charlotte regional transportation planning organization

600 East Fourth Street
Charlotte, NC 28202
704-336-2205
www.crtpo.org

TO: TCC Members
FROM: Robert W. Cook, AICP
CRTPO Secretary
DATE: January 31, 2014

SUBJECT: Technical Coordinating Committee (TCC) Agenda
February 2014 TCC Meeting—February 6, 2014

The next TCC meeting is scheduled for **Thursday, February 6** at **10:00 AM** in **Room 267** of the Charlotte-Mecklenburg Government Center (600 East Fourth Street). Attached is a copy of the agenda.

Please call me at (704) 336-8309 if you have any questions.

charlotte regional transportation planning organization

TECHNICAL COORDINATING COMMITTEE
AGENDA
February 6, 2014
10:00 AM
Room 267 – CMGC

---

1. **Adoption of the Agenda** Danny Pleasant

2. **Consideration of February Meeting Minutes** Danny Pleasant
ACTION REQUESTED: Approve as presented, or with amendments.

3. **Transportation Improvement Program Financial Plan** (10 minutes) Sashi Amatya
ACTION REQUESTED: Recommend to the MPO that it adopt the TIP financial plan and find that the 2012-2015 TIP is financially constrained.

BACKGROUND: See attached memorandum.

ATTACHMENT: Memorandum; draft TIP Financial Plan. (To be provided under separate cover on February 3.)

4. **CATS 2012 JARC and New Freedom Project Solicitation** (5 minutes) LaPronda Spann
ACTION REQUESTED: Recommend to the MPO that it endorse the projects recommended for funding.

BACKGROUND: The TCC received a detailed report in January on the 2012 Job Access and Reverse Commute (JARC)/New Freedom project solicitation and resulting funding recommendations. The request before the TCC is to recommend to the MPO that it endorse the projects recommended for funding during the January presentation, as shown on the attached funding recommendation list.

ATTACHMENT: Funding recommendation list.

5. **TCC Bylaws** (15 minutes) Robert Cook
ACTION REQUESTED: FYI

BACKGROUND: The TCC's bylaws are being updated due to the planning area expansion as well as to reflect changing circumstances since they were last reviewed in 2003.

ATTACHMENT: Draft bylaws. (To be provided under separate cover on February 3.)

6. **2040 Metropolitan Transportation Plan** (15 minutes) Robert Cook
ACTION REQUESTED: FYI

BACKGROUND: An update on activities related to the MTP's preparation will be provided.

At its January 15, 2014 meeting, the MPO approved the start of a public comment period once the draft MTP and draft conformity determination report are available. The comment period is tentatively scheduled to begin on February 14. A joint MPO/TCC workshop has been scheduled for February 12 at 10:00 AM to review the draft documents.

7. **Prioritization 3.0 (P3.0)** (15 minutes)
a. Update Neil Burke
ACTION REQUESTED: FYI

BACKGROUND: NCDOT has modified the P3.0 new project submittal timeframe to now begin on January 27, 2014 and end on February 24, 2014. This is a delay of one week, but this change is expected to have a minimal effect to the overall P3.0 timeline.

b. P3.0 Local Input Point Methodology Neil Burke
ACTION REQUESTED: Recommend that CRTPO staff address any public comments during the two-week comment period and recommend the revisions to the draft local input point methodology to the MPO for adoption and subsequent submittal to NCDOT.

BACKGROUND: The TCC and MPO recommended that the draft local point allocation methodology be sent to NCDOT for review. Comments were received from NCDOT on January 21, and NCDOT has granted conditional approval of the draft methodology once a few clarifying comments have been addressed. NCDOT recommended that the local point methodology is posted on CRTPO website in addition to the CRTPO meetings serving as an opportunity for public comment. A two-week public comment period started on Tuesday, January 28th referencing the opportunity for public comment on the methodology document posted on the CRTPO website. Based on comments received from the MPO and NCDOT, the methodology will be finalized and presented to the MPO for approval no later than March 2014.

ATTACHMENT: CRTPO Draft P3.0 Local Input Point Methodology Memorandum.

8. **Proposed Ramp Metering Feasibility Study** (15 minutes) Scott Cole
ACTION REQUESTED: FYI

BACKGROUND:
NCDOT is interested in beginning a feasibility study of potential ramp metering locations in the Charlotte area. The Transportation Mobility & Safety Division will lead the study and anticipates the Department funding 75% of the $700,000 expected cost, equaling $525,000. The region's MPOs are being asked to fund a prorated share of the remaining 25%, equaling $175,000. CRTPO's share is proposed to be $152,857. Ramp metering has been identified as a potential strategy in CRTPO's Congestion Management Process.

ATTACHMENTS: Fact sheet; feasibility study overview; potential location list; Triangle study summary.

9. **Unified Planning Work Program** (15 minutes) Robert Cook
a. FY 2015 UPWP
ACTION REQUESTED: FYI

BACKGROUND: The Unified Planning Work Program (UPWP) is adopted annually in accordance with joint Federal Highway Administration/Federal Transit Administration (FHWA/FTA) transportation planning guidelines. The UPWP describes the planning activities that are anticipated for the coming fiscal year and documents the allocation of state and federal funds associated with each planning activity. An update on the FY 2015 UPWP's preparation will be provided.

b. FY 2014 UPWP Amendment
ACTION REQUESTED: FYI

BACKGROUND: A mid-year review of the FY 2014 UPWP has been conducted and several minor amendments are needed. Additional information will be provided at the TCC meeting.

10. Tolling Policies in the Charlotte Region (15 minutes) Norm Steinman & Tim Gibbs
ACTION REQUESTED: FYI

BACKGROUND: NCDOT has studies underway that are likely to culminate in HOT lanes or Express Toll Lanes on some facilities; therefore, a discussion of regional tolling policies must begin soon.

11. Upcoming Issues

12. Adjourn

CRTPO TECHNICAL COORDINATING COMMITTEE
Summary Meeting Minutes
Charlotte-Mecklenburg Government Center
Room 267
January 9, 2014

Voting Members: *TCC Chair* – Danny Pleasant (CDOT), Dan Leaver – alt for David Meachum (Charlotte E&PM), Ken Tippette (CDOT-Bicycle Coordinator), Debra Campbell (C-M Planning), Andrew Grant (Cornelius), Bill Coxe (Huntersville), Adam McLamb – alt for Scott Kaufhold (Indian Trail), Andrew Ventresca (Iredell County), Ralph Messera (Matthews), Eric Moore (LUESA-Air Quality), David McDonald (CATS), Lisa Stiwinter (Monroe), Allison Kraft (Mooresville), Scott Cole – alt for Louis Mitchell (NCDOT-Div. 10), David Keilson (NCDOT-Div. 12), Anil Panicker (NCDOT-TPB), Shannon Martel (Stallings), Phil Collins (Statesville), Erika Martin (Troutman), Greg Mahar (Waxhaw), Jordan Cook (Weddington)

Staff: Curtis Bridges (CRTPO), Robert Cook (CRTPO), Nick Landa (CRTPO), Tim Gibbs (CDOT), Norm Steinman (CDOT), Jonathan Wells (C-M Planning), John Rose (CATS), Gwen Cook (Mecklenburg County Park & Recreation), Sherry Ashley (Statesville), Loretta Barren (FHWA)

Guests: Sashi Amatya (PB), Todd Steiss (PB), Jim Trogdon (Atkins), Bjorn Hansen (Centralina COG), Bill Thunberg (LNTC), LaPronda Spann (Lain Consulting)

Danny Pleasant opened the meeting at 10:00 AM.

1. Election of Officers

Summary/Action Requested:

Mr. Pleasant stated that it is the responsibility of the TCC to annually elect new officers as the first action item of the first meeting of the year. He then opened the nominations for Chair of the TCC.

Chair Nominations

Andrew Grant nominated Mr. Pleasant for Chair of the TCC; Shannon Martel seconded the nomination. No other nominations were put forth.
Jonathan Wells made a motion to close the nominations; Mr. Grant seconded the motion.
Mr. Danny Pleasant was elected Chair of the TCC for 2014 by acclamation.

Mr. Pleasant noted his acceptance to serve another term as chair of the TCC, but expressed a desire to share the responsibility of chairing the TCC in the future because participation by the membership throughout the planning area is important. He then opened the nominations for Vice-Chair of the TCC.

Vice-Chair Nominations

Lisa Stiwinter nominated Joe Lesch for Vice-Chair of the TCC; Greg Mahar seconded the motion. No other nominations were put forth.
David McDonald made a motion to close the nominations; Ms. Martel seconded the motion.
Mr. Joe Lesch was elected Vice-Chair of the TCC for 2014 by acclamation.

2. Adoption of the Agenda

Mr. Pleasant asked if any changes to the agenda are necessary. Hearing none, the January agenda was adopted by acclamation.

3. Consideration of December Meeting Minutes

Mr. Pleasant asked if any changes to the minutes are necessary. Hearing none, he asked for a motion to approve the minutes. Mr. Mahar made a motion to approve the December TCC minutes. Anil Panicker seconded the motion. Upon being put to a vote, the motion passed unanimously.

4. NC 73 Council of Planning Memorandum of Understanding

Presenter: Bjorn Hansen, Centralina COG

Summary/Action Requested:

Mr. Hansen provided an overview of the NC 73 Council of Planning, and specifically noted that the request before the TCC is to recommend changes to its MOU. He noted the new MPO boundaries that now exist as a result of the 2010 Census, and indicated that the new MPO names need to be reflected in the MOU. He also provided an update on the activities of the Council of Planning, informing the TCC that intersection improvement projects along the NC 73 corridor are being scoped and appropriate funding sources are being identified for the projects proposed. Loretta Barren noted that there is other text in the MOU that needs clarification to reference current plans and legislation, and recommended those changes be made at the same time the MPO name updates are being made.

Motion:

Mr. Coxe made a motion to recommend that the MPO amend the NC 73 Council of Planning MOU to reflect the new names of the MPOs represented, make other necessary changes, and to sign the amended document. Mr. McDonald seconded the motion. The motion passed unanimously.

5. 2040 Metropolitan Transportation Plan (MTP)

Presenter: Nick Landa

Summary/Action Requested:

Mr. Landa provided the TCC with an update about the progress of the 2040 MTP update, highlighted by the following:

- Chapter content is being finalized and is anticipated to be completed within a couple weeks;
- The transit component of the financial plan chapter is not yet completed;
- Mapping is anticipated to be completed within the same timeline as the chapter content;
- All MTP content and a draft Plan are expected to be ready by Friday, January 24;
- The draft conformity document is currently being prepared and is expected to be finished in time to go out for public comment beginning February 14 for a 30-day comment period ending on March 17;
- Conformity is required for all 3 MPOs in the region currently working on MTP updates, so the comment period is timed for all three to occur concurrently; and
- MPO action for approval of the final document is anticipated in April based on the current schedule, which would still allow for federal approval no later than May 2, 2014.

Mr. Landa then stated that the TCC is being requested to recommend that the MPO authorize the release of the draft 2040 MTP and conformity determination report and initiate a 30-day public comment period, at which time both draft documents are completed. Mr. Pleasant noted the amount of effort that is involved with the travel demand model in order to complete the MTP. Mr. Coxe asked if there needs to be a resolution to indicate when the documents are completed, to which CRTPO staff indicated they are comfortable making that determination. The TCC chair also stated he is comfortable with that, especially since it is a draft document. Mr. Landa then noted that a workshop will be scheduled in early February for MPO and TCC members to review the draft document prior to the official 30-day comment period.

Motion:
Mr. Coxe made a motion to recommend that the MPO authorize the release the draft 2040 MTP and draft conformity determination report for public review. Mr. McDonald seconded the motion. Upon being put to a vote, the motion passed unanimously.

6. Prioritization 3.0 (P3.0)

a. Update

Presenter: Nick Landa

Summary/FYI:
Mr. Landa provided the following update about the P3.0 process:

- New transportation legislation was approved in North Carolina in 2013;
- The P3.0 process has been established to evaluate capital projects statewide;
- The MPO is tasked with determining which projects to submit to NCDOT to be evaluated, including projects of various modes;
- The TCC, at its December meeting, recommended a list of P3.0 highway projects for endorsement by the MPO, so no further TCC action is necessary for highway projects;
- The MPO will be asked to approve the P3.0 highway project list at its January 15 meeting;
- Other modes, including aviation, rail and transit projects are also allowed to be submitted, but had alternate deadlines for submission to NCDOT;
- Because the "other modes" did not follow the same submittal process as the highway and bicycle and pedestrian projects, no action is requested; but
- TCC members were asked to submit P3.0 "other modes" projects for information, and the project lists are included in the agenda packet.

b. P3.0 Bicycle and Pedestrian Projects

Presenter: Curtis Bridges

Summary/Action Requested:
Mr. Bridges reminded the TCC that a subcommittee was established to make a recommendation about which bicycle and pedestrian projects to submit for P3.0. He noted that the TCC previously received information about potential projects, and that the pool of projects to be considered have now all been evaluated using the MPO's approved bicycle and pedestrian ranking methodology. One exception that was noted from the previous list provided to the TCC is that one additional project was submitted since that time and made it into the top 20. He then stated that the TCC is requested to recommend that the MPO approve the top 20 projects to be submitted to NCDOT for P3.0. Mr. Panicker asked why some of the projects on the list provided to the TCC do not show a cost, to which Mr. Bridges noted that cost is not

a requirement for the MPO's ranking methodology and some of the project sponsors did not provide a cost. Mr. Coxe asked if cost is necessary to submit P3.0 bicycle and pedestrian projects, to which Mr. Bridges responded that it is not. It was noted that limited funding is available statewide for bicycle and pedestrian projects, but nonetheless, it is important for the MPO to continue to show the state that there is a need for modes other than highway.

Motion:
Adam McLamb made a motion to recommend that the MPO approve the list of bicycle and pedestrian projects to be submitted to NCDOT, as presented. Erika Martin seconded the motion. Upon being put to a vote, the motion passed unanimously.

Mr. Landa reminded the TCC that all the projects recommended to be submitted to NCDOT for P3.0 must be entered into the database during the submittal window of January 21-February 17, 2014. He also stated that for highway projects, a local contribution can be provided via a statement or letter from the MPO chair. He noted that the four jurisdictions of Charlotte, Indian Trail, Matthews and Mooresville have indicated their intent to request a local contribution. Mr. Grant noted that the Town of Cornelius also intends to provide a local contribution.

c. P3.0 Local Input Point Methodology
Presenter: Nick Landa

Summary/Action Requested:
Mr. Landa informed the TCC that another important part of the P3.0 process is the allocation of local points. He noted that each MPO is required to approve a methodology outlining how local points will be allocated, and NCDOT must also approve each MPO's methodology. He highlighted the process as follows:

- A committee of the TCC was established to develop CRTPO's recommended methodology;
- CRTPO will receive 2500 points for both Regional Impact and Division Needs projects – Statewide Mobility projects are not eligible for local input points;
- The methodology must have a minimum of one quantitative and one qualitative criteria, and a public involvement component;
- The committee recommends that each project should receive either the full allocation of local points (100) or no points, projects should be divided based on their category and geography, and projects eligible for the Statewide Mobility category should not receive Division Needs local points if they cascade down into that category;
- The criteria proposed by the committee includes a filter criteria that is intended to weed out projects that do not score well enough to be considered for funding through NCDOT's quantitative process, the MPO's MTP scores, and the pure quantitative score given to P3.0 projects by NCDOT;
- The Division Offices and MPO also should have input into the local point allocation; and
- Local points would be set aside for non-highway projects to reflect the same percentage of funding the MPO endorsed for non-highway projects in its MTP revenue assumptions;

Mr. Landa then provided an example of how the methodology would work. He also noted that the local points for non-highway projects are intended to be spread among each non-highway mode. Finally, Mr. Landa reiterated that the methodology must be approved by NCDOT, and recommended that the TCC release the draft methodology for review and comment by NCDOT's review committee. Mr. Panicker asked what the NCDOT timeline is for returning comments on the proposed methodology, to which Mr.

Landa responded he is not sure. Mr. Coxe suggested using the MPO score for bicycle and pedestrian projects instead of the P3.0 quantitative score. The TCC discussed it briefly, but decided not to amend the criteria at this time. Mr. Landa noted that a two-week public involvement period is also included as a part of the methodology. Finally, he emphasized the short timeline for all P3.0-related activities and encouraged the TCC to respond to all requests from staff in as timely a manner as possible.

Motion:
Ralph Messera made a motion to recommend that the draft P3.0 local input point methodology be submitted to NCDOT for review and comment. Ms. Martel seconded the motion. The motion passed unanimously.

7. Transportation Improvement Program Financial Plan
Presenter: Sashi Amatya, Parsons Brinckerhoff

Summary/FYI:
Mr. Amatya provided information to the TCC via a Power Point presentation, the contents of which are incorporated into the minutes here. He indicated that a kickoff meeting was held in December, the outcome of which is to focus on developing a financial plan for the first four years of the current TIP. He explained the process for developing the Plan, including the funding estimates and ensuring that the project costs and revenues received can be justified. It was stated that the TIP Financial Plan approval is anticipated to be requested at the February MPO meeting. Ms. Barren, with the Federal Highway Administration (FHWA), indicated that she would like to review the plan before it is approved by the MPO.

Mr. Hansen announced that the Centralina COG will be hosting an upcoming freight planning workshop sponsored by the National Highway Institute, and that space is still available.

8. TIP Project U-5107: Marion Diehl Center
Presenter: Robert Cook

Summary/FYI:
Mr. Cook provided the TCC with a brief update about funding associated with a project near Queens University. He indicated that the TCC already took action to recommend that the MPO approve a TIP amendment to shift funds from FY 2013 to FY 2015, but that the TCC also requested that staff follow up with the university to clarify the project proposed to be funded. He noted that the response he received was consistent with a project that the Charlotte DOT discussed with the university, but that something in writing is still being pursued for further clarification.

9. TCC Bylaws
Presenter: Robert Cook

Summary/FYI:
Mr. Cook informed the TCC that the Bylaws committee met on December 16, and the focus was primarily the MPO Bylaws and not the TCC Bylaws. He indicated that the next Bylaws meeting will be held on January 16. He highlighted some of the TCC items discussed at the December Bylaws meeting as follows:

- Whether to including the FHWA and NCDOT Public Transportation Division as non-voting members of the TCC;
- Changing the quorum requirement to 40% of the membership (opposed to the current 50%);
- Whether attendance should impact voting rights (as it currently does);
- Including a public comment period on TCC agendas; and
- How to determine the focus area representatives, and their term lengths.

10. NO_2 National Ambient Air Quality Standard (NAAQS) Update

Presenter: Eric Moore, LUESA-Air Quality

Summary/FYI:

Mr. Moore provided information to the TCC via a Power Point presentation, the contents of which are incorporated into the minutes here. He began by presenting some background information about new monitoring requirements for nitrogen dioxide (NO_2) that were established by the Environmental Protection Agency (EPA) in January 2010, specifically that a near road monitor is now required. He stated that a location in Charlotte for a near road monitor has been chosen within the I-77 corridor, north of Uptown Charlotte. Mr. Moore discussed some of the requirements of the monitor, and also some of the challenges of determining a site. He concluded by noting that a three-year period of data collection is necessary to determine if the region meets the new NO_2 standard, so we will have to wait until the results are in to find out how the Charlotte region is doing.

11. FY 2015 Unified Planning Work Program (UPWP)

Presenter: Robert Cook

Summary/FYI:

Mr. Cook provided information to the TCC via a Power Point presentation, the contents of which are incorporated into the minutes here. He first drew the TCC's attention to the UPWP budget, specifically the unobligated balance of $580,383. He explained that a decision would have to be made regarding how much of the unobligated balance to program, indicating that by programming more funding the MPO could accomplish more work, but that it will also increase the local shares paid by each CRTPO member jurisdiction. He suggested that a more detailed discussion is necessary to sort out the details and ramifications, and recommended the item be included on a transportation staff meeting agenda.

Mr. Cook then provided information about local planning projects that were proposed to be included as a part of the FY 2015 UPWP, including proposals by Cornelius, Huntersville, Indian Trail and Troutman. He also presented some potential projects that could be undertaken if the unobligated funds were to be programmed, which include ramp metering, an I-77 corridor study, and modeling activities, among others.

12. CATS 2012 JARC and New Freedom Project Soliciation

Presenter: LaPronda Spann, Lain Consulting

Summary/FYI:

Ms. Spann provided information to the TCC via a Power Point presentation, the contents of which are incorporated into the minutes here. Her presentation outlined the background and eligibility for Job

Access and Reverse Commute (JARC) and New Freedom projects, noting that CATS is the direct recipient of the funds, and that a competitive process is required in order to allocate the funds. She noted that depending on the type of project, there are specific local match requirements. After providing information about the solicitation process, she stated that six projects were received and scored by the designated review committee, two of which were recommended for funding. She explained the reasons for recommending funding to the two projects selected, and provided a funding summary. No action was requested.

13. Enhanced Mobility of Seniors & Individuals with Disabilities Program

Presenter: Robert Cook

Summary/FYI:

Mr. Cook stated that this item is on the agenda to provide the TCC with information about the need to determine a direct recipient for federal Section 5310 funds. He noted that in the past CATS has been designated the recipient of similar funding, so they will need to be involved in the conversation. He also requested that a meeting to begin this discussion be scheduled in February.

14. Upcoming Issues

Mr. McLamb announced that a workshop will be held to provide information about Indian Trail Road at South Piedmont Community College in Monroe on January 21 from 5:00-8:00 PM.

Scott Cole announced that NCDOT's Division 10 office will hold an outreach meeting to solicit projects for P3.0 on January 30. David Keilson announced that NCDOT's Division 12 will be holding a similar outreach meeting to solicit projects in that Division, which is tentatively scheduled for January 15.

Gwen Cook announced that Mecklenburg County is updating its greenway master plan, which will include the addition of the Mooresville to Charlotte Trail.

15. Adjourn: The meeting was adjourned at 12:00 PM.

charlotte regional transportation planning organization

600 East Fourth Street
Charlotte, NC 28202
704-336-2205
www.crtpo.org

TO: TCC Members
FROM: Robert W. Cook, AICP
CRTPO Secretary
DATE: January 31, 2014
SUBJECT: TIP Financial Plan

ACTION REQUESTED
Recommend to the MPO that it adopt the TIP financial plan and find that the 2012-2015 TIP is financially constrained.

BACKGROUND
TIPs are required to be financially constrained. This means that the cost of projects planned for implementation cannot exceed the amount of revenue that can reasonably be expected to be available to carry out those projects.

A plan demonstrating TIP financial constraint is required for each MPO. Past practice in North Carolina has been for NCDOT to provide this documentation; however, the FHWA now requires each MPO to develop and maintain such a plan. The current TIP was adopted by the MPO in July 2011 and extends from FY 2012 through FY 2018. The FHWA recognizes only the first four years of a TIP, thus the action being requested covers only FY 2012 through FY 2015.

JANUARY 29 TRANSPORTATION STAFF MEETING
A draft TIP financial plan covering years 2012-2015 was reviewed at the January 29, 2014 Transportation Staff meeting. Comments received at the meeting indicated the need to clarify the contents of Table 2 in the document, as well as to make a few minor corrections. FHWA staff also requested the addition of text regarding a financing technique known as advance construction. Meeting participants were given until Friday, January 31, 2014 to provide additional comments.

NEXT STEPS
The draft financial plan will be revised to reflect comments received at the January 29 Transportation Staff meeting, as well as any other comments received by January 31. An updated draft will be distributed on February 3.

2012 JARC/NF GRANT PROJECT SOLICITATION

Table 2 - Projects Recommended For Funding

Applicant	**CATS**	**Metrolina Association for the Blind**
Project Title	Steel Creek Enhancement	Transportation for Blind and Visually Impaired
Total Project Cost	$524,804	Capital: $82,400 Operating: $100,600
Grant Request	$262,402	Capital: $65,920 Operating: $50,300
Type of Funding	JARC Operating (50/50)	New Freedom Capital: (80/20) Operating (50/50
Amount Recommended for Funding	**$262,402**	**$116,220**
Category Scores		
Implementation Plan (20 Points)	17.7	19
Project Budget (20 points)	16.3	17.2
Coordination and Program Outreach (20 Points)	18.4	18.5
Benefits and Performance Indicators (20 Points)	18.6	19
Organizational Capacity (20 Points)	18.6	17.7
Total (100 points)	89.6	91.4

Ramp Metering Fact Sheet

What is a Ramp Meter?
A ramp meter monitors the flow of traffic on the freeway and on-ramp, and manages the flow onto the freeway by briefly stopping vehicles on the on-ramp..

Congestion Reduction
Ramp metering alleviates freeway congestion caused by the merging of traffic from an entrance ramp.

Ramp Metering Helps Reduce Congestion in Two Ways:
1. Reduces the flow rate of vehicles onto the freeway.
2. Reduces the platoon size entering the freeway to make merging easier.

Where Does Ramp Metering Work?
Ramp metering works best at locations where freeway congestion is primarily caused by traffic merging from ramps.

Reported Benefits of Ramp Meter

Performance Measure	Location and Result
Travel time	Atlanta – 10% decrease in peak period Houston – 22% decrease in peak period Arlington – 10% decrease in peak period
Travel speed	Milwaukee – 35% increase in peak period Portland –155% increase in peak period Detroit – 8% increase Los Angeles – 15 mph increase
Crash rate	Phoenix – 16% decrease during metered hours Milwaukee – 15% decrease in peak period
Crash frequency	Portland – 43% decrease Sacramento – 50% decrease Los Angeles – 20% decrease
Driver hours saved	Sacramento – 50% decrease Los Angeles – 8,470 hours per day
Vehicle volume	Milwaukee – 22% increase in peak period Sacramento – 5% increase in peak period Detroit – 14% increase in volume Los Angeles – increase of 900 vehicles per day
Gallons of fuel saved	Portland – 700 gallons per weekday
Emissions reduction	Minneapolis – reduction of 1,160 tons annually
Benefit-Cost ratio	Atlanta – about 4:1 in year 1, about 20:1 after 5 years

Typical Issues

Concerns	*Solutions*
1. Traffic backups on cross streets 2. Route diversion 3. Impact of travel time	1. System software selection 2. Signal timing 3. Siting and design

Overview of Study
The Feasibility Study will include a screening analysis to determine the optimum site(s) for ramp metering on interstate freeways in Cabarrus, Gaston, Iredell, and Mecklenburg Counties. (approx. 245 locations on I-77, I-277, I-85 & I-485)

The Scope of Work Will Consist of the Following:
- Gather and evaluate all available data along the mainline freeway and arterial routes
- Perform detailed analysis of both the freeways and arterials
- Determine the estimated delay reduction and financial benefits due to the installation of ramp metering
- Develop an implementation plan (with costs) that ranks potential ramp metering projects by county.

Charlotte Regional Ramp Metering Feasibility Study

Overview

Ramp Metering: **Cabarrus, Gaston, Iredell, and Mecklenburg Counties**

A Steering Committee will be formed to guide the study from inception to completion. The Steering Committee will consist of representatives of the MPO's, NCDOT, and affected local jurisdictions.

The Feasibility Study will include performing a screening assessment and analysis to determine the optimum site(s) for deploying ramp metering along the following routes in Cabarrus, Gaston, Iredell, and Mecklenburg Counties: I-77, I-277, I-85 and certain locations along I-485, approximately 245 locations. Through this Feasibility Study the consultant will identify locations where ramp metering deployment can maximize benefits and minimize negative impacts to surrounding areas. The consultant will identify performance measures that should be used to evaluate the effectiveness of ramp metering at deployed site(s). The consultant will develop a Plan for implementation of a ramp metering system. The main objective of the plan is to determine which locations will yield the most benefits from the installation of ramp metering.

The final determination of potential locations for detailed analysis will be at the discretion of the Steering Committee.

At a minimum, the Scope of Work will consist of the following:

- Gather and evaluate all available data along mainline and arterials for current and future-year conditions.
- Perform detailed analysis of both the freeways and arterials utilizing accepted procedures.
- Develop corridor and interchange level performance measures and measures of effectiveness.
- Using all appropriate criteria, develop an implementation plan with costs that ranks potential ramp metering projects by county.
- Prepare and conduct presentations of the Feasibility Study recommendations.
- Compile the findings into a final report.

Note: Some items in the previous Triangle Ramp Metering Feasibility Study were developed for statewide use, as follows:

- National Research Report
- Legal and Legislative Review
- Typical Design Criteria
- Marketing and Outreach Plan

POTENTIAL RAMP METERING LOCATIONS IN DIVISION 10

Route	Exit #		I-77 Mecklenburg Co. Interchanges	On-Ramps	Count
I-77	1A		Westinghouse	2	1
I-77	1B		I-485	3	2
I-77	3		Arrowood Rd	2	3
I-77	4		Nations Ford Rd	2	4
I-77	5		Tyvola Rd	2	5
I-77	6A		Woodlawn Rd	1	6
I-77	6B		Tryon St	2	7
I-77	7		Clanton Rd	2	8
I-77	8		Remount Rd	1	9
I-77	9A		West Blvd	1	10
I-77	9		US 74 (Wilkinson Blvd)/ Freedom Dr / I-277 (John Belk Frwy)	1	11
I-77	9B-9C		I-277(John Belk Frwy) / US 74 (Wilkinson Blvd)	1	12
I-77	10A		US 29-NC 27 (Morehead St)	1	13
I-77	10B		Trade St	2	14
I-77	10C		5th St.	1	15
I-77	11		NC 16 (Brookshire Fwy) & I-277	4	16
I-77	12		Lasalle St / Atando Ave.	2	17
I-77	13		I-85(SB) / Statesville Ave. / HOV	6	18
I-77	16		Sunset Rd.	2	19
I-77	18		WT Harris Blvd	4	20
I-77	19		I-485	3	21
I-77	23		Gilead Rd	2	22
I-77	25		NC 73 (Sam Furr Rd)	3	23
I-77	28		US 21 (Catawba Ave) -- [I-4733 convert to DDI]	2	24
I-77	30		Goodrum Rd / Griffith St	2	25
			On-Ramps	**54**	**25**

Route	Exit #		I-77 Iredell Co. Interchanges up I-40	On-Ramps	Count
I-77	31		Langtree Rd	2	1
I-77	33		Williams Rd / US 21 (Charlotte Hwy)	3	2
I-77	35		SR 1100 (Brawley School Rd)	2	3
I-77	36		NC 150 (W Plaza Dr)	2	4
I-77	42		US 21-NC 115 (Main St / Charlotte Hwy)	2	5
I-77	45		Amity Hill Rd	2	6
I-77	49A		US 70 (Garner Bagnal Blvd)	2	7
I-77	49B		Salisbury Rd	2	8
I-77	50		E Broad St	2	9
I-77	51		I-40	4	10
			On-Ramps	**23**	**10**

Route	Exit #		I-85 Gaston Co. Interchanges to US 321	On-Ramps	Count
I-85	17		US 321 (N. Chester St)	2	1
I-85	19		NC 7 (Ozark Ave	2	2
I-85	20		NC 279 (New Hope Rd)	2	3
I-85	21		Cox Rd	2	4
I-85	22		S Main St	2	5
I-85	23		NC 7 (McAdenville Rd)	2	6
I-85	26		Belmont-Mt. Holly Rd	2	7
I-85	27		NC 273 (Beatty Dr/Park St)	2	8
			On-Ramps	**16**	**8**

Route	Exit #		I-85 Mecklenburg Co. Interchanges	On-Ramps	Count
I-85	29		Sam Wilson Rd	1	1
I-85	30		I-485 (West)	4	2
I-85	32		Little Rock Rd	2	3
I-85	33		Billy Graham Pkwy	3	4
I-85	34		Tuckaseegee Rd	1	5
I-85	34		Freedom Dr	2	6
I-85	35		Glenwood Dr	2	7
I-85	36		NC 16 (Brookshire Blvd)	2	8
I-85	37		Beatties Ford Rd	2	9
I-85	38		I-77	4	10
I-85	39		Statesville Rd	2	11
I-85	40		Graham St	2	12
I-85	41		Sugar Creek Rd.	2	13
I-85	42		I-85 Connector (US 29/49)	1	14
I-85	43		University City Blvd	3	15
I-85	45		WT Harris Blvd	2	16
I-85	46		Mallard Creek Church Rd	2	17
I-85	48		I-485 (North)	2	18
			On-Ramps	**39**	**18**

Route	Exit #		I-85 Cabarrus Co. Interchanges	On-Ramps	Count
I-85	49		Concord Mills / Bruton Smith Blvd.	3	1
I-85	52		Poplar Tent Rd	2	2
I-85	54		Kannapolis Pkwy / George Liles Pkwy	2	3
I-85	55		NC 73 (Davidson Hwy)	2	4
I-85	58		US 29-601 (Concord Pkwy)	2	5
I-85	60		Dale Earnhardt Blvd	2	6
I-85	63		Lane St	2	7
			On-Ramps	**15**	**7**

Route	Exit #		I-277 Mecklenburg Co. Interchanges	On-Ramps	Count
I-277	1		Clarkson St, I-77 NB, I-77 SB	3	1
I-277	1E		Hill St. / Church St.	2	2
I-277	1E		South Blvd	2	3
I-277	2A		Stonewall St. / Kenilworth Ave.	2	4
I-277	2A		NC 16 (3rd St & 4th St)	2	5
I-277	2B		US 74	2	6
I-277	3A		11th St / E. 12th St.	3	7
I-277	3B		W. 12 St.	1	8
I-277	4		US 29 (Graham St)	1	9
I-277	5A		I-77	2	10
			On-Ramps	**20**	**10**

Route	Exit #		I-485 Mecklenburg Co. Interchanges	On-Ramps	Count
I-485	1		NC 49 (S. Tryon St)	3	1
I-485	3		Arrowood Rd. Exd	2	2
I-485	4		NC 160 (Steele Creek Rd)	4	3
I-485	6		West Blvd	2	4
I-485	9		US 29-74 (Wilkinson Blvd)	1	5
I-485	10		I-85 (West)	2	6
I-485	12		Moores Chapel Rd (round abouts)	2	7
I-485	14		Mt. Holly Rd	2	8
I-485	16		NC 16 (Brookshire Blvd)	4	9
I-485	21		NC 24 (WT Harris Blvd)	3	10
I-485	23		I-77 (North)	2	11
I-485	23		NC 115 (Old Statesville Rd)	2	12
I-485	26		Prosperity Church Rd / Loganville Rd	2	13
I-485	28		Mallard Creek Rd	2	14
I-485	31		I-85 (North)	2	15
I-485	32		US 29 (N. Tryon St)	3	16
I-485	33		University City Blvd	2	17
I-485	36		Rocky River Rd	2	18
I-485	39		Harrisburg Rd	2	19
I-485	41		NC 24-27 (Albemarle Rd)	2	20
I-485	43		NC 51 (Blair Rd)	2	21
I-485	44		NC 218 (Fairview Rd)	2	22
I-485	47		Lawyers Rd	2	23
I-485	49		Idlewild Rd	2	24
I-485	51		US 74 (Independence Blvd))	2	25
I-485	52		E. John St	2	26
I-485	57		NC 16 (Providence Rd)	4	27
I-485	59		Rea Rd	4	28
I-485	61		US 521 (Johnston Rd)	3	29
I-485	64		NC 51 (Pineville-Matthews Rd)	2	30
I-485	65		Pineville Rd / South Blvd	3	31
I-485	67		I-77 (South)	4	32
			On-Ramps	**78**	**32**

TOTAL NUMBER OF ON-RAMPS	**245**	**110**

Executive Summary

M-0446 Ramp Metering Feasibility Study for Durham and Wake Counties

Executive Summary

The Need for Ramp Metering

Congestion along North Carolina's limited access highways has continued to grow and congestion is increasing while the state's ability to widen existing facilities and build new ones is declining. NCDOT is looking for innovative solutions to address this increasing congestion. One method is to employ ramp metering technology on the entrance ramp of limited access highways. This technology meters the flow of entering vehicles proportionate to the available gaps in traffic. This will help to maintain travel speeds and capacity and mitigate the potential for crashes where the entrance ramps meet the freeway.

NCDOT contracted with Atkins to conduct a feasibility study for the implementation of ramp metering in the Raleigh/Durham area. This study serves as a pilot study statewide. The study's final recommendations were based on tasks that included: Data Collection, Screening and Detailed Analysis, National Research, Legal and Regulatory Review, Typical Design Criteria, Typical Cost Estimates, Performance Measures, Implementation Plan and Marketing and Outreach. This project included implementation recommendations for the Raleigh/Durham area with guidance on design criteria and costs.

Data Collection

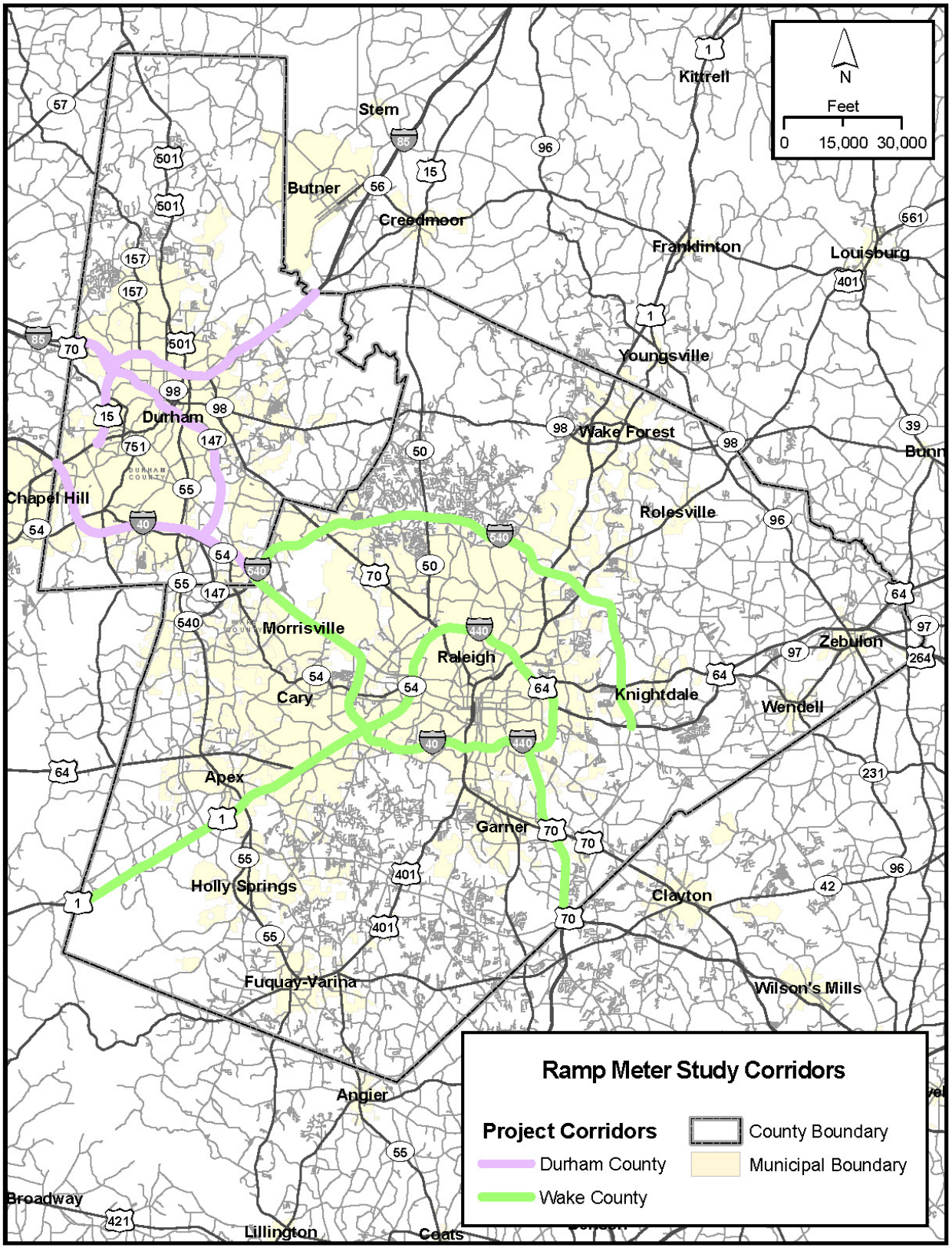
The project study began with 208 sites in Durham and Wake Counties on sections of I-40, I-440, I-540, US 1, US 15/501, and NC 147. Initially traffic congestion data and basic geometric data was collected to ascertain whether sites are freeway-to-freeway ramps and to determine if they have an appropriate level of traffic congestion.

This initial data was organized into a master database, designed to accommodate the additional data collected, analyses performed and any other relevant data collected over the course of this project.

National Research

The national research report summarized the state of ramp metering systems throughout the United States and Europe. It discussed ramp metering hardware, technology, site selection criteria, costs, implementation methods, and design standards currently used by agencies that employ ramp meters. A key element of this research was to draw upon the experiences of other areas to prepare NCDOT for successful implementation of ramp metering.

The report included a review of marketing and outreach strategies used by other states when implementing new ramp metering systems. Additionally, the research included the measures of effectiveness or benefits that ramp meters have provided to those areas.


N
Feet
0 15,000 30,000
Kittrell
Stem
Butner
Creedmoor
Franklinton
Louisburg
Youngsville
Durham
Wake Forest
Chapel Hill
Rolesville
Morrisville
Raleigh
Cary
Knightdale
Wendell
Zebulon
Apex
Garner
Holly Springs
Clayton
Fuquay-Varina
Wilson's Mills
Angier
Broadway
Lillington
Ramp Meter Study Corridors
Project Corridors
Durham County
Wake County
County Boundary
Municipal Boundary
RampMeteringSites.mxd JNL 02.19.13

Legal and Legislative Review

A thorough review was conducted of North Carolina state law to ascertain if there are any restrictions on the implementation of ramp metering and whether any changes were needed to North Carolina state laws and NCDOT policies. The effort also summarizes the experiences of other states with regard to legal and regulatory issues.

The requirements of the most current (2009) *Manual of Uniform Traffic Control Devices* (MUTCD) were evaluated to assess any impacts on the implementation of ramp metering.

The review identified some potential issues with the enforcement of the ramp meters during non-operational periods. The review recommended several alternatives to address these issues. A recommendation was proposed to make minor changes in the state statutes to explicitly allow motorists to proceed past a non-operating ramp metering signal without stopping first.

Screening and Detailed Analysis

The analysis of the candidate study sites consisted of a four-step review and analysis process that examined a higher level of detail to evaluate sites as being good candidates. This process provided a cost effective means to evaluate and rule out sites that were not suitable without collecting unnecessary data.

The initial step of the screening and detailed analysis was to create a Master List of all sites within the study area. This review included a geometric data review and analysis to categorize each site as freeway-to-freeway, direct semi-direct and indirect ramp types. A complete inventory of the geometric features, including number of lanes, lane additions and deletions, ramp lengths, grades, shoulder and lane widths, and observations of traffic flow, was conducted.

During a review of the Master List by NCDOT, it was agreed that five F2F sites that have high volumes and experience frequent congestion should be included in further analysis. This provided the Department a better appreciation of the particular issues, safety concerns, associated costs, and potential for future improvements at these locations, and would provide a baseline for further evaluation and consideration in the future.

The second step of the screening and detailed analysis was an initial screening of the data that identified those sites suitable for carrying forward to a more detailed analysis. The bottleneck ranking application of the Vehicle Probe Project (VPP) software suite developed by the University of Maryland CATT Lab was used to determine if a bottleneck is causing congestion. The bottleneck ranking application is an algorithm that compares the current speed to the free flow speed at night to determine if a bottleneck is causing congestion. If the current speed fell below 60% of the free flow speed, the location was flagged as a potential bottleneck. This location is observed for 5 minutes, and if the speed stays below 60%, the bottleneck was confirmed. The bottleneck is not cleared until conditions have risen above the 60% threshold and held for 10 minutes. Data was collected using this application for at least one month each in the spring and fall of 2011.

Many of the bottleneck locations coincided with the merge of an entrance ramp, suggesting that the merge could be the cause of congestion. Entrance ramps adjacent to the bottleneck and the associated congestion spilling back upstream were considered "congested" and were identified and recorded in the Master List. There were 77 "congested" candidate sites in 42 "significant" bottlenecks.

In the third step of the screening and detailed analysis the sites were reviewed to identify any factors that would obviously rule them out as suitable sites in the future. The three main reasons for ruling out sites were:

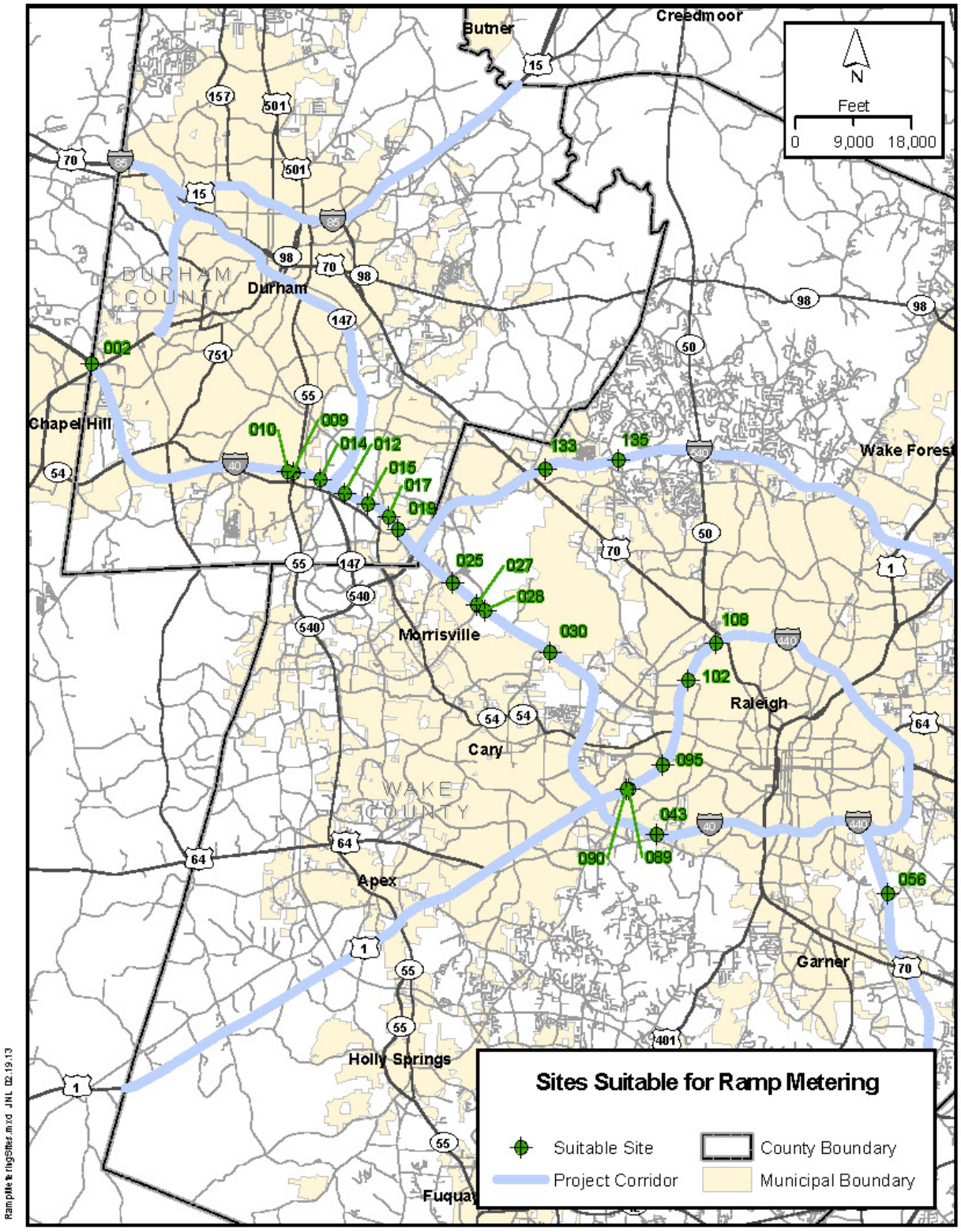
- Site subject to congestion that could be attributed to lane closures for current roadway project
- Site upstream of a primary site already ruled out due to it being freeway-to-freeway site
- Site at the back of, or beyond the back of, congestion

At the conclusion of this screening analysis, 34 sites were carried forward for the detailed analysis. The detailed analysis included:

- Collecting and analyzing traffic flow data to identify whether volumes at each site were within acceptable limits for ramp metering
- Collecting data concerning the locations and type of traffic signals
- Verifying that the period of congestion coincided with the period of suitable volumes
- Analyzing crash data
- Conducting field visits to each site
- Investigating the cause of congestion
- Quantifying the amount of congestion in the vicinity of the site
- Grouping sites by the congestion source
- Performing an analysis of crash data

For each of these 34 sites, a site summary was prepared that summarized the data collected and analyzed with recommendations as to whether a site should be carried forward for further analysis. Following the detailed review, the sites were categorized as follows:

- Not Suitable: A critical reason for the site not being suitable for ramp metering has been identified, such as very low entrance ramp volumes.
- Review in Future: In some locations with more than one site in proximity, upstream sites may no longer be congested once the downstream sites have been implemented. In this case, the site would be reviewed and evaluated at a future time.


Butner
Creedmoor
N
Feet
0 9,000 18,000
DURHAM COUNTY
Durham
Chapel Hill
Wake Forest
Morrisville
Cary
Raleigh
WAKE COUNTY
Apex
Garner
Holly Springs
Fuquay
002
009
010
012
014
015
017
018
025
027
028
030
033
035
043
056
089
090
095
102
106
Sites Suitable for Ramp Metering
Suitable Site
Project Corridor
County Boundary
Municipal Boundary
RampMeteringSites.mxd JNL 02.19.13

- Suitable for Taking Forward: These sites have good characteristics and demonstrated potential to reduce observed congestion and will be taken forward to the next phase of the study.

There were 21 sites identified as having significant recurring congestion and suitable for ramp metering.

Typical Design Criteria

This task included the development of recommended standards for site selection, locating the ramp meter, design criteria, operational strategies, and the design standards. The design standards included geometric layout, signalization design, signing, and pavement markings. Guidance is provided on the appropriate use of the standards and typical designs details. Six typical details were developed showing conceptual designs for the following configurations:

- Single lane ramp meter
- Single lane loop ramp meter
- Two-lane ramp meter
- Single lane ramp meter with a restricted use transit bypass lane
- Single lane freeway-to-freeway ramp meter
- Two lane freeway-to-freeway ramp meter
- Optional enforcement features

Typical Cost Estimates

Utilizing the above typical design configurations for ramp meters, typical planning level cost estimates were developed. The report includes for each typical ramp meter configuration the type-specific capital, design, and construction administration, costs associated with the:

- Geometric construction (pavement, drainage, structures, and guardrail)
- Signal displays and supports
- Detection
- Controllers
- Traffic control
- Signing
- Pavement markings

Additionally, the report included program costs including procurement and integration of the central control software and controller firmware, and training. Annual operations and maintenance costs were estimated using information from other areas.

Each typical ramp configuration included certain assumptions of typical quantities. In the implementation plan, type-specific costs were developed for each of the 21 sites that address the specific conditions and recommended solutions.

Performance Measures

The 21 sites suitable for ramp metering were evaluated to determine if each site has sufficient estimated benefits versus the estimated costs to ascertain if they are financially viable. Based upon the availability of data, only reduction in delay (vehicle-hours) was used. However, other studies have found benefits such as trip reliability, crash reduction, and air emissions can be realized. A range of delay reductions (10%, 15% and 20%) were evaluated. The results of this analysis show that there is a wide range of estimated annual financial savings due to the delay reduction, from $22,170 per year to $405,096 per year for the 20% reduction scenario.

Implementation Plan

In the Implementation Plan, a site specific estimated cost was developed for the recommended improvement at each of the 21 sites. These improvements include:

- Single lane
- Single lane loop
- Two lane loop
- Two lane
- Single lane freeway-to-freeway
- Two lane freeway-to-freeway

The development of the implementation plan considers planned projects and their potential impacts on ramp metering and whether ramp metering might mitigate existing traffic congestion.

Using the estimate of 20% reduction in travel time, five- and ten-year horizon years were studied to determine if each candidate site produced a positive benefit-cost ratio greater than 1.0, indicating financial feasibility.

A sensitivity analysis was performed to test the impact on the decision-making if a 10% or 20% reduction in travel time was realized. The analysis validated the ranking of the 21 sites.

Sixteen sites have a benefit cost ratio greater than 1.0 in both horizon years. Using the 20% delay reduction, the benefit-cost ratios of the 16 sites range from 12.72 to 1.81. Five sites had benefit-cost ratios less than 1.0. Several strategies were developed to determine a logical order for implementation. Factors that were considered were financial viability, correct sequencing of upstream and downstream sites, relationship to STIP projects, risk, and ease of construction. Fourteen sites were recommended for implementation.

Using the predicted costs and benefits of the sites taken from the list of the 21 sites, a benefit-cost analysis was performed. This analysis took into account implementation costs, maintenance costs, and program costs. The financial benefits were only for the reduction in travel time expected from the system.

From this analysis, two strategies were identified:

- Strategy 1: Included all sites suitable for ramp metering that pay back within 5 years (i.e., have a 5-year benefit-to-cost ratio greater than 1.0), did not include one site that overlapped an STIP project, and did not include three sites that are freeway-to-freeway sites.
- Strategy 2: This lower-risk strategy included only sites with a 5-year payback that have an effectiveness factor of 1.0, did not include one site that overlaps an STIP project, and did not include three sites that are freeway-to-freeway sites.

Strategy 1 offered more potential to learn about the performance of the system in different scenarios—knowledge that could then be used to decide where to apply ramp metering elsewhere in North Carolina.

Strategy 2 removed some sites that have a slightly higher chance of not performing as expected. The key results of these two strategies are shown in the table below.

The benefits were conservatively estimated based upon other states' implementations and without the benefit of estimating emissions, safety, etc. Since this a pilot study, a logical goal of the project would be to gain as much knowledge about a variety of sites. Therefore, it was recommended the Strategy 1 implementation sites be installed.

Strategy Results

Strategy	Number of Sites	10-Year Total Cost	10-Year Total Benefit	10-Year BCR
1	14	$3,210,274	$22,900,932	7.13
2	10	$2,465,848	$17,823,120	7.23

Each site in Strategy 1 was ranked based upon four criteria—benefit-cost ratio, congestion importance, and relative difficulty of design. Each site was graded as follows:

- For benefit-cost ranking, B/C ratio > 5 is a 1, B/C ratio > 4 is a 2, B/C ratio > 2 is a 3, and B/C ratio > 1 is a 4.
- For congestion importance ranking, each site was graded with a score—primary congestion site = 1, median site = 2, and every secondary site = 3.
- For relative difficulty of design, each site was scored—low design difficulty site = 1, medium-low difficulty design = 2, medium difficulty design = 3, and high difficulty design = 4. The lowest overall score is the highest ranking.
- Each site was given a score of 1 if there is no conflict with a STIP project, a score of 2 if there was a potential conflict, and a score of 3 if there is a definite conflict with a STIP project.

The following table presents those results in the order of recommended implementation.

Recommended Order of Implementation

Log	Freeway	Cross Street	Exit	Direction	F2F?	TIP Conflict	Congestion Location	Design Difficulty	Ramp Meter Configuration	Location Notes	TIP Conflict	B/C Ranking	Congestion ranking	Design Difficulty	Total Score	Ranking
017	I-40	S Miami Blvd	281	EB	No	No	primary	Low	Single Lane	downstream	1	1	1	1	4	1
095	I-440	SR 1012 - Western Blvd	2	SB-M2 (EB to SB)	No	No	primary	Low	Single Lane	downstream	1	1	1	1	4	1
102	I-440	Lake Boone Trail	5	NB	No	No	primary	Low	Single Lane	downstream	1	2	1	1	5	2
135	I-540	SR 1829 - Leesville Rd	7	EB	No	No	solo site	Low	Single Lane	downstream	1	2	1	1	5	2
028	I-40	SR 1002 - Aviation Pkwy	285	EB-M2 (NB to EB)	No	No	primary	Low	Single Lane	downstream	1	3	1	1	6	3
030	I-40	SR 1652 - N Harrison Ave	287	EB	No	No	secondary	Low	Single Lane	upstream of 019	1	1	3	1	6	3
108	I-440	US-70 / NC-50 / Glenwood Ave	7	WB-M2 (SB to WB)	No	No	secondary	Low	Single Lane	upstream of 019 amd 017	1	1	3	1	6	3
009	I-40	NC-55 / Apex Hwy	278	EB	No	No	secondary	Low	Single Lane Loop	(F2F) and 011 (unsuitable)	1	2	3	1	7	4
010	I-40	NC-55 / Apex Hwy	278	WB	No	No	secondary	Low	Single Lane	upstream of 028	1	2	3	1	7	4
019	I-40	Page Rd	282	EB	No	No	secondary	Medium	Two Lane Loop	upstream of F2F one and non-suitable one	1	1	3	3	8	5
027	I-40	SR 1002 - Aviation Pkwy	285	EB-M1 (SB to EB)	No	No	secondary	Low	Single Lane Loop	upstream of 028	1	3	3	1	8	5
056	I-40	SR 5220 - Jones Sausage Rd	303	WB	No	Potential	secondary	Low	Single Lane	TIP Conflict	2	2	3	1	8	5
002	I-40	US-15 / US-501	270	WB	No	No	secondary	Low	Single Lane	upstream of non-suitable site 104	1	4	3	1	9	6
015	I-40	Davis Dr	280	EB	No	No	secondary	Medium-Low	Two Lane	upstream of 019 and 017	1	3	3	2	9	6

For sites 015 and 019 the ramp meter would be two lanes and would include some ramp widening.

NCDOT might not deploy ramp metering projects in the order that they are ranked, due to other considerations and constraints.

Marketing and Outreach

The key to success in the deployment of new technology such as ramp metering is the successful education of the various constituent groups in the goals and the benefits of ramp metering. Based upon the significant database built up from multiple ramp metering deployments, both nationally and worldwide, issues with ramp metering focus on two principal areas of concern:

- Concern that ramp meters will back up traffic onto crossing arterials, impacting the operation of these facilities.
- Concern that motorists will take another route to avoid ramp metering sites.
- Perception from the public that ramp meters are going to unfairly increase their trip time.

The overall approach to these concerns is similar, to present the benefits and dispel the myths of ramp metering. The method of engaging groups with these concerns is different in both the content and amount of detail, because the important issues and the technical knowledge of each stakeholder group is not the same.

From research and discussions with other agencies that have ramp meter deployments, public support of ramp meters is essential for a successful implementation. Opposition toward ramp metering usually stems from public perception that delays increase due to ramp metering implementation, while their associated benefits may not be obvious. There is also a perception that ramp meters may contribute to increased rear-end accidents due to cars stopped on the ramp. Local agencies tend to perceive the ramp meters will back up traffic and degrade traffic flow on their crossing arterial roadway.

Agencies operating ramp meters have altered these perceptions through focused public communications and involvement. By proactively disseminating information to the public, these agencies are demonstrating the benefits ramp metering can offer: lower and more reliable trip times, reduced congestion, and increased peak period speeds. A marketing and outreach plan must be tailored to address the concerns of the following constituent groups that have respective interests in the proposed project:

- Technical staff – Engineers, planners, transit agency staff, and related management,
- Law enforcement/emergency responders – Principally, the NC State Highway Patrol, city police, county sheriffs, local fire and rescue personnel,
- Public officials – Appointed and elected citizens on the NCDOT Board of Transportation, Metropolitan Planning Organization officials and local government elected officials,
- General public – End users of the ramp meters, community leaders, and
- Media

It is important to reach out to constituents who may be both proponents and opponents of ramp meters. Many concerns can be addressed in the implementation of ramp meter

strategies—often these concerns are products of misinformation or misunderstanding and can be resolved.

The marketing and outreach report described the appropriate materials and techniques for such a campaign with the understanding there are different target audiences with different interests and concerns. The recommended approach included the following:

- Brochures, flyers, and/or newsletters,
- Website,
- Videos and simulations,
- Open house meetings
- Inter-agency and public officials' meetings,
- Media releases,
- Automated messages,
- Signs, and
- Social Media (e.g. Facebook, Twitter, Pinterest, Instagram).

From the above marketing and outreach resources, certain materials can be designed to serve each constituent group. The table below depicts the recommended and appropriate resources for each group. For each constituent group, there are particular marketing and outreach materials that are more effective and more appropriate. As an example, it is more effective to use brochures, flyers, and newsletters, and websites for the general public than it is for public officials, local transportation agency law enforcement and emergency responder staff. A "P" indicates a primary communications media for that constituent group. An "S" indicates a secondary communications media for that constituent group.

Constituent Group Recommendations

Resource	Local Transportation Agencies	Law Enforcement and Emergency Responders	General Public	Public Officials
Brochures, Flyers, and Newsletters	S	S	P	S
Websites	S	S	P	S
Videos and Simulations	P	P	P	S
Open House Meetings			P	S
Inter-Agency and Public Officials' Meetings	P	P		P
Media Releases	S	S	P	S
Automated Messages			P	
Social Media			P	S

The process of marketing and outreach should begin before funding is secured for the first project. For local transportation agencies, law enforcement and emergency responders, and public officials, marketing and outreach should begin prior to the approval of funding, when the projects are being reviewed for inclusion in state and MPO TIPs.

Ideally, the marketing and outreach program for the general public should begin one year prior to implementation. It should continue through design and after implementation, and until first installations can be evaluated.