ORIGINAL TO GENERAL FILES

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

OFFICE OF DESIGN POLICY & SUPPORT
INTERDEPARTMENTAL CORRESPONDENCE

FILE P.I. # 0008350
CSSTP-0008-00(350)
Columbia County
GDOT District 2 - Tennille
SR 388 From I-20 to SR 232 - TIA

OFFICE Design Policy & Support

DATE 5/19/2014

FROM for Brent Story, State Design Policy Engineer

TO SEE DISTRIBUTION

SUBJECT **APPROVED CONCEPT REPORT**

Attached is the approved Concept Report for the above subject project.

Attachment

DISTRIBUTION:

Glenn Bowman, Director of Engineering
Joe Carpenter, Director of P3/Program Delivery
Genetha Rice-Singleton, Assistant Director of P3/Program Delivery
Albert Shelby, State Program Delivery Engineer
Bobby Hilliard, Program Control Administrator
Cindy VanDyke, State Transportation Planning Administrator
Hiral Patel, State Environmental Administrator
Ben Rabun, State Bridge Engineer
Kathy Zahul, State Traffic Engineer
Angela Robinson, Financial Management Administrator
Lisa Myers, State Project Review Engineer
Charles "Chuck" Hasty, State Materials Engineer
Mike Bolden, State Utilities Engineer
Paul Tanner, Asst. State Transportation Data Administrator
Attn: Systems & Classification Branch
Jeff Fletcher, Statewide Location Bureau Chief
Jimmy H. Smith, District Engineer
Neal O'Brien, District Preconstruction Engineer
Lynn E. Bean, District Utilities Engineer
George Brewer, Project Manager
BOARD MEMBER - 12th Congressional District

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
PROJECT CONCEPT REPORT

Project Type:	Road Widening	P.I. Number:	0008350
GDOT District:	2	County:	Columbia
Federal Route Number:	N/A	State Route Number:	388

Project Number: CSSTP-0008-00(350)

This project involves widening SR 388 from I-20 to SR 232 / Columbia Rd from two lanes to four lanes with a raised median. This project also includes the addition of sidewalk and bike lanes.

Submitted for approval:

Consultant Designer & Firm, URS Corporation	DATE 1/14/14
State Program Delivery Engineer	DATE 1/21/2014
GDOT Project Manager	DATE 1/14/14

Recommendation for approval:

Program Control Administrator	DATE
Glenn Bowman*	2/23/2014
State Environmental Administrator	DATE
Kathy Zahul*	3/04/2014
State Traffic Engineer	DATE
Lisa Myers*	2/17/2014
Project Review Engineer	DATE
Jun Birnkammer*	2/20/2014
for State Utilities Engineer	DATE
Ben Rabun*	2/28/2014
State Bridge Design Engineer	DATE
District Engineer	DATE
State Transportation Financial Management Administrator	DATE
TIA Administrator	DATE

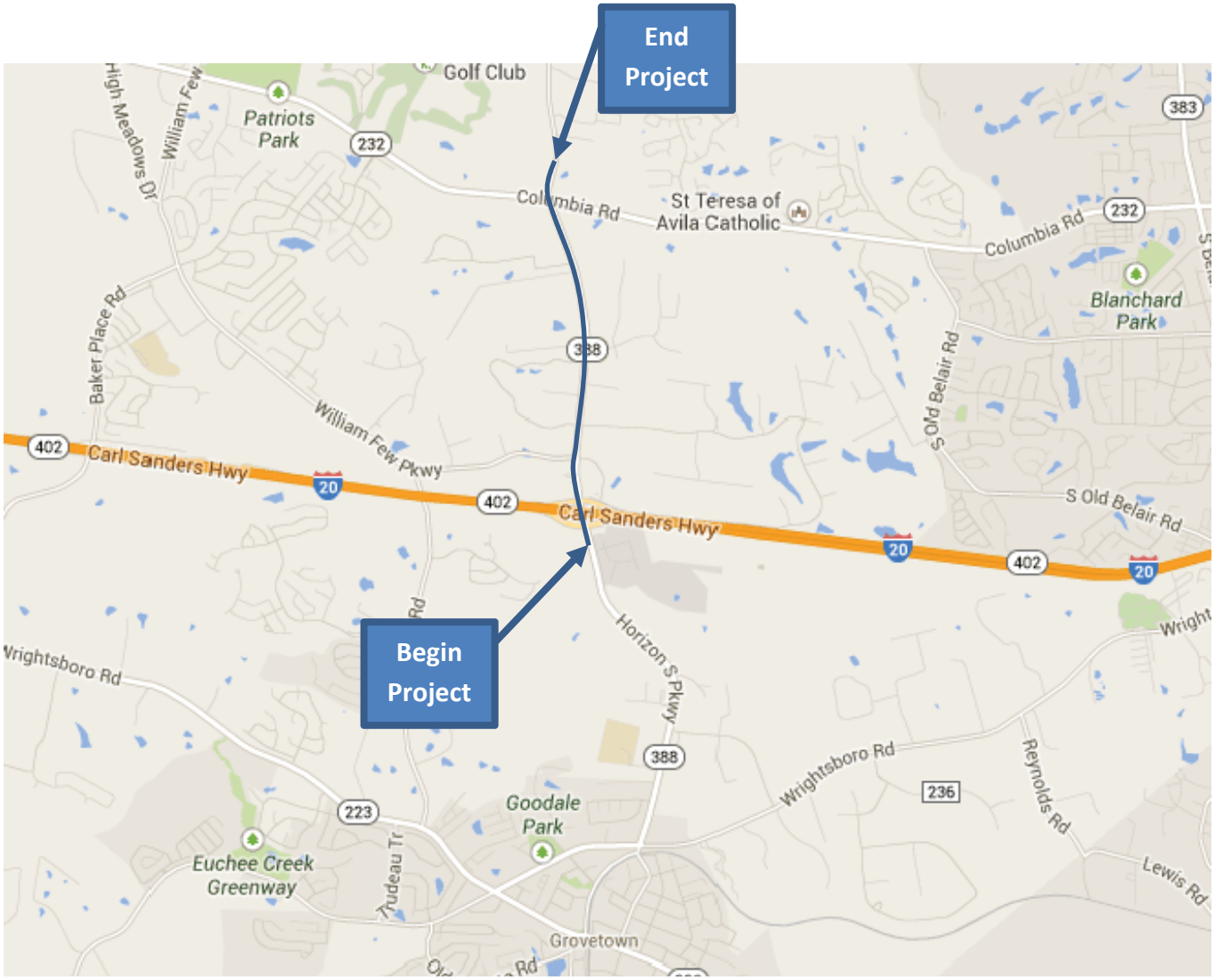
The concept as presented herein and submitted for approval is consistent with that which is included in the Regional Transportation Plan (RTP) and/or the State Transportation Improvement Program (STIP).

Cynthia VanDyke*	3/3/2014
State Transportation Planning Administrator	DATE

* - Recommendation on file

P.I. Number: 0008350

PROJECT LOCATION MAP



SR 388 from I-20 to SR 232 / Columbia Rd.

COLUMBIA COUNTY

PROJECT NO. CSSTP-0008-00(350) / P.I. NO. 0008350

PLANNING & BACKGROUND DATA

Project Justification Statement:

As a project in their adopted Long Range Transportation Plan, the Augusta-Richmond County Metropolitan Planning Organization (MPO) requested the Department to program a project on SR 388 from I-20 to SR 232/Columbia Road in August of 2006. In FY11, funds for the project's scoping phase were authorized and the scoping work began. Funds for the preliminary engineering phase are identified in the MPO's FY2012-2015 Transportation Improvement Program, with the remaining phases yet to be funded. State Route 388, within the project area, currently consists of a two lane section that is functionally classified as a Rural Major Collector. The SR 388 corridor is currently listed as a state bicycle route as per the Statewide Bicycle Plan.

In reviewing existing annual traffic data obtained from the GDOT STARS traffic count database, this section of SR 388 has an AADT of 22,300 in the year 2012. This volume is projected to increase up to 30,350 AADT by the year 2037. The existing Level of Service in the area is "E" and is projected to maintain a Level of Service of "E" through 2035. The Augusta MPO's 2035 Long Range Transportation Plan sets a performance measure for congestion at Level of Service D and defines congestion as: "Roadways that have a Level of Service D, E, and F are considered unacceptable" traffic conditions. For the last three years of available data (2007, 2008, 2009), crash rates for the corridor were above the state average for comparable facilities.

The currently programmed limits of this project are between Interstate 20 and SR 232. At the northern limit of this project at SR 232, SR 388 is an existing two lane section as it crosses over SR 232 and becomes CR 102 / Hereford Farm Road. At the northern location, the currently identified project limit appears inadequate with the project ending at the intersection with SR232 and an unacceptable LOS of E continuing beyond SR 232. It is recommended that improvements on CR 102 / Hereford Farm Road be explored from SR 232 to SR 383 to address the remaining congestion along the corridor. Improvements on Hereford Farm Road are not currently listed in the ARTS LRTP. The southern limit of the project ties into the existing four lane section of SR 388 at Interstate 20.

This section of the SR 388 corridor under review is in need of capacity increasing improvements as demonstrated through high traffic volumes and deficient Level of Service. Providing these improvements in the corridor will serve to relieve traffic congestion in this area and reduce the number of crashes on the corridor.

Existing conditions: The existing SR 388 corridor between I-20 and SR 232/Columbia Road is 2 lane road with rural shoulders and some auxiliary lanes at intersections. The existing roadway widens out to a 4 lane section on the bridge over I-20. There are few sidewalks along the corridor. The existing utilities along SR 388 are generally on the west side of road, including fiber optic cables, a water main, and overhead power lines. The major intersections along SR 388 are at the ramps with I-20, William Few Parkway, and SR 232/Columbia Road.

Other projects in the area:

- 0012865 – Widening CR 102/Hereford Farm Road From SR 232 to SR 383
- 0008349 – Widening SR 232 from CR 238/Chamblin Road to CR 221/Old Belair Road
- 0008348 – Widening Wrightsboro Road from SR 388 to SR 383/Jimmie Dyess Pkwy
- 0008351 – Widening SR 388/South Horizon Pkwy from CR 571/ Wrightsboro Road to I-20
- 0008347 – Widening SR 388 from SR 223/Robinson Ave to CR 571/Wrightsboro Road
- 0008345 – Widening I-20 from McDuffie County Line to SR 383/Belair Road
- 0010454 – Lewiston Elementary School – Safe Route To School

This project has adjacent projects at both the southern (PI# 0008351) and northern (PI# 0012865) termini. This project is currently scheduled to be built in 2018. The southern adjacent project, PI# 0008351, is currently scheduled to be built after this project, with a projected construction date of 2021. The northern adjacent project, PI# 0012865, is currently scheduled to be built before this project, with a projected construction date of 2017. Coordination with PI# 0008351 has occurred, to get a common termini between the two projects. Coordination with PI# 0012865 will be needed as it is progressed further. SR 232/Columbia Road also has a programmed project (PI# 0008349) to widen the road, through its intersection with SR 388. The funding for this project is in long range, but the new intersection is designed to accommodate this project with only minor widening for when this project does come through.

MPO: Augusta Regional Transportation Study (ARTS) **MPO Project ID:** STP-8
Regional Commission: Central Savannah River RC **RC Project ID**: RC07-000025
Congressional District(s): 12

Federal Oversight: ☐ Full Oversight ☐ Exempt ☐ State Funded ☒ Other
This is a TIA project.

Projected Traffic: ADT
Current Year (2012):22,300 Open Year (2017):24,100 Design Year (2037): 30,350
Traffic Projections Performed by: Gresham Smith and Partners.

Functional Classification (Mainline): Rural Major Collector

Complete Streets - Bicycle, Pedestrian, and/or Transit Warrants:
Warrants met: ☐ None ☒ Bicycle ☒ Pedestrian ☐ Transit

Is this a 3R (Resurfacing, Restoration, & Rehabilitation) Project? ☒ No ☐ Yes

Pavement Evaluation and Recommendations
Preliminary Pavement Evaluation Summary Report Required? ☐ No ☒ Yes
Preliminary Pavement Type Selection Report Required? ☐ No ☒ Yes
Feasible Pavement Alternatives: ☒ HMA ☐ PCC ☐ HMA & PCC
Pavement Evaluation and Type Selection Reports will be completed during preliminary design.

DESIGN AND STRUCTURAL DATA

Description of the proposed project:
The proposed project will widen a 2.1 mile section of SR 388 in Columbia County, Georgia from I-20 to SR 232. It is proposed to widen the existing two lane rural section to a four lane urban section divided by a planted raised median with median breaks at designated locations. The project includes the addition of sidewalks and bike lanes. The preferred alternative will also convert the existing interchange at SR 388/I-20 to a Diverging Diamond Interchange (DDI). The DDI is expected to improve LOS at the ramp termini intersections, while minimizing cost. Nicoles Way and Mill Creek Road will be realigned to form a common intersection. Meadowlark Lane will be realigned to intersect Mill Branch Road, not SR 388. The project also includes a sidewalk extension to the Safe Routes to School project at Lewiston Elementary School. The existing right of way varies from 70 to 160 feet. Additional right of way will be required for the widening, and will have a standard width of 145 feet.

Major Structures:

Structure	Existing	Proposed
Existing SR 388 Bridge over I-20 (073-5023-0)	223' long bridge, 95' wide bridge deck, 6 lanes with 6' sidewalks on both sides.	Take out existing sidewalks on outside, and adjust to be in median for the DDI.

Mainline Design Features: State Route 388

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**2**	**4**	**4**
- **Lane Width(s)**	**12'**	**11' to 12'**	**Corridor-11' DDI-11' to 15'**
- **Median Width & Type**	**None**	**20' Raised**	**20' Raised**
- **Outside Shoulder or Border Area Width**		**10' rural**	**12' urban**
- **Outside Shoulder Slope**		**6% rural**	**4%**
- **Inside Shoulder Width**	**None**	**N/A**	**N/A**
- **Sidewalks**	**5' intermittent**	**None (rural)**	**5'**
- **Auxiliary Lanes**	**None**	**None**	**None**
- **Bike Lanes**	**None**	**4'**	**4'**
Posted Speed	**55 mph**		**45 mph**
Design Speed			**Corridor-45 mph DDI-25 mph**
Min Horizontal Curve Radius			**Corridor-643' DDI-231'**
Maximum Superelevation Rate		**6%**	**6%**
Maximum Grade		**6%**	**6%**
Access Control	**Corridor-Permitted Interchange- Limited**	**Corridor-Permitted Interchange- Limited**	**Corridor- Permitted Interchange-Limited**

Design Vehicle		**Corridor-SU Interchange-WB-67**	**Corridor-WB-50, Interchange-WB-67**
Pavement Type	**Corridor-Asphalt Ramps-Concrete**		**Corridor-Asphalt Ramps-Concrete**

*According to current GDOT design policy if applicable

Major Interchanges/Intersections:

I-20 Eastbound Ramps at SR 388 – The I-20 East off ramp will consist of one left turn only lane and one right turn only lane. The I-20 East on ramp will consist of two through lanes. SR 388 northbound has two through lanes, one right turn lane, and a 4 foot bike lane. SR 388 southbound will consist of two through lanes, one left turn lane, and a bike lane. This intersection is currently signalized.

I-20 Westbound Ramps at SR 388 – The I-20 West off ramp will consist of two left turn only lanes and two right turn only lanes. The I-20 West on ramp will consist of two through lanes. SR 388 southbound has three through lanes, one right turn lane, and a 4 foot bike lane. SR 388 northbound will consist of one through lane, a through/left lane, and a 4 foot bike lane. This intersection is currently signalized.

William Few Pkwy at SR 388 – William Few Pkwy eastbound will consist of a through/left lane and a right turn lane. SugarCreek Drive westbound will consist of a through/left/right lane. SR 388 northbound will consist of two through lanes, two left turn lanes, a right turn lane, and a 4 foot bike lane. SR 388 southbound will consist of two through lanes, a left turn lane, a right turn lane, and a four foot bike lane.

SR 232 at SR 388 –SR 232 eastbound will consist of a through lane, a left turn lane, and a right turn lane. SR 232 westbound will consist of a through lane, dual left turn lanes, and a right turn lane. SR 388 northbound will consist of two through lanes, a left turn lane, a right turn lane, and a 4 foot bike lane. SR 388 southbound will consist of two through lanes, a left turn lane, and a right turn lane.

Lighting required: ☐ No ☒ Yes
Columbia County has requested High Mast Lighting to be installed at the interchange of SR 388 and I-20.

Off-site Detours Anticipated: ☒ No ☐ Undetermined ☐ Yes
It is expected that traffic will be staged and no detours will be required.

Transportation Management Plan [TMP] Required: ☒ No ☐ Yes
If Yes: Project classified as: ☐ Non-Significant ☐ Significant
TMP Components Anticipated: ☐ TTC ☐ TO ☐ PI

Design Exceptions to FHWA/AASHTO controlling criteria anticipated:

FHWA/AASHTO Controlling Criteria	No	Undeter-mined	Yes	Appvl Date (if applicable)
1. Design Speed	☒	☐	☐	
2. Lane Width	☒	☐	☐	
3. Shoulder Width	☒	☐	☐	
4. Bridge Width	☒	☐	☐	
5. Horizontal Alignment	☒	☐	☐	
6. Superelevation	☒	☐	☐	
7. Vertical Alignment	☒	☐	☐	
8. Grade	☒	☐	☐	
9. Stopping Sight Distance	☒	☐	☐	
10. Cross Slope	☒	☐	☐	
11. Vertical Clearance	☒	☐	☐	
12. Lateral Offset to Obstruction	☒	☐	☐	
13. Bridge Structural Capacity	☒	☐	☐	

Design Variances to GDOT Standard Criteria anticipated:

GDOT Standard Criteria	Reviewing Office	No	Undeter-mined	Yes	Appvl Date (if applicable)
1. Access Control/Median Openings	DP&S	☒	☐	☐	
2. Intersection Sight Distance	DP&S	☒	☐	☐	
3. Intersection Skew Angle	DP&S	☒	☐	☐	
4. Lateral Offset to Obstruction	DP&S	☒	☐	☐	
5. Rumble Strips	DP&S	☒	☐	☐	
6. Safety Edge	DP&S	☒	☐	☐	
7. Median Usage	DP&S	☒	☐	☐	
8. Roundabout Illumination Levels	DP&S	☒	☐	☐	
9. Complete Streets	DP&S	☒	☐	☐	
10. ADA & PROWAG	DP&S	☒	☐	☐	
11. GDOT Construction Standards	DP&S	☒	☐	☐	
12. GDOT Drainage Manual	DP&S	☒	☐	☐	
13. GDOT Bridge & Structural Manual	Bridges	☒	☐	☐	

VE Study anticipated: ☒ No ☐ Yes ☐ Completed – Date:

UTILITY AND PROPERTY

Temporary State Route needed: ☒ No ☐ Yes ☐ Undetermined

Railroad Involvement: None

Utility Involvements:
Atlanta Gas Light Company – Gas
AT&T – Telephone
Columbia County Broadband Utility - Telecommunications
Georgia Power – Power
Comcast – Cable
Wide Open West – Cable
Tower Cloud – Telecommunications
Columbia County – Water / Sewer

SUE Required: ☐ No ☒ Yes
QL-D is Complete.

Public Interest Determination Policy and Procedure recommended (Utilities)? ☒ No ☐ Yes

Right-of-Way (ROW): Existing width: 70-160 ft Proposed width: 145 ft standard
Required Right-of-Way anticipated: ☐ No ☒ Yes ☐ Undetermined
Easements anticipated: ☐ None ☒ Temporary ☐ Permanent ☐ Utility ☐ Other

Anticipated number of impacted parcels:	82
Displacements anticipated: Total:	5
Businesses:	1
Residences:	4
Other:	0

Location and Design approval: ☐ Not Required ☒ Required

CONTEXT SENSITIVE SOLUTIONS

Issues of Concern:

1. The interchange at I-20 and SR 388 in this suburban area, is experiencing rapid traffic growth. The 2037 No-Build scenario has an LOS of C and E levels during the AM peak and an LOS of E and F levels during the PM peak.
2. The existing roadway corridor has little to no bicycle or pedestrian accommodations. Lewiston Elementary School has little pedestrian accessibility.
3. The existing corridor has a higher crash rate than other roadways also classified as rural major collectors.
4. Adding extra pavement and changing the hydraulics of the area could result in flooding.
5. There are two historic properties along the corridor that will need to be preserved. They are the Hair House, and Lewis Memorial United Methodist Church. There is also a cemetery adjacent to the Lewis Memorial United Methodist Church.

Context Sensitive Solutions:

1. A DDI will be constructed on the existing bridge at the interchange, minimizing cost. The 2037 Build DDI scenario would have an LOS of B levels during the AM peak and B and C levels during the PM peak
2. Sidewalks and bike lanes will be added along the corridor, also conforming to the Augusta Regional Transportation Study, Bicycle and Pedestrian Plan. To increase pedestrian accessibility to Lewiston Elementary School, sidewalks will be extended along Hereford Farm Road to Lewiston Elementary School.
3. A raised median, which has been shown by FHWA to reduce crashes, will be installed.
4. To minimize the risk of risk of flooding, under the GAR41000 NPDES/MS4 permit, the implementation of post-construction BMPs is required to treat the first 1.2 inches of stormwater runoff for water quality, provide detention of the channel protection volume, and provide safe passage of the 100-year storm event.
5. Impacts to the two historic properties and the cemetery will be minimized by widening to the opposite side of the road.

ENVIRONMENTAL DATA

Anticipated Environmental Document:

GEPA: ☒ **NEPA:** ☐ CE ☐ EA/FONSI ☐ EIS

Project is fully funded by TIA and is only required to have a GEPA document.

MS4 Compliance – Is the project located in an MS4 area? ☐ No ☒ Yes

Environmental Permits/Variances/Commitments/Coordination anticipated:

Permit/ Variance/ Commitment/ Coordination Anticipated	No	Yes	Remarks
1. U.S. Coast Guard Permit	☒	☐	
2. Forest Service/Corps Land	☒	☐	
3. CWA Section 404 Permit	☒	☐	
4. Tennessee Valley Authority Permit	☒	☐	
5. Buffer Variance	☒	☐	
6. Coastal Zone Management Coordination	☒	☐	
7. NPDES	☐	☒	
8. FEMA	☒	☐	
9. Cemetery Permit	☒	☐	
10. Other Permits	☒	☐	
11. Other Commitments	☒	☐	
12. Other Coordination	☒	☐	

Project will need to comply with the GAR 10002 permit for erosion and sediment control as well as the GAR 41000 permit for MS4 since Columbia County is within the Phase 1 boundary.

Is a PAR required? ☒ No ☐ Yes ☐ Completed – Date:

Environmental Comments and Information:

NEPA/GEPA:

There are no significant issues that occur along the SR 388 project area. However, two historical resources are located along the corridor, the Hair House located at 120 Lewiston Road and the Lewis Memorial United Methodist Church located at 5555 Hereford Farm Road.

Ecology:

Please see attached document from the Georgia Department of Natural Resources Wildlife Resources Division for a list known occurrences of special concern natural communities, plants and animals within Columbia County and within 3 miles of the project area.

History:

The review of existing information revealed two properties 50 years old or older were identified within the proposed project's APE in the 1991 GADNR Columbia County survey. These survey sites are the Hair House and Lewis Memorial United Methodist Church (NAHRGIS No. 4794 and 4791) located at 120 Lewiston Road and 5555 Hereford Farm Road, respectively.

In addition, five properties 50 years of age or older not identified in the GADNR survey were identified within the proposed project's APE during the historic resources windshield survey. As a result of these efforts, a total of seven properties 50 years old or older were identified within the proposed project's APE during the historic resources field survey. These seven resources are located at:

- 214 Lewiston Road
- 120 Lewiston Road (Hair House)
- 5555 Hereford Farm Road (Lewis Memorial United Methodist Church)
- 113 Lewiston Road
- 133 Lewiston Road
- 141 Lewiston Road
- 248 Lewiston Road

Of the seven, the original two sites, the Hair House and Lewis Memorial United Methodist Church (NAHRGIS No. 4794 and 4791), were the only sites identified as eligible for National Register Recommendation.

Archeology:

No archaeological sites have been recorded within a one-kilometer radius of the project area.

Air Quality:

Is the project located in a PM 2.5 Non-attainment area?	☒ No	☐ Yes
Is the project located in an Ozone Non-attainment area?	☒ No	☐ Yes
Is a Carbon Monoxide hotspot analysis required?	☒ No	☐ Yes

Noise Effects:
The level of Air & Noise analysis is to be determined later.

Public Involvement:
The level of public involvement on this project is to be determined later.

Major stakeholders:
Columbia County
Lewiston Elementary School

CONSTRUCTION

Issues potentially affecting constructability/construction schedule: None

Early Completion Incentives recommended for consideration: ☒ No ☐ Yes

COORDINATION, ACTIVITIES, RESPONSIBILITIES, AND COSTS

Initial Concept Meeting: Not held.

Concept Meeting:
Meeting held 11-14-2013 - minutes attached

Other coordination to date:
Meeting with Columbia County – 02/11/2013 – minutes attached

8 Policy Requirements for an Interchange Modification Report (IMR)

The FHWA Guidance on Interstate Access Requests document provides the requirements for the justification and documentation necessary to substantiate any proposed changes in access to the Interstate System. This policy also facilitates decision making regarding proposed changes in access to the Interstate System in a manner that considers and is consistent with the vision, goals and long-range transportation plans of a metropolitan area, region and State.

The FHWA's decision to approve a request is dependent on the proposal satisfying and documenting the following eight requirements.

1) The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands.

The initial Synchro model analysis of the DDI at the proposed interchange has indicated that the average delay at the interchange is reduced both in the AM and PM. Through modifications to the surface street, the DDI enhances the efficiency of the traffic operations on SR 388, which satisfies this requirement.

2) The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access.

   The DDI is an alternative improvement on the SR 388 interchange that will have minimal (if any) impacts to I-20. The DDI can be constructed requiring only minor modifications to the existing bridge without the need to replace or widen (i.e. sidewalk and barrier reconstruction). With the reduction in delays achieved with the proposed project, the traffic flow rate to the interstate entrance ramps can be expected to increase. I-20 is anticipated to have excess capacity, and the increased traffic flow from the on ramps is not expected to significantly alter traffic flow.

   No change in access to the interstate facility is proposed.

3) An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access. The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network.
   Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network. Each request must also include a conceptual plan of the type and location of the signs proposed to support each design.

   The DDI would have no impact to the safety of the I-20 corridor, as it will not change the operations of the existing ramps. The change in traffic flow is not expected to significantly impact operations of I-20 as outlined in the response to requirement 2 above.

The Synchro model analysis of the DDI for the design year (2037) at the proposed interchange has indicated that the efficiency of the traffic operations on SR 388 will improve. By virtue of its geometry, the DDI will have lower operating speeds along SR 388. However, the benefits realized by the reduction in delay on the exit ramps far exceeds the losses due to a lower operating speed on SR 388.

Reductions in delay are observed at the ramp terminal intersection locations. LOS is improved from C and E levels in the 2037 No-Build scenario to B levels in the 2037 Build scenario during the AM peak and LOS is improved from E and F levels in the 2037 No-Build scenario to B and C levels in the 2037 Build scenario during the PM peak.

4) The proposed access connects to a public road only and will provide for all traffic movements. Less than ``full interchanges'' may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards.

   The DDI does not change the access to the I-20 corridor. The DDI will be constructed to be as unobtrusive as possible to the existing infrastructure. The proposed access will be designed to meet or exceed current standards.

5) The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, the applicable provisions of 23 CFR part 450 and the transportation conformity requirements of 40 CFR parts 51 and 93.

   The DDI will provide operational improvements and efficiency improvements to the interchange without the costly reconstruction/widening of the bridge over I-20.

6) In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan.

   The TIP does not indicate any new or planned interchanges on I-20 adjacent to SR 388 in the future.

7) When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements. The request must describe the commitments agreed upon to assure adequate collection and dispersion

of the traffic resulting from the development with the adjoining local street network and Interstate access point.

This is not a new access point, but a modification to an existing access point. There is no known planned development accompanying the proposed interchange modifications.

8) The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing.

The proposed DDI project will follow GDOT's TIA Manual, including GEPA documentation taking place during the preliminary plans phase. For this project, the anticipated class of action is a GEPA Type B document. All environmental documentation must be approved by GDOT and will be shared with FHWA for their review.

Project Activities:

Project Activity	Party Responsible for Performing Task(s)
Concept Development	URS Corporation
Design	Columbia County
Right-of-Way Acquisition	Columbia County
Utility Relocation	Regional Program Manager
Letting to Contract	Columbia County
Construction Supervision	Regional Program Manager
Providing Material Pits	Contractor
Providing Detours	Columbia County
Environmental Studies, Documents, and Permits	Columbia County
Environmental Mitigation	Columbia County
Construction Inspection & Materials Testing	Regional Program Manager

Project Cost Estimate and Funding Responsibilities:

	Breakdown of PE	ROW	Reimbursable Utility	CST*	Environmental Mitigation	Total Cost
By Whom	TIA	TIA	TIA	TIA	TIA	
$ Amount	$448,408	$8,832,000	$1,392,500	$15,323,339.40	$82,530	$26,078,777.4
Date of Estimate	Unknown	3/12/2014	12/12/2013	4/17/2014	11/22/2013	

*CST Cost includes: Construction, Engineering and Inspection, and Liquid AC Cost Adjustment.

ALTERNATIVES DISCUSSION

Numerous alternatives have been evaluated including a two to four lane widening project with the conversion of the existing interchange to a DDI, no-build, and a two to four lane widening project that will tie to the existing interchange.

Preferred Alternative: Two to four lane widening project with the conversion of the existing interchange to a DDI.			
Estimated Property Impacts:	82	**Estimated Total Cost:**	$26,078,777.4
Estimated ROW Cost:	$8,832,000.00	**Estimated CST Time:**	2-3 Years
Rationale: This alternative was chosen because it improves the roadway to have a design year LOS of B rather than a design year LOS of F and it will improve the existing interchange so that it will have a design year LOS of B or C, rather than C, E, or F.			

No-Build Alternative:			
Estimated Property Impacts:	0	**Estimated Total Cost:**	$0
Estimated ROW Cost:	$0	**Estimated CST Time:**	None
Rationale: This alternative was not chosen due to this being a TIA project. The public voted for TIA, and were promised to have this roadway improved.			

Alternative 1: Two to four lane widening project that will tie to the existing interchange.			
Estimated Property Impacts:	73	**Estimated Total Cost:**	$20,262,755.71
Estimated ROW Cost:	$6,850,000.00	**Estimated CST Time:**	2-3 Years
Rationale: This alternative will improve the roadway to have a design year LOS of B rather than a design year LOS of F, but it will tie to an existing interchange with a design year LOS ranging from C to F.			

Comments: None

Attachments

1. Environmental Screening Memo
2. Concept Layout
3. Typical sections
4. Detailed Cost Estimates:
    a. Construction including Engineering and Inspection
    b. Completed Fuel & Asphalt Price Adjustment forms
    c. Right-of-Way
    d. Utilities
    e. Environmental Mitigation (EPD, etc)
5. Traffic Diagrams
6. Traffic Engineering Report
7. DDI Traffic Memo
8. Traffic Data Approval Letter
9. Hydrology Study for MS4 Permit
10. Phase I Environmental Site Assessment Report
11. Minutes of Meetings
12. TIA Project Sheet
13. S I & A Report

APPROVALS

Concur: _____
Director of Engineering

Approve: _____ 5/16/14
Chief Engineer Date

Attachment #1

Edwards-Pitman
Environmental, Inc.

Memo

To: Nick Castronova, P.E.
URS
From: Russ Danser, AICP
CC: EPEI File No. URS 1204
Date: November 9, 2012
Re: SR 388/Lewiston Road Widening, Columbia County
Environmental Screening

Edwards-Pitman Environmental, Inc. (EPEI) has completed an environmental screening for the project that would involve the widening of State Route 388/Lewiston Road (SR 388) in Columbia County between the roadway's interchange with Interstate 20 (I-20) and State Route 232/Columbia Road (SR 232). The length of the surveyed area was approximately 2.2 miles and extended from a beginning point approximately 0.33 mile south of the I-20 interchange to an end point approximately 0.13 mile north of the SR 232 intersection. An aerial of the general limits of the study area is provided below.

FIGURE 1: STUDY AREA

This memo serves to summarize the findings of this screening and is organized by area of concern (land use, historic resources, etc.). EPEI staff specialists Russ Danser (NEPA), Leslie Brown (history), Rick Filer/Dave Pearce (ecology), and Lauren Welch (archaeology) conducted field surveys and research for the screening. Field surveys were conducted in August, September and November 2012 and focused on the identification of visible constraints that should be considered during the development of the proposed project concept. The field reconnaissance for the study area focused on both sides of the existing roadway noted in the previous description and provided in Figure 1.

The environmental survey included identification of historical and archaeological resources, underground storage tank (UST) locations, natural features, and parks and other sensitive land uses (churches, cemeteries, libraries, and schools) that could be viewed from the roadway and which could impact the proposed project. In addition to field reconnaissance, available documentation from the National Register of Historic Places (NRHP) and the Georgia Department of Natural Resources (GADNR) was reviewed to obtain additional information related to historic resources, threatened and endangered species, and hazardous materials.

LAND USES

The area of the proposed project is mixed in land use. A majority of the parcels along the immediate project corridor are single-family residential. A majority of the single-family properties have direct driveway access to SR 388. However, two named subdivisions (as indicated by street signage) are located along the corridor at the SR 388 intersections with Autumn Trail (Sugar Creek-Autumn Woods) and Nicole's Way (Nicole's Cove).

The southern end of the study area – in close proximity to the I-20 interchange – is characterized by commercial development consistent with interchange land uses (gas station, restaurants, etc.). South of the interchange, land use consists of larger strip commercial development that includes a Wal-Mart and other separate strip centers containing various businesses (Verizon, Arby's, Mexican restaurant, etc.). At the northern end of the study area – in close proximity to the SR 388 intersection with SR 232 – the land use is mixed and consists of a Food Lion and strip commercial development in the intersection's northeast quadrant. The intersection's northwest quadrant contains the Lewis Memorial United Methodist Church and cemetery in the northwest quadrant.

A review of the interactive, online Columbia County, Georgia Future Land Use Map indicates that the anticipated future land use is consistent with the existing land use that was observed in the field. The map coverage for the study area is provided in Figure 2. As indicated in this figure, much of the study area is anticipated to remain medium- (beige) to low-density residential (orange). However, in the proximity of the I-20 interchange and the SR 232 intersection, future land use will include commercial development (red) as well as the institutional land use of the existing church (light blue).

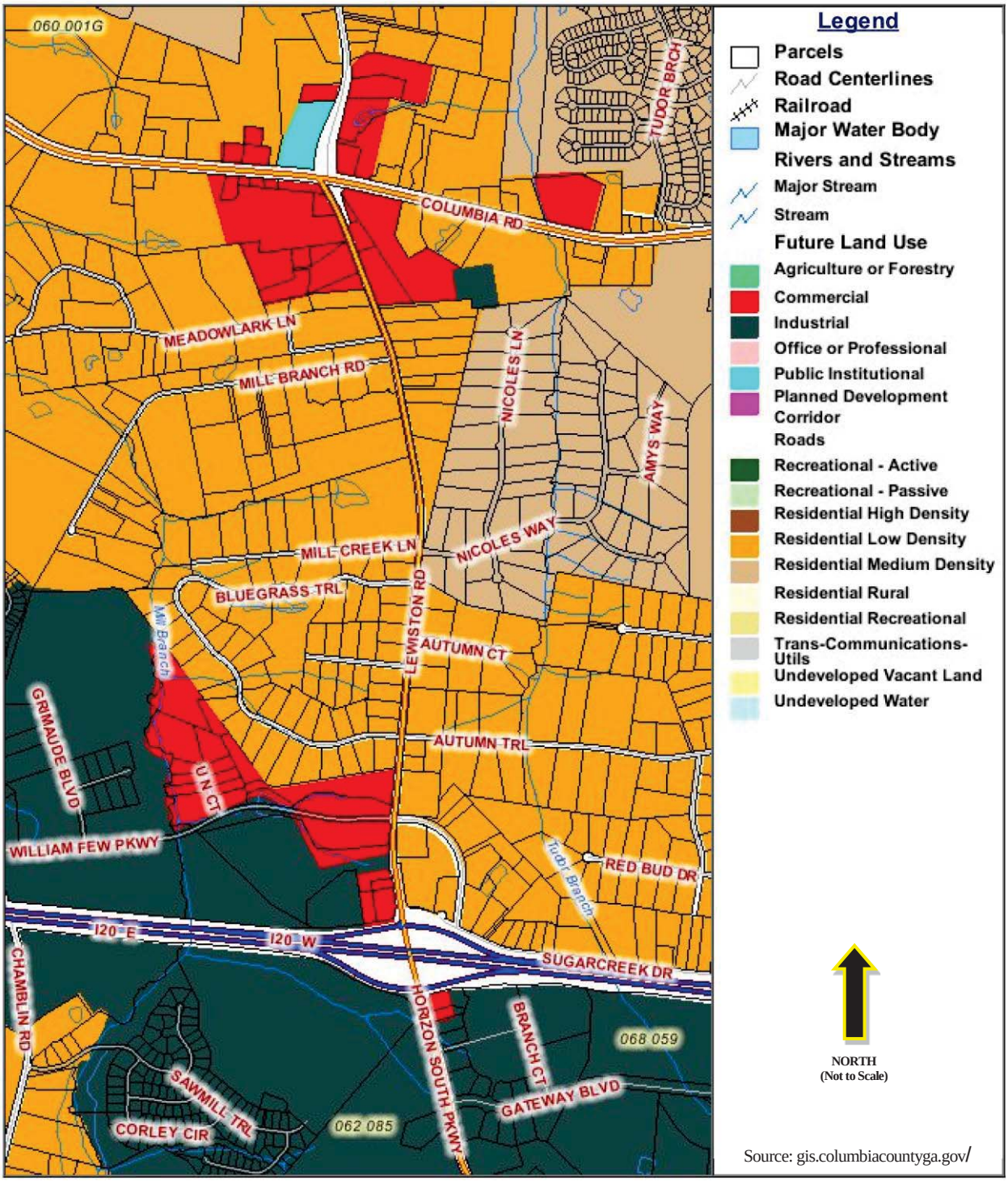


FIGURE 2: COLUMBIA COUNTY FUTURE LAND USE MAP

HISTORIC RESOURCES

Existing information on previously identified historic properties was consulted to determine if any are located within the area of potential effects (APE) of the proposed project. The review of existing information on previously identified historic properties revealed that no National Register listed properties, proposed National Register nominations, National Historic Landmarks, or bridges determined eligible for inclusion in the National Register in the updated Georgia Historic Bridge Survey (GHBS) were identified within the proposed project's APE.

The review of existing information also revealed that two properties 50 years old or older were identified within the proposed project's APE in the 1991 GADNR Columbia County survey. These survey sites are NAHRGIS No. 4794 and 4791. These sites were windshield surveyed by an Edwards-Pitman Environmental, Inc. historian on August 22, 2012.

In addition, five properties 50 years of age or older not identified in the GADNR survey were identified within the proposed project's APE during the historic resources windshield survey.

As a result of these efforts, a total of seven properties 50 years old or older were identified within the proposed project's APE during the historic resources field survey. These seven properties are described in Table 1, the location of these properties is depicted on Figure 3, and photographs are provided in Attachment 1.

TABLE 1: HISTORIC RESOURCES

Name of Resource	Date of Construction	Type and/or Style	Location	National Register Recommendation
Resource 1	1960	Front Gabled Bungalow	214 Lewiston Road	Not Eligible
The Hair House (Resource 2) (NAHRGIS 4794)	1919	Central Hallway	120 Lewiston Road	**Eligible**
Lewis Memorial United Methodist Church/Cemetery (Resource 3) (NAHRGIS 4791)	ca. 1925	Front Gabled Church/ Cemetery	5555 Hereford Farm Road	**Eligible**
Resource 4	1950	American Small House	113 Lewiston Road	Not Eligible
Resource 5	1956	American Small House	133 Lewiston Road	Not Eligible
Resource 6	1963	Linear Ranch	141 Lewiston Road	Not Eligible
Resource 7	ca. 1962	Bungalow Ranch	248 Lewiston Road	Not Eligible

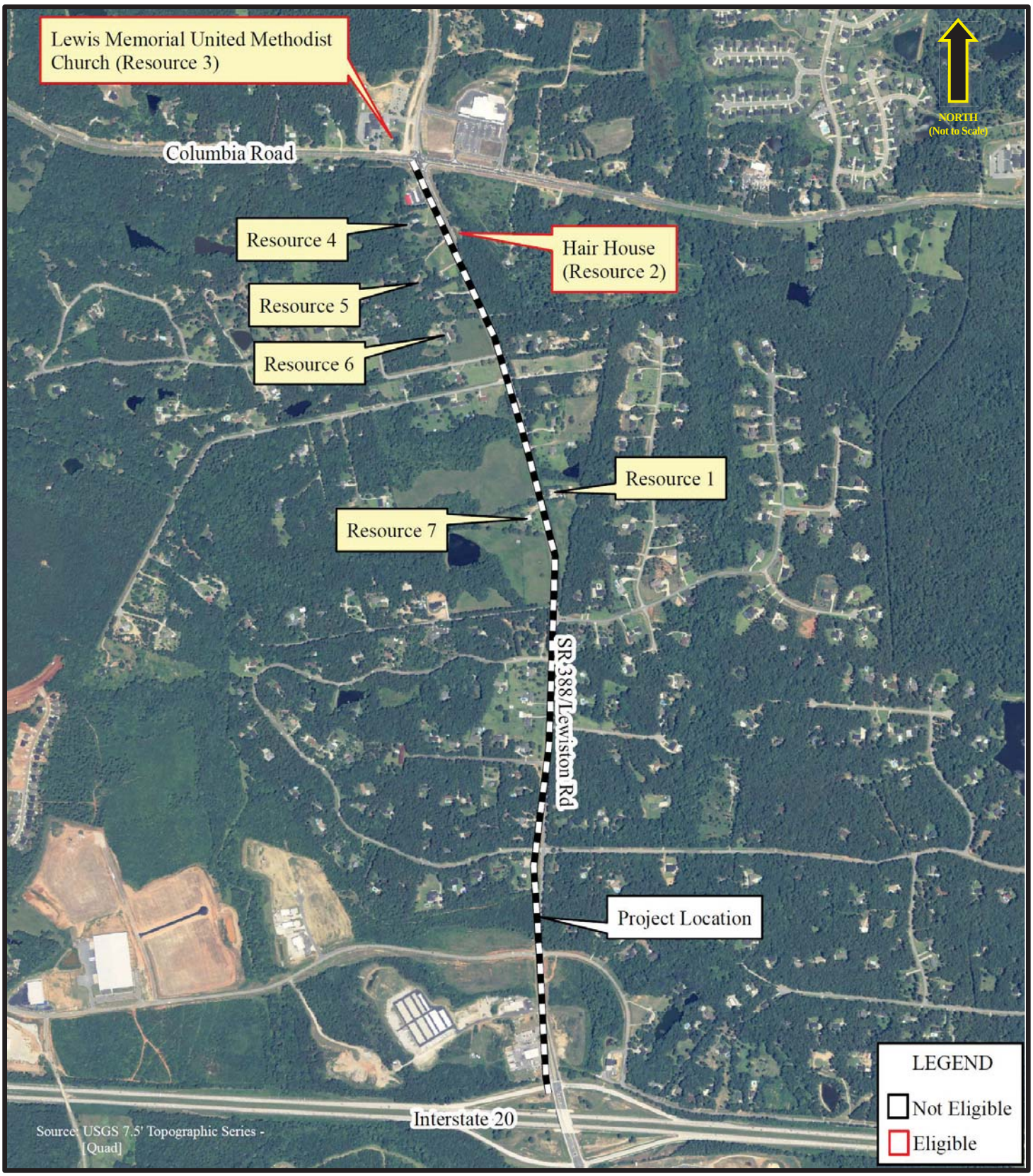


FIGURE 3: HISTORIC RESOURCES MAP

ARCHAEOLOGICAL RESOURCES

On November 9, 2012, a check of the Georgia Archaeological Site File was conducted electronically for this project at the University of Georgia in Athens. No previous surveys were conducted within the proposed project area, and no previously recorded sites lie within the project's APE. No archaeological sites have been recorded within a one-kilometer radius of the project area.

UNDERGROUND STORAGE TANKS AND HAZARDOUS MATERIALS

Field reconnaissance was conducted for the project to identify locations that might contain underground storage tanks (USTs) or other hazardous materials. Three gas stations located within the study corridor contain USTs. Their approximate locations are indicated by yellow stars in Figure 4. The Murphy's Gas is adjacent to the large Wal-Mart – located on the east side of SR 388 and south of the I-20 interchange (approximately 120 feet east of SR 388). The TPS Gas Station is located just north of the I-20 interchange – approximately 80 feet west of SR 388. The Lewiston Express Gas Station is located approximately 200 feet south of the SR 388/SR 232 intersection on the west side of the roadway (approximately 100 feet from SR 388). No other land uses associated with the production/handling of hazardous waste (dry cleaners, auto repair shops, etc.) were identified in the corridor.

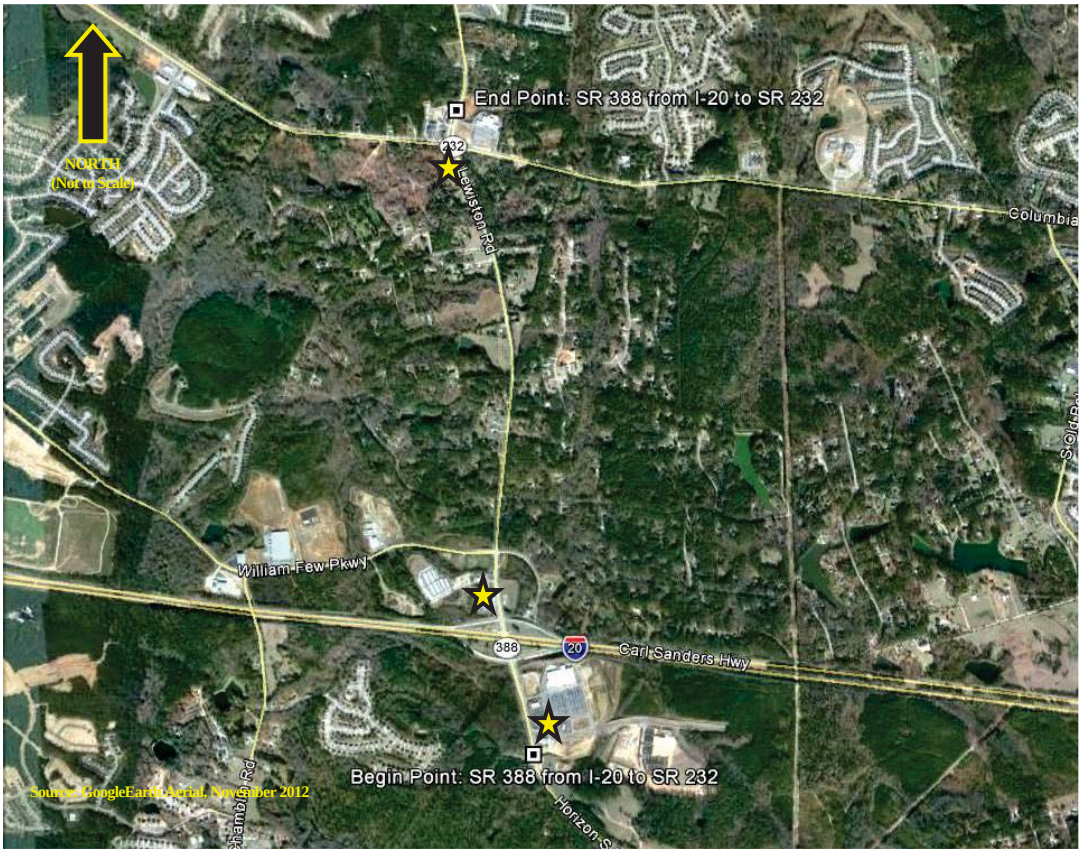


FIGURE 4: UST SITE MAP

PROJECT SENSITIVE LAND USES

Project sensitive land uses include such things as schools, churches, cemeteries and parks. There is one such land use located in the study area. The previously noted Lewis Memorial United Methodist Church is located in the northwest quadrant of the intersection. Figure 5 shows a greater detail of the property and the location of the various church structures and cemetery relative to the subject roadways.

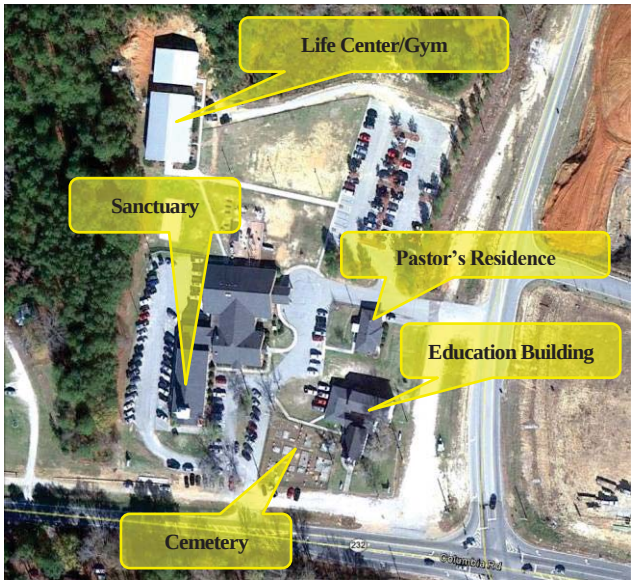


FIGURE 5: LEWIS MEMORIAL UMC

NATURAL FEATURES

Natural feature reconnaissance of the project area was conducted on September 28, 2012. A number of streams, open waters, wetlands, and non-buffered state waters (NBSW) were identified within the project corridor. The locations of these features were located by GPS and are displayed on Figure 6. The GPS location data of these features has been compiled and provided to URS as dgn data for inclusion in their work.

PROTECTED SPECIES

On September 26, 2012, information was requested of GADNR's Wildlife Resource Division related to protected species within the corridor. A copy of the October 16, 2012 response is provided in Attachment 2 of this memo. Attachment 2 also contains the GADNR species list for Columbia County as well as the US Fish and Wildlife Service's species list from their Information, Planning, and Conservation System (IPaC) data.

Because survey for the species is time-sensitive, it should be noted that a survey for Georgia aster (*Symphyotrichum georgianum*) was conducted within the study area on November 2, 2012. No Georgia aster was identified within the study area. In addition, a survey for relict trillium (*Trillium reliquum*) is recommended for this study area during the flowering season in March/April of 2013.

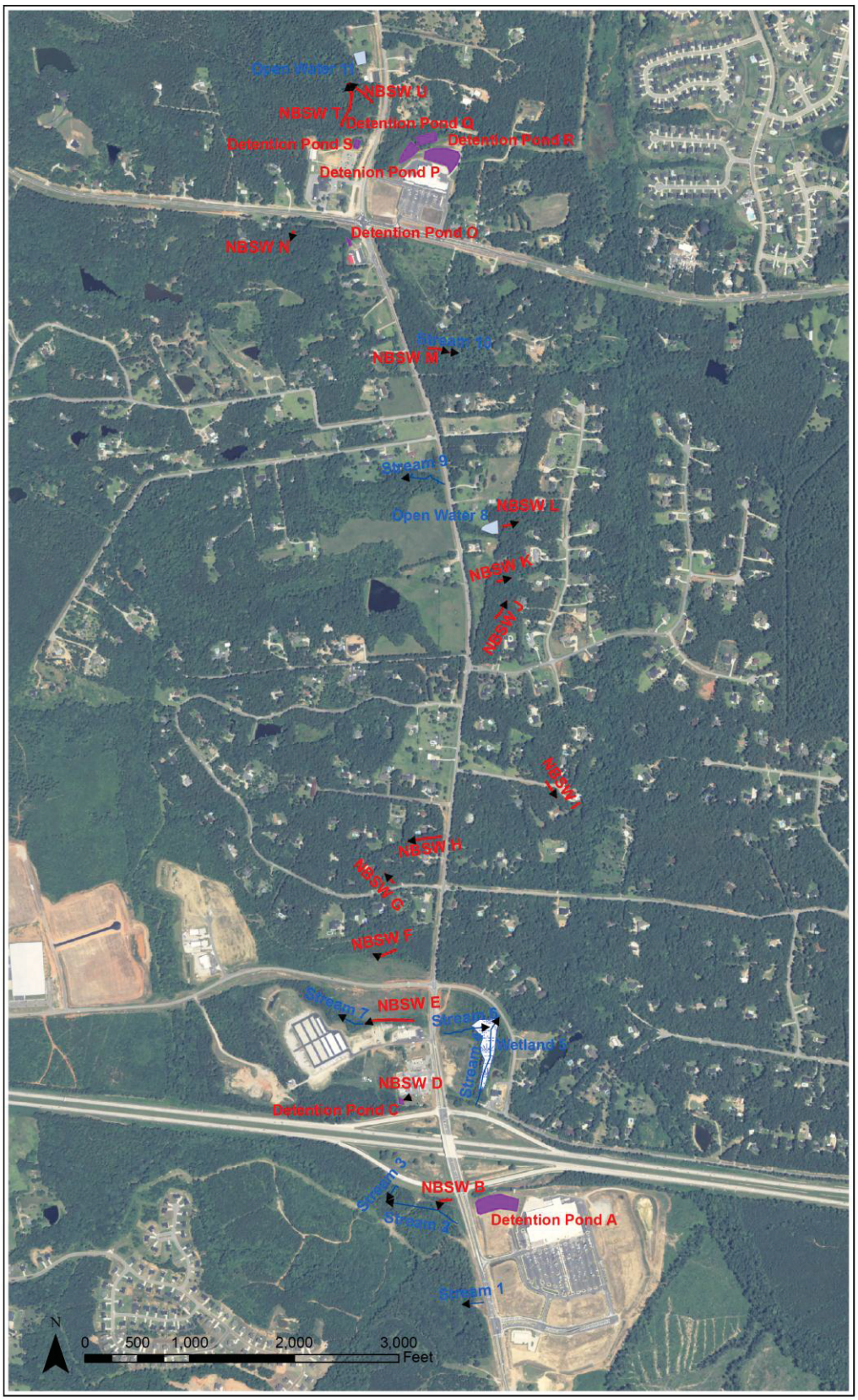


FIGURE 6: NATURAL FEATURES MAP

Attachments Provided Upon Request

Attachment #2

DATE$$$	TIME$$$	$PRF8$	DGN	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
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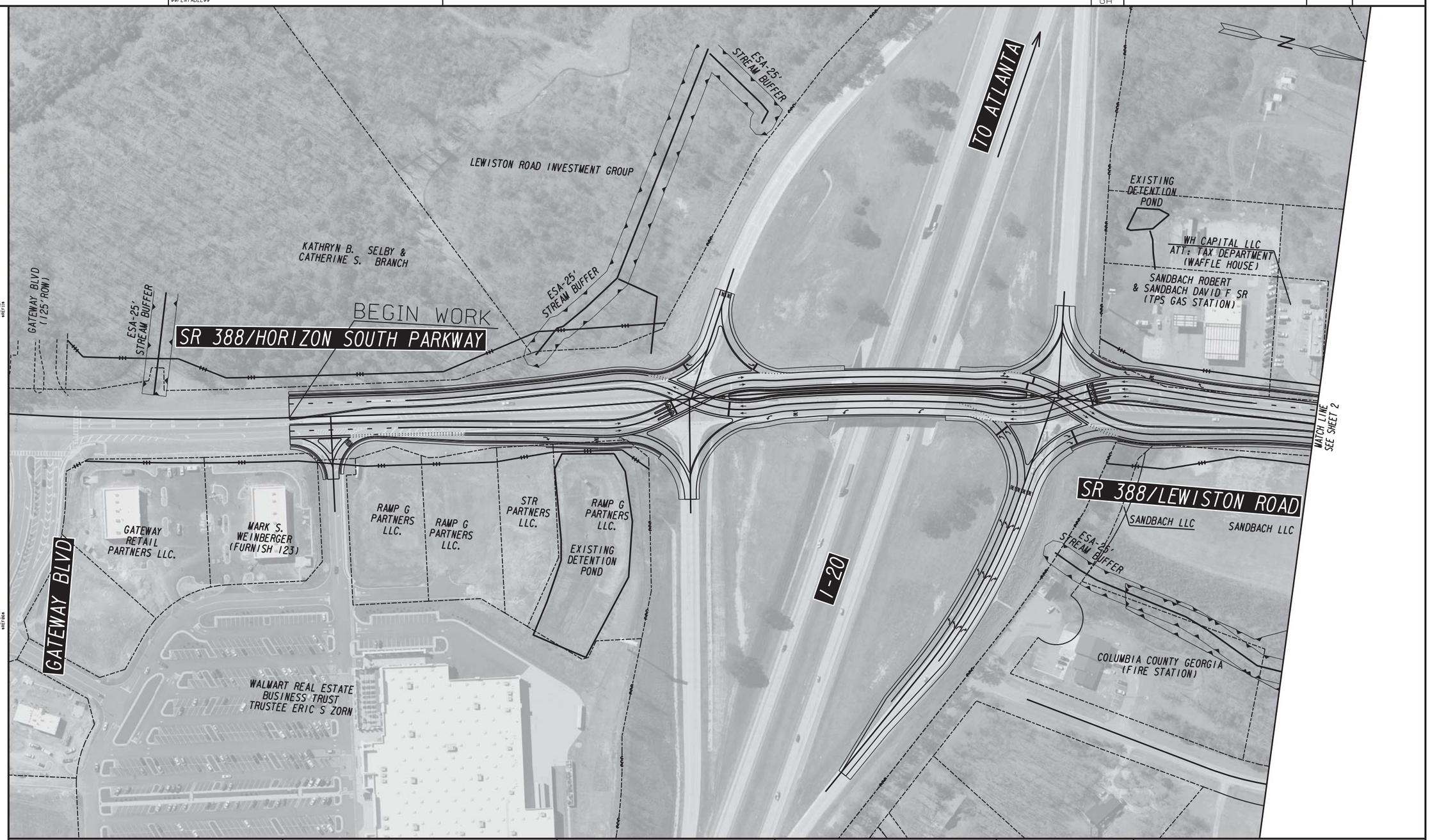

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

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0 100 200 400

REVISION DATES

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CONCEPT PLAN

SR 388 FROM I-20
TO SR 232 / COLUMBIA RD.

DRAWING No. 1

6/20/2011 GPLN

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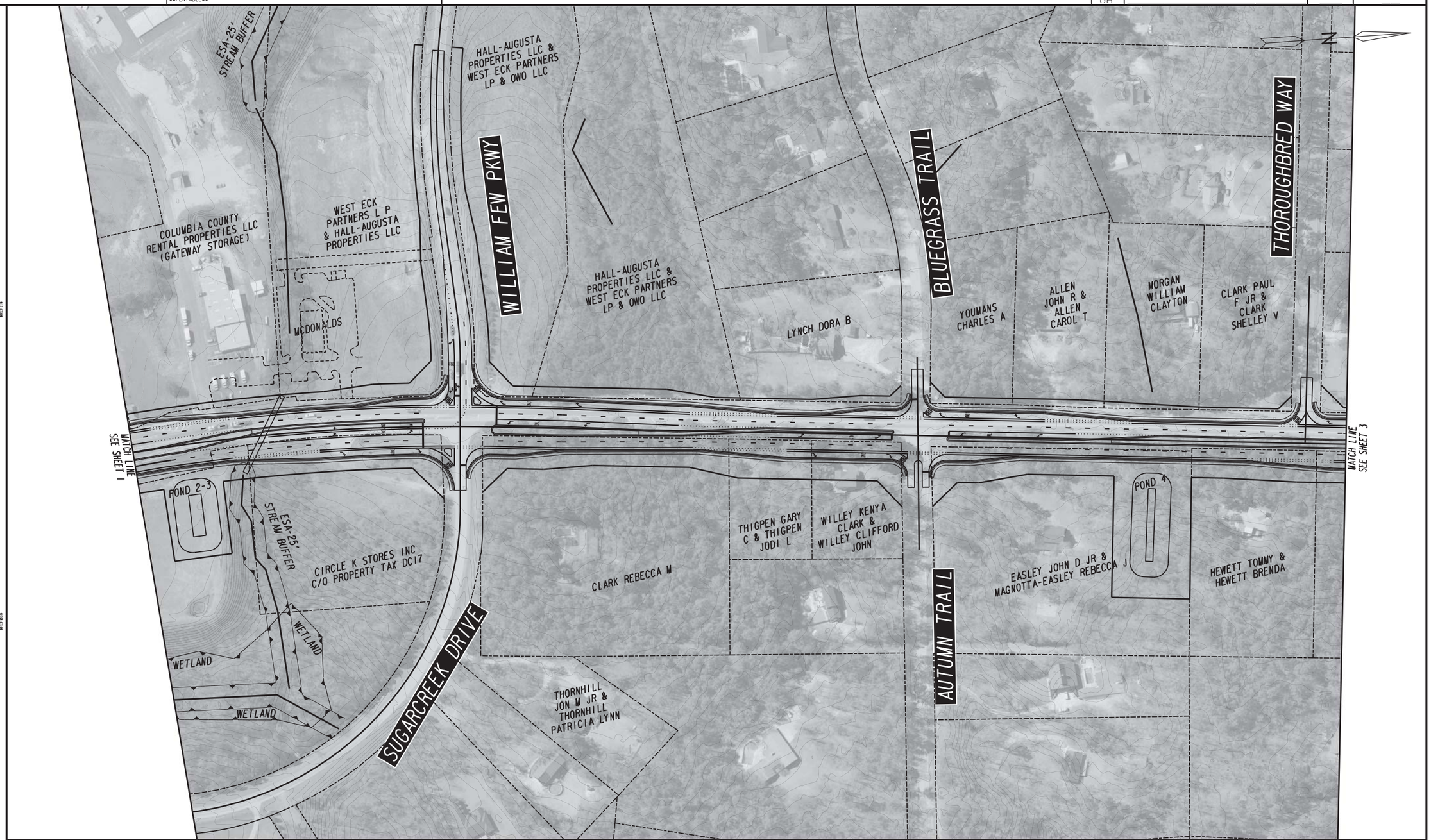

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DRAWING No. 2

6/20/2011 GPLN

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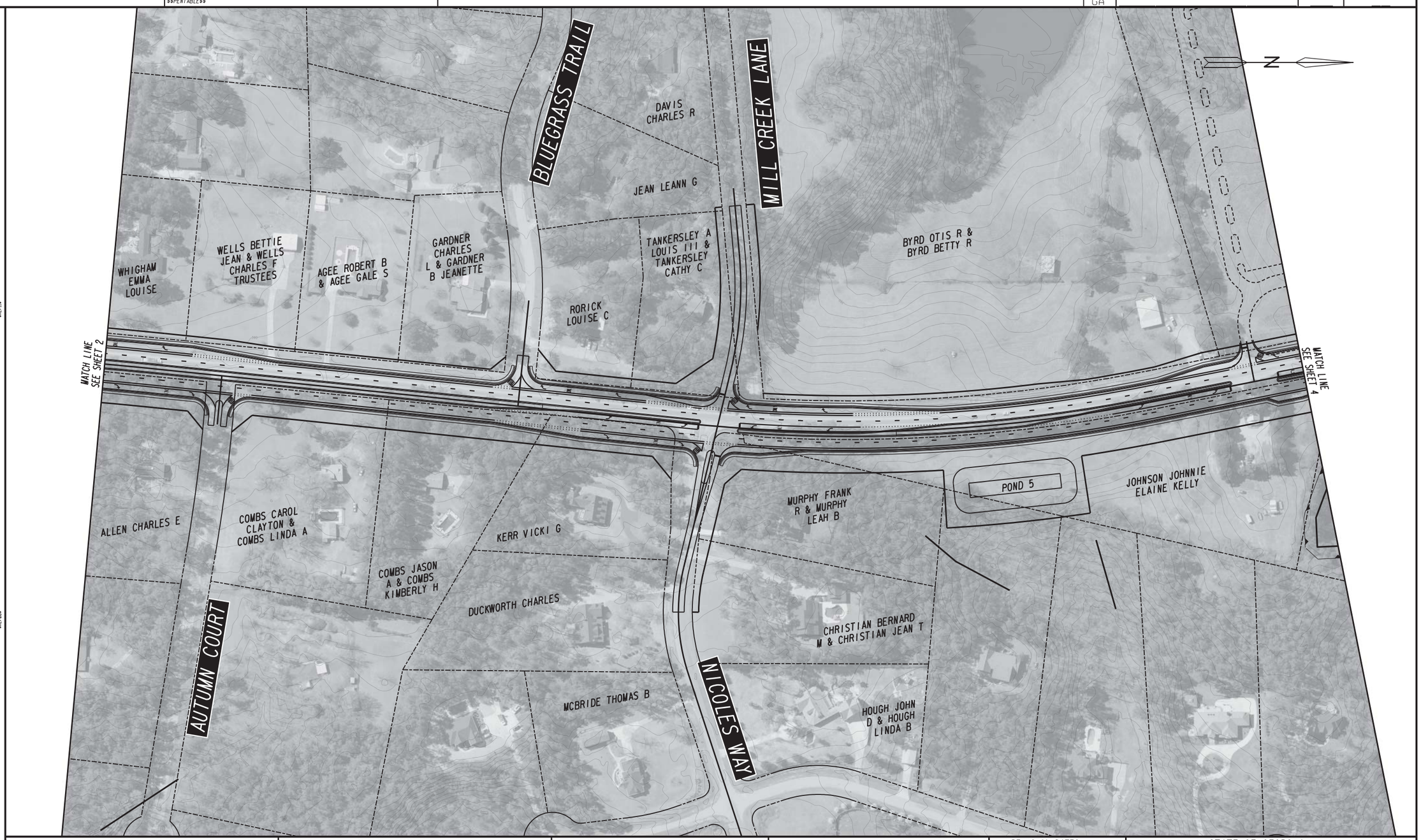

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SR 388 FROM I-20
TO SR 232 / COLUMBIA RD.

DRAWING No. 3

6/20/2011 GPLN

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SR 388 FROM I-20
TO SR 232 / COLUMBIA RD.

DRAWING No. 4

6/20/2011 GPLN

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DRAWING No. 5

6/20/2011 GPLN

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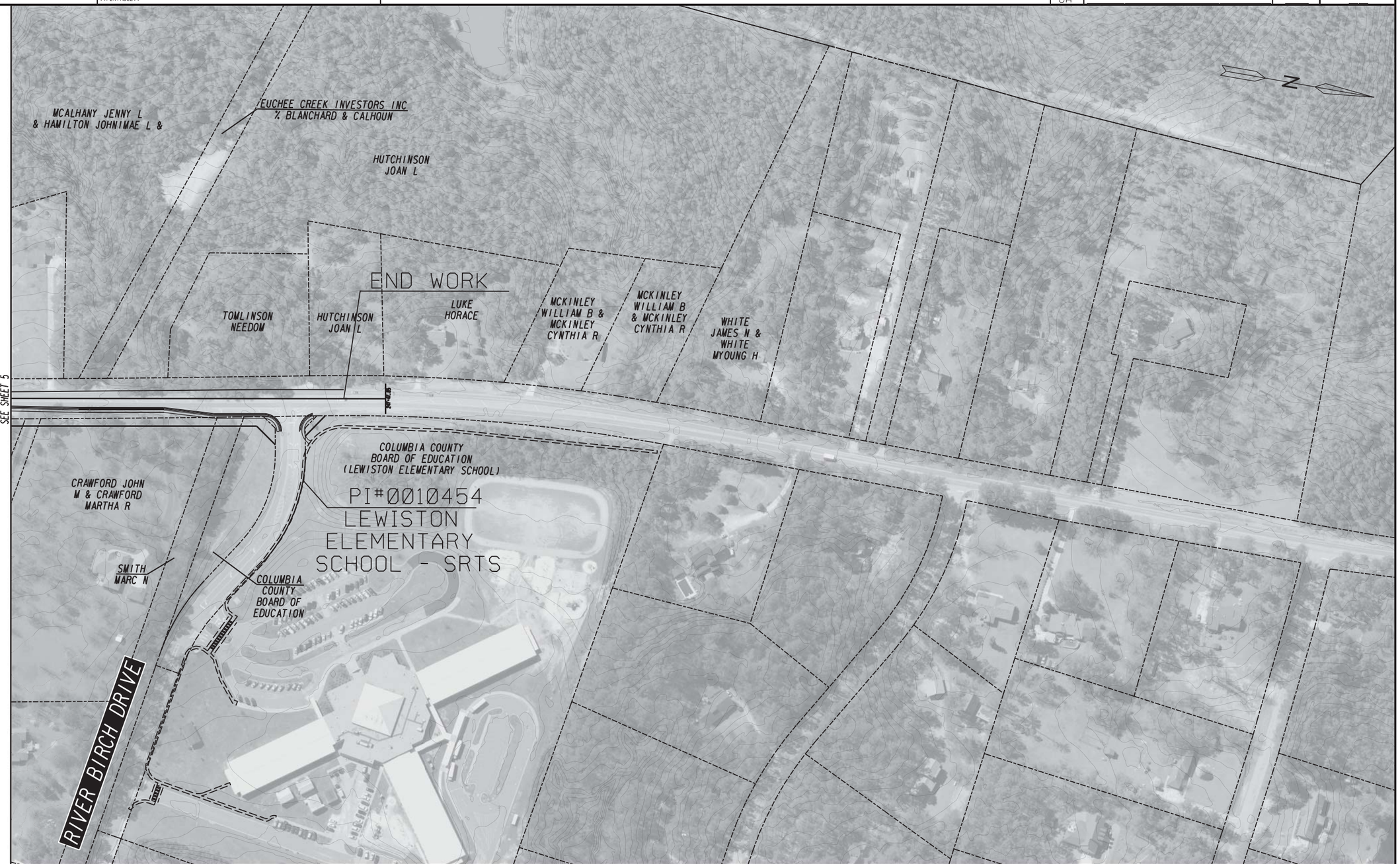

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SR 388 FROM I-20
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DRAWING No. 6

6/20/2011 GPLN

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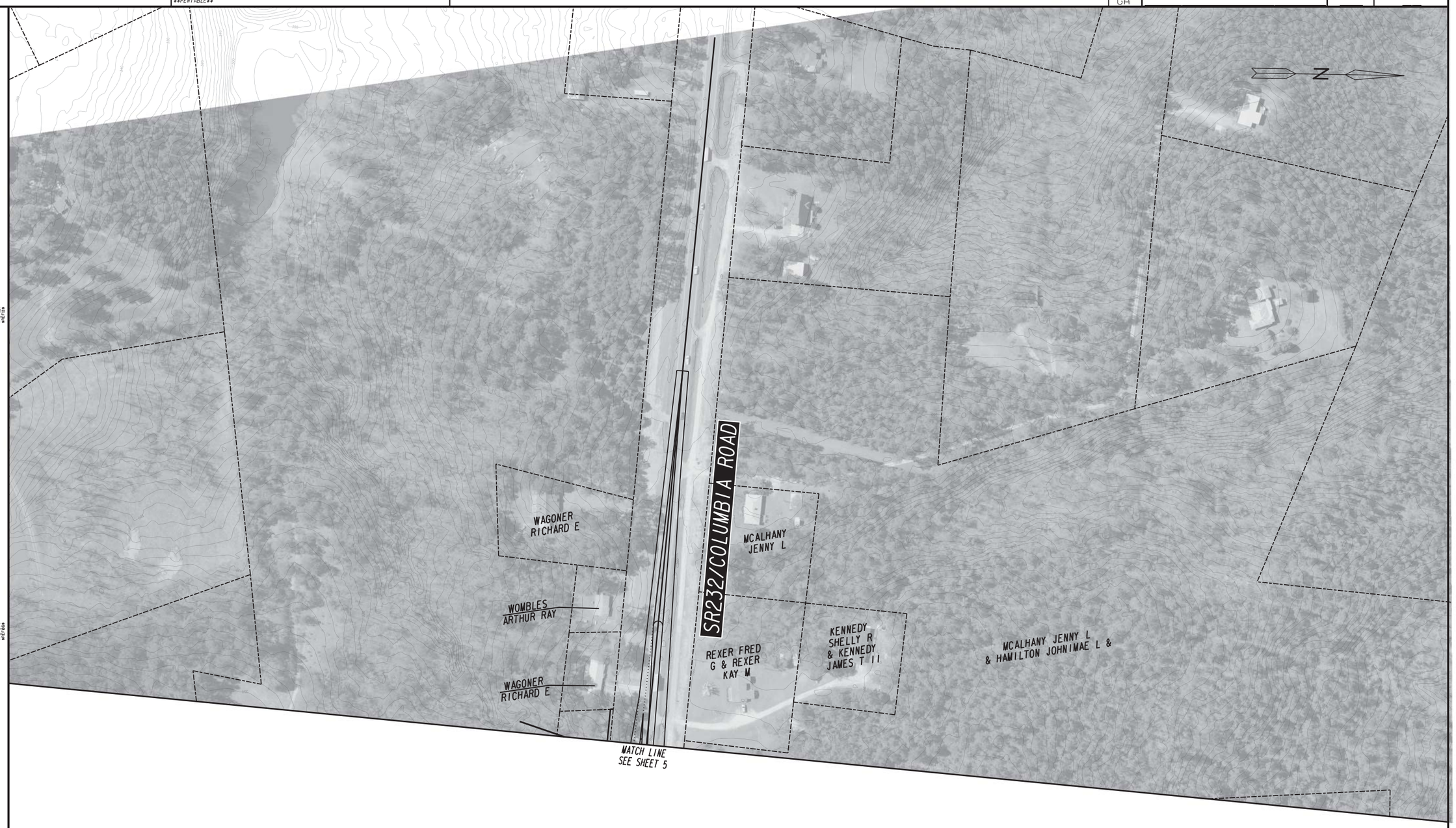

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SR 388 FROM I-20
TO SR 232 / COLUMBIA RD.

DRAWING No. 7

6/20/2011 GPLN

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REVISION DATES

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CONCEPT PLAN

SR 388 FROM I-20
TO SR 232 / COLUMBIA RD.

DRAWING No. 8

6/20/2011 GPLN

Attachment #3

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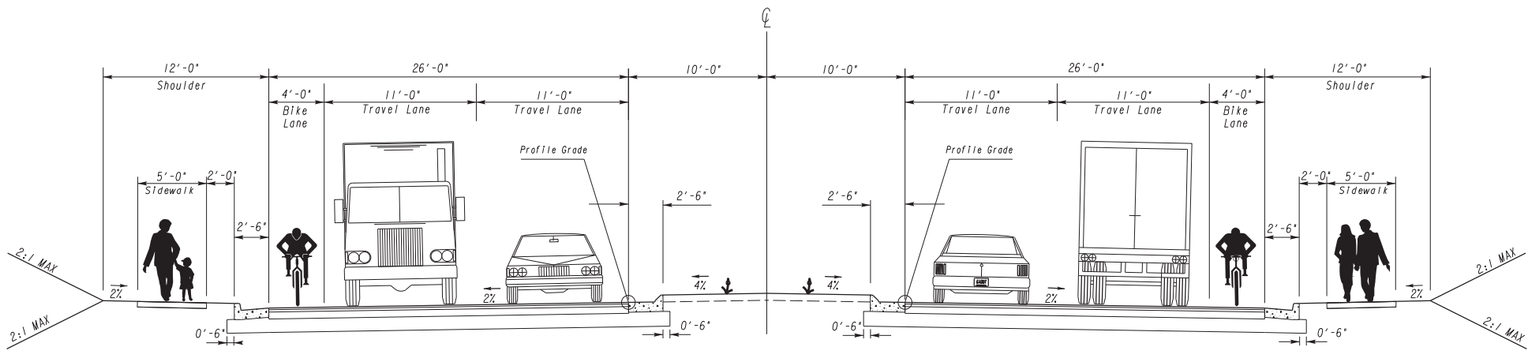
SR 388 TYPICALS
Proposed Typical Section



NOT TO SCALE

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TYPICAL SECTIONS

SR 388 FROM I-20
TO SR 232 / COLUMBIA RD.

DRAWING No. 1

6/20/2011 GPLN

Attachment #4

JOB ESTIMATE REPORT

JOB NUMBER : 0008350-WID-RCG SPEC YEAR: 01
DESCRIPTION: SR 388 FROM I-20 TO SR 232

COST GROUPS FOR JOB 0008350-WID-RCG

COST GROUP	DESCRIPTION	QUANTITY	PRICE	AMOUNT	ACTIVE?
SGNL	TRAFFIC SIGNALS (EA)	2.000	150000.00000	300000.00	Y
EROC	EROSION CONTROL (LS)	1.000	470000.00000	470000.00	Y
MISC	MS4 REQUIREMENTS (LS)	1.000	1000000.00000	1000000.00	Y
MISC	LANDSCAPING (LS)	1.000	200000.00000	200000.00	Y
SGNL	DDI TRAFFIC SIGNALS (LS)	1.000	500000.00000	500000.00	Y
MISC	OVERHEAD SIGNS	1.000	190000.00000	190000.00	Y
LTNG	HIGH MAST LIGHTING (EA)	1.000	1000000.00000	1000000.00	Y
MISC	BRIDGE (LS)	1.000	230000.00000	230000.00	Y
ACTIVE COST GROUP TOTAL				3890000.00	
INFLATED COST GROUP TOTAL				3890000.00	

ITEMS FOR JOB 0008350-WID-RCG

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	150-1000		LS	TRAFFIC CONTROL - 0008350	1.000	950000.00	950000.00
0010	153-1100		EA	FIELD ENGINEERS OFFICE TP 1	1.000	75000.00	75000.00
0030	310-1101		TN	GR AGGR BASE CRS, INCL MATL	54700.000	16.63	909911.53
0035	402-1802		TN	RECYL AC PATCHING, INCL BM&HL	1000.000	96.97	96971.08
0040	402-1812		TN	RECYL AC LEVELING,INC BM&HL	11930.000	73.86	881210.88
0045	402-3121		TN	RECYL AC 25MM SP,GP1/2,BM&HL	23990.000	64.39	1544834.37
0050	402-3130		TN	RECYL AC 12.5MM SP,GP2,BM&HL	10465.000	78.09	817229.75
0055	402-3190		TN	RECYL AC 19 MM SP,GP 1 OR 2 ,INC BM&HL	12000.000	67.47	809716.68
0060	413-1000		GL	BITUM TACK COAT	9700.000	2.52	24515.59
0065	432-0206		SY	MILL ASPH CONC PVMT/ 1.50" DEP	72300.000	0.91	66329.47
0070	441-0104		SY	CONC SIDEWALK, 4 IN	12045.000	19.68	237157.14
0074	441-0740		SY	CONC MEDIAN, 4 IN	1450.000	27.14	39359.90
0075	441-0754		SY	CONC MEDIAN, 7 1/2 IN	3200.000	41.73	133562.40
0079	441-4000		SY	CONC VALLEY GUTTER, SPCL DES	900.000	20.00	18000.00

0080	441-6222	LF	CONC CURB & GUTTER/ 8"X30"TP2	23300.000	13.33	310808.02
0084	441-6720	LF	CONC CURB & GUTTER/ 6"X30"TP7	16200.000	12.31	199422.00
0085	446-1100	LF	PVMT REF FAB STRIPS, TP2,18 INCH WIDTH	21270.000	2.26	48122.74
0088	500-3201	CY	CL B CONC, RET WALL	150.000	572.66	85900.12
0090	550-1180	LF	STM DR PIPE 18",H 1-10	16220.000	29.68	481555.09
0095	550-1240	LF	STM DR PIPE 24",H 1-10	5410.000	37.62	203558.39
0096	550-4118	EA	FLARED END SECT 18 IN, SIDE DR	8.000	216.60	1732.84
0101	550-4124	EA	FLARED END SECT 24 IN, SIDE DR	8.000	339.17	2713.38
0106	603-2184	SY	STN DUMPED RIP RAP, TP 3, 30"	160.000	32.00	5120.00
0111	603-7000	SY	PLASTIC FILTER FABRIC	160.000	3.26	522.30
0116	634-1200	EA	RIGHT OF WAY MARKERS	300.000	98.73	29621.73

0121	636-1020	SF	HWY SGN,TP1MAT,REFL SH TP3	825.000	11.18	9224.67
0126	636-1041	SF	HWY SIGNS,TP 2MAT,REFL SH TP 9	450.000	40.67	18306.00
0131	636-2070	LF	GALV STEEL POSTS, TP 7	1525.000	4.86	7423.49
0136	636-2090	LF	GALV STEEL POSTS, TP 9	825.000	6.31	5210.32
0141	641-1200	LF	GUARDRAIL, TP W	1600.000	16.14	25827.89
0146	641-5012	EA	GUARDRAIL ANCHORAGE, TP 12	8.000	1822.11	14576.94
0151	653-0120	EA	THERM PVMT MARK, ARROW, TP 2	89.000	62.40	5554.00
0156	653-0210	EA	THERM PVMT MARK, WORD , TP 1	41.000	100.77	4131.66
0161	653-0230	EA	THERM PVMT MARK, WORD , TP 3A	20.000	136.58	2731.75
0166	653-1501	LF	THERMO SOLID TRAF ST 5 IN, WHI	68900.000	0.32	22685.33
0171	653-1502	LF	THERMO SOLID TRAF ST, 5 IN YEL	29200.000	0.37	10952.34
0176	653-1704	LF	THERM SOLID TRAF STRIPE,24",WH	685.000	6.23	4272.13
0181	653-1804	LF	THERM SOLID TRAF STRIPE, 8",WH	21800.000	1.92	41889.35
0186	653-3501	GLF	THERMO SKIP TRAF ST, 5 IN, WHI	6975.000	0.29	2048.35
0191	653-6004	SY	THERM TRAF STRIPING, WHITE	5425.000	2.72	14763.27
0196	653-6006	SY	THERM TRAF STRIPING, YELLOW	4800.000	2.85	13695.36
0201	654-1001	EA	RAISED PVMT MARKERS TP 1	100.000	3.50	350.90
0206	654-1003	EA	RAISED PVMT MARKERS TP 3	1400.000	3.04	4266.11
0211	668-1100	EA	CATCH BASIN, GP 1	180.000	2192.65	394678.62
0216	700-6910	AC	PERMANENT GRASSING	40.000	814.28	32571.58
0221	700-8000	TN	FERTILIZER MIXED GRADE	30.000	493.42	14802.64
0226	700-8100	LB	FERTILIZER NITROGEN CONTENT	2000.000	1.90	3810.22
0231	210-0100	LS	GRADING COMPLETE - 0008350	1.000	1000000.00	1000000.00
0236	439-0022	SY	PLN PC CONC PVMT CL3 10" THK	5300.000	53.75	284875.00
0241	652-0094	EA	PVMT MARKING, SYMBOL, TP 4	6.000	47.42	284.54
0246	653-0110	EA	THERM PVMT MARK, ARROW, TP 1	19.000	62.97	1196.51
0251	653-0130	EA	THERM PVMT MARK, ARROW, TP 3	3.000	85.83	257.50
0256	653-0140	EA	THERM PVMT MARK, ARROW, TP 4	5.000	151.60	758.01
0261	441-4040	SY	CONC VALLEY GUTTER,W/CURB,6"	880.000	47.25	41580.00

ITEM TOTAL	9955599.85
INFLATED ITEM TOTAL	9955599.85

TOTALS FOR JOB 0008350-WID-RCG

ESTIMATED COST:	13845599.88
CONTINGENCY PERCENT (5.0):	692279.99
ESTIMATED TOTAL:	14537879.87

14537879

PROJ. NO.	8350
P.I. NO.	0008350
DATE	3/12/2014

CALL NO.

INDEX (TYPE)	DATE	INDEX
REG. UNLEADED	Mar-14	$ 3.293
DIESEL		$ 3.909
LIQUID AC		$ 563.00

Link to Fuel and AC Index:
http://www.dot.ga.gov/doingbusiness/Materials/Pages/asphaltcementindex.aspx

LIQUID AC ADJUSTMENTS

PA=[((APM-APL)/APL)]xTMTxAPL

Asphalt

Price Adjustment (PA)				**735897.3**	**$ 735,897.30**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	900.80	
Monthly Asphalt Cement Price month project let (APL)			$	563.00	
Total Monthly Tonnage of asphalt cement (TMT)				2178.5	

ASPHALT	Tons	%AC	AC ton
Leveling	9800	5.0%	490
12.5 OGFC	0	5.0%	0
12.5 mm	10220	5.0%	511
9.5 mm SP	0	5.0%	0
25 mm SP	15700	5.0%	785
19 mm SP	7850	5.0%	392.5
	43570		**2178.5**

BITUMINOUS TACK COAT

Price Adjustment (PA)			**$**	**13,638.32**	**$ 13,638.32**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	900.80	
Monthly Asphalt Cement Price month project let (APL)			$	563.00	
Total Monthly Tonnage of asphalt cement (TMT)				40.37394867	

Bitum Tack Gals	gals/ton	tons
9400	232.8234	40.3739487

PROJ. NO.	8350		CALL NO.
P.I. NO.	0008350		
DATE	3/12/2014		

BITUMINOUS TACK COAT (surface treatment)

Price Adjustment (PA)				**35923.91486**	**$ 35,923.91**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	900.80	
Monthly Asphalt Cement Price month project let (APL)			$	563.00	
Total Monthly Tonnage of asphalt cement (TMT)				106.3466988	

Bitum Tack	SY	Gals/SY	Gals	gals/ton	tons
Single Surf. Trmt.	123800	0.20	24760	232.8234	106.3466988
Double Surf.Trmt.	0	0.44	0	232.8234	0
Triple Surf. Trmt	0	0.71	0	232.8234	0
					106.3466988

TOTAL LIQUID AC ADJUSTMENT	**$ 785,459.53**

GEORGIA DEPARTMENT OF TRANSPORTATION
PRELIMINARY ROW COST ESTIMATE SUMMARY

Date: 3/7/2014
Revised:

Project: CSSTP-0008-00(350)
County: Columbia
PI: 0008350

Description: SR 388 frm I-20 to CR 232/Columbia Rd
Project Termini: SR 388 frm I-20 to CR 232/Columbia Rd

Existing ROW: vaires
Parcels: 82
Required ROW: vaires

Land and Improvements		$7,208,595.00
Proximity Damage	*$0.00*	
Consequential Damage	*$1,850,000.00*	
Cost to Cures	*$400,000.00*	
Trade Fixtures	*$0.00*	
Improvements	*$1,600,000.00*	
Valuation Services		$57,500.00
Legal Services		$542,850.00
Relocation		$324,000.00
Demolition		$0.00
Administrative		$699,000.00
TOTAL ESTIMATED COSTS		$8,831,945.00
TOTAL ESTIMATED COSTS (ROUNDED)		***$8,832,000.00***

Preparation Credits	Hours	Signature

Prepared By: LaShone Alexander CG#: 286999 03/07/2014
Approved By: LaShone Alexander CG#: 286999 03/07/2014

NOTE: No Market Appreciation is included in this Preliminary Cost Estimate

Georgia Department of Transportation
Preliminary ROW Cost Estimate Worksheet

Project/County/PI CSSTP-0008-00(350) Columbia 0008350

		A	B	C	D
	Land and Improvements	**Agriculture**	**Residential**	**Commercial**	**Industrial**
1	Estimate Low (ac)	$0.00	$30,492.00	$39,204.00	$0.00
2	Estimate High (ac)	$0.00	$39,204.00	$70,132.00	$0.00
3	Estimate Used (ac)	$0.00	$34,900.00	$60,500.00	$0.00
4	Fee Simple Area (ac)	0.00	20.00	4.26	0.00
5	Fee Simple Estimate	$0.00	$698,000.00	$257,730.00	$0.00
6	Perm Esmt Area (ac)	0.00	0.00	0.00	0.00
7	Perm Esmt Factor	0%	50%	50%	0%
8	Perm Esmt Estimate	$0.00	$0.00	$0.00	$0.00
9	Temp Esmt Area (ac)	0.00	0.00	0.00	0.00
10	Temp East Factor	0%	0%	0%	0%
11	Temp Esmt Estimate	$0.00	$0.00	$0.00	$0.00
12	Proximity Damages	$0.00	$0.00	$0.00	$0.00
13	Consequential Damages	$0.00	$1,100,000.00	$750,000.00	$0.00
14	Cost to Cures	$0.00	$300,000.00	$100,000.00	$0.00
15	Improvements	$0.00	$1,250,000.00	$350,000.00	$0.00
16	Trade Fixtures	$0.00	$0.00	$0.00	$0.00
17					
18	PROPERTY TYPE TOTALS	$0.00	$3,348,000.00	$1,457,730.00	$0.00
19			SUB TOTAL PROPERTY TYPES		$4,805,730.00
20			Counter Offers and Condemnation Increases		$2,402,865.00
21					
22			**GRAND TOTAL LANDS AND IMPROVEMENTS**		$7,208,595.00

Georgia Department of Transportation
Preliminary ROW Cost Estimate Worksheet

Project/County/PI CSSTP-0008-00(350) Columbia 0008350

		A	B	C	D
	Valuation Services	**Agriculture**	**Residential**	**Commercial**	**Industrial**
1	Appraisals (# of Parcels)	0	14	10	0
2	Estimated Fees (per Parcel)	$0.00	$1,500.00	$2,500.00	$0.00
3	TOTAL APPRAISALS	$0.00	$21,000.00	$25,000.00	$0.00
4	Sign Estimates	0	0	0	0
5	Estimated Fees	$0.00	$0.00	$1,500.00	$0.00
6	TOTAL SIGN ESTIMATES	$0.00	$0.00	$0.00	$0.00
7	Specialty Reports	0	0	0	0
8	Estimated Fees	$0.00	$0.00	$0.00	$0.00
9	TOTAL SPECIALTY REPORTS	$0.00	$0.00	$0.00	$0.00
10	Septic/Well Reports	0	0	0	0
11	Estimated Fees	$0.00	$0.00	$0.00	$0.00
12	TOTAL SEPTIC/WELL REPORTS	$0.00	$0.00	$0.00	$0.00
13					
14					
15					
16	TOTAL VALUATION FEES	$0.00	$21,000.00	$25,000.00	$0.00
17			SUB TOTAL VALUATION SERVICES		$46,000.00
18			Updates and Incidentals (Min $2,500 or 25%)		$11,500.00
19			**GRAND TOTAL VALUATION SERVICES**		$57,500.00

Georgia Department of Transportation
Preliminary ROW Cost Estimate Worksheet

Project/County/PI CSSTP-0008-00(350) Columbia 0008350

		A	B	C	D
	Legal Services	**Parcels**	**Estimated Fees**		**TOTALS**
1	Meeting with Attorney	82	$125.00		$10,250.00
2	Preliminary Titles	82	$200.00		$16,400.00
3	Closing and Final Title	82	$300.00		$24,600.00
4	Recording Fees	82	$50.00		$4,100.00
5	Condemnation Filing	13	$5,000.00		$65,000.00
6	Litigation Costs	13	$25,000.00		$325,000.00
7	Updates and Incidentials	13	$7,500.00		$97,500.00
8					
9					
10					
11					
12					
13					
14					
15					
16					
17			**GRAND TOTAL LEGAL SERVICES**		$542,850.00

Georgia Department of Transportation
Preliminary ROW Cost Estimate Worksheet

Project/County/PI CSSTP-0008-00(350) Columbia 0008350

		A	B	C	D
	Relocation	**Displacements**	**Estimated Costs**		**TOTALS**
1	Business Displacement	0	$15,000.00		$0.00
2	Residential Tenant		$20,000.00		$0.00
3	Residential Owner	4	$40,000.00		$160,000.00
4	Pro-Rata Taxes	82	$1,000.00		$82,000.00
5	Property Pin Replacement	82	$1,000.00		$82,000.00
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17			**GRAND TOTAL RELOCATION**		$324,000.00

Georgia Department of Transportation
Preliminary ROW Cost Estimate Worksheet

Project/County/PI CSSTP-0008-00(350) Columbia 0008350

		A	B	C	D
	Demolition	**Items/Improvements**	**Estimated Costs**		**TOTALS**
1	Residential Structures		$15,000.00		$0.00
2	Commercial Structures		$25,000.00		$0.00
3	Hotels/Apartments		$60,000.00		$0.00
4	UST's - Dispensers		$50,000.00		$0.00
5	Billboards		$8,000.00		$0.00
6	Signs - Light Standards		$1,500.00		$0.00
7	Water Vaults		$15,000.00		$0.00
8	Gas/Water Service Separation		$2,500.00		$0.00
9					
10					
11					
12					
13					
14					
15					
16					
17			**GRAND TOTAL DEMOLITION**		$0.00

Georgia Department of Transportation
Preliminary ROW Cost Estimate Worksheet

Project/County/PI CSSTP-0008-00(350) Columbia 0008350

		A	B	C	D
	Administrative	**Parcels**	**Man hours per Parcel**		**TOTALS**
1	Pre-Acquisition	82	40		$164,000.00
2	Acquisition	82	100		$410,000.00
3	Relocation	3	50		$7,500.00
4	Administrative Appeals	21	50		$52,500.00
5	Post-Acquisition	13	100		$65,000.00
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17			**GRAND TOTAL INHOUSE**		$699,000.00

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE CSSTP-0008-00(350) Columbia County
P.I. No. 0008350

OFFICE Tennille

DATE December 12, 2013

FROM Lynn Bean, District Utilities Engineer

TO Genetha Rice-Singleton, State Program Delivery Engineer
ATTN George Brewer, Project Manager

SUBJECT **CONCEPT UTILITY COST ESTIMATE**

As requested by your office, we are furnishing you with a Concept Utility Cost estimate for each utility with facilities located within the project limits.

FACILITY OWNER	NON-REIMBURSABLE	REIMBURSABLE
GEORGIA POWER (POWR DIST.)	$ 0.00	$1,188,000.00
ATLANTA GAS LIGHT RESOURCES (GAS)	$ 1,167,230.00	$ 0.00
AT&T	$ 300,000.00	$ 200,000.00
WOW CATV	$ 166,650.00	$ 0.00
COMCAST	$ 118,495.00	$ 0.00
COLUMBIA COUNTY WATER	$ 1,863,104.00	$ 0.00
COLUMBIA COUNTY SEWER	$ 3,750.00	$ 4,500.00
COLUMBIA COUNTY TELECOMMUNICATIONS	$ 427,725.00	$ 0.00
TOWER CLOUD, INC.	$ 145,275.00	$ 0.00
	$4,192,229.00	$1,392,500.00

Totals

Total Non-Reimbursable Cost: $ 4,192,229.00
Total Reimbursable Cost: $ 1,392,500.00
Total Relocations: $5,584,729.00

This estimate was compiled using information provided by the various utility owners, past estimates and the Item Mean Summary. Please be advised this is an estimate and may be revised when prior rights research is completed.

If you should have questions or need additional information, please contact Jimmy Hobby at 478-552-4633.

LB: JFH

C: Mike Bolden, State Utilities Engineer
Lee Upkins, Assistant State Utilities Engineer
Angela D. Robinson, Office of Financial Management;
Rodney Way, Area Engineer

Opinion of Probable Costs

Conceptual Environmental Mitigation Cost Estimate

GDOT PI# 0008350

November 22, 2013

Project impacts

Stream impacts - 125 Lin. Ft.

Estimated stream credits needed – 818.75 credits

Estimated Cost = $68,775

Additional impacts if build DDI.

Stream impacts - 25 Lin. Ft.

Estimated stream credits needed – 163.75 credits

Estimated Cost = $13,755

Total project impacts with DDI

Stream impacts- 150 Lin. Ft.

Estimated stream credits needed - 982.5 credits

Estimated Total Cost = $82,530

Attachment #5

3/1/2013 5:21:48 PM	GPLOT-V8	G:\2741908\0_Comm\T_Traffic\TO 33\Graphics\0008350_10-001.dgn	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
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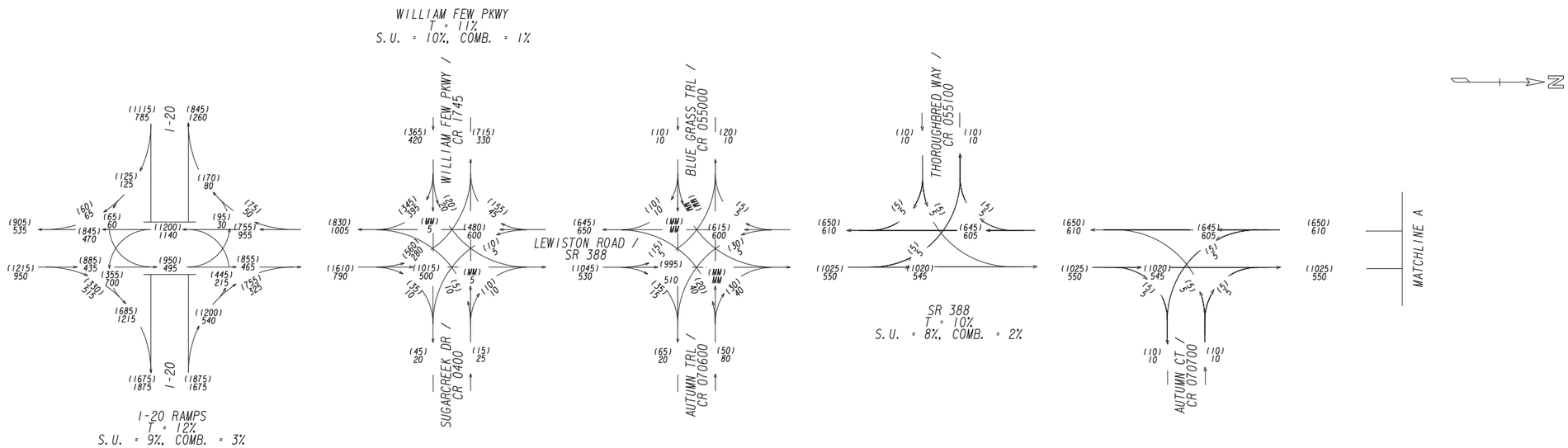
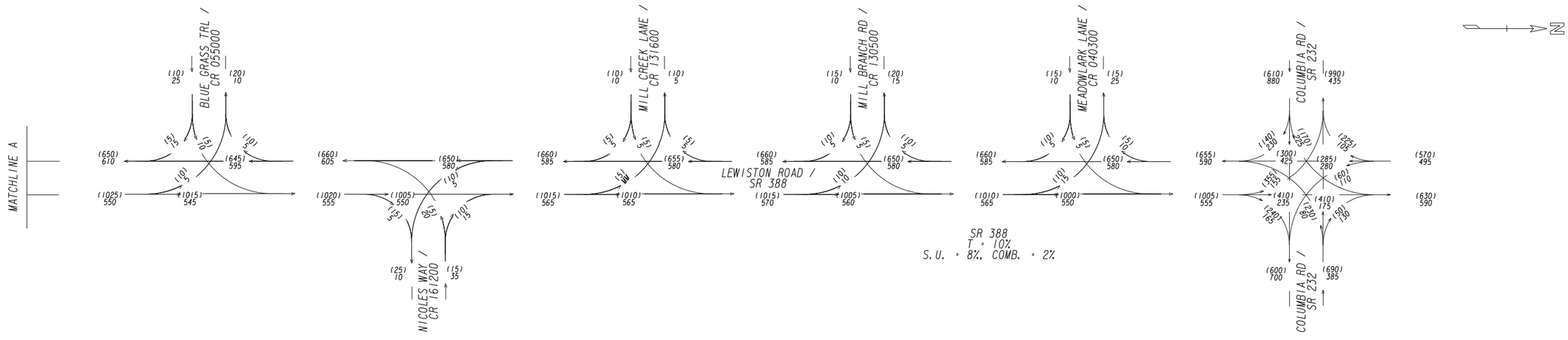
SHEET 1 OF 8





P.I. NO: 0008350

2012 AM DHV = 000
2012 PM DHV = (000)

GRESHAM SMITH AND PARTNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

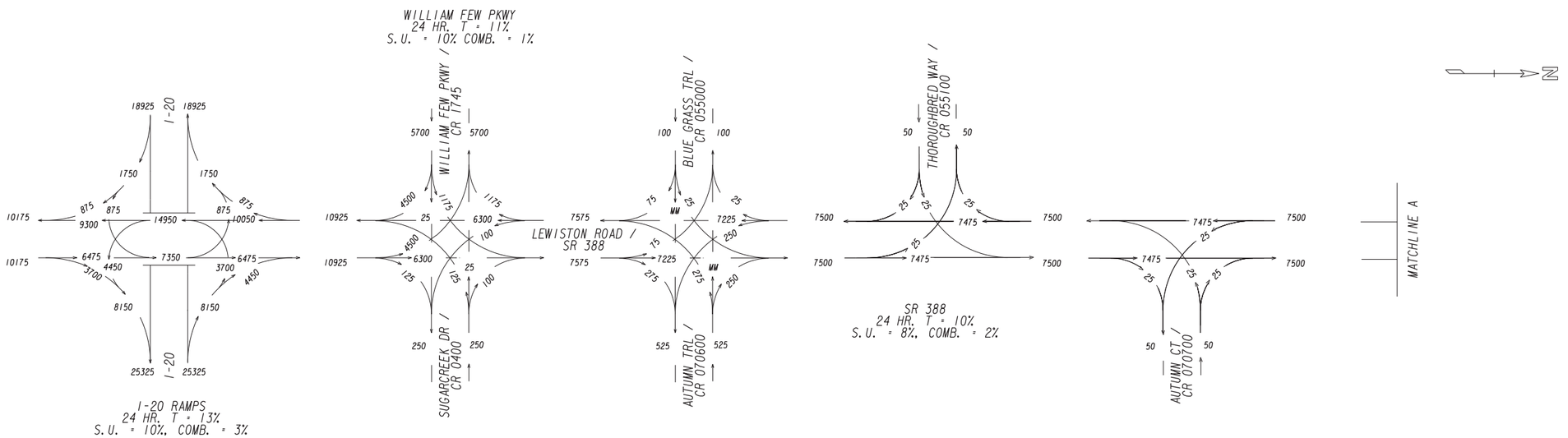
TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

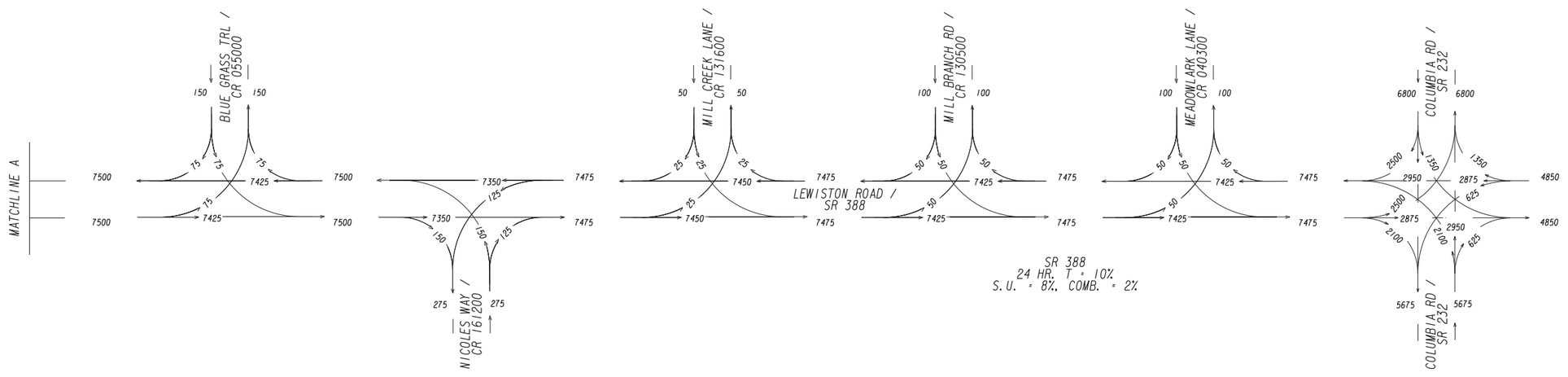
CSSTP-0008-00(350)
COLUMBIA COUNTY

DRAWING No. 10-001

4/27/2012 GPLN

SHEET 2 OF 8





P.I. NO: 0008350

2012 ADT = 000

GRESHAM SMITH AND PARTNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

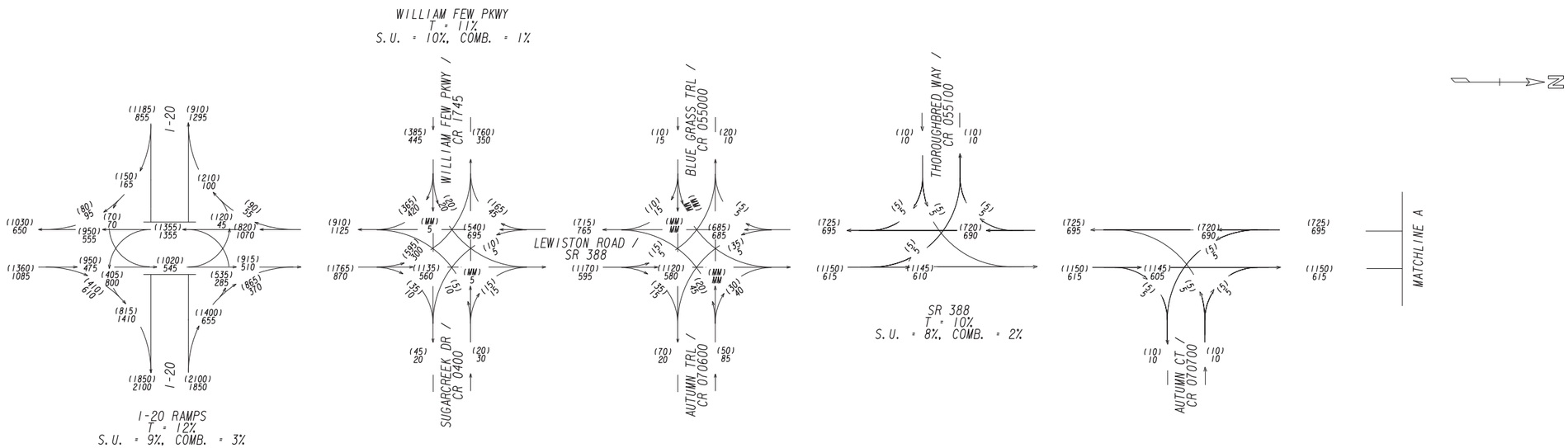
TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

DRAWING No. 10-002

4/27/2012 GPLN

SHEET 3 OF 8



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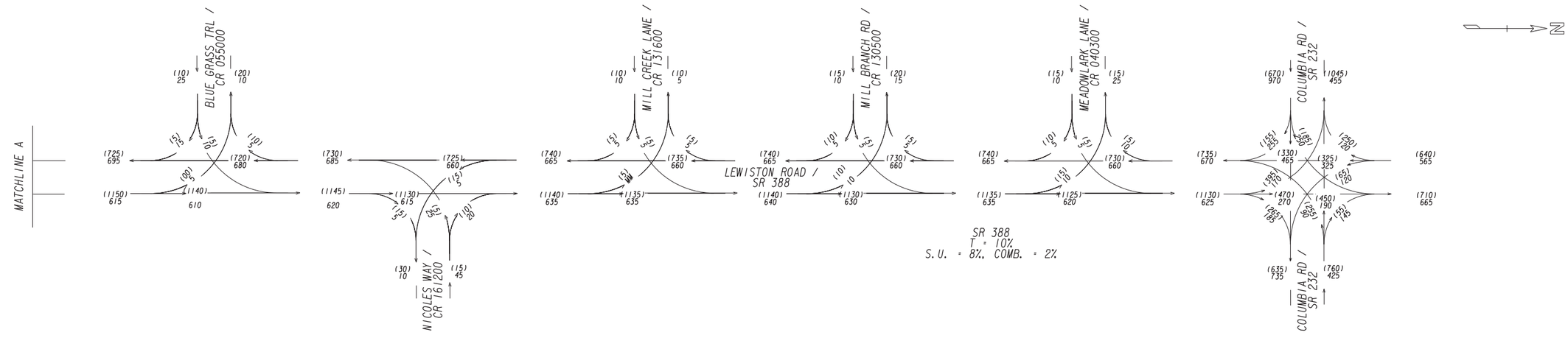

2017 NO BUILD AM DHV = 000
2017 NO BUILD PM DHV = (000)

GRESHAM SMITH AND PARTNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

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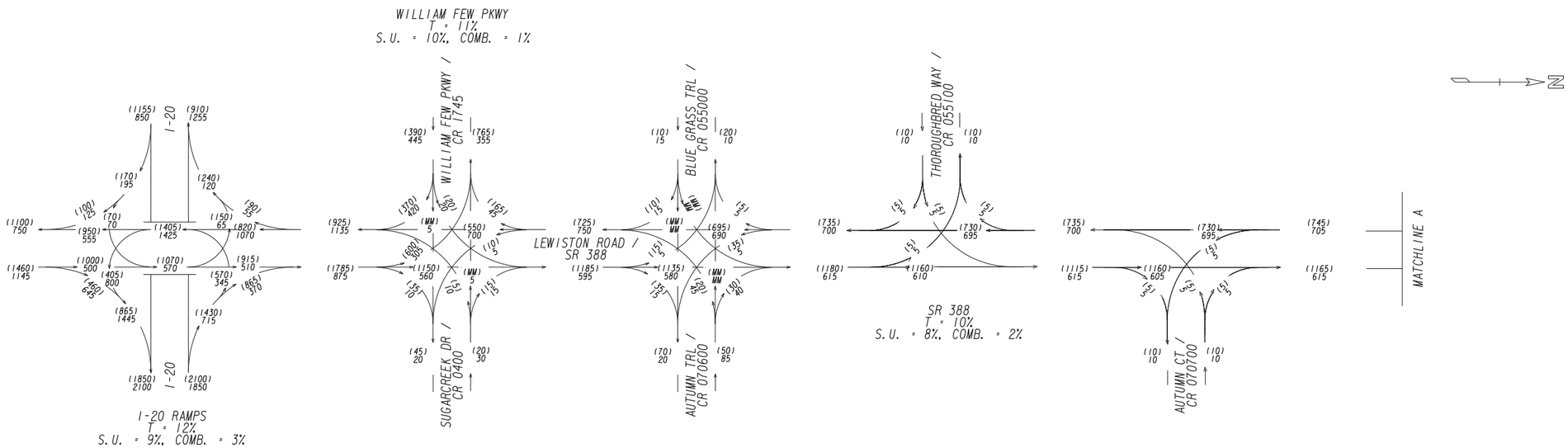
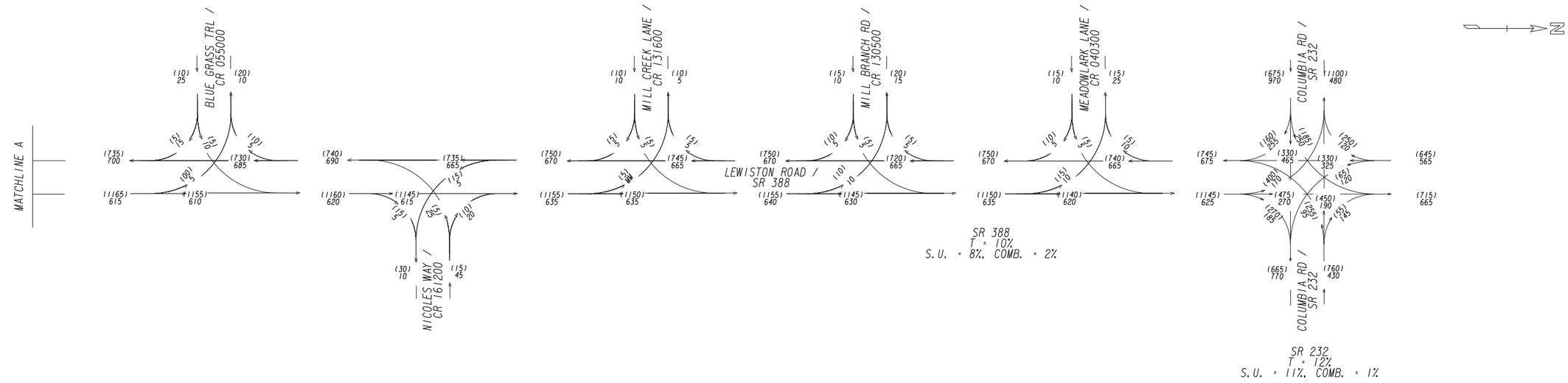




P.I. NO: 0008350

2017 BUILD AM DHV = 000
2017 BUILD PM DHV = (000)

GRESHAM SMITH AND PARTNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

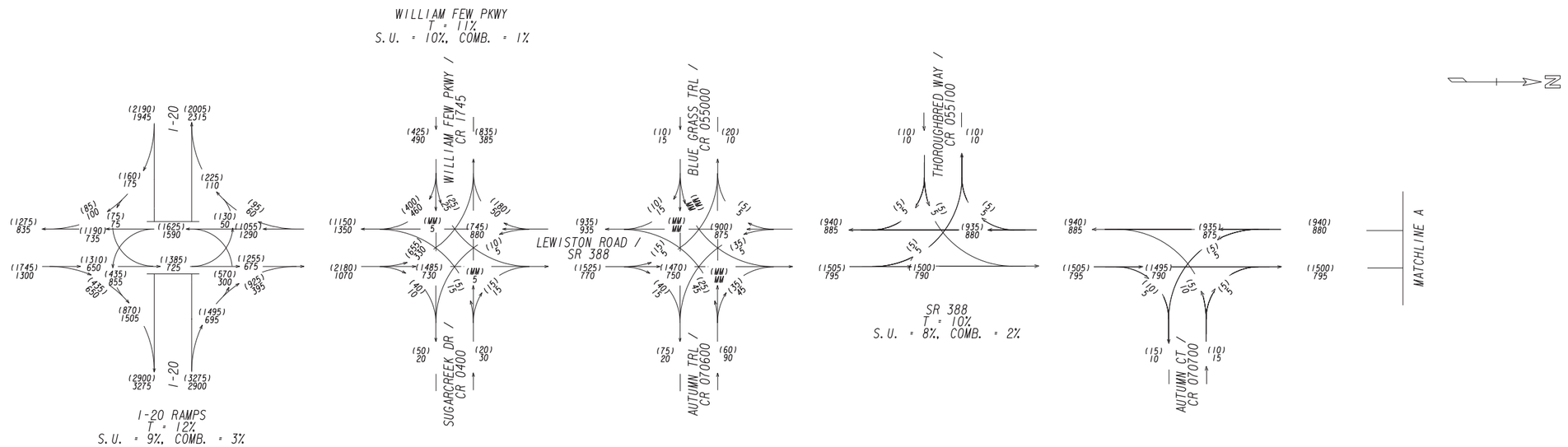
TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

DRAWING No. 10-004

4/27/2012 GPLN

SHEET 5 OF 8



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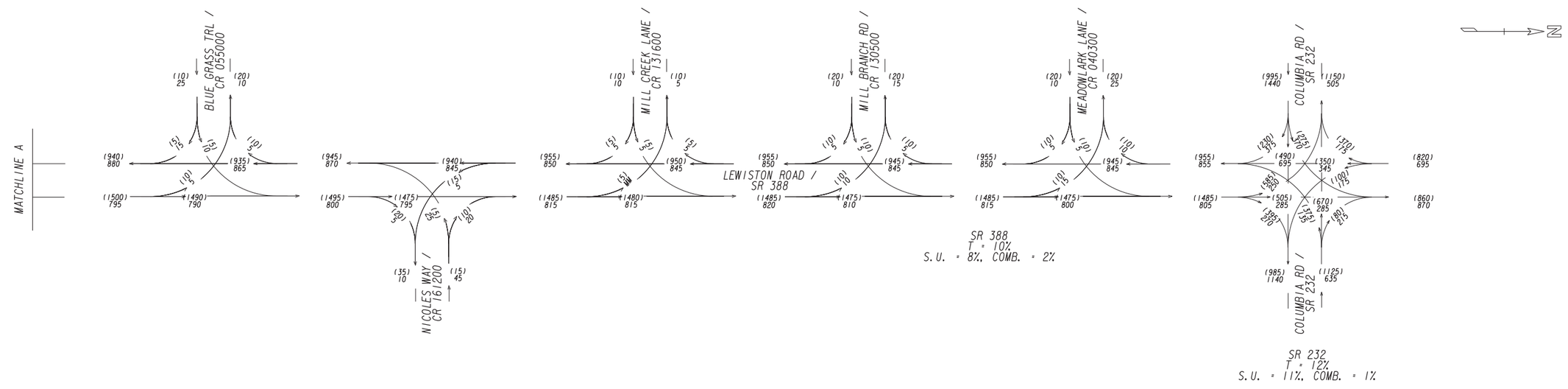

2037 NO BUILD AM DHV = 000
2037 NO BUILD PM DHV = (000)

GRESHAM SMITH AND PARTNERS

GEORGIA DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

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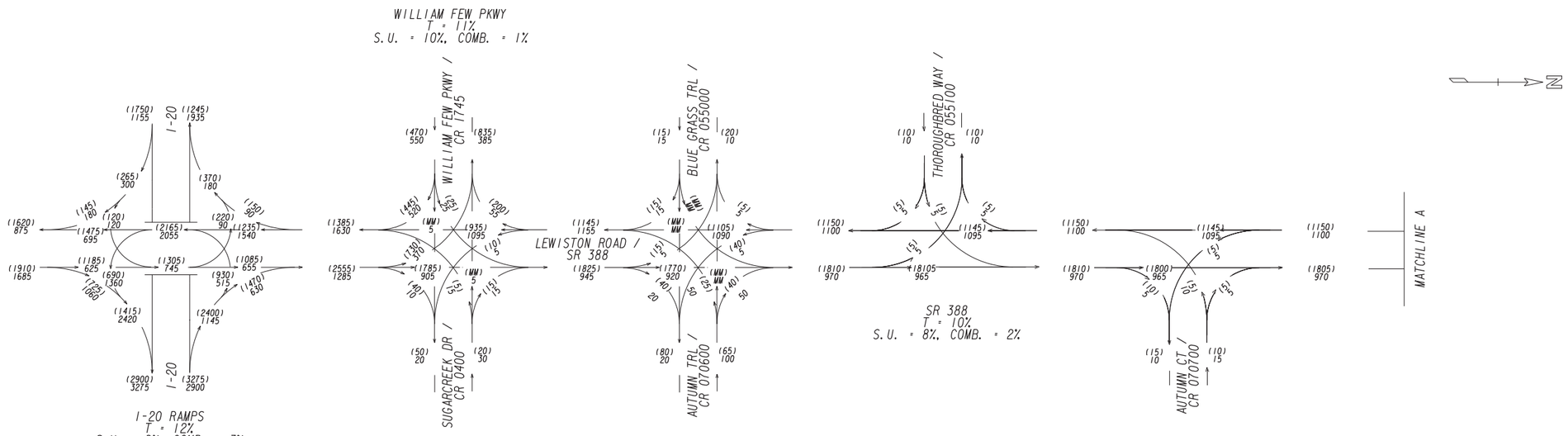
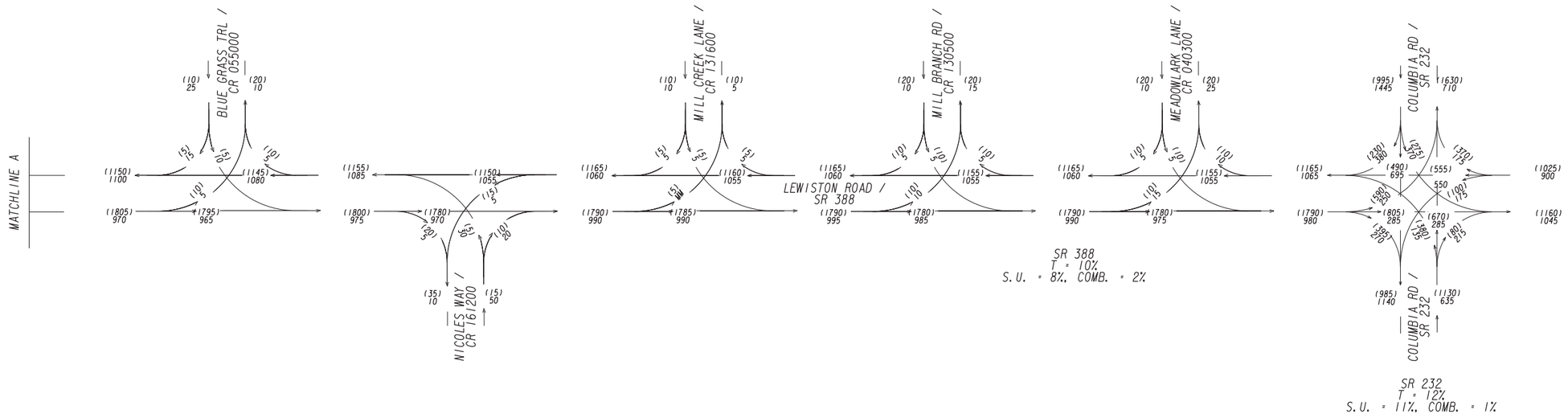
SHEET 6 OF 8





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GRESHAM SMITH AND PARTNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

DRAWING No. 10-006

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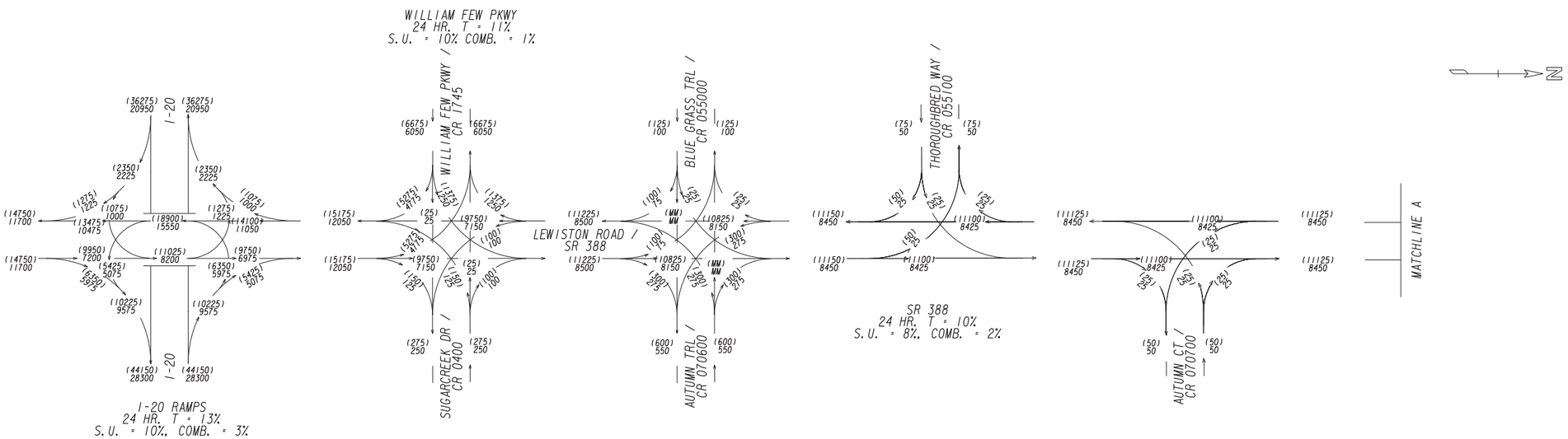

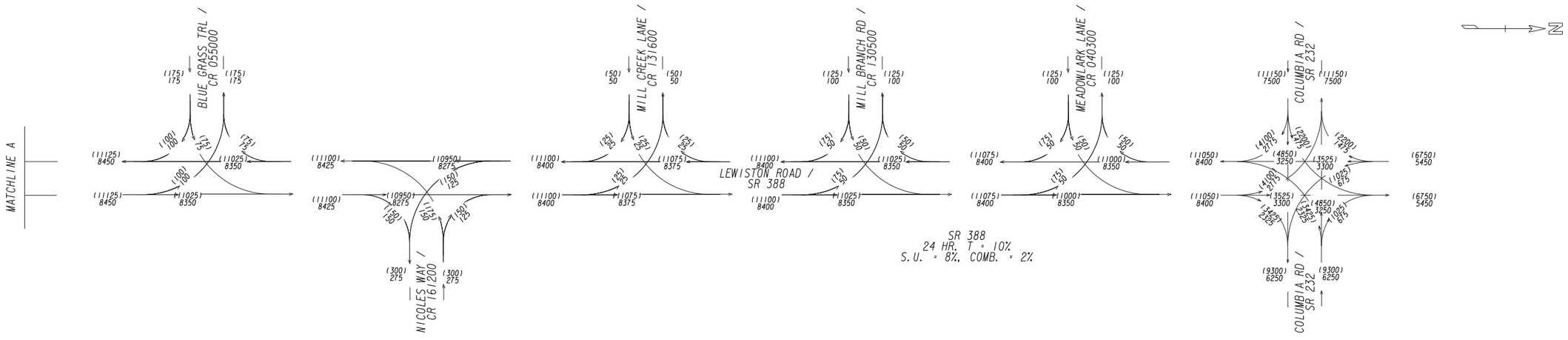

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GRESHAM SMITH AND PARTNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

DRAWING No. 10-007

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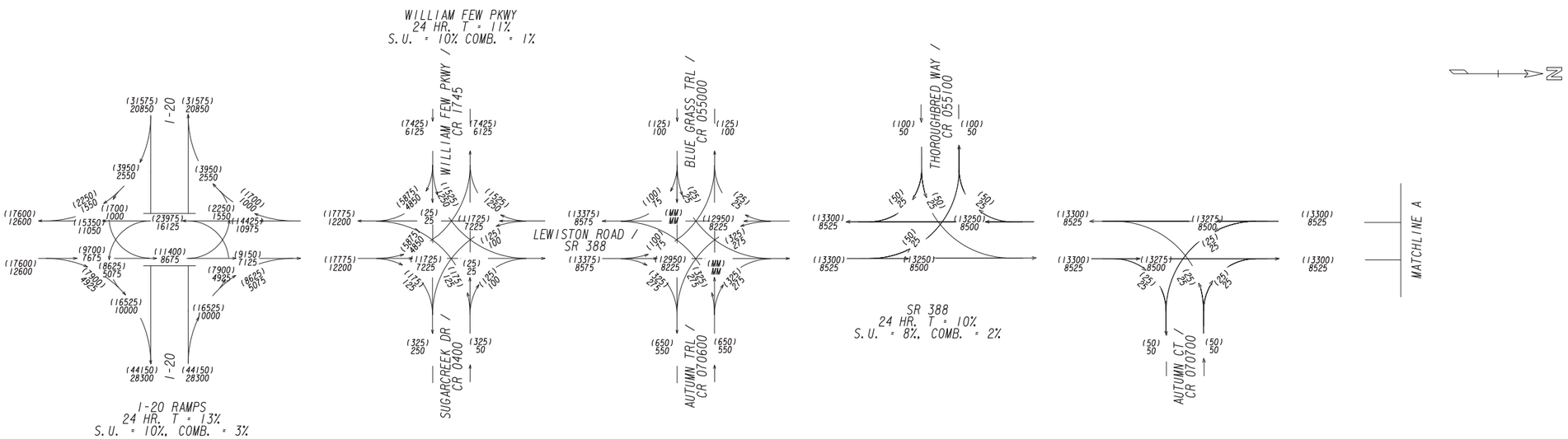

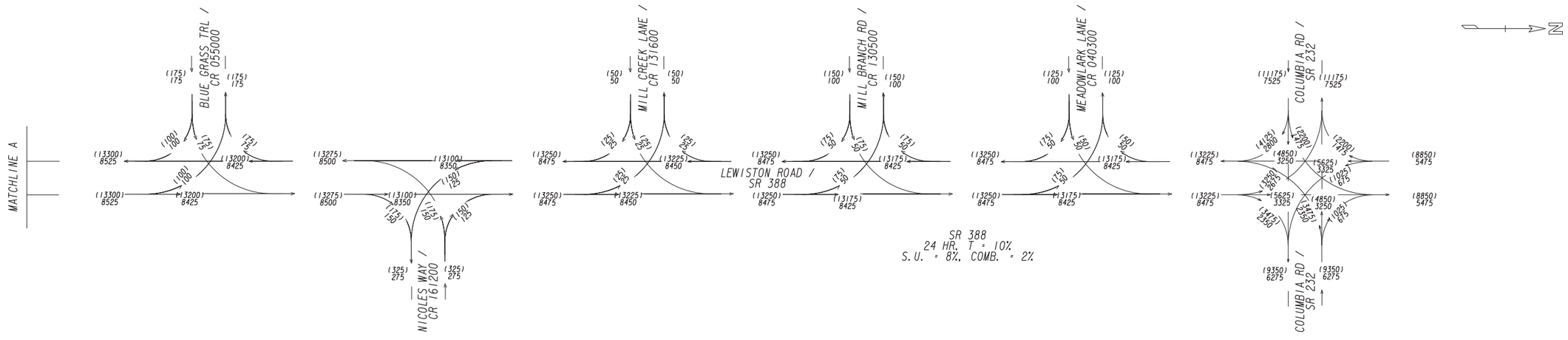

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GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PROGRAM DELIVERY

TRAFFIC DIAGRAM
SR 388 FROM I-20 TO SR 232

CSSTP-0008-00(350)
COLUMBIA COUNTY

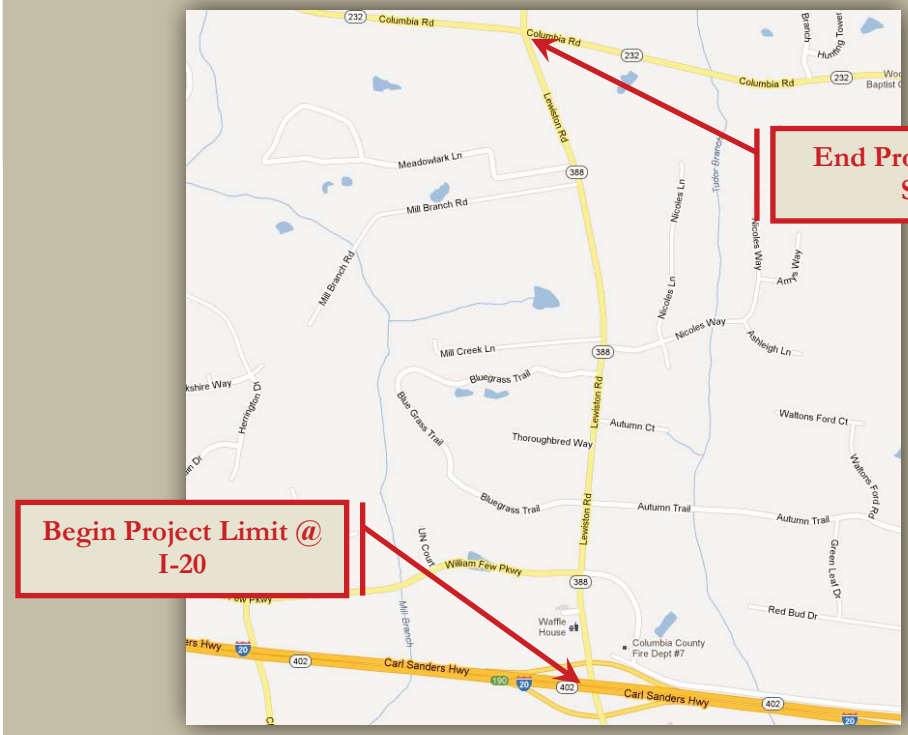
DRAWING No. 10-008

4/27/2012 GPLN

Attachment #6

TRAFFIC ENGINEERING REPORT

SR 388 Roadway Widening
FROM I-20 TO SR 232
CSSTP-0008-00(350), Columbia County
P.I. # 0008350



Prepared For:

GEORGIA DEPARTMENT OF TRANSPORTATION

Prepared By:

G S & P

2325 Lakeview Parkway, Suite 400
Alpharetta, Georgia 30009
770-754-0755

May 10th, 2013

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INTRODUCTION

Gresham, Smith and Partners (GS&P) has prepared a traffic analysis for the proposed SR 388 widening project in Columbia County, Georgia. Under this project, the section of SR 388 between I-20 and SR 232 will be widened from the existing 2-lane roadway to a 4-lane facility with a 20-foot raised median and appropriate intersection improvements.

This traffic operations analysis has been prepared in accordance with the following standards:

- *Manual on Uniform Traffic Control Devices (MUTCD)*, 2009 Edition, AASHTO.
- *Highway Capacity Manual 2010*, *Transportation Research Board.*
- *GDOT Design Policy Manual*, Georgia Department of Transportation (GDOT).
- *GDOT Construction Standards and Details*, GDOT.
- NCHRP Report 457. *Evaluating Intersection Improvements: An Engineering Study Guide*

STUDY LOCATION

SR 388 within the project limits runs in a north-south direction. The project limits begin on the southern end at I-20 and extend to SR 232 in the north. Figure 1 shows the vicinity and limits of the project.

REASON FOR INVESTIGATION

There is a need to adequately accommodate future capacity requirements along SR 388 in Columbia County, Georgia. Therefore, the Georgia Department of Transportation has decided to improve and upgrade SR 388. This traffic engineering study was conducted to support the reconstruction and widening of the section of SR 388 between I-20 and SR 232. These improvements include widening of SR 388 from the existing 2-lane roadway to a 4-lane facility with a 20-foot raised median and appropriate intersection improvements.

This traffic engineering study supports the proposed SR 388 roadway project to evaluate the planned improvements. Specifically, capacity analyses of SR 388 roadway segments and intersections along SR 388 were carried out to determine levels of service.

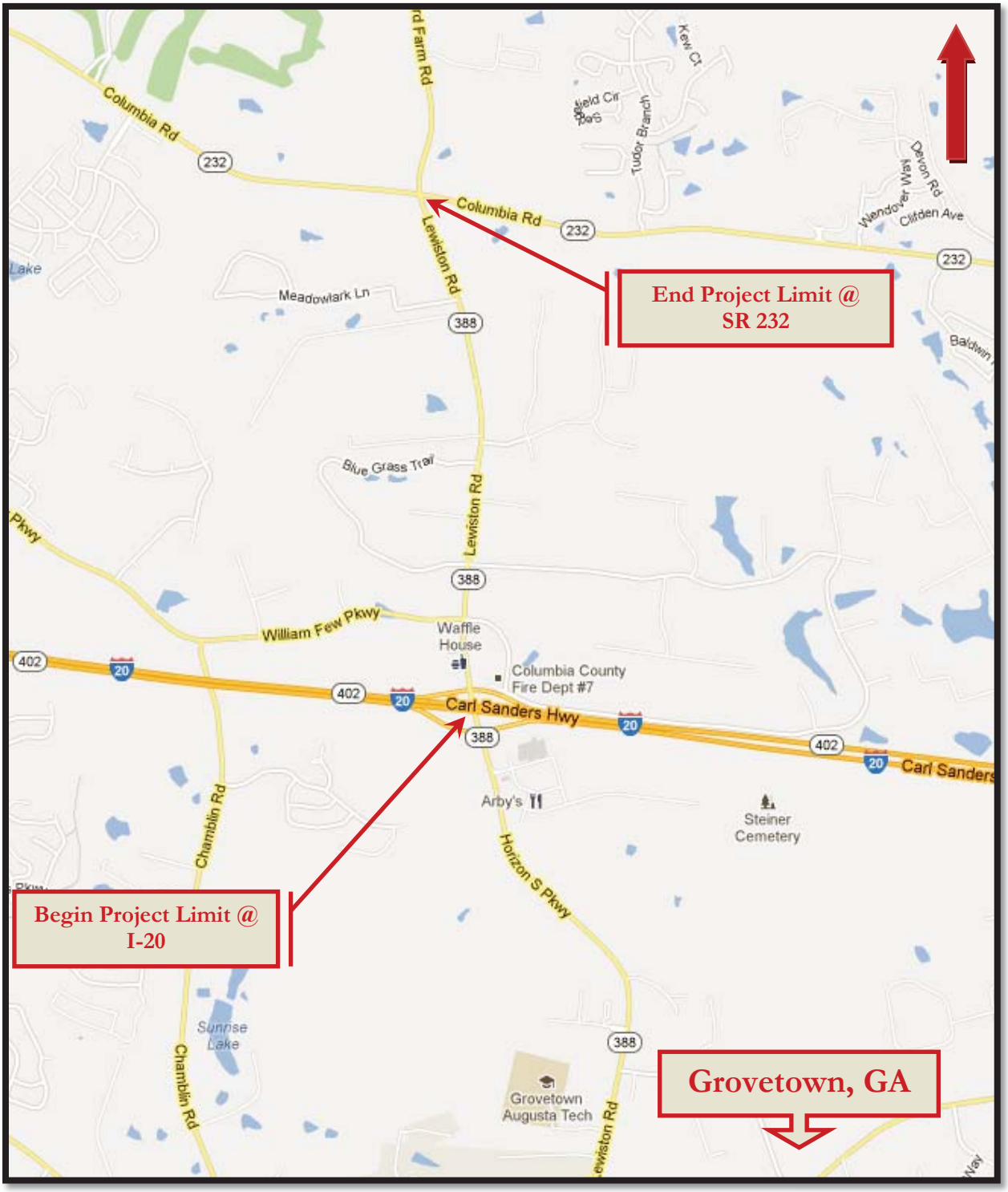


Figure 1. Project Vicinity and Limits

DESCRIPTION OF STUDY LOCATION

SR 388 as existing is a 2-lane undivided north-south roadway and is classified as an rural major collector according to the GDOT's roadway functional classification system. Within the project limits, there are several intersections along SR 388, which are listed from the southern end to the northern end as follows:

- Intersection #1: SR 388 & William Few Pkwy
- Intersection #2: SR 388 & Autumn Trl
- Intersection #3: SR 388 & Thoroughbred Way
- Intersection #4: SR 388 & Autumn Ct
- Intersection #5: SR 388 & Blue Grass Trl
- Intersection #6: SR 388 & Nicoles Way
- Intersection #7: SR 388 & Mill Creek Ln
- Intersection #8: SR 388 & Mill Branch Rd
- Intersection #9: SR 388 & Meadowlark Ln
- Intersection #10: SR 388 & SR 232

EXISTING ROADWAY GEOMETRY AND TRAFFIC CONTROL

The existing lane configuration and traffic control at all the intersections along the section of SR 388 within the project limits is shown in Figure 2.

EXISTING TRAFFIC VOLUMES

A.M. and P.M. peak hour turning movement counts were obtained at the major study area intersections by National Data and Surveying Services on October 10th 2012. 24-hour bi-directional counts were also conducted by National Data and Surveying Services along SR 388 and other major side-streets on October 10th 2012. These "short-term" traffic counts were adjusted using day of the week, month of the year and axle adjustment factors obtained from GDOT to develop annual average daily traffic (AADT) volumes.

The peak hour turning movement count worksheets and the 24-hour bi-directional count worksheets are provided in Appendix A. The existing A.M. and P.M. peak hour turning movement volumes and the existing annual average daily traffic (AADT) volumes are presented in Appendix B.

VEHICULAR SPEEDS

The posted speed limit on the section of SR 388 within the project limits is 55 mph.

PEDESTRIAN MOVEMENTS

As existing, there are no continuous sidewalks along the section of SR 388 within the project limits. Field observations indicate that there is currently minimal pedestrian activity in the study area. The proposed project adds sidewalks along SR 388 for the full length of the project and also crosswalks at major intersections.

OTHER MODES OF TRANSPORTATION

Currently, there are no provisions for bikes or transit stops in the section of SR 388 within the project limits. The proposed project adds bike lanes along SR 388 in both directions for the full length of the project.

PARKING

There was no on-street parking observed or expected in the section of SR 388 within the project limits.

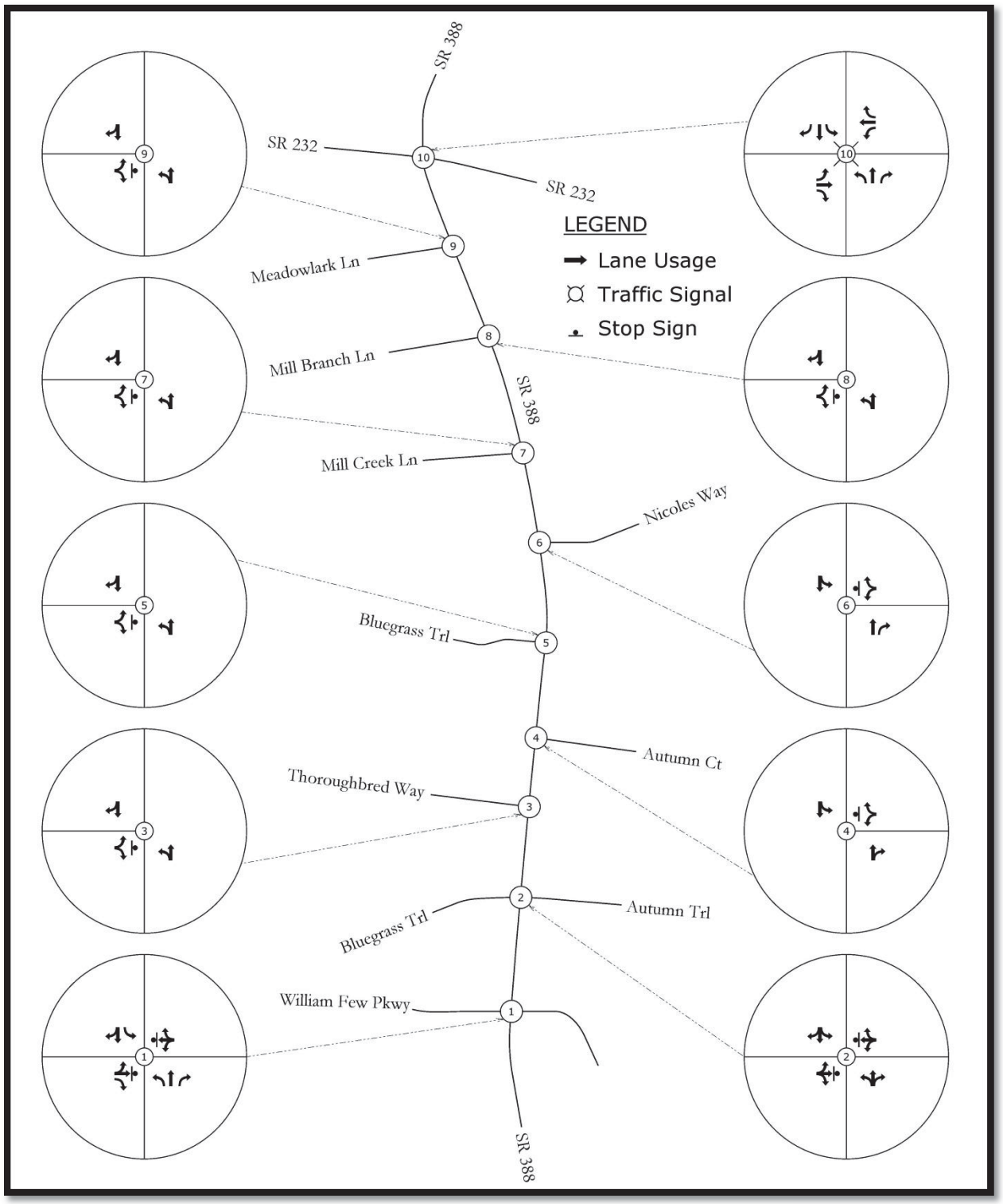


Figure 2. Existing Lane Configurations and Traffic Control

CRASH HISTORY

Crash data along the section of SR 388 within the project limits was obtained from GDOT for the period between January 1, 2004 and December 31, 2009. The crash data summarized by severity and by type for the section of SR 388 is provided in Tables 1 and 2 respectively.

As shown in Table 1, there were a total of 116 crashes reported in this 1.64 mile section of roadway for the six (6) year period, which included 30 injury crashes. No fatal crashes were reported. Based on the crash data gathered, crash rates for the section of SR 388 were calculated. SR 388 within the project limits is classified as a rural major collector according to GDOT's RCInfo Database. Therefore the crash rates calculated for the section of SR 388 analyzed here were compared to the statewide average crash rates for rural major collectors. As shown in Table 1, the total crash rates calculated for the section of SR 388 within the project limits are higher than the statewide average crash rates for urban major collectors for four out of the six years. The injury and fatal crash rates for the section of SR 388 within the project limits are lower than the statewide average crash rates for urban major collectors.

Table 1. Traffic Crash History by Severity along SR 388[1]

	Crashes			Crashes Per 100 Million Vehicle Miles[2]		
Year	Total	Injury	Fatal	Total	Injury	Fatal
2004	15	3	0	170 (273)	34 (94)	0.00 (2.93)
2005	11	2	0	125 (197)	23 (74)	0.00 (3.00)
2006	25	6	0	284 (203)	68 (73)	0.00 (3.28)
2007	20	7	0	227 (203)	79 (72)	0.00 (3.24)
2008	26	6	0	295 (178)	68 (60)	0.00 (2.70)
2009	19	6	0	216 (160)	68 (56)	0.00 (2.05)
Total	**116**	**30**	**0**			

Note: (1) The crash data provided is for the section of SR 388 between I-20 and SR 232.
(2) The number in parentheses represents the statewide average crash rates for rural major collectors.

A detailed analysis of the crashes was undertaken to determine the type of crashes along this section of roadway. The number of each type of crash was summarized to determine crash patterns. As shown in Table 2, there were 116 total crashes in this section of roadway over the six (6) year period (2004 - 2009). Majority of the crashes recorded were "Rear End" type, which accounted for about 42% of the total number of crashes. About 34% of the total number of crashes was found to be "Single-Vehicle" crashes and another 17% was found to be "Angle" crashes.

Table 2. Traffic Crash History by Type along SR 388

Year	Manner of Collision						Total
	Angle	Head On	Rear End	Sideswipe - Same Direction	Sideswipe - Opposite Direction	Other (Single-Vehicle)	
2004	4	0	4	0	0	7	15
2005	2	0	5	0	0	4	11
2006	3	2	9	0	1	10	25
2007	4	0	10	1	0	5	20
2008	4	0	10	1	2	9	26
2009	2	2	11	0	0	4	19
Total	**19**	**4**	**49**	**2**	**3**	**39**	**116**

ROADWAY IMPROVEMENT PLANS

Under the proposed project SR 388 will be widened from the existing 2-lane roadway to a 4-lane facility with 20-foot raised median, curb and gutter, sidewalks, bike lanes, crosswalks and appropriate intersection improvements along SR 388. As part of the improvement plans, a traffic signal would be installed at the SR 388 & William Few Pkwy intersection, Nicoles way would be realigned to be across from Mill creek lane and Meadowlark Lane would be realigned to intersect Mill Branch Road and not SR 388.

The lane configurations and traffic control as proposed by this project are shown in Figure 5.

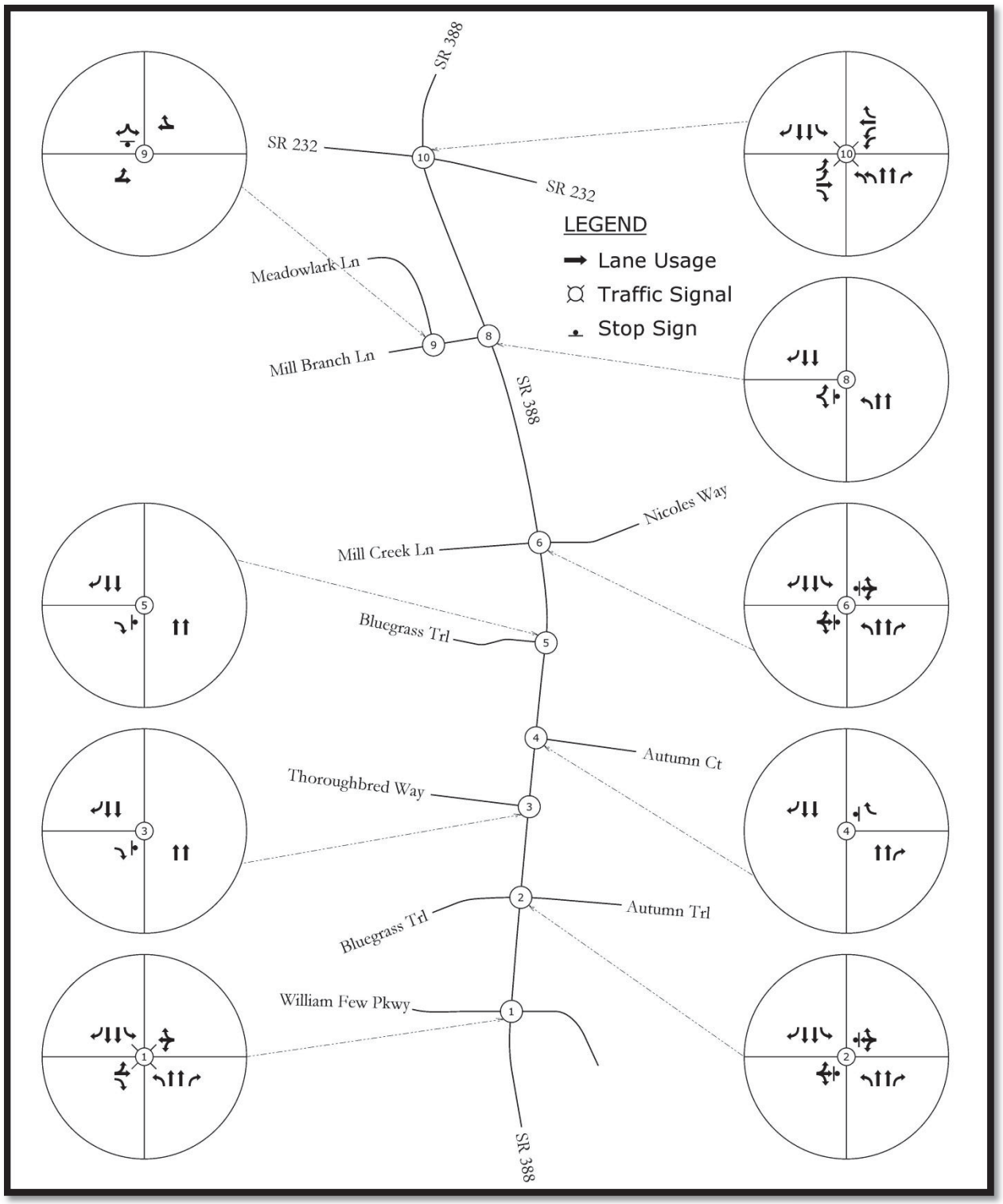


Figure 5. Proposed Lane Configurations and Traffic Control

2017 "OPENING YEAR" AND 2037 "DESIGN YEAR" TRAFFIC VOLUMES

The projected opening year of SR 388 roadway improvements was assumed to be 2017. Future year (2017 "Opening Year" and the 2037 "Design Year") traffic volumes were forecasted by growing the existing traffic at an estimated annual growth rate and incorporating new traffic volumes generated by planned developments in the vicinity of the project. The annual growth rate was estimated from traffic volume information obtained from the GDOT's Annual Traffic Count Data. Historical AADT volumes and the corresponding growth rates calculated at five traffic count locations along SR 388 were obtained from the GDOT's Annual Traffic Count Data website and are provided in Tables 3A and 3B respectively.

Table 3A. Historical AADT Volumes

Year	TC 181	TC 258	TC 263	TC 229	TC 178
1995	5,500	6,200	7,000	4,000	4,300
2000	6,860	8,900	8,540	6,000	7,530
2005	8,770	10,880	12,040	9,420	5,740
2010	10,830	13,790	11,290	11,550	5,100

Table 3B. Calculated Growth Rates

Growth	TC 181	TC 258	TC 263	TC 229	TC 178	Average
15-Year	4.6%	5.5%	3.2%	7.3%	1.1%	4.4%
10-Year	4.7%	4.5%	2.8%	6.8%	-3.8%	3.0%
5-Year	4.3%	4.9%	-1.3%	4.2%	-2.3%	1.9%
Weighted Average	**4.4%**	**4.8%**	**0.8%**	**5.6%**	**-2.2%**	**2.7%**

Based on the growth rates calculated from the GDOT's Annual Traffic Count, a growth rate of 2.70% was assumed to be representative of the future growth in traffic on the project area major roadways including SR 388 and SR 232. A growth rate of 1.00% was assumed for minor side streets in the project area. The 2.70% and 1.00% growth rates were used for the 2017 "Opening Year" No-Build and Build conditions and the 2037 "Design Year" Build condition. For the 2037 "Design Year" No-Build condition smaller growth rates were assumed to reflect the constrained growth expected on SR 101 due to capacity limits of a two-lane highway versus a four-lane highway. The growth rates used for the 2037 "Design Year" No-Build condition were 0.80% for the study area major roadways including SR 388 and SR 232 and 0.60% for the for minor side streets in the project area.

Traffic generated by three new planned developments were also considered in calculating the traffic

forecasts for the 2017 "Opening Year" and the 2037 "Design Year" conditions. As the three planned developments are partially built and already generating some traffic, only 50% of the entire estimated new traffic generated by these three developments were considered for forecasting the future project area traffic volumes. The three new planned developments considered for forecasting traffic volumes on project area roadways are as follows:

1. Mill Branch Planned Unit Developments on SR 388 south of I-20
2. Walmart Development on SR 388 south of I-20
3. Park and Ride Site on SR 388 south of I-20

The following formula was used for the traffic projections:

$$F = P (1+i)^n + ODT$$

Where:
F = future projected traffic volume, vehicles per hour
P = 2012 peak hour traffic volume, vehicles per hour
i = annual growth rate = 2.70 percent (0.027)
n = number of years in projection, 5 for 2017, 25 for 2037
ODT = other development traffic, vehicles per hour

The 2017 "Opening Year" and 2037 "Design Year" condition peak hour volumes and AADT volumes are included in the attachment B.

ROADWAY CAPACITY ANALYSIS

Roadway capacity for the section of SR 388 within the project limits was analyzed for 2009 "Existing Year", 2037 "Design Year No Build" and 2037 "Design Year Build" conditions based on the methodology outlined in the *2010 Highway Capacity Manual* (HCM) and summarized in FDOT's *2007 Quality/Level of Service Handbook* . The results of the roadway capacity analysis are provided in Table 4. Under the existing 2-lane configuration, SR 388 operates at near capacity of a 2-lane facility or at LOS E. The LOS is expected to deteriorate to F by year 2037, if no improvements are made. If SR 388 is widened to a 4-lane section the roadway operation is expected to be improve to LOS B.

Table 4. SR 388 Roadway Segment Levels of Service

	AADT			Level of Service		
				Year 2007	Year 2037	
SR 388 Roadway Segment	Year 2009	Year 2037 No Build	Year 2037 Build	2-Lane	No-Build (2-Lane)	Build (4-Lane)
From I-20 to SR 232	15,680	23,045	27,460	E	F	B

INTERSECTION CAPACITY ANALYSIS

Intersection capacity analysis for the study area intersections along the section of SR 388 within the project limits was undertaken using the methodologies outlined in the HCM and the Synchro 8.0 software program. According to the HCM, there are six levels of service (LOS) by which the operational performance of an intersection may be described. These levels of service range between LOS "A" which indicates free-flowing condition and LOS "F" which indicates forced/breakdown flow.

The HCM determines LOS and delay for each movement and for the entire intersection at signalized intersections. At a two-way-stop-controlled (TWSC) intersection, the HCM determines LOS for all the minor movements by computing their respective control delays. In a case where more than one movement is shared in a lane, control delays and LOS are computed for the lane as a whole. Once the control delays and LOS are computed for all lane groups in an approach, the approach control delay and LOS can be computed as well. While the HCM computes delay and LOS for each movement, the LOS for the worst approach is reported here.

2012 "Existing Year" Condition Intersection Levels of Service

Based on the existing traffic volumes presented in Appendix B and the existing lane configurations and traffic control shown in Figure 2, peak hour traffic operations were analyzed at the study area intersections. As shown in Table 5, all intersections currently operate at LOS D or better during the AM and PM Peak hours except for the SR 388 & William Few Pkwy intersection (Intersection #1) which operates at LOS F during the AM and PM peak hours and the SR 388 & Autumn Trl (Intersection #2) which operates at LOS F during the PM peak hour. Levels of service worksheets for the 2012 "Existing Year" condition are presented in Appendix C.

Table 5. 2012 "Existing" Intersection Levels of Service[1]

Signalized Intersection	2012 "Existing"	
	AM Peak	PM Peak
Intersection #10: SR 232 & SR 388	C	C
Unsignalized Intersection		
Intersection #1: SR 388 & William Few Pkwy	F	F
Intersection #2: SR 388 & Autumn Trl	D	F
Intersection #3: SR 388 & Thoroughbred Way	C	D
Intersection #4: SR 388 & Autumn Ct	C	D
Intersection #5: SR 388 & Blue Grass Trl	C	D
Intersection #6: SR 388 & Nicoles Way	C	D
Intersection #7: SR 388 & Mill Creek Ln	C	D
Intersection #8: SR 388 & Mill Branch Rd	C	D
Intersection #9: SR 388 & Meadowlark Ln	C	D

Note: (1) Level of service for signalized intersections is for the entire intersection; for unsignalized intersections the level of service provided is for the worst approach.

2017 "Opening Year" Condition Intersection Levels of Service

Levels of service were calculated at the study area intersections for the 2017 "Opening Year No Build" condition and are presented in Table 6. As shown in Table 6, all intersections currently operate at LOS D or better during the AM and PM Peak hours except for the SR 388 & William Few Pkwy intersection (Intersection #1) which operates at LOS F during the AM and PM peak hours and the SR 388 & Autumn Trl (Intersection #2) which operates at LOS E and at LOS F during the AM and PM peak hours respectively.

Table 6. 2017 "Opening Year" No-Build Intersection Levels of Service [1]

Signalized Intersection	2017 "Opening Year" No Build	
	AM Peak	PM Peak
Intersection #10: SR 232 & SR 388	C	C
Unsignalized Intersection		
Intersection #1: SR 388 & William Few Pkwy	F	F
Intersection #2: SR 388 & Autumn Trl	E	F
Intersection #3: SR 388 & Thoroughbred Way	C	D
Intersection #4: SR 388 & Autumn Ct	C	D
Intersection #5: SR 388 & Blue Grass Trl	C	D
Intersection #6: SR 388 & Nicoles Way	C	D
Intersection #7: SR 388 & Mill Creek Ln	C	D
Intersection #8: SR 388 & Mill Branch Rd	C	D
Intersection #9: SR 388 & Meadowlark Ln	C	D

Note: (1) Level of service for signalized intersections is for the entire intersection; for unsignalized intersections the level of service provided is for the worst approach.

Levels of service calculated for the 2017 "Opening Year Build" condition based on the proposed lane configurations and are presented in Table 7. As shown in Table 7, all signalized intersections are projected to operate at LOS D or better during the AM and PM peak hours. All unsignalized intersections, except the SR 388 & Autumn Trl intersection (Intersection #2), and the SR 388 & Mill Creek Ln (Intersection #7) operate at LOS D or better. The SR 388 & Autumn Trl intersection (Intersection #2) and the SR 388 & Mill Creek Ln (Intersection #7) operate at LOS E during the PM peak hour. Levels of service worksheets for the 2017 "Opening Year No-Build" and 2017 "Opening Year Build" conditions are presented in Appendix C.

Table 7. 2017 "Opening Year" Build Intersection Levels of Service [1]

Signalized Intersection	2017 "Opening Year" No Build	
	AM Peak	PM Peak
Intersection #1: SR 388 & William Few Pkwy	B	B
Intersection #10: SR 232 & SR 388	C	D
Unsignalized Intersection		
Intersection #2: SR 388 & Autumn Trl	C	E
Intersection #3: SR 388 & Thoroughbred Way	B	B
Intersection #4: SR 388 & Autumn Ct	B	B
Intersection #5: SR 388 & Blue Grass Trl	B	B
Intersection #7: SR 388 & Mill Creek Ln	C	E
Intersection #8: SR 388 & Mill Branch Rd	C	D

Note: (1) Level of service for signalized intersections is for the entire intersection; for unsignalized intersections the level of service provided is for the worst approach.

2037 "Design Year" Condition Intersection Levels of Service

Levels of service were calculated at the study area intersections for the 2037 "Design Year No Build" condition and are presented in Table 8. As shown in Table 8, almost all study area intersections are projected to operate at LOS F during the AM and PM peak hours.

Table 8. 2037 "Design Year" No-Build Intersection Levels of Service [1]

	2017 "Opening Year" No Build	
Signalized Intersection	AM Peak	PM Peak
Intersection #10: SR 232 & SR 388	E	F
Unsignalized Intersection		
Intersection #1: SR 388 & William Few Pkwy	F	F
Intersection #2: SR 388 & Autumn Trl	F	F
Intersection #3: SR 388 & Thoroughbred Way	F	F
Intersection #4: SR 388 & Autumn Ct	F	F
Intersection #5: SR 388 & Blue Grass Trl	F	F
Intersection #6: SR 388 & Nicoles Way	F	F
Intersection #7: SR 388 & Mill Creek Ln	F	F
Intersection #8: SR 388 & Mill Branch Rd	F	F
Intersection #9: SR 388 & Meadowlark Ln	F	F

Note: (1) Level of service for signalized intersections is for the entire intersection; for unsignalized intersections the level of service provided is for the worst approach.

Levels of service calculated for the 2037 "Design Year Build" condition based on the proposed lane configurations and are presented in Table 9. As shown in Table 9, all signalized intersections are projected to operate at LOS D or better during the AM and PM peak hours. There are several unsignalized intersections which operate at LOS F during the AM and PM peak hours. Even though these intersections operate at LOS F, they do not warrant a traffic signal based on preliminary signal warrant analysis conducted at these intersections as detailed later in this report. Levels of service worksheets for the 2037 "Design Year No-Build" and 2037 "Design Year Build" conditions are presented in Appendix C.

Table 9. 2037 "Design Year" Build Intersection Levels of Service [1]

Signalized Intersection	2017 "Opening Year" No Build	
	AM Peak	PM Peak
Intersection #1: SR 388 & William Few Pkwy	D	B
Intersection #10: SR 232 & SR 388	D	D
Unsignalized Intersection		
Intersection #2: SR 388 & Autumn Trl	F	F
Intersection #3: SR 388 & Thoroughbred Way	B	B
Intersection #4: SR 388 & Autumn Ct	B	C
Intersection #5: SR 388 & Blue Grass Trl	B	B
Intersection #7: SR 388 & Mill Creek Ln	F	F
Intersection #8: SR 388 & Mill Branch Rd	E	F

Note: (1) Level of service for signalized intersections is for the entire intersection; for unsignalized intersections the level of service provided is for the worst approach.

PRELIMINARY SIGNAL WARRANT ANALYSIS

Preliminary signal warrant analysis was performed for the study area unsignalized intersections based on the 2017 "Opening Year Build" traffic volumes. The Warrant 1 – Eight-Hour Vehicular Volume of the MUTCD was used to determine if any of the study area unsignalized intersections required a traffic signal. The analysis was conducted using the methodologies outlined in the *GDOT's Design Policy Manual*, where the eighth-highest volume is compared to the requirement of Warrant 1 to determine if the warrant is met. The eighth-highest volume was estimated as 5.6% of the daily volume.

Based on the analysis the SR 388 & William Few Pkwy intersection (Intersection #1) was found to be a candidate for signalization. For the purposes of the analysis the northbound left-turn was assumed to be the minor street and the opposing southbound through movement was considered the major movement. Based on these findings, it is recommended that traffic signals be installed at the SR 388 & William Few Pkwy intersection (Intersection #1) with a protected/permitted phasing for the northbound left-turn movement. For analysis purposes a traffic signal is assumed at these intersections to derive the 2017 "Opening Year" Build and 2037 "Design Year" Build intersection LOS and is reflected in the proposed lane configuration and traffic control figures (Figures 5).

A similar signal warrant analysis was carried out for the study area unsignalized intersections based on the 2037 "Design Year Build" traffic volumes. No additional study area unsignalized intersections were found to be candidates for signalization.

TURN LANE LENGTH REQUIREMENTS

Left-turn lane and right-turn lane requirements at the proposed median openings along SR 388 were determined based on *GDOT's Construction Standards and Details*, the NCHRP Report 457. *Evaluating Intersection Improvements: An Engineering Study Guide* and the procedures outlined in the *Highway Capacity Manua*l to determine queue lengths.

Based on the GDOT's construction detail for median crossovers, particularly the Type-C median crossovers, the minimum deceleration length for a right turn lane is 200' and 100' taper and the minimum deceleration length for a left turn lane is 250' feet and 60' taper for a design speed of 45 MPH. Turn lane storage requirements were estimated based on the methodologies outlined in the *GDOT's Design Policy Manual.* Turn lane storage requirements at unsignalized intersections were calculated using the NCHRP 457 procedures and the turn lane storage requirements at signalized intersections were calculated using highway capacity methodologies and obtained from the Synchro 8.0 traffic analysis software.

The 2037 "Design Year Build" traffic volumes were used to determine the storage requirements. The turn lane length requirements including storage and deceleration are presented in Table 10.

Table 10. Turn Lane Length Requirements

Turn Bay	SBR	SBL	WBR	WBL	NBR	NBL	EBR
Signalized Intersection							
Intersection #1: SR 388 & William Few Pkwy	375	375	-	-	200	635	-	75
Intersection #10: SR 232 & SR 388	265	250	530	530	275	350	490	490
Unsignalized Intersection							
Intersection #2: SR 388 & Autumn Trl	215	260	-	-	215	250	-	-
Intersection #3: SR 388 & Thoroughbred Way	215	-	-	-	-	-	-	-
Intersection #4: SR 388 & Autumn Ct	-	-	-	-	215	-	-	-
Intersection #5: SR 388 & Blue Grass Trl	215		-	-	-	-	-	-
Intersection #7: SR 388 & Mill Creek Ln	215	250	-	-	215	250	-	-
Intersection #8: SR 388 & Mill Branch Rd	215	250	-	-	215	250	-	-

CONCLUSIONS

The following key conclusions were developed from the traffic analysis for SR 388:

- The total crash rates calculated for the section of SR 388 within the project limits are higher than the statewide average crash rates for urban major collectors for four out of the six years (2004 -2009). The injury and fatal crash rates for the section of SR 388 within the project limits are lower than the statewide average crash rates for urban major collectors. Majority of the crashes recorded were "Rear End" type, which accounted for about 42% of the total number of crashes. About 34% of the total number of crashes was found to be "Single-Vehicle" crashes and another 17% was found to be "Angle" crashes. With the roadway alignment and intersection improvements as proposed by this project implemented, significant reductions can be expected in both these types of crashes.

- The section of SR 388 within the project limits currently operates at LOS E. According to the TRB, LOS E represents operating conditions at or near the capacity level. At LOS E, traffic conditions are usually unstable, because even small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

- If no improvements are made to the section of SR 388 within the project limits, the roadway section LOS is projected to further depreciate to LOS F and can result in increased number of crashes. According to the Transportation Research Board (TRB), LOS F represents forced or breakdown flow and is characterized by stop-and-go traffic and vehicle queues.

- Under the proposed project, SR 388 will be widened from the existing 2-lane roadway to a 4-lane facility with 24-foot raised median and appropriate intersection improvements along SR 388. With the proposed improvements implemented, the section of SR 388 within the project limits is projected to operate at LOS B. According to the TRB, LOS B represents reasonable free-flow operations.

- Under the existing conditions, most of the study area intersections operate at LOS D or better. If no improvements were made, almost all of the study area intersections are projected to operate at LOS F by the year 2037.

- With the proposed improvements implemented, all the study area signalized intersections are projected to operate at LOS D or better. There are three unsignalized intersections which are projected to operate at LOS F. Even though these intersections operate at LOS F, they do not warrant a traffic signal based on preliminary signal warrant analysis conducted at these intersections.

- Preliminary signal warrant analysis was performed at the study area unsignalized intersections to determine candidates for signalization. Based on the analysis the SR 388 & William Few

Pkwy intersection (Intersection #1) was found to be a candidate for signalization. Based on these findings, it is recommended that traffic signals be installed at the SR 388 & William Few Pkwy intersection (Intersection #1) with a protected/permitted phasing for the northbound left-turn movement

- Left and right turn lanes are required at all median openings (left turn lanes) and all paved public streets (right turn lanes) based on GDOT guidelines.

Attachment #7

URS

Memo

To: Nick Castronova, PE
From: Jeff Wood, PE
Date: August 16, 2013
Re: SR 388 Interchange DDI Alternate Traffic Analysis

This document serves as an addendum to the *Traffic Engineering Report: SR 388 Roadway Widening from I-20 TO SR 232* prepared by Gresham, Smith and Partners dated May 10, 2013. Specifically, a traffic analysis was completed for the proposed modification of the I-20 interchange with SR 388 from its current configuration to a diverging diamond interchange (DDI). Using approved traffic volumes, a *Highway Capacity Manual* (HCM) based analysis was completed for the existing condition, no-build condition, and a build alternative using Synchro 8.0. Based on the analysis, summarized in **Table 1,** a 5-lane bridge section (two southbound through lanes, an exclusive southbound left-turn lane, and two northbound through lanes) with signalized dual rights and dual lefts on the westbound ramp would provide the best level of service in the build year (2037).

Table 1: Level of Service (LOS) and Delay (Seconds)

Intersection	Delay		LOS	
	AM	PM	AM	PM
2012 Existing				
SR 388 @ I-20 Eastbound Ramps	17.9	17.8	B	B
SR 388 @ I-20 Westbound Ramps	21.3	89.6	C	F
2017 No-Build				
SR 388 @ I-20 Eastbound Ramps	25.0	25.7	C	C
SR 388 @ I-20 Westbound Ramps	36.8	124.8	D	F
2017 Build DDI				
SR 388 @ I-20 Eastbound Ramps	10.1	18.5	B	B
SR 388 @ I-20 Westbound Ramps	8.7	10.7	A	B
2037 No-Build				
SR 388 @ I-20 Eastbound Ramps	30.0	66.8	C	E
SR 388 @ I-20 Westbound Ramps	71.3	176.0	E	F
2037 Build DDI				
SR 388 @ I-20 Eastbound Ramps	10.6	26.4	B	C
SR 388 @ I-20 Westbound Ramps	11.8	17.8	B	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	0	65	0	0	0	0	435	515	700	470	0
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	
Lane Util. Factor	0.95	0.95						1.00	1.00	0.97	0.95	
Frt	1.00	0.86						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1559	1411						1727	1468	3183	3282	
Flt Permitted	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1559	1411						1727	1468	3183	3282	
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)	65	0	71	0	0	0	0	473	560	761	511	0
RTOR Reduction (vph)	0	60	0	0	0	0	0	0	344	0	0	0
Lane Group Flow (vph)	58	18	0	0	0	0	0	473	216	761	511	0
Turn Type	Split	NA						NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	16.0	16.0						23.0	23.0	19.0	46.0	
Effective Green, g (s)	16.0	16.0						23.0	23.0	19.0	46.0	
Actuated g/C Ratio	0.23	0.23						0.33	0.33	0.27	0.66	
Clearance Time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	356	322						567	482	863	2156	
v/s Ratio Prot	c0.04	0.01						c0.27		c0.24	0.16	
v/s Ratio Perm									0.15			
v/c Ratio	0.16	0.06						0.83	0.45	0.88	0.24	
Uniform Delay, d1	21.6	21.1						21.7	18.5	24.4	4.9	
Progression Factor	1.00	1.00						0.81	0.48	0.79	0.49	
Incremental Delay, d2	1.0	0.3						12.8	2.8	5.2	0.1	
Delay (s)	22.6	21.4						30.4	11.6	24.5	2.5	
Level of Service	C	C						C	B	C	A	
Approach Delay (s)		21.9			0.0			20.2			15.7	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	215	0	325	30	465	0	0	955	50
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
Lane Util. Factor				0.95	0.95		0.97	0.95			1.00	1.00
Frt				1.00	0.86		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)				1559	1406		3183	3282			1727	1468
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1559	1406		3183	3282			1727	1468
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)	0	0	0	234	0	353	33	505	0	0	1038	54
RTOR Reduction (vph)	0	0	0	0	303	0	0	0	0	0	0	18
Lane Group Flow (vph)	0	0	0	211	73	0	33	505	0	0	1038	36
Turn Type				Split	NA		Prot	NA			NA	Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)				10.0	10.0		1.6	52.0			46.4	46.4
Effective Green, g (s)				10.0	10.0		1.6	52.0			46.4	46.4
Actuated g/C Ratio				0.14	0.14		0.02	0.74			0.66	0.66
Clearance Time (s)				4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				222	200		72	2438			1144	973
v/s Ratio Prot				c0.14	0.05		0.01	c0.15			c0.60	
v/s Ratio Perm												0.02
v/c Ratio				0.95	0.37		0.46	0.21			0.91	0.04
Uniform Delay, d1				29.8	27.1		33.8	2.7			10.0	4.1
Progression Factor				1.00	1.00		0.78	0.09			0.67	0.27
Incremental Delay, d2				46.4	1.1		2.9	0.1			11.8	0.1
Delay (s)				76.2	28.3		29.3	0.4			18.5	1.2
Level of Service				E	C		C	A			B	A
Approach Delay (s)		0.0			45.5			2.2			17.6	
Approach LOS		A			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	0	60	0	0	0	0	885	330	355	845	0
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	
Lane Util. Factor	0.95	0.95						1.00	1.00	0.97	0.95	
Frt	1.00	0.86						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1559	1412						1727	1468	3183	3282	
Flt Permitted	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1559	1412						1727	1468	3183	3282	
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)	71	0	65	0	0	0	0	962	359	386	918	0
RTOR Reduction (vph)	0	55	0	0	0	0	0	0	147	0	0	0
Lane Group Flow (vph)	64	17	0	0	0	0	0	962	212	386	918	0
Turn Type	Split	NA						NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	16.0	16.0						59.0	59.0	13.0	76.0	
Effective Green, g (s)	16.0	16.0						59.0	59.0	13.0	76.0	
Actuated g/C Ratio	0.16	0.16						0.59	0.59	0.13	0.76	
Clearance Time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	249	225						1018	866	413	2494	
v/s Ratio Prot	c0.04	0.01						c0.56		c0.12	0.28	
v/s Ratio Perm									0.14			
v/c Ratio	0.26	0.08						0.94	0.24	0.93	0.37	
Uniform Delay, d1	36.8	35.7						19.0	9.8	43.1	4.0	
Progression Factor	1.00	1.00						0.54	0.05	0.77	0.38	
Incremental Delay, d2	2.5	0.7						16.3	0.6	9.7	0.1	
Delay (s)	39.3	36.4						26.6	1.1	42.8	1.6	
Level of Service	D	D						C	A	D	A	
Approach Delay (s)		37.7			0.0			19.7			13.8	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	445	0	755	95	855	0	0	755	75
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
Lane Util. Factor				0.95	0.95		0.97	0.95			1.00	1.00
Frt				1.00	0.86		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)				1559	1404		3183	3282			1727	1468
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1559	1404		3183	3282			1727	1468
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)	0	0	0	484	0	821	103	929	0	0	821	82
RTOR Reduction (vph)	0	0	0	0	50	0	0	0	0	0	0	48
Lane Group Flow (vph)	0	0	0	436	819	0	103	929	0	0	821	34
Turn Type				Split	NA		Prot	NA			NA	Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)				43.0	43.0		4.0	49.0			41.0	41.0
Effective Green, g (s)				43.0	43.0		4.0	49.0			41.0	41.0
Actuated g/C Ratio				0.43	0.43		0.04	0.49			0.41	0.41
Clearance Time (s)				4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				670	603		127	1608			708	601
v/s Ratio Prot				0.28	c0.58		0.03	c0.28			c0.48	
v/s Ratio Perm												0.02
v/c Ratio				0.65	1.36		0.81	0.58			1.16	0.06
Uniform Delay, d1				22.6	28.5		47.6	18.1			29.5	17.8
Progression Factor				1.00	1.00		0.78	0.42			0.84	0.66
Incremental Delay, d2				2.3	171.7		15.2	0.6			86.5	0.2
Delay (s)				24.8	200.2		52.2	8.3			111.2	11.9
Level of Service				C	F		D	A			F	B
Approach Delay (s)		0.0			141.6			12.7			102.1	
Approach LOS		A			F			B			F	

Intersection Summary			
HCM 2000 Control Delay	89.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	0	95	0	0	0	0	475	610	800	555	0
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	
Lane Util. Factor	0.95	0.95						1.00	1.00	0.97	0.95	
Frt	1.00	0.86						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1559	1407						1727	1468	3183	3282	
Flt Permitted	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1559	1407						1727	1468	3183	3282	
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)	76	0	103	0	0	0	0	516	663	870	603	0
RTOR Reduction (vph)	0	85	0	0	0	0	0	0	252	0	0	0
Lane Group Flow (vph)	68	26	0	0	0	0	0	516	411	870	603	0
Turn Type	Split	NA						NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	16.0	16.0						34.9	34.9	27.1	66.0	
Effective Green, g (s)	16.0	16.0						34.9	34.9	27.1	66.0	
Actuated g/C Ratio	0.18	0.18						0.39	0.39	0.30	0.73	
Clearance Time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	277	250						669	569	958	2406	
v/s Ratio Prot	c0.04	0.02						c0.30		c0.27	0.18	
v/s Ratio Perm									0.28			
v/c Ratio	0.25	0.11						0.77	0.72	0.91	0.25	
Uniform Delay, d1	31.8	31.0						24.1	23.4	30.3	3.9	
Progression Factor	1.00	1.00						1.00	1.00	0.80	1.36	
Incremental Delay, d2	2.1	0.8						8.4	7.7	3.5	0.1	
Delay (s)	33.9	31.8						32.5	31.2	27.8	5.4	
Level of Service	C	C						C	C	C	A	
Approach Delay (s)		32.6			0.0			31.7			18.6	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	285	0	370	45	510	0	0	1070	55
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
Lane Util. Factor				0.95	0.95		0.97	0.95			1.00	1.00
Frt				1.00	0.86		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)				1559	1407		3183	3282			1727	1468
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1559	1407		3183	3282			1727	1468
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)	0	0	0	310	0	402	49	554	0	0	1163	60
RTOR Reduction (vph)	0	0	0	0	331	0	0	0	0	0	0	20
Lane Group Flow (vph)	0	0	0	279	102	0	49	554	0	0	1163	40
Turn Type				Split	NA		Prot	NA			NA	Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)				16.0	16.0		2.4	66.0			59.6	59.6
Effective Green, g (s)				16.0	16.0		2.4	66.0			59.6	59.6
Actuated g/C Ratio				0.18	0.18		0.03	0.73			0.66	0.66
Clearance Time (s)				4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				277	250		84	2406			1143	972
v/s Ratio Prot				c0.18	0.07		c0.02	0.17			c0.67	
v/s Ratio Perm												0.03
v/c Ratio				1.01	0.41		0.58	0.23			1.02	0.04
Uniform Delay, d1				37.0	32.8		43.3	3.9			15.2	5.3
Progression Factor				1.00	1.00		1.29	0.90			0.67	0.50
Incremental Delay, d2				55.9	1.1		7.2	0.2			30.8	0.1
Delay (s)				92.9	33.9		62.9	3.6			41.0	2.7
Level of Service				F	C		E	A			D	A
Approach Delay (s)		0.0			57.0			8.4			39.1	
Approach LOS		A			E			A			D	

Intersection Summary			
HCM 2000 Control Delay	36.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	0	80	0	0	0	0	950	410	405	950	0
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	
Lane Util. Factor	0.95	0.95						1.00	1.00	0.97	0.95	
Frt	1.00	0.86						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1559	1410						1727	1468	3183	3282	
Flt Permitted	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1559	1410						1727	1468	3183	3282	
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)	76	0	87	0	0	0	0	1033	446	440	1033	0
RTOR Reduction (vph)	0	75	0	0	0	0	0	0	167	0	0	0
Lane Group Flow (vph)	68	20	0	0	0	0	0	1033	279	440	1033	0
Turn Type	Split	NA						NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	16.0	16.0						75.0	75.0	17.0	96.0	
Effective Green, g (s)	16.0	16.0						75.0	75.0	17.0	96.0	
Actuated g/C Ratio	0.13	0.13						0.62	0.62	0.14	0.80	
Clearance Time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	207	188						1079	917	450	2625	
v/s Ratio Prot	c0.04	0.01						c0.60		c0.14	0.31	
v/s Ratio Perm									0.19			
v/c Ratio	0.33	0.10						0.96	0.30	0.98	0.39	
Uniform Delay, d1	47.1	45.7						21.0	10.4	51.3	3.5	
Progression Factor	1.00	1.00						1.00	1.00	0.87	0.64	
Incremental Delay, d2	4.2	1.1						18.9	0.9	8.3	0.0	
Delay (s)	51.3	46.8						39.9	11.3	53.1	2.3	
Level of Service	D	D						D	B	D	A	
Approach Delay (s)		48.7			0.0			31.3			17.5	
Approach LOS		D			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	535	0	865	120	915	0	0	820	90
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
Lane Util. Factor				0.95	0.95		0.97	0.95			1.00	1.00
Frt				1.00	0.86		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)				1559	1405		3183	3282			1727	1468
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1559	1405		3183	3282			1727	1468
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)	0	0	0	582	0	940	130	995	0	0	891	98
RTOR Reduction (vph)	0	0	0	0	34	0	0	0	0	0	0	59
Lane Group Flow (vph)	0	0	0	524	964	0	130	995	0	0	891	39
Turn Type				Split	NA		Prot	NA			NA	Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)				56.0	56.0		4.0	56.0			48.0	48.0
Effective Green, g (s)				56.0	56.0		4.0	56.0			48.0	48.0
Actuated g/C Ratio				0.47	0.47		0.03	0.47			0.40	0.40
Clearance Time (s)				4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				727	655		106	1531			690	587
v/s Ratio Prot				0.34	c0.69		c0.04	0.30			c0.52	
v/s Ratio Perm												0.03
v/c Ratio				0.72	1.47		1.23	0.65			1.29	0.07
Uniform Delay, d1				25.7	32.0		58.0	24.5			36.0	22.2
Progression Factor				1.00	1.00		0.79	0.48			0.75	0.41
Incremental Delay, d2				3.5	220.8		131.6	0.9			141.0	0.2
Delay (s)				29.2	252.8		177.2	12.6			168.0	9.2
Level of Service				C	F		F	B			F	A
Approach Delay (s)		0.0			175.8			31.6			152.2	
Approach LOS		A			F			C			F	

Intersection Summary			
HCM 2000 Control Delay	124.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	0	100	0	0	0	0	650	650	855	735	0
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	
Lane Util. Factor	0.95	0.95						1.00	1.00	0.97	0.95	
Frt	1.00	0.86						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1559	1407						1727	1468	3183	3282	
Flt Permitted	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1559	1407						1727	1468	3183	3282	
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)	82	0	109	0	0	0	0	707	707	929	799	0
RTOR Reduction (vph)	0	93	0	0	0	0	0	0	204	0	0	0
Lane Group Flow (vph)	74	24	0	0	0	0	0	707	503	929	799	0
Turn Type	Split	NA						NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	16.0	16.0						49.0	49.0	33.0	86.0	
Effective Green, g (s)	16.0	16.0						49.0	49.0	33.0	86.0	
Actuated g/C Ratio	0.15	0.15						0.45	0.45	0.30	0.78	
Clearance Time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	226	204						769	653	954	2565	
v/s Ratio Prot	c0.05	0.02						c0.41		c0.29	0.24	
v/s Ratio Perm									0.34			
v/c Ratio	0.33	0.12						0.92	0.77	0.97	0.31	
Uniform Delay, d1	42.2	40.9						28.6	25.8	38.1	3.5	
Progression Factor	1.00	1.00						1.00	1.00	0.83	0.40	
Incremental Delay, d2	3.8	1.2						17.9	8.6	4.4	0.0	
Delay (s)	46.0	42.0						46.5	34.3	36.1	1.4	
Level of Service	D	D						D	C	D	A	
Approach Delay (s)		43.6			0.0			40.4			20.0	
Approach LOS		D			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	300	0	395	50	675	0	0	1290	60
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
Lane Util. Factor				0.95	0.95		0.97	0.95			1.00	1.00
Frt				1.00	0.86		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)				1559	1407		3183	3282			1727	1468
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1559	1407		3183	3282			1727	1468
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)	0	0	0	326	0	429	54	734	0	0	1402	65
RTOR Reduction (vph)	0	0	0	0	269	0	0	0	0	0	0	19
Lane Group Flow (vph)	0	0	0	293	193	0	54	734	0	0	1402	46
Turn Type				Split	NA		Prot	NA			NA	Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)				17.0	17.0		3.2	85.0			77.8	77.8
Effective Green, g (s)				17.0	17.0		3.2	85.0			77.8	77.8
Actuated g/C Ratio				0.15	0.15		0.03	0.77			0.71	0.71
Clearance Time (s)				4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				240	217		92	2536			1221	1038
v/s Ratio Prot				c0.19	0.14		c0.02	0.22			c0.81	
v/s Ratio Perm												0.03
v/c Ratio				1.22	0.89		0.59	0.29			1.15	0.04
Uniform Delay, d1				46.5	45.6		52.7	3.7			16.1	4.9
Progression Factor				1.00	1.00		1.02	0.22			0.69	0.85
Incremental Delay, d2				130.9	33.1		4.6	0.1			75.9	0.1
Delay (s)				177.4	78.7		58.4	1.0			87.0	4.2
Level of Service				F	E		E	A			F	A
Approach Delay (s)		0.0			117.0			4.9			83.4	
Approach LOS		A			F			A			F	

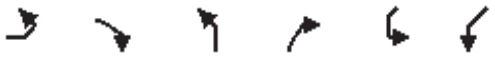
Intersection Summary			
HCM 2000 Control Delay	71.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	0	85	0	0	0	0	1310	435	435	1190	0
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	
Lane Util. Factor	0.95	0.95						1.00	1.00	0.97	0.95	
Frt	1.00	0.86						1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1559	1409						1727	1468	3183	3282	
Flt Permitted	0.95	1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1559	1409						1727	1468	3183	3282	
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)	82	0	92	0	0	0	0	1424	473	473	1293	0
RTOR Reduction (vph)	0	83	0	0	0	0	0	0	131	0	0	0
Lane Group Flow (vph)	74	17	0	0	0	0	0	1424	342	473	1293	0
Turn Type	Split	NA						NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	16.0	16.0						112.0	112.0	20.0	136.0	
Effective Green, g (s)	16.0	16.0						112.0	112.0	20.0	136.0	
Actuated g/C Ratio	0.10	0.10						0.70	0.70	0.12	0.85	
Clearance Time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	155	140						1208	1027	397	2789	
v/s Ratio Prot	c0.05	0.01						c0.82		c0.15	0.39	
v/s Ratio Perm									0.23			
v/c Ratio	0.48	0.12						1.18	0.33	1.19	0.46	
Uniform Delay, d1	68.0	65.6						24.0	9.4	70.0	3.0	
Progression Factor	1.00	1.00						1.00	1.00	0.96	0.93	
Incremental Delay, d2	10.2	1.8						89.3	0.9	88.6	0.1	
Delay (s)	78.2	67.4						113.3	10.3	155.9	2.8	
Level of Service	E	E						F	B	F	A	
Approach Delay (s)		72.0			0.0			87.6			43.8	
Approach LOS		E			A			F			D	

Intersection Summary			
HCM 2000 Control Delay	66.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	113.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	570	0	925	130	1255	0	0	1055	95
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
Lane Util. Factor				0.95	0.95		0.97	0.95			1.00	1.00
Frt				1.00	0.86		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)				1559	1405		3183	3282			1727	1468
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1559	1405		3183	3282			1727	1468
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)	0	0	0	620	0	1005	141	1364	0	0	1147	103
RTOR Reduction (vph)	0	0	0	0	19	0	0	0	0	0	0	48
Lane Group Flow (vph)	0	0	0	558	1048	0	141	1364	0	0	1147	55
Turn Type				Split	NA		Prot	NA			NA	Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)				71.0	71.0		5.0	81.0			72.0	72.0
Effective Green, g (s)				71.0	71.0		5.0	81.0			72.0	72.0
Actuated g/C Ratio				0.44	0.44		0.03	0.51			0.45	0.45
Clearance Time (s)				4.0	4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				691	623		99	1661			777	660
v/s Ratio Prot				0.36	c0.75		c0.04	0.42			c0.66	
v/s Ratio Perm												0.04
v/c Ratio				0.81	1.68		1.42	0.82			1.48	0.08
Uniform Delay, d1				38.6	44.5		77.5	33.4			44.0	25.1
Progression Factor				1.00	1.00		0.74	0.43			1.00	1.00
Incremental Delay, d2				6.9	314.0		196.3	0.4			221.2	0.2
Delay (s)				45.5	358.5		253.9	14.9			265.2	25.4
Level of Service				D	F		F	B			F	C
Approach Delay (s)		0.0			251.0			37.3			245.5	
Approach LOS		A			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	176.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.57		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	113.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

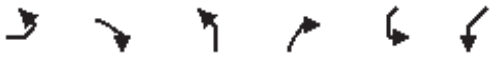


Movement	EBL2	EBR	NBL	NBR2	SWL2	SWL
Lane Configurations						
Volume (vph)	70	125	500	645	800	555
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	0.97
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	1641	1468	3183	1468	1641	3183
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	1641	1468	3183	1468	1641	3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	136	543	701	870	603
RTOR Reduction (vph)	57	37	0	0	0	0
Lane Group Flow (vph)	19	99	543	701	870	603
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	4	2	2		2 4	4
Permitted Phases				Free		
Actuated Green, G (s)	24.7	67.3	67.3	100.0	100.0	24.7
Effective Green, g (s)	24.7	67.3	67.3	100.0	100.0	24.7
Actuated g/C Ratio	0.25	0.67	0.67	1.00	1.00	0.25
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	405	987	2142	1468	1641	786
v/s Ratio Prot	0.01	0.07	0.17		c0.53	c0.19
v/s Ratio Perm				0.48		
v/c Ratio	0.05	0.10	0.25	0.48	0.53	0.77
Uniform Delay, d1	28.7	5.7	6.4	0.0	0.0	35.0
Progression Factor	1.00	1.00	1.21	1.00	1.00	0.89
Incremental Delay, d2	0.0	0.2	0.3	1.0	0.3	4.3
Delay (s)	28.7	5.9	8.1	1.0	0.3	35.3
Level of Service	C	A	A	A	A	D
Approach Delay (s)			4.1			14.7
Approach LOS			A			B

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL2	WBR	SBL	SBR2	NEL2	NEL
Lane Configurations						
Volume (vph)	345	370	1070	55	65	510
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	0.88	0.94	1.00		0.97
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95
Satd. Flow (prot)	3183	2584	4627	1468		3183
Flt Permitted	0.95	1.00	0.95	1.00		0.95
Satd. Flow (perm)	3183	2584	4627	1468		3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	375	402	1163	60	71	554
RTOR Reduction (vph)	145	86	0	0	0	0
Lane Group Flow (vph)	230	316	1163	60	0	625
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	8	6	6		6 8	8
Permitted Phases				Free		
Actuated Green, G (s)	13.5	78.5	78.5	100.0		100.0
Effective Green, g (s)	13.5	78.5	78.5	100.0		100.0
Actuated g/C Ratio	0.14	0.78	0.78	1.00		1.00
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	429	2028	3632	1468		3183
v/s Ratio Prot	c0.07	0.12	c0.25			0.20
v/s Ratio Perm				0.04		
v/c Ratio	0.54	0.16	0.32	0.04		0.20
Uniform Delay, d1	40.3	2.6	3.1	0.0		0.0
Progression Factor	1.00	1.00	1.61	1.00		1.00
Incremental Delay, d2	1.3	0.2	0.2	0.0		0.0
Delay (s)	41.6	2.8	5.2	0.0		0.0
Level of Service	D	A	A	A		A
Approach Delay (s)			4.9			0.0
Approach LOS			A			A

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

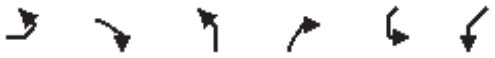


Movement	EBL2	EBR	NBL	NBR2	SWL2	SWL
Lane Configurations						
Volume (vph)	70	100	1000	460	405	950
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	0.97
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	1641	1468	3183	1468	1641	3183
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	1641	1468	3183	1468	1641	3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	109	1087	500	440	1033
RTOR Reduction (vph)	31	22	0	0	0	0
Lane Group Flow (vph)	45	87	1087	500	440	1033
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	4	2	2		2 4	4
Permitted Phases				Free		
Actuated Green, G (s)	39.5	52.5	52.5	100.0	100.0	39.5
Effective Green, g (s)	39.5	52.5	52.5	100.0	100.0	39.5
Actuated g/C Ratio	0.40	0.52	0.52	1.00	1.00	0.40
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	648	770	1671	1468	1641	1257
v/s Ratio Prot	0.03	0.06	c0.34		0.27	c0.32
v/s Ratio Perm				0.34		
v/c Ratio	0.07	0.11	0.65	0.34	0.27	0.82
Uniform Delay, d1	18.8	12.0	17.1	0.0	0.0	27.1
Progression Factor	1.00	1.00	1.40	1.00	1.00	0.89
Incremental Delay, d2	0.0	0.3	1.7	0.5	0.1	4.2
Delay (s)	18.9	12.3	25.6	0.5	0.1	28.3
Level of Service	B	B	C	A	A	C
Approach Delay (s)			17.7			19.8
Approach LOS			B			B

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL2	WBR	SBL	SBR2	NEL2	NEL
Lane Configurations						
Volume (vph)	570	865	820	90	150	915
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	0.88	0.94	1.00		0.97
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95
Satd. Flow (prot)	3183	2584	4627	1468		3183
Flt Permitted	0.95	1.00	0.95	1.00		0.95
Satd. Flow (perm)	3183	2584	4627	1468		3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	620	940	891	98	163	995
RTOR Reduction (vph)	201	190	0	0	0	0
Lane Group Flow (vph)	419	750	891	98	0	1158
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	8	6	6		6 8	8
Permitted Phases				Free		
Actuated Green, G (s)	28.1	63.9	63.9	100.0		100.0
Effective Green, g (s)	28.1	63.9	63.9	100.0		100.0
Actuated g/C Ratio	0.28	0.64	0.64	1.00		1.00
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	894	1651	2956	1468		3183
v/s Ratio Prot	c0.13	c0.29	0.19			0.36
v/s Ratio Perm				0.07		
v/c Ratio	0.47	0.45	0.30	0.07		0.36
Uniform Delay, d1	29.8	9.2	8.1	0.0		0.0
Progression Factor	1.00	1.00	1.53	1.00		1.00
Incremental Delay, d2	0.4	0.9	0.2	0.1		0.1
Delay (s)	30.2	10.1	12.6	0.1		0.1
Level of Service	C	B	B	A		A
Approach Delay (s)			11.4			0.1
Approach LOS			B			A

Intersection Summary			
HCM 2000 Control Delay	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

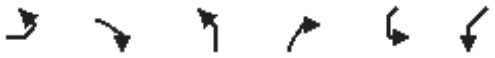


Movement	EBL2	EBR	NBL	NBR2	SWL2	SWL
Lane Configurations						
Volume (vph)	120	180	625	1060	1360	695
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	0.97
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	1641	1468	3183	1468	1641	3183
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	1641	1468	3183	1468	1641	3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	196	679	1152	1478	755
RTOR Reduction (vph)	56	97	0	0	0	0
Lane Group Flow (vph)	74	99	679	1152	1478	755
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	4	2	2		4 2	4
Permitted Phases				Free		
Actuated Green, G (s)	52.0	40.0	40.0	100.0	100.0	52.0
Effective Green, g (s)	52.0	40.0	40.0	100.0	100.0	52.0
Actuated g/C Ratio	0.52	0.40	0.40	1.00	1.00	0.52
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	853	587	1273	1468	1641	1655
v/s Ratio Prot	0.05	0.07	0.21		c0.90	0.24
v/s Ratio Perm				0.78		
v/c Ratio	0.09	0.17	0.53	0.78	0.90	0.46
Uniform Delay, d1	12.1	19.3	22.9	0.0	0.0	15.1
Progression Factor	1.00	1.00	1.31	1.00	1.00	0.91
Incremental Delay, d2	0.0	0.6	0.1	0.4	6.4	0.2
Delay (s)	12.1	19.9	30.2	0.4	6.4	13.9
Level of Service	B	B	C	A	A	B
Approach Delay (s)			11.4			8.9
Approach LOS			B			A

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	109.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL2	WBR	SBL	SBR2	NEL2	NEL
Lane Configurations						
Volume (vph)	515	630	1540	90	90	655
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	0.88	0.94	1.00		0.97
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95
Satd. Flow (prot)	3183	2584	4627	1468		3183
Flt Permitted	0.95	1.00	0.95	1.00		0.95
Satd. Flow (perm)	3183	2584	4627	1468		3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	560	685	1674	98	98	712
RTOR Reduction (vph)	9	230	0	0	0	0
Lane Group Flow (vph)	551	455	1674	98	0	810
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	8	6	6		6 8	8
Permitted Phases				Free		
Actuated Green, G (s)	25.6	66.4	66.4	100.0		100.0
Effective Green, g (s)	25.6	66.4	66.4	100.0		100.0
Actuated g/C Ratio	0.26	0.66	0.66	1.00		1.00
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	814	1715	3072	1468		3183
v/s Ratio Prot	c0.17	0.18	c0.36			0.25
v/s Ratio Perm				0.07		
v/c Ratio	0.68	0.27	0.54	0.07		0.25
Uniform Delay, d1	33.5	6.9	8.8	0.0		0.0
Progression Factor	1.00	1.00	1.29	1.00		1.00
Incremental Delay, d2	2.2	0.4	0.5	0.1		0.0
Delay (s)	35.7	7.2	11.9	0.1		0.0
Level of Service	D	A	B	A		A
Approach Delay (s)			11.3			0.0
Approach LOS			B			A

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL2	EBR	NBL	NBR2	SWL2	SWL
Lane Configurations						
Volume (vph)	120	145	1185	725	690	1475
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	1.00	1.00	0.97	1.00	1.00	0.97
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (prot)	1641	1468	3183	1468	1641	3183
Flt Permitted	0.95	1.00	0.95	1.00	0.95	0.95
Satd. Flow (perm)	1641	1468	3183	1468	1641	3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	158	1288	788	750	1603
RTOR Reduction (vph)	7	9	0	0	0	0
Lane Group Flow (vph)	123	149	1288	788	750	1603
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	4	2	2		2 4	4
Permitted Phases				Free		
Actuated Green, G (s)	51.0	41.0	41.0	100.0	100.0	51.0
Effective Green, g (s)	51.0	41.0	41.0	100.0	100.0	51.0
Actuated g/C Ratio	0.51	0.41	0.41	1.00	1.00	0.51
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	836	601	1305	1468	1641	1623
v/s Ratio Prot	0.07	0.10	c0.40		0.46	c0.50
v/s Ratio Perm				0.54		
v/c Ratio	0.15	0.25	0.99	0.54	0.46	0.99
Uniform Delay, d1	13.0	19.4	29.2	0.0	0.0	24.2
Progression Factor	1.00	1.00	1.45	1.00	1.00	0.84
Incremental Delay, d2	0.1	1.0	5.1	0.1	0.1	16.1
Delay (s)	13.1	20.4	47.4	0.1	0.1	36.4
Level of Service	B	C	D	A	A	D
Approach Delay (s)			29.5			24.9
Approach LOS			C			C

Intersection Summary			
HCM 2000 Control Delay	26.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL2	WBR	SBL	SBR2	NEL2	NEL
Lane Configurations						
Volume (vph)	930	1470	1235	150	220	1085
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	0.88	0.94	1.00		0.97
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95
Satd. Flow (prot)	3183	2584	4627	1468		3183
Flt Permitted	0.95	1.00	0.95	1.00		0.95
Satd. Flow (perm)	3183	2584	4627	1468		3183
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1011	1598	1342	163	239	1179
RTOR Reduction (vph)	72	166	0	0	0	0
Lane Group Flow (vph)	939	1432	1342	163	0	1418
Turn Type	Prot	custom	NA	Free	Prot	NA
Protected Phases	8	6	6		6 8	8
Permitted Phases				Free		
Actuated Green, G (s)	32.2	59.8	59.8	100.0		100.0
Effective Green, g (s)	32.2	59.8	59.8	100.0		100.0
Actuated g/C Ratio	0.32	0.60	0.60	1.00		1.00
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	1024	1545	2766	1468		3183
v/s Ratio Prot	c0.30	c0.55	0.29			0.45
v/s Ratio Perm				0.11		
v/c Ratio	0.92	0.93	0.49	0.11		0.45
Uniform Delay, d1	32.6	18.1	11.4	0.0		0.0
Progression Factor	1.00	1.00	0.37	1.00		1.00
Incremental Delay, d2	12.5	11.1	0.3	0.1		0.0
Delay (s)	45.1	29.2	4.5	0.1		0.0
Level of Service	D	C	A	A		A
Approach Delay (s)			4.0			0.0
Approach LOS			A			A

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Attachment #8

Department of Transportation
State of Georgia

INTERDEPARTMENT CORRESPONDENCE

FILE CSSTP-0008-00(350), Columbia County
P.I. # 0008350

OFFICE Planning

DATE March 12, 2013

FROM Cynthia L. VanDyke, State Transportation Planning Administrator

TO Genetha Rice-Singleton, State Program Delivery Engineer
Attention: George Brewer

SUBJECT **Design Traffic Review** for SR 388 FROM I-20 TO SR 232/COLUMBIA ROAD.

We have reviewed the consultant's traffic data for the above project. The Design Traffic is approved.

If you have any questions concerning this information, please contact Rhonda Niles at (404) 631-1924.

CLV/RFN

Attachment #9

Hydrology Study

SR388 from I-20 to SR 232

Project # CSSTP-0008-00(350)
PI # 0008350
County: Columbia

Prepared by:

URS Corporation
400 Northpark Town Center
1000 Abernathy Road, NE Suite 900
Atlanta, Georgia 30328

Project #15281307

April 25, 2013

Background and Purpose

The purpose of this report is to prepare a concept level hydrology study the project located on SR388 between I-20 and SR232/Columbia Road to comply with the recently approved MS4 permit. This project is within the designated MS4 area and will need to adhere to the rules and requirements of this permit. As part of the MS4 compliance, project area's drainage basins were delineated and preliminarily sized for post-construction stormwater best management practices (BMP's) that provide water quality and/ or water storage for the drainage basins. Below summarizes the design process and the structural stormwater controls that were considered.

Methodology

As stated above, the goal of this study is to attain MS4 compliance for the project area by satisfying the Georgia Stormwater Management Manual (GSMM) requirements for stormwater management standards. The GSMM requires that stormwater runoff generated by a site must be treated before discharge. In order to achieve this, the designers must utilize structural stormwater controls and better site design practices to remove 80% of the average annual post-development total suspended solids (TSS) from the stormwater runoff. Structural stormwater controls such as stormwater ponds, stormwater wetlands, bioretention areas, sand filters, infiltration trenches, and enhanced swales account for 80% TSS removal. Other limited application structural stormwater controls such as filter strips, grass channels, organic filters, underground sand filters, etc. remove 40%-80% of TSS from the stormwater runoff.

Before the post-construction stormwater BMP's for the project site could be designed, drainage basins and corresponding outfalls, the pre-construction impervious and pervious areas within each basin, and the post-construction impervious and pervious areas within each basin had to be located. After studying a topographic map of the area and visiting the project site to verify the contours, ten drainage basins were delineated within the project site. (See the attached layout for the location of the ten drainage basins and the outfalls).

Upon determining the basins and outfalls, the impervious and pervious areas of each basin for the pre-construction and post-construction phases were measured, as shown in Table 1 on the next page. Using the USDA's Natural Resources Conservation Services Web Soil Survey for the project area and the GSMM Soil Series Interpretations section, it was determined that all of the soil series within the project limits are classified as hydrologic soil group B. Given the soil group classification and the GSMM Runoff Curve Number Table, the designers were able to assign the pervious areas a curve number (CN) of 61 (Good condition –grass cover > 75%), the impervious areas a curve number of 89 (paved areas with open ditches) for pre-construction conditions, and 98 (paved areas with curbs and storm drains) for the post-construction conditions. Next,

composite curve numbers of pre-construction and post-construction conditions for the project site were found, as shown in Table 1 below.

Table 1: Drainage Basins with Pre-Construction and Post-Construction Impervious Area, Pervious Area, and Curve Numbers (CN)

Basin(s)	Total Area (acres)	Pre-Construction			Post-Construction		
		Impervious Area (acres)	Pervious Area (acres)	CN	Impervious Area (acres)	Pervious Area (acres)	CN
1	7.01	4.59	2.41	79	5.61	1.40	91
2-3	4.58	3.22	1.37	81	3.53	1.05	90
4	6.82	2.03	4.78	69	4.40	2.42	85
5	9.69	2.08	7.61	67	5.59	4.11	82
6	7.35	0.97	6.38	65	2.11	5.25	72
7	1.30	0.31	0.98	68	0.47	0.83	85
8	10.29	1.60	8.68	65	3.38	6.91	72
9	4.35	1.90	2.45	73	3.35	1.00	89
10	10.35	2.12	8.23	16	2.55	7.80	70

The project's design calls for an increase in the amount of impervious area and the addition of curb and gutter. These factors lead to higher curve numbers for each of the basins and thus higher peak discharges. The final design must correct the increased peak discharge through the use of storage and outlets so that the post-construction peak discharge is less than that of the pre-construction condition.

After determining both the pre-construction and post-construction conditions of the project are, the water quality volume (WQ_v) was calculated for each basin and can be found on Table 2 located on the following page. The WQ_v is the runoff volume that requires 80% TSS removal and therefore acts as the sizing criterion for water quality treatment. The WQv equation can be found in the GSMM and is as follows:

$$WQv = (1.2R_vA) / 12$$

A = Total Basin Area (Acres)

I = Percent Impervious (%)

R_v = Volumetric Runoff Coefficient = 0.05 + 0.009*I

Next, the volume of storage required for Channel Protection (CP_v) was calculated using SCS TR-55 method. The purpose of CP_v is to provide 24 hours of extended detention for the runoff generated by the 1-year, 24-hour rainfall event in order to protect downstream channels. Using the curve number for each basin, the initial abstraction (I_a) was found using Table 2.1.5-3 in the

GSMM. Next, the precipitation for the 1-year, 24-hour storm was calculated by finding the corresponding rainfall intensity on Table A-4 in the GSMM then multiplying by 24-hours, thus creating a total precipitation of 3.12 inches. For this project, it was assumed that the time of concentration for the pre-construction phase is 15 minutes and the time of concentration for the post-construction phase decreased to 10 minutes, due to the increase in impervious surface. Using the post-construction time of concentration, initial abstraction, and precipitation while referring to Figure 2.1.5-6 in the GSMM, the unit peak discharge (q_o/q_i) was found. The unit peak discharge was then used in conjunction with figure 2.2.5-1 to determine the peak outflow to peak inflow ratio. The ratio of required storage to volume of runoff (V_s/V_r) was calculated using the following formula:

$$V_s/V_r = 0.682-1.43*(q_o/q_i) +1.64*(q_o/q_i)^2 + 2-0.804*(q_o/q_i)^3$$

Finally, the CP_v was calculated using the following equation:

$$CP_v = [((3.12-0.2*(1000/CN-10))\text{^}2)/(3.12+0.8*(1000/CN-10))]*A*(V_s/V_r)*3630$$

The CP_v for each basin is located in Table 2 below.

Table 2: Required Storage for Water Quality, Channel Protection, and 25-Year Rainfall Event

Basin(s)	Water Quality Volume (cubic feet)	Channel Protection (cubic feet)	Overbank Flood Protection (cubic feet)
1	23,521	36,565	44,450
2-3	14,848	22,920	22,578
4	18,726	27,472	54,199
5	24,012	34,054	71,513
6	9,856	15,364	34,122
7	2,145	5,237	12,619
8	15,484	2,717	50,339
9	14,098	20,875	34,777
10	12,264	19,174	30,595

Hydraflow Hydrographs SCS method was used to determine the pre-construction and post-construction discharge and stormwater control structure sizing. First, all ten basins (pre-construction and post-construction) were added to the Hydraflow Hydrograph and modeled with corresponding basin areas, CNs, and time of concentration. The hydrographs attached to this

report enumerate the peak discharge and hydraulic volume for each pre-construction and post-construction basin when using the IDF Table for nearby Augusta.

The GSMM criteria was used to determine the volume requirements for Water Quality and Channel Protection; while Hydraflow Hydrographs pond tool was used for determining Overbank Flood Protection, pond geometry, and pond discharge. An iterative process of adjusting the pond size/geometry and outlets (weirs and inlets) was used until the post-construction discharge was less than the pre-construction for up to the 100-year rainfall event. To satisfy quality and storage requirements, extended detention ponds were used for basins 2-3, 4, 5, 6, 7, 8, and 10. Each pond was designed with 4:1 side slopes, a 12-inch freeboard, at least a 1.5:1 length to width ratio, and is no deeper than ten feet. Furthermore, each was designed to contain half of the calculated WQ_v with an outlet orifice sized according to the hydraulic head. The orifice size calculations are attached to this report. For basins 7 and 9 enhanced swales were used. The swales were designed with 3:1 side slopes, bottom widths between two to eight feet, and the ability to contain WQ_v. However, GSMM prohibits the use of swales for extended detention on large basins. Therefore, runoff from Basin 9 is collected in a swale then, once it has reached its Water Quality requirements, is routed to the extended detention pond located in Basin 10 to fulfill Channel Protection. Basin 1 currently has no proposed BMP's due to rapid development surrounding the site and will need to be addressed at a later time.

Summary

As mentioned above, Hydraflow Hydrographs 2007 was used to determine the stormwater BMP's for achieving water quality and water storage. The BMP's geometry and storage capacity are detailed in Table 3 on the following two pages. Basins 2-3, 4, 5, 6, 7, 8, and 10 utilize wet extended detention ponds to achieve stormwater quality and storage. Basin 7 uses an enhanced swale for water quality and storage while Basin 9 uses an enhanced swale for quality and a detention pond for storage. Due to the development occurring around Basin 1, the engineers deemed it imprudent to design BMP's until a clearer picture of the area's future is determined.

Currently, the BMP's fit near the project area and do not result in any displacements; however, some of the BMP's may be deemed infeasible due to their cost, both for the required right-of-way and the actual cost of installation and maintenance. Also, using the BMP's listed below, the total TSS removal for the project is 71%. This is mainly due to the fact that there are no BMP's in place for Basin 1. Since the calculations and delineations are all based on limited data during the conceptual stage, it may not be feasible to actually construction these improvements upon receipt of a more accurate survey and actual field report and studies.

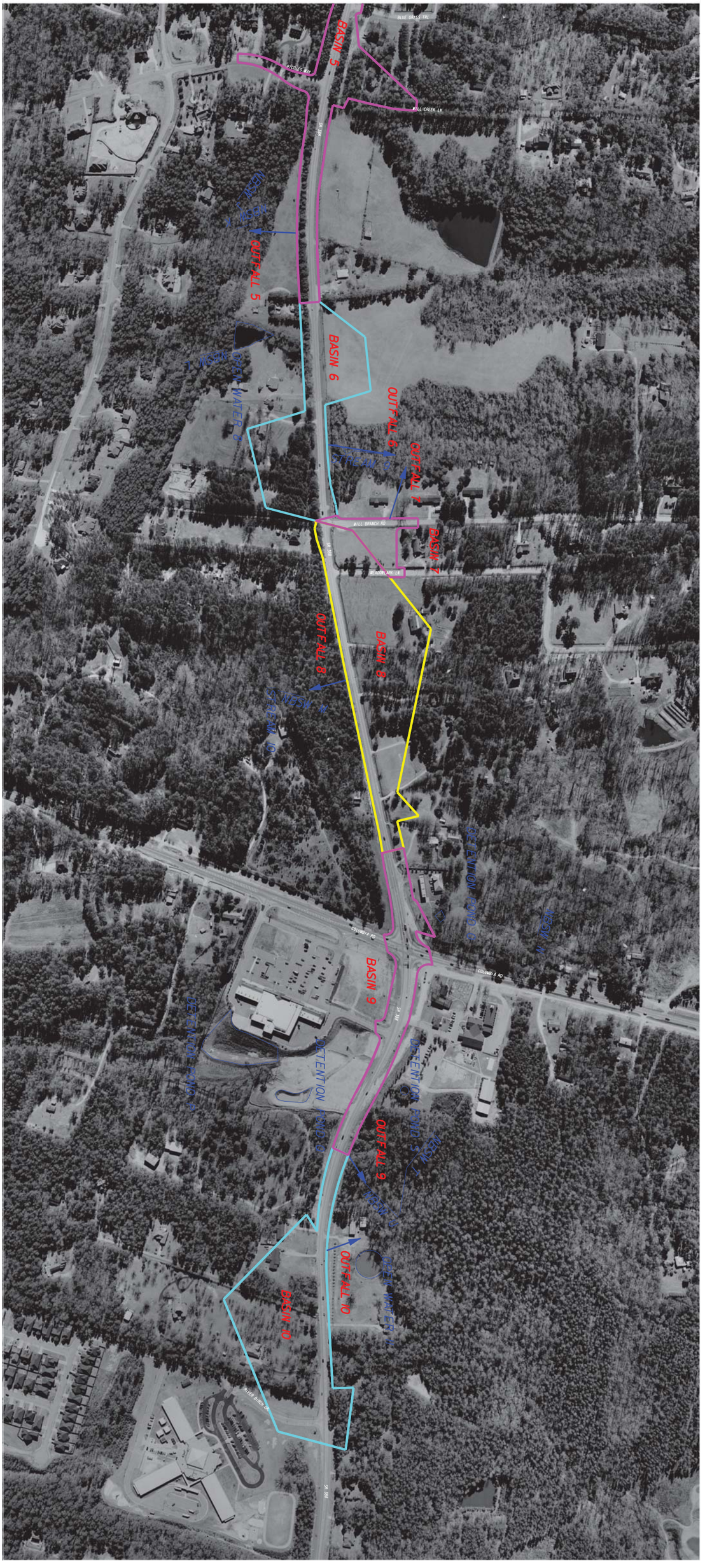
Table 3: Post-Construction Stormwater BMP Design

Basins	Outfall	Water Quality BMP's	Water Storage BMP's
1	1	None	None
2-3	2-3	Pond 2-3 Bottom length: 85 ft Bottom width: 25 ft Side Slope: 4:1 Depth: 8 ft. Storage: 61,544 ft3	Pond 2-3 Bottom length: 85 ft Bottom width: 25 ft Side Slope: 4:1 Depth: 8 ft. Storage: 61,544 ft^3
4	4	Pond 4 Bottom length: 150 ft Bottom width: 15 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 76,624 ft^3	Pond 4 Bottom length: 150 ft Bottom width: 15 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 76,624 ft^3
5	5	Pond 5 Bottom length: 190 ft Bottom width: 30 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 118,304 ft^3	Pond 5 Bottom length: 190 ft Bottom width: 30 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 118,304 ft^3
6	6	Pond 6 Bottom length: 90 ft Bottom width: 10 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 49,184 ft^3	Pond 6 Bottom length: 90 ft Bottom width: 10 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 49,184 ft^3
7	7	Swale 7 Bottom length: 400 ft Bottom width: 2 ft Side Slope: 3:1 Depth: 3 ft Shape: Trapezoidal Storage: 2,515 ft^3	Swale 7 Bottom length: 400 ft Bottom width: 2 ft Side Slope: 3:1 Depth: 3 ft Shape: Trapezoidal Storage: 2,515 ft^3
8	8	Pond 8 Bottom length: 125 ft Bottom width: 30 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 86,064 ft^3	Pond 8 Bottom length: 125 ft Bottom width: 30 ft Side Slope: 4:1 Depth: 8 ft. Shape: Trapezoidal Storage: 86,064 ft^3

9	9-10	Swale 9 Bottom length: 1000 ft Bottom width: 8 ft Side Slope: 3:1 Depth: 3.5 ft Shape: Trapezoidal Storage: 65,558 ft^3	Pond 9-10 Bottom length: 140 ft Bottom width: 70 ft Side Slope: 4:1 Depth: 4 ft. Shape: Trapezoidal Storage: 54,005 ft^3
10	9-10	Pond 10 Bottom length: 140 ft Bottom width: 70 ft Side Slope: 4:1 Depth: 4 ft. Shape: Trapezoidal Storage: 54,005 ft^3	Pond 9-10 Bottom length: 140 ft Bottom width: 70 ft Side Slope: 4:1 Depth: 4 ft. Shape: Trapezoidal Storage: 54,005 ft^3

PRECONSTRUCTION - MATCHLINE

PRECONSTRUCTION - MATCHLINE



POST CONSTRUCTION - MATCHLINE

POSTCONSTRUCTION - MATCHLINE

Georgia Stormwater Management Manual
Stormwater Quality Site Development Review Tool

General Information

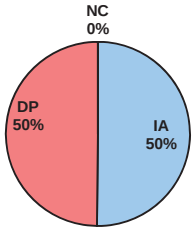
Name of Developer:		Date Submitted:	
Development Name:		Permit Number:	
Site Location / Address:	*SR 388 from I-20 to Columbia Road*	Developer Contact:	
	Columbia County, GA	Phone Number:	
Development Type:	*Office/Professional*	Name of Engineer(s):	
Area of Development (acres):	61.75	Maintenance Responsibility:	

Land Use Distribution Error

Summary of Site and Structural Control Information

Number of Drainage Areas:	10
Sum of Drainage Areas (ac) :	61.75
Total (IA) Impervious Area (ac) :	30.99
Total (DP) Disturbed Pervious Area (ac) :	30.77
Total (NC) Natural Conservation Area (ac) :	0.00
Percent Imperviousness (%) :	50%

Land Use Distribution Pie

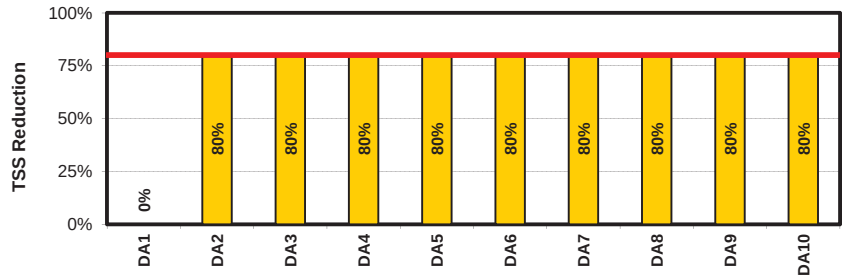


Total # of Structural Controls Used: 9

General Application Structural Stormwater Controls		Limited Application Structural Stormwater Controls	
Stormwater Pond	7	Filter Strip	0
Stormwater Wetland	0	Grass Channel	0
Bioretention Area	0	Organic Filter	0
Sand Filter	0	Underground Sand Filter	0
Infiltration Trench	0	Submerged Gravel Wetland	0
Enhanced Swales	2	Gravity (Oil-Grit) Separator	0
Detention Structural Stormwater Controls		Porous Concrete**	0
Dry Detention / Dry ED Basin	0	Modular Porous Paver System**	0
Multi-Purpose Detention Area	0	Alum Treatment System	0
Underground Detention	0	Proprietary Structural Control***	0

TSS Reduction

Total TSS Reduction (%) : 71%



Official Use Only

Tracking #:	
Reviewed By:	
Date Approved:	
Conditions of Approval:	

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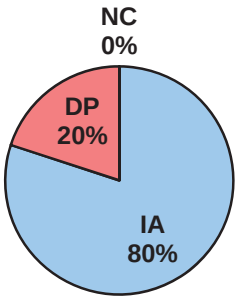
Drainage Area 01

Land Use Distribution (acres)

Enter Total Area :	**7.01**
Enter Impervious Area (IA) :	5.61
Enter Disturbed Pervious Area (DP) :	1.40
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***7.01***
Percent Imperviousness (%) :	**80%**



Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

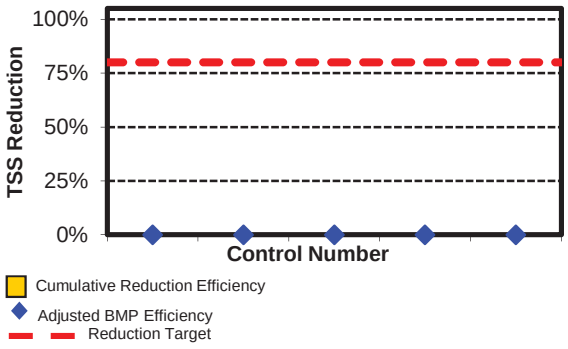
WQ_V (ac-ft) w/o Credits =	**0.540**
WQ_V w/ Non-Struc. Credits =	**0.540**

Structural Controls

	Select Structural Control(s)	Control ID
Control 1	NONE	NONE
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **0%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable): **0%**

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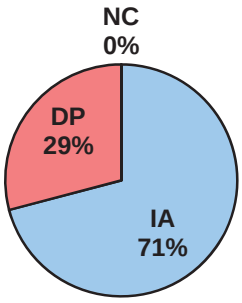
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 02

Land Use Distribution (acres)

Enter Total Area :	**2.44**
Enter Impervious Area (IA) :	1.73
Enter Disturbed Pervious Area (DP) :	0.71
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***2.44***
Percent Imperviousness (%) :	**71%**

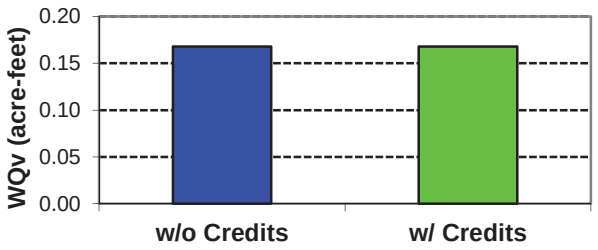


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.168**
WQ_V w/ Non-Struc. Credits =	**0.168**

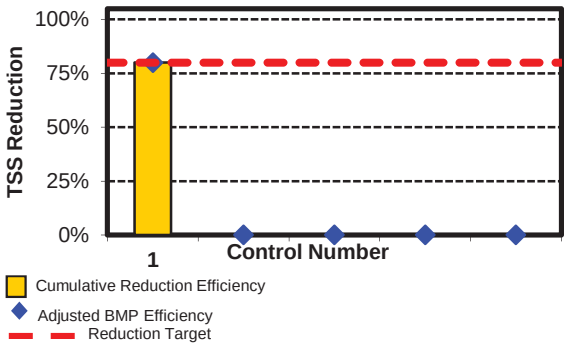


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-02-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable): **80%**

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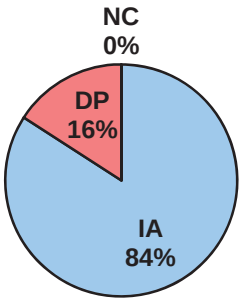
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 03

Land Use Distribution (acres)

Enter Total Area :	**2.14**
Enter Impervious Area (IA) :	1.80
Enter Disturbed Pervious Area (DP) :	0.34
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***2.14***
Percent Imperviousness (%) :	**84%**

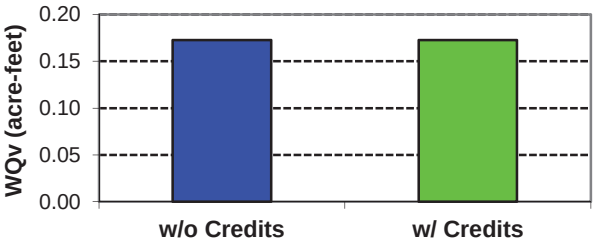


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.173**
WQ_V w/ Non-Struc. Credits =	**0.173**

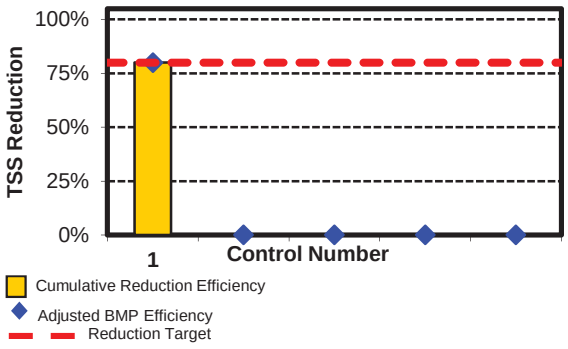


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-03-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable): **80%**

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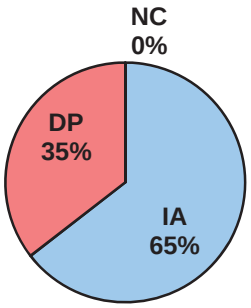
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 04

Land Use Distribution (acres)

Enter Total Area :	**6.82**
Enter Impervious Area (IA) :	4.40
Enter Disturbed Pervious Area (DP) :	2.42
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***6.82***
Percent Imperviousness (%) :	**65%**

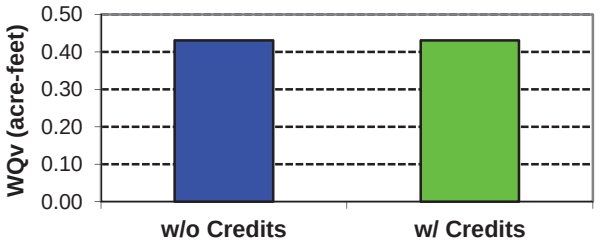


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.430**
WQ_V w/ Non-Struc. Credits =	**0.430**

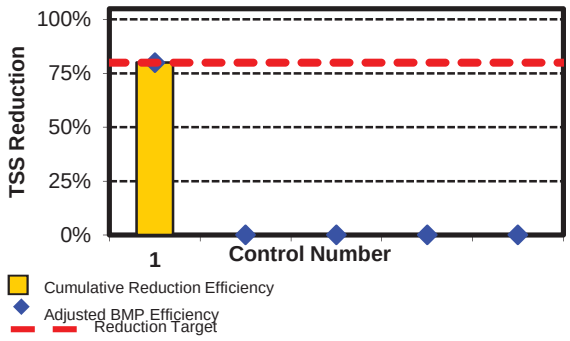


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-04-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

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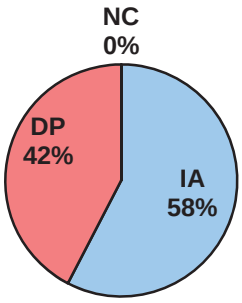
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 05

Land Use Distribution (acres)

Enter Total Area :	**9.70**
Enter Impervious Area (IA) :	5.59
Enter Disturbed Pervious Area (DP) :	4.11
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***9.70***
Percent Imperviousness (%) :	**58%**

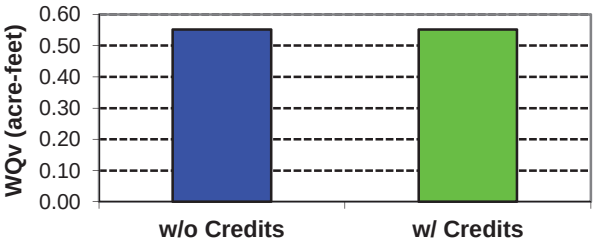


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.552**
WQ_V w/ Non-Struc. Credits =	**0.552**

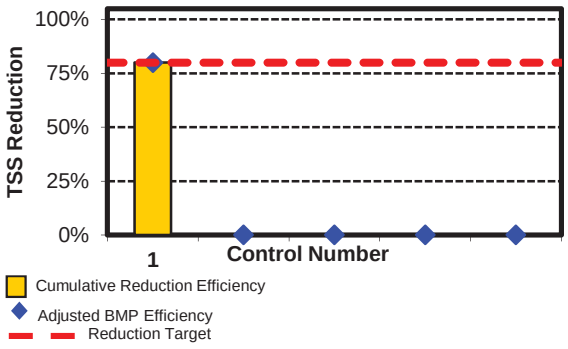


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-05-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

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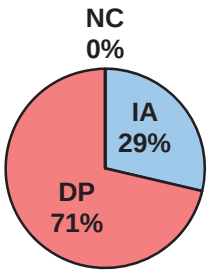
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 06

Land Use Distribution (acres)

Enter Total Area :	**7.36**
Enter Impervious Area (IA) :	2.11
Enter Disturbed Pervious Area (DP) :	5.25
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***7.36***
Percent Imperviousness (%) :	**29%**



Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

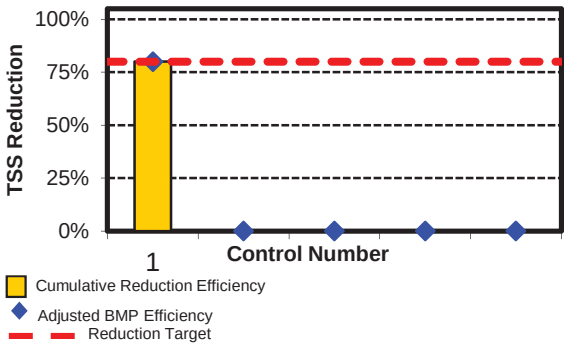
WQ_V (ac-ft) w/o Credits =	**0.227**
WQ_V w/ Non-Struc. Credits =	**0.227**

Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-06-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 7 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

CH2MHILL

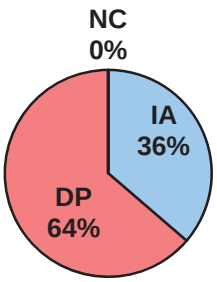
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 07

Land Use Distribution (acres)

Enter Total Area :	**1.30**
Enter Impervious Area (IA) :	0.47
Enter Disturbed Pervious Area (DP) :	0.83
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***1.30***
Percent Imperviousness (%) :	**36%**

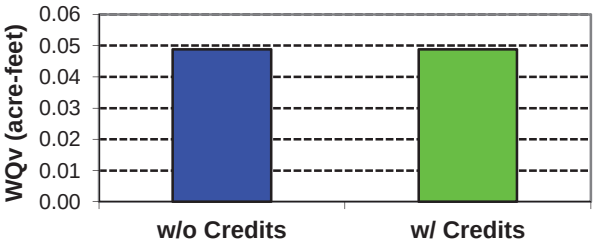


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.049**
WQ_V w/ Non-Struc. Credits =	**0.049**

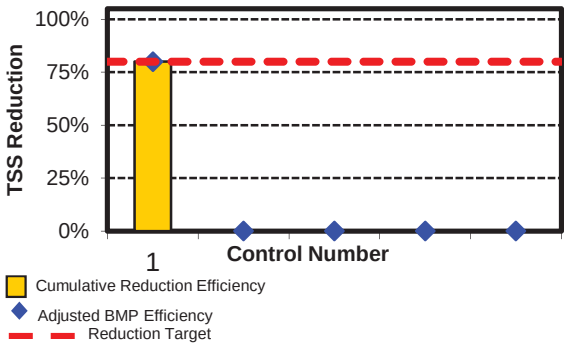


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Enhanced Swales	ESW-07-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 8 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

CH2MHILL

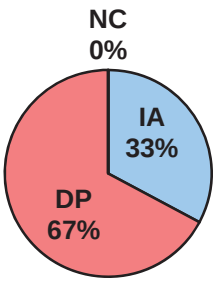
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 08

Land Use Distribution (acres)

Enter Total Area :	**10.29**
Enter Impervious Area (IA) :	3.38
Enter Disturbed Pervious Area (DP) :	6.91
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***10.29***
Percent Imperviousness (%) :	**33%**

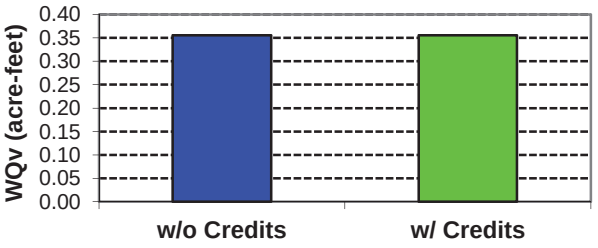


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.355**
WQ_V w/ Non-Struc. Credits =	**0.355**

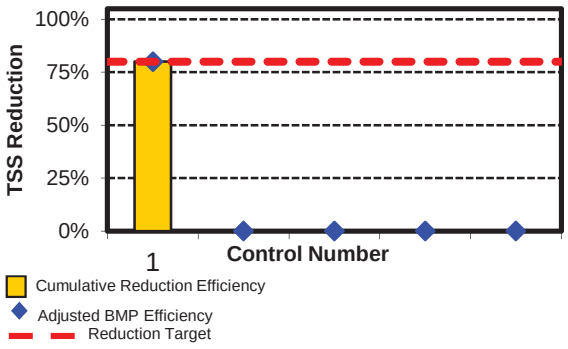


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-08-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 9 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

CH2MHILL

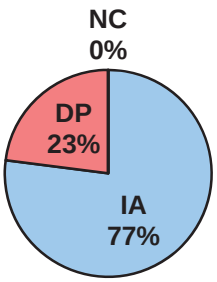
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 09

Land Use Distribution (acres)

Enter Total Area :	**4.35**
Enter Impervious Area (IA) :	3.35
Enter Disturbed Pervious Area (DP) :	1.00
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***4.35***
Percent Imperviousness (%) :	**77%**

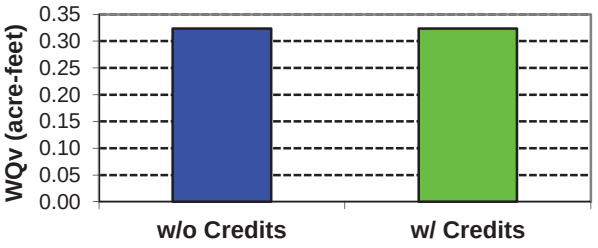


Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

WQ_V (ac-ft) w/o Credits =	**0.323**
WQ_V w/ Non-Struc. Credits =	**0.323**

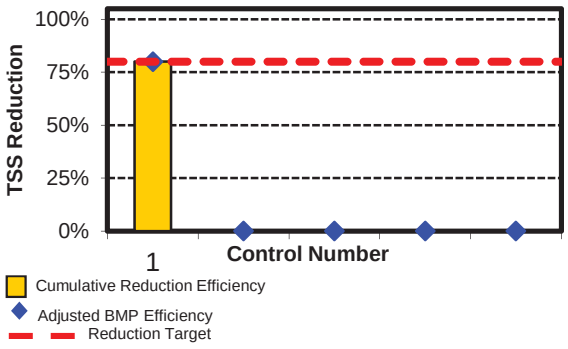


Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Enhanced Swales	ESW-09-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 10

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

CH2MHILL

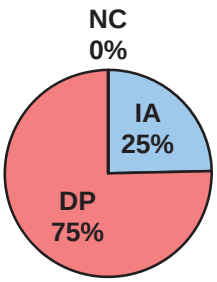
Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Drainage Area 10

Land Use Distribution (acres)

Enter Total Area :	**10.35**
Enter Impervious Area (IA) :	2.55
Enter Disturbed Pervious Area (DP) :	7.80
Enter Natural Conservation Area (NC) :	0.00
Total Area for check :	***10.35***
Percent Imperviousness (%) :	**25%**



Non-Structural Controls (Site Design Credits)

Natural Conservation Area (acres):	0.00
Enter Area (acres) Treated by (if applicable):	
Undisturbed Stream Buffers :	
Vegetated Channels :	
Overland Flow Filtration / Recharge :	
Total Area receiving Credits (acres):	**0.00**

Water Quality Volume (WQ_V)

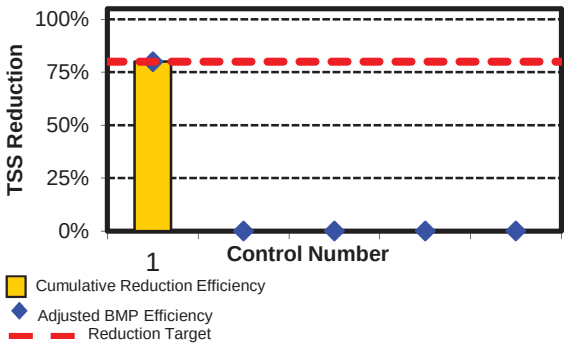
WQ_V (ac-ft) w/o Credits =	**0.281**
WQ_V w/ Non-Struc. Credits =	**0.281**

Structural Controls

	Select Structural Control(s)	Control ID
Control 1	Stormwater Pond	STP-10-1
Control 2	NONE	NONE
Control 3	NONE	NONE
Control 4	NONE	NONE
Control 5	NONE	NONE

TSS Reduction Chart

TSS Reduction from Structural Controls: **80%**



Additional Downstream Treatment

If the runoff leaving this drainage area is treated by one or more additional structural controls downstream, please specify the appropriate drainage area(s) below:

☐ DA 1 ☐ DA 2 ☐ DA 3 ☐ DA 4 ☐ DA 5 ☐ DA 6 ☐ DA 7 ☐ DA 8 ☐ DA 9

Total TSS Reduction Using Non-Structural Controls (Site Design Credits), Structural Controls, and Additional Downstream Treatment (if applicable):	**80%**

CH2MHILL

Local Government Specific Information (fill in only if required by Development Review Department)

Watershed Basin:	District/LL/Parcel:	Comm. District:

Attachment #10

Ranger Consulting, Inc.
Geotechnical, Environmental, Drilling, Construction
3147 Martha Berry Highway, Rome; Georgia 30165; Phone: 706-290-1782; Fax: 706-290-1701

October 4, 2013

Mr. Nick Castronova
URS Corporation
400 Northpark Town Center
1000 Abernathy Road, NE
Suite 900
Atlanta, Georgia 30328

RE: Limited Phase I Environmental Site Assessment Report
SR 388 from I-20 to SR 232
Project No. CSSTP-0008-00(350)
PI No. 0008350
Columbia County, Georgia

Dear Mr. Castronova:

Ranger Consulting, Inc. is pleased to submit the attached draft Limited Phase I Environmental Site Assessment Report. In summation, the report provides documentation of five *Recognized Environmental Concerns (RECs).*

Three of the properties Ranger considers to be RECs are The Pumping Station #8, Lewiston Food Mart and Murphy Express #8575, located at 499 Lewiston Road, 107 Lewiston Road and 4009 Gateway Boulevard, respectively. All three are currently operating as convenience stores and retail fueling facilities. Based upon Environmental Protection Division (EPD) file reviews, it appears that the facilities are operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although the compliance records are in order and there are no records of any confirmed releases at the facilities, it does not negate the possibility that the UST systems could have developed as yet undetected releases of petroleum products to the subsurface. Given the proximity of the UST systems to the proposed corridor these facilities are considered RECs.

Beacon Automotive, located at 475 Lewiston Road, performs oil changes, brake repairs, tire changes and other small miscellaneous auto repair jobs. Prior to Beacon Automotive, Dixie Meter and Service Company owned and occupied the entire building from 1996 till 2006 fabricating and converting large trucks into propane service trucks for refilling residential tanks. The shop was a fully functional mechanic shop, including painting trucks. Although there was no visual evidence of underground storage or surface staining noted during the reconnaissance, due to the lengthy history of automotive repair and painting services dating back to 1996, this property is considered a REC.

An unpermitted solid waste landfill, located just west of the Site and south of William Few Parkway, was operated by private landowners in the mid-1960's until Columbia County assumed operation in 1974. The landfill accepted all forms of waste, including residential, commercial and industrial. Although there are no records to confirm the limits of the landfill, reportedly the open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building. The landfill was closed on November 9, 1982 by the placement of a two-foot soil cover over the top of the waste. Following the closure, Columbia County received a 'closure' letter from Georgia's EPD.

In April 1990, a concerned property owner reported to EPD that laboratory results indicated that contaminants from the landfill had impacted his drinking water well. The residence and drinking water well are located east of the project corridor, implying that groundwater contaminants could have potentially migrated beneath the roadway and across the project corridor. Consequently, this property is considered a REC.

We appreciate the opportunity to provide you with our services. If you develop any questions regarding the content of the report please call me at (706) 290-1782.

Respectfully,

Peggy McGee	Sandra A. Miller, P.E.	Warren F. Bailey, Jr., P.E.
Senior Engineer	Project Engineer	Principal Engineer
	Georgia P.E. No. 36138	Georgia P.E. No. 11462

SR 388 from I-20 to SR 232
Project No. CSSTP-0008-00(350)
PI No. 0008350
Columbia County, Georgia

Limited Phase I
Environmental Site Assessment

Prepared For:

URS Corporation
400 Northpark Town Center
1000 Abernathy Road, NE
Suite 900
Atlanta, Georgia 30328

Prepared By:
Ranger Consulting, Inc.
3147 Martha Berry Highway
Rome, GA 30165

October 4, 2013

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LIST OF APPENDICES

1.0 SUMMARY

Ranger Consulting, Inc. (Ranger) has performed a *Phase I Environmental Site Assessment* (ESA) in conformance with the scope and limitations of the American Society for Testing and Materials (ASTM) Practice E 1527-05 for the widening of the SR 388 North corridor from just south of Interstate 20 (I-20) to 0.65 miles north of SR 232/Columbia Road in Grovetown, Columbia County, Georgia, hereafter referred to as the Site. The ESA included a site reconnaissance, interviews, historical research, file reviews and database searches for the Site, which is the proposed right-of-way along SR 388 from I-20 to SR 232. Any exceptions to, or deletions from this practice are described in Section 10.0 of this report. The Summary should not be considered a stand-alone document. The complete report including support documentation and limitations should be evaluated in its entirety.

The Site is comprised of multiple properties located immediately adjacent to and/or proximal to the proposed roadway project. A site vicinity map, topographic map and site plan depicting the location of the subject Site and its surrounding topography are included in Appendix A, Figures 1 through 3, respectively. During the course of the ESA the following properties were evaluated for potential environmental concerns:

- J&H Stores Pump & Shop #5, KAK, Inc., 500 Lewiston Road at I-20, Parcel No. 068 1058 5020
- The Pumping Station #8, 499 Lewiston Road, Parcel No. 061 030D
- Lewiston Food Mart, 107 Lewiston Road, Parcel No. 061 072
- Walmart Supercenter #5735, 5010 Steiner Way, Parcel No. 068 059Z
- National Environmental Group, 2530 Grier Circle, Parcel No. 060 235
- Murphy Express #8575, 4009 Gateway Blvd., Parcel No. 068 1062
- Beacon Automotive, 475 Lewiston Road, Parcel No. 061-030F
- Columbia County Landfill, 475 Lewiston Road to William Few Parkway, Parcel No. 061-030F

This assessment has revealed evidence of *recognized environmental conditions* (RECs) and *historical recognized environmental conditions* (HRECs) in connection with the Site.

On September 9, 2013 Ranger made a reconnaissance of the Site, which is comprised of numerous properties proximal to the roadway that will be used for right-of-way associated with the proposed road widening project. The Site currently consists predominantly of forested land, planted fields and private residences with several commercial properties primarily located at or near the I-20 off and on ramps and at the intersection of Lewiston Road and SR 232/Columbia Road. The Project Site is bordered by forested land, planted fields and private residences. Based upon a review of historical records and interviews, the Project Site appeared to be undeveloped, with the exception of a few private residences until the mid-60's when I-20 was constructed.

Select photographs of the Site taken by Ranger during the site reconnaissance are included in Appendix B.

The investigation revealed evidence of five properties that would be considered RECs and one property that would be considered an HREC.

- J&H Stores Pump & Shop #5 has operated under several different ownerships and names through the years as a retail gas station since the first underground storage tanks (USTs) were installed in 1970. The facility experienced a confirmed release on July 23, 1992. Groundwater contamination was present above Georgia's In-stream Water Quality Standards and more importantly, a nearby stream was impacted by methyl tertiary butyl ether (MTBE), which is a component of petroleum but not yet regulated by the State of Georgia. The Georgia Underground Storage Tank Management Program (USTMP) awarded the facility No Further Action Required (NFAR) status in 2000. In 2005 the Georgia Department of Transportation (GDOT) completed a UST Site Screening, which detected soil contamination. The USTMP elected to allow the initial NFAR status to stand. In 2008 three additional tanks were removed and a second NFAR was awarded. The reported groundwater flow direction is west southwest toward the Site. Although groundwater flow direction is toward the Site, given the NFARs awarded to the Site through the years, this property is considered an HREC.

- The Pumping Station #8 is currently operating as a convenience store and retail fueling facility with one 12,000-gallon diesel, one 12,000-gallon gasoline and two 8,000-gallon gasoline USTs. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, the property is considered a REC.

- Lewiston Food Mart is currently operating as a convenience store and retail fueling facility with one 15,000-gallon gasoline and one composite UST with 6,000 gallons of gasoline and 6,000 gallons of diesel. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, the property is considered a REC.

- Beacon Automotive has been an occupant of the 475 Lewiston Road building since January 2013. Beacon Automotive performs oil changes, brake repairs, tire changes and other small miscellaneous auto repair jobs. Used oil, transmission fluid, solvents and batteries are routinely reclaimed by a recycler for proper disposal.

Dixie Meter owned and occupied the entire building from 1996 till 2006 fabricating and converting large trucks into propane service trucks for refilling residential tanks. The shop was a fully functional mechanic shop, including truck painting. All waste materials were routinely reclaimed by a local recycler. Due to the lengthy history of automotive repair and painting services at this location, this property is considered a REC.

- Murphy Express #8575 is currently operating as a retail fueling facility with one 12,000-gallon diesel, one 8,000-gallon gasoline and one 20,000-gallon gasoline UST. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, the property is considered a REC.

- An unpermitted solid waste landfill, located just west of the Site and south of William Few Parkway, was operated by private landowners in the mid-1960's until Columbia County assumed operation in 1974. The landfill accepted all forms of waste, including residential, commercial and industrial. Although there are no records to confirm the limits of the landfill, reportedly the open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building. The landfill was closed on November 9, 1982 by the placement of a two-foot soil cover over the top of the waste. Following the closure, Columbia County received a 'closure' letter from Georgia's Environmental Protection Division (EPD).

  In April 1990, a concerned property owner reported to Columbia County that laboratory results indicated that contaminants from the landfill had impacted his drinking water well. The residence and drinking water well are located east of the project corridor, implying that groundwater contaminants could have potentially migrated beneath the roadway and across the project corridor. Consequently, this property is considered a REC.

This summary is provided for convenience and should not be substituted for review of the full report, including all attachments as provided herein.

2.0 INTRODUCTION

2.1 PURPOSE

The Phase I ESA was performed in an attempt to identify, to the extent feasible, RECs associated with the proposed widening project of SR 388 North from just south of I-20 to just north of SR 232/Columbia Road located in Grovetown, Columbia County, Georgia, the Site. The ESA is intended to constitute "all appropriate inquiry" into the previous ownership and uses of the Site consistent with good commercial and customary practices as defined by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 USC § 9601). In addition, the ESA is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability.

Phase I ESAs address existing and past uses and conditions relative to the Site. Ranger makes no representation regarding the future or potential use of the Site except for those items explicitly stated in this report.

This assessment was conducted in general accordance with the scope and limitations of the generally accepted ASTM *Standard Practice for Site Assessments: Phase I Environmental Site Assessment Process, Designation: E 1527-05* unless otherwise stated herein. Our assessment, conclusions and recommendations are based on site conditions, observations, interviews, and a review of readily available information, as they existed at the time of our review.

2.2 SCOPE OF SERVICES

Phase I ESAs are described as general characterizations of environmentally sensitive activities and conditions that are identifiable through readily available information and visual, non-invasive observations for the purpose of identifying RECs. ATSM E 1527-05 defines a REC as the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property. The term includes hazardous substances or petroleum products, even under conditions in compliance with laws.

ASTM E-1527-05 also defines an HREC as an environmental condition which in the past would have been considered a REC, but which may or may not be considered an environmental condition currently.

These terms are not intended to include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment, and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

Services performed for this project include a process involving and/or considering the following:

- Review of available environmental lists published by federal and state agencies (i.e., regulatory database report) in an attempt to identify environmentally sensitive activities (past or present) on the subject and adjoining properties.

- Review of physical characteristics of the Site through field observations and a review of readily available documents including topographic maps, aerial photographs, and historic maps.

- Reconnaissance of reasonably accessible portions of the Site and surrounding areas to visually identify obvious present or past conditions or activities that may pose an environmental threat to the Site.

- Interview of local regulatory agency personnel and others knowledgeable about the history of the Site.

- A qualitative hydrogeologic evaluation of the Site and vicinity using both published topographic maps and field observations.

- Preparation of this report summarizing our services, findings, and conclusions.

A Site vicinity map, topographic map, aerial photograph, Site photograph, regulatory database report, regulatory and/or government agency correspondence, and other supporting documents and information may be included as appendices to this report.

The sampling and testing of soil, air and/or other materials is beyond the scope of this study. The identification of asbestos containing materials (ACM), radon, lead based paint (LBP), lead in drinking water, wetlands, Waters of the United States, Waters of the State, regulatory compliance, cultural and historic resources, industrial hygiene, health and safety, ecological resources, rare or endangered species, air quality (including but not limited to vapor intrusion), noise impacts, biological agents and mold are also beyond the ASTM E1527-05 defined scope of this Phase I ESA. No implication is intended as to the relative importance of these additional environmental items, and this list of items is not intended to be all inclusive.

2.3 SIGNIFICANT ASSUMPTIONS

The information gathered during this assessment was information that was available at the time of the assessment and "practically reviewable." This is, by definition, information that is provided by the source in a manner and in a form that, upon examination, yields information relevant to the property without the need for extraordinary analysis of irrelevant data. The form of the information is such that the environmental professional can review the records for a limited geographic area. Records that cannot be feasibly retrieved by reference to the location of the property or a geographic area in which the property is located (such as records that are sorted chronologically) are not considered practically reviewable.

In addition, for large databases with numerous records it is common for an unmanageable number of sites to be identified, even within a smaller geographic area such as a zip code. In these cases when so much data is generated that it cannot be feasibly reviewed for its impact on the property, it is considered not practically reviewable.

The information provided herein is that which is publicly available. Information that is publicly available means that the source of the information allows access to the information by anyone upon request at a reasonable time and cost. Additionally, it is possible that unreported disposal of waste or other activities impairing the environmental condition of the Site may have occurred which could not be identified.

2.4 LIMITATIONS AND EXCEPTIONS

2.4.1 Limitations

Ranger has performed this Phase I ESA in general accordance with ASTM E1527-05, which is a limited inquiry into a property's environmental status and is not sufficient to discover every potential source of environmental liability or environmental impact, if any, of the property to be evaluated. No ESA can wholly eliminate uncertainty regarding the potential for RECs in connection with a property. Performance of this practice is intended to reduce, but not eliminate, uncertainty regarding the potential for RECs in connection with a property, and this practice recognizes reasonable limits of time and cost.

Ranger's assessment represents a review of certain information relating to the Site that was obtained by methods described above and does not include sampling or monitoring activities at the Site. While Ranger has used reasonable care to avoid reliance upon data and information that is inaccurate, Ranger is not able to verify the accuracy or completeness of all data and information available during the investigation. Some of the conclusions in this report would be different if the information upon which they are based is determined to be false, inaccurate or incomplete. Ranger shall not be held responsible

for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed by interviewees at the time this investigation was performed.

Ranger makes no legal representations whatsoever concerning any matter including, but not limited to, ownership of any property or the interpretation of any law. Ranger further disclaims any obligations to update the report for events taking place after the time during which the assessment was conducted. This report is not a comprehensive site characterization and should not be construed as such. The opinions presented in this report are based upon the findings derived from a site reconnaissance, a limited review of specified regulatory records and historical sources, and comments made by the interviewees.

Phase I ESAs, by their nature, are limited. Ranger has endeavored to meet what it believes is the applicable standard of care, and, in doing so, is obliged to advise the Client of Phase I ESA limitations. Ranger believes that providing information about limitations is essential to help the Client identify and thereby manage its risks. Through additional research, these risks can be mitigated, but they cannot be eliminated.

The level of inquiry is variable. Not every property will warrant the same level of assessment. Consistent with good commercial or customary practices, the appropriate level of environmental site assessment will be guided by the type of property subject to assessment, the expertise and risk tolerance of the User, and the information developed in the course of the inquiry.

Ranger's findings, opinions, and conclusions are based on information which is reasonably ascertainable from standard sources at the time of the assessment through site reconnaissance, visual assessment of surficial conditions, records review, interviews and other standard investigative techniques used in the industry at this time. It is possible that other information exists or may subsequently become known that may impact or change the site assessment after Ranger's services are complete.

In conducting this Phase I ESA and preparing the ESA report, Ranger reviewed, interpreted, and relied upon information provided by others, including, but not limited to, Mr. Nick Castronova, Project Manager for URS Corporation (Client or User), individuals, government authorities, and other entities. Ranger has not performed an independent evaluation of the accuracy or completeness of such information.

Ranger's assessment represents our professional opinion only. Therefore, Ranger cannot, under any circumstances, make a statement of warranty or guarantee, expressed or implied, that RECs, environmental impairment, or environmental impacts are limited to those that are discovered while we are performing the Phase I ESA.

2.4.2 Exceptions/Data Gaps

Data gaps are the lack or inability to obtain information required by ASTM Standard E 1527-05 despite good faith professional efforts to gather such information, such as, but not limited to, the inability to conduct a site visit, inability to conduct interviews, and the inability to establish historical uses of the Site or surrounding properties. Not all data gaps are significant, and a data gap will only be discussed in this section if: 1) a data gap occurs during investigation, and/or 2) the data gap impairs Ranger's ability to meet the objectives of ASTM Standard E 1527-05.

Multiple data gaps were encountered during the site evaluation: The use of the Site was not identified back to the Site's first developed use, chain-of-title was not provided by the Client to Ranger for review, Sanborn maps were not available, the aerial photographs were not consistently available at five year intervals, the City Directories were only available from 1997 to 2012 and the multiple owners of the former 500 Lewiston Road gas station (J&H Stores Pump & Shop #5, KAK, Inc., Vijay Kumar, Pantry #3268, Yogeshwar Enterprises, Depot Food Store #3268, Depot Food Store #131, and Gulf #26503) were not interviewed. Therefore, the Site and surrounding area could not be fully investigated in this regard for the historical records research and interviews. However, the data gaps are not considered significant because the apparent past history and current use of the Site were able to be determined by a site reconnaissance, current owner/manager interviews and by using the available historical records and database reports: Environmental Data Resources, Inc. (EDR), U.S. Environmental Protection Agency (EPA) Enforcement and Compliance History Only (ECHO), Georgia Environmental Protection Division (EPD) Leaking Underground Storage Tank (LUST), UST, Solid Waste, Hazardous Waste and Emergency Response Team files.

2.5 SPECIAL TERMS AND CONDITIONS

None.

2.6 USER RELIANCE

This Phase I ESA report, along with the findings and conclusions contained in the report, either in completed form, summary form, or by extraction, is prepared, and intended, for the sole use of Mr. Nick Castronova, Project Manager for URS Corporation (Client or User), and therefore may not contain sufficient information for other purposes or parties. The Client (URS and Georgia Department of Transportation) is the only intended beneficiary of this report. The contents of Ranger's report will continue to be the property of Ranger. Ranger's report may not be disclosed to, used by, or relied upon by, any person or entity other than the Client without the express written consent of Ranger.

The passage of time may result in changes in technology, economic conditions, site variations, or regulatory provisions which would render the report inaccurate. Reliance on the report after the date of issuance as an accurate representation of current site conditions shall be at the client's sole risk. Should Ranger be required to review the report after six months from its date of submission, Ranger shall be entitled to additional compensation at the existing rates or other such terms as may be agreed between Ranger and the Client.

Authorization for disclosure to a third party or authorization for third-party reliance on any report will be considered by Ranger upon the written request of the Client. Ranger reserves the right to deny authorization to allow disclosure or reliance of Ranger's report to third parties.

3.0 SITE DESCRIPTION

3.1 LOCATION AND LEGAL DESCRIPTION

The Site is a corridor located along SR 388 from approximately 700 feet south of the I-20 eastbound on ramp to approximately 0.65 miles north of SR 232/Columbia Road in Grovetown, Columbia County, Georgia. The Site measures approximately two miles in length.

A Site location map and a topographic map depicting the location of the subject Site and its surrounding topography are included in Appendix A (Figures 1 and 2). The approximate latitude and longitude coordinates of the subject Site are between 33°28'50" north and 82°11'53" west, and 33°30'31" north and 82°12'09" west, respectively.

3.2 SITE AND VICINITY GENERAL CHARACTERISTICS

The Site is located within the Grovetown, Georgia United States Geological Survey (USGS), 7.5-minute series topographic quadrangle map. This map indicates that the Site slopes from a topographic high of approximately 440 feet above mean sea level (msl) in the southern portion to a low of approximately 320 feet msl in the northern portion of the Site. Select photographs of the Site taken by Ranger during the site reconnaissance are included in Appendix B.

3.3 CURRENT USE(S) OF THE PROPERTIES

At the time of the site reconnaissance, portions of the Site were being utilized as a commercial area consisting of gas stations, restaurants, various retail stores, private businesses, a church and elementary school. During the site reconnaissance, evidence of the use and storage of petroleum products was observed at the Site and in the surrounding area. Observations made during the site reconnaissance are further discussed in Section 6 of this report.

The Columbia County Tax Assessor website provided information on the properties being evaluated for environmental concerns that are located along the Site corridor (http://gis.columbiacountyga.gov/). Table 1 below summarizes each property. Please refer to Appendix C for a copy of the tax assessor records for individual properties.

Table 1: Summary of Site Property Data

Parcel Number	Owner	Address	Site Acreage	Current Use
068-1062	Murphy Oil USA, Inc.	4009 Gateway Blvd.	2.1387	Commercial fueling facility
068-059Z	Walmart Real Estate Business Trust	5010 Steiner Way	18.4527	Retail store
061-030D	Robert and David Sandback	499 Lewiston Road	1.935	Convenience store with fuel sales
061-072	Bhagavati, Inc.	107 Lewiston Road	1.75	Convenience store with fuel sales
068 1058	Ramp G Partners, LLC	500 Lewiston Road (5020 Steiner Way)	1.9451	Retention pond
061-030F	Columbia County tax records indicate owner information is not available.	475 Lewiston Road		Automotive repair and closed solid waste landfill

3.4 DESCRIPTIONS OF STRUCTURES, ROADS, OTHER IMPROVEMENTS

The Site is developed with several commercial buildings including retail and convenience stores, several restaurants and private businesses located mainly at or near the I-20/SR 388 interchange. Clearing and grading for a large development of unknown origin is ongoing in the southwest quadrant of the I-20/SR 388 interchange. A convenience store, retail store, a church and elementary school are also located at or near the intersection of SR 388 and Columbia Road. Several private residences fronting SR 388 and on small side roads are evident along SR 388 between the aforementioned intersections.

Several roads are located on the Site including the I-20/SR 388 interchange, William Few Parkway proximal to the interchange, the SR 232/SR 388 intersection, and multiple residential side roads.

Columbia County operates a municipally-owned water and sewer utility serving all commercial entities at the I-20/SR 388 interchange north to William Few Parkway. All residences along the project corridor utilize individual septic systems. Sewer services provided by Columbia County resume at the north end of the project at Lewiston Elementary School. The Village at Hereford Farm development is also connected to the system at the school. Columbia County provides water through the entire length of the project corridor. Electricity is provided by Georgia Power. Natural gas is provided by Georgia Natural Gas and Scana. Telephone, including fiber optics, is provided by AT&T.

3.5 CURRENT USE(S) OF THE ADJOINING PROPERTIES

Properties with reported environmental concerns were observed individually. All other properties, including those in the immediate vicinity of the Site were examined from the roadway or by a physical walk-around of the property. Adjoining properties in all directions are predominantly private residences, undeveloped forested land, planted fields, a Walmart commercial development as well as cleared and graded land for a planned large commercial development across from Walmart in the southwest quadrant of the SR 388 and I-20 interchange.

4.0 USER PROVIDED INFORMATION

Interviews were conducted with Mr. Nick Castronova of URS Corporation (Client representative).

4.1 TITLE RECORDS

A chain of title report for the Site was not provided by the Client.

4.2 ENVIRONMENTAL LIENS OR ACTIVITY AND USE LIMITATIONS

The Client has stated that they are not aware of any environmental liens or activity or use limitations for the Site.

4.3 SPECIALIZED KNOWLEDGE

The Client has stated that they are not aware of any specialized knowledge or experience of the Client that is material to RECs in connection for the Site.

4.4 COMMONLY KNOWN OR REASONABLY ASCERTAINABLE INFORMATION

The Client has stated that they are not aware of any commonly known or reasonably ascertainable information that is material to RECs in connection with the Site.

4.5 VALUATION REDUCTION FOR ENVIRONMENTAL ISSUES

No valuation reduction or environmental issues were identified by the Client.

4.6 OWNER, PROPERTY MANAGER, AND OCCUPANT INFORMATION

The Client has stated that they are not aware of any owner, property manager or occupant information that is material to RECs in connection with the Site.

4.7 REASON FOR PERFORMING PHASE I ESA

The Phase I ESA is being performed as a requirement for the SR 388 widening project from I-20 to SR 232/Columbia Road (GDOT Project No. CSSTP-0008-00(350), Columbia County, PI No. 0008350) in Grovetown, Columbia County, Georgia.

5.0 RECORDS REVIEW

5.1 STANDARD ENVIRONMENTAL RECORD SOURCES

Environmental Data Resources, Inc. (EDR) of Milford, Connecticut conducted a commercial database search of regulatory databases. This is a review of published governmental records from federal and state environmental regulatory agencies. It was conducted to identify use, generation, storage, treatment or disposal of hazardous substances and petroleum products, and/or release incidents of such materials that may have the potential to impact the Site or nearby sites. The federal and state environmental databases obtained from EDR and reviewed by Ranger were generated in general accordance with the ASTM E-1527-05 guidelines for standard environmental record sources for this assessment. Such reports are typically used to review the potential environmental impact of activities at the Site or nearby sites. The full EDR database search report for this project is included in Appendix D.

Standard Environmental Record Sources

Federal NPL site list	1.0 mile
Federal Delisted NPL site list	1.0 mile
Federal CERCLIS list	0.5 mile
Federal CERCLIS NFRAP site list	0.5 mile
Federal RCRA CORRACTS facilities list	1.0 mile
Federal RCRA non-CORRACTS TSD facilities list	0.5 mile
Federal RCRA generators list	Property and adjoining properties
Federal Institutional control/engineering control registries	Property only
Federal ERNS List	Property only
State and tribal lists of hazardous waste sites identified for investigation for remediation:	
• State and tribal equivalent NPL	1.0 mile
• State and tribal equivalent CERCLIS	0.5 mile
State and tribal landfill and/or solid waste disposal site lists	0.5 mile
State and tribal equivalent leaking storage tank lists	0.5 mile
State and tribal registered storage tank lists	Property and adjoining properties
State and tribal Institutional control/engineering control registries	Property only
State and tribal voluntary cleanup sites	0.5 mile
State and tribal Brownfield sites	0.5 mile

The EDR Report includes searches for State and Tribal lists for Indian Reservations, UST and LUST sites. According to the EDR Report, there were no Indian Reservations, Tribal USTs or Tribal LUST sites within the recommended search distances.

Since Tribal lands are not present within the search radii, it can be concluded that there will be no Tribal hazardous waste sites, landfills or solid waste disposal sites, institutional control/engineering control, voluntary cleanup sites and/or Brownfield sites within the recommended search distances.

5.1.1 Site

A total of six different regulated facilities were identified within a one-mile radius of the Site from the EDR report. Some of the regulated facilities are listed on multiple regulatory databases; and some of the facilities were combined in the Phase I ESA because they share the same location/business classification information. In addition, four EDR orphan facilities were not mapped in relation to the Site because of inadequate address information. None of the orphan facilities were identified within a 0.25 mile radius of the Site during the reconnaissance or in an office review.

CVS Pharmacy #4589, 869 Horizon South Parkway was incorrectly attributed to this search by EDR and is actually located approximately 1.5 miles south of the beginning of the project corridor. Therefore, it was not considered germane to this Phase I ESA.

A file review of the facilities on the LUST and the UST regulatory compliance databases was performed on August 22, 2013 at the USTMP Office. Information retained from the file review is included in Appendix D. A summary of the information regarding each identified facility is listed below:

- J&H Stores Pump & Shop #5, 500 Lewiston Road, operated over the years under several different ownerships and names (KAK, Inc., Vijay Kumar, Pantry #3268, Yogeshwar Enterprises, Depot Food Store #3268, Depot Food Store #131, and Gulf #26503) through the years as a full service gas station since the first UST's were installed in 1970. The chain of UST ownership is documented in Appendix D. A review of the USTMP regulatory compliance files confirmed that three of the original tanks were removed in 1987 and a fourth was removed in 1992. The USTMP LUST files revealed that a Phase II Assessment performed in 1992 detected petroleum contamination, which led to a confirmed release on July 23, 1992. A used oil and diesel tank were removed in 1993. A Corrective Action Plan – Part B prepared in 1998 indicated groundwater contamination above Georgia's In-stream Water Quality Standards and most importantly a nearby stream was impacted by MTBE, which is a component of petroleum but not yet regulated by the State of Georgia. The USTMP awarded the facility NFAR status in 2000. In 2005 the GDOT completed a UST Site Screening with the installation of several soil borings along the proposed right-of-

way. The Screening detected soil contamination, however, the USTMP elected to allow the NFAR status to stand. In 2008 three additional tanks were removed. The facility received a second NFAR for the tank closure. Photos of the tank removal, obtained from the USTMP files, are provided in Appendix D. The facility has since been removed and the field reconnaissance determined that the property is currently a retention pond for the Walmart development. Disposition of contaminated soils excavated for the retention pond is unknown. The reported groundwater depth varied from 14 to 18 feet below ground surface with a flow direction of west southwest toward the Site. Although groundwater flow direction is toward the Site, given the NFARs awarded to the Site through the years, this property is considered an HREC.

- The Pumping Station #8, 499 Lewiston Road, is currently operating as a convenience store and retail fueling facility with one 12,000-gallon diesel, one 12,000-gallon gasoline and two 8,000-gallon gasoline USTs. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, the property is considered a REC.

- Lewiston Food Mart, 107 Lewiston Road, is currently operating as a convenience store and retail fueling facility with one 15,000-gallon gasoline and one composite UST with 6,000 gallons of gasoline and 6,000 gallons of diesel. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, the property is considered a REC.

5.1.2 Adjoining Properties

Adjoining sites were not listed on the regulatory databases included in the EDR Report. However, two adjoining properties of potential environmental concern were identified during the course of the Phase I ESA.

- An unpermitted solid waste landfill, located just west of the Site and south of William Few Parkway, was operated by private landowners in the mid-1960's until Columbia County assumed operation in 1974. The landfill accepted all forms of waste, including residential, commercial and industrial. Although there are no records to confirm the limits of the landfill, reportedly the open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building. The landfill was closed on November 9, 1982 by the placement of a two-foot soil cover over the top of the

waste. Following the closure, Columbia County received a 'closure' letter, included in Appendix D, from the Georgia EPD.

The Columbia County Building Department required the installation of a methane monitoring system and two methane monitoring wells as a requirement for the construction of mini warehouses currently located on top of the closed landfill. The warehouses and methane system were built sometime after the plan approval in August 2007. Routine monitoring of the wells ceased approximately four years post installation. A portion of the monitoring report, provided by Columbia County, is included in Appendix D. A photo of one of the wells is included in Appendix B.

Ranger reviewed the solid waste files of Georgia's Solid Waste Management Program stored at the Georgia Archives. A Notice of Probable Contaminant Release assumed to be associated with this landfill was submitted to the Columbia County Public Works Department on April 10, 1990 by a local homeowner, Mr. H. Thomas Hicks, Jr. Mr. Hicks lived at 5197 Memory Lane, located on the east side of SR 388 approximately ¼-mile from the former landfill location. A map indicating the approximate location of his residence is included in Appendix D. After learning of the existence of the landfill in close proximity to his residence and drinking water well, Mr. Hicks collected water samples from his well for laboratory analysis of fecal coliform, the EPA listed Primary Drinking Water Standard constituents, total organic halides and purgeable halocarbons. The analyses indicated the presence of methylene chloride, chloroform and 1,1-dichloroethylene in Mr. Hicks' well water. Columbia County forwarded this information to the Georgia EPD. According to correspondence dated May 2, 1990, EPD's Solid Waste Management Program forwarded the information to EPA Region IV for further action. There was no evidence of further action beyond the May 1990 notification to EPA. A review of EPA's Solid Waste Landfill database did not reveal a listing for this landfill. Based on the past presence of contamination, the former landfill is considered a REC.

- During a regulatory UST database search, Murphy Express #8575 was identified as a UST site that is currently operating as a retail fueling facility. The files indicate the presence of one 12,000-gallon diesel, one 8,000-gallon gasoline and one 20,000-gallon gasoline UST. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, the property is considered a REC.

5.1.3 Surrounding Area

Sites in the surrounding area were not identified in the EDR Report within the specified search distances relative to the Site.

5.1.4 Orphan Sites

Four additional facilities were listed as "unmappable" or "orphan" sites in the EDR database report. These facilities were determined to be located beyond the applicable search distance from the Site based on the information provided and are not considered RECs to the Site.

5.2 ADDITIONAL ENVIRONMENTAL RECORD SOURCES

A review of the facilities listed on EPA's Enforcement & Compliance History Only (ECHO) database was performed. Two facilities that are located within the search distance from the Site were listed on the ECHO database. Copies of the database listing and individual data sheets are provided in Appendix D.

- Walmart Supercenter #5735, located at 5010 Steiner Way, which adjoins the beginning of the project, was not listed on the regulatory databases included in the EDR Report. The facility is listed on the ECHO database as a Resource Conservation and Recovery Act (RCRA) – Small Quantity Generator (SQG). No information relative to the details of the listing was provided on the database. The regulatory contact for Walmart informed Ranger that the listing is due to the storage of returned and damaged items that could be considered hazardous. These items are stored on pallets for reclamation and/or disposal by a hazardous waste contractor. Walmart is not considered a REC to the Site.

- The National Environmental Group, located at 2530 Grier Circle, was also listed on the ECHO database. Based upon a visual reconnaissance it was determined that this address was a private residence located approximately 0.4 miles from the northern end of the Site. The owner was contacted to confirm that only the administration of the business is operated out of the residence. Consequently, this property is not considered a REC.

5.3 PHYSICAL SETTING SOURCES

The Grovetown, Georgia USGS Topographic Quadrangle Map, the USGS Mineral Resources website, the United States Department of Agriculture (USDA) Natural Resources Conservation Service Soil Survey website, the Geologic Map of Georgia, and the EDR report were reviewed as sources for ascertaining information relative to the physical setting of the Site and surrounding area.

5.3.1 Site And Area Geology

The Site is located in the Piedmont Geologic Province, a broad plateau region underlain by crystalline rocks up to 600 million years old. The Piedmont trends to the northeast from Alabama to New Jersey. In Georgia, the Piedmont is bounded by the Blue Ridge Range of the Appalachian Mountains to the northwest, and to the southeast, it is bounded by the leading edge of Coastal Plain sediments, commonly referred to as the "Fall Line". Numerous episodes of crystal deformation have produced varying degrees of metamorphism, folding and shearing in the underlying rock. The resulting metamorphic rock types in this area of the Piedmont are predominantly a series of Precambrian age schists and gneisses, with scattered granitic or quartzite intrusions.

Residual soils in the Piedmont region are primarily the product of in-situ chemical decomposition of the parent rock. The extent of the weathering is influenced by the mineral composition of the rock and defects such as fissures, faults and fractures. Boundaries between zones of soil, partially weathered rock and bedrock are erratic and poorly defined. Weathering is often more advanced next to fractures and joints that transmit water, and in mineral bands that are more susceptible to decomposition. Boulders and rock lenses are sometimes encountered within the overlying PWR or soil matrix.

According to the Geologic Map of Georgia, 1976, the site is generally underlain by a formation of granitic gneiss undifferentiated. Based on a soil survey conducted by the USDA Soil Conservation Service, soil types common along the project corridor include Cecil sandy clay loam, Appling sandy loam and Wedowee loamy sand.

5.3.2 Groundwater

Groundwater in the Piedmont typically occurs as an unconfined or semi-confined aquifer condition. Recharge is provided by the infiltration of rainfall and surface water through the soil overburden. More permeable zones in the soil matrix, as well as fractures, joints and discontinuities in the underlying bedrock can affect groundwater conditions. The groundwater table in the Piedmont is expected to be a subdued replica of the original surface topography. Based on a review of the topographic maps and visual observations, the project Site generally appears to run along the east side of a ridge. We anticipate the groundwater to generally flow to the east with local groundwater flow varying along the project corridor.

No drinking water wells were identified within the applicable radii of the Site during the site reconnaissance nor were any identified by EDR; however, private drinking water wells may exist. The majority of the residences along the Site corridor are quite a distance from the roadway and evidence of drinking water wells wasn't obvious during the visual survey.

5.4 HISTORICAL USE INFORMATION

Ranger attempted to conduct a review of dated reasonably ascertainable environmental reports, historical maps and aerial photographs to gain an understanding of the development history of the Site. Available historical records reviewed by Ranger were used to review the potential environmental impact of activities on the integrity of the Site.

5.4.1 Topographical Maps

The 7.5-minute topographic map of the Grovetown, Georgia (1980) depicted the Site as being a roadway surrounded by wooded and cleared land with numerous structures and intersecting roadways throughout. Copies of historical topographic maps from the years 1892, 1921, 1922, 1946, 1948, 1950, 1957, 1964, 1971, 1977, and 1980 were obtained by Ranger from EDR. The maps reviewed did not show any nearby pipelines, landfills or surface mines. Copies of the topographical maps are included in Appendix E.

5.4.2 Historical Aerial Photographs

To evaluate the previous land uses of the Site and surrounding area, a series of aerial photographs were reviewed. The aerial photographs provide a progressive overview of properties pertaining to this Phase I ESA.

Copies of USGS historical aerial photographs taken in the years 1974 and 2000 were obtained by Ranger from Microsoft Research Maps. Additionally, photographs taken in 1994, 1999, 2002, 2006, 2007, 2009, 2010, 2011 and 2013 by Google Earth were also reviewed. These photographs were reviewed in an attempt to identify changes in land use and areas of potential environmental concern. Copies of the aerial photographs are included in Appendix E. Descriptions and interpretations from the aerial photograph reviews are described below.

1974 Aerial Photograph: The aerial photograph indicates that the Site is predominantly residentially developed or wooded and agricultural land with some commercial development. A roadway in a configuration similar to the existing SR 388/Lewiston Road alignment is present. Structures appear to be present on the properties formerly and currently occupied by J&H Stores Pump & Shop #5 at 500 Lewiston Road and The Pumping Station #8 at 499 Lewiston Road, respectively. A structure is also present on a portion of the current Lewis Memorial United Methodist Church (UMC) property in the northwest quadrant of the SR 388 and SR 232/Columbia Road intersection. Surrounding land appears to be primarily residentially developed or wooded and agricultural land with some commercial development. A cleared area is present on the portion of the property occupied at that time by a solid waste landfill in the northwest quadrant of the SR 388 and I-20 interchange.

1994, 1999 and 2000 Aerial Photographs: The aerial photographs do not indicate significant change has occurred to the Site or surrounding area. The Site still predominantly appears to be residentially developed or wooded and agricultural land with some commercial development. In the 1999 aerial photograph, the current Beacon Automotive property, located at 475 Lewiston Road, is developed with a structure similar in configuration to the structure currently present. Surrounding land appears to be primarily residentially developed or wooded and agricultural land with increasing commercial development. The solid waste landfill previously located in the northwest quadrant of the SR 388 and I-20 interchange no longer appears to be operational.

2002, 2006 and 2007 Aerial Photographs: The aerial photographs indicate increasing residential and commercial development along the project corridor with decreasing wooded and agricultural land. Increasing development (residential and commercial) is indicated on surrounding land.

2009, 2010 and 2011 Aerial Photograph: The aerial photographs indicate increasing commercial development along the project corridor and on surrounding land. In the 2009 aerial photograph, the SR 388 bridge and I-20 entrance and exit ramps appear to have been widened. A structure is no longer present on the former J&H Stores Pump & Shop #5 property in the 2009 aerial photograph. Instead, the retention pond associated with the Walmart shopping center, shown under construction, is visible. In the 2010 aerial photograph, the current Lewiston Food Mart property, located at 107 Lewiston Road, and the current Murphy Express #8575 property, located at 4009 Gateway Boulevard, are developed with structures similar in configuration to the structures currently present. The Village at Hereford Farm development and associated retention pond also appear in the 2010 aerial photograph.

Recent Aerial Photograph: A color aerial photograph of the Site is included in Figure 3 Site Plan (Appendix A). The photograph was obtained from Google Earth. The aerial photograph depicts the Site and surrounding land generally as it appears presently (as of this report date), with the exception of the area in the southwest quadrant of the SR 388 and I-20 interchange which is currently cleared and being graded. The aerial photograph shows this area as being wooded land.

5.4.3 Historical City Directories

Copies of historical city directories were obtained for the years between 1997 and 2012 in approximate five-year intervals. The City Directory is provided in Appendix D. The following facilities of concern were noted on the Site during our review of the City Directories.

2012

- 107 Lewiston Road; Lewiston Express; convenience stores
- 475 Lewiston Road; Transagri, Inc.; trucking
- 499 Lewiston Road; Pumping Station; convenience stores
- 500 Lewiston Road; AT&T Store; cellular telephones (formerly J&H Stores)

2007

- 475 Lewiston Road; City Electric Supply; electric equip/supl-whol
- 499 Lewiston Road; Pumping Station; truck stops & plazas
- 500 Lewiston Road; AT&T Wireless; cellular telephones (formerly J&H Stores)

2002

- 475 Lewiston Road; Dixie Meter & Svc Co; truck canopies caps & shells
- 499 Lewiston Road; Pumping Station; truck stops & plazas
- 500 Lewiston Road; Cingular Wireless; cellular telephones (formerly J&H Stores)
- 500 Lewiston Road; Depot Food Store, convenience stores (formerly J&H Stores)

5.4.4 Previous Environmental Reports – Site

Previous environmental reports for the Site were not provided to Ranger for review.

5.4.5 Previous Environmental Reports – Surrounding Sites

Previous environmental reports for surrounding sites were not provided to Ranger for review.

6.0 SITE RECONNAISSANCE

6.1 METHODOLOGY AND LIMITING CONDITIONS

Ms. Sandra Miller, P.E. and Ms. Peggy McGee conducted a site visit on September 9, 2013. The site visit consisted of an initial site reconnaissance, a walk-through of individual properties perceived to show evidence of environmental concerns and a thorough drive-through of the remaining project corridor. Additionally, an area reconnaissance was conducted as a driving tour to identify facilities within specified regulatory search distances listed within the previously referenced EDR report. This visual and physical reconnaissance of the Site focused primarily on its surface features.

The site reconnaissance was performed in an attempt to identify observed obvious indications of present or past activities that may have caused a significant environmental impact(s) to the Site. Select photographs of the Site taken by Ranger during the site reconnaissance are included in Appendix B.

6.2 GENERAL SITE SETTING

Current Use(s) of the Site

The proposed road widening Site is approximately two miles in length and is located in Grovetown, Columbia County, Georgia. The Site is developed with several commercial buildings including retail and convenience stores, restaurants, private businesses, located mainly at or near the SR 388 and I-20 interchange. Additionally, ongoing clearing and grading for a large commercial development is ongoing in the southwest quadrant of SR 388 and the I-20 interchange. A convenience store, retail store, a church and elementary school are also located at or near the intersection of SR 388 and Columbia Road. Several private residences, forested land and planted fields are evident along SR 388 between the aforementioned intersections. Surrounding sites in all directions are predominantly private residences and forested land.

Past Use(s) of the Site

Based upon a review of the LUST files, it appears that a former gas station referred to as J&H Pump & Shop #5 and KAK, Inc. in the EDR report, was located in the southeast quadrant of the I-20 on ramp with an address of 500 Lewiston Road. A review of the City Directory indicated that Cingular Wireless was located at this address in 2002 and an AT&T Store was located there from 2007 to 2012. However, a search of the Columbia County tax records indicated that the Lewiston Road address is no longer viable. Currently, a retention pond for the Walmart development is located on this property with an address of 5020 Steiner Way.

Current Use(s) of Adjoining Properties

Adjoining properties in all directions are predominantly private residences and undeveloped forested land, with the exception of the commercial properties located north of the SR 388 and I-20 interchange as well as those within the Walmart development and those planned for the clearing and grading currently ongoing in the southwest quadrant of SR 388 and I-20 interchange.

Past Use(s) of Adjoining Properties

A solid waste landfill, located just west of the Site and south of William Few Parkway, was operated by private landowners in the mid-1960's until Columbia County assumed operation in 1974. Although there are no records to confirm the limits of the landfill, reportedly the open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building.

Columbia County Building Department required the installation of a methane monitoring system and two methane monitoring wells be installed as a requirement for the construction of mini warehouses currently located on top of the closed landfill. The only remaining evidence of the closed landfill is the methane wells.

6.3 OBSERVATIONS

Site observations and conditions identified during Ranger's site reconnaissance are summarized as follows:

6.3.1 Structures, Roads and Other Improvements on the Site

Existing Structures

At the time of the reconnaissance, the Site was developed with several commercial buildings including retail and convenience stores, several restaurants and private businesses, located mainly at or near the SR 388 and I-20 interchange. Clearing and grading for a large development of unknown origin was ongoing in the southwest quadrant of the SR 388 and I-20 interchange. A convenience store, retail store, a church and elementary school are also located at or near the intersection of SR 388 and Columbia Road. Several private residences fronting SR 388 and on small side roads are evident along SR 388 between the aforementioned intersections.

Existing Roads

Several roads are located on the Site including the SR 388 and I-20 interchange, William Few Parkway proximal to the interchange, entrances to the Walmart development, the SR 232/Columbia Road and SR 388 intersection and multiple residential side roads.

Utilities (Including Sewage Disposal)

Based upon observations during the site reconnaissance and interviews with local government personnel, the utilities service providers along the Site are as follows: Columbia County operates a municipally-owned water and sewer utility serving all commercial entities at the SR 388 and I-20 interchange north to William Few Parkway. All residences along the project corridor utilize individual septic systems. Sewer services provided by Columbia County resume at the north end of the project at Lewiston Elementary School. The Village at Hereford Farm development is also connected to the system at the school. Columbia County provides water through the entire length of the project corridor. Electricity is provided by Georgia Power. Natural gas is provided by Georgia Natural Gas and Scana. Telephone, including fiber optics, is provided by AT&T.

Large pad-mounted power utility boxes were observed in the right-of-way in front of Murphy Express and Beacon Automotive. In addition a pad-mounted transformer was noted in front of Murphy Express. Also noted on the right-of-way in front of Beacon Automotive was a large enclosure for a heating system for backflow preventers, presumably for the Columbia County water system. A utility box was noted along the SR 388 right-of-way in front of the Lewis Memorial UMC.

Hazardous Substances and Petroleum Products in Connection with Identified Uses:

Three facilities are currently operating as a gas station and/or convenience store with petroleum sales – Murphy Express # 8578, The Pumping Station #8 and Lewiston Food Mart. All systems appear to be operating in compliance with Georgia's Rules for Underground Storage Tank Management. Current tank registrations were posted at all three facilities.

The tank basin for Murphy Express is located in the northwest corner of the property and holds one 12,000-gallon diesel, one 8,000-gallon gasoline and one 20,000-gallon gasoline UST.

The tank basin for The Pumping Station is located in the southeastern corner of the property and holds one 12,000-gallon diesel, one 12,000-gallon gasoline and two 8,000-gallon gasoline USTs.

The tank basin for Lewiston Food Mart is located in the northeastern corner of the property and holds one 15,000-gallon gasoline UST and one compartment UST of 6,000 gallons each for gasoline and diesel.

Storage Tanks: Two carbon dioxide above ground storage tanks (ASTs) were observed at the rear of The Pumping Station #8 building. Propane ASTs for onsite use and individual containers for retail sales were observed at locations as follows:

- The Pumping Station #8, 499 Lewiston Road
- Waffle House, 491 Lewiston Road
- Beacon Automotive, 475 Lewiston Road
- Lewiston Express, 107 Lewiston Road
- Lewis Memorial United Methodist Church, 5545 Hereford Farm Road
- Private Residences

Odors: None observed.

Pools of Liquid: None observed.

Drums: None observed.

Hazardous Substances and Petroleum Products Containers (Not in Connection with Identified Uses): None observed.

Unidentified Substance Containers: None observed.

PCBs (Electrical Transformers): Pole-mounted transformers were observed throughout the project corridor. In addition, a pad-mounted transformer was observed along the right-of-way in front of the Murphy Express. The transformers appeared to be in good condition and no stains or leaks were noted. Based on our past conversations, electrical utility companies generally accept responsibility for their equipment and any releases or spills associated with their intended use.

Pits, Ponds and Lagoons: A retention pond for the Walmart development was located in the southwest quadrant of the SR 388 and I-20 interchange eastbound on ramp, formerly a gas station known as J&H Stores Pump & Shop #5, KAK, Inc. and Vijay Kumar, which experienced a confirmed petroleum release on July 23, 1992. Disposition of contaminated soils excavated from the retention pond is unknown.

A retention pond for the Village at Hereford Farm shopping center was located along the east side of SR 388 just north of the Village at Hereford Farm shopping center driveway.

Stained Soil or Pavement: None observed.

Stressed Vegetation: None observed.

Solid Waste: Dumpsters were observed at all of the commercial properties along the project corridor.

Waste Water (including Storm Water): Storm water drop inlets were noted in the curbed area at the SR 388 and I-20 interchange, which drain into side and surface ditches.

Wells: Neither groundwater monitoring wells nor drinking water wells were observed on any of the properties; however, private drinking water wells may exist. The majority of the residences along the Site corridor are quite a distance from the roadway and evidence of drinking water wells was not obvious during the visual survey. Observation wells proximal to the UST system were observed at The Pumping Station #8. Columbia County water service is available the entire length of the project corridor.

Septic Systems: All private properties along the corridor are serviced by individual septic systems.

Surface Water: A small wet weather creek runs westerly behind Beacon Automotive and then turns northerly to flow beneath William Few Parkway. No other surface water features were observed along the project corridor.

6.3.2 Other Observations

Three man holes marked as 'grease traps' are present in the asphalt-paved parking lot behind The Pumping Station #8 building.

A restored Gulf Oil sign and dispenser are displayed at a small directional drilling business, located at 5485 Hereford Farm Road. According to the property/business owner, USTs have never been present on site.

A cemetery for the Lewis Memorial UMC is located in the northwest quadrant of the SR 388 and SR 232/Columbia Road intersection.

7.0 INTERVIEWS

As part of the Phase I ESA, interviews were conducted with select persons familiar with the Site to provide insight into past activities or conditions material to RECs in connection with the Site.

7.1 INTERVIEWS WITH OWNER

Edward Jones, previous owner of Dixie Meter and Service Company, formerly located at 475 Lewiston Road, informed Ranger that they owned and occupied the entire building from 1996 till 2006 fabricating and converting large trucks into propane service trucks for refilling residential tanks. The shop was a fully functional mechanic shop, including truck painting. According to Mr. Jones all waste materials were routinely reclaimed by a local recycler. Mr. Jones also informed Ranger of a closed landfill located just to the rear of the building. Mr. Jones recalled that the landfill operated during the late 60s and early 70s and accepted all forms of waste.

Jerry Havens of Gateway Realty is the owner of the building located at 475 Lewiston Road. He leases office and shop space to Wilco Electric, Beacon Automotive, Premium Cabinetry and Buzzy Bee, a pest control company. Mr. Havens stated that Wilco Electric utilizes warehouse space, Premium Cabinetry fabricates cabinets and Buzzy Bee leases office space and does not store chemicals on site. Beacon Automotive shares office space with Mr. Havens, and he confirmed that all waste materials are properly stored for recycling and proper disposal. Mr. Havens further stated that the mini warehouses located behind Beacon Automotive are situated on top of a closed landfill. Prior to construction of the warehouses, Columbia County required that a methane monitoring system be installed inside the structures and two methane monitor wells be installed on the periphery of the site. The warehouses and methane system were built sometime after the plan approval in August 2007. The wells were monitored for approximately four years, but readings were never above reportable levels. Mr. Havens provided a copy of the 'closure' letter, dated December 3, 1982 that Columbia County received from the Georgia EPD. The letter is provided in Appendix D.

Tammy Nelson, owner of National Environmental Group informed Ranger that their company is a transporter of recycled petroleum products that is operated out of their home located at 2530 Grier Circle just northeast of the project's northern limits. They operate one transport truck that is parked in a rental lot in Evans, Georgia. They currently provide reclamation services for the aforementioned Beacon Automotive.

Mr. Tom Tomlinson, owner of the property located at 5485 Hereford Farm Road, stated that the Gulf Oil sign and dispenser observed at his shop building is former equipment that he restored and erected for display purposes only. Mr. Tomlinson operates a directional drilling business at this address. His drilling equipment is stored beneath a metal pole shed. The shop building houses parts and tools for his small business.

7.2 INTERVIEWS WITH SITE MANAGER

Assistant Manager, Ida McChill of Murphy Express #8578 located at 4009 Gateway Boulevard stated that in her six months at this location she was not aware of any spills or releases associated with the property. Ms. McChill was not aware of any environmental cleanups at the property.

Site manager, Atul Patel, of Lewiston Food Mart located at 107 Lewiston Road stated that he was not aware of any spills or releases associated with the property. Mr. Patel was not aware of any environmental cleanups at the property.

7.3 INTERVIEWS WITH OCCUPANTS

Business owner, Mr. Jeff Hawn of Beacon Automotive located in the 475 Lewiston Road building, stated that he is not aware of any RECs in connection with the property. Beacon Automotive performs oil changes, brake repairs, tire changes and other small miscellaneous auto repair jobs. Used oil and transmission fluid is stored in a plastic holding tank and is reclaimed by a recycler, National Environmental Group, every week for proper disposal. All used batteries are regularly reclaimed and properly disposed of by Interstate Batteries. The hydraulic lift is above ground. They do not perform radiator work; therefore, no used antifreeze is stored on site. Halco Lubricants routinely reclaims and properly disposes of the solvents used in the parts washer.

7.4 INTERVIEWS WITH LOCAL GOVERNMENT OFFICIALS

Don Bartles, the Columbia County Solid Waste Department Manager, confirmed that a closed municipal solid waste landfill is located in the northwest quadrant of SR 388 and I-20. Columbia County assumed operations of the landfill from private ownership in 1974. All manner of waste was accepted at the landfill, including but not limited to household, commercial and industrial waste. Although there are no records to confirm the limits of the landfill, Mr. Bartles stated that open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building. Mr. Bartles believes that the landfill began as a borrow pit for the construction of I-20. The landfill was closed in 1982 by the placement of a two-foot soil cover over the top of the waste. Following the closure, Columbia Count received a ‘closure’ letter from the Georgia EPD.

Kevin Fort, with the Columbia County Engineering and Commercial Building and Planning Department informed Ranger that when Havens Mini Storage was constructed on top of the closed landfill, the County required a methane monitoring system and monitoring wells be installed. Mr. Fort provided Ranger with file information that he deemed relevant to our assessment, which included a graphic of the monitoring system and a portion of the report describing the operation of the system. According to Mr. Fort,

there are no records of methane sampling and reporting to the County. Methane monitoring system information is provided in Appendix D.

Pam Tucker, Division Director for Columbia County Emergency Operations informed Ranger that there were no records related to historical incidents that may have included hazardous substance spills or releases reported for the Site.

7.5 INTERVIEWS WITH OTHERS

Ranger requested an interview with a manager at The Pumping Station #8 located at 499 Lewiston Road, but was informed by an employee that company policy disallowed any divulgence of information relative to employees or store operation.

Justin Wilson, the regulatory contact for Walmart, stated that the facility located at the southeast end of the project and considered an adjoining property is listed as a RCRA SQG for the disposal of damaged and returned goods that are considered hazardous materials. Local hazardous waste disposal contractors routinely transport and properly dispose of all material considered hazardous at a hazardous waste facility.

8.0 FINDINGS AND OPINIONS

Ranger has performed a Phase I ESA in general conformance with the scope and limitations of ASTM Practice E 1527-05 for the SR 388 widening project from I-20 to SR 232/Columbia Road in Grovetown, Columbia County, Georgia.

Findings, opinions, and conclusions reported herein are based on information obtained during the course of our studies and upon our experience. Information provided in this report is relevant to the dates of our site work and should not be relied on to represent conditions at substantially later dates or locations not investigated.

8.1 HISTORICAL RECOGNIZED ENVIRONMENTAL CONDITIONS

8.1.1 On-Site

One on-site HREC was identified during the site reconnaissance, interviews, file reviews and/or review of regulatory databases performed by Ranger personnel:

- J&H Stores Pump & Shop #5 reported a petroleum release from the UST system on July 23, 1992. A Corrective Action Plan – Part B prepared in 1998 indicated groundwater contamination above Georgia's In-stream Water Quality Standards and most importantly a nearby stream was impacted by methyl tertiary butyl ether (MTBE), which is a component of petroleum but not yet regulated by the State of Georgia. The USTMP awarded the facility No Further Action Required (NFAR) status in 2000. In 2005 the GDOT completed a UST Site Screening with the installation of several soil borings along the proposed right-of-way. The Screening detected soil contamination, however, the USTMP elected to allow the NFAR status to stand. In 2008 three additional tanks were removed. The facility received a second NFAR for the tank closure. The facility has since been removed and the field reconnaissance determined that the property is currently a retention pond. Disposition of contaminated soils excavated for the retention pond is unknown. The reported groundwater depth varied from 14 to 18 feet below ground surface with a flow direction of west southwest toward the Site. Although groundwater flow direction is toward the Site, given the NFARs awarded to the Site through the years, this property is considered an HREC.

8.1.2 Off-Site

No off-site HRECs were identified during the site reconnaissance, review of regulatory databases, interviews and/or file reviews performed by Ranger personnel.

8.2 RECOGNIZED ENVIRONMENTAL CONDITIONS

8.2.1 On-Site

Three on-site RECs were identified during the site reconnaissance, review of regulatory databases, interviews and/or file reviews performed by Ranger personnel.

- The Pumping Station #8 has been operating as a convenience store with petroleum sales since September 1991. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although the compliance records are in order, it's possible that the UST system has experienced an as yet undetected release of petroleum product to the subsurface and given the proximity of the UST system to the proposed corridor this facility would be considered a REC.

- Lewiston Food Mart has been operating as a convenience store with petroleum sales since May 2008. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although the compliance records are in order, it's possible that the UST system has experienced an as yet undetected release of petroleum product to the subsurface and given the proximity of the UST system to the proposed corridor this facility would be considered a REC.

- Beacon Automotive performs oil changes, brake repairs, tire changes and other small miscellaneous auto repair jobs. Used oil and transmission fluid is stored in a plastic holding tank and is reclaimed by a recycler. All used batteries are regularly reclaimed and properly disposed. The hydraulic lift is above ground. They do not perform radiator work; therefore, no used antifreeze is stored on site. Prior to Beacon Automotive, Dixie Meter and Service Company owned and occupied the entire building from 1996 till 2006 fabricating and converting large trucks into propane service trucks for refilling residential tanks. The shop was a fully functional mechanic shop, including truck painting. According to Mr. Jones all waste materials were routinely reclaimed by a local recycler. Although there was no visual evidence of underground storage or surface staining noted during the reconnaissance; due to the lengthy history dating back to 1996 when Dixie Meter performed automotive repair and painting services at this location, this property is considered a REC.

8.2.2 Off-Site

Two off-site RECs were identified during the site reconnaissance, review of regulatory databases, interviews and/or file reviews performed by Ranger personnel.

- Murphy Express #8575 is currently operating as a retail fueling facility with one 12,000-gallon diesel, one 8,000-gallon gasoline and one 20,000-gallon gasoline underground storage tank. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, this property is considered a REC.

- An unpermitted solid waste landfill, located just west of the Site and south of William Few Parkway, was operated by private landowners in the mid-1960's until Columbia County assumed operation in 1974. The landfill accepted all forms of waste, including residential, commercial and industrial. Although there are no records to confirm the limits of the landfill, reportedly the open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building. The landfill was closed on November 9, 1982 by the placement of a two-foot soil cover over the top of the waste. Following the closure, Columbia County received a 'closure' letter from Georgia's Environmental Protection Division (EPD).

  In April 1990, a concerned property owner reported to EPD that laboratory results indicated that contaminants from the landfill had impacted his drinking water well. The residence and drinking water well are located east of the project corridor, implying that groundwater contaminants could have potentially migrated beneath the roadway and across the project corridor. Consequently, this property is considered a REC.

8.3 DE MINIMIS CONDITIONS

None observed.

9.0 CONCLUSIONS

We have performed a *Phase I Environmental Site Assessment* in conformance with the scope and limitations of ASTM Practice E 1527 for the SR 388 widening project from I-20 to SR 232/Columbia Road in Grovetown, Columbia County, Georgia. Any exceptions to, or deletions from, this practice are described in Section 10.0 of this report.

This assessment has revealed the following evidence of RECs in connection with the Site. Five RECs were identified during the site reconnaissance, review of regulatory databases, interviews and/or file reviews performed by Ranger personnel.

- The Pumping Station #8 is currently operating as a convenience store and retail fueling facility with one 12,000-gallon diesel, one 12,000-gallon gasoline and two 8,000-gallon gasoline USTs. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although the compliance records are in order and there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum products to the subsurface. Given the proximity of the UST system to the proposed corridor this facility is considered a REC.

- Lewiston Food Mart has been operating as a convenience store with petroleum sales since 2008. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although the compliance records are in order and there is no record of a confirmed release at the facility, it's possible that the UST system has experienced an as yet undetected release of petroleum products to the subsurface and given the proximity of the UST system to the proposed corridor this facility is considered a REC.

- Beacon Automotive performs oil changes, brake repairs, tire changes and other small miscellaneous auto repair jobs. Used oil and transmission fluid is stored in a plastic holding tank and is reclaimed by a recycler. All used batteries are regularly reclaimed and properly disposed. The hydraulic lift is above ground. Prior to Beacon Automotive, Dixie Meter and Service Company owned and occupied the entire building from 1996 till 2006 fabricating and converting large trucks into propane service trucks for refilling residential tanks. The shop was a fully functional mechanic shop, including painting trucks. According to Mr. Jones all waste materials were routinely reclaimed by a local recycler. Although there was no visual evidence of underground storage or surface staining noted during the reconnaissance, due to the lengthy history of automotive repair and painting services dating back to 1996, this property is considered a REC.

- Murphy Express #8575 is currently operating as a retail fueling facility with one 12,000-gallon diesel, one 8,000-gallon gasoline and one 20,000-gallon gasoline underground storage tank. Based upon EPD file reviews it appears that the facility is operating in compliance with Georgia's Rules for Underground Storage Tank Management. Although the compliance records are in order and there is no record of a confirmed release at the facility, it does not negate the possibility that the UST system could have developed an as yet undetected release of petroleum to the subsurface. Consequently, this property is considered a REC.

- An unpermitted solid waste landfill, located just west of the Site and south of William Few Parkway, was operated by private landowners in the mid-1960's until Columbia County assumed operation in 1974. The landfill accepted all forms of waste, including residential, commercial and industrial. Although there are no records to confirm the limits of the landfill, reportedly the open dumping area began approximately 250 feet west of SR 388 and extended south towards I-20 and north to the creek behind the existing Beacon Automotive building. The landfill was closed on November 9, 1982 by the placement of a two-foot soil cover over the top of the waste. Following the closure, Columbia County received a 'closure' letter from Georgia's EPD.

  In April 1990, a concerned property owner reported to EPD that laboratory results indicated that contaminants from the landfill had impacted his drinking water well. The residence and drinking water well are located east of the project corridor, implying that groundwater contaminants could have potentially migrated beneath the roadway and across the project corridor. Consequently, this property is considered a REC.

10.0 DEVIATIONS

Deletions or substantial deviations from the ASTM E-1527-05 standard practice are:

The use of the Site was not identified back to the Site's first developed use, chain-of-title was not provided by the Client to Ranger for review, Sanborn maps were not available, the aerial photographs were not consistently available at five year intervals, the City Directories were only available from 1997 to 2012, the multiple owners of the former 500 Lewiston Road gas station (J&H Stores Pump & Shop #5, KAK, Inc., Vijay Kumar, Pantry #3268, Yogeshwar Enterprises, Depot Food Store #3268, Depot Food Store #131, and Gulf #26503) were not interviewed. Therefore, the Site and surrounding area could not be fully investigated in this regard for the historical records research and interviews. However, the data gaps are not considered significant because the apparent past history and current use of the Site were able to be determined by using the available historical records, EDR and US EPA ECHO regulatory database reports, Georgia EPD UST, LUST, Solid Waste, Hazardous Waste and Emergency Response Team files, site reconnaissance, and current owner/manager interviews. Therefore, it is our professional opinion that this data gap is not significant and does not impact the ability to identify RECs, or impact the findings or conclusions of this report.

11.0 ADDITIONAL SERVICES

None provided.

12.0 REFERENCES

Environmental Data Resources, Inc.

- EDR DataMap Corridor Study, Inquiry Number: 3688062.1s, August 08, 2013
- EDR DataMap Well Search Report, Inquiry Number: 3688062.1w, August 08, 2013
- EDR Historical Topographic Map Report, Inquiry Number: 3688062.2, August 06, 2013

Environmental Protection Agency, Facility Registry Services

- Facility Detail Report (http://epa-echo.gov/)

Georgia Environmental Protection Division, Underground Storage Tank Management Program

- Underground Storage Tank Compliance Files
- Leaking Underground Storage Tank Files
- Solid Waste Management Archive Files
- Hazardous Waste Management Files
- Emergency Response Team Files

Columbia County Tax Assessor

- http://gis.columbiacountyga.gov/

Microsoft Research Maps (maps courtesy of USGS)

- http://msrmaps.com/

U.S. Geological Survey

- Mineral Resources On-Line Spatial Data (http://mrdata.usgs.gov/)

Geologic Map of Georgia: Georgia Geological Survey, 1976

Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA)

- Georgia Online Soil Survey Manuscripts:
  Soil Survey of Columbia, McDuffie and Warren Counties, USDA Soil Conservation Service and the University of Georgia College of Agriculture, Agricultural Experiment Stations, April 1981 (http://soils.usda.gov/survey/online_surveys/georgia/index.html)

13.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

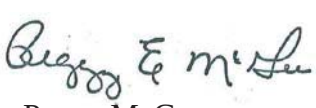
Signatures of the Environmental Professionals are included on the cover letter of this Phase I Environmental Site Assessment.

14.0 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

The qualifications of Ranger's Environmental Professional are summarized in Appendix G.

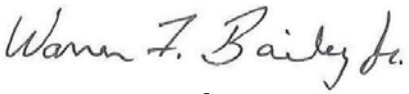
I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in 321.10 of 40 CFR 312.

I have the specific qualifications based on education, training, and experience to assess a property of the nature, history and setting of the Site. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.



Peggy McGee
Senior Engineer

Sandra A. Miller, P.E.
Project Engineer
Georgia P.E. No. 36138



Warren F. Bailey, Jr., P.E.
Principal Engineer
Georgia P.E. No. 11462

Appendices Provided Upon Request

Attachment #11

MEETING MINUTES
SR 388 Concept Team Meeting
Project No: CSSTP-0008-00(350)
PI No: 0008350
County: Columbia

Meeting Date: November 14, 2013 (10:00 AM – 12:00 PM)

Location: Columbia County – Evans, GA

Attendees:	**Organization & Title:**
Matt Schlachter	*Columbia County, Construction and Maintenance Director*
Steve Exley	*Columbia County, Engineering Manager*
Don Barrow	*Columbia County, Road Construction Manager*
Glen Bollinger	*Columbia County, Traffic Engineer*
Steve Tiedemann	*GDOT/Office of TIA, Project Manager*
George Brewer	*GDOT/Office of Program Delivery, Project Manager*
Neal O'Brien	*GDOT/District 2, Preconstruction Engineer*
Brock Tyson	*GDO/ District 2, Traffic Engineer*
Nick Castronova	*URS Corporation, Project Manager*
Travis McClam	*URS Corporation, Roadway Designer*
Joe Tiernan	*URS Corporation, Roadway Designer*

SUBJECT:

A concept meeting was held on November 14, 2013 with members of GDOT, Columbia County, and URS in attendance. The purpose of the meeting was to discuss the conceptual design and concept report for SR 388 from I-20 to SR 232. The meeting began at 10:00 AM with introductions of participants and passing around the sign in sheet. A conceptual roll plot of the design was displayed on the meeting table during the meeting for reference. The following summarizes the meeting:

- George introduced everyone to the project and gave an overview of this project as well as the adjacent southern project of SR388 from I-20 south to Wrightsboro Road. He announced that the concept team meeting for the SR 388 south project will take place on December 4, 2013.
- Nick stepped through the project from the south to the north while referencing the layout. He started with the tie-in at the WalMart shopping center and the development that is currently under construction to the west of SR388. He then talked about the proposed DDI and explained how the DDI works with the cross over traffic and elimination of left turn conflicts. Due to the implementation of the DDI, URS had to extend the limits of the project to the south. He also briefly discussed how it worked within the provided TIA budget.
- Matt began talking about adaptive traffic control Columbia County was looking into and how they will need to figure out how it will work with the DDI interchange signals.
- Matt discussed the possibility of high mast lighting at this interchange and how they have submitted a request for it to be installed. George Brewer brought up the possibility of including the high mast lighting into this project budget. This will require the County to sign an agreement to energize and maintain the equipment. If there is not a separate project to install the lighting before this project is let, the lighting can be included in the TIA project and is currently included in the concept report.
- Steve asked if there will need to be an IMR and if so how will it affect the project and schedule since the ramps are being affected by the project. Nick responded by discussing how the ramp lengths and locations will not be changing. URS has also included eight (8) policy points in the concept report. Nick mentioned that in the past this has been enough to not conduct an IMR and was the case for a previous DDI that URS designed. George requested that coordination be held with FHWA just to make sure they were OK with this approach.

MEETING MINUTES
SR 388 Concept Team Meeting
Project No: CSSTP-0008-00(350)
PI No: 0008350
County: Columbia

- Nick then began discussing access rights to properties leading up to the DDI from the north and also the south. Some alternatives were discussed from buying the properties to providing access behind the properties from William Few Parkway north of the DDI. The minimum of 300 feet was the decided length for access control for now. A new R/W estimate will be needed to assess damages to parcels.
- Glen brought up the possibility of a free flow right turn from William Few Parkway onto SR 388 south. This was discussed but the weaving movement caused by the traffic wanting to go I-20 east would create a problem. Traffic approaching the DDI will need to be in the desired lane before the approach to the intersection. Try to limit lane changes.
- As the discussion went to the last intersection, Nick discussed the historic property at the intersection of Columbia Rd and SR 388 and how the widening will stay off the property as much as possible.
- Nick continued by discussing how URS extended the project to the north to include new sidewalks to Lewiston Elementary School since there as a safe route to school project currently.
- Matt asked about the swale and the ponds. Nick responded with discussing the new MS4 policy and how URS conceptually oversized the ponds and how they will reduce in size further into design as more information is known.
- Once we had gone through the entire project layout, Nick began going through the Concept Report. George said there is a new project to the north of Columbia Road that everyone needed to be aware of and it needed to added to the Concept Report. George will send the PI number to URS.
- Nick discussed the need for a pavement evaluation for this project. Nick stated that there will not be full depth construction, just overlay on existing pavement. Tia budget would not allow for full depth pavement the whole way. Steve stated that there is rutting happening at the intersection of SR 388 and Columbia Road.
- Matt would like the speed limit to be dropped from its current speed of 55 mph to 45 mph. Everyone was in agreement that would be best. Also there would need to be a further reduction in speed at the DDI.
- Steve brought up the opportunity for trees and green space. Plant trees in the median and/or near back of walk. Steve suggested Fury's Ferry Road as a model. This will be incorporated to the extent possible. Since these are TIA funds, those amenities may need to be added after the widening is constructed.
- Nick then said there were no design exceptions or variances or VE study. Steve said a VE study was not needed.
- Matt suggested the possibility of 11 foot lanes instead of 12 foot lanes. Nick said it was a possibility but the turn lanes all would need to stay at 12 feet.
- Nick then asked if Columbia County would be updating any of their utilities. Matt claimed most of the utility work was new and all that would need to be paid for was the relocation cost.
- Nick then began talking about Right of Way and there are 81 parcels that will be affected by this project.
- Nick then stated that URS expects the project to be cleared with a GEPA document.
- Nick presented the construction cost estimate. George claimed it was in the right ballpark for this project. The 11 foot lanes would help reduce cost if that is what the final decision was.
- Nick then opened the meeting up to any questions:
    1. Columbia County asked when they would be reimbursed for project costs by TIA?
        Steve will look into the timeline of design and payment for project development since some cost will need to be incurred before the start of the band that the projects are currently in.
    2. Steve asked about a clarification on the DDI and the eighth point?
        This will have to be determined at a later date

The meeting was then concluded.

Attachment #12

Project Sheet

Project Number: RC07-000025 ***Project Name:*** SR 388/Horizon South Parkway Widening from I-20 to SR 232/Columbia Road

GDOT ID: 0008350

Project Description: Widening SR 388/Horizon South Parkway from 2 to 4 lanes from I-20 to SR 232/Columbia Road.

Regional Commission: Central Savannah River Area

County: Columbia County

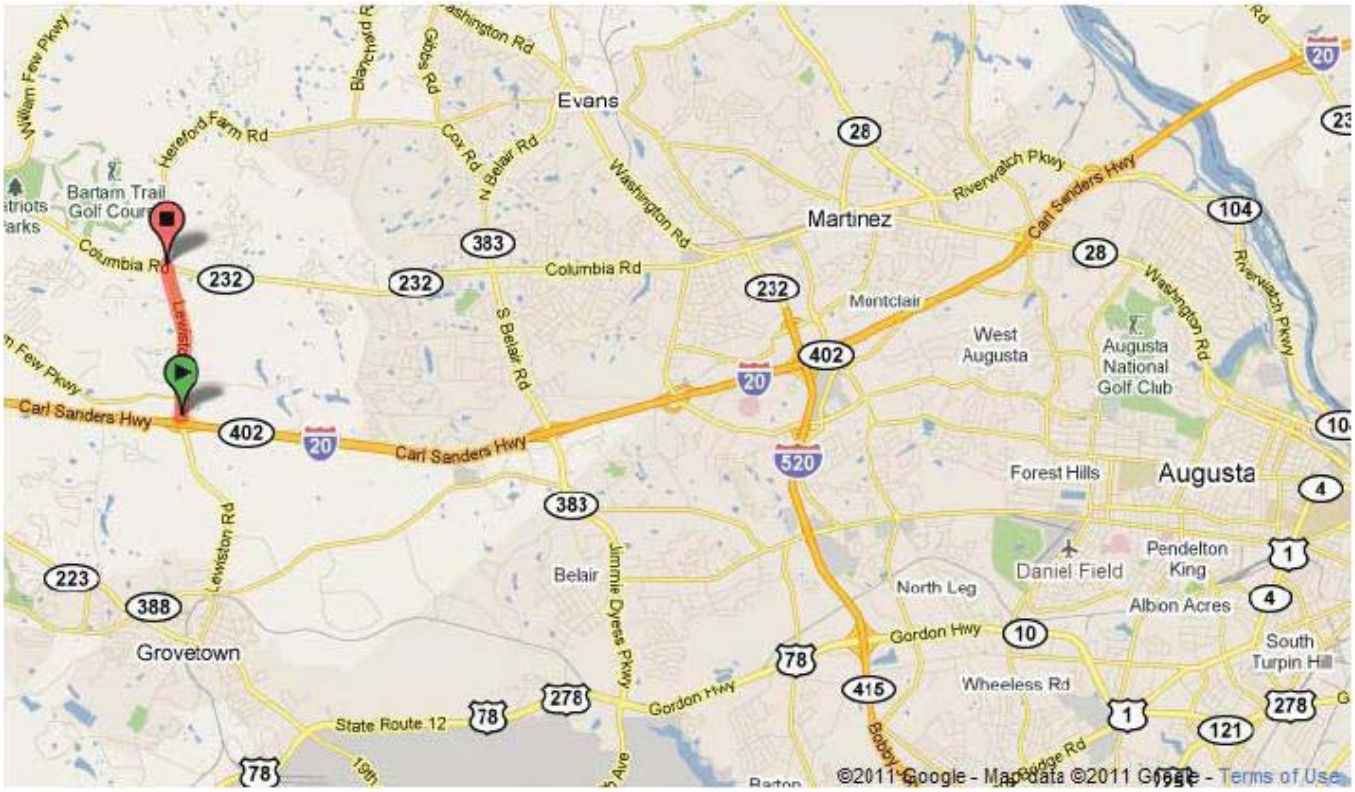
Phase	Total Project Cost	Total TIA Amount
PE	$448,408	$448,408
ROW	$3,794,300	$3,794,300
CST	$18,610,102	$18,610,102
UTL	$2,653,098	$2,653,098
Total	**$25,505,908**	**$25,505,908**

Comments (Please note all cost estimates are in 2011 dollars and actual costs for all phases at year of expenditure will be higher):

The purpose of the project is to widen SR 388/Horizon South Parkway to relieve congestion and improve LOS. The road widening project would improve the LOS for this major commuter route. Additionally, the project would provide a better access to an area that is currently experiencing major growth.

Public Benefit	Notes
Maximizing the value of Georgia's Assets	This project could potentially maximize the full utility of an existing transportation facility(s). In some cases, bypasses will be necessary. Example benefits could be: mitigating congestion (e.g. operational improvements) and optimizing capital asset management (e.g. resurfacing, rehabilitation). The impacts would apply to this roadway segment, corridor, and/or intersection.
Supporting Economic Growth/Competitiveness	This project could assist in having a positive impact on the economic vitality for this region, and in some cases possibly for the entire state. Its impact could also be observed along the roadway segment, corridor, and/or intersection. Example benefits could be: improved access to jobs; improved travel times for drivers; increased lane capacity; improved efficiency and reliability for freight cargo/goods movement; providing border to border and inter-regional connectivity; and improve local connectivity to statewide transportation network.
Ensuring Safety and Security	This project would benefit the public by potentially reducing the incidence of crashes along this roadway segment, corridor, and/or intersection.
Additional Benefits	This project would benefit the public by widening the road to improve the level of service for this major commuter route that currently has traffic volumes that range from 13,010 to 11,420 vehicles per day utilizing the road. Provides a better access to an area that is currently experiencing major growth.

Project Location



Attachment #13

Processed Date:10/10/2013

Parameters: Bridge Serial Num

Bridge Inventory Data Listing

Structure ID:073-5023-0 **Columbia** **SUFF. RATING:** 94.86

Location & Geography

Structure ID:	073-5023-0
200 Brdge Information:	02
*6A Feature Int:	I-20
*6B Critical Bridge:	0
*7A Route No Carried:	SR00388
*7B Facility Carried:	LEWISTON ROAD
9 Location:	2.1 MI NORTH OF GROVETOWN
2 Dot District:	2
207 Year Photo:	2013
*91 Inspection Frequency:	24 Date: 06/04/2013
92A Fract Crit Insp Freq:	0 Date: 02/01/1901
92B Underwater Insp Freq:	0 Date: 02/01/1901
92C Other Spc. Insp Freq:	0 Date: 02/01/1901
* 4 Place Code:	00000
*5 Inventory Route(O/U):	1
Type:	3
Designation:	1
Number:	00388
Direction:	0
*16 Latitude:	33 29.0100 HMMS Prefix:00
*17 Longtitude:	82 -11.9410 HMMS Suffix:000 MP:0.00
98 Border Bridge:	000%Shared:00
99 ID Number:	000000000000000
*100 STRAHNET:	0
12 Base Highway Network:	1
13A LRS Inventory Route:	731038800
13B Sub Inventory Route:	0
101 parellel Structure:	N
*102 Direction of Traffic:	2
*264 Road Inventory Mile Post:	002.80
*208 Inspection Area:	2 Initials: EFP
Engineer's Initials:	JTB
* Location ID No:	073-00388D-002.80N

*104 Highway System:	0
*26 Functional Classification:	07
*204 Federal Route Type:	M No: 07061
105 Federal Lands Highway:	0
*110 Truck Route:	0
2006 School Bus Route:	1
217 Benchmark Elevation:	0000.00
218 Datum:	0
*19 Bypass Length:	00
*20 Toll:	3
*21 Maintanance:	01
*22 Owner:	01
*31 Design Load:	6
37 Historical Significance:	5
205 Congressional District:	12
27 Year Constructed:	2009
106 Year Reconsrtucted:	0000
33 Bridge Medium:	0
34 Skew:	19
35 Structure Flared:	0
38 Navigation Control:	0
213 Special Steel Design:	0
267 Type of Paint:	0
*42 Type of Service On:	5
Type of Service Under:	1
214 Movable Bridge:	0
203 Type Bridge:	O
259 Pile Encasement	3
*43 Structure Type Main:	5 02
45 No.Spans Main:	002
44 Structure Type Appr:	0 00
46 No Spans Appr:	0000
226 Bridge Curve Horz	0 Vert: 1
111 pier Protection	0
107 Deck Structure Type:	1
108 Wearing Structure Type:	1
Membrane Type:	8
Deck Protection:	0

Signs & Attachments

225 Expansion Joint Type:	02
242 Deck Drains:	0
243 Parapet Location:	3
Height:	3
Width:	1
238 Curb Height:	1
Curb Material:	1
239 Handrail	1 1
*240 Medium Barrier Rail:	0
241 Bridge Median Height:	0
* Bridge Median Width:	0
230 Guardrail Loc. Dir. Rear:	3
Fwrd:	3
Oppo. Dir. Rear:	0
Oppo. Fwrd:	0
244 Aproach Slab	3
224 Retaining Wall:	7
233Posted Speed Limit:	55
236 Warning Sign:	0.00
234 Delineator:	1.00
235 Hazzard Boards:	0
237 Utilities Gas:	00
Water:	00
Electric:	21
Telephone:	22
Sewer:	00
247 Lighting Street:	0
Navigation:	0
Aerial:	0
*248 County Continuity No.:	00

Bridge Inventory Data Listing

Structure ID:073-5023-0

Programming Data

201 Project No: NHS-0000-00(766)
202 Plans Available: 2
249 Prop Proj No: 000000000000000000000000
250 Approval Status: 0000
251 PI Number: 0000000
252 Contract Date: 02/01/1901
260 Seismic No: 00000
75 Type Work: 00 0
94 Bridge Imp: Cost: $1,584
95 Roadway Imp. Cost: 158
96 Total Imp Cost: 2376
76 Imp Length: 000000
97 Imp Year: 2013
114Furure ADT: 021750 Year:2032

Hydralic Data

215Waterway Data:
High Water Elev: 0000.0 Year:0000
Flood Elev: 0000.0 Freq:000
Avg Streambed Elev: 0000.0
Drainage Area: 00000
Area of Opening: 000000
113 Scour Critical N
216Water Depth: 00.0 Br.Height:00.0
222Slope Protection: 0
221Slope Protection 0 Fwd:0
219Fender System 0
220Dolphin: 0
223Current Cover: 000
Type: 0
No. Barrels: 00
* Width: 0.00 Height:0.00
* Length: 0 Apron:0
265 U/W Insp. Area 0 Diver:ZZZ
Location ID No: 073-00388D-002.80N

Measurements:

*29ADT 014500 Year:2012
109%Trucks: 0
* 28 Lanes On: 05 Under:04
210 No. Tracks On: 00 Under:00
* 48 Max. Span Length 0112
* 49 Structure Length: 223
51 Br. Rwdy. Width 86.60
52 Deck Width: 95.00
* 47 Tot. Horiz. Cl: 87

50 Curb / Sidewalk Width 0.00 / 6.00
32 Approach Rdwy. Width 030
*229 Shoulder Width:
Rear Lt: 3.50 Type:2 Rt:3.50
Fwd. Lt: 3.50 Type:2 Rt:3.50

Permanent Width:
Rear: 22.50 Type:2
22.50 Type:2
Intersaction Rear: 1 Fwd: 1
36Safety Features Br. Rail: 1
Transition: 1
App. G. Rail: 1
App. Rail End: 1
53 Minimum Cl. Over: 99' 99 "
Under:
*228 Minimum Vertical Cl
Act. Odm Dir:: 99' 99"
Oppo. Dir: 99' 99"
Posted Odm. Dir: 00' 00"
Oppo. Dir: 00' 00"
55 Lateral Undercl. Rt: H 41 41
56 Lateral Undercl. Lt: 28.50
*10 Max Min Vert Cl: 99' 99" Dir:0
39 Nav Vert Cl: 000 Horiz:0000
116 Nav Vert Cl Closed: 000
245 Deck Thickness Main 7.30
Deck Thick Approach: 0.00
246 Overlay Thickness: 0.00

212 Year Last Painted: Sup:0000Sub:0000

65 Inventory Rating Mathod: 1
63 Operating Rating Method: 1
66 Inventory Type: 2 Rating: 29
64 Operating Type: 2 Rating: 29
231Calculated Loads:
H-Modified: 21 0
HS-Modified: 30 0
Type 3: 33 0
Type 3s2: 40 0
Timber: 37 0
Piggyback: 40 0
261 H Inventory Rating: 26
262 H Operating Rating 65
67 Structural Evaluation: 6
58 Deck Condition: 7
59 Superstructure Condition: 8
* 227 Collision Damage: 0
60A Substructure Condition: 8
60B Scour Condition: N
60C Underwater Condition N
71 Waterway Adequacy: N
61 Channel Protection Cond.: N
68 Deck Geometry: 9
69 UnderClr. Horz/Vert: 9
72 Appr. Alignment: 8
62 Culvert: N

Posting Data

70 Bridge Posting Required 5
41 Struct Open, Posted, CL: A
* 103 Temporary Structure: 0
232 Posted Loads
H-Modified: 00
HS-Modified: 00
Type 3: 00
Type 3s2: 00
Timber: 00
Piggyback 00
253 Notification Date: 02/01/1901
258 Fed Notify Date: 2/1/1901 12:00:00AM