Location Planning)
Jason Newman (FHWA)
Paul Stanton (Fitzgerald & Halliday)
Steve Mitchell (F.A. Hesketh Associates)
Tom Maziarz (CRCOG)

Comments on Plan:
1. Off ramp and on ramp onto I-84 scissored with connection to Slater Street.
2. Fly over from Frontage Road at extended to at grade intersection with Slater Street and continuing on to Route 30.
3. Connector to Deming and Ellington Road
4. Slip ramp from I-84 to extended Frontage Road and replace on-ramp at Route 30.
5. New Frontage Road from Route 30 to WB exit ramp and Pleasant Valley Road.

Group 3

Attendees:
Jim Mayer (Town of Manchester)
Sue O'Connor (President, Greater Manchester Chamber of Commerce)
Howard Beeler (Manchester Police Department)
Leonard Lapsis (ConnDOT Intermodal Planning)
Mark Pellegrini (Town of Manchester / Planning Department)
Gary Sojka (ConnDOT Planning)

Comments:
1. Diverging diamond
2. Fly over for HOV
3. HOV to commuter street

4. Integrate Buckland / Clark Street into the I-291 ramp

Group 4

Attendees:
Jim Morrin (ConnDOT Intermodal Planning)
Carmine Trotta (ConnDOT Planning)
George Jacobs (Dewberry)
Kate Driscoll (ConnDOT Intermodal Planning)
Mike Connors (ConnDOT Planning)
Chet Camarata (CTDECP)

Comments on Plan:
1. Extend acceleration lane
2. HOV off and on to Buckland Street.
3. Extend 2 lane and provide operational lane between interchanges on both sides of I-84
4. Operational lane already proposed and in design

Transit Station

Group 1

Attendees:
Rick Gary (ConnDOT Public Transportation)
Sue O'Connor (President, Greater Manchester Chamber of Commerce)
Mark Pellegrini (Town of Manchester / Planning Department)
Gary Sojka (ConnDOT Planning)
Leonard Lapsis (ConnDOT Intermodal Planning)

Comments:
1. Transit center at Buckland park & ride lot
2. All Routes stop at Transit Center + Buckland Mall
3. Shuttles operate from Transit Center to all other secondary retail locations and apartments
4. Users of shuttle would probably be regular transit user versus shoppers shuttling between stores.

Group 2

Attendees:
Jim Morrin (ConnDOT Intermodal Planning)
Carmine Trotta (ConnDOT Planning)
George Jacobs (Dewberry)
Philip Fry (CTTransit)
Chet Camarata (CTDECP)
Mike Connors (ConnDOT Planning)
Kate Driscoll (ConnDOT Intermodal Planning)

Comments:

1. Improved park & ride lot
   More of them – with some type of security in the Buckland area
2. Possibly relocate Buckland park & ride lot so that it takes this commuter traffic away from this problem area.

Group 3

Attendees:
Jennifer Babowicz (ConnDOT Traffic)
Jim Andrini (ConnDOT Location Planning)
Charlie Carson (CTTransit)
Robert Hamersley (Transportation Strategy Board)
Philip Fry (CTTransit)
Jeff Hunter (ConnDOT Intermodal Planning)
Mark Carlino (Town of Manchester / Public Works & Engineering)

Comments:

1. Locate a transit center at Buckland Mall between I-84 and Macy's rather than using park & ride lot for transit centers.
2. Multiple circulators or shuttles between shopping districts and apartments
3. Silver Lane park & ride lot at exit 1 on I-384 needs to be connected to HOV lanes

Comments on Plan:

1. Access to HOV lanes from park and ride lot

Group 4

Attendees:
Jason Newman (FHWA)
Tom Maziarz (CRCOG)
Charlie Carson (CTTransit)
Steve Mitchell (F.A. Hesketh Associates)
Adam LeBlanc (ConnDOT)

Comments:

1. Invest in better bus stop & shelters. Be prepared to spend beyond $15,000 limit to fit difficult sites (ie: Dunkin Donuts on Tolland Turnpike)
2. Highest priority unserved
   Activity center = Plaza at Buckland Hills
3. Access to the Plaza at Buckland Hills
4. Bus stop at Tolland Turnpike at Buckland Hills Plaza westbound needs improving
5. Frequent shuttle service multiple routes to reduce travel time
6. Transit subsidiaries for mall workers.
7. More frequent transit service.

Group 5

Attendees:
Bill Taylor (Town of East Hartford)
Mark Witek (Dewberry)
Richard Gray (ConnDOT)
Marcia Banach (Town of South Windsor)
Jon Ford (ET)
George Jacobs (Dewberry)
Daniel Gladowski (ConnDOT)
Jeff Doolittle (Town of South Windsor)
Dave Balzer (Bike Pedestrian Coordinator ConnDOT)

Comments:
1. Pedestrian Safety
2. Center Islands at intersections
3. Pedestrian phase signal
4. Race track issues
5. New sidewalks

Report of Meeting

BUCKLAND AREA TRANSPORTATION STUDY
Workshop No. 2

Date: May 23, 2007, 9:00 AM

Location: ConnDOT Room G300 Newington

Attendees:	Jim Andrini	ConnDOT	860-594-2148
	George Jacobs	Dewberry	203-776-2277
	Mark Witek	Dewberry	203-776-2277
	Jim Ford	Earth Tech	860-657-1200
	Paul Stanton	Fitzgerald & Halliday	860-247-7200

Transactions and Determinations:

1. Introductions

2. Workshop goals and overview of Transportation Systems Management (TSM) & Transportation Demand Management (TDM), Transit and Bicycle / Pedestrian Alternatives.
    - Traffic Signal Coordination – possible expansion into South Windsor
    - Access Management – connections between retail areas
    - Transportation Center – two possible locations identified
    - Parking

3. Discussions:
    - Queue management
    - Interconnect enhanced features (video monitoring & system expansion), allows reaction to retail traffic situations
    - Variable Message Signs (VMS) – sign control
    - No new driveways (maximum walking distance 600')
    - Review left turns of major traffic flows
    - Special Holiday traffic plans
    - Intelligent Transportation Systems (ITS)
    - TSM/TDM: Demand management options include Park & Ride, HOV, and Transit Interconnect.
    - Solutions should relate to all users (commuters traveling through the area, people who work in the area, and people who live in the area)
    - TDM:
        i. Method to improve drop point conflict
        ii. Way Finding – sign coding with the best route to primary facilities, with a map at the centers
        iii. Circulation Shuttle
        iv. Remote Shuttle – requires a fixed route… timed and secure
        v. Remote Shuttle for employees (Buckland Mall has 4000 with 1200 at one time)
    - To improve operations, more travel lanes are needed
    - "Big Assumption" is that the largest volume of traffic is due to shopping

- Designated Routes for Pedestrians, Shuttles and Bicycles
- Cost v. Benefit (dollars v. traffic)
- There needs to be a willingness to share the cost of shuttles by various retail points
    i. Public/Private cost sharing was investigated at the casinos
    ii. What is the benefit to the user for each option
- Benefits when parking at a location is completely full may still have room for additional benefits if additional people will result from some of the options reviewed
- Theme Park Concept:
    i. Remote lot with dependable and frequent transportation
    ii. Parking management
    iii. Fixed Route
- How many people are looking for parking… How many people are in the retail shops versus looking for parking? Nancy Murray indicated that Buckland Hill Shoppes lot only full two weekends per year in December.
- Direct vehicles to alternate routes using ITS
- Provide incentives for using the shuttles
    i. The Shoppes at Buckland Hills spends about $40,000 for 5-6 weeks of incentives for employees to use parking off-site.
- Land Use → people passing features on the way to a store have a better experience and may be willing to park farther away and walk.
- *Someone talked about express lines??? Development standards… less parking (could be a problem with financing developments by the banks).*
- West Hartford & Blue Back Square: different concept for pedestrian/vehicle use **(report by the Transportation Research Board)**
- Peter (DOT Project Concept)
    i. Sufficient Parking
    ii. Don't like buses
    iii. Funding for shuttles by retail stores
    iv. Bus people from highway to retail stores
    v. If you can get a vehicle to the retail stores, then you don't need buses
    vi. Increase capacity first (with sufficient parking)
    vii. **BTS committed to an intermodal solution.**
- The entire picture will be presented at the next AC meeting
- Tom Maziarz (CRCOG)
    i. Land use & demand management is essential
    ii. Demand Management – for long term with land use discussions
    iii. Retail is the most difficult to manage with TDM measures… car pool for retail doesn't work
- 16th Street (Denver, CO) – 3 minute bus interval. Buses designed with retail shoppers in mind (one side seating, the other side racks for packages). Buses were empty at first but now system works well and is heavily used.
- **Think to the year 2030**
    i. Transit options
    ii. I-84 corridor
    iii. Remember how area was in 1975 compared to now. We are planning for 20 years out (2030)
    iv. Different Focus… based on development
    v. Revisit plan often over the 20 year period to make adjustments
    vi. Availability of land

vii. Be sure to make the basis of the land use for the 2030 projection known for everyone using our report
viii. Keep the study focused on FUTURE and ALL issues, options and the potential for change.

4. Next Step
   - At the next Advisory Committee Meeting we will present concepts for the road alternatives, TDM and TSM
   - We need to make it clear that what is presented is the status of the "ideas" and "out-of-the-box" thinking to develop concepts and that they are subject to change.

Prepared by: _____
Mark Witek - Dewberry

Approved by: _____
James Andrini

Report of Meeting

Date: Thursday, September 27, 2007
1:30 PM - 3:30 PM

Subjects: Planning Workshop # 3 Land Use Discussion

Location: ConnDOT, Room G300
2800 Berlin Turnpike, Newington, CT

Attendees:

George Jacobs	Dewberry	203-776-2277
Peter Schirmer	Dewberry	203-776-2277
Miguel Gavino	Dewberry	203-776-2277
Kurt Thompson	Dewberry	203-776-2277
Isabella Quagliato	Dewberry	203-776-2277
Elizabeth Mahey	EvergreenWalk	860-432-3398
Marcia Banach	Town of South Windsor	860-644-2511
Jeff Doolittle	Town of South Windsor	860-644-2511
Mike Connors	ConnDOT Planning	860-549-2037
Gary Sojka	ConnDOT Planning	860-549-2025
Gramson Wright	ConnDOT Planning	860-549-2154
Carmine Trotta	ConnDOT Planning	860-549-2134
Ned Hurle	ConnDOT Planning	860-594-2005
Robert W. Turner	FHWA	860-659-6703
Roxame Fromson	ConnDOT	860-594-2038
Jeff Hunter	ConnDOT	860-594-2139
Melanie Zimyeski	ConnDOT	860-594-2144
Katie Driscoll	ConnDOT	860-594-2146
Paul Stauton	Fitzgerald & Halleday	860-247-7200
Steve Mitchell	Fahesketh & Assoc.	860-653-8000
Frank Hubeny	FLB Arch. & Planning	860-568-4030
Tom Maziarz	CRCOG	860-522-2217
David Fox	DEP	860-424-4111
Nancy Murray	Shoppes at Buckland Hills	860-644-6369
James Morrin	ConnDOT	860-594-2147
Mark Pellegrini	Town of Manchester	860-647-3043

FACTS:

- Currently the Town of Manchester has a pad development including a 2000 rental unit with $3 million in retail.
- The voice of the public is important.

DISCUSSION :

1. Previous Workshop

- TSM/TDM Workshop: Traffic and transportation infrastructure brainstorm, in order to improve highway systems.

2. Today's Workshop

- Focused of Land Use, obtained some input from towns about their vision plans.
- Two engineers from Dewberry presented several scenarios exemplifying different approaches to land use, traffic and transportation infrastructure and methods used to achieve their vision goals.

Dewberry:

- Kurt Thompson emphasized the importance of linkage between transportation and land use. A couple of keys to obtain good land usage include: embracing transit and being aware of the community desires.

Town of South Windsor:

- The town is interested in the possibilities of Buckland Area becoming a compacted suburban business district. They express concern as to how this can be achieved: naturally through market growth? Planned?

Dewberry:

- Town of South Windsor should work together and think of what vision they have for their town. Based on those visions Dewberry and ConnDOT can present several scenarios and its consequences based on the chosen visions. (See "Reinventing American Suburban Business District" pg. 13.
- Two part process:
    1. Land Use
    2. Physical Form (Ex. shared parking)

ACTION ITEMS:

1. Towns to coordinate their vision goals amongst themselves and the community in order to agree with a few common visions.

2. Dewberry and ConnDOT to develop those visions into scenarios and present the pros and cons of each in the next meeting.

3. Dewberry to post meeting slides on project's website.

4. Dewberry/ConnDOT research Land Development, do they evolve from market source?

5. Dewberry suggested implementation of "Growth Management Act". In addition to towns vision coordination, they should also think if a boundary should be established, and politics involving such decision (who's in our out of the boundary? What's the town's and community interest?)

6. Dewberry (Miguel) to post information about the Growth Management Act on the website.

7. AC Meeting, October 18th: present output of this workshop.

Report of Meeting

THOUGHTS TO TAKE HOME:

- What can towns do differently for results to be different?
- Can Buckland area become a compacted suburban district? Is that the intention of the town and its community?

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Submitted by: Isabella Quagliato 10-18-07
Isabella Quagliato Date

Reviewed by: George Jacobs 10-18-07
George Jacobs, P.E. Date

Approved by: George Jacobs 10-18-07
George Jacobs, P.E. Date

Report of Meeting

Date:	Thursday, December 13, 2007 9:00 AM - 11:00 AM		
Subjects:	Planning Workshop # 4 Highway Alternatives		
Location:	Manchester Town Hall 41 Central Street, Manchester, CT		
Attendees:	Jim Morrin	ConnDOT	860-594-2147
	George Jacobs	Dewberry	203-776-2277
	Pete Schirmer	Dewberry	203-776-2277
	Tom Maziarz	CRCOG	860-522-2217
	Mark Carlino	Town of Manchester	860-647-3067
	Jeff Doolittle	Town of South Windsor	860-644-2511
	Hon. Mary Ann Handley	4th Senate District	860-240-0567

DISCUSSION :

1. Introduction by G. Jacobs:
   - Reviewed current highway concepts. Explained that local roads improvements are part of the study, but will be covered at another meeting.
   - Recent developments: Public Info meeting on 11/29/2007, about 15 residents attended and provided project related input.
   - Will discuss 10 options developed from the last AC Meeting today.
   - Also have new ideas for connecting Redstone Road across I-84 to the Mall, with consideration for N. Murray's comments about high traffic volumes on the Mall's ring road (Nancy Murray represents "The Shoppes at Buckland Hills" on the Advisory Committee for the study).

2. Senator Handley had little time before next appointment, requested to have all options explained briefly.

   Option 1 – additional connection from Pleasant Valley ramps to Tolland Turnpike for access to I-291NB.
   - J. Morrin stated problems with this option would be wetland impacts and a deep cut into a hillside.

   Option 2 - Direct connection from Pleasant Valley to I-291NB using existing ramp. Also connects I-291SB to EB frontage road/Buckland Street.
   - T. Maziarz stated a direct connection from Pleasant Valley Road to I-291 NB was needed.
   - M. Carlino stated that Option 2 relieves a lot of traffic from Buckland Street. Representatives from South Windsor agreed.

3. Discussion concluded that Option 1 would not be studied further and Option 2 should be developed further. J. Morrin asked if everyone agreed – Reply was "yes".

4. Next topic was to discuss Redstone Extension options.
    - T. Maziarz commented that an advantage to a direct Mall ring road connection to Redstone Road is that it would provide a 3rd access point to the ring road – currently there are only two access points. Traffic also needs to get to Hale Road without major impact to the mall traffic.
    - There was general agreement that a direct Redstone/Mall ring road connection would shift the traffic bottleneck from Buckland Street to a different location, but that this option looks very promising and needs to be carried forward and the new problems need to be worked out.
    - The direct Redstone/mall ring road connection is not off the table, but the Mall's requirements/commitments to tenants need to be considered and addressed.

COMMENTS:

- Have Mall-bound traffic on one structure and frontage road/highway bound traffic on 2nd structure – overpass structures would be one-way to enhance flow through intersections (J. Morrin).
- Spacing of intersections on overpasses is important – frontage roads and HOV entering overpass at close intervals would probably not be ideal for flow through intersections.
- HOV and frontage road connections to overpasses should be on different structures.
- Roundabout as I-84 overpass was considered, but is not feasible. "Square" roundabout with intersections should be analyzed.
- Need to determine if Redstone connection to ring road/hill should only have access to/from west, or from east and west – which would be the most beneficial considering future development and traffic?

ACTION ITEMS:

- DOT has auxiliary lane project between exits 63 and 64 in design and needs to be accounted for while investigating options.
- The Auxiliary Lane option between exits 62 and 63 should be a part of any other option considered.
- If HOV access remains at Buckland Street, will the Redstone connection have a positive impact on the HOVs at Buckland Street? Traffic should be analyzed for that scenario (J. Doolittle).
- DOT – need definition of Transit Center. How will it be used? Who will it serve? How will it function? What will it look like? Who will it draw and from where? Commuters? Shoppers? What is it meant to accomplish? Definition needs to be made before location and access to Transit Center can be determined.
- Transit Center on top of hill or at existing lot at Pleasant Valley Road? Separate Transit Center nodes, one at each location?
- Redstone connection(s) need to be ironed out before Transit Center impact can be analyzed (J. Doolittle).

- M. Carlino and N. Murray to discuss Mall's requirements/commitments to tenants to determine if provisions can be made for direct ring road connection.
- I-291NB ramp to be part of all Options.

Prepared by: Pete Schirmer
Pete Schirmer

Approved by: George Jacobs, P.E.
George Jacobs, P.E.

Report of Meeting

Date: Thursday, February 14, 2008
1:30 PM - 3:30 PM

Subjects: Planning Workshop # 5 Local Roads

Location: ConnDOT Room G300
2800 Berlin Turnpike, Newington, CT

Attendees:

Advisory Committee Members and study team:

Mark Carlino	Town of Manchester	Phillip Fry	CT Transit
James Morrin	ConnDOT	Bill Taylor	East Hartford
George Jacobs	Dewberry	Marcia Banach	Town of South Windsor
Peter Schirmer	Dewberry	David Fox	DEP
Isabella Quagliato	Dewberry	Matthew Streeter	Mayor of South Windsor
Sue O'Connor	GMCC	Katie Driscoll	ConnDOT
		Mark Pellegrini	Town of Manchester

Public and interested parties who signed in:

Melanie Zimyeski	ConnDOT	Rick Jacobson	ConnDOT
Bruce Hillson	Traf. Eng. Sol. Sep. Buck. Mall	Tom Maziarz	CRCOG
Chat Camarata	State DECD	Gary Sojka	Conn DOT
Steve Mitchell	F. A. Hesketh & Assoc.	Jennifer Babowicz	Conn DOT
Beth Caron	Shipman & Goodwin, LLP	Peter Macher	Conn DOT
Jim Ford	EarthTech	Daniel Gladowski	Conn DOT
Jeff Hunter	ConnDOT	Charlie Carson	CT Transit
Carmine Trotta	ConnDOT	Mike Connors	ConnDOT
Nancy Murray	Shoppes @ Buck. Hills		

WELCOME AND OPENING COMMENTS:

G. Jacobs opened the meeting with a brief overview on local roads, including state roads, Deming St, Pleasant Valley Rd and Redstone overpass.
Several aerial maps were laid out on large tables and attendees discussed possibilities and ideas for improvement and marked the drawings to express those ideas on paper.

COMMENTS & QUESTIONS DISCUSSION

Deming St:

- The Mayor of South Windsor, M. Streeter, stated that Deming St. needs significant improvements, especially traffic reduction.
- M. Banach stated that such connections at Slater and Summit Dr/Felt Rd would be difficult due to steep grades in those areas.
- Connections or improvements to connections between Oakland Rd and Deming St. were recommended.

Report of Meeting

Clark St:

- I-291 Connectivity?
- M. Banach: Clark St improvements have been designed, but not constructed due to lack of funding.
- G. Jacobs: Perhaps Dewberry can incorporate design elements from the Clark Street project in this study and consider funding options along with other local road improvements in the corridor.

Tolland Turnpike:

- Implement safe bike and pedestrian lanes.

GENERAL COMMENTS/SUGGESTIONS:

- Looking out 20 years from now, consideration for short term and long term solutions.
- J. Morrin: Adding guide and informational signs, such as "Buckland Mall, ⟶ "to make people aware of alternate routes they may not be aware of can also be helpful.
- Redstone connector as a local road may be considered a near term solution.
- DOT presented several alternatives for improving capacity between Buckland Hills Mall, Pleasant Valley Rd and the Exit 62 ramps.

See drawings for additional meeting notes and solutions.

Prepared by: Isabella Quagliato
Isabella Quagliato

Approved by: George Jacobs, P.E.
George Jacobs, P.E.

Appendix I
Public Informational Meeting Minutes

Report of Meeting

Date: March 29, 2007
6:00 PM – 8:45 PM

Subject: Buckland Area Transportation Study
Public Meeting #1

Location: South Windsor Public Library Friends Room
1550 Sullivan Avenue
South Windsor, Connecticut

Attendance

Advisory Committee Members and Public who signed in:

CT State Rep. Bill Aman	S. Windsor's 14th Dist.	Roselle MacDonald	S. Windsor resident
Marcia Banach	Town of S. Windsor	Elizabeth Maheu	Evergreen Walk
S. Barry	S. Windsor resident	Jim Mayer	Town of Manchester
Peter DeMallie	S. Windsor resident	Jason Newman	FHWA
Jeff Doolittle	Town of S. Windsor	Chris Smith	Shipman & Goodwin, LLP
Paul Dunia	S. Windsor resident	Christopher Squires	Lebanon resident
Philip Fry	CT Transit	Mayor Matthew Streeter	Town of S. Windsor
Bill Krezowsky	S. Windsor resident	Beverly Titus	S. Windsor Resident
Senator Gary LeBeau	3rd Senate District	Bob White	Stafford resident
James MacDonald	S. Windsor resident		

Study Team:

James Andrini	ConnDOT	Jeff Hunter	ConnDOT
David Balzer	ConnDOT	George Jacobs	Dewberry
Leslie Black	FHI	Jeff Maxtutis	EarthTech
Woodney Christophe	Dewberry	James Morrin	ConnDOT
Mike Connors	ConnDOT	Paul Stanton	FHI
Kate Driscoll	ConnDOT	Carmine Trotta	ConnDOT
Dennis Flynn	EarthTech	Grayson Wright	ConnDOT

Welcome and Opening Comments:

Leslie Black opened the presentation with introductions and an overview of the public participation process. This is the first of three public meetings to present study findings in order to gain public input that will assist the study process as it moves forward. The public were encouraged to complete "Comments" forms and visit the study website, www.bucklandstudy.org to keep informed about the study and provide comments via the website survey and contact site.

George Jacobs discussed the public participation process and stakeholder meetings.

Comments & Questions Discussion

- Sullivan Avenue was designated at one point as Rte. 194 and should receive the same attention as other state routes in terms of services such as plowing.
- Open up other conduits to relieve congestion. An example is Slater Street which is shut off in S. Windsor and could be opened to relieve congestion from Buckland Street. Three other roads are shut off in this same way.

Report of Meeting

- Three outlets that should be considered for alteration are: Slater Street, Smith Street, and Ridge Road.
- Evergreen Walk should have a large bus station instead of having it out on Buckland Road.
- Landscaping on Buckland Road with center-boulevard trees looks nice but won't survive in the long term.
- Roundabouts should be considered where possible as they provide constant traffic flow at low speeds due to angle of entry into the roundabout. Roundabouts would solve the problem with intersections that are currently dangerous.
- Bicycle/pedestrian issues must be considered at all intersections with connectivity throughout the region.
- Route 83, Route 30 intersection and Exit 63 ramp off I-84: exit ramp is curved too sharply. The intersection is not flat. This impacts the left turn lane coming form Manchester on Rt. 83. There should be two left hand lanes but the tilt of the intersection makes cars drift into the rightmost lane of Rt. 30. A flat intersection would allow two lanes. In order to accommodate the number of cars wanting to turn left, the traffic light has to stay green for a considerable time. This causes all the other lines to back up. Of the two lanes that go straight on Rt. 83 North at the intersection, only one is needed.
- Exit 62 coming from Hartford gets incredibly backed up. It is much too long with no way to get off. There used to be another exit at North Main Street that is about halfway down the current exit ramp (by McDonalds). This should be reopened to provide a relief valve for those stuck in the long backup and would provide another route to the mall.
- Traffic lights at the intersections on Hale Road stay red too long where the condominiums are located. There is rarely much traffic from the condominiums.
- The entrance to Wal-Mart is very poor with no separate left turn lane. Also, making a left turn out the Wal-Mart is almost impossible.
- The Slater Street, Hale Road intersection should be larger with more lanes.
- There is no direct connection from the mall to I-291 even though the entrance ramp to I-84 could be connected to I-291 instead of going under it. In the reverse case, there is no connection from I-291 to the mall, even though the I-291 exit to I-84 runs parallel to the entrance tot the mall.
- Much of the problem in the area is that there are too many left turns to get into the mall from both exits from I-84. Maybe dedicated overpasses taking traffic directly into the mall should be considered.

Prepared by: Leslie Black
Leslie Black

Approved by: James Andrini
James Andrini

Report of Meeting

Date: November 29, 2007
6:00 PM – 8:45 PM

Subject: Buckland Area Transportation Study
Public Meeting #2

Location: Culinary Arts Center Room, Lowe Building
Manchester Community College
Manchester, Connecticut

Attendance

Advisory Committee Members and Public who signed in:

Mark Carlino	Town of Manchester	Bill Krezowsky	S. Windsor resident
Beth Caron	Shipman & Goodwin, LLP	Steven Lyons	Manchester resident
Charles Carson	CT Transit	Nancy Murray	Shoppes at Buckland Hills
Jeff Doolittle	Town of S. Windsor	Steve Mitchell	F. A. Hesketh Associates
Julian Freund	Manchester resident	Jim Mayer	Town of Manchester
Philip Fry	CT Transit	Robert Pellegatto	S. Windsor resident
Mick Heath	S. Windsor resident	Leslie Pirtel	Manchester resident
Faye Heath	S. Windsor resident	Gary Pitcock	S. Windsor resident
Holly Hood	Manchester resident	Christopher Squires	Lebanon resident
Stephany Kennedy	Manchester resident	Beverly Titus	S. Windsor resident

Study Team:

Leslie Black	FHI	George Jacobs	Dewberry
Mike Connors	ConnDOT	Rick Jacobson	ConnDOT
Andy Davis	ConnDOT	Tom Maziarz	CRCOG
Kate Driscoll	ConnDOT	James Morrin	ConnDOT
Jim Ford	EarthTech	Peter Schirmer	Dewberry
Jeff Hunter	ConnDOT	Carmine Trotta	ConnDOT

Welcome and Opening Comments:

Approximately 12 people from the general public attended this meeting.

Leslie Black opened the presentation with introductions and an overview of the public participation process. This is the second of three public meetings to present study findings in order to gain public input that will assist the study process as it moves forward. The public were encouraged to complete "Comments" forms and visit the study website, www.bucklandstudy.org to keep informed about the study and provide comments via the website survey and contact site.

James Morrin discussed the current status of the study.

George Jacobs made a PowerPoint presentation about the study findings and alternatives being considered for highway, local roadway, bicycle and pedestrian pathway, and transit options.

The public audience then adjourned to an open house format where maps showing each alternative were made available for the public to view and provide feedback/make suggestions for each alternative. Comments and questions are recorded as follows:

Comments & Questions Discussion

General Comments/Suggestions:

- A local resident applauded the study team at the effort being undertaken with the study. He remarked that as a pilot flying over the corridor for many years, he has noted the visible increase in traffic congestion with particular seasonal fluctuations, and that it is time to address the congestion. ***Mr. Jacobs responded that the proposed concepts will be tested with virtual traffic simulations that project traffic volumes to the year 2030 to ensure the benefit of the concept before it goes any further in the study and implementation process.***
- The island at Pleasant Valley and Buckland Streets should be more visible or striped with possible dashed lines. Left turn from Pleasant Valley Road to Buckland Road creates confusion for unfamiliar drivers and on occasion drivers are trapped behind the median curb traveling head on into oncoming traffic.
- Frontage Road should have an exit to Slater Road.

Transit Comments:

- With respect to malls and shopping, have offsite parking and shuttle services been looked at? ***Mr. Jacobs responded that the transit options being considered include a shuttle service that would provide small shuttles – comfortable vehicles that make dependable timely loops to serve the corridor area. Also, a transportation center is under consideration where a central parking location will be provided with access to user-friendly transit that serves the residential and retail community.***
- Commuter rail service between Hartford, the airport, and other major destinations should be considered if feasible.
- HOV connections: Would it be possible to make an HOV connection from Manchester to I-384 and or I-291?
- Will better use be made of HOV lanes? These lanes are often practically empty while all other lanes are at a standstill. ***Mr. Jacobs commented that HOV lanes are being looked at as part of the study to improve traffic movement.***

Retail Access Comments:

- Has a flyover ramp directly to the mall been considered? ***Mr. Jacobs noted that a flyover alternative is one of the highway alternatives under consideration at this point in the study.***
- Will exits to get back out of the shopping area be looked at? Right now these exits are difficult to access and take shoppers through the most congested part of the whole study area when all they are trying to do is leave the area. ***Mr. Jacobs responded that access is a priority and that a variety of alternatives address this concern.***

Bicycle Pedestrian Comments:

- The bike trail along Chapel Road is not in good condition and quite bumpy even on a mountain bike and efforts should be made to improve the quality of construction for this current trail and all future trails.

- The Hale Road at Deming Street (Route 30) intersection would be greatly served by a crosswalk. A crosswalk and pedestrian phase would allow residential areas west of the commercial district to walk there.
- The historical residences on Long Hill Road as well as historically significant cemeteries should be noted in the study so that they are preserved in any future land use plan.

Avery Rd Comments:

- Thru truck traffic from Vernon to Manchester is utilizing this residential street to avoid lights on the commercial route.
- There are concerns about traffic at Avery Street from Vernon Street.
- Making a turn from Kelly St. (outside of study area) onto Avery St. is nearly impossible.
- The light timing/phasing at Avery and Deming were recently revised. It has created a backup in the morning and afternoon on Avery and into the residential streets adjacent. This had created an issue with school busses being able to complete their routes efficiently.
- The person also requested information regarding who, at the DOT, would be responsible for a traffic calming initiative on Avery St. that was cited by the S. Windsor town official.

Public Outreach Comments:

- Town council meetings would be a good opportunity to reach citizens as they are public and televised on Public Access TV. Would it be possible for the state to make a presentation to the council? ***Ms. Black and Mr. Jacobs responded that they will speak with town council about the possibility of making such a presentation.***
- Some public asked how to find out more about the study. ***Ms. Black referred them to "Comments Forms" and the study website, www.bucklandstudy.org to find information, take a survey about the study, and have their names added to an email address notification list.***

The meeting adjourned at 8:30 p.m.

Prepared by: *Leslie Black*
Leslie Black

Approved by: *James Morrin*
James Morrin

Appendix J
Screening Matrices

Buckland Area Transportation Study
Alternatives Screening Matrix[1]

Option	Concept	Zones Affected	Summary	Description	Principle(s)	Pros	Cons	Kept/Dropped
1	2B Mod	1	Pleasant Valley ramp to Tolland Turnpike.	Additional ramp from Pleasant Valley entrance ramp toTolland Turnpike at Chapel Road.	Provide access to I-291 N via Chapel Road.	Provides access from Pleasant Valley Road to I-291 N via Chapel Road.	Low benefit (pm peak hour volume on new ramp = 190) for high cost of construction/ maintenance.	Dropped
2	2D Mod	1 & 2	I-291 ramps, Redstone Extension overpass with frontage road flyover over Buckland St.	WB I-84: Relocate I-291 N ramp (remove exit 61) to Pleasant Valley Road entrance ramp. I-84 W traffic to access I-291 N via exit 60/62. Add ramp from Redstone Extension to exit 62. EB I-84: Extend eastbound frontage road (exit 62) as Buckland St. flyover to Redstone Extension.	Provide I-291 N access from Pleasant Valley Road. Reduce Buckland St. traffic by providing direct access from I-84 to The shoppes at Buckland Hills, and by providing an alternative for local traffic.	Significant reduction of Buckland Street traffic. Helps Pleasant Valley Road at entrance ramp to I-84 W (a)	Connects town road (Redstone Road) to private road (Mall Service Road).	Kept, but without I-291 E to I-84 E connection. Need to determine connection point of Redstone Road Extension.
3	1 Mod	2 & 3	Add frontage roads between exits 62 (Buckland St.) and 63 (Route 30)	WB I-84 & F/R: relocate entrance ramp from Route 30 approx. 0.8 miles west. Relocate exit 60/62 approx. 0.9 miles east. EB I-84 & F/R: Entrance ramp from Buckland St. continues as frontage road. Relocate exit 63 approx. **1.5 or 0.5** miles to west. Frontage road connects to existing exit 63 ramp and continues to Route 30 entrance ramp.	Reverse I-84 Exit/Entrance ramps - traffic exits before entrance ramps to clear right lane for entering traffic. Weaving occurs on frontage roads instead of on highway mainline.	Mainline weaving reduced.	No impact to Buckland Street traffic volumes.	Dropped
4	2C Mod	2 & 3	Add frontage roads between exits 62 (Buckland St.) and 63 (Route 30), frontage road flyover over Buckland St.	WB I-84 & F/R: add connection from Exit 63 to new frontage road. Relocate entrance ramp from Route 30 approx. 0.9 miles to west. Remove exit 60/62. EB I-84 & F/R: Extend eastbound frontage road (exit 62) as Buckland St. flyover. Entrance ramp from Buckland St. continues on frontage road. Relocate exit 63 approx. 0.6 miles to west. Frontage road connects to existing exit 63 ramp, and continues to Route 30 entrance ramp. Add interchange ramps connecting frontage road to Tolland Turnpike between Buckland St. and Route 30.	Reverse I-84 Exit/Entrance ramps - traffic exits before entrance ramps to clear right lane for entering traffic. Weaving occurs on frontage roads instead of on highway mainline. Allows EB exit 62 traffic the option of Mall Access via Route 30.	Mainline weaving reduced.	No impact to Buckland Street traffic volumes. Condo Development at Frontage Road/Tolland Tpke. Connection.	Dropped

Buckland Area Transportation Study
Alternatives Screening Matrix[1]

Option	Concept	Zones Affected	Summary	Description	Principle(s)	Pros	Cons	Kept/Dropped
5	1A	2 & 3	Add frontage roads between exits 62 (Buckland St.) and 63 (Route 30), frontage road flyover over Buckland St. EB frontage road connects with Left turn only to Tolland Turnpike. New entrance ramp across Route 30 at Tolland Turnpike.	WB I-84 & F/R: Route 30 entrance ramp becomes frontage road. Relocate entrance ramp from Route 30 approx. 0.8 miles to west. Relovate exit 60/62 approx. 0.8 miles to east. EB I-84 & F/R: Entrance ramp from Buckland St. becomes frontage road. Relocate exit 63 approx. 1.2 miles to west. Relocate Entrance ramp from Buckland St. approx. 0.7 miles to east. New ramp at Route 30 acrosss from Tolland Turnpike connects to existing entrance ramp. Add interchange ramps connecting frontage road to Tolland Turnpike between Buckland St. and Route 30.	Reverse I-84 Exit/Entrance ramps - traffic exits before entrance ramps to clear right lane for entering traffic. Weaving occurs on frontage roads instead of on highway mainline.	Mainline weaving reduced.	No impact to Buckland Street traffic volumes. Adverse impact to Route 30 and Tolland Turnpike. Condo Development at Frontage Road/Tolland Tpke. Connection.	Dropped (07/25/07), Originally "Highway Concept #1"
6	2E	2 & 3	Add Redstone Extension overpass, frontage roads between exits 62 (Buckland St.) and 63 (Route 30), and frontage road flyover over Buckland St. Frontage roads connect to Redstone Extension overpass.	WB I-84 & F/R: Route 30 entrance ramp becomes frontage road, entrance to I-84 moves approx. 0.6 miles to west. Add connection from exit 63 to frontage road. Frontage road connects to Redstone Extension overpass. Remove exit 62/60 (access via exit 63 to frontage road). EB I-84 & F/R: Extend eastbound frontage road (exit 62) as Buckland St. flyover to Redstone Extension overpass. Move entrance ramp from Buckland St. to west of design standards allow. Relocate exit 63 approx. 0.5 miles to west. Connect frontage road to existing exit 63 entrance/exit ramps.	Reverse I-84 Exit/Entrance ramps - traffic exits before entrance ramps to clear right lane for entering traffic. Weaving occurs on frontage roads instead of on highway mainline. Exit 62 traffic has option of direct connection to The Shoppes at Buckland Hills via Redstone Extension to relieve traffic on Buckland St. and Pleasant Valley Road.	Significant reduction of Buckland Street traffic. Helps Pleasant Valley Road at entrance ramp to I-84 W (a). Mainline weaving reduced.		Dropped

Buckland Area Transportation Study
Alternatives Screening Matrix[1]

Option	Concept	Zones Affected	Summary	Description	Principle(s)	Pros	Cons	Kept/Dropped
7[2]	3B	2 & 3	Add Redstone Extension overpass, frontage roads between exits 62 (Buckland St.) and 63 (Route 30), and frontage road flyover over Buckland St. Frontage roads connect to Redstone Extension overpass. Relocate HOV access (EB exit, WB entrance) from Buckland St. to Redstone Extension overpass.	WB I-84 & F/R: Route 30 entrance ramp becomes frontage road, entrance to I-84 moves approx. 0.6 miles to west. Add connection from exit 63 to frontage road. Frontage road connects to Redstone Extension overpass. Remove exit 62/60 (access via exit 63 to frontage road). Relocate HOV entrance from Buckland St. to Redstone Extension overpass. EB I-84 & F/R: Extend eastbound frontage road (exit 62) as Buckland St. flyover to Redstone Extension overpass. Move entrance ramp from Buckland St. to west of design standards allow. Relocate exit 63 approx. 0.5 miles to west. Connect frontage road to existing exit 63 entrance/exit ramps. Relocate HOV exit from Buckland St. to Redstone Extension overpass.	Reverse I-84 Exit/Entrance ramps - traffic exits before entrance ramps to clear right lane for entering traffic. Weaving occurs on frontage roads instead of on highway mainline. Exit 62 traffic has option of direct connection to The Shoppes at Buckland Hills via Redstone Extension to relieve traffic on Buckland St. and Pleasant Valley Road. Eliminates delays caused by HOV signal from Buckland St.	Significant reduction of Buckland Street traffic. Helps Pleasant Valley Road at entrance ramp to I-84 W (a). Mainline weaving reduced.		Dropped
9	3A	2	Add HOV flyover ramps to Transit Center at commuter lot at Pleasant Valley/Buckland St.	Removes HOV ramps at Buckland St. Adds EB and WB HOV entrance and exit flyover ramps connecting directly to a Transit Center at the commuter lot at the intersection of Pleasant Valley Road and Buckland Street.	Eliminates delays caused by HOV signal from Buckland St. Promotes transit use by providing direct access to (intermodal) transit facility.	HOV ramps removed from Buckland Street. Provides central location for intermodal transfer of HOV, commuter and transit traffic.		Kept
10	2 Mod	2 & 3	Adds auxiliary lanes between exits 62 (Buckland St.) and 63 (Route 30).	Adds WB and EB right lane (auxiliary lanes) to I-84 mainline between exits 62 (Buckland St.) and 63 (Route 30).	Moves weaving traffic one lane to right on I-84 mainline, allowing better traffic flow in center and left lanes.	Mainline weaving reduced.	No impact to Buckland Street traffic volumes.	Kept

Buckland Area Transportation Study
Alternative Screening Matrix[1]

Corridor/ Area	Corridor Goals	BUILD ALTERNATIVES								
		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7[2]	Option 9	Option 10
		Concept 2B Mod	Concept 2D Mod	Concept 1 Mod	Concept 2C Mod	Concept 1A	Concept 2E	Concept 3B	Concept 3A	Concept 2 Mod
	Zones Affected	1	1 & 2	2 & 3	2 & 3	2 & 3	2 & 3	2 & 3	2	2 & 3
I-291	Additional Access to I-291	M	H				H	H		
	Safety									
	Interstate Capacity									
	Intermodal									
Tolland Turnpike	Reduce Congestion		M				M	M		
	Support Local Access	M			H	H		M		
	Safety						M			
	Intermodal							H		
Buckland Street	Reduce Congestion		H				H	H	H	
	Optimize Access to Developments		H				H	M		
	Safety							M		
	Intermodal							H	M	
Pleasant Valley Road	Reduce Congestion						M	M		
	Improve Circulation to Adjacent and Planned Development					M	M		M	
	Safety						M			
	Intermodal							H	M	
Route 30	Reduce Congestion						M	M		
	Safety						M	M		
	Minimizes Impacts to Neighborhood						M	M		
I-84 Corridor	Capacity									M
	Land Access Support	M	H			M	H	H		
	Safety		H	H	H	H	H	H		M
	Through Traffic							H	M	M

KEY SCREEN CRITERIA

H High Positive Impact, Greatly Supports Goals of Area
M Medium Positive Impact; Moderately Supports Goals of Area

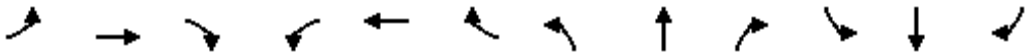
CONGESTION REDUCTION CRITERIA

	Percent Reduction	Volume Reduction
H	50-100	>500
M	16-50	N/A

1 - Evaluation Based on Comparison of ConnDOT 2030 PM Peak Hour traffic volumes with No-Build volumes.
2 - Proposed Transportation Center with connection to Red Stone Road extension south of I-84. Assumed travel benefits to Buckland St, Pleasant Vallet Rd, Tolland Tnpk, and I-84.
a - from "Highway Concept #2D", 07/25/07

Dewberry

Appendix K
SYNCHRO Output



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00					0.91	1.00	0.97	0.95	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1698	1704	1599					5136	1599	3467	3574	
Flt Permitted	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1698	1704	1599					5136	1599	3467	3574	
Volume (vph)	1050	15	590	0	0	0	0	1430	310	770	1250	0
Peak-hour factor, PHF	0.86	0.86	0.86	0.92	0.92	0.92	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	1221	17	686	0	0	0	0	1625	352	837	1359	0
RTOR Reduction (vph)	0	0	24	0	0	0	0	0	75	0	0	0
Lane Group Flow (vph)	611	627	662	0	0	0	0	1625	277	837	1359	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Split		Prot						Perm	Prot		
Protected Phases	4	4	4					2		1	1 2	
Permitted Phases									2			
Actuated Green, G (s)	43.5	43.5	43.5					35.0	35.0	23.0	64.0	
Effective Green, g (s)	46.0	46.0	46.0					37.0	37.0	25.0	66.0	
Actuated g/C Ratio	0.38	0.38	0.38					0.31	0.31	0.21	0.55	
Clearance Time (s)	6.5	6.5	6.5					6.0	6.0	6.0		
Vehicle Extension (s)	2.0	2.0	2.0					0.2	0.2	2.0		
Lane Grp Cap (vph)	651	653	613					1584	493	722	1966	
v/s Ratio Prot	0.36	0.37	c0.41					c0.32		c0.24	0.38	
v/s Ratio Perm									0.17			
v/c Ratio	0.94	0.96	1.08					1.03	0.56	1.16	0.69	
Uniform Delay, d1	35.6	36.1	37.0					41.5	34.7	47.5	19.6	
Progression Factor	1.00	1.00	1.00					1.02	1.06	1.13	1.72	
Incremental Delay, d2	21.0	25.5	59.8					27.6	3.9	80.9	0.5	
Delay (s)	56.6	61.6	96.8					70.1	40.6	134.5	34.2	
Level of Service	E	E	F					E	D	F	C	
Approach Delay (s)		72.6			0.0			64.9			72.4	
Approach LOS		E			A			E			E	

Intersection Summary			
HCM Average Control Delay	70.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	1050	15	590	1430	310	770	1250
Lane Group Flow (vph)	611	627	686	1625	352	837	1359
Turn Type	Split		Prot		Perm	Prot	
Protected Phases	4	4	4	2		1	1 2
Permitted Phases					2		
Detector Phases	4	4	4			1	
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	14.5	14.5	14.5	14.0	14.0	14.0	
Total Split (s)	50.0	50.0	50.0	41.0	41.0	29.0	70.0
Total Split (%)	41.7%	41.7%	41.7%	34.2%	34.2%	24.2%	58.3%
Yellow Time (s)	3.0	3.0	3.0	4.0	4.0	4.0	
All-Red Time (s)	3.5	3.5	3.5	2.0	2.0	2.0	
Lead/Lag				Lag	Lag	Lead	
Lead-Lag Optimize?							
Recall Mode	None	None	None	C-Max	C-Max	None	
v/c Ratio	0.94	0.96	1.08	1.03	0.62	1.16	0.69
Control Delay	59.5	63.2	92.4	69.6	30.2	127.7	35.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	2.4
Total Delay	59.5	63.2	92.4	69.6	30.2	127.7	37.9
Queue Length 50th (ft)	473	492	~574	~501	197	~407	445
Queue Length 95th (ft)	#664	#690	#749	#573	263	#537	554
Internal Link Dist (ft)		795		500			524
Turn Bay Length (ft)					80		
Base Capacity (vph)	651	654	637	1584	568	722	1966
Starvation Cap Reductn	0	0	0	0	0	0	458
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.96	1.08	1.03	0.62	1.16	0.90

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 84 (70%), Referenced to phase 2:NBSB, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

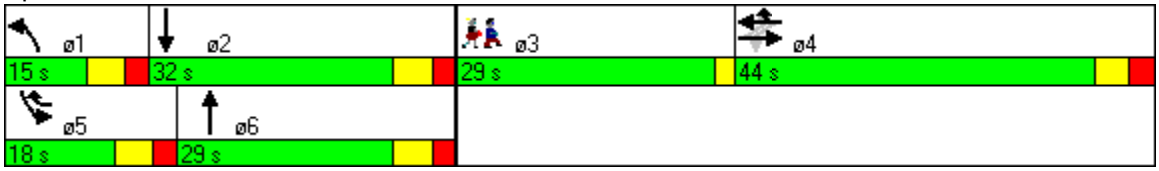
Splits and Phases: 13: I-84 EB Off & Buckland St

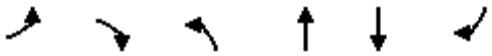
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	ø3
Lane Configurations										
Volume (vph)	220	20	40	10	140	40	1380	100	1570	
Lane Group Flow (vph)	242	66	0	62	175	43	1638	111	1933	
Turn Type	Perm		Perm		pt+ov	Prot		Prot		
Protected Phases		4		4	4 5	1	6	5	2	3
Permitted Phases	4		4							
Detector Phases	4	4	4	4	4 5	1	6	5	2	
Minimum Initial (s)	9.0	9.0	9.0	9.0		4.0	20.0	4.0	20.0	1.0
Minimum Split (s)	15.5	15.5	15.5	15.5		10.5	26.5	10.5	26.5	29.0
Total Split (s)	44.0	44.0	44.0	44.0	62.0	15.0	29.0	18.0	32.0	29.0
Total Split (%)	36.7%	36.7%	36.7%	36.7%	51.7%	12.5%	24.2%	15.0%	26.7%	24%
Yellow Time (s)	3.5	3.5	3.5	3.5		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	3.0	3.0	3.0	3.0		2.5	2.5	2.5	2.5	0.0
Lead/Lag	Lag	Lag	Lag	Lag		Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Recall Mode	None	None	None	None		None	C-Max	None	C-Max	None
v/c Ratio	0.75	0.15		0.18	0.25	0.29	0.59	0.58	0.93	
Control Delay	56.1	14.2		34.4	3.5	43.6	24.4	57.8	27.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	56.1	14.2		34.4	3.5	43.6	24.4	57.8	27.1	
Queue Length 50th (ft)	176	13		39	0	30	311	83	527	
Queue Length 95th (ft)	238	44		59	24	m50	m383	m109	m#976	
Internal Link Dist (ft)		467		1967			939		500	
Turn Bay Length (ft)						140				
Base Capacity (vph)	445	588		481	733	162	2762	207	2081	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	
Reduced v/c Ratio	0.54	0.11		0.13	0.24	0.27	0.59	0.54	0.93	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 48 (40%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: Red Stone Rd. & Buckland St

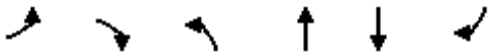




Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	800	322	0	318	119	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	870	350	0	346	129	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	302	129	129			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	302	129	129			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	61	100			
cM capacity (veh/h)	665	896	1454			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	580	640	173	173	129
Volume Left	580	290	0	0	0
Volume Right	0	350	0	0	0
cSH	665	775	1700	1700	1700
Volume to Capacity	0.87	0.83	0.10	0.10	0.08
Queue Length 95th (ft)	258	230	0	0	0
Control Delay (s)	35.9	27.6	0.0	0.0	0.0
Lane LOS	E	D			
Approach Delay (s)	31.5		0.0		0.0
Approach LOS	D				

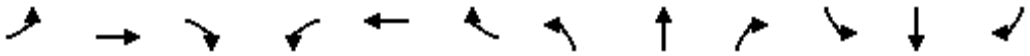
Intersection Summary			
Average Delay	22.7		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	0	71	1047	119	400
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	75	1102	125	421
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1036	336	546			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1036	336	546			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	93			
cM capacity (veh/h)	210	660	1019			

Direction, Lane #	NB 1	NB 2	SB 1
Volume Total	442	735	546
Volume Left	75	0	0
Volume Right	0	0	421
cSH	1019	1700	1700
Volume to Capacity	0.07	0.43	0.32
Queue Length 95th (ft)	6	0	0
Control Delay (s)	2.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.8		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	110	520	440	1410	380	420	110	100	600	0	0	0
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.85	0.85	0.85	0.50	0.50	0.50
Hourly flow rate (vph)	118	559	473	1533	413	457	129	118	706	0	0	0
Approach Volume (veh/h)		1151			2402			953			0	
Crossing Volume (veh/h)		1533#			365			677			2075#	
High Capacity (veh/h)		400			1039			809			251	
High v/c (veh/h)		2.88			2.31			1.18			0.00	
Low Capacity (veh/h)		295			849			645			176	
Low v/c (veh/h)		3.90			2.83			1.48			0.00	

Intersection Summary				
Maximum v/c High	2.88			
Maximum v/c Low	3.90			
Intersection Capacity Utilization	145.2%	ICU Level of Service	H	

Crossing flow exceeds 1200, method is not applicable

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Sign Control		Free			Free		Yield		Yield	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	0	760	0	520	0	0	1720	0	0
Peak Hour Factor	0.92	0.95	0.92	0.95	0.95	0.95	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	826	0	547	0	0	1870	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)										
pX, platoon unblocked										
vC, conflicting volume	547			826			1373	547	2417	547
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	547			826			1373	547	2417	547
tC, single (s)	4.1			4.1			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	100			100			100	0	0	100
cM capacity (veh/h)	1022			805			146	537	0	444

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	826	547	1870
Volume Left	0	0	0
Volume Right	826	0	1870
cSH	1700	1700	537
Volume to Capacity	0.49	0.32	3.48
Queue Length 95th (ft)	0	0	Err
Control Delay (s)	0.0	0.0	Err
Lane LOS			F
Approach Delay (s)	0.0	0.0	Err
Approach LOS			F

Intersection Summary			
Average Delay	5764.3		
Intersection Capacity Utilization	140.5%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.91		1.00	0.95	
Frt	1.00	0.90			1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1676			1791	1583	1770	5080		1770	3487	
Flt Permitted	0.72	1.00			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1335	1676			1419	1583	1770	5080		1770	3487	
Volume (vph)	220	20	40	40	10	140	40	1530	10	140	1570	170
Peak-hour factor, PHF	0.91	0.91	0.91	0.80	0.80	0.80	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	242	22	44	50	12	175	43	1628	11	156	1744	189
RTOR Reduction (vph)	0	33	0	0	0	107	0	0	0	0	4	0
Lane Group Flow (vph)	242	33	0	0	62	68	43	1639	0	156	1929	0
Turn Type	Perm			Perm		pt+ov	Prot			Prot		
Protected Phases		4			4	4 5	1	6		5	2	
Permitted Phases	4			4								
Actuated Green, G (s)	26.4	26.4			26.4	44.2	6.4	62.8		11.3	67.7	
Effective Green, g (s)	28.9	28.9			28.9	46.7	8.9	65.3		13.8	70.2	
Actuated g/C Ratio	0.24	0.24			0.24	0.39	0.07	0.54		0.12	0.59	
Clearance Time (s)	6.5	6.5			6.5		6.5	6.5		6.5	6.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	322	404			342	616	131	2764		204	2040	
v/s Ratio Prot		0.02				0.04	0.02	0.32		c0.09	c0.55	
v/s Ratio Perm	c0.18				0.04							
v/c Ratio	0.75	0.08			0.18	0.11	0.33	0.59		0.76	0.95	
Uniform Delay, d1	42.2	35.3			36.2	23.4	52.7	18.4		51.5	23.1	
Progression Factor	1.00	1.00			1.00	1.00	0.78	1.22		1.01	0.84	
Incremental Delay, d2	9.5	0.1			0.3	0.1	1.0	0.6		8.2	6.1	
Delay (s)	51.7	35.4			36.4	23.5	42.2	23.2		60.2	25.6	
Level of Service	D	D			D	C	D	C		E	C	
Approach Delay (s)		48.2			26.9			23.6			28.2	
Approach LOS		D			C			C			C	

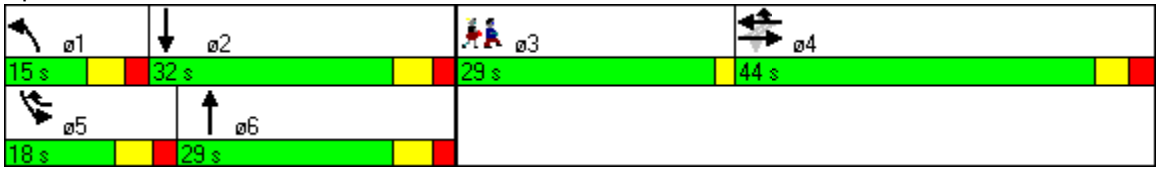
Intersection Summary			
HCM Average Control Delay	27.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

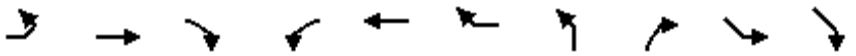
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	ø3
Lane Configurations										
Volume (vph)	220	20	40	10	140	40	1530	140	1570	
Lane Group Flow (vph)	242	66	0	62	175	43	1639	156	1933	
Turn Type	Perm		Perm		pt+ov	Prot		Prot		
Protected Phases		4		4	4 5	1	6	5	2	3
Permitted Phases	4		4							
Detector Phases	4	4	4	4	4 5	1	6	5	2	
Minimum Initial (s)	9.0	9.0	9.0	9.0		4.0	20.0	4.0	20.0	1.0
Minimum Split (s)	15.5	15.5	15.5	15.5		10.5	26.5	10.5	26.5	29.0
Total Split (s)	44.0	44.0	44.0	44.0	62.0	15.0	29.0	18.0	32.0	29.0
Total Split (%)	36.7%	36.7%	36.7%	36.7%	51.7%	12.5%	24.2%	15.0%	26.7%	24%
Yellow Time (s)	3.5	3.5	3.5	3.5		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	3.0	3.0	3.0	3.0		2.5	2.5	2.5	2.5	0.0
Lead/Lag	Lag	Lag	Lag	Lag		Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Recall Mode	None	None	None	None		None	C-Max	None	C-Max	None
v/c Ratio	0.75	0.15		0.18	0.24	0.29	0.59	0.76	0.93	
Control Delay	56.1	14.2		34.4	3.5	43.6	24.9	65.4	26.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	56.1	14.2		34.4	3.5	43.6	24.9	65.4	26.5	
Queue Length 50th (ft)	176	13		39	0	30	313	122	532	
Queue Length 95th (ft)	238	44		59	24	m50	m386	m154	m#938	
Internal Link Dist (ft)		467		1967			939		500	
Turn Bay Length (ft)						140				
Base Capacity (vph)	445	588		481	733	162	2767	207	2081	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	
Reduced v/c Ratio	0.54	0.11		0.13	0.24	0.27	0.59	0.75	0.93	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 48 (40%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: Red Stone Rd. & Buckland St





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SEL	SER
Lane Configurations										
Sign Control		Free			Free		Yield		Stop	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	410	0	0	0	570	0	840	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	446	0	0	0	620	0	913	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)					193					
pX, platoon unblocked										
vC, conflicting volume	620			446			1065	223	1136	446
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	620			446			1065	223	1136	446
tC, single (s)	4.1			4.1			6.5	6.9	7.5	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	100			100			100	0	0	100
cM capacity (veh/h)	957			1111			221	781	0	506

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	223	223	620	913
Volume Left	0	0	0	0
Volume Right	0	0	620	913
cSH	1700	1700	1700	781
Volume to Capacity	0.13	0.13	0.36	1.17
Queue Length 95th (ft)	0	0	0	714
Control Delay (s)	0.0	0.0	0.0	110.1
Lane LOS				F
Approach Delay (s)	0.0		0.0	110.1
Approach LOS				F

Intersection Summary			
Average Delay	50.8		
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	NBL	NBT	SBL	SBT	NEL	SWL
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	8.0	8.0
Lane Util. Factor	0.97	0.95	0.97	0.95	0.97	0.97
Frt	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	3467	3574	3467	3574	3467	3467
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	3467	3574	3467	3574	3467	3467
Volume (vph)	980	1160	330	1060	370	270
Peak-hour factor, PHF	0.86	0.86	0.93	0.93	0.91	0.93
Adj. Flow (vph)	1140	1349	355	1140	407	290
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1140	1349	355	1140	407	290
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Turn Type	Prot		Prot		Prot	Prot
Protected Phases	5	2	1	6	8	4
Permitted Phases		2		6		
Actuated Green, G (s)	24.0	42.0	9.0	26.0	14.4	15.4
Effective Green, g (s)	28.0	44.0	12.0	28.0	14.4	14.4
Actuated g/C Ratio	0.32	0.50	0.14	0.32	0.16	0.16
Clearance Time (s)	8.0	8.0	7.0	8.0	8.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1098	1779	471	1132	565	565
v/s Ratio Prot	c0.33	0.38	0.10	c0.32	c0.12	0.08
v/s Ratio Perm						
v/c Ratio	1.04	0.76	0.75	1.01	0.72	0.51
Uniform Delay, d1	30.2	17.9	36.8	30.2	35.1	33.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.6	1.9	6.7	28.5	4.5	0.8
Delay (s)	67.8	19.8	43.5	58.7	39.6	34.6
Level of Service	E	B	D	E	D	C
Approach Delay (s)		41.8		55.1		
Approach LOS		D		E		

Intersection Summary			
HCM Average Control Delay	45.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	88.4	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	NEL	SWL
Lane Configurations						
Volume (vph)	980	1160	330	1060	370	270
Lane Group Flow (vph)	1140	1349	355	1140	407	290
Turn Type	Prot		Prot		Prot	Prot
Protected Phases	5	2	1	6	8	4
Permitted Phases		2		6		
Detector Phases	5	2	1	6	8	4
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	24.0	24.0	11.0	24.0	24.0	23.0
Total Split (s)	32.0	50.0	16.0	34.0	24.0	24.0
Total Split (%)	35.6%	55.6%	17.8%	37.8%	26.7%	26.7%
Yellow Time (s)	5.0	5.0	4.0	5.0	5.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Recall Mode	Min	Min	None	Min	None	None
v/c Ratio	1.04	0.76	0.76	1.01	0.72	0.51
Control Delay	69.0	21.7	48.6	60.3	42.9	37.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.0	21.7	48.6	60.3	42.9	37.2
Queue Length 50th (ft)	~367	313	101	~351	112	77
Queue Length 95th (ft)	#457	373	#163	#494	160	116
Internal Link Dist (ft)		165		152		
Turn Bay Length (ft)						
Base Capacity (vph)	1098	1778	470	1132	616	616
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.04	0.76	0.76	1.01	0.66	0.47

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 88.5
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Int

Movement	NBL	NBT	SBL	SBT	NEL	SWL
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	8.0	8.0
Lane Util. Factor	0.97	0.95	0.97	0.95	0.97	0.97
Frt	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	3467	3574	3467	3574	3467	3467
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	3467	3574	3467	3574	3467	3467
Volume (vph)	980	1160	330	1060	370	270
Peak-hour factor, PHF	0.86	0.86	0.93	0.93	0.91	0.93
Adj. Flow (vph)	1140	1349	355	1140	407	290
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1140	1349	355	1140	407	290
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Turn Type	Prot		Prot		Prot	Prot
Protected Phases	5	2	1	6	8	4
Permitted Phases		2		6		
Actuated Green, G (s)	27.3	46.6	10.1	28.4	15.4	16.4
Effective Green, g (s)	31.3	48.6	13.1	30.4	15.4	15.4
Actuated g/C Ratio	0.29	0.45	0.12	0.28	0.14	0.14
Clearance Time (s)	8.0	8.0	7.0	8.0	8.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1008	1613	422	1009	496	496
v/s Ratio Prot	c0.33	0.38	0.10	c0.32	c0.12	0.08
v/s Ratio Perm						
v/c Ratio	1.13	0.84	0.84	1.13	0.82	0.58
Uniform Delay, d1	38.2	26.0	46.3	38.6	44.8	43.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	71.6	3.9	14.1	71.2	10.5	1.8
Delay (s)	109.8	30.0	60.3	109.8	55.3	44.9
Level of Service	F	C	E	F	E	D
Approach Delay (s)		66.5		98.1		
Approach LOS		E		F		

Intersection Summary			
HCM Average Control Delay	74.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	30.6
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

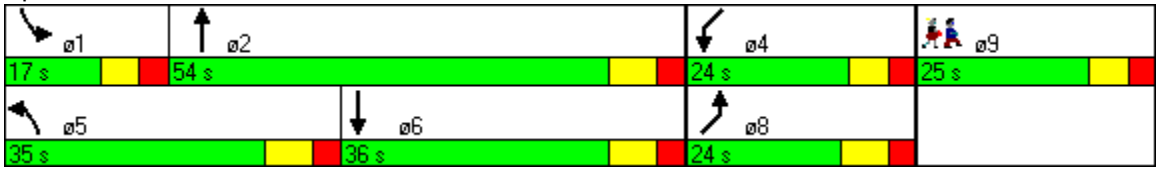
c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	NEL	SWL	ø9
Lane Configurations							
Volume (vph)	980	1160	330	1060	370	270	
Lane Group Flow (vph)	1140	1349	355	1140	407	290	
Turn Type	Prot		Prot		Prot	Prot	
Protected Phases	5	2	1	6	8	4	9
Permitted Phases		2		6			
Detector Phases	5	2	1	6	8	4	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	24.0	24.0	11.0	24.0	24.0	23.0	25.0
Total Split (s)	35.0	54.0	17.0	36.0	24.0	24.0	25.0
Total Split (%)	29.2%	45.0%	14.2%	30.0%	20.0%	20.0%	21%
Yellow Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None	None
v/c Ratio	1.08	0.80	0.80	1.09	0.79	0.56	
Control Delay	88.8	30.1	60.5	90.1	56.0	47.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	88.8	30.1	60.5	90.1	56.0	47.3	
Queue Length 50th (ft)	~357	324	107	~366	120	82	
Queue Length 95th (ft)	#643	569	#230	#706	#241	155	
Internal Link Dist (ft)		165		152			
Turn Bay Length (ft)							
Base Capacity (vph)	1052	1680	441	1050	538	538	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.08	0.80	0.80	1.09	0.76	0.54	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 103.5
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Int



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Sign Control		Free			Free		Yield		Yield	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	0	760	0	800	0	0	1840	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	826	0	870	0	0	2000	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)		732								
pX, platoon unblocked										
vC, conflicting volume	870			826			1696	435	2435	870
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	870			826			1696	435	2435	870
tC, single (s)	4.1			4.1			6.5	6.9	7.5	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	100			100			100	0	0	100
cM capacity (veh/h)	771			800			92	569	0	288

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	826	435	435	2000
Volume Left	0	0	0	0
Volume Right	826	0	0	2000
cSH	1700	1700	1700	569
Volume to Capacity	0.49	0.26	0.26	3.51
Queue Length 95th (ft)	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	Err
Lane LOS				F
Approach Delay (s)	0.0	0.0		Err
Approach LOS				F

Intersection Summary			
Average Delay	5411.2		
Intersection Capacity Utilization	142.7%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.91		1.00	0.95	
Frt	1.00	0.90			1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1676			1791	1583	1770	5080		1770	3487	
Flt Permitted	0.72	1.00			0.76	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1335	1676			1419	1583	1770	5080		1770	3487	
Volume (vph)	220	20	40	40	10	140	40	1530	10	140	1570	170
Peak-hour factor, PHF	0.91	0.91	0.91	0.80	0.80	0.80	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	242	22	44	50	12	175	43	1628	11	156	1744	189
RTOR Reduction (vph)	0	33	0	0	0	107	0	0	0	0	4	0
Lane Group Flow (vph)	242	33	0	0	62	68	43	1639	0	156	1929	0
Turn Type	Perm			Perm		pt+ov	Prot			Prot		
Protected Phases		4			4	4 5	1	6		5	2	
Permitted Phases	4			4								
Actuated Green, G (s)	26.4	26.4			26.4	44.2	6.4	62.8		11.3	67.7	
Effective Green, g (s)	28.9	28.9			28.9	46.7	8.9	65.3		13.8	70.2	
Actuated g/C Ratio	0.24	0.24			0.24	0.39	0.07	0.54		0.12	0.59	
Clearance Time (s)	6.5	6.5			6.5		6.5	6.5		6.5	6.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	322	404			342	616	131	2764		204	2040	
v/s Ratio Prot		0.02				0.04	0.02	0.32		c0.09	c0.55	
v/s Ratio Perm	c0.18				0.04							
v/c Ratio	0.75	0.08			0.18	0.11	0.33	0.59		0.76	0.95	
Uniform Delay, d1	42.2	35.3			36.2	23.4	52.7	18.4		51.5	23.1	
Progression Factor	1.00	1.00			1.00	1.00	0.78	1.22		1.01	0.84	
Incremental Delay, d2	9.5	0.1			0.3	0.1	1.0	0.6		8.2	6.1	
Delay (s)	51.7	35.4			36.4	23.5	42.2	23.2		60.2	25.6	
Level of Service	D	D			D	C	D	C		E	C	
Approach Delay (s)		48.2			26.9			23.6			28.2	
Approach LOS		D			C			C			C	

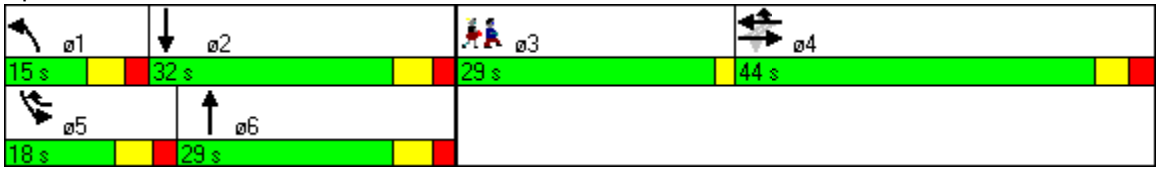
Intersection Summary			
HCM Average Control Delay	27.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

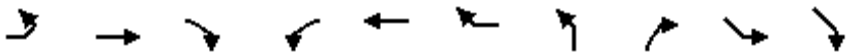
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	ø3
Lane Configurations										
Volume (vph)	220	20	40	10	140	40	1530	140	1570	
Lane Group Flow (vph)	242	66	0	62	175	43	1639	156	1933	
Turn Type	Perm		Perm		pt+ov	Prot		Prot		
Protected Phases		4		4	4 5	1	6	5	2	3
Permitted Phases	4		4							
Detector Phases	4	4	4	4	4 5	1	6	5	2	
Minimum Initial (s)	9.0	9.0	9.0	9.0		4.0	20.0	4.0	20.0	1.0
Minimum Split (s)	15.5	15.5	15.5	15.5		10.5	26.5	10.5	26.5	29.0
Total Split (s)	44.0	44.0	44.0	44.0	62.0	15.0	29.0	18.0	32.0	29.0
Total Split (%)	36.7%	36.7%	36.7%	36.7%	51.7%	12.5%	24.2%	15.0%	26.7%	24%
Yellow Time (s)	3.5	3.5	3.5	3.5		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	3.0	3.0	3.0	3.0		2.5	2.5	2.5	2.5	0.0
Lead/Lag	Lag	Lag	Lag	Lag		Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?										
Recall Mode	None	None	None	None		None	C-Max	None	C-Max	None
v/c Ratio	0.75	0.15		0.18	0.24	0.29	0.59	0.76	0.93	
Control Delay	56.1	14.2		34.4	3.5	43.6	24.9	65.4	26.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	56.1	14.2		34.4	3.5	43.6	24.9	65.4	26.5	
Queue Length 50th (ft)	176	13		39	0	30	313	122	532	
Queue Length 95th (ft)	238	44		59	24	m50	m386	m154	m#938	
Internal Link Dist (ft)		467		1967			939		500	
Turn Bay Length (ft)						140				
Base Capacity (vph)	445	588		481	733	162	2767	207	2081	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	
Reduced v/c Ratio	0.54	0.11		0.13	0.24	0.27	0.59	0.75	0.93	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 48 (40%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: Red Stone Rd. & Buckland St





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SEL	SER
Lane Configurations										
Sign Control		Free			Free		Yield		Stop	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	410	0	0	0	570	0	840	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	446	0	0	0	620	0	913	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)					193					
pX, platoon unblocked										
vC, conflicting volume	620			446			1065	223	1136	446
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	620			446			1065	223	1136	446
tC, single (s)	4.1			4.1			6.5	6.9	7.5	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	100			100			100	0	0	100
cM capacity (veh/h)	957			1111			221	781	0	506

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	223	223	620	913
Volume Left	0	0	0	0
Volume Right	0	0	620	913
cSH	1700	1700	1700	781
Volume to Capacity	0.13	0.13	0.36	1.17
Queue Length 95th (ft)	0	0	0	714
Control Delay (s)	0.0	0.0	0.0	110.1
Lane LOS				F
Approach Delay (s)	0.0		0.0	110.1
Approach LOS				F

Intersection Summary			
Average Delay	50.8		
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	NBL	NBT	SBL	SBT	NEL	SWL
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	8.0	8.0
Lane Util. Factor	0.97	0.95	0.97	0.95	0.97	0.97
Frt	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	3467	3574	3467	3574	3467	3467
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	3467	3574	3467	3574	3467	3467
Volume (vph)	980	1160	330	1060	370	270
Peak-hour factor, PHF	0.86	0.86	0.93	0.93	0.91	0.93
Adj. Flow (vph)	1140	1349	355	1140	407	290
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1140	1349	355	1140	407	290
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Turn Type	Prot		Prot		Prot	Prot
Protected Phases	5	2	1	6	8	4
Permitted Phases		2		6		
Actuated Green, G (s)	24.0	42.0	9.0	26.0	14.4	15.4
Effective Green, g (s)	28.0	44.0	12.0	28.0	14.4	14.4
Actuated g/C Ratio	0.32	0.50	0.14	0.32	0.16	0.16
Clearance Time (s)	8.0	8.0	7.0	8.0	8.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1098	1779	471	1132	565	565
v/s Ratio Prot	c0.33	0.38	0.10	c0.32	c0.12	0.08
v/s Ratio Perm						
v/c Ratio	1.04	0.76	0.75	1.01	0.72	0.51
Uniform Delay, d1	30.2	17.9	36.8	30.2	35.1	33.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.6	1.9	6.7	28.5	4.5	0.8
Delay (s)	67.8	19.8	43.5	58.7	39.6	34.6
Level of Service	E	B	D	E	D	C
Approach Delay (s)		41.8		55.1		
Approach LOS		D		E		

Intersection Summary			
HCM Average Control Delay	45.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	88.4	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	NEL	SWL
Lane Configurations						
Volume (vph)	980	1160	330	1060	370	270
Lane Group Flow (vph)	1140	1349	355	1140	407	290
Turn Type	Prot		Prot		Prot	Prot
Protected Phases	5	2	1	6	8	4
Permitted Phases		2		6		
Detector Phases	5	2	1	6	8	4
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	24.0	24.0	11.0	24.0	24.0	23.0
Total Split (s)	32.0	50.0	16.0	34.0	24.0	24.0
Total Split (%)	35.6%	55.6%	17.8%	37.8%	26.7%	26.7%
Yellow Time (s)	5.0	5.0	4.0	5.0	5.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Recall Mode	Min	Min	None	Min	None	None
v/c Ratio	1.04	0.76	0.76	1.01	0.72	0.51
Control Delay	69.0	21.7	48.6	60.3	42.9	37.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.0	21.7	48.6	60.3	42.9	37.2
Queue Length 50th (ft)	~367	313	101	~351	112	77
Queue Length 95th (ft)	#457	373	#163	#494	160	116
Internal Link Dist (ft)		165		152		
Turn Bay Length (ft)						
Base Capacity (vph)	1098	1778	470	1132	616	616
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.04	0.76	0.76	1.01	0.66	0.47

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 88.5
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Int

Movement	NBL	NBT	SBL	SBT	NEL	SWL
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	8.0	8.0
Lane Util. Factor	0.97	0.95	0.97	0.95	0.97	0.97
Frt	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	3467	3574	3467	3574	3467	3467
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	3467	3574	3467	3574	3467	3467
Volume (vph)	980	1160	330	1060	370	270
Peak-hour factor, PHF	0.86	0.86	0.93	0.93	0.91	0.93
Adj. Flow (vph)	1140	1349	355	1140	407	290
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1140	1349	355	1140	407	290
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Turn Type	Prot		Prot		Prot	Prot
Protected Phases	5	2	1	6	8	4
Permitted Phases		2		6		
Actuated Green, G (s)	27.3	46.6	10.1	28.4	15.4	16.4
Effective Green, g (s)	31.3	48.6	13.1	30.4	15.4	15.4
Actuated g/C Ratio	0.29	0.45	0.12	0.28	0.14	0.14
Clearance Time (s)	8.0	8.0	7.0	8.0	8.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1008	1613	422	1009	496	496
v/s Ratio Prot	c0.33	0.38	0.10	c0.32	c0.12	0.08
v/s Ratio Perm						
v/c Ratio	1.13	0.84	0.84	1.13	0.82	0.58
Uniform Delay, d1	38.2	26.0	46.3	38.6	44.8	43.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	71.6	3.9	14.1	71.2	10.5	1.8
Delay (s)	109.8	30.0	60.3	109.8	55.3	44.9
Level of Service	F	C	E	F	E	D
Approach Delay (s)		66.5		98.1		
Approach LOS		E		F		

Intersection Summary			
HCM Average Control Delay	74.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	30.6
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

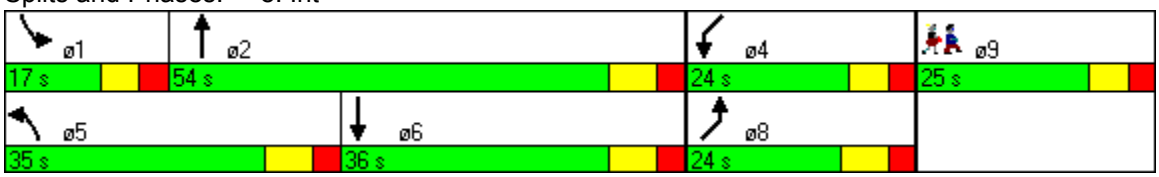
c Critical Lane Group

Lane Group	NBL	NBT	SBL	SBT	NEL	SWL	ø9
Lane Configurations							
Volume (vph)	980	1160	330	1060	370	270	
Lane Group Flow (vph)	1140	1349	355	1140	407	290	
Turn Type	Prot		Prot		Prot	Prot	
Protected Phases	5	2	1	6	8	4	9
Permitted Phases		2		6			
Detector Phases	5	2	1	6	8	4	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	24.0	24.0	11.0	24.0	24.0	23.0	25.0
Total Split (s)	35.0	54.0	17.0	36.0	24.0	24.0	25.0
Total Split (%)	29.2%	45.0%	14.2%	30.0%	20.0%	20.0%	21%
Yellow Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None	None
v/c Ratio	1.08	0.80	0.80	1.09	0.79	0.56	
Control Delay	88.8	30.1	60.5	90.1	56.0	47.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	88.8	30.1	60.5	90.1	56.0	47.3	
Queue Length 50th (ft)	~357	324	107	~366	120	82	
Queue Length 95th (ft)	#643	569	#230	#706	#241	155	
Internal Link Dist (ft)		165		152			
Turn Bay Length (ft)							
Base Capacity (vph)	1052	1680	441	1050	538	538	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.08	0.80	0.80	1.09	0.76	0.54	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 103.5
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

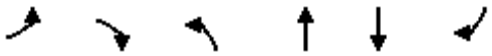
Splits and Phases: 8: Int



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Sign Control		Free			Free		Yield		Yield	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	0	760	0	800	0	0	1840	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	826	0	870	0	0	2000	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)		717								
pX, platoon unblocked										
vC, conflicting volume	870			826			1696	435	2435	870
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	870			826			1696	435	2435	870
tC, single (s)	4.1			4.1			6.5	6.9	7.5	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	100			100			100	0	0	100
cM capacity (veh/h)	771			800			92	569	0	288

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	826	435	435	2000
Volume Left	0	0	0	0
Volume Right	826	0	0	2000
cSH	1700	1700	1700	569
Volume to Capacity	0.49	0.26	0.26	3.51
Queue Length 95th (ft)	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	Err
Lane LOS				F
Approach Delay (s)	0.0	0.0		Err
Approach LOS				F

Intersection Summary			
Average Delay	5411.2		
Intersection Capacity Utilization	142.7%	ICU Level of Service	H
Analysis Period (min)	15		



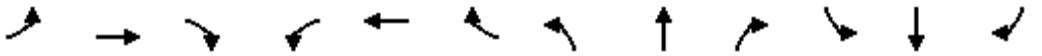
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	126	3539	3539	1583
Volume (vph)	520	440	210	600	1810	800
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	565	478	228	652	1967	870
RTOR Reduction (vph)	0	176	0	0	0	0
Lane Group Flow (vph)	565	302	228	652	1967	870
Turn Type		custom	pm+pt			Free
Protected Phases	4	4 5	5	2	6	
Permitted Phases		4	2			Free
Actuated Green, G (s)	16.1	31.1	67.3	67.3	52.3	106.3
Effective Green, g (s)	19.1	34.1	70.3	70.3	55.3	106.3
Actuated g/C Ratio	0.18	0.32	0.66	0.66	0.52	1.00
Clearance Time (s)	7.0		7.0	7.0	7.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	617	508	253	2340	1841	1583
v/s Ratio Prot	c0.16	0.19	c0.09	0.18	c0.56	
v/s Ratio Perm			0.50			c0.55
v/c Ratio	0.92	0.59	0.90	0.28	1.07	0.55
Uniform Delay, d1	42.8	30.3	49.0	7.5	25.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.3	1.9	31.8	0.1	42.0	1.4
Delay (s)	61.1	32.2	80.8	7.5	67.5	1.4
Level of Service	E	C	F	A	E	A
Approach Delay (s)	47.8			26.5	47.2	
Approach LOS	D			C	D	

Intersection Summary			
HCM Average Control Delay	43.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	106.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø3
Lane Configurations							
Volume (vph)	520	440	210	600	1810	800	
Lane Group Flow (vph)	565	478	228	652	1967	870	
Turn Type		custom	pm+pt			Free	
Protected Phases	4	4 5	5	2	6		3
Permitted Phases		4	2			Free	
Detector Phases	4	4 5	5	2	6		
Minimum Initial (s)	4.0		4.0	4.0	4.0		4.0
Minimum Split (s)	23.0		11.0	23.0	23.0		23.0
Total Split (s)	23.0	38.0	15.0	74.0	59.0	0.0	23.0
Total Split (%)	19.2%	31.7%	12.5%	61.7%	49.2%	0.0%	19%
Yellow Time (s)	4.0		4.0	4.0	4.0		4.0
All-Red Time (s)	3.0		3.0	3.0	3.0		3.0
Lead/Lag	Lag		Lead		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes		Yes
Recall Mode	None		None	Min	Min		None
v/c Ratio	0.87	0.68	0.85	0.26	1.01	0.55	
Control Delay	55.3	18.7	51.5	6.6	47.1	1.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	55.3	18.7	51.5	6.6	47.1	1.4	
Queue Length 50th (ft)	174	109	86	61	582	0	
Queue Length 95th (ft)	#336	281	#279	147	#1048	0	
Internal Link Dist (ft)	72			404	83		
Turn Bay Length (ft)			300				
Base Capacity (vph)	651	708	269	2474	1944	1583	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.87	0.68	0.85	0.26	1.01	0.55	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 100.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 144: Pleasant Valley Rd & I-84 Westbound Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0			4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00			1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85			0.86		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00			1.00		0.97	1.00
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583			1611		3450	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00			1.00		0.97	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583			1611		3450	1583
Volume (vph)	310	1310	290	690	1460	620	0	0	290	180	170	250
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	337	1424	315	750	1587	674	0	0	315	196	185	272
RTOR Reduction (vph)	0	0	140	0	0	0	0	0	0	0	0	218
Lane Group Flow (vph)	337	1424	175	750	1587	674	0	0	315	0	381	54
Turn Type	Prot		Prot	Prot		Perm			Free	Split		Prot
Protected Phases	1	6	6	5	2					4	4	4
Permitted Phases						2			Free			
Actuated Green, G (s)	19.0	43.1	43.1	20.0	44.1	44.1			101.0		16.9	16.9
Effective Green, g (s)	22.0	46.1	46.1	23.0	47.1	47.1			101.0		19.9	19.9
Actuated g/C Ratio	0.22	0.46	0.46	0.23	0.47	0.47			1.00		0.20	0.20
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0					7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0					3.0	3.0
Lane Grp Cap (vph)	386	1615	723	782	1650	738			1611		680	312
v/s Ratio Prot	0.19	0.40	0.11	c0.22	c0.45						c0.11	0.03
v/s Ratio Perm						0.43			c0.20			
v/c Ratio	0.87	0.88	0.24	0.96	0.96	0.91			0.20		0.56	0.17
Uniform Delay, d1	38.2	25.0	16.8	38.5	26.1	25.1			0.0		36.6	33.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00
Incremental Delay, d2	19.0	6.0	0.2	22.4	14.1	15.7			0.3		1.1	0.3
Delay (s)	57.2	31.0	16.9	60.9	40.2	40.7			0.3		37.7	34.0
Level of Service	E	C	B	E	D	D			A		D	C
Approach Delay (s)		33.1			45.5			0.3			36.1	
Approach LOS		C			D			A			D	

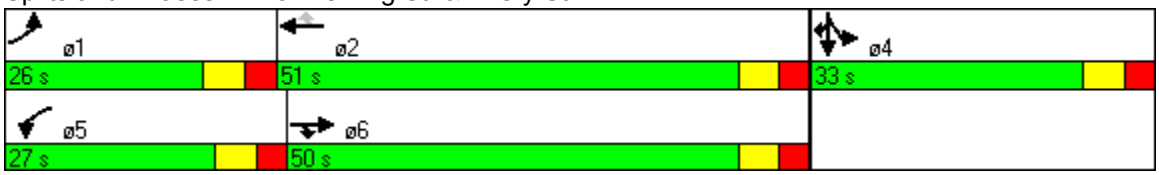
Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	101.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBR	SBT	SBR
Lane Configurations									
Volume (vph)	310	1310	290	690	1460	620	290	170	250
Lane Group Flow (vph)	337	1424	315	750	1587	674	315	381	272
Turn Type	Prot		Prot	Prot		Perm	Free		Prot
Protected Phases	1	6	6	5	2			4	4
Permitted Phases						2	Free		
Detector Phases	1	6	6	5	2	2		4	4
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0		6.0	6.0
Minimum Split (s)	12.0	22.3	22.3	12.0	22.3	22.3		33.0	33.0
Total Split (s)	26.0	50.0	50.0	27.0	51.0	51.0	0.0	33.0	33.0
Total Split (%)	23.6%	45.5%	45.5%	24.5%	46.4%	46.4%	0.0%	30.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			
Recall Mode	None	Min	Min	None	Min	Min		None	None
v/c Ratio	0.87	0.88	0.37	0.96	0.96	0.91	0.20	0.56	0.51
Control Delay	63.0	33.6	5.5	63.4	42.3	45.0	0.3	39.7	7.8
Queue Delay	0.0	0.3	0.0	0.0	1.1	0.0	0.0	0.0	0.1
Total Delay	63.0	34.0	5.5	63.4	43.5	45.0	0.3	39.7	7.9
Queue Length 50th (ft)	212	428	20	247	506	393	0	117	0
Queue Length 95th (ft)	#399	#636	79	#398	#747	#690	0	164	64
Internal Link Dist (ft)		555			724			776	
Turn Bay Length (ft)	200		300	350					200
Base Capacity (vph)	386	1613	862	782	1649	737	1611	910	618
Starvation Cap Reductn	0	23	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	16	0	0	0	21
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.90	0.37	0.96	0.97	0.91	0.20	0.42	0.46

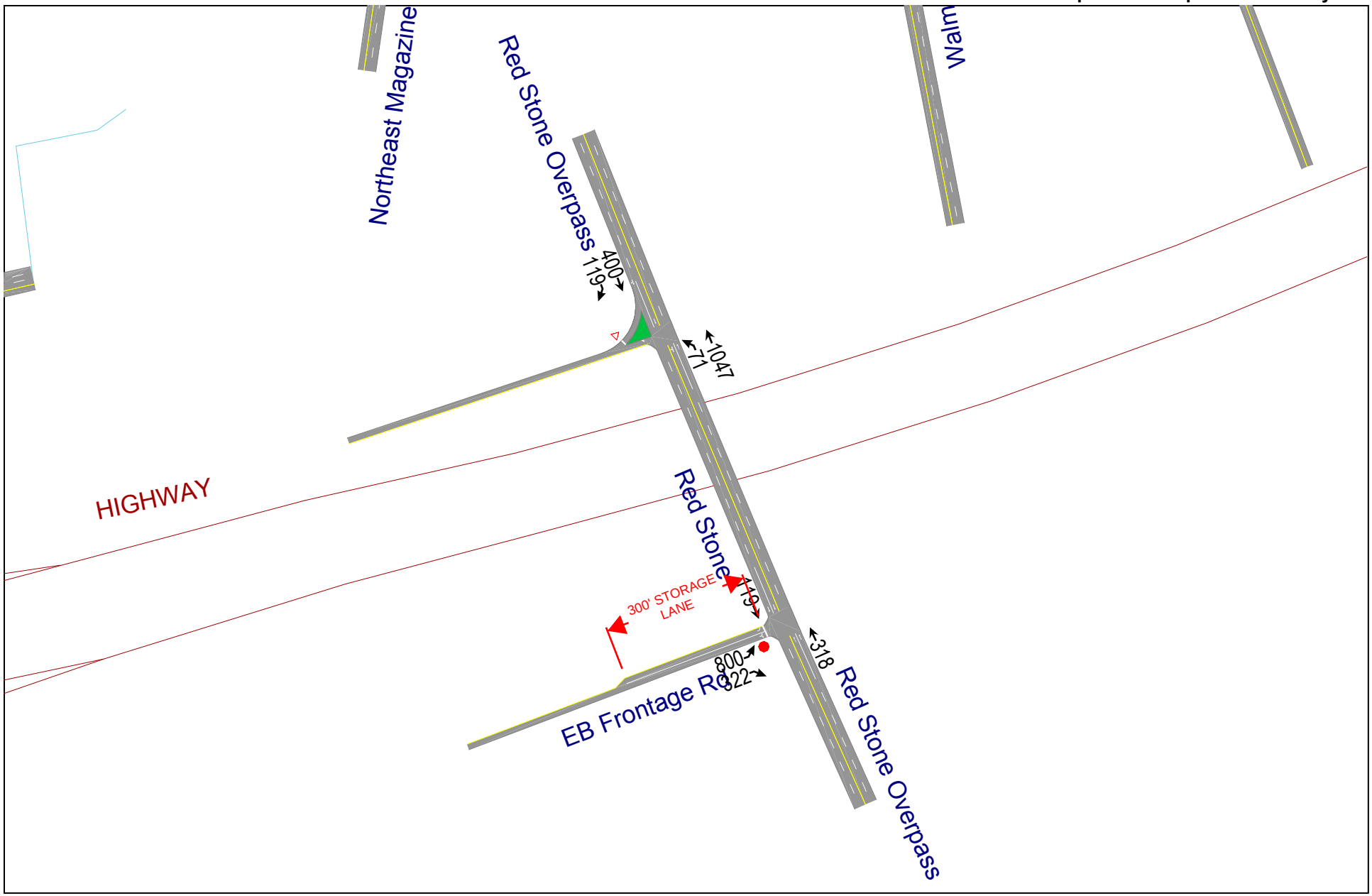
Intersection Summary

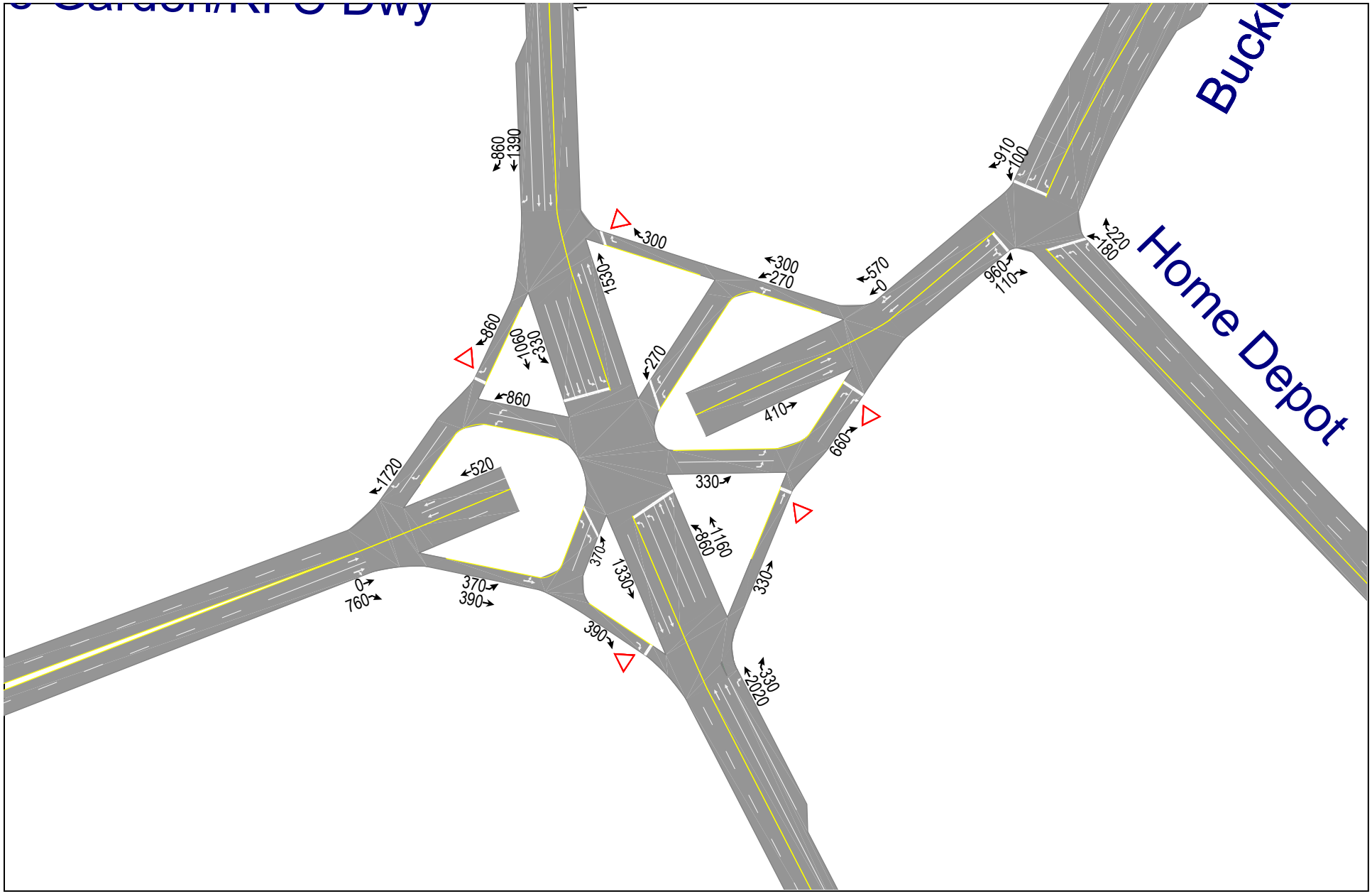
Cycle Length: 110
Actuated Cycle Length: 101.1
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

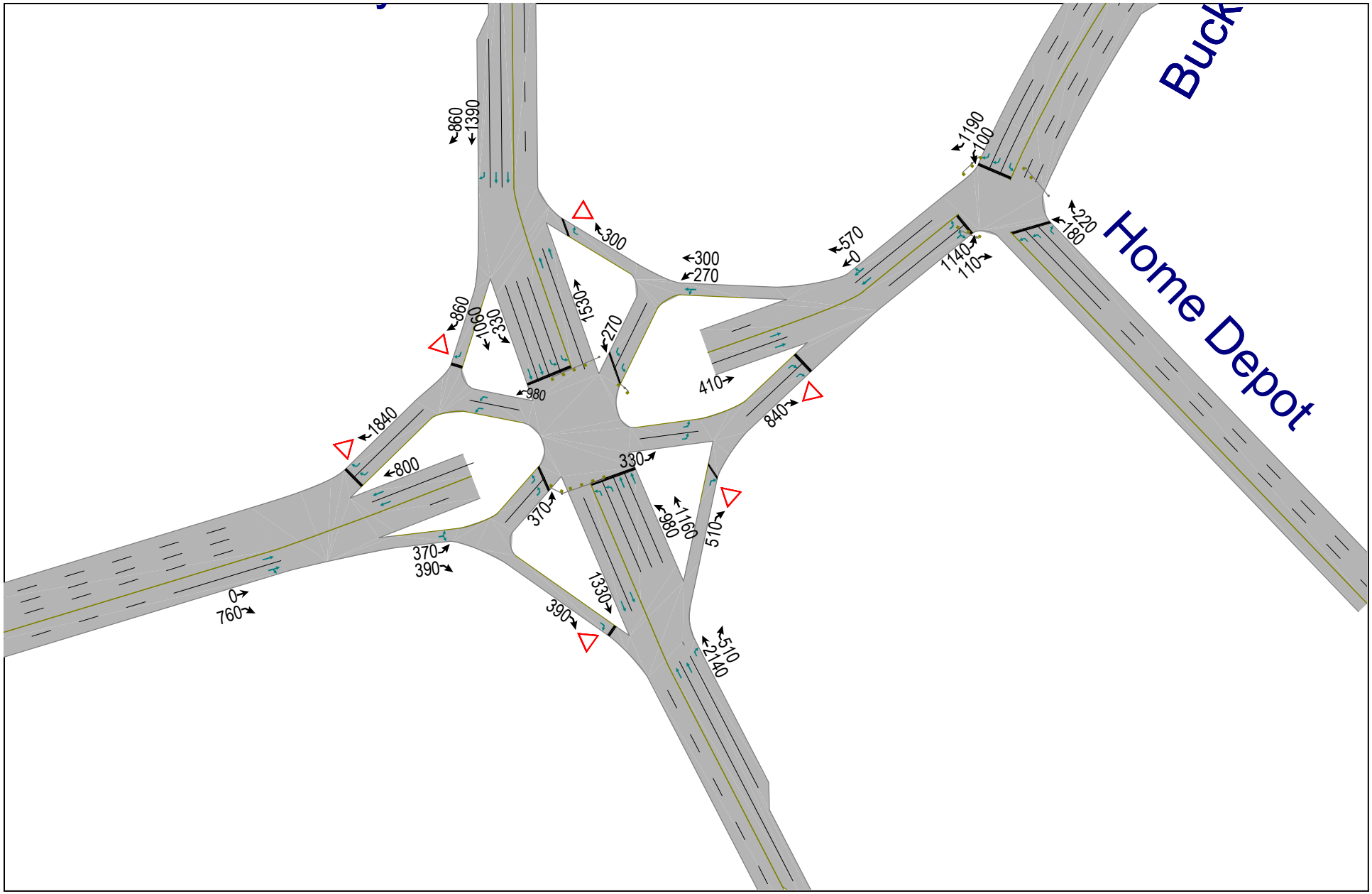
Splits and Phases: 23: Deming St. & Avery St

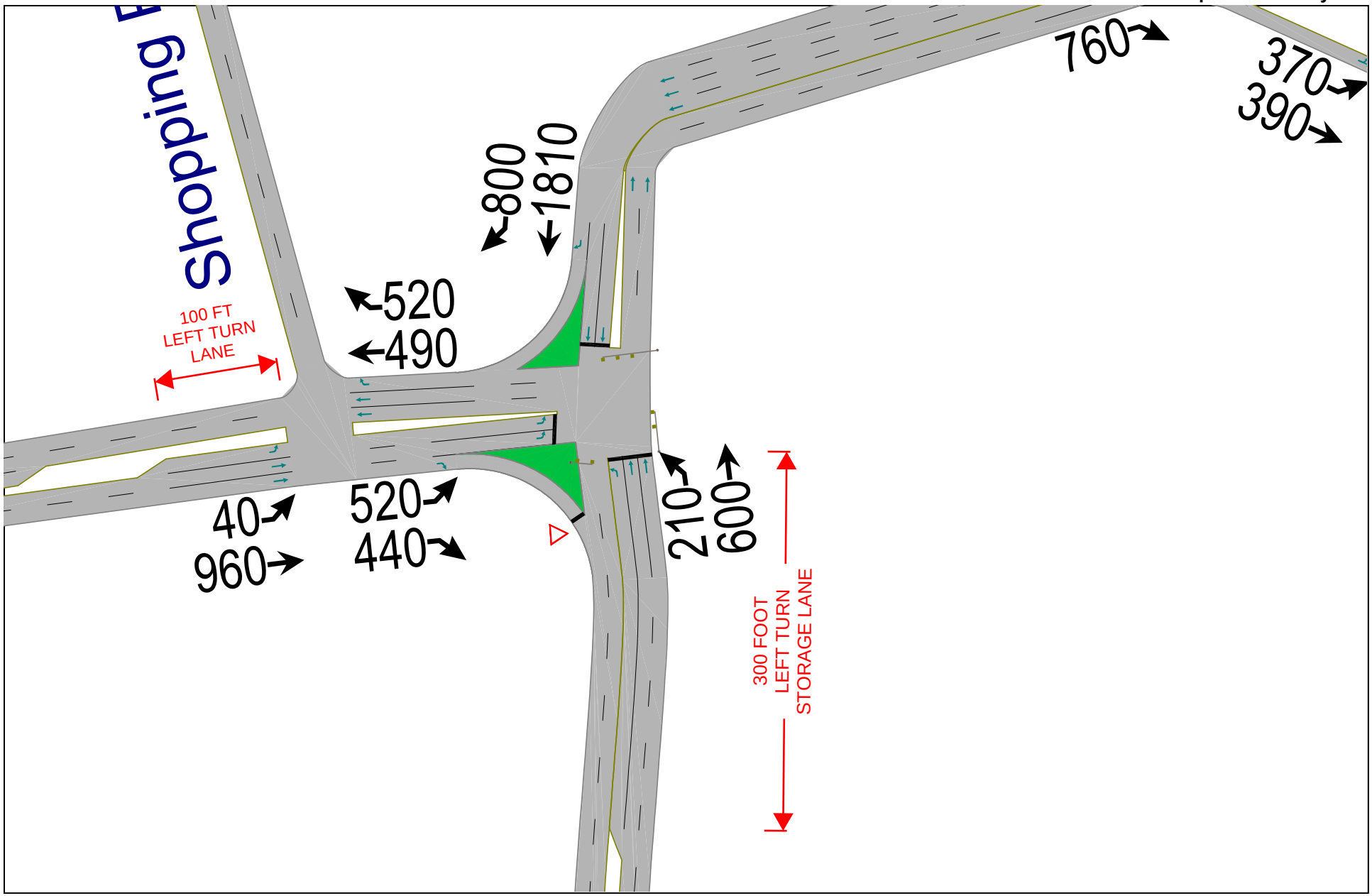


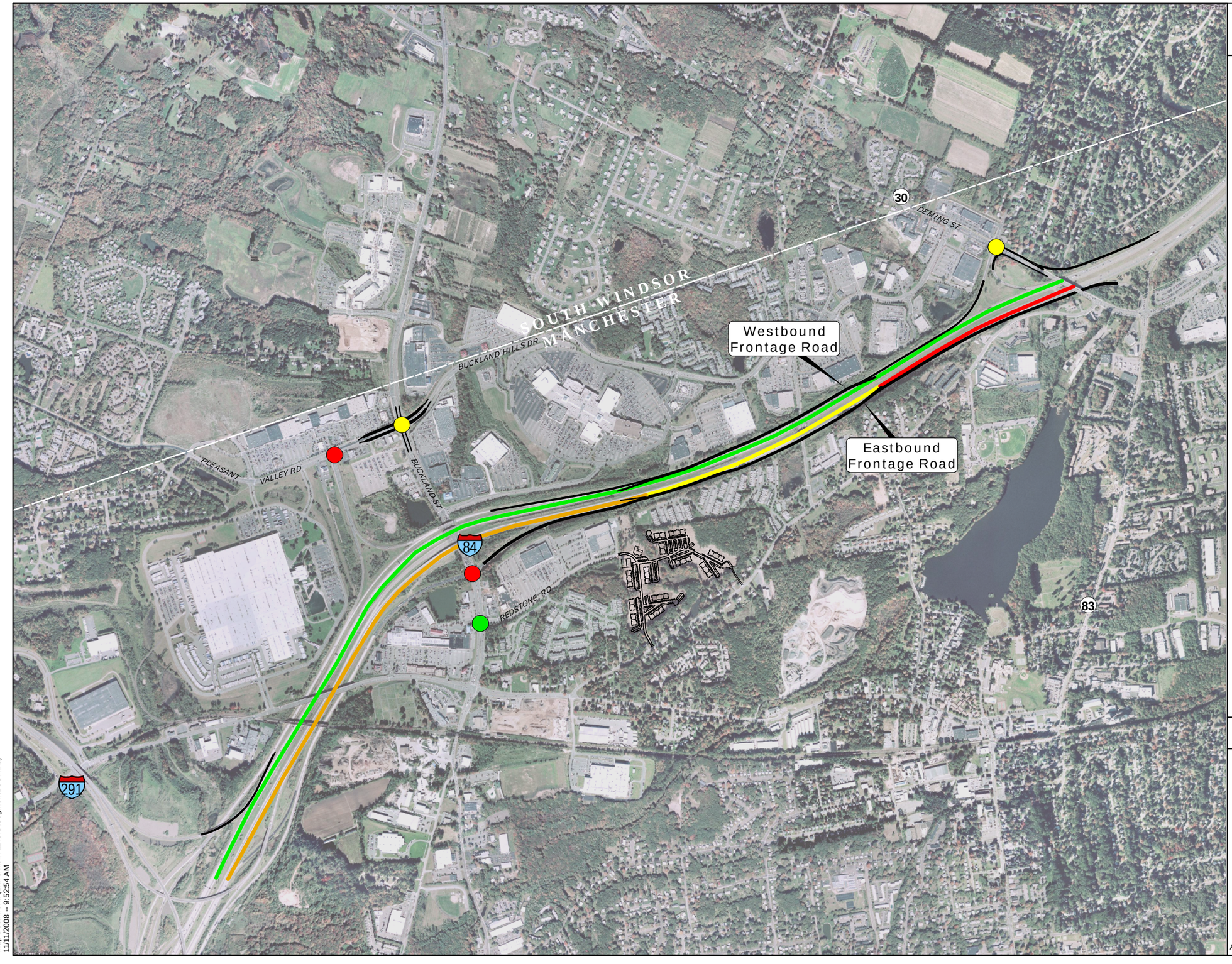
Appendix L
LOS for Optimized Preferred Alternatives


Northeast Magazine
Red Stone Overpass
Walm
400
119
1047
71
HIGHWAY
Red Stone
300' STORAGE LANE
449
318
800
822
EB Frontage Rd
Red Stone Overpass


Home Depot
860
1390
300
1630
300
270
570
0
910
100
220
180
960
110
860
1060
330
270
860
410
660
1720
520
330
1160
860
370
1330
330
0
760
370
390
390
330
2020


Buck
Home Depot
860
1390
300
300
270
570
0
1190
100
220
180
1140
110
860
1010
330
1530
270
980
410
840
1840
800
330
370
1160
980
510
370
390
0
760
390
1330
510
2140


760
370
390
800
1810
520
490
100 FT
LEFT TURN
LANE
40
960
520
440
210
600
300 FOOT
LEFT TURN
STORAGE LANE



EARTH TECH | AECOM

Intersection LOS

- A,B,C
- D,E
- F

Segment LOS

- A,B,C
- D,E
- F (Improvement over No Build)
- F

Buckland Area Transportation Study

Level of Service Summary

Option 3 Concept 1 Modified

Year 2030 Friday PM Peak Hour

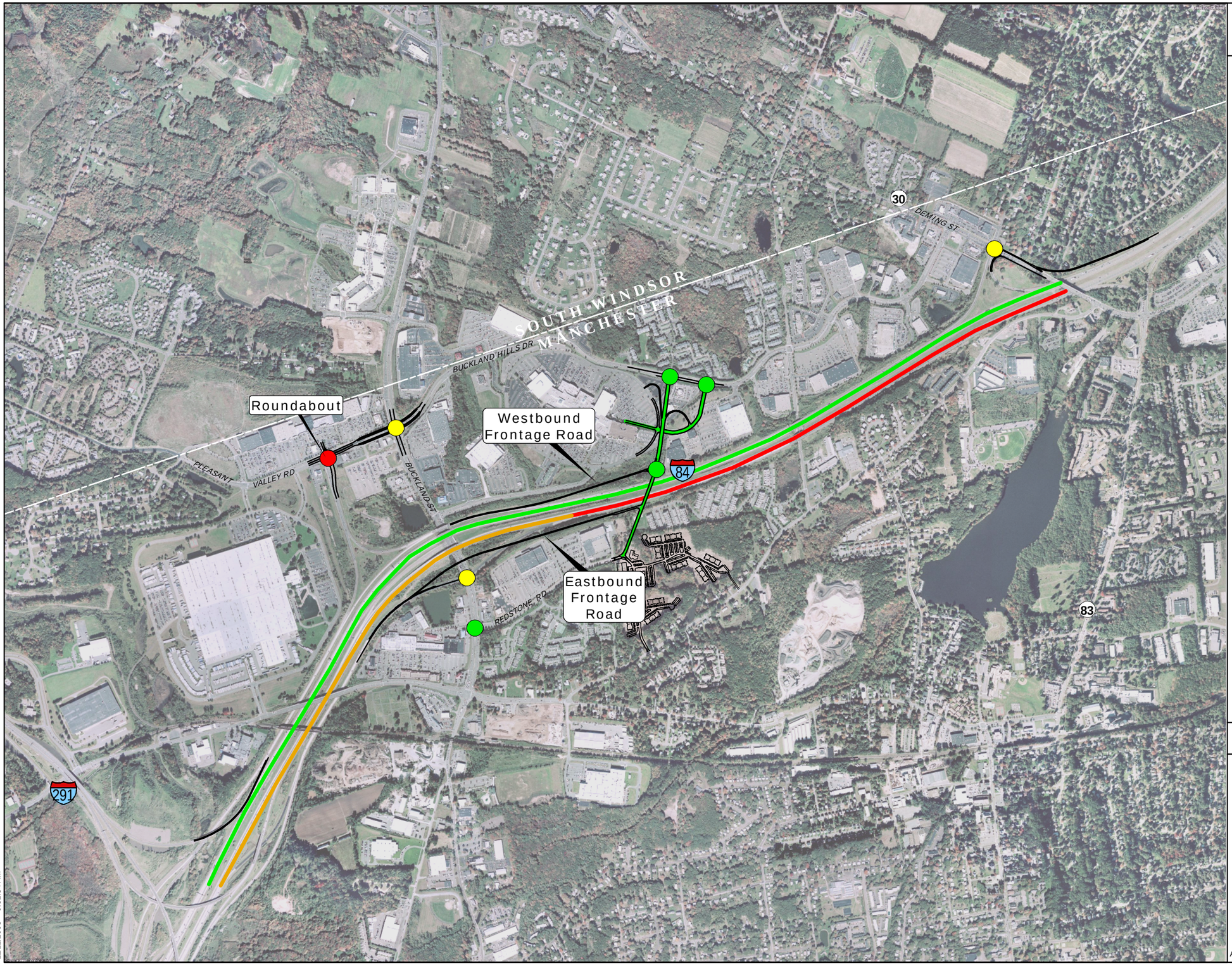
0 0.25 0.5

Miles

Aerial photo supplied by Digital Globe. Date of photo: 2006.

Map Document: (L:\work\94711\GIS\SegmentLOS.mxd)
11/11/2008 -- 9:52:54 AM

EARTH TECH | AECOM



Intersection LOS

- A,B,C
- D,E
- F

Segment LOS

- A,B,C
- D,E
- F (Improvement over No Build)
- F

Buckland Area Transportation Study

Level of Service Summary

Option 2 Concept 2D Modified

Year 2030 Friday PM Peak Hour

0 0.25 0.5

Miles

Aerial photo supplied by Digital Globe. Date of photo: 2006.

Map Document: (L:\work\94711\GIS\SegmentLOS.mxd)
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EARTH TECH | AECOM

Intersection LOS
- A,B,C
- D,E
- F

Segment LOS
- A,B,C
- D,E
- F (Improvement over No Build)
- F

Buckland Area Transportation Study

Level of Service Summary
Option 10 Concept 2 Modified

Year 2030 Friday PM Peak Hour

0 0.25 0.5
Miles

Aerial photo supplied by Digital Globe. Date of photo: 2006.

Map Document: (L:\work\94711\GIS\SegmentLOS.mxd)
11/11/2008 -- 9:52:54 AM