HATTIESBURG AREA
ITS MASTER PLAN

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Prepared for:

Mississippi Department of Transportation

Prepared by:

NEEL-SCHAFFER
Solutions you can build upon

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09-12-11	0.1	Draft ITS Master Plan - SEA
01-09-12	1.0	Final ITS Master Plan - SEA

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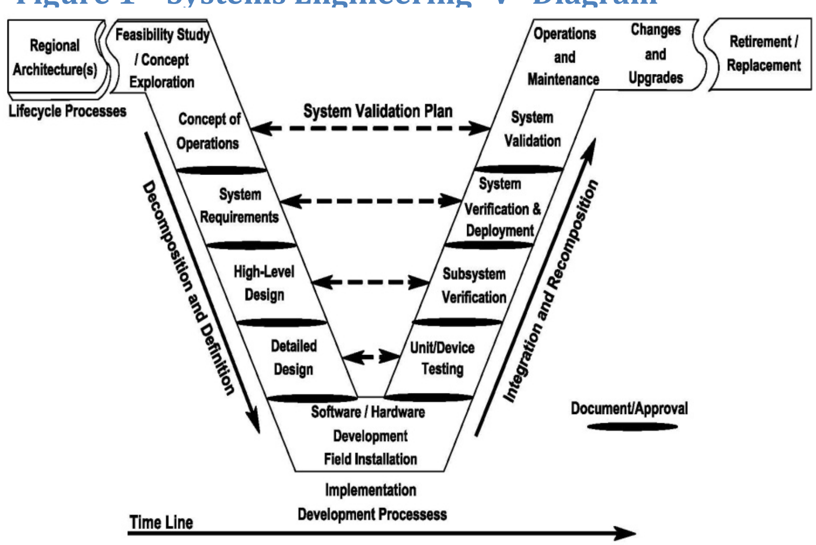
1.0 Executive Summary

The purpose of this ITS Master Plan is to outline requirements in planning for of the Mississippi Department of Transportation (MDOT) Intelligent Transportation System in the Hattiesburg area. The study is intended to follow the Federal Highway Administration (FHWA) system engineering requirements as outlined in Title 23-Code of Regulations, Section 940. This master plan will become part of the MDOT Hattiesburg Regional ITS System. The following components of the Hattiesburg ITS System were evaluated:

- Identify the applicable portions of the Hattiesburg Regional ITS Architecture
- Identify the ITS System users/stakeholders
- Assist in identifying communication needs and requirements
- Analyze alternative system configurations and technology
- Provide a framework for developing system concepts
- Provide guidelines for developing and implementation plan

FHWA Rule 940 provides policies and procedures for implementing Section 5206(e) of the Transportation Equity Act of 21st Century (TEA 21), Public Law 105-178, 112 Stat. 457 pertaining to the conformance with the National ITS architecture and supporting standards. This rule basically states that all ITS projects funded with Federal Highway Trust Funds must be based on a Systems Engineering Analysis (SEA). The "V" Diagram or Model is a visual illustration of a SEA used for ITS, with each step involved as the project progresses through the development stages. The left side of the diagram provides a top-down approach for the system planning and design development while the right side provides the bottom-up implementation approach to the system. The SEA "V" Diagram is shown ***Figure 1***.

Figure 1 – Systems Engineering "V" Diagram



The SEA is a means of developing a successful system through an interdisciplinary approach. Reliance on a knowledge base into network development is a key resource in the SEA process. An interdisciplinary approach is used in developing the SEA. Assessments of applicable users and stakeholders, existing infrastructure, ITS needs, functional requirements, regional architecture and alternative technologies have been carried out in consideration of the system as a whole as well as its individual subsystems.

Consideration has been given to ITS System users at the state, regional and local level and how these agencies disseminate information and manage traffic operations, emergency response, incidents and special events. Stakeholder input was elicited through group gatherings as well as individual meetings which included City of Hattiesburg division managers and department heads, Forrest and Lamar County officials, Forrest and Pearl River County Emergency Management officers, Hattiesburg and University of Southern Mississippi law enforcement, Hattiesburg and Camp Shelby Fire officials as well as MDOT officials from the state and district six.

As the user needs were identified and prioritized; primarily falling into traffic operations, emergency response, incident management, event management, and high bandwidth communications; applicable market packages categorized according to need priority and project components. At this point the current regional architecture document was consulted in aligning the market packages and functional requirements of the Hattiesburg area ITS System to those of the MDOT Hattiesburg Regional Architecture.

With information into the local user needs and the prioritization as well as categorization of those needs was accomplished, project phasing was undertaken. In development of project phasing, conceptual planning was developed. Investigations into alternate technologies were carried out in an effort to find the optimum project components. The phased projects were reviewed with stakeholders during a final ITS Master Plan meeting and consensus was built around the seven project phases. Through public partnerships, the stakeholders will use this document as a tool to seek funding from local, county, state and federal grant programs to implement ITS projects within the Hattiesburg ITS Master Plan.

2.0 Introduction

An Intelligent Transportation System planning document's purpose is to provide a strategy for ITS deployment within a municipality or sub regional jurisdiction. The master plan should examine the relationships between existing and proposed ITS projects at the local level with considerations made into the regional ITS architecture. The study will be utilized by the Mississippi Department of Transportation as a tool in ITS planning efforts and to advance transportation safety, mobility and productivity.

The ITS Master Plan for the Hattiesburg Area is intended to document the initial planning and development process that follows the FHWA minimum systems engineering requirements as outlined in Title 23 – Code of Federal Regulations, Section 940. The study will document system users/stakeholders, communication and ITS needs and requirements, relevant regional architectures, and analysis of alternative system configurations and technology. The document shall provide a framework for developing system concepts and guidelines for developing an implementation plan.

3.0 Stakeholders / Needs Assessment

In developing the systems engineering process for the Hattiesburg Area ITS Master Plan, it was necessary to involve local, regional and state officials in the stakeholder input process. At the onset of the project, stakeholders were identified that represent agencies that would benefit from ITS services in traffic management, emergency management, traveler information and mass transit.

Once all stakeholders were considered, an initial master plan stakeholder meeting was coordinated. Held at the Hattiesburg Train Depot / Intermodal Facility; the meeting took place on May 17th, 2011. The meeting brought together administrators, law enforcement, planners and engineers from the public and private sectors. The City of Hattiesburg was represented by the Fire Department Chief, Directors of Engineering, Grant Administration and Planning as well as Division Managers of Traffic, Information Technology, and Mass Transit. The University of Southern Mississippi (USM) was represented by USM Police and Information Technology Personnel. Camp Shelby was represented by Fire Department staff. Forrest County Emergency Management District (HFEOC) Director and Management were in attendance. MDOT staff attending included State ITS and District Six Engineers as well as MDOT Enforcement Officers. Private industry attendees included ambulance service executives as well as ITS and communications engineers. The attendee list for the initial stakeholder meeting is located in ***Appendix A***.

Coordination efforts are continuous between the Statewide, District Six and Municipal Traffic Personnel in daily traffic operations and maintenance. The Forrest County Emergency Management District is an independent office of Forrest County and City of Hattiesburg government which facilitates emergency response coordination and communications between emergency responders throughout Forrest County and the Hattiesburg Metro Area. The HFEOC also acts as a conduit for the flow of information between State / District Six Traffic

Management Centers and Emergency Responders. The IT department for the city of Hattiesburg provides communications equipment for all Hattiesburg Municipal Public Servants coordinating heavily with the HFEOC. The IT department for USM maintains communications and data management for the university through fiber optics and wireless communication. MDOT currently has a resource sharing agreement in place with USM The university utilizes MDOT fiber along US Hwy 49 from the main campus to the technical park at Classic Drive.

The stakeholder meeting consisted of presentations geared toward informing the audience on ITS goals and vision, elements, systems and user needs as it pertains to the Hattiesburg area. Speakers reviewed local ITS asset locations and services provided by the existing infrastructure as well as insight into the Hattiesburg Regional Architecture.

Group discussions were encouraged throughout the presentation. Discussions involved information on traveler information provided locally in the way of Dynamic Message Signs (DMS), Highway Advisory Radio (HAR), traffic website MSTraffic.com, smart phone applications and future 511 services. Parking information for downtown events displayed on DMS signs was discussed as a possible service coordinated through the Statewide and Regional TMCs. Detection of train movements and the relaying of that information to travelers was discussed as being a valuable resource to commuters between Petal and Hattiesburg.

Traffic signal coordination and responsiveness along the Hardy Street/US 98 and US 49 routes through the city were of primary concern in discussions. Information into adaptive signal systems was provided by attendees. Open discussions during the master plan meeting also involved traffic signal preemption. The city's Fire Department and Traffic Division discussed the importance of drafting a policy regarding traffic signal emergency vehicle preemption usage. The policy and protocols would need eventual City Council approval. It was discussed that the City now has approximately 98% of its signals equipped with preemption devices. The question was posed, do any of the stakeholders utilize GPS in fleet management, where AAA ambulance service responded that they do use GPS in all their emergency vehicles.

Stakeholder feedback was also elicited through surveys provided at the initial stakeholder meeting. Survey results of the data obtained from the initial stakeholder meeting are shown in **Table 1.**

Table 1 – Stakeholder Meeting Survey Results

System User	ITS Service	Ranking
Traffic/Emergency Operations	Peak-hour traffic management center operation	**1**
Emergency	Emergency vehicle traffic signal preemption	
Traffic	Remote traffic signal control	**2**
Traffic	Signal coordination	
Traveler Information	Dynamic message signs	
Traveler Information	Internet	
Traffic/Emergency Operations	Traffic surveillance capabilities	
Traveler Information	Highway advisory radio	**3**
Traffic/Emergency Operations	Dispatching capabilities	
Traffic	Vehicle counting capabilities	**5**
Traffic/Emergency Operations	24-hour traffic management center operation	
Traffic	Automated crash data collection	**6**
Traveler Information	Kiosks	
Traveler Information	Telephone (511)	
Traffic	Data storage	**7**
Traffic/Emergency Operations	Weather sensors	
Traffic	Automated vehicle location for traffic service vehicles	
Traffic/Emergency Operations	Flood Detection sensors	
Traffic	Vehicle classification capabilities	
Transit	Transit vehicle signal priority	
Traffic	Vehicle speed detection capabilities	**8**
Traveler Information	Private sector providers	
Transit	Transit vehicles as probes	
Traffic	Electronic parking payment	**9**
Traffic	Bridge coordination	**10**

Note: Rank 4 in Table 1 was omitted due to no ITS service landing in that section of survey result distribution.

Survey Findings

Peak-Hour traffic management center operations received the highest ranking of all ITS services in the survey while 24-hour TMC operations ranked 5th overall. In order to fully utilize ITS elements in the field, there must be operators present to observe the video and react by adjusting signal timings or relay traffic information to the public via the traveler information systems. These services are primarily used during peak-hours but as the system is expanded and capabilities increase, 24-hour TMC operations will become relied upon.

Traffic signal coordination and remote traffic signal timing operations both ranked 2nd. Traffic signal coordination is of utmost importance in the Hattiesburg area where high levels of traffic throughput combined with busy side roads often cause congestion on US 49 and US 98 West. Remote signal timings are also crucial to traffic operations in Hattiesburg in making the signal system more responsive and alternate timing plans can be easily implemented.

Traveler information services such as dynamic message signs and internet resources (MSTraffic.com) were ranked 2nd, highway advisory radio ranked 3rd while kiosks and telephone systems (511) were ranked 6th among stakeholders. These methods of traffic information dissemination are powerful tools used by the public in pre-trip and en-route planning.

Dispatching capabilities ranked 3rd in the stakeholder ITS survey. With improved dispatching capabilities there will be a reduction in response times. As response times decrease, route obstruction times are reduced.

Along with the input received at the initial stakeholder meeting, one on one interviews were conducted with stakeholders. Through the group and individual stakeholder meetings; users, system elements and key functions were developed as shown in **Table 2** below:

Table 2 – System Users, Elements and Functions

Users	User System Elements	Key Functions
• Police	Incident Management Surveillance	1. Direct incident response units to locations. 2. Identify and verify incidents. 3. Monitor the incident. 4. Provide information to field unit. 5. GPS to track vehicles.
• Fire	Incident Management	1. Direct incident response. 2. Monitor the incident. 3. Provide information to field unit. 4. GPS to track vehicles.
• Public Works	Incident Management Surveillance	1. Incident secondary response. 2. Notify maintenance of incident.
• Mass Transit	Transit Management	1. Fixed route and demand response ops. 2. Multimodal coordination. 3. Transit traveler Information
• Traffic	Traffic Control En-Route Driver Information Surveillance	1. Provide sharing traffic signal information. 2. Provide agency communication. 3. Implement traffic management strategies 4. Monitor traffic and signal timings. 5. Process, update, and retrieve traffic data. 6. Identify and verify incidents.
• Emergency Management	Incident Management Emergency Notification Emergency Management Event Management	1. Monitor the incident. 2. Provide information to field units. 3. Notify 1st and 2nd responders of incident. 4. Coordinate traffic control.

4.0 Existing and Proposed Conditions

4.1 Existing Conditions

Hattiesburg is the fourth largest city in the state. As a regional transportation hub, the City encompasses the crossing of interstate 59, US highway 11, US Highway 49, US Highway 98, State Route 42, Kansas City Southern RR, Canadian National RR and Norfolk Southern RR. In the wake of Hurricane Katrina, Hattiesburg became a central area for the rebuilding of cities along the Gulf Coast. The City of Hattiesburg also serves as host for the nearby Camp Shelby Training Center which is a major deployment site. The city is home to learning institutions such as the University of Southern Mississippi, William Carrey College, Pearl River Community College as well as medical facilities Forrest General Hospital and Wesley Medical Center.

The Mississippi Department of Transportation (MDOT) has its District Six and local project office located in Hattiesburg. The regional Traffic Management Center (TMC) is housed within the MDOT District Six complex. The MDOT regional TMC is fully staffed during peak hours with a TMC manager and two operators. The statewide TMC in Jackson has connectivity with all ITS devices in the Hattiesburg area through servers at the regional TMC. The MDOT TMC staff in Jackson and Hattiesburg oversee the operation of seven dynamic message signs, two highway advisory radio (HAR) sites and carries out surveillance on traffic conditions through 12 radar detection sites and seventy-five fixed and pan-tilt-zoom (PTZ) traffic cameras within the Hattiesburg city limits.

In reference to the City of Hattiesburg governmental agencies, there are eight departments. The police, fire and public works departments are of primary importance as it relates to the ITS infrastructure needs. The traffic division lies within the Public Works Department. Hattiesburg's traffic division is responsible for maintaining all traffic signal equipment within the city limits, of which there are approximately seventy-five signalized intersections. The City of Hattiesburg TMC is housed in the traffic division headquarters downtown. Traffic signal operations and incident management for the area are carried out between the MDOT statewide TMC, MDOT regional TMC and supplemented by the City of Hattiesburg TMC through approximately 25 miles of fiber optic cable.

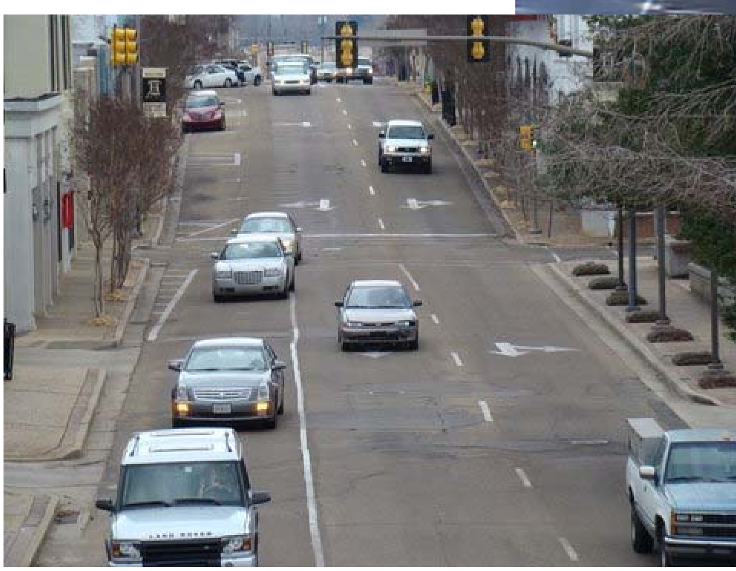
The City of Hattiesburg IT department is responsible for communications between city division complexes as well as keeping its fire, police and public works personnel equipped with mobile communication units. Currently Hattiesburg primarily uses lease line connections to communicate between agency complexes but has approximately four miles of fiber optic cable within its ROW and has plans for new fiber construction in the near future to connect the traffic division with the intermodal facility.

The City IT division works closely with the Hattiesburg/Forrest Emergency Operations Center (HFEOC) in their efforts to strengthen interagency communication networks. The HFEOC is tasked with maintaining radio communications for first and second responders through three existing towers which are leased from a number of cellular service providers. Staffs at the HFEOC are the point of contact for emergency management in the Hattiesburg/Forrest County area and coordinates those operations between city, county, state agencies.

The University of Southern Mississippi (USM) is located centrally to Hattiesburg between MS 198 (Hardy Street) and 4th Street between US 49 and 38th Avenue. USM has its own police force and IT department that maintains the university robust wireless and fiber optic communications network. The USM police force utilizes mobile data terminals using the USM wireless system. Radio communications are facilitated by the HFEOC's analog system. Currently USM has a resource sharing agreement in place that provides for allocation of communication infrastructure between MDOT and the university. At present MDOT has the use of USM's LED sign structure to house state transportation communications equipment while the school utilizes MDOT fiber optics for data transfer from facilities off campus.

The existing ITS infrastructure in the Hattiesburg area is comprised of fiber optic and wireless communications conveying data to/from interconnected traffic signals, traffic cameras (CCTV), Radar Detection Systems (RDS), Dynamic Message Signs (DMS), and Highway Advisory Radio (HAR). The local traffic management centers (TMC) communicate with the field devices via fiber optics. The statewide TMC achieves data transfer with field devices via leased lines through the MDOT regional TMC equipment. **Existing ITS Infrastructure** in Hattiesburg is shown graphically in ***Figure 2***.

Dynamic Message Sign Alert
View from MDOT CCTV on US 49 at Lee Avenue
Camp Shelby



View from City of Hattiesburg Traffic Camera
E. Pine Street NE
Downtown Hattiesburg

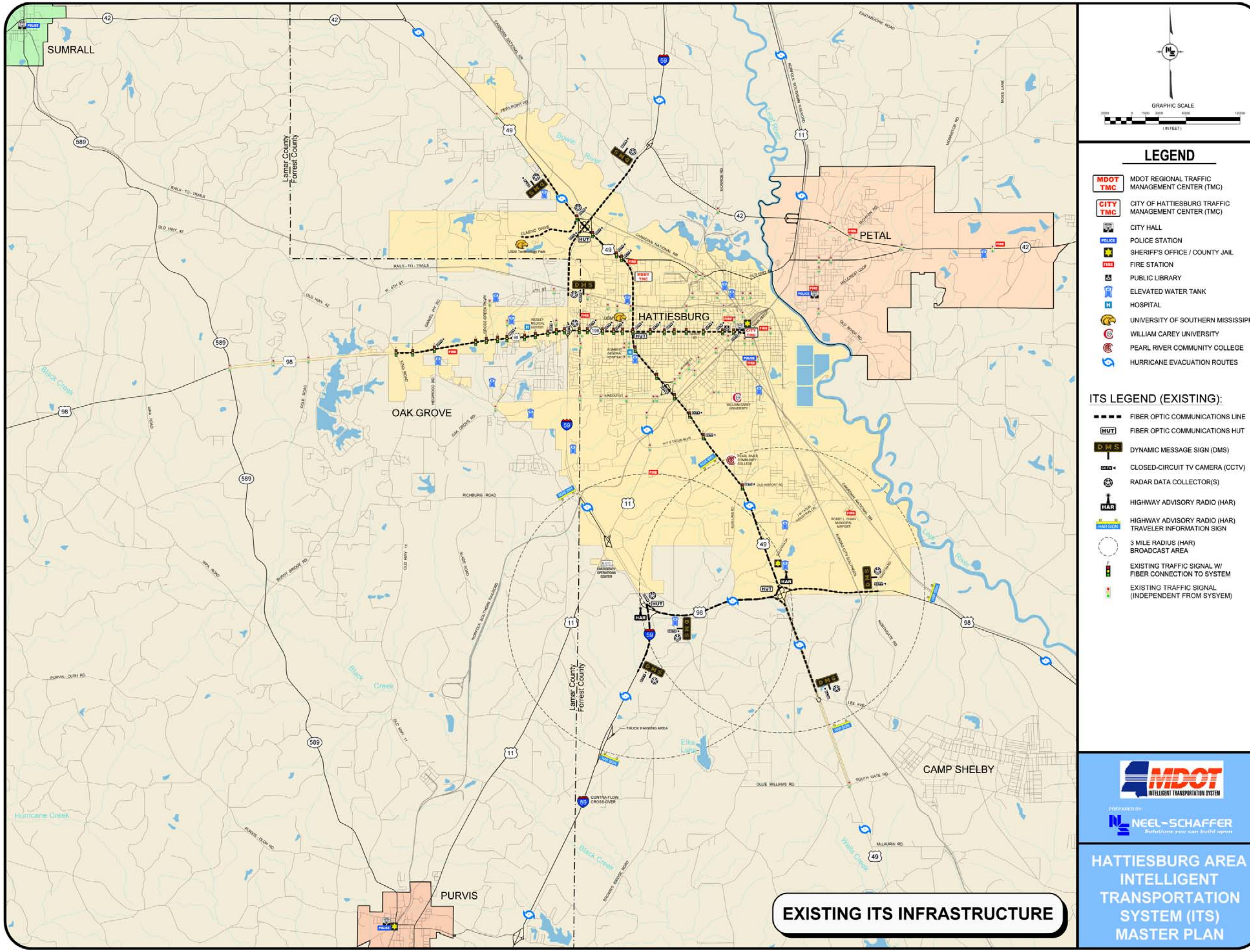

SUMRALL
HATTIESBURG
PETAL
OAK GROVE
CAMP SHELBY
PURVIS
LEGEND
MDOT REGIONAL TRAFFIC MANAGEMENT CENTER (TMC)
CITY OF HATTIESBURG TRAFFIC MANAGEMENT CENTER (TMC)
CITY HALL
POLICE STATION
SHERIFF'S OFFICE / COUNTY JAIL
FIRE STATION
PUBLIC LIBRARY
ELEVATED WATER TANK
HOSPITAL
UNIVERSITY OF SOUTHERN MISSISSIPPI
WILLIAM CAREY UNIVERSITY
PEARL RIVER COMMUNITY COLLEGE
HURRICANE EVACUATION ROUTES
ITS LEGEND (EXISTING):
FIBER OPTIC COMMUNICATIONS LINE
FIBER OPTIC COMMUNICATIONS HUT
DYNAMIC MESSAGE SIGN (DMS)
CLOSED-CIRCUIT TV CAMERA (CCTV)
RADAR DATA COLLECTOR(S)
HIGHWAY ADVISORY RADIO (HAR)
HIGHWAY ADVISORY RADIO (HAR) TRAVELER INFORMATION SIGN
3 MILE RADIUS (HAR) BROADCAST AREA
EXISTING TRAFFIC SIGNAL W/ FIBER CONNECTION TO SYSTEM
EXISTING TRAFFIC SIGNAL (INDEPENDENT FROM SYSYEM)
GRAPHIC SCALE
PREPARED BY:
NEEL-SCHAFFER
EXISTING ITS INFRASTRUCTURE
HATTIESBURG AREA INTELLIGENT TRANSPORTATION SYSTEM (ITS) MASTER PLAN

Figure 2

4.2 Proposed Future Conditions

4.2.1 Adaptive Signal System for US 49 and US 98 (Phase 1)

As previously discussed the Hattiesburg area is located at the crossroads of an Interstate highway, three US highways and a state route of which convey a high volume of traffic through the city. The east/west corridor of US 98 has a large amount of congestion and the average daily traffic is expected to increase steadily in years to come. With the expansion of the Port of Gulfport, US Highway 49 traffic volumes are expected to increase as well. With increases freight capacity at the Port, so too will freight volume increase along the US 49 corridor through Hattiesburg. An Adaptive Signal System has been proposed as a tool for managing the increasing traffic demand through Hattiesburg's signalized arterials. The Adaptive Signal System is expected to respond to the varying traffic conditions. The system has shown to be effective in managing traffic conditions caused by construction, special events, incidents as well as hurricane evacuation.

The existing Advanced Traffic Management System along the US 98 and US 49 arterials in Hattiesburg is comprised of ACTRA central computer software at the Regional TMC and "On Street" signal controller software at the cabinets. Communications between the central computer and the 38 signal controllers along US 98 and US 49 is conveyed primarily over fiber optic cable with radio interconnects at two signals to the extreme west on US 98. With the exception of additional detection at signalized intersections, a majority of the infrastructure needed for the adaptive system is currently in place.

Future construction required to install the adaptive signal system involves incorporating supplementary vehicle detection for the existing traffic signals on US 49 from Elks Lake Road to Classic Drive and on US 98 / SR 198 / Hardy Street from State Route 589 to Pine Street in downtown Hattiesburg. As the initial demonstration project is carried out, upgrades to controllers and cabinet network equipment may be necessary. **Phase 1** proposed coverage area of the adaptive signal system is shown graphically in **Figure 3.**

View from City of Hattiesburg Traffic Camera Intersection of Hardy St. with Green St., Adeline St. and 2nd Avenue near downtown Hattiesburg

Video Wall at the MDOT Regional TMC in Hattiesburg

4.2.2 I-59 Contraflow ITS for I-59 (Phase 2)

Hurricane evacuation response is a top priority within MDOT and city/county emergency response agencies. ITS infrastructure can be utilized for hurricane and emergency response efforts in Forrest and Pearl River County in the way of traffic cameras and Highway Advisory Radio (HAR). The HAR would serve in providing traveler information primarily during hurricane evacuation and emergency response scenarios. Video and detection data would serve field operations through observations and traffic data at key points along the I-59 corridor.

During hurricane evacuations, contraflow operations require a coordinated effort in determining length of contraflow, time periods, and crossover point locations. Contraflow crossover points are access points by which travelers can enter or exit contraflow operation limits. The crossover point must be monitored for flow which warrants contraflow operations as well as public safety factors involved in interstate flow reversal. Video feeds and radar detection data could be utilized by MDOT in evaluation of contraflow operations in consideration of beginning and ending contraflow. Information gained from images and detector data would prove valuable to emergency operations as well as field officers and transportation personnel.

In addition to contraflow crossover points, Exits along I-59 from the Louisiana State Line northward to Hattiesburg often see congestion and public safety issues arise as arterials and ramps become congested. Louisiana and South Mississippi I-59 ramp closures are often needed during evacuation operations. During hurricane evacuations, Mississippi exits are often the first available stops for many motorists that have been on the stretch of I-59 with no available shelter, food or gas stops. Many times nearby gas station drives become overburdened with traffic and that traffic backs up onto arterials creating traffic safety issues. The interference of arterial flow creates delay and safety issues with entrance and exits of I-59 in the area.

It is proposed that traffic cameras and Radar Detection Systems (RDS) at Contraflow Crossover points and strategic exits along I-59 would provide valuable information into traffic conditions there. MDOT Emergency Services, Forrest and Pearl River County Emergency Operations Centers through MDOT TMCs will be able to identify traffic safety issues and provide info to officers and transportation personnel for proceeding actions. The traffic cameras and RDS would provide real-time information to emergency response efforts. Additionally these field devices would free up officers that at present would man these locations for a visual of the site, effectively offering extra manpower to response efforts.

Proposed wireless communications would supply video and traffic flow data to the Statewide and Regional TMCs as well as county EOCs. The MSTraffic.com website currently offers a secure virtual TMC to municipal and county emergency operations staff by application. The detection and video equipment is proposed at I-59 contraflow crossover points on the MS/LA state line, mile marker 21 and mile marker 55 as well as I-59 Exits with US 11 in Hattiesburg, SR 13 in Lumberton, SR 53 in Poplarville and SR 43 in Picayune (all of which are primary and alternate hurricane evacuation routes).

The system would also be comprised of highway advisory radio that would give the info starved evacuees updates on weather and road conditions during contraflow operations. The optimum locations for HAR transmitters were found to be at the Mississippi Rest Area near the MS/LS state line and at the MDOT project office in Poplarville, MS. The HAR transmitter, traffic cameras and radar detection would be tied into the long-haul wireless system via line of sight microwave subscriber units. The Statewide and Regional TMCs currently operate two HAR devices in the Hattiesburg area.

In comparison to fiber optic communications cost, microwave transmission was found to be the most feasible mode of data transfer for the Contraflow ITS Project. Microwave subscriber links at field devices would communicate with TMCs via five successive long-haul microwave hops. Data would be sent over microwave transmission from the MS/LA state line to the I-59/US 98 interchange in Hattiesburg and switched onto the existing MDOT ITS System. **Phase 2** proposed construction is shown graphically in **Figure 4.**

Hurricane Gustav Evacuation Traffic
I-59 near Poplarville, MS

Hurricane Katrina Evacuation Traffic
I-10 at Pascagoula, MS

Hurricane Gustav Evacuation Traffic
I-59 near Picayune, MS

Hurricane Katrina Track August 2005

Hurricane Gustav Track August 2008

4.2.3 US 11/Broadway Drive and Lincoln Road Fiber Optics. (Phase 3)

In emergency operations for Hattiesburg and its major routes (I-59, US 49, US 98 and US 11), the Forrest County Emergency Management District facilitates coordination of response efforts. The Forrest-Hattiesburg Emergency Operations Center (EOC) housed at the FCEMD headquarters provides facilities for municipal, county and state interest during emergency preparations and response efforts. The FCEMD manages the 911 address-mapping program for the area as well as the county wide radio system. A fiber connection between the HFEOC, City of Hattiesburg, Forrest County, and MDOT TMCs could provide high bandwidth communications for emergency operations as well as day to day coordination between agencies for traffic operations.

The MDOT Regional TMC, Hattiesburg Traffic Division, and the USM Police Department are currently on the Regional Fiber System in Hattiesburg. Hattiesburg City Hall, Forrest County Courthouse, New Forrest County Jail, Forrest County Multipurpose Center and the Hattiesburg Convention Center are adjacent to the MDOT fiber optic backbone on US 49 and US 98. Currently the HFEOC and City of Hattiesburg utilize leased line connections for high bandwidth communication between the HFEOC and City of Hattiesburg.

A proposed fiber optic connection between the HFEOC, MDOT TMCs and City of Hattiesburg would be a valued addition to the existing fiber optic system. Through new fiber constructed underground along US 11/Broadway and existing MDOT and City of Hattiesburg fiber a link between the HFEOC could be achieved. Not only would this provide a reliable communications link between these agencies but also provide interconnects to the traffic signals along the route.

As Lincoln Road continues to grow as a bypass to the heavily congested US 98, traffic signal interconnects along Lincoln Road are needed. The interconnected signals and traffic cameras would provide a means for the city's traffic division to adjust signal timings remotely and increase Hattiesburg Traffic effectiveness in monitoring and responding to east/west traffic on the Lincoln Road.

Another aspect of the phase 3 project includes the formation of a redundant fiber optic ring with future fiber optic installations along Interstate 59. Once a redundant ring of fiber is formed, if a break in MDOT or the City's fiber optic trunk should occur, data could by reversed in direction along the standard pair fibers and communication flow can resume. The completion of phase 3 and the following phase 4 would produce the areas first redundant communications ring. **Phase 3** proposed construction is shown graphically in **Figure 3**.

4.2.4 I-59 ITS (Phase 4)

An advantage to communicating via fiber optic cable is the ability to incorporate a redundant ring. Should there be a break in the fiber optic trunk communications, the flow of data can be reversed and communications can continue without interruption in system data transfer. In order to create a redundant ring from the existing fiber optics currently within the Hattiesburg Area, three miles of fiber optic trunk line will need to be installed along I-59 from 4th Street to the US 98 / I-59 junction. The proposed I-59 MDOT trunk line installation would not only create a redundant fiber ring in MDOT fiber optic communications, but also would serve to tie in Phase 3 proposed fiber optic lines along Lincoln Road and US 11 effectively forming redundant rings with the City of Hattiesburg fiber.

It has also been communicated that cameras and detection along this corridor would be invaluable to the HFEOC and MDOT TMC in incident management and emergency response. The installation of cameras every mile and radar detection every half mile would follow MDOT's current design guidelines for new ITS construction.

Within Phase 4, installation of driver feedback devices are also proposed in efforts to decrease accidents in the area. It was communicated by emergency response personnel that a large volume of overturning truck incidents occur at the I-59 / US 98 interchange, which could be combatted with driver feedback devices. The device would display the travelers speed and if the speed is beyond speed restrictions, beacons would flash alerting the driver. With a high number of incidents occurring on I-59 at mile marker 60 during wet weather conditions, it is proposed that a combination of detection, warning beacons and signage be used to make drivers aware of roadway hazards. Detectors can relay data to a beacon which can alert motorist to a hydroplaning danger ahead. **Phase 4** proposed construction is shown graphically in **Figure 3**.

4.2.5 4th Street and 38th Avenue ITS (Phase 5)

Event management in the Hattiesburg area is a primary concern for MDOT TMC, HFEOC, and the University of Southern Mississippi (USM) police force. At the conclusion of football, baseball and basketball games, a large influx of fans exit the campus via 4th Street and onto US 49 or US 98. These occurrences often cause large amounts of congestion within those routes due to the large traffic influx over a short period of time.

The USM fiber optic system is currently connected with the MDOT fiber optic trunk. USM has been coordinating with MDOT TMCs and the HFEOC for event management planning. It is proposed that event management at USM could be facilitated with information provided by traffic cameras connected via fiber optics along 4th Street at its intersections with US 49, Golden Eagle Drive and 38th Avenue; and along 38th Avenue from 4th Street to Hardy Street/MS 198. Traffic signal interconnects along 4th Street and 38th Avenue could be utilized to implement special event signal timing and response to traffic conditions. **Phase 5** proposed construction is shown graphically in **Figure 3**.

4.2.6 US 98 and US 49 ITS (Phase 6)

The proposed extension of existing fiber optic communications on US 98 will provide for the interconnecting of existing traffic signals from King Road to SR 589 via buried fiber optic cable. The traffic signals are currently interconnected via 700 MHZ point to point wireless communications, but as traffic cameras are needed and installed through MDOT force labor, video data will require higher bandwidth communications. Also, as the adaptive signal system is incorporated into the existing traffic signals in the area, the high bandwidth communications will be required for effective operation of the Advanced Traffic Management System.

On US 49, extension of the fiber optic trunk line that terminates at Camp Shelby's Lee Avenue is needed for communication with the traffic signal at Camp Shelby's South Gate. The proposed fiber optics would make it possible for the City of Hattiesburg Traffic Division to adjust timings for that signal remotely from the city TMC, greatly increasing the effectiveness of traffic operations. Traffic cameras at Camp Shelby's South Gate and at the US 49/US 98E interchange would increase the incident and emergency management capabilities in the area. **Phase 6** proposed construction is shown graphically in **Figure 3**.

4.2.7 Transportation and Emergency Response Communications Project (Phase 7)

In Hattiesburg, The MDOT TMC, Hattiesburg Traffic Division and USM are connected via fiber optic cable within the MDOT and City of Hattiesburg ITS Systems. Under design is the Intermodal Planning Facilities connection to the ITS fiber system via City fiber optic cable downtown. There is potential for connection of other transportation and emergency operation agencies in the Hattiesburg area. The City of Hattiesburg relies upon leased lines for communication between municipal facilities and other local agencies. As fiber optic cable has been installed on traffic related projects, the interconnecting of municipal facilities via city and MDOT fiber has become a viable option for high bandwidth data transfer. The City of Hattiesburg Communications Division has shown the need for interconnecting a number of their municipal buildings that are directly related to incident management and emergency response. The following City of Hattiesburg transportation and response related municipal complexes have been prioritized by communication/bandwidth need and nearness to in place ITS fiber:

1. Municipal Airport Hanger (Bobby L. Chain Municipal Airport)
2. Police and Fire Academy (Bobby L. Chain Municipal Airport)
3. Hattiesburg-Forrest Emergency Operations Center
4. Fire Administration and Prevention Office
5. Fire Stations (8)
6. Municipal Fueling Facility
7. Mass Transit
8. Police Department
9. Police Substations (2)
10. Public Works (Faulkner Street).

Forrest County has many transportation and response agency buildings in close proximity to MDOT and City of Hattiesburg ITS fiber. The Forrest County Courthouse in downtown Hattiesburg is within blocks of existing ITS fiber optic cable connected to the MDOT System. Also, the new Forrest County Jail and the Forrest County Multipurpose Center is located on Sullivan Drive adjacent to the MDOT fiber trunk on US 49.

Traffic operations in Hattiesburg continues to benefit from the growing ITS infrastructure in the area. Recent coordination efforts between the HFEOC and MDOT TMC personnel has resulted in more rapid information dissemination within local incident and emergency response circles. Information conveyed to the TMCs from incident responders is very useful in posting traveler information just as TMC video provides visual confirmation of traffic safety issues as well as incident characteristics before response arrival. High bandwidth interagency communication would further improve emergency response as well as day to day incident management in the city. **Phase 7** proposed construction is shown graphically in **Figure 5.**

4.2.8 Alternate Transportation and Emergency Response Communications Project (Phase 7A Alternate)

Wireless communications has been looked at as an alternative to the use of fiber optic communications. While fiber is more stable and requires less maintenance than wireless, wireless communication tends to be less expensive. Wireless communications for interconnecting city and county transportation/response related buildings is proposed as a microwave long haul mounted atop public water towers at USM, Forrest General, Seventh Street, Industrial Drive and Richburg Road. Short haul subscriber units would be installed at municipal and county buildings. The wireless communications system could be connected to the MDOT Regional ITS System via interconnects between existing fiber trunk and proposed microwave sites at USM and Forrest General Hospital. Associated cost of the alternate communications for **Phase 7A** is shown in ***Table 10.***

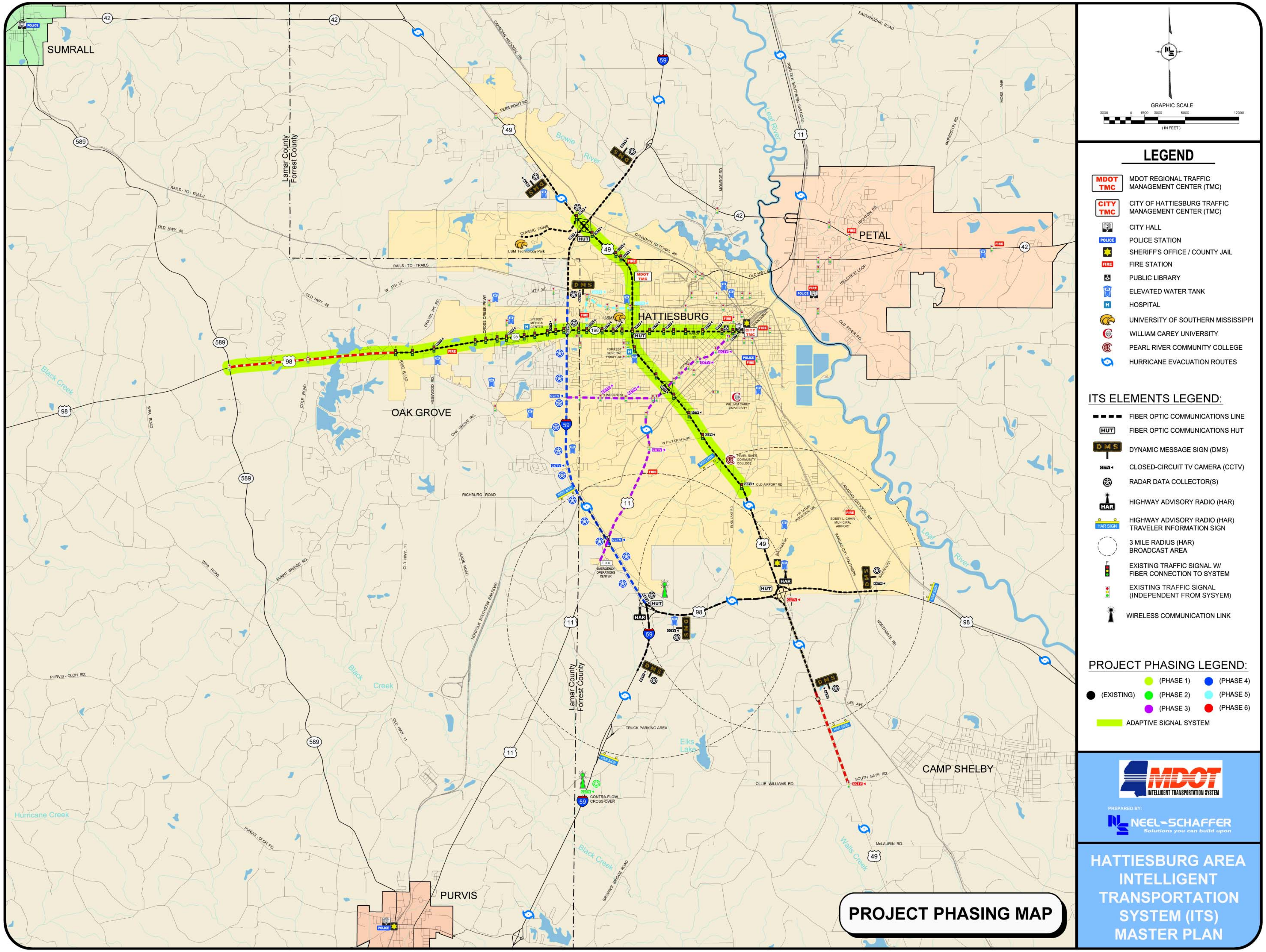

SUMRALL
HATTIESBURG
PETAL
OAK GROVE
CAMP SHELBY
PURVIS
Lamar County
Forrest County
GRAPHIC SCALE
LEGEND
MDOT REGIONAL TRAFFIC MANAGEMENT CENTER (TMC)
CITY OF HATTIESBURG TRAFFIC MANAGEMENT CENTER (TMC)
CITY HALL
POLICE STATION
SHERIFF'S OFFICE / COUNTY JAIL
FIRE STATION
PUBLIC LIBRARY
ELEVATED WATER TANK
HOSPITAL
UNIVERSITY OF SOUTHERN MISSISSIPPI
WILLIAM CAREY UNIVERSITY
PEARL RIVER COMMUNITY COLLEGE
HURRICANE EVACUATION ROUTES
ITS ELEMENTS LEGEND:
FIBER OPTIC COMMUNICATIONS LINE
FIBER OPTIC COMMUNICATIONS HUT
DYNAMIC MESSAGE SIGN (DMS)
CLOSED-CIRCUIT TV CAMERA (CCTV)
RADAR DATA COLLECTOR(S)
HIGHWAY ADVISORY RADIO (HAR)
HIGHWAY ADVISORY RADIO (HAR) TRAVELER INFORMATION SIGN
3 MILE RADIUS (HAR) BROADCAST AREA
EXISTING TRAFFIC SIGNAL W/ FIBER CONNECTION TO SYSTEM
EXISTING TRAFFIC SIGNAL (INDEPENDENT FROM SYSYEM)
WIRELESS COMMUNICATION LINK
PROJECT PHASING LEGEND:
(EXISTING)
(PHASE 1)
(PHASE 2)
(PHASE 3)
(PHASE 4)
(PHASE 5)
(PHASE 6)
ADAPTIVE SIGNAL SYSTEM
PREPARED BY:
NEEL-SCHAFFER
PROJECT PHASING MAP
HATTIESBURG AREA INTELLIGENT TRANSPORTATION SYSTEM (ITS) MASTER PLAN

Figure 3

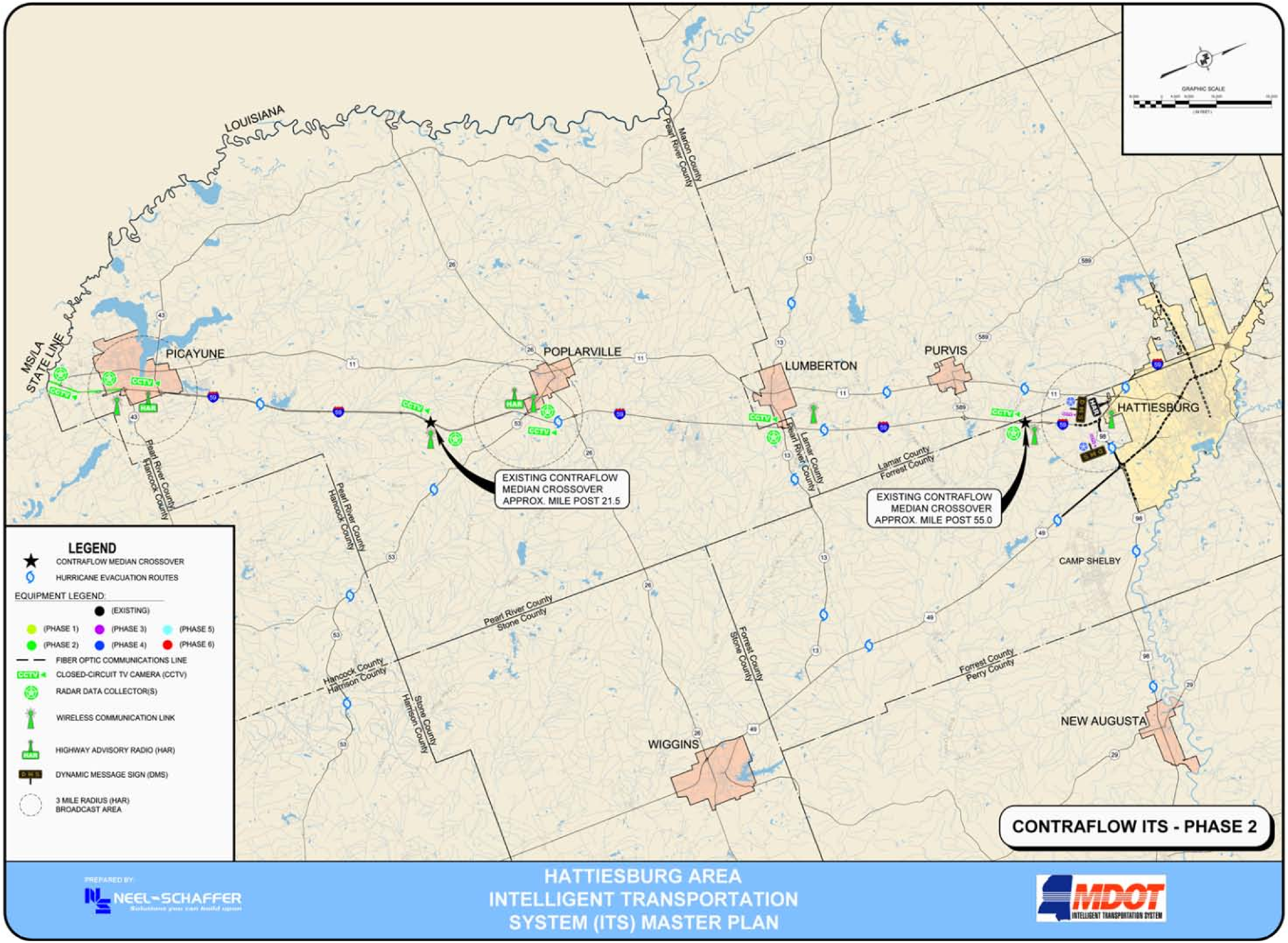

LOUISIANA
MS/LA STATE LINE
PICAYUNE
POPLARVILLE
LUMBERTON
PURVIS
HATTIESBURG
CAMP SHELBY
NEW AUGUSTA
WIGGINS
Pearl River County
Marion County
Hancock County
Harrison County
Stone County
Lamar County
Forrest County
Perry County
EXISTING CONTRAFLOW MEDIAN CROSSOVER APPROX. MILE POST 21.5
EXISTING CONTRAFLOW MEDIAN CROSSOVER APPROX. MILE POST 55.0
LEGEND
CONTRAFLOW MEDIAN CROSSOVER
HURRICANE EVACUATION ROUTES
EQUIPMENT LEGEND:
(EXISTING)
(PHASE 1)
(PHASE 2)
(PHASE 3)
(PHASE 4)
(PHASE 5)
(PHASE 6)
FIBER OPTIC COMMUNICATIONS LINE
CLOSED-CIRCUIT TV CAMERA (CCTV)
RADAR DATA COLLECTOR(S)
WIRELESS COMMUNICATION LINK
HIGHWAY ADVISORY RADIO (HAR)
DYNAMIC MESSAGE SIGN (DMS)
3 MILE RADIUS (HAR) BROADCAST AREA
CONTRAFLOW ITS - PHASE 2
PREPARED BY:
NEEL-SCHAFFER
HATTIESBURG AREA
INTELLIGENT TRANSPORTATION
SYSTEM (ITS) MASTER PLAN
MDOT

Figure 4

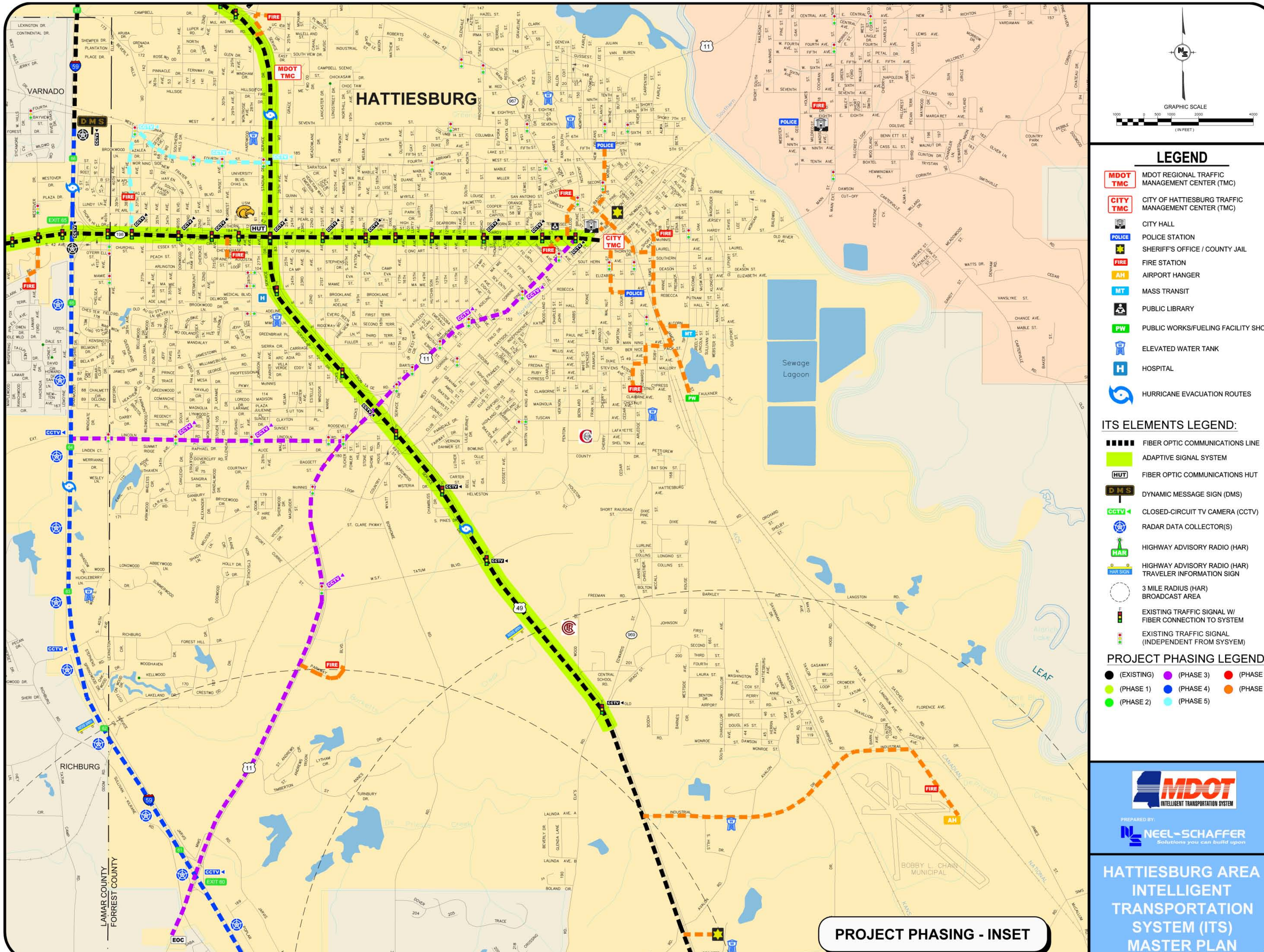

HATTIESBURG
VARNADO
RICHBURG
LAMAR COUNTY
FORREST COUNTY
Sewage Lagoon
MDOT TMC
CITY TMC
GRAPHIC SCALE
(IN FEET)
LEGEND
MDOT REGIONAL TRAFFIC MANAGEMENT CENTER (TMC)
CITY OF HATTIESBURG TRAFFIC MANAGEMENT CENTER (TMC)
CITY HALL
POLICE STATION
SHERIFF'S OFFICE / COUNTY JAIL
FIRE STATION
AIRPORT HANGER
MASS TRANSIT
PUBLIC LIBRARY
PUBLIC WORKS/FUELING FACILITY SHOP
ELEVATED WATER TANK
HOSPITAL
HURRICANE EVACUATION ROUTES
ITS ELEMENTS LEGEND:
FIBER OPTIC COMMUNICATIONS LINE
ADAPTIVE SIGNAL SYSTEM
FIBER OPTIC COMMUNICATIONS HUT
DYNAMIC MESSAGE SIGN (DMS)
CLOSED-CIRCUIT TV CAMERA (CCTV)
RADAR DATA COLLECTOR(S)
HIGHWAY ADVISORY RADIO (HAR)
HIGHWAY ADVISORY RADIO (HAR) TRAVELER INFORMATION SIGN
3 MILE RADIUS (HAR) BROADCAST AREA
EXISTING TRAFFIC SIGNAL W/ FIBER CONNECTION TO SYSTEM
EXISTING TRAFFIC SIGNAL (INDEPENDENT FROM SYSYEM)
PROJECT PHASING LEGEND:
(EXISTING)
(PHASE 1)
(PHASE 2)
(PHASE 3)
(PHASE 4)
(PHASE 5)
(PHASE 6)
(PHASE 7)
MDOT INTELLIGENT TRANSPORTATION SYSTEM
PREPARED BY:
NEEL-SCHAFFER
Solutions you can build upon
HATTIESBURG AREA INTELLIGENT TRANSPORTATION SYSTEM (ITS) MASTER PLAN
PROJECT PHASING - INSET

Figure 5

5.0 Regional System Analysis

5.1 Hattiesburg Region ITS Architecture

ITS Architecture documents are used in long-range planning and deployment of ITS elements and systems. Architectures have been developed for the Mississippi ITS program at the state and regional levels. Regional architectures are necessary to ensure ITS projects in the region are eligible for federal funding.

The current Hattiesburg Region ITS Architecture was developed in 2008 through identification, long range planning, solicitation of ITS needs from regional stakeholders, as well as identification of procurement, operation, and maintenance processes. The regional architecture boundary encompasses Forrest, Lamar, Perry and Jones Counties. As part of the Hattiesburg ITS Master Plan, it is important to document how the Hattiesburg Region ITS Architecture interrelates and conforms to the proposed ITS systems and services in the Hattiesburg ITS Master Plan

5.2 Applicable Market Packages

Market packages are systems with combinations of equipment that are related to each other and are operated by stakeholders. Different pieces of equipment within one market package may be operated by several different stakeholder agencies. For Instance, traffic cameras that are owned and maintained by the City of Hattiesburg may be operated by MDOT TMC staff and utilized by HFEOC staff for emergency operations. Another example of resource sharing would be radio communications infrastructure which is utilized by Hattiesburg Police and Fire Departments with the infrastructure overseen by HFEOC staff. The market package summary shown in **Table 3** links market packages to proposed ITS projects and project components described in section 4.

Table 3 – Applicable Market Package Summary

Project Phase	Project Description	Major Project Components	Applicable Market Package
Phase 1	**Adaptive Signal System** US 49 and US 98	TMC Signal Communications Detection	ATMS03 - Surface Street Control
Phase 2	**Contraflow ITS** CCTV, RDS and HAR on I-59 through Forrest and Pearl River Counties communicating via microwave point-to-point line of sight	TMC	EM01 - Emergency Response EM02 - Emergency Routing EM09 - Evacuation and Reentry Management EM08 - Disaster Response and Recovery
		CCTV	ATMS01 - Network Surveilance
		RDS	ATMS01 - Network Surveilance
		HAR	EM06 - Wide Area Alerts EM10 - Disaster Traveler Information
Phase 3	**US 11/Broadway Drive and Lincoln Road ITS** Fiber Optics and Interconnects to HFEOC with CCTV and Traffic Signals on Broadway Drive, Lincoln Road and US Hwy 11	CCTV	ATMS01 - Network Surveilance
		Signal Communications	ATMS03 - Surface Street Control
Phase 4	**I-59 ITS** Fiber Optics, CCTV and RDS on I-59 from 4th Street to US 98E	CCTV RDS	ATMS01 - Network Surveilance
Phase 5	**4th Street and 38th Avenue ITS** Fiber Optics and CCTV along 4th Street from 38th Avenue to US Hwy 49	CCTV	ATMS01 - Network Surveilance
Phase 6	**US 98 and US 49 ITS** Fiber Optics, Traffic Signal Interconnects and CCTV on US 49S and US 98	CCTV	ATMS01 - Network Surveilance
		Signal Communications	ATMS03 - Surface Street Control
Phase 7	**Transportation and Emergency Response Communications Project** Hattiesburg and County Transportation Related Municipal Building Interconnects	HFEOC	CV10-HAZMAT Management EM01 - Emergency Response EM02 - Emergency Routing EM08 - Disaster Response and Recovery
		Police	EM02 - Emergency Routing APT05 - Transit Security
		Fire	EM02 - Emergency Routing
		Public Works	MC07 - Roadway Maintenance MC08 - Work Zone Management
		Mass Transit	APTS01 - Transit Vehicle Tracking APTS02 - Transit Fixed-Route Operations APTS03 - Demand Response Transit Ops APTS05 - Transit Security APTS06 - Transit Maintenance APTS07 - Multimodal Coordination APTS08 - Transit Traveler Information
		Fueling Facility	EM08 - Disaster Response and Recovery

6.0 Analysis of Communications and Technology Options

A communication network is simply a group of connected devices which are communicating with each other. An example of these connection devices are telephones and computers. A communication network is the transmission of data in analog or voice communication between two or more devices. There are a number of different types of communication technologies available for ITS system applications. Some of these technologies are listed below but may not be suitable for the city's needs. However, it is important that this SEA identify the various elements as required by MDOT for the SEA analysis. The following is a list of various technologies currently being used throughout the communication industry:

- Fiber Optic Cable
- Cellular Digital Package Data
- Global System for Mobile Communication
- Radio Frequency (spread spectrum)
- Terrestrial Microwave Links
- Area Radio Network
- Telephone Leased Lines
- Code-Division Multiple Access (CDMA)

The critical factors in the selection of a preferred communication alternative are as follows:

- High reliability and availability
- Low capital and operating cost
- Provisions for high bandwidth capacity and transmission speed
- Protection of the interconnected server, workstations and controllers from unauthorized access

General advantages of a direct wire communication connection versus a wireless system are the following:

- Bandwidth is limited only to the devices
- Life span of 15+ years
- Connections can only be interrupted by invasive measures
- Maintenance is generally less than the wireless
- Security of the cable in the ground or on aerial lines

General disadvantages of direct wire connection versus a wireless system are as follows:

- Susceptible to being broken by construction activities or weather problems for aerial installations
- Requires costly conduit for underground installations
- Installation cost is higher than that of wireless
- Limited to serve fixed locations (no connections to mobile operations)

6.1 Fiber Optic Cable (Single Mode)

Fiber-optic cable is fast becoming the medium of choice for most telecommunication applications. It has a very high capacity and uses light to transmit signals, making it immune to electromagnetic interference. It can be placed underground in conduits, directly buried, or strung up along utility poles. Fiber-optic communication uses a beam of light that is generated by a laser diode. This pulse of light with wave lengths between 850 and 1550 nanometers turn on and off depending on the logic state of the transmitted data bits. Fiber-optic cables are typically bundled with multiple fibers, providing several data channels. Data rates of up to 2.4 Gigabytes (2.4 billion bytes) per second can be accommodated by using Time Division Multiplexing (TDMP). Data can be transmitted over several miles (20 to 30) and the transmission range is rarely a limitation provided communication hubs and fiber-optic repeaters are installed.

To ensure quality performance, the bend radii must be limited to avoid signal attenuation (data loss). This requires pull-box entry and interval characteristics different from those used for coax cable installation. Special installation requirements are also needed for the placement of the fiber-optic cable during construction to avoid damaging the fiber-optics. In addition, splicing fiber-optic cable to interface with traffic signal controllers will require a unit to convert the controller's electric signals into light signals which could be transmitted over the fiber-optic lines. Many cities are finding that fiber-optic cable is ideal as a trunk line (backbone), which is then spliced off into another medium to serve peripheral locations.

The advantages of the use of single mode fiber optic cable are as follows:

- Allowable distance between transmission equipment, transmission rate, and bandwidth capacity is significantly greater than any other communication method, thereby providing nearly unlimited future system expansion.
- Lighting protection devices are not required.
- Ratio of cable diameter to bandwidth capacity is very small.
- Provides highest level of security when properly monitored.
- Not susceptible to electro-magnetic and radio frequency interference.
- Not susceptible to corrosion.
- Provides high transmission reliability if quality materials are used and tested.
- Pre-terminated fiber available for quick installations and no splicing required.

The disadvantages of single mode fiber optic cable are as follows:

- Splicing and connector termination requires specialized equipment and skilled technicians.
- Technician training is required for repairing and replacing and testing fiber cable.
- Test equipment is more complex and expensive relative to copper testing.
- Susceptible to breaking if the fiber bends are smaller than the recommended bending radius or excessive load is applied in the installation.
- Requires devices to convert from optical to electrical end users.
- Substantial capital cost of the installation.
- Preterminated fiber requires additional planning since the fiber is dropped off the backbone and no longer continuous beyond the drop point.

6.3 Cellular Digital Packet Data (CDPD)

CDPD is a packet switched full duplex data communication system that cellular carriers use specifically for data transmission and as a means of filling unused voice channel capacity.

The advantages of CDPD are as follows:

- Eliminates need for incurring underground cable installation costs.
- Not susceptible to electro-magnetic interference and limited susceptibility to radio frequency interference.
- Maximum flexibility in locating and moving the required modem.

The disadvantages of CDPD are as follows:

- Requires payment of a recurring service fee.
- Major carriers plan to discontinue CDPD services with the migration to 3G technologies.
- Transmission speed limited to 28.8 Kbps.
- Dependent on cellular coverage provided by existing infrastructure.
- Requires separate modem for each controller.

6.4 Global System for Mobile Communication (GSM)

CDMA is the dominant technology for cellular and/or PCS networks in North America. GSM is the dominant technology for cellular and/or PCS networks in other countries such as Europe. Cellular and PCS differ primarily in their respective operational frequency band of 800 MHz for cellular and 1900 MHz for PCS.

The advantages for GSM are as follows:

- Lower cost of the data rate plans for wireless WANS, process for these plans have fallen significantly creating a more compelling demand to switch to wireless data networks for remote device communication
- New technology gives wireless gateways the ability to maintain an always on connection without being charged for the total airtime
- Maximum flexibility in locating and moving the required gateways
- Transmission speed of Mbps can be achieved with EDGE technology where service is available

The disadvantages are as follows:

- Airtime costs excessive for continuous communication service
- Only two providers in one area
- Actual data throughput is reduced due to protocol overhead
- Remote areas may not have service

6.5 Radio Frequency (Spread Spectrum)

This medium of communication, originally developed for military purposes, uses a coded message spread over a range of frequencies instead of one narrowband frequency. This enables a large number of individual transmissions to share the same frequency band without interfering with each other. As with other radio media, it requires a line of sight between the source transmitter and receiver. The bandwidth is spread by means of a code which is independent of the data. The independence of the code distinguishes this from standard modulation schemes in which the data modulation will always spread the spectrum. Frequency hopping and direct sequence systems are the most widely used implementation of this technology.

Most cities are interested in wireless spread spectrum radio communication because they require a power level of less than one watt and have a minimal licensing requirement to obtain frequency use through the federal government. This power level would be sufficient to transmit control and surveillance data and compressed video signals, but would be unsuitable for transmitting high quality, full motion video. The technology appears to hold promise, but has not been widely applied in traffic signal systems.

The advantages of radio frequency transmission are as follows:

- Eliminates need for incurring underground cable installation cost
- Not susceptible to electro-magnetic interference
- Provides a low probability of intercept and includes anti-jam features
- Radio frequency interference with narrowband communication is minimized by use of lower spectral power density and for hopping implementation an ability to reconstruct the data when some frequencies are blocked
- Does not require a FCC license to operate

The disadvantages of radio frequency transmission are as follows:

- Requires overhead location to mount antennas that maintain line of sight
- Requires routing cable and conduit from antenna to modem installed in cabinet
- Requires separate modem for each controller
- Limited susceptibility to radio frequency interference
- Requires highest equipment expenditure including sufficient spares, operating and maintenance cost
- Antenna is susceptible to vandalism
- Requires special skills and equipment to maintain
- Requires the most training to maintain
- Limited bandwidth, streaming video not an option

6.6 Terrestrial Microwave Links

Terrestrial Microwave is a line of sight technology that cannot extend beyond the earths horizon. Long distance terrestrial transmission of data is accomplished using relay points known as Hops. Typically, each Hop consists of a tower with one antenna for receiving and another for transmitting. Terrestrial Microwave Linkks operate in the low-gigahertz range, typically at 4-6 GHz, 11 GHz, 18 GHz and 21-23 GHz. Microwave transmission uses directional beams of radio waves sent and received by parabolic dish antennae. Microwave links offer the advantage of long distance communication without the need for costly underground or aerial cables. Microwave communication is capable of providing high-capacity, high-data rate transmission over many miles at a substantial lower cost. This technology is limited to line of sight transmissions and is subject to interference from wave reflection, heavy rains, and atmospheric effects. The Federal Communication Commission (FCC) has varying licensing requirements for different power levels and frequencies. Depending on the configuration, high quality, full motion video can be transmitted using microwaves.
The advantages of terrestrial microwave transmission are as follows:

- Useful as a point-to-point trunk communication
- Can transmit data and limited number of full motion video channels
- Can control groups of traffic control devices
- Can use both analog and digital transmission
- Offers the highest data throughput rates of wireless technology

The disadvantages of terrestrial microwave transmission are as follows:

- Line of sight may be required based on the frequency.
- Requires FCC license
- Channel availability limited
- Possible interference due to rain, snow, and other atmospheric effects
- Require an antenna on towers
- Available bandwidth usually limited
- Typically most expensive wireless technology to implement

6.7 Area Radio Network (ARN)

Area Radio Network (ARN) is representative of a radio network usually operating in the UHF/VHF frequency band. These networks are normally used for in-house communications of equipment devices, maintenance staff, and personnel.

The advantages of ARN are as follows:

- Can operate traffic controllers or other devices
- Can provide voice communication to highway maintenance workers
- Can support 9600 baud data rate
- Can be cost effective depending on application

The disadvantages of ARN are as follows:

- Terrain may be limited
- Limited channel availability in urban areas
- Requires antenna at each site
- Turnaround time excessive for some application
- Service reliability may be limited use for some applications

6.8 Telephone Lease Lines

Telephone lease lines are lines which are permanently routed by the phone company between two points. Since they are not switched through the telephone network, they provide a more reliable connection with less noise than switched lines. These lease lines range in capacity from the basic phone service of (9600 baud) to T1 (1.54 Mbps) and T3 (43.7 Mbps). These lines have installation fees and fixed monthly service and mileage charges.

The advantages of the telephone line are as follows:

- Can operate traffic controllers or other devices
- Can provide video transmission at low fps
- Asymmetric Digital Subscriber (ADSL) can support full motion video

The disadvantages of the telephone line are as follows:

- ADSL leasing costs are high
- Limited video transmission availability

6.9 Code-Division Multiple Access (CDMA)

CDMA refers to any protocols used in so-called second generation (2G) and third generation (3G) wireless communications. As the term implies, CMDA is a form of multiplexing, which allows numerous signals to be transmitted in a single transmission channel, optimizing the use of available bandwidth. The technology is used in ultra-high-frequency (UHF) cellular telephone systems in the 800 MHz and 1.9 GHz bands. CDMA employs analog-to-digital conversation (ADC) in combination with spread spectrum technology. Audio input is first digitized into binary elements. The frequency of the transmitted signal is then made to vary according to a defined patter (code) so that it can be intercepted only by a receiver whose frequency response is programmed with the same code, and so it follows along with the exact transmitter frequency. There are trillions of possible frequency-sequencing codes which enhance privacy and makes cloning difficult.

The CDMA channel is nominally 1.23 MHz wide. CMDA networks use a scheme called soft handoff which minimizes signal breakup as a handset passes from one cell to another. The combination of digital and spread-spectrum modes supports several times as many signals per unit bandwidth as analog modes. CDMA is compatible with other cellular technologies which allows for nationwide roaming. The original CDMA standards also known as CDMA One and still common in cellular telephones in the US only offers a transmission speed of up to 14.4 Kbps in its single channel form and up to 115 Kbps in an eight-channel form. CDMA 2000 and wideband CDMA delivers data many times fasters.

The advantages of CDMA are as follows:

- Frequency diversity
- Multi-path resistance
- Privacy/security
- Graceful degradation

The disadvantages with CDMA are as follows:

- Self-jamming due to sequences are not exactly orthogonal
- Near-far problem in transmission
- Soft hand-off
- Not suitable for very high byte rates (like a WLAN)
- Monthly service subscription cost

7.0 Development of System Concepts

A brief summary of the various types of communication technologies identified in the previous section are used by cities, counties and state DOT for ITS communication. These communication system concepts are typical in communication technologies and their maturity levels are listed below.

Technology	Maturity
• Fiber Optic (Single Mode)	Proven
• Cellular Digital Packet Data	Proven
• Global System Mobile Communication	Proven
• Radio Frequency (spread spectrum)	Proven
• Terrestrial Microwave	Proven
• Area Radio Network (ARN)	Proven
• Leased Telephone Lines	Proven
• Code-Division Multiple Access	Proven

7.1 Communication Network Concept

The communication or transmission media for the new network can utilize hard-line cable, wireless media, or a combination of both. A hard-line connection is by far the most expensive cost in implementing a communication network. However, it does provide the best option for safety, security, and maintenance. Hard line cable connection is still the most practical and proven method for agencies to provide ITS communication. The fiber-optic cable will provide the necessary high bandwidth capability required for the communication network.

8.0 Procurement Options

This project is in the initial preliminary planning study and deployment plan for the communication and various ITS elements within the Hattiesburg area and adjacent regional facilities. As the project moves forward into the various implementation phasing as recommended, the city or MDOT will use typical State procurement procedures. It will probably go through the MDOT procurement process with the normal low-bid selection and construction process. It is noted that some of the ITS elements may be under a current state contract or that the state may also identify certain ITS equipment to be consistent with the statewide communication network. For implementation and construction, final specifications will be required for the communication and various ITS elements and that the manufacturer is qualified to provide these devices and communication system.

9.0 Identification of ITS Standards and Testing

As mentioned, this project is in the initial preliminary planning and deployment planning stage for the communication and ITS elements. As this project moves into the design and construction stages, all of the ITS devices, equipment and communication infrastructure will meet the latest approved National Transportation Communication for ITS protocols (NTCIP) standards. In addition, the project will meet the latest MDOT ITS standards and specification for ITS construction projects. The specifications required for the various ITS elements and communication will meet compliance with the NEMA Standards Publications and the NTCIP requirements.

9.1 Communication Testing

All testing shall meet the latest state MDOT standards and specification for testing fiber optic cable and communication devices. The Contractor shall notify the city/state Project Engineer in writing, a minimum of seven (7) days before the scheduled start of any testing to permit attendance of the appropriate personnel. The Contractor shall be totally responsible for the documentation of the results of all tests.

During the fiber optic cable tests, all transient suppression devices shall be disconnected. If any test is failed, repairs or cable replacement shall be made by the Contractor and the entire test series for the fiber optic cable shall be repeated. The cost or repairs including the replacement or reinstallation of cable shall be absorbed by the Contractor. All test equipment shall be provided by the Contractor and all tests shall be conducted in the presence of the city or state Project Engineer. The Contractor shall perform the tests and document the test results. The testing will include:

- Pre-installation OTDR Testing
- Post installation Testing
- Warranty and Maintenance
- As Built Documentation

The tests are completed and whether successful or not, the test results shall be furnished to the city/state agency for acceptance. The tests shall be conducted for all fibers including spares and shall include all field terminations. Test procedures shall be submitted to the city/state for approval prior to testing.

10.0 Implementation Plan

The following provides details into the implementation of the proposed ITS project phasing in the Hattiesburg Area.

10.1 Adaptive Signal System on US 49 and US 98

Table 10.1 – Proposed Phase 1 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project

Adaptive Signal System - US Hwy 98 and US Hwy 49

US Hwy 49 from Elks Lake Road to Classic Drive (12 intersections);

US Hwy 98/SR 198/Hardy Street from SR 589 to Pine Street (27 intersections)

1. Document existing equipment inventory and existing system effectiveness
2. Communications equipment upgrades (Fiber Optic Switches)
3. Detection upgrades at 39 singalized intersections within project limits
4. Adaptive signal software install at Regional and Statewide TMCs
5. Document new system effectiveness

Phase 1 Implementation

Item	Quantity		Unit Cost	Extension
Intersection Detection Upgrade	39	EA	$ 30,000	$ 1,170,000.00
Intersection Comm. Upgrades	10	EA	$ 5,000	$ 50,000.00
TMC Modifications	1	LS	$ 350,000	$ 350,000.00
Subtotal				**$ 1,570,000.00**
Preliminary Engineering	8%			$ 125,600.00
Construction Engineering	10%			$ 157,000.00
Total Project				**$ 1,852,600.00**

Federal Funding Requested Provided 80% Match

$ 1,482,080 FY 2013

Figure 10. 1W, Phase 1 West

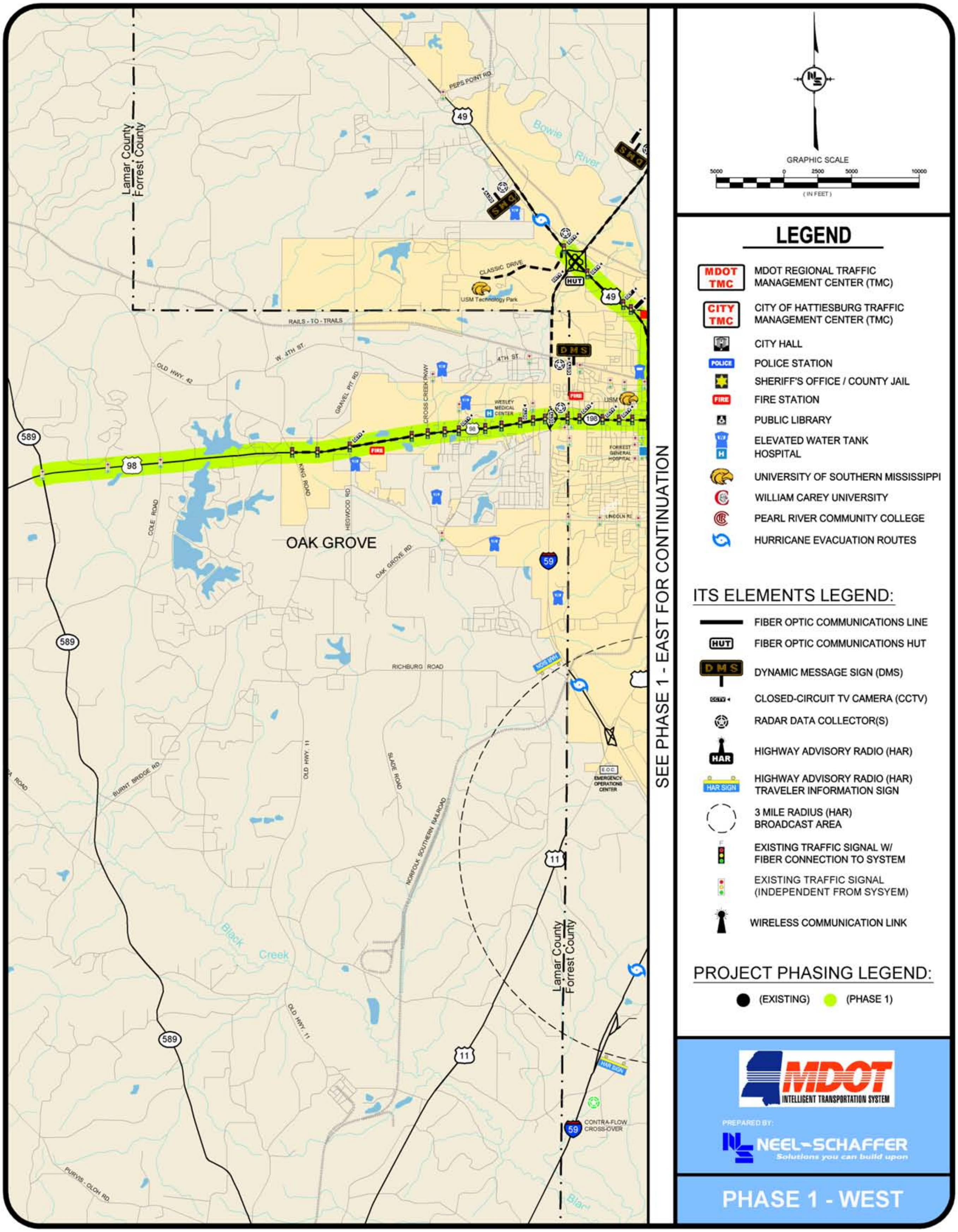
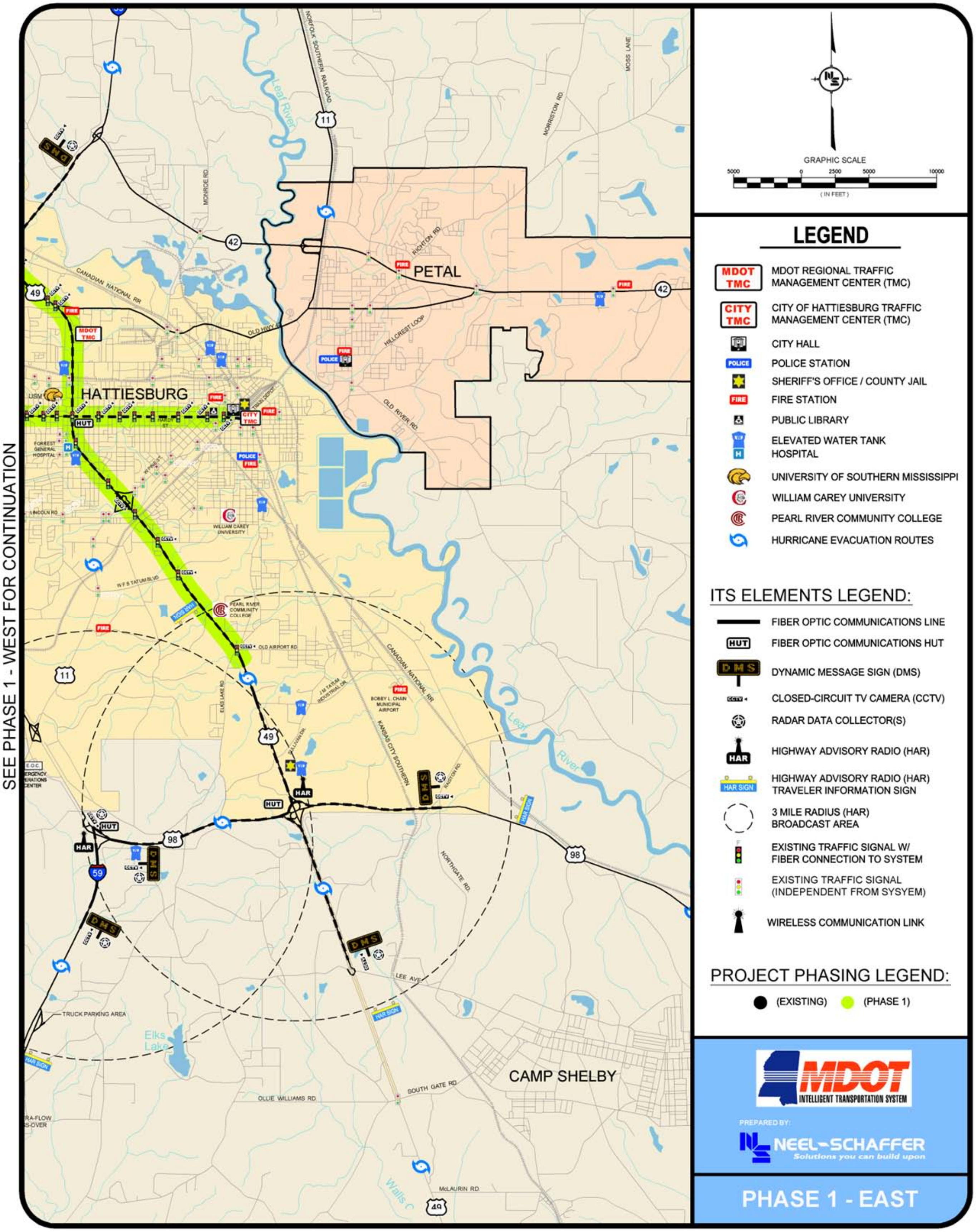


Figure 10. 1E, Phase 1 East



10.2 Contraflow ITS

Table 10.2 – Proposed Phase 2 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project

Contraflow ITS - I-59 through Forrest and Pearl River Counties

Microwave Communications between I-59 Contraflow ITS devices and Regional ITS System

Seven Traffic Camera and Radar Detection Sites and Two Highway Advisory Radio Sites

1. Long-Haul microwave transmitter/reciever installs (100' Height on ROW)
2. Fixed camera, PTZ camera, RDS and HAR installations at I-59 contraflow sites
3. Microwave subscriber unit installs at field devices
4. Statewide and Regional TMC Modifications

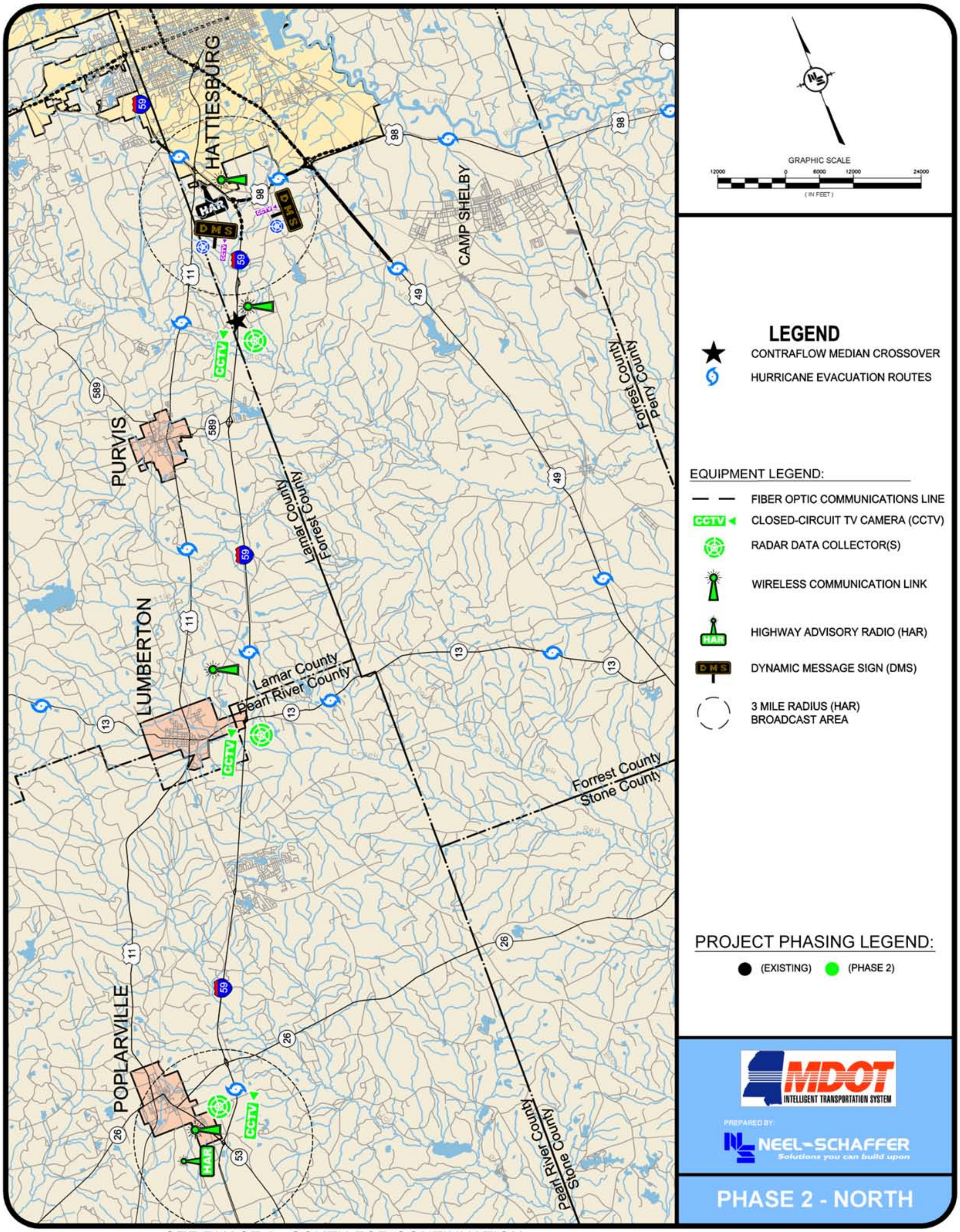
Phase 2 Implementation

Item	Quantity			Unit Cost		Extension
RDS	7	EA	$	6,000	$	42,000.00
CCTV (4 Fixed, 1 PTZ, 50' Pole)	7	EA	$	25,000	$	175,000.00
HAR System	2	EA	$	55,000	$	110,000.00
Microwave Subsriber Units	10	EA	$	9,000	$	90,000.00
Network Equipment, Enclosures	10	EA	$	25,000	$	250,000.00
Microwave Long Haul Sites	6	EA	$	135,000	$	810,000.00
TMC Modifications and Training	1	LS	$	125,000	$	125,000.00
Subtotal					**$**	**1,602,000.00**
Preliminary Engineering		8%			$	128,160.00
Construction Engineering		10%			$	160,200.00
Total Project					**$**	**1,890,360.00**

Federal Funding Requested Provided 80% Match

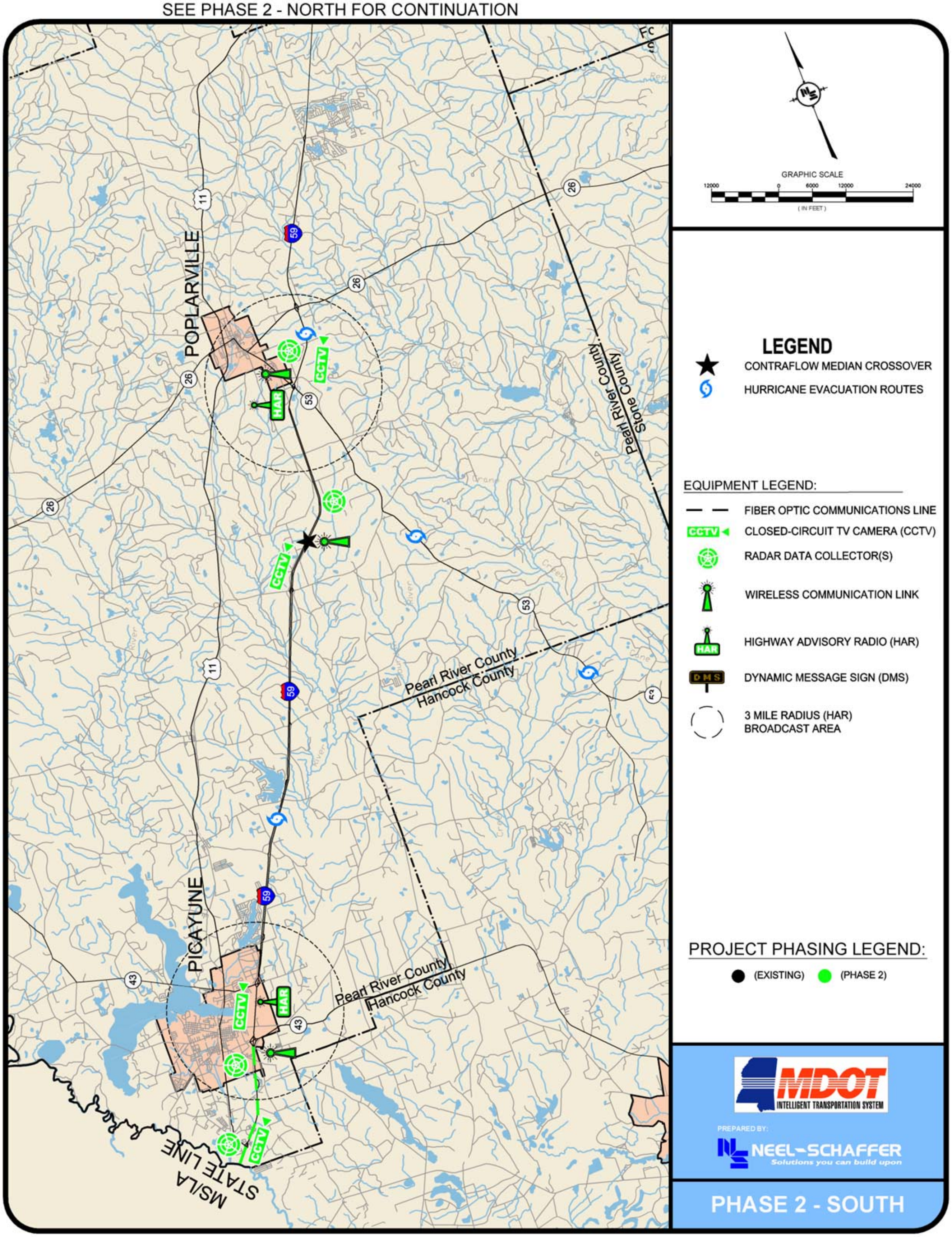
$ 1,512,288 FY 2013

Figure 10.2N, Contraflow ITS North



SEE PHASE 2 - SOUTH FOR CONTINUATION

Figure 10.2S, Contraflow ITS South



10.3 US 11 / Broadway Drive and Lincoln Road Fiber Optics

Table 10.3 – Proposed Phase 3 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project
US 11/Broadway Drive and Lincoln Road Fiber Optics

Fiber optics and traffic signal interconnects along US 11/Broadway Drive

Fiber optics and traffic signal interconnects along Lincoln Road.

1. Fiber Optic Trunk Line installation along US 11 / Broadway Drive and Lincoln Road.
2 Traffic Signal Interconnects along US 11 / Broadway Drive and Lincoln Road
3. Fiber Optic connections to HFEOC and City of Hattiesburg Communications
3. TMC modifications and training (TMCs, HFEOC, City of Hattiesburg Communications)

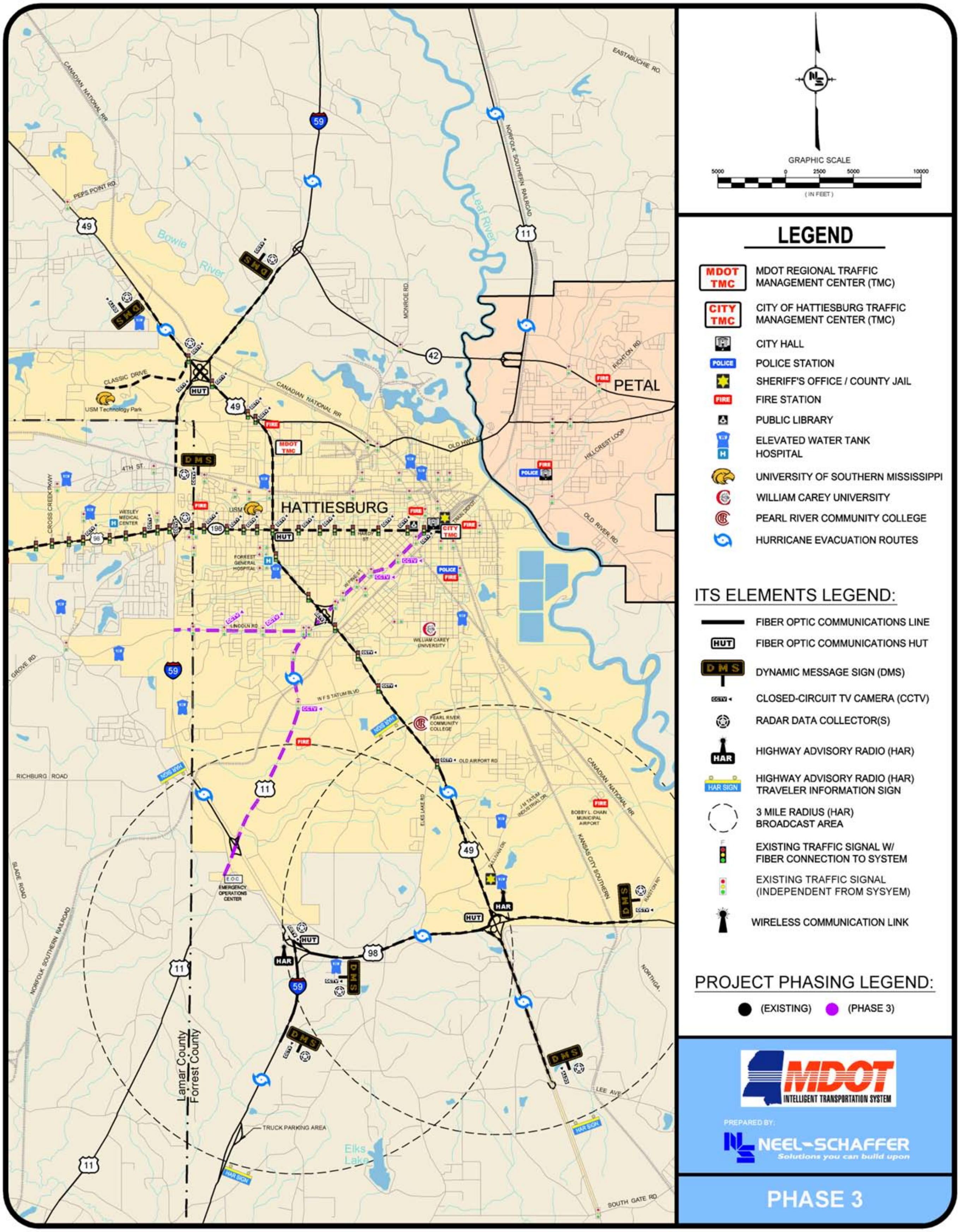
Phase 3 Implementation

Item	Quantity			Unit Cost		Extension
Fiber Optic Trunk (72SM in cond.)	38,764	LF	$	28	$	1,085,392.00
Fiber Optic Drop (12SM in cond.)	2,500	LF	$	15	$	37,500.00
Traffic Signal Interconnect	14	EA	$	3,000	$	42,000.00
Controller/Comm. Upgrades	14	EA	$	10,000	$	140,000.00
CCTV (2 Fixed, 1 PTZ, 20' Ext.)	6	EA	$	11,000	$	66,000.00
TMC/EOC Modifications	1	LS	$	150,000	$	150,000.00
Subtotal					**$**	**1,520,892.00**
Preliminary Engineering		8%			$	121,671.36
Construction Engineering		10%			$	152,089.20
Total Project					**$**	**1,794,652.56**

Federal Funding Requested Provided 80% Match

$ 1,435,722 FY 2013

Figure 10. 3, US 11 / Broadway Drive and Lincoln Road Fiber Optics



10.4 I-59 ITS in Hattiesburg

Table 10.4 – Proposed Phase 4 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project

I-59 ITS in Hattiesburg

Fiber optics along constructed along a seven mile stretch of I-59

Traffic cameras installed every mile, RDS installed every half mile

Driver feedback device at I-59 on-ramp from US 98 E

Hydroplane detection and advanced warning beacon with signage at mile marker 60

1. Fiber optics trunk installation on I-59 from 4th Street to I-59 / US 98 E Interchange
2. ITS field devices installed
3. TMC modifications and training

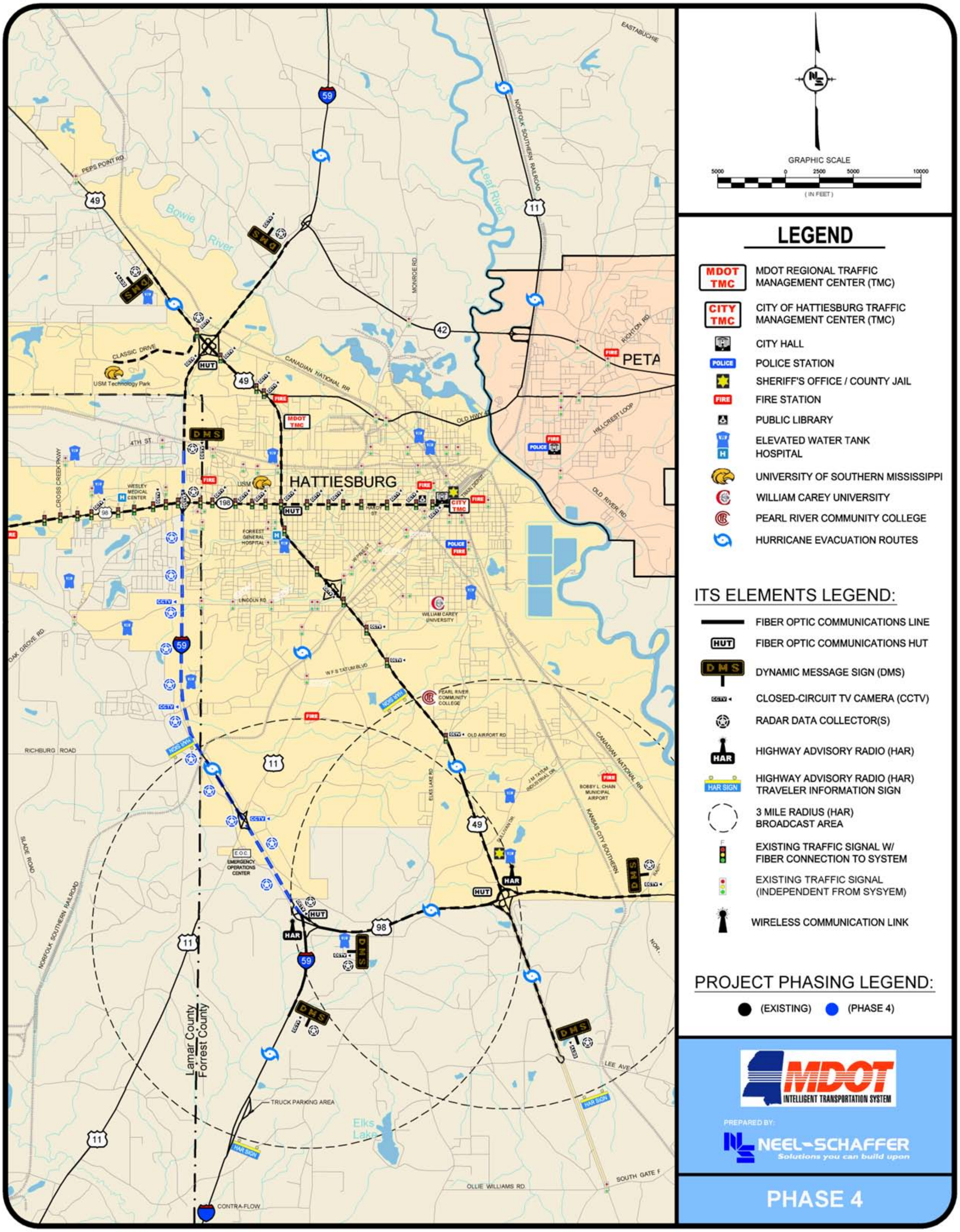
Phase 4 Implementation

Item	Quantity			Unit Cost		Extension
Fiber Optic Trunk (72SM in cond.)	36,674	LF	$	28	$	1,026,872.00
Fiber Optic Drop (12SM in cond.)	2,200	LF	$	15	$	33,000.00
CCTV (2 Fixed, 1 PTZ, 50' Pole)	3	EA	$	21,000	$	63,000.00
Hardened Network Switch Type A	11	EA	$	3,000	$	33,000.00
Encoder	11	EA	$	2,500	$	27,500.00
RDS (25' pole)	11	EA	$	10,000	$	110,000.00
Terminal Server	11	EA	$	1,200	$	13,200.00
Cabinet Type B	11	EA	$	6,500	$	71,500.00
Driver Feedback Detector/Signage	1	LS	$	30,000	$	30,000.00
Hydroplane Detector and Beacon	1	LS	$	25,000	$	25,000.00
TMC Modifications	1	LS	$	75,000	$	75,000.00
Subtotal					**$**	**1,508,072.00**
Preliminary Engineering		8%			$	120,645.76
Construction Engineering		10%			$	150,807.20
Total Project					**$**	**1,779,524.96**

Federal Funding Requested Provided 80% Match

$ 1,423,620 FY 2013

Figure 10. 4, I-59 ITS in Hattiesburg



10.5 US 11 / Broadway Drive and Lincoln Road Fiber Optics

Table 10.5 – Proposed Phase 5 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project

4th Street and 38th Avenue ITS

Fiber optics (Buried) constructed along 4th Street and 38th Avenue along the USM Campus

Cameras installed at 4th Street intersections with US 49, Golden Eagle Drive and 38th Ave.

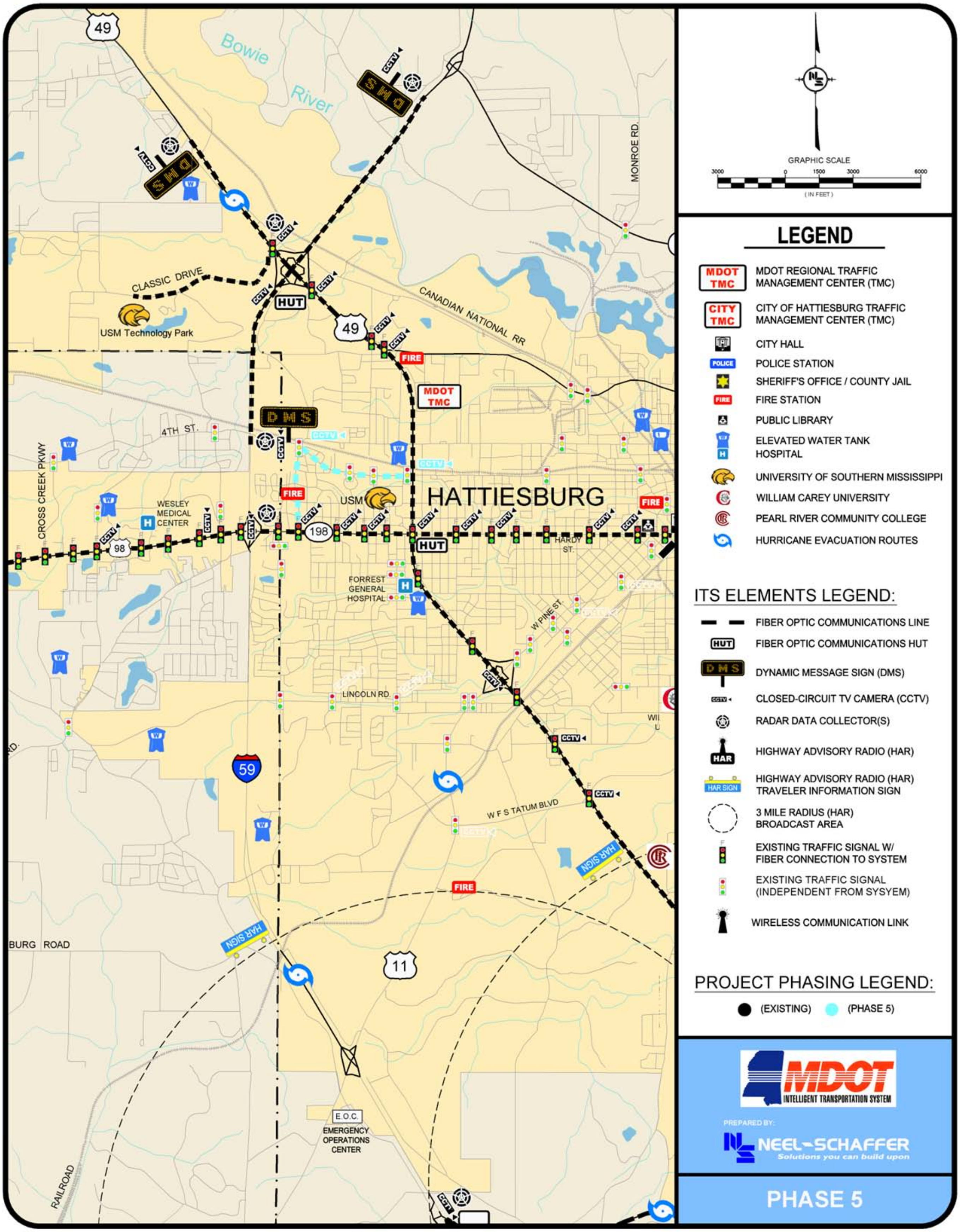
TMC Modifications at the Statewide and Regional TMCs as well as USM Police Ops Center

1. Fiber optics installation along 4th Street between US 49 and 38th Avenue
2. Fiber optics installation along 38th Avenue between 4th Street and Hardy Street
3. CCTV installations at 4th Street intersections with US 49, Goden Eagle Drive and 38th Ave.
3. TMC modifications and training

Phase 5 Implementation

Item	Quantity		Unit Cost		Extension	
Fiber Optic Trunk (72SM in Cond.)	9,200	LF	$	35	$	322,000.00
Fiber Optic Drop (12SM in Cond.)	600	LF	$	22	$	13,200.00
CCTV (4 Fixed, 1 PTZ, 50' Pole)	3	EA	$	26,000	$	78,000.00
Hardened Network Switch Type A	3	EA	$	3,000	$	9,000.00
Encoder	3	EA	$	2,500	$	7,500.00
Traffic Signal Interconnects	4	EA	$	1,500	$	6,000.00
Traffic Signal Controller Upgrades	4	EA	$	10,000	$	40,000.00
Cabinet Type B	3	EA	$	6,500	$	19,500.00
TMC Modifications	1	LS	$	35,000	$	35,000.00
Subtotal					**$**	**530,200.00**
Preliminary Engineering		8%			$	42,416.00
Construction Engineering		10%			$	53,020.00
Total Project					**$**	**625,636.00**
Federal Funding Requested Provided 80% Match						
			$	**500,509**	**FY 2013**	

Figure 10.5, 4th Street and 38th Avenue ITS



10.6 I-59 ITS in Hattiesburg

Table 10.6 – Proposed Phase 6 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project

US 49 and US 98 ITS

Fiber optic trunk extension on US 98 and US 49

Traffic camera installation at US 98 / US 49 interchange and US49 / Camp Shelby South Gate

Traffic Signal Interconnects at US 49 / Camp Shelby South gate and US 98 intersections with SR 589, Cole Road and Kind Road

1. Fiber optics installation along US 49 from Camp Shelby South Gate to Lee Avenue
2. Fiber optics installation along US 98 from King Road to SR 589
3. Traffic Signal Interconnects on US 98 at SR 589, Cole Rd., and King Rd. as well as US 49 intersection with Camp Shelby Southgate
4. CCTV installs at US 49 intersections with US 98 E and Camp Shelby South Gate
5. TMC modifications and training

Phase 6 Implementation

Item	Quantity		Unit Cost		Extension
Fiber Optic Trunk (72SM in Cond.)	29,476	LF	$	28	$ 825,328.00
Fiber Optic Drop (12SM in Cond.)	800	LF	$	15	$ 12,000.00
CCTV (4 Fixed, 1 PTZ, 50' Pole)	2	EA	$	26,000	$ 52,000.00
Hardened Network Switch Type A	5	EA	$	3,000	$ 15,000.00
Encoder	2	EA	$	2,500	$ 5,000.00
Traffic Signal Interconnects	4	EA	$	1,500	$ 6,000.00
Cabinet Type B	1	EA	$	6,500	$ 6,500.00
TMC Modifications	1	LS	$	35,000	$ 35,000.00
Subtotal					**$ 956,828.00**
Preliminary Engineering		8%			$ 76,546.24
Construction Engineering		10%			$ 95,682.80
Total Project					**$ 1,129,057.04**

Federal Funding Requested Provided 80% Match

$ 903,246 FY 2013

Figure 10.6W, US 49 and US 98 ITS West

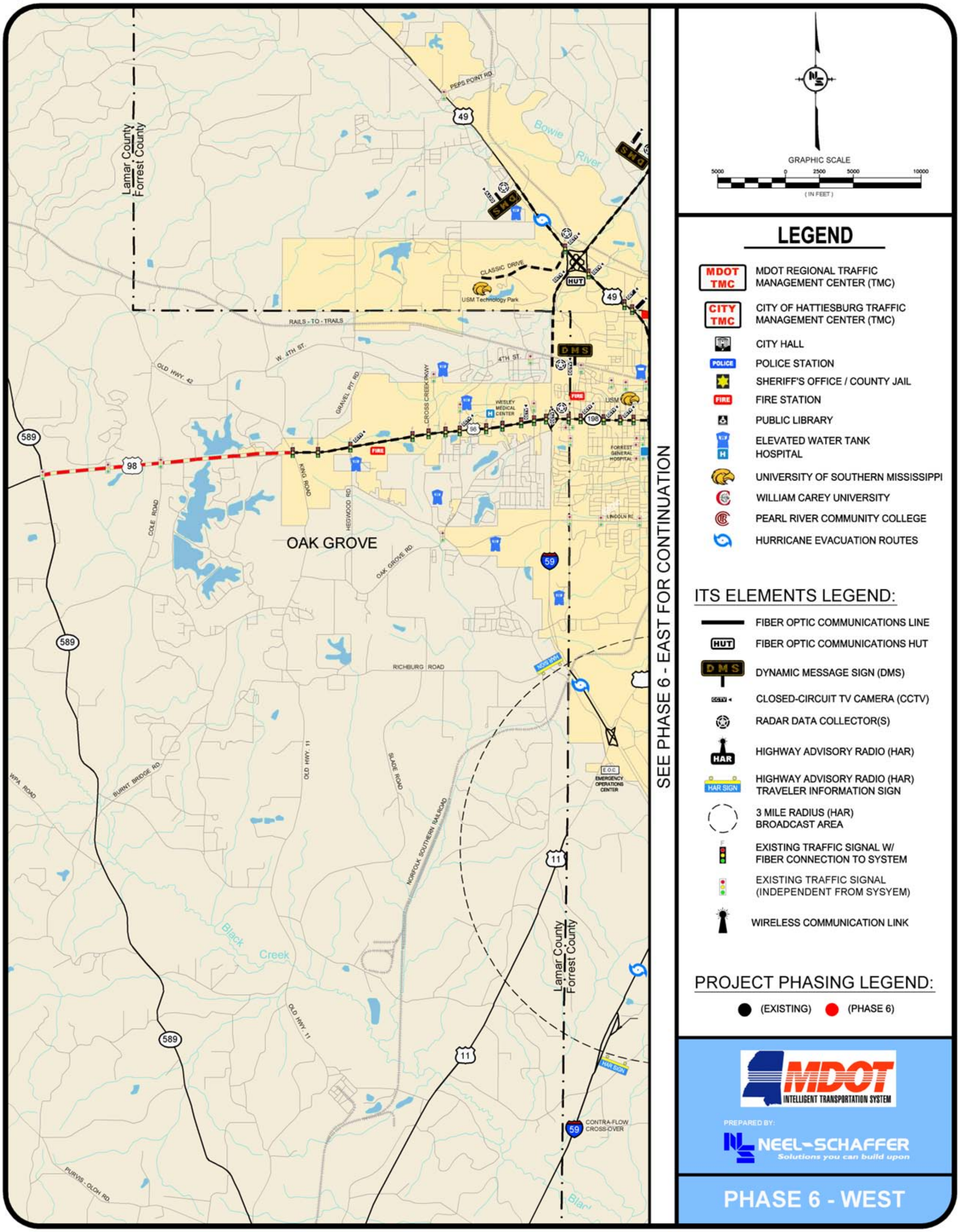
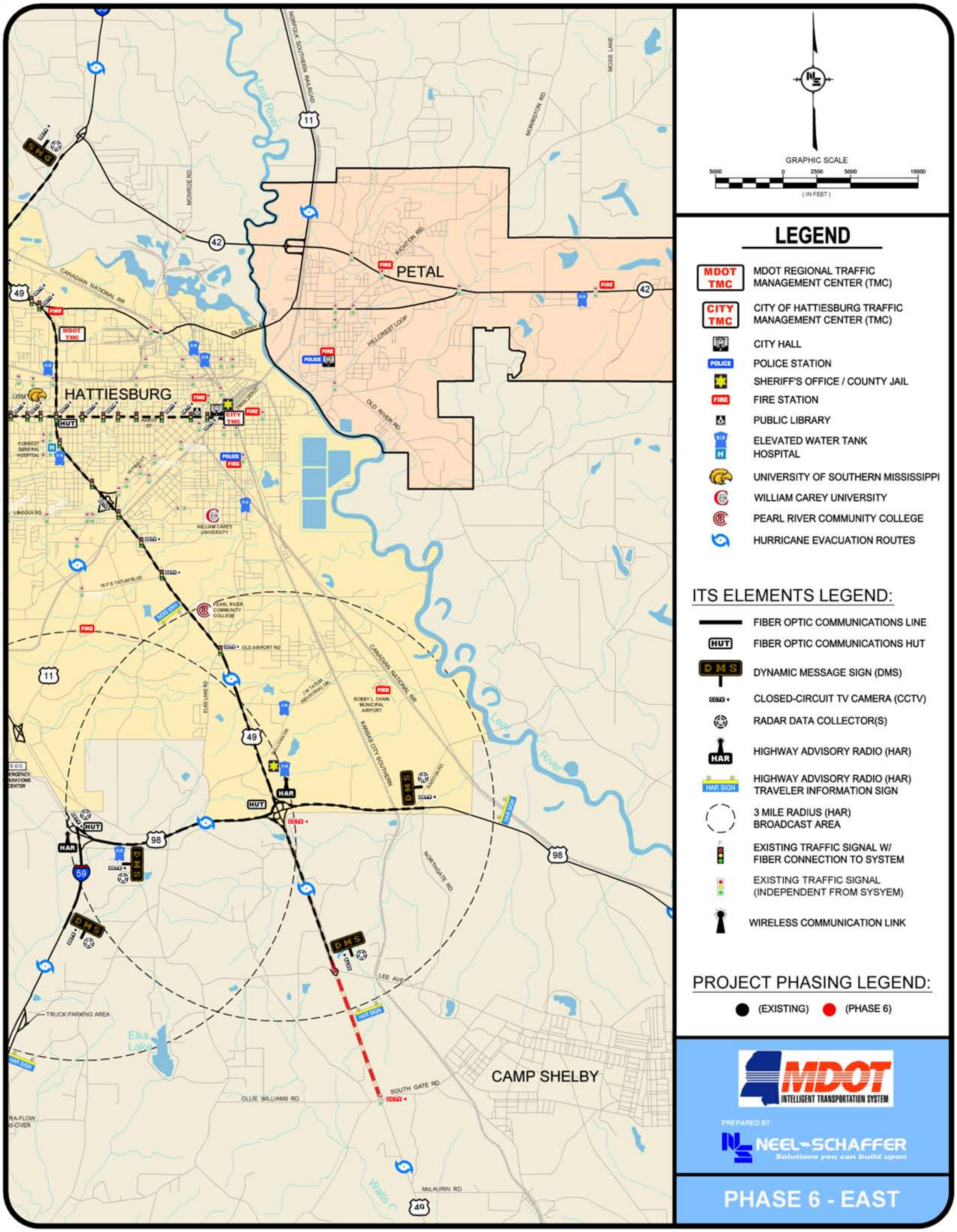


Figure 10.6E. US 49 and US 98 ITS East



10.7 Transportation and Emergency Response Communications Project

Table 10.7 – Proposed Phase 7 Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project

Transportation and Emergency Response Communications Project

Install conduit (primarily bored) and construct fiber optic entrances into buildings

Pull fiber optic trunks and fiber optic drops

Terminate proposed ITS fiber into transportation/response buildings

Server and communication equipment upgrades at Buildings

Update Statewide and Regional TMCs with appropriate modifications

Carry out training for system operation and maintenance

1. Install (buried) fiber trunk and drops to Hattiesburg Municipal Transportation/Response Facilities
2. Server and communication equipment upgrades for Hattiesburg Buildings
3. Install (buried) fiber trunk and drops to Forrest County Transportation/Response Facilities
4. Server and communication equipment upgrades for Forrest County Buildings
5. City of Hattiesburg System Training
6. Forrest County System Training
7. TMC Modifications and Training

Phase 7 Implementation

Item	Quantity			Unit Cost		Extension
Hattiesburg Municipal Bldg Mods. (21)	21	EA	$	60,000	$	1,260,000.00
Fiber Optic Trunk (72SM in Cond.)	25,000	LF	$	35	$	875,000.00
Fiber Optic Drop (12SM in Cond.)	17,000	LF	$	25	$	425,000.00
Forrest County Bldg Mods (3)	3	EA	$	60,000	$	180,000.00
Fiber Optic Trunk (72SM in Cond.)	3,200	LF	$	35	$	112,000.00
Fiber Optic Drop (12SM in Cond.)	1,000	LF	$	22	$	22,000.00
TMC Modifications and training	1	LS	$	75,000	$	75,000.00
Subtotal					**$**	**2,949,000.00**
Preliminary Engineering		8%			$	235,920.00
Construction Engineering		10%			$	294,900.00
Total Project					**$**	**3,479,820.00**

Federal Funding Requested Provided 80% Match

$ 2,783,856 FY 2013

Figure 10.7W, Transportation and Emergency Response Communications Project West

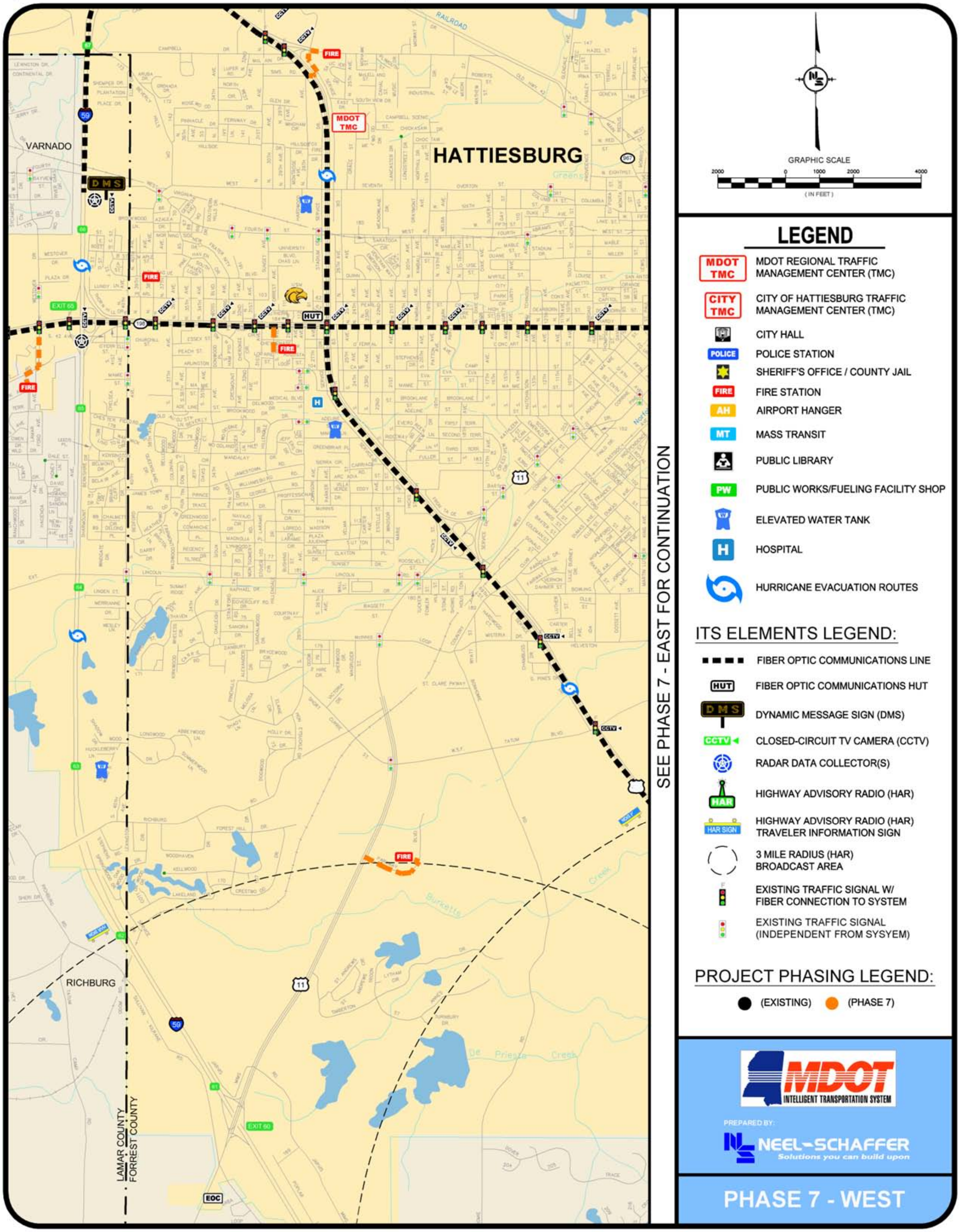
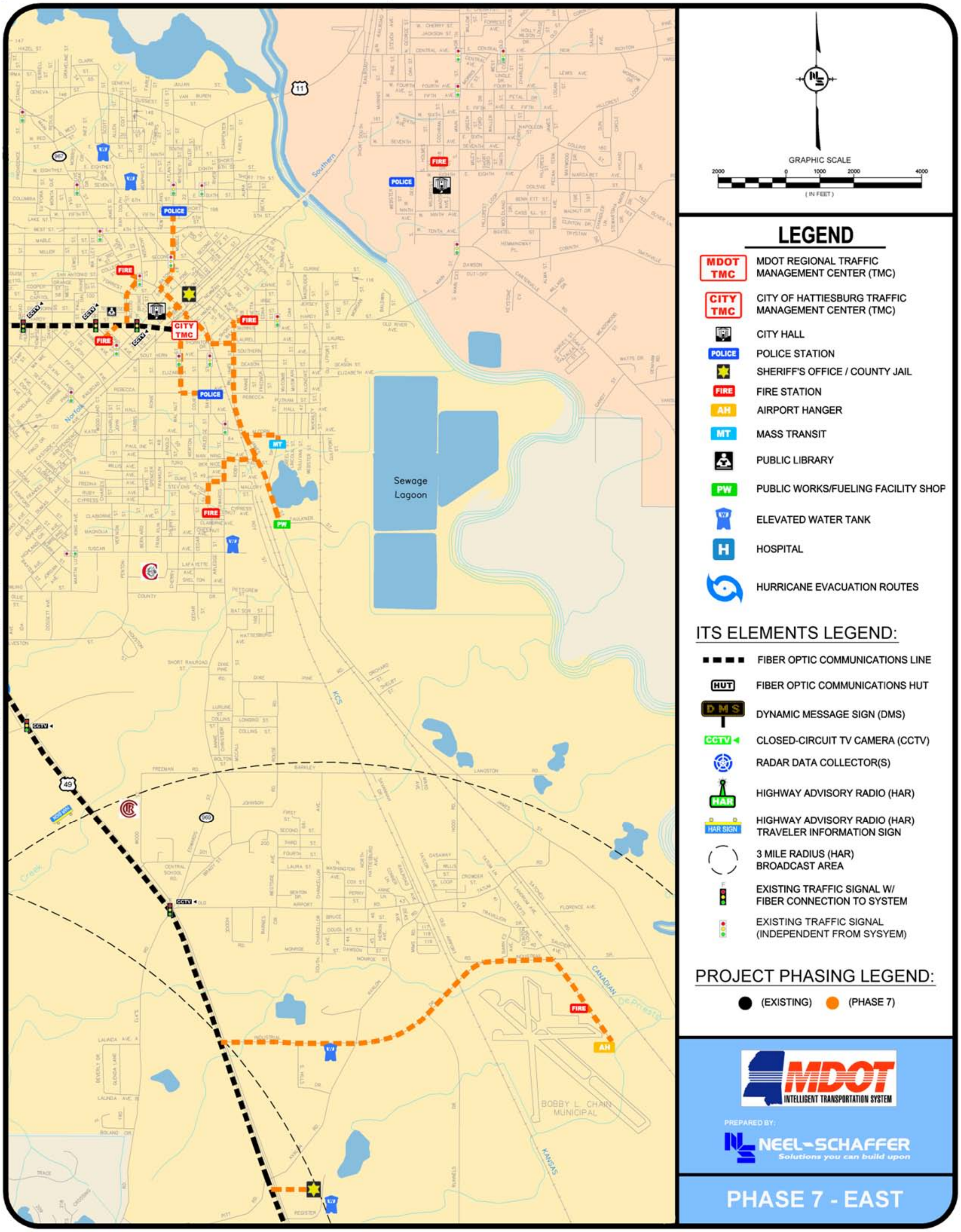


Figure 10.7E, Transportation and Emergency Response Communications Project East



10.7A Transportation and Emergency Response Communications Project (Alternate)

Table 10.7A – Proposed Phase 7A Implementation

Hattiesburg ITS
(Intelligent Transportation System)

Project
Transportation and Emergency Response Communications Project Alternate

Construct longhaul microwave system

Construct subscriber unit interconnects to longhaul system

Install subscriber transmitter/recievers at municipal and county transportation buildings

Interconnect to fiber via USM and Forrest General water towers

Update Statewide and Regional TMCs with appropriate modifications

Carry out training for system operation and maintenance

1. Install longhaul microwave links atop 5 existing water towers
2. Install subscriber transmitters/recievers atop water towers and interconnect to longhaul
3. Install subscriber transmitters/recievers at municipal and county transportation buildings
4. Interconnect to fiber via USM and Forrest General water towers
5. Update Statewide and Regional TMCs with appropriate modifications
6. Carry out training for system operation and maintenance

Phase 7 Alternative Implementation

Item	Quantity			Unit Cost		Extension
Longhaul Wireless Sites (PTP)	5	EA	$	135,000	$	675,000.00
Longhaul to Subscriber interconnect	24	EA	$	5,500	$	132,000.00
Hattiesburg Municipal Bldg Mods. (21)	21	EA	$	60,000	$	1,260,000.00
Microwave Subscriber Units (PTP)	21	LF	$	8,000	$	168,000.00
Forrest County Bldg Mods (3)	3	EA	$	60,000	$	180,000.00
Microwave Subscriber Units (PTP)	3	LF	$	8,000	$	24,000.00
TMC Modifications and training	1	LS	$	75,000	$	75,000.00
Subtotal					**$**	**2,514,000.00**
Preliminary Engineering		8%			$	201,120.00
Construction Engineering		10%			$	251,400.00
Total Project					**$**	**2,966,520.00**

Federal Funding Requested Provided 80% Match

$ 2,373,216 FY 2013

Note: Phase 7A Transportation and Emergency Response Communications Project Alternate was developed with the intention of using five water towers in the area Hattiesburg area. See Phase 7 map above for water tower locations.

Appendix

Appendix A –Stakeholder Meeting Agenda

Agenda
Hattiesburg Area ITS Master Plan - Stakeholder Meeting

May 17th, 2011

1. Introduction	**Mike Stokes (MDOT ITS Program Manager)**
2. Goal and Vision	**Frank Watanabe (Neel-Schaffer, Inc.)**
3. User Need Themes	**Christopher Schultz (Neel-Schaffer, Inc.)**
4. Sample Strategic Issues	**Open Discussion**
5. Questions	**Open Discussion**
6. Lunch	
7. Regional Architecture	**Ming Shiun Lee (URS)** **Jeff Benson (URS)**
8. Review of schedule	
9. Where do we go from here?	

Contact Info:

Hattiesburg Area ITS Master Plan

Frank Watanabe, P.E., T.E.
772-770-4707
frank.watanabe@neel-schaffer.com

Chris Schultz, E.I.
601-545-1565
chris.schultz@neel-schaffer.com

Neel-Schaffer, Inc.
Post Office Box 1487
Hattiesburg, MS 39403-1487
www.neel-schaffer.com

Regional Architecture

Ming-Shiun Lee, Ph. D, P.E.
612-373-6335
Ming_Shiun_Lee@URSCorp.com

Jeff Benson, Vice President
612-373-6444
Jeff_Benson@URSCorp.com

URS Corporation
Fifth Street Towers
100 South Fifth Streets, Suite 1500
Minneapolis, MN 55402

MDOT
Mike Stokes, MDOT ITS Program Manager
601-359-1454
mstokes@mdot.state.ms.us

MS Department of Transportation
Post Office Box 1850
Jackson, MS 39215-1850

City of Hattiesburg

ITS Master Plan

Intelligent Transportation System (ITS) provides tools to better manage and operate transportation systems. Why ITS? It represents the application of advance information, electronic devices and communication technology to manage transportation systems.

ITS Goals and Vision

- **ITS System –** implement, integrate and manage a responsive local/regional/state ITS program.
- **Safety and Security –** improve the safety and security of the transportation system users.
- **Mobility and Convenience –** enhance personal mobility and accessibility to services and provide a convenience of the system to new and unfamiliar users
- **Efficiency –** Increase operational efficiency and productivity of the transportation system.
- **Sustainability –** Provide transportation services to build sustainable communities with improved accessibility, regional mobility, environmental protection and local/regional planning**.**

User Needs - General Themes

1. **Need for Education and Outreach –** educating the decision makers, the public and businesses about the benefits of ITS.
    - Educate staff and elected officials
    - Workshops, presentations and forums
    - Presentations on the ITS systems
2. **Develop and support standards and agreements –** the system will require jurisdictional interaction with an understanding the system users will benefit from a centralized, information sharing and standardized system.
    - Standard for achieving uniformity and compatibility in design and operation
    - Agreements of participants responsibilities
    - Coordination and cooperation between agencies
3. **Communication needs –** type of transmission – data, voice and video
    - Lease or shared communication
    - Fiber optic communication
    - Wireless communication
    - Hybrid system
    - Public/Private partnership

4. **User Needs for the Local Agency**
    - Incident and emergency management
    - Information management
    - Communication – data, voice and video
    - Traveler information (511, Dynamic message signs, etc)
    - Vehicle tracking – GPS
    - Intelligent vehicles – information
    - Monitor and control isolated stations and controllers
    - Enhance maintenance and operations
    - Education and training (video classes)
    - Weather and roadway management
5. **User Needs for the Transportation System – Typical ITS/MDOT**
    - Road/Weather information *Advance Traveler Information System (ATIS)*
    - Traveler Web Site
    - Traveler Hotline
    - Dynamic Message Signs (DMS)
    - Highway Advisory Radio (HAR)
    - In-vehicle Information System
    - Coordinated traffic signal systems *Advanced Traffic Management Systems (ATMS)*
    - Local and regional traffic management centers (TMC)
    - Closed circuit television cameras (CCTV)
    - Variable Speed Limit Signs
    - Traffic signal Pre-emption/prioritization
    - Integrated train detection
    - Automated Accident location system *Emergency Response Systems*
    - Automated Vehicle location on emergency response units
    - Uniform rural addressing (911)
    - Video/Radar Detection System (VDS/RDS) traffic data collection
6. **Need for training staff –** limited resources and need for training
    - Need to train staff on ITS software and hardware
    - What type of technical support/training needed

<u>Review of the MDOT ITS Strategic Conceptual Plan</u> – See sample MDOT Statewide ITS strategic issues on the following page.

Strategic Issues

1. Education and Outreach

- What is the existing communication network and how can it be improved to reach audiences at the local and regional level?
- What opportunities exist for the area to link with other local cities, regions and State to maximize its education and public outreach?
- How much coordination of the private sector outreach is needed?

2. Interagency cooperation and coordination

- Who should participate in the dialogue for interagency coordination?
- Does there need to be a formal interlocal agreement with the other agencies/State?
- What funding incentives, if any is required at the local level to maintain their involvement in the ITS statewide program?
- What fair and equitable system can be developed for new ITS programs within the region that have varying levels of system infrastructure and need?

3. Alliance with other agencies

- How can the local agencies work proactively to develop interstate ITS alliances with adjacent local, regional and state agencies?
- Which adjacent local/regions have similar ITS programs and will benefit with this alliance?
- How can MDOT encourage alliance between local and regional jurisdictions?

4. System integration

- How can the local agencies expand and implement future ITS elements in coordination with Statewide ITS system?
- How can the integration of the local system be consistent and compatible with others, like the Statewide system?
- Is the ITS architecture open for system expansion to accommodate local elements?

5. Operation and Maintenance of ITS

- How can adequate operational and maintenance funds be secured for ITS systems?
- How can adequate training be ensured for implementing ITS systems?
- Who will have responsibility for maintenance of shared ITS systems?

6. Evaluation

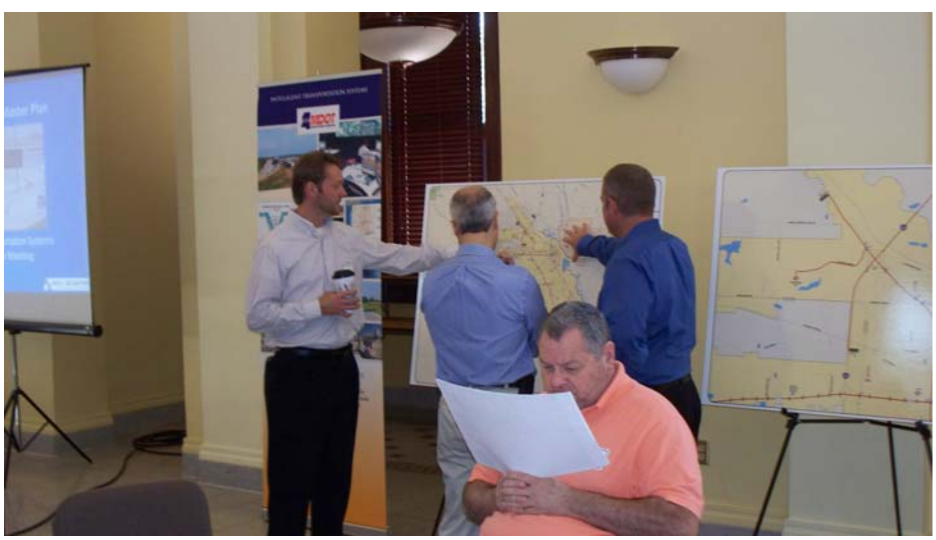
- What role will the Local or State play in the evaluation of the system?

Appendix B – Initial Stakeholder Meeting Attendee List and Photos

Hattiesburg Area ITS Master Plan
Stakeholder Meeting Initial
(May 17, 2011)

Attendees

Name	Representing
John Gilligan	MDOT/URS - TMC
Gerald Rice	USM - Police
Andrew Ellard	City of Hattiesburg
Ben Jackson	William Carey University
Robert Stanton	MDOT
Chip Brown	Emergency Management District
April Lazenby	City of Hattiesburg
Joe Baggett	MDOT
David Webster	Hattiesburg Fire Department
Kelly Castleberry	MDOT
Keith Steele	MDOT
Suzanne Dees	MDOT
Jay Montgomery	Temple, Inc.
Stacy Tucker	USM
George Herrington	Camp Shelby - Fire
Mike Stokes	MDOT
Chris Carr	Hattiesburg MPO
Pattie Brantley	City of Hattiesburg
Wayne Curry	InLine
Frank Watanabe	Neel-Schaffer
Franklin Tate	City of Hattiesburg
Layne Girouard	MDOT
Leslie T. Pullens	MDOT
Todd Pounds	AAA Ambulance
Ranzy Whiticker	G S + P
Mark Bailey	Neel-Schaffer
Michael Cribb	FHWA
Vincent Nelms	City of Hattiesburg/Mississippi Transit
Jeff Smith	Temple, Inc.
Red Stringfellow	MDOT - District 6
Craig Dearman	City of Hattiesburg
Robert Hedyepeth	USM
John Hayman	USM
Christopher Schultz	Neel-Schaffer
Richard Thompson	City of Hattiesburg



Appendix C - Final Stakeholder Meeting Attendee List

Hattiesburg Area ITS Master Plan Stakeholder Meeting Final (September 13, 2011)	
Attendees	
Name	Representing
Terry Steed	Forrest EMA
Jim Hennessey	Forrest EMA
Christopher Schultz	Neel-Schaffer
Michael Hershman	Lamar County
Katyonya Mclaughlin	City of Hattiesburg
Toby Barker	MS House of Represenatives
Scott Mohler	URS
Joe Baggett	MDOT
Keith Steele	MDOT
Mike Stokes	MDOT
Wayne Curry	InLine
Frank Watanabe	Neel-Schaffer
Franklin Tate	City of Hattiesburg
Vincent Nelms	City of Hattiesburg/Mississippi Transit
Richard Thompson	City of Hattiesburg