

Memorandum

To: Dwight Bassett
Town of Chapel Hill

From: Amy Massey, P.E.



Date: June 21, 2013

Re: Ephesus Church Road/Fordham Boulevard Small Area Plan and
Traffic Analysis- Phase 3 Summary

The purpose of this memorandum is to transmit and summarize project results and outcomes for the above identified project. This work was requested by the Town of Chapel Hill, and builds upon the *Ephesus Church Road/Fordham Boulevard Small Area Plan (SAP) Traffic Analysis* (Kimley-Horn and Associates, Inc., February 2011). This memorandum presents project background information, task deliverables, and a listing of next steps.

Executive Summary

Building upon the *Ephesus Church Road/Fordham Boulevard SAP and Traffic Analysis*, task deliverables incorporated into Phase 3 include the following:

- *Task 1- Town Phasing Approach and Costs*—Based on a review of the draft improvement sequencing provided by the Town against the proposed improvements identified on the Ephesus Church Road/Fordham Boulevard SAP Roadway Connectivity Map, six individual phases are listed below (and shown on Figure 1) with planning-level construction cost opinions (OPCCs):
 - Phase I \$2.4M
 - Phase II \$4.0M (assuming stop control at Ephesus Church)
 - Phase III \$1.3M
 - Phase IV included in Phase II OPCC
 - Phase V included in Phase I OPCC
 - Phase VI \$1.1M (assuming roundabout at Elliott)
- *Task 2- Traffic Analysis of Rams Plaza area access improvements*—Based on the results of this analysis, a new ingress connection from the southbound superstreet U-turn onto the eastern service road and addition of right-out egress onto Fordham Boulevard at the northbound slip lane are expected to better serve Rams Plaza/Volvo traffic to and from the north and reduce turning movements at the Ephesus Church/Fordham intersection.
- *Task 3- Concept Layouts of Rams Plaza area access improvements*—The purpose of the layouts is to represent the application and feasibility of the Task 2

recommended improvements. The concept layouts have been prepared on available aerial base mapping and supplemental field survey mapping provided by the Town. The planning-level OPCCs are:

- Superstreet U-turn connector \$300K
- Slip lane right-out \$200K

- *Task 4A- Functional Plans for Legion Road Extension*— The functional design provides for the extension of Legion Road southwestward approximately 600 feet from its existing intersection with Ephesus Church Road to Fordham Boulevard, prepared on available aerial base mapping with supplemental field survey mapping provided by the Town. The plan incorporates an intent of minimizing public right-of-way for the extension, in order to maximize developable area. The planning-level OPCC is approximately \$1.3M.
- *Task 4B- Legion Road Extension Environmental Screening*— The environmental screening associated with the Legion Road Extension functional design has consisted of a desktop analysis of readily available data and limited field review of potential issues identified within the project area. The screening provides a description of land use, natural habitats, and potential presence of jurisdictional waters regulated under the Clean Water Act. Potential permitting requirements include:
 - Section 404 Permit and Section 401 General Water Quality Certification.
 - NC Department of Environment and Natural Resources (NCDENR) Erosion Control Permit.
 - Federal Emergency Management Agency (FEMA) Conditional Letter of Map Revision.
 - Floodplain development permit – Coordination with the local floodplain administrator will be necessary to determine whether a floodplain development permit is required.
 - Town of Chapel Hill Resource Conservation District (RCD) Variance
- *Task 5- Flood Mitigation and Stormwater Infrastructure Feasibility Study*— This task provides site-specific stormwater options as they relate to the Booker Creek flood hazards. Detailed flood modeling has been performed to analyze the interaction between Booker Creek and the stormwater infrastructure within the SAP area, used to simulate potential flood reduction scenarios. The study incorporates the following recommendations:
 - Disconnection of the Eastgate stormwater system from the Booker Creek culvert and redirection to the proposed wetland (in Task 6).
 - Redirection of stormwater infrastructure from the commercial sites adjoining Eastgate.
 - Replacement and realignment of the existing Elliott Road culvert
 - Replacement of the existing Fordham Boulevard culvert
 - Redirection of the ditch in front of the Holiday Inn to a location further downstream of Fordham Boulevard.
 - Inclusion of wetland storage in the lower reach of Booker Creek.

- *Task 6- Stormwater Quality/Quantity Planning*—The purpose of this task is to review Town-identified stormwater best management practice (BMP) retrofit locations for potential to serve as regional stormwater treatment and detention facilities, in an effort to assist the Town in finding balance between redevelopment flexibility and stormwater regulations within the SAP area. This review provides conceptual design of the identified BMPs, as well as the following elements:
 - Qualitative and quantitative environmental benefits.
 - Planning-level cost analysis.
 - Regulatory and permitting requirements to establish each BMP.
 - Potential for establishing regulatory credit provided by the BMPs.
- *Task 7- Directional/Wayfinding Signage Plan*— A directional/wayfinding signage plan has been developed to identify recommended locations for signage to improve awareness of existing and future travel alternatives and provide direction to the available SAP destinations, and encourage preferred traffic movements.
- *Task 8- Willow Connector Concept Layouts*— The purpose of the layouts is to represent the application and feasibility of the connector road between Elliott Road and Willow Drive. The concept layouts have been prepared on available aerial base mapping in collaboration with Town staff. The planning-level OPCC is \$0.9-1.1M, depending on implementation of stop control or a roundabout at Elliott Road.

Background

The Town of Chapel Hill initiated the *Ephesus Church Road/Fordham Boulevard Small Area Plan and Traffic Analysis* to better define future land uses and develop transportation solutions that encourage reinvestment within the areas surrounding the Ephesus Church Road/Fordham Boulevard intersection.

Kimley-Horn (KHA) was part of the project's consultant team. The consultant team, in coordination with the Town of Chapel Hill and North Carolina Department of Transportation (NCDOT), prepared a proposed Small Area Plan (SAP) framework based on identified issues/opportunities and public input. The SAP consists of a mix of identified redevelopment land use, and transportation components targeted to be in place by the year 2020.

The transportation objective for the SAP is: optimal access and mobility in balance with safety for all modes (vehicular, bicycle and pedestrian, and transit) while respecting existing land use, the environment, and property impacts. Based on this objective, the Ephesus Church Road/Fordham Boulevard intersection was identified early-on (by staff and public input) as the primary transportation concern of the SAP.

Key transportation elements in the SAP framework are summarized below and shown in *Figure 2*.

- Improved vehicle, pedestrian, and bicycle access and connectivity within the study area.
- Extension of Elliott Road eastward to Ephesus Church Road.
- Realignment of Ephesus Church Road to be a through movement with Elliott Road Extension.
- Access limitations to decrease congestion and conflict points on Ephesus Church Road.
- Improved transit access.
- Improvements to coordinated traffic signal system.
- Directional/wayfinding signage to encourage preferred traffic movements.

The traffic analysis was prepared (by KHA February 2011) to support the SAP transportation improvements with technical analyses to identify associated intersection-level improvements. The intent of the intersection-level improvements is to accommodate existing traffic and additional SAP redevelopment traffic. The analysis focuses on projected 2020 SAP conditions and transportation improvements needed to accommodate the associated traffic demands within the following study area intersections:

- Franklin Street – Elliott Road
- Ephesus Church Road – Legion Road
- Legion Road – Clover Drive/Rams Plaza Drive
- Elliott Road Extension and Ephesus Church Road (new intersection)
- Legion Road Extension and Fordham Boulevard (new intersection)

The traffic analysis generated a series of transportation improvements that were subsequently vetted by and supplemented by NCDOT, as shown in *Figure 3*.

The following sections summarize the Phase 3 transportation deliverables:

- Task 1- Town Phasing Approach and Costs
- Task 2- Traffic Analysis of Rams Plaza area access improvements
- Task 3- Concept Layouts of Rams Plaza area access improvements
- Task 4A- Functional Plans for Legion Road Extension
- Task 4B- Legion Road Extension Environmental Screening
- Task 5- Flood Mitigation and Stormwater Infrastructure Feasibility Study
- Task 6- Stormwater Quality/Quantity Master Plan
- Task 7- Directional/Wayfinding Signage Plan
- Task 8- Willow Connector Concept Layouts

Task 1- Town Phasing Approach and Costs

Based on a review of the draft improvement sequencing provided by the Town against the proposed improvements identified on the Ephesus Church Road/Fordham Boulevard SAP Roadway Connectivity Map, six individual phases are shown on *Figure 1*. A memorandum submitted under separate cover (June 2013) describes the implementation phasing plan.

KHA prepared planning-level opinions of probable construction cost (OPCC) for the components of the six phases using the available NCDOT planning-level spreadsheet. It is noted that the conceptual layouts and functional plans have not yet been formally reviewed by NCDOT staff. OPCCs have been prepared as follows:

- Phase I \$2.4M
- Phase II \$4.0M (assuming stop control at Ephesus Church)
- Phase III \$1.3M
- Phase IV included in Phase II OPCC
- Phase V included in Phase I OPCC
- Phase VI \$1.1M (assuming roundabout at Elliott)

Task 2- Traffic Analysis of Rams Plaza area access improvements

Based on the results of this analysis, a new ingress connection from the southbound superstreet U-turn onto the eastern service road and addition of right-out egress onto Fordham Boulevard at the northbound slip lane are expected to better serve Rams Plaza/Volvo traffic to and from the north and reduce turning movements at the Ephesus Church/Fordham intersection, while having little to know negative effect on the Superstreet intersections. Tasks 2 and 3 are summarized under separate cover (June 2013). It is noted that NCDOT has not formally reviewed the traffic study.

Task 3- Concept Layouts of Rams Plaza area access improvements

The purpose of the layouts is to represent the application and feasibility of the Task 2 recommended improvements. The concept layouts have been prepared on available aerial base mapping and supplemental field survey mapping provided by the Town, provided within the Task 2 Traffic Analysis Technical Memo (under separate cover). The planning-level OPCCs (attached) are:

- Superstreet U-turn connector \$300K
- Slip lane right-out \$200K

It is noted that the concept plans have not yet been formally reviewed by NCDOT staff.

Task 4A- Functional Design of Legion Road Extension

KHA prepared functional plans for the extension of Legion Road southwestward approximately 600 feet from its existing intersection with Ephesus Church Road to Fordham Road, incorporating the following elements:

- Two-lane cross section, possibly with a left-turn lane at internal drives at location(s) defined by the Town.
- Fordham Boulevard/Legion Road intersection features-
 - Stop-controlled, right-in/right-out Legion Road operations.
 - Addition of an exclusive northbound right-turn lane on existing Fordham Boulevard with 150 feet of storage.
 - Consideration of most recent proposed Holiday Inn site redevelopment plan, and environmental characteristics.
- The alignment for the Legion Road Extension will generally be as shown in the SAP Framework Plan. The functional design incorporates design criteria developed and utilized as the basis for the functional design in collaboration with Town staff, as shown in *Table 1*.
- There will be no bus pull outs.
- Roadway will have vehicular focus, limiting the necessary pavement and right-of-way to maximize development opportunity, as well as to reflect its termination at Fordham Boulevard.
- Include sidewalk and utility strip in easement to assist in development setback issues.

The functional design (attached) has been prepared on available aerial base mapping, with supplemental field survey mapping provided by the Town. To understand challenges associated with the Legion Extension, a centerline sketch was created for discussion purposes. Based on subsequent review of the sketch (attached) with Town staff, the functional roadway design was ultimately developed based on the following methodology created in collaboration with Town staff:

1. Shift alignment to the south of Holiday Inn property, as close to stream running along property line while not directly impacting stream.
2. Relocate signalized intersection to the south in order to shift roadway extension further toward property line.
3. Drop speed limit and speed design at intersection from 35 mph posted/40 mph design to 25 mph posted/30 mph design in order to shift roadway extension further toward property line.
4. Addition of minimal left-turn lane on Ephesus Church Road northbound onto Legion Road Extension to line up with existing left-turn lane southbound onto existing Legion Road.
5. Existing southbound bike lane on Legion Road maintained through relocated section of Legion Road north of Ephesus Church Road intersection, but bike lane terminates at intersection.

Table 1- Legion Road Extension Design Criteria

DESIGN SPEED (mph)	30
POSTED SPEED (mph)	25 (note existing Legion is posted at 35 mph)
TYPICAL SECTION TYPE	2-lane curb & gutter
CURB OUTSIDE	2'-6"
LANE WIDTH	12'
PLANTING STRIP	Match existing (4')
GRADE	
MAXIMUM	8%
MINIMUM	0.5%
K VALUE	
SAG	37
CREST	19
HORIZ. ALIGNMENT	
MAX. SUPER	4%
MIN. RADIUS	250' (4%), 333' (NC)
PAVEMENT CROSS SLOPES	2%
TERRAIN TYPE	Rolling
SIDEWALKS	5' on north side only
BICYCLE LANES	None

6. The typical section incorporates consideration for sidewalk, street lighting, pedestrian-scale lighting, and street trees on the north side only of Legion Road Extension due to the proximity of the road to the stream, and consistency with potential future development plans in the Holiday Inn area. The typical section for the relocated section of Legion Road north of Ephesus Church Road incorporates these considerations on both sides of the roadway.

The planning-level OPCC developed for the functional design using the available NCDOT planning-level spreadsheet is approximately \$1.3M. It is noted that the functional plan has not yet been formally reviewed by NCDOT staff. The following assumptions apply:

- Construction of Legion Road Extension through greenfield (without consideration for existing building/site demo).
- Stormwater management not included. (Roadway drainage system would collect and convey stormwater from the right-of-way, but not detain/treat it.)
- Right-of-way costs not included.
- Utility relocation costs not included.
- Environmental impact fees and mitigation not included.
- Today's costs represented, with 30% contingency.

Potential constraints and concerns:

- Environmental issues represented in Task 4B.
- The driveway entrance off of Ephesus Church Road for the apartment site would be closer to the intersection of Legion Road once the intersection is relocated. Given the addition of a left-turn lane and the proximity of the driveway to the intersection, it is recommended that this driveway is limited to right-in/right-out operation only. While full-movement access is shown in the functional plans, a left-turn operation restriction such as a 4-foot monolithic concrete island may be recommended. Otherwise it could be recommended to remove the driveway from Ephesus Church Road and only allow access for the apartments to occur on the existing driveway along Legion Road.

Task 4B- Legion Road Extension Environmental Screening

KHA conducted an environmental desktop analysis and limited field review in performing an environmental screening of the Legion Road Extension project area. The desktop analysis included a review of data and mapping from readily available sources within the established study area. Data sources for use in the desktop analysis consisted of the following:

- Aerial photography
- US Geological Survey (USGS) topographic mapping
- US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping
- NCDENR databases and mapping
- NC Natural Heritage Program (NCNHP) database and mapping
- Natural Resource Conservation Service (NRCS) soil mapping
- USFWS list of federally protected species
- NC State Historic Preservation Office (NCSHPO) database and mapping

KHA's field reconnaissance was performed to review areas of potential concern and/or environmental permitting issues identified in the desktop review. An environmental screening memorandum was prepared by KHA (under separate cover, June 2013) to document potential issues and constraints identified during the desktop analysis and field reconnaissance and provide a preliminary review of land use, natural habitats, and potential presence of jurisdictional waters regulated under the Clean Water Act. This memo summarizes the following categories of the review:

- Physical Resources, Soils, and Geology
- Water Resources
- Wetlands
- Buffer Rules
- Floodplains
- Biotic Resources
- Federally-Protected Species

Figure 4 summarizes water resource findings of the screening exercise. The memo also addresses potential permitting requirements based on the screening, as follows:

- Section 404 (Impacts to “Waters of the United States”) – Impacts to “Waters of the United States” (including wetlands, streams, and ponds that are hydrologically connected to a navigable water) come under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Discharges of dredge or fill material into jurisdictional wetlands, streams, or open waters associated with the construction of the roadway extension project will likely require a Section 404 permit from the USACE. The Nationwide Permit 14 (Linear Transportation Projects) may cover the impacts to the jurisdictional wetlands/streams within the project area. If project impacts exceed the Nationwide Permit impact thresholds, an Individual Section 404 Permit will be required. Final determination of permit applicability lies with the Us Army Corps of Engineers.
- Section 401 General Water Quality Certification – A Section 401 General Water Quality Certification will be required for any activity that may result in a discharge into “Waters of the United States” or for which an issuance of a federal permit is required. The issuance of a required Section 401 certification is a prerequisite to the issuance of a Section 404 permit. If project impacts exceed the Nationwide Permit impact thresholds, an Individual Section 401 Water Quality Certification will be required. In addition, as part of the 401 review, NCDWQ will also evaluate compliance with the Jordan Lake Buffer Rules and stormwater/water quality requirements.
- NC Department of Environment and Natural Resources (NCDNR) Erosion Control Permit from the Division of Land Resources.
- Floodplain development permit – Coordination with the local floodplain administrator will be necessary to determine whether a floodplain development permit is required.
- Town of Chapel Hill Resource Conservation District (RCD) Variance – Based on the general alignment of the proposed Legion Road Extension, the roadway will likely be within the RCD buffer boundary and development will require a variance from the ordinance from the Town. This is expected to be possible, considering that the roadway may not present a significant increase in impervious surfaces due to existing land use, and stormwater treatment incorporated into the design would be an improvement upon the existing water quality condition.

Task 5- Flood Mitigation/Stormwater Infrastructure Feasibility Study

This task provides site-specific stormwater options as they relate to the Booker Creek flood hazards. Detailed flood modeling has been performed to analyze the interaction between Booker Creek and the stormwater infrastructure within the SAP area, used to simulate potential flood reduction scenarios. The study and its recommendations are

summarized under separate cover (June 2013), and incorporate the following recommendations:

- Disconnection of the Eastgate stormwater system from the Booker Creek culvert and redirection to the proposed wetland (in Task 6).
- Redirection of stormwater infrastructure from the commercial sites adjoining Eastgate.
- Replacement and realignment of the existing Elliott Road culvert.
- Replacement of the existing Fordham Boulevard culvert.
- Redirection of the ditch in front of the Holiday Inn to a location further downstream of Fordham Boulevard.
- Inclusion of wetland storage in the lower reach of Booker Creek.

The improvements above are represented in the Flood Study report as Alternative C. *Figures 5 and 6* (attached) represent a comparison of existing versus recommended Alternative C flood conditions. Order of magnitude costs for Alternatives A-C were developed, as shown in *Table 2*.

Table 2- Flood Mitigation/Stormwater Infrastructure Improvements

Option	Alternative A	Alternative B	Alternative C
Replace Elliott Culvert	\$1.5M	\$1.5M	\$1.5M
Eastgate and Franklin Culvert Connection		\$2.0M	\$2.0M
Replace Fordham Culvert			\$2.5M
Total Cost	\$1.5M	\$3.5M	\$6.0M

Task 6- Stormwater Quality/Quantity Planning

The purpose of this task is to review Town-identified stormwater best management practice (BMP) retrofit locations for potential to serve as regional stormwater treatment and detention facilities, in an effort to assist the Town in finding balance between redevelopment flexibility and stormwater regulations within the SAP area. This review is summarized under separate cover (June 2013) and provides conceptual design of the identified BMPs (locations shown in attached *Figure 7*). If both BMPs were implemented, a 14-percent reduction in nitrogen and 26-percent reduction in phosphorus would be expected. Table 3 summarizes order-of-magnitude design, permitting, construction and maintenance costs.

Table 3- Anticipated BMP Costs

BMP	Design/ Permitting	Construction	Total Implementation	Maintenance per year (annualized)
Eastgate	\$120K	\$600K	\$720K	\$20K
Willow	\$90K	\$310K	\$400K	\$15K

Task 7- Directional/Wayfinding Signage Plan

A directional/wayfinding signage plan has been developed to identify recommended locations for signage to improve awareness of existing and future travel alternatives, provide direction to the available SAP destinations, and encourage preferred traffic movements. The wayfinding concept plan is shown in *Figure 8* (attached).

Task 8- Willow Connector Concept Layouts

The purpose of the layouts is to represent the application and feasibility of the connector road between Elliott Road and Willow Drive. The concept layouts have been prepared on available aerial base mapping in collaboration with Town staff. Concept layouts are included in the Legion Extension functional plan set (attached).

To understand challenges associated with the Willow Drive Connector, high-level sketches (attached) were created for discussion purposes. Based on subsequent review of the sketches with Town staff, the functional roadway design was ultimately developed based on the following methodology:

1. Shift alignment further to the west than shown in the SAP. This allowed for the following:
 - Greater separation from the existing signalized intersections with Fordham Boulevard.
 - Avoid blue-line impacts for the connector road.
 - Better intersection angles and geometry.
2. Run connector road down center of apartment complex parking lot to limit impacts to apartment buildings.
3. The typical section incorporates consideration for street lighting, pedestrian-scale lighting, and street trees on both sides of the Willow Drive connector to incorporate both vehicular and greenway components into a complete street.

Five conceptual roadway layouts were performed:

1. Stop control intersection at connection with Elliott Road, intersecting at Village Plaza driveway, includes 4-foot bike lanes.
2. Stop control intersection at connection with Elliott Road, relocating Village Plaza driveway to align with new intersection location, includes 4-foot bike lanes.
3. Roundabout intersection at connection with Elliott Road, intersecting at Village Plaza driveway, includes 4-foot bike lanes.
4. Stop control intersection at connection with Elliott Road, intersecting at Village Plaza driveway, does not include 4-foot bike lanes to provide more distance from shopping center structure.
5. Roundabout intersection at connection with Elliott Road, intersecting at Village Plaza driveway, does not include 4-foot bike lanes to provide more distance from shopping center structure.

Alternatives 1-3 incorporate 11-foot travel lanes with marked bike lanes on both sides, while Alternatives 4-5 incorporate 12-foot travel lanes without marked bike lanes. Alternatives 1 and 3-5 tie-in at Elliott and the Village Plaza driveway, while Alternative 2 involves a modified Village Plaza driveway location. There are multiple parking impacts for each of these alternatives to the properties that the connector road passes through, as shown in *Table 4*.

Table 4- Anticipated Parking Impacts

	Apartment Complex	Large Building	Village Plaza
Alternative 1	33 Impacted 21 Replaced (Parallel)	29 Impacted	0 Impacted
Alternative 2	33 Impacted 22 Replaced (Parallel)	27 Impacted	10 Impacted 3 Replaced
Alternative 3	33 Impacted 22 Replaced (Parallel)	34 Impacted	6 Impacted
Alternative 4	33 Impacted 21 Replaced (Parallel)	29 Impacted	0 Impacted
Alternative 5	33 Impacted 22 Replaced (Parallel)	34 Impacted	6 Impacted

A planning-level OPCC was developed for two of the conceptual designs using the available NCDOT planning-level spreadsheet. The planning-level OPCC for Alternative 1 (stop control intersection located at Village Plaza driveway, with marked bike lanes) is approximately \$0.9M. The planning-level OPCC Alternative 3 (roundabout intersection located at Village Plaza driveway, with marked bike lanes) is approximately \$1.1M.

The following assumptions apply:

- Construction of Willow Drive connector through greenfield (without consideration for existing building/site demo).
- Stormwater management to be addressed by adjacent development. (Roadway drainage system would collect and convey stormwater from the right-of-way, but not detain/treat it; abutting properties would be responsible for managing their stormwater on-site.)
- Right-of-way costs not included.
- Utility relocation costs not included.
- Environmental impact fees and mitigation not included.
- Today's costs with 30% contingency.

Potential constraints and concerns:

- Each alternative would require the removal of one apartment structure.
- Each alternative would involve potential set-back compliance issues.
- Parking impacts and potential compliance issues would need to be addressed.
- The parking spaces replaced for the apartment complex would likely be parallel parking spaces for Alternatives 1-3 given the bike lanes running adjacent to the parking.

Next Steps

Potential actions for next steps of the Ephesus Church Road/Fordham Boulevard Small Area Plan Traffic Analysis project are identified as Phase 4:

- Town and NCDOT approvals of transportation improvement concepts and functional plans included in SAP Phase 2 and 3 studies.
- Obtain property owner support for improvements associated with private property.
- Develop/confirm funding plan and sources for implementation phases I-VI, and associated environmental implications.
- Determine support and funding options for stormwater and flood-related improvements, as well as development of form-based code.
- Develop construction documents for initial implementation phase(s).

Attachments

- Figures 1-8
- Tasks 2 and 3 attachments- Rams Plaza Access Improvement OPCCs
- Task 4 attachments- Legion Extension Alignment Alternatives, Functional Plans, and OPCCs
- Task 8 attachments- Willow Connector Alignment Sketches, Concept Plans (incorporated in Legion Extension plan set), and OPCCs