SECTION 4.0
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This section presents the results of the analysis of direct, indirect, and cumulative environmental and socioeconomic impacts that would likely occur from implementing the No Build Alternative, Alternative B/O, Alternative J, Alternative P, and Alternative Q. In addition, this section identifies any adverse unavoidable environmental effects, the relationship between short-term environmental uses and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitment of resources involved with implementing the proposed action.

It is important to note that potential environmental and/or socioeconomic impacts and changes identified throughout Section 4.0 that could result from future growth or "induced development" following construction of one of the proposed alternatives, are speculative in nature and not guaranteed to occur, these changes being influenced by and dependent upon a multitude of factors and variables including, but not limited to, national and regional economics, population growth, employment opportunities, housing availability, social issues, etc. While addressed in this evaluation to assist in informed agency decision-making, such potential changes are, ultimately, uncertain and beyond USACE's authority under the Clean Water Act to control.

4.1.1 Direct versus Indirect Impacts

The terms *impact* and *effect* are synonymous as used in this EIS. Impacts could be beneficial or adverse and could apply to the full range of natural, aesthetic, historic, cultural, and economic resources of St. Tammany Parish. Definitions and examples of direct and indirect impacts as used in this document are as follows:

- ***Direct Impact.*** A direct impact would be caused by implementing one of the four alternatives and would occur at the same time and place. Direct impacts are those impacts that could happen during construction within or adjacent to the 250-ft ROW of a particular alignment.
- ***Indirect Impact.*** An indirect impact would be caused by operating one of the four alternatives and would occur later in time or farther removed in distance, but it would still be a reasonably foreseeable outcome of the action. Indirect impacts could include induced changes in the pattern of land use, population density or growth rate, and indirect impacts on air, water, and other natural resources and social systems. Indirect impacts are those impacts that could happen beyond the 250-ft ROW of a particular alignment and/or that could occur after project construction is complete.
- ***Direct versus Indirect Impacts.*** For direct effects to occur, a resource must be present. For example, if highly erodible soils were disturbed as a direct result of using heavy equipment during construction of an alternative, there could be a direct impact on soils due to erosion. This could later indirectly affect water quality if stormwater runoff containing sediment from the construction site enters adjacent waterbodies.

4.1.2 Short-term versus Long-term Impacts

Impacts are also expressed in terms of duration. Short-term impacts are described as lasting one year or less. For example, the construction of an alternative would likely expose soil in the immediate area of construction. However, this impact would be considered short-term because it would be expected that vegetation would be reestablished on the disturbed area within a year of the disturbance. Long-term impacts are described as lasting beyond one year and can potentially continue into perpetuity, in which case they would also be described as permanent.

4.1.3 Cumulative Impacts

Increasing evidence indicates that the most severe environmental consequences do not result from the direct impacts of any particular action but from the combination of impacts of multiple, independent actions over time. As defined in 40 CFR 1508.7 (CEQ Regulations), a cumulative impact is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions." Some authorities contend that most environmental impacts could be seen as cumulative because almost all systems have already been modified. Table 4-1 presents the principles of cumulative impacts analysis, as described in the CEQ guide *Considering Cumulative Impacts under the National Environmental Policy Act*.

Table 4-1.
Principles of cumulative impacts analysis

Cumulative impacts are caused by the aggregate of past, present, and reasonably foreseeable future actions.
Cumulative impacts are the total impacts, including both direct and indirect impacts, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, nonfederal, or private) has taken the actions.
Cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
It is not practical to analyze the cumulative impacts of an action on the universe; the list of environmental impacts must focus on those that are truly meaningful.
Cumulative impacts on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
Cumulative impacts could result from the accumulation of similar impacts or the synergistic interaction of different impacts.
Cumulative impacts could last for many years beyond the life of the action that caused the impacts.
Each affected resource, ecosystem, and human community must be analyzed in terms of the capacity to accommodate additional impacts, based on its own time and space parameters.

4.1.4 Intensity of Impacts

The following terms are used to describe the degree of direct and indirect impacts, whether they are adverse or beneficial:

- Negligible – the impact is at the lowest levels of detection.
- Minor – the impact is slight but detectable.
- Moderate – the impact is readily apparent.
- Major – the impact is severely adverse or exceptionally beneficial.

The descriptor *major* does not imply a significant impact (see below) unless specifically stated.

4.1.5 Significance

In accordance with CEQ regulations and implementing guidance, impacts are also evaluated in terms of being significant. The term *significant*, as defined in 40 CFR 1508.27, part of the CEQ regulations for implementing NEPA, requires considerations of both context and intensity. *Context* means that the significance of an action must be analyzed in several settings, such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend on the impacts on the locale rather than on the world as a whole. Both short- and long-term impacts are relevant to the consideration of the significance of an impact.

Intensity refers to the severity of impact and includes the ratings described in Section 4.1.4 (i.e., negligible through major). Factors contributing to the evaluation of the intensity of an impact include, but are not limited to, the following:

- The balance of beneficial and adverse impacts in a situation where an activity has both.
- The degree to which the action affects public health or safety
- The unique characteristics of the geographic area where the action is proposed, such as proximity to parklands, historic or cultural resources, wetlands, prime farmlands, wild and scenic rivers, and ecologically critical areas.
- The degree to which the impacts on the quality of the human environment are likely to be controversial
- The degree to which the impacts of the action on the quality of the human environment are likely to be highly uncertain or involve unique or unknown risks
- The degree to which the action might establish a precedent for future actions with significant impacts or represents a decision in principle about a future consideration
- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts
- The degree to which the action might adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP or might cause loss or destruction of significant scientific, cultural, or historical resources
- The degree to which the action might adversely affect an endangered or threatened species or habitat that has been determined to be critical under the Endangered Species Act of 1973
- Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment

4.1.6 Rationale for Alternative Analysis

The USACE has identified the No Build Alternative, Alternative B/O, Alternative J, Alternative P, and Alternative Q as the principal alternatives for detailed analysis. The underlying rationale for each of the alternatives developed for analysis is provided in Sections 2.1 and 2.2.

4.2 LAND USE

4.2.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to land use within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.2.2 Build Alternatives

Direct and indirect impacts to land use would be expected to be similar for each of the Build Alternatives as described below. Differences in land use impacts between alternatives are described in Sections 4.2.2.1 through 4.2.2.4.

Direct Impacts to Land Use

Long-term significant adverse impacts to existing land use would be expected to occur under each of the Build Alternatives. Existing land use would be converted to impervious road surfaces and a simplified habitat of grasses and herbaceous material in the 250-ft ROW.

Conflicts with existing state, parish, or local land use plans, policies, or controls would be anticipated. Areas zoned as suburban, estate, industrial, and single-family residential could be converted and existing homes and commercial buildings could be acquired and converted to roadway.

Indirect Impacts to Land Use

Long-term significant adverse indirect impacts could occur under the Build Alternatives. Highway development could indirectly induce secondary development along the alignment or at intersections with other roadways. New developments including residential and commercial areas, lodging, and convenience stores could occur as a result of construction of the roadway.

In St. Tammany Parish secondary development is limited to some extent through zoning. A parish-wide zoning plan has been developed to concentrate industrial, commercial, and business growth along existing major roads near I-12 and limit majority of the project area to suburban development (see Figure 3-3). The ND 2025 plan identifies the best locations for business parks and regional retail facilities to be in the vicinity of intersections of local roadways with I-12. Construction of the I-12 to Bush roadway could be expected to service these locations leading to additional development and changes in land use from open space to developed. As development and population in the parish increase, additional changes in land use could be expected from open space and natural settings to developed areas.

4.2.2.1 Alternative B/O

Direct Impacts to Land Use

Long-term significant adverse direct impacts to land use would be expected to occur under Alternative B/O. Approximately 6.0 miles of the proposed 19.5-mile alignment would be built and expanded over existing roadway and 12.5 miles would be a new roadway alignment. Under Alternative B/O, approximately 138 acres of existing land use would be converted to highway and associated ditches in the 250-ft ROW. Table 4-2 lists the land use types directly impacted in the 250-ft ROW for Alternative B/O.

Table 4-2.
Alternative B/O land use converted to highway

Land Use	Area (acres)
Developed, Low Intensity	20.84
Developed, Medium Intensity	3.60
Developed, High Intensity	0.22
Developed, Open Space	113.19

Source: U.S. Department of Interior 2007

Existing development in the proposed ROW would be relocated or removed. An estimated 14 owner-occupant families and five businesses, including three service stations, one Dollar General store, and one insurance company would be displaced.

Indirect Impacts to Land Use

No additional indirect impacts would be expected beyond those listed in Section 4.2.2.

4.2.2.2 Alternative J

Direct Impacts to Land Use

Long-term significant adverse direct impacts to land use would be expected to occur under Alternative J. Alternative J is a 21.1 mile alignment with 14.2 miles on an existing abandoned railroad corridor, 1.5 miles on existing roadway, and 5.4 miles on new alignment. Under Alternative J, approximately 52 acres of existing land use would be converted to highway and associated ditches in the 250-ft ROW. Table 4-3 lists the land use permanently lost and converted to roadway under this alternative.

Table 4-3.
Alternative J land use/land cover converted to highway

Land Use	Area (acres)
Developed, Low Intensity	5.53
Developed, Medium Intensity	4.99
Developed, Open Space	41.61

Source: U.S. Department of Interior 2007

Existing development in the proposed ROW would be relocated or removed. Construction of Alternative J would displace an estimated 51 families. Of these families, 26 are owner-occupants and 25 are apartment tenants. Fifteen families occupy mobile homes which are considered movable, but owner occupied. Approximately 14 businesses would also be displaced (C.H. Fenstermaker 2011).

Indirect Impacts to Land Use

No additional indirect impacts would be expected beyond those listed in Section 4.2.2.

4.2.2.4 Alternative P

Direct Impacts to Land Use

Long-term significant adverse direct impacts to land use would be expected to occur under Alternative P. Alternative P is 17.4 miles with 13.3 miles on new alignment that would permanently remove agricultural land, forests, managed forests, developed areas, and wetlands and 2.5 miles would be on an existing abandoned railroad corridor. Under Alternative P, approximately 30 acres of existing land use would be permanently lost converted to highway and associated ditches in the 250-ft ROW limit of construction. Table 4-4 lists the land use and land cover that would be directly impacted under this alternative.

Table 4-4.
Alternative P land use converted to highway

Land Use	*Area (acres)*
Developed, Low Intensity	1.08
Developed, Open Space	28.85

Source: U.S. Department of Interior 2007

Existing development in the proposed ROW would be relocated or removed and would displace approximately six families. Two of the six families occupy mobile homes, and only replacement site would be required. No businesses or facilities would be displaced (C.H. Fenstermaker 2011).

Indirect Impacts to Land Use

No additional indirect impacts would be expected beyond those listed in Section 4.2.2.

4.2.2.5 Alternative Q

Direct Impacts to Land Use

Long-term significant adverse direct impacts to land use would be expected to occur under Alternative Q. Alternative Q would be a 19.8 mile alignment with 9.8 miles on an existing abandoned railroad corridor, 1.3 miles on existing roadway, and 8.7 miles on new alignment. Under Alternative Q, approximately 58 acres of existing land use would be converted to highway and associated ditches in the 250-ft ROW limit of construction. Table 4-5 lists the land use that would be directly impacted.

Table 4-5.
Alternative Q land use converted to highway

Land Use	*Area (acres)*
Developed, Open Space	52.48
Developed, Low Intensity	3.46
Developed, Medium Intensity	2.69

Source: U.S. Department of Interior 2007

Existing development in the proposed ROW would displace approximately 19 families. Fifteen of the 19 families occupy mobile homes and replacement sites for those homes would be required (C.H. Fenstermaker 2011).

Indirect Impacts to Land Use

No additional indirect impacts would be expected beyond those listed in Section 4.2.2.

4.3 WATER RESOURCES

4.3.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to water resources within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.3.2 Build Alternatives Analysis

The proposed I-12 to Bush roadway proposes work in wetlands and structural crossings along various waterways in the project area. In order to evaluate the direct and indirect impacts to water resources in the project area, hydrologic modeling, hydraulic analysis, and indirect wetland impact analysis was performed for the existing conditions, as well as for the four alternative alignments. Details of the methodology, modeling, and model results are provided in the Hydrology and Hydraulics (H&H) Report in Appendix G.

4.3.2.1 Drainage Impacts

The impact of structural crossings (bridge or culvert) on the hydrology and hydraulics of the existing system is dependent on a number of factors. The impacts created by each bridge and culvert crossing can vary significantly based on the conditions at each location. For example, two alternatives may cross the same channel at different locations and both require bridges, but the flows at the downstream location may be significantly greater, thus creating more impacts and requiring a much larger bridge. Another example is the limited impact from a culvert crossing located along an existing railroad corridor because the existing crossing already affected the channel system even though the proposed improvements could increase the length and size of the structure. For that reason, each culvert and bridge crossing was analyzed based on existing conditions, size of structure, and design flows. The locations of the proposed structural crossings for each alternative alignment are shown in Figures 4-1 through 4-4.

Alternative Q includes the least number of major structure crossings (25 crossings) and only three bridge crossings. Much of the alignment also follows existing roadway and the abandoned railroad corridor. Thus, many of the structures for this alternative would be replacements of existing structure crossings. The majority of Alternative J follows Airport Road and the abandoned railroad corridor, requiring only one bridge and five culverts on a new alignment.

Alternatives P and B/O both have greater lengths of roadway on new alignments, which increases the impacts to the existing drainage characteristics of the project area. The project area also drains in a northeast to southwest direction, which results in increased flows for the western alternatives and requires a larger number of structure crossings.

4.3.2.2 Overland Sheet Flow Impact Analysis

This section provides an analysis for the indirect impact of the proposed alignments on the natural overland sheet flow patterns. Field inspection of the project area indicates that a significant interaction exists between the floodplain and wetland areas and the drainage channel network. There is also evidence of inter-basin exchange during larger rain events. A one and two-dimensional coupled modeling approach (MIKE FLOOD) is a suitable tool for this application, which appropriately captures the exchange of flow between the overland areas and the channels and dynamically integrates those flow regimes. Details of the modeling methodology and setup are provided in Appendix G.

4.3.2.2.1 *Methodology*

The construction of roads across streams and wetlands areas especially in shallow systems such as eastern St. Tammany Parish may alter the natural drainage pattern and specifically the flow exchange between streams and surrounding wetland areas. The impact may cover large areas around the road alignment (Wright 2006). Full mitigation of such impacts or pursuing damage-sensitive construction alternatives can be challenging, time-consuming and costly. Therefore, it is critical to assess the potential indirect impact of roadways on wetland areas. A list of common hydrologic stressors on urban wetlands is provided below (Wright 2006):

- Changes to topography and canopy
- Changes to inundation (ponding)
- Increased hydrologic drought of riparian wetlands
- Changes to water level fluctuations
- Increased flow constrictions
- Changes to sedimentation and nutrient loading

These hydrologic stressors were evaluated individually for each alternative to determine the indirect impact to the wetland areas located outside of each alignment's 250-ft ROW. All analyses were performed on the entire drainage system to determine the total impacts. These results were then filtered to focus on the impacts to wetland areas.

Wetlands in the project area were determined using hydric soil classifications and LiDAR data (Figure 4-5). These wetland areas were used for analysis purposes herein. It should be noted that the wetland areas identified in this analysis may not match with areas classified as wetlands in other publications. In order to properly classify an area as a wetland a complete field investigation and wetland delineation outside of the alternative ROWs is needed. Such extensive field investigation was beyond the scope of this EIS.

4.3.2.2.2 *Impact on Topography*

Constructing a new roadway may require clearing of canopy and vegetation along its alignment. Alignments constructed on undeveloped terrain change the existing canopy and topography. Anytime topography is altered sheet flow is redirected. Therefore, when a proposed roadway is placed along an existing roadway or abandoned railroad bed, the impact would be less significant. However the potential for changes in ponding, drought, and inundation could still occur. These, changes were analyzed and quantified for each alternative. Sensitive areas that currently lack the capacity to absorb additional floodwater could suffer from artificial diversions. Long segments of roadside ditches could become major conduits of stormwater and contaminants, and may permanently alter the hydrology of nearby areas. Concentrated ditch flow and culverts may also hinder the movement of water-dependent species. Additionally, changes to canopy and land use could increase the peak discharge of a watershed. These changes are evident not only along areas of new roadway, but as well as along existing roadways and railroad beds where the new roadway would be widened and paved.

Each of the alternative alignments was assessed to determine the length of roadway constructed on undeveloped land not previously altered. Table 4-6 summarizes these results.

Figure 4-1 Alternative B/O - Hydraulic Structures & Hydrologic Basins

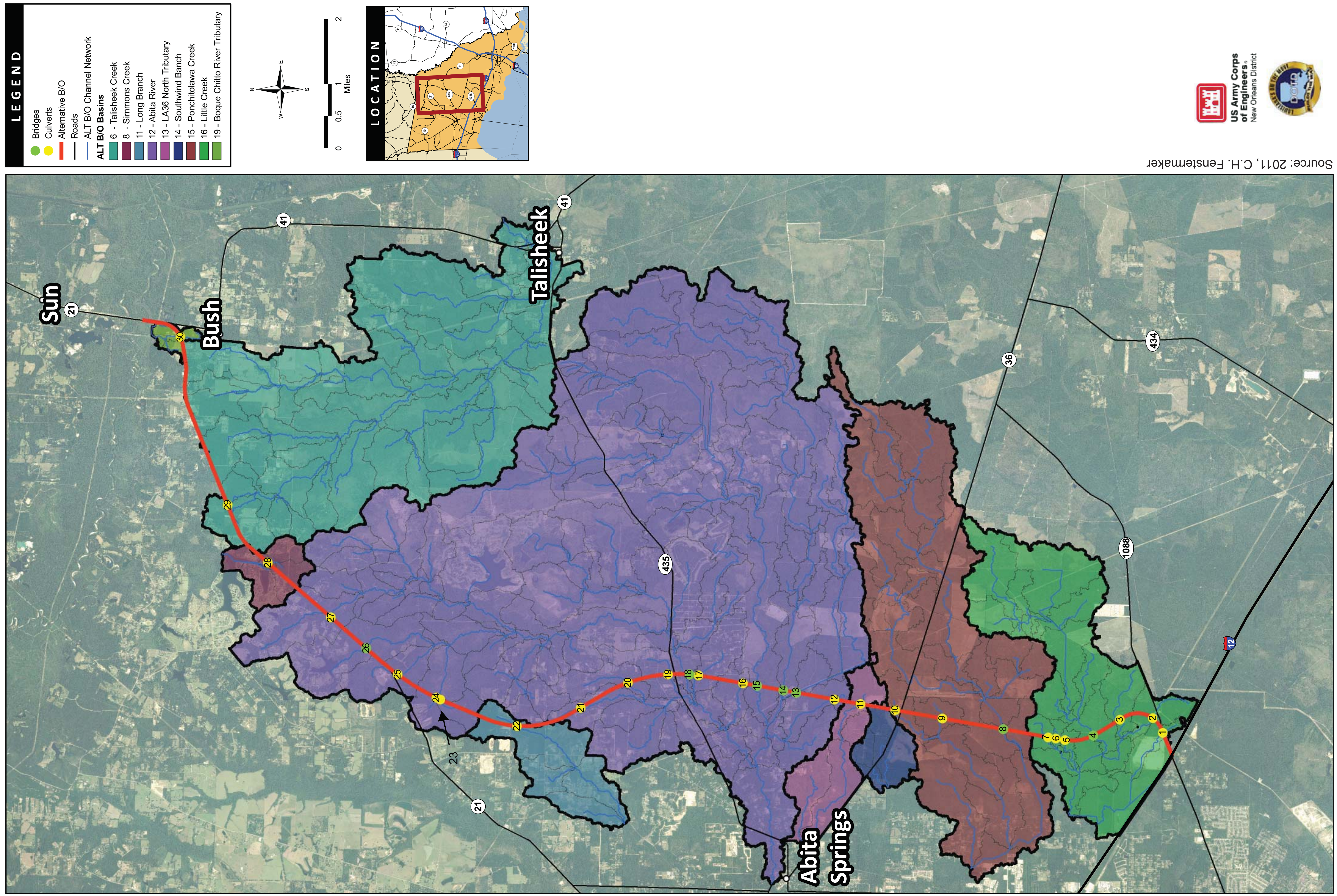


Figure 4-2 Alternative J - Hydraulic Structures & Hydrologic Basins

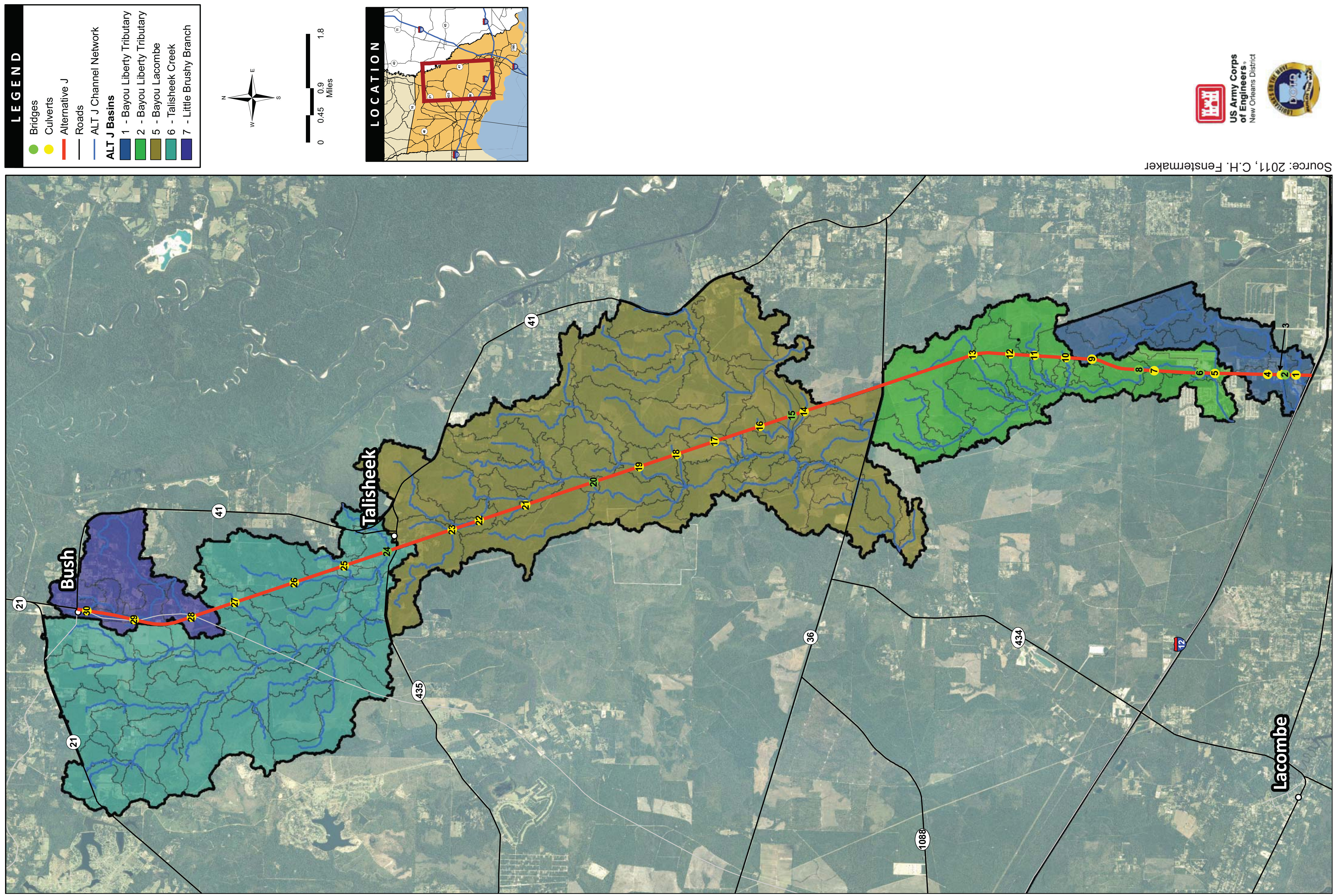


Figure 4-3 Alternative P - Hydraulic Structures & Hydrologic Basins

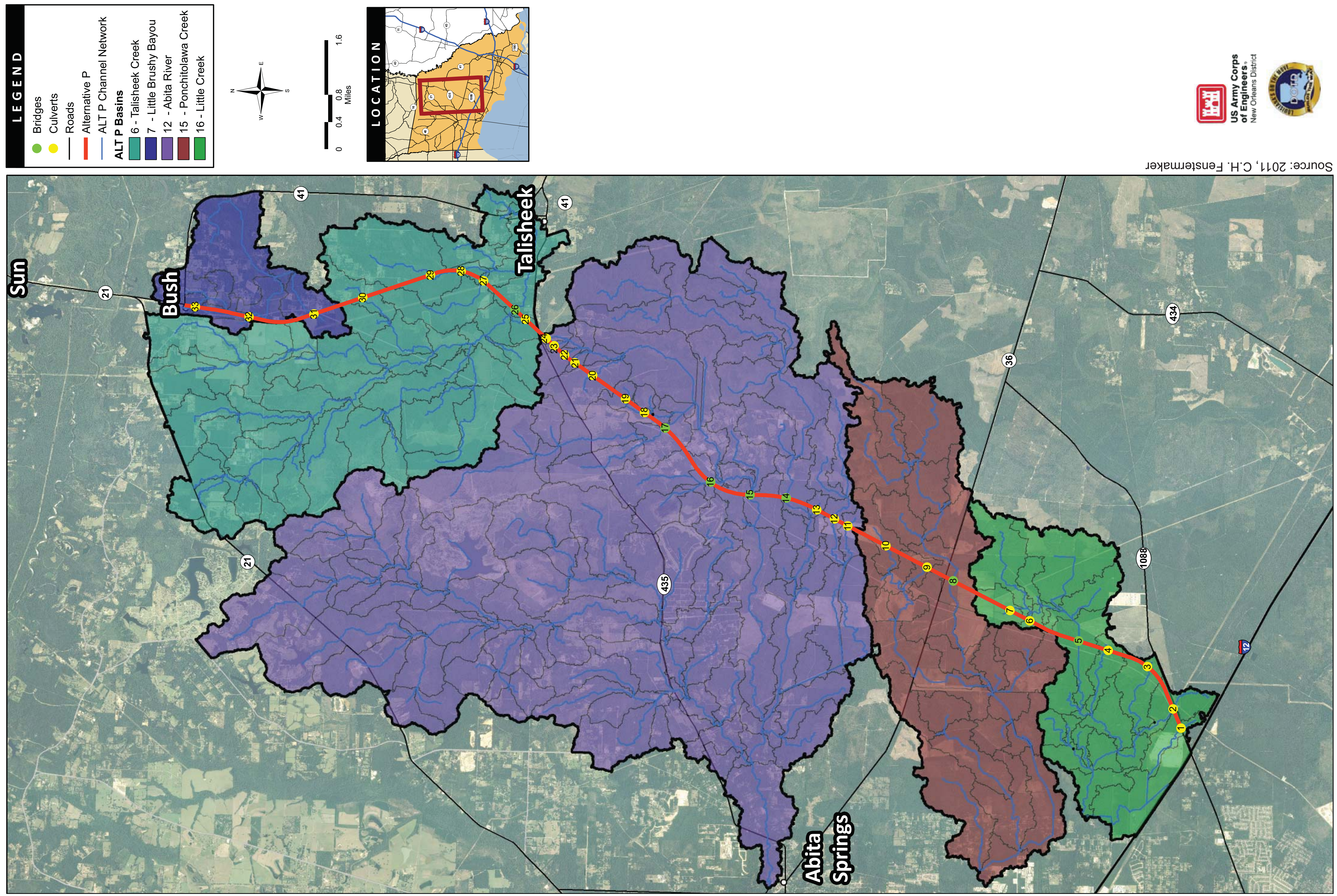


Figure 4-4 Alternative Q - Hydraulic Structures & Hydrologic Basins

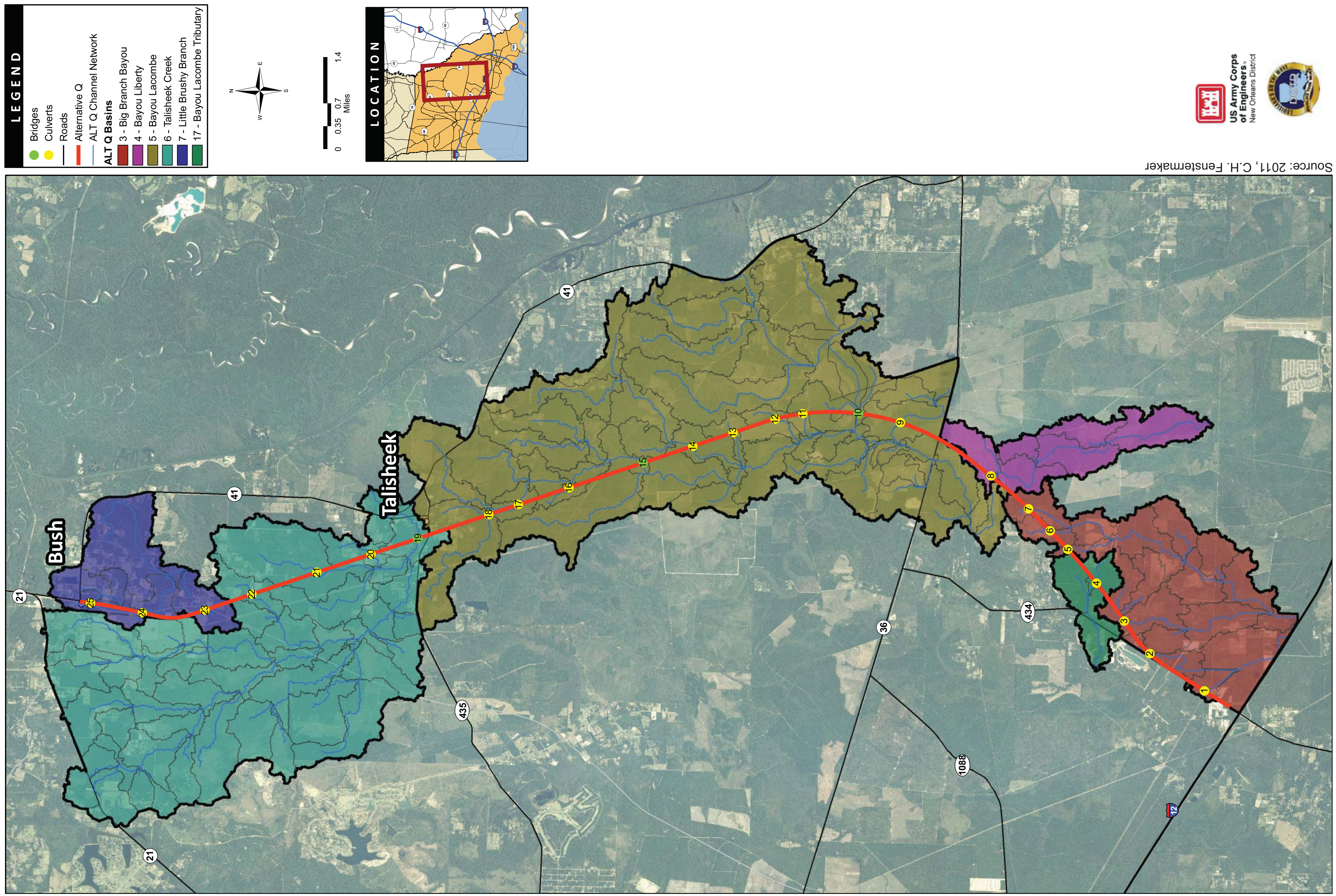


Figure 4-5 Wetland Areas Identified by Hydric Soil & LiDAR Data

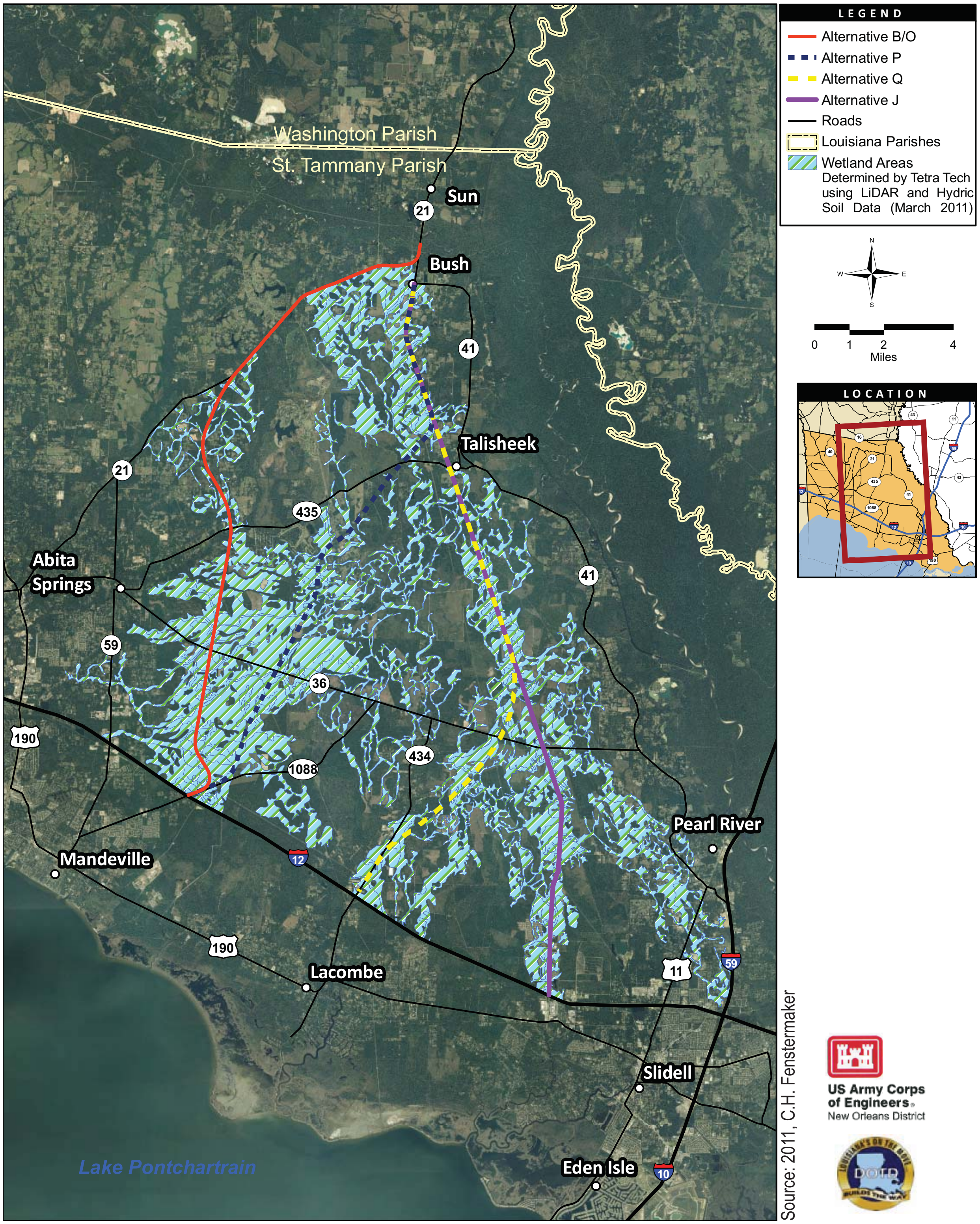


Table 4-6.
Length of new roadway constructed on undeveloped land

Alternative	Length of New Roadway (Miles)
Alternative B/O	12.5
Alternative J	5.4
Alternative P	14.8
Alternative Q	8.7

In addition to the impact on canopy and topography by each alignment, the wetland area along the length of each alternative alignment was delineated and can be found in Appendix H. Table 4-7 summarizes the results of the direct impacts on the wetlands within the 250 ft ROW.

Table 4-7.
Direct wetland impacts within the 250 ft right-of-way of each alternative

Alternative	Direct Wetland Impacts (acres)
Alternative B/O	385
Alternative J	373
Alternative P	358
Alternative Q	305

4.3.2.2.3 *Impact on Inundation (Ponding)*

Changes to the extent or inundation (ponding) duration of wetland areas may occur when obstructions such as roadways alter the natural sheet flow of water. Altering the ponding duration (increase or reduction) leads to changes, often undesirable, in wetland type, function, and quality, as well as to the native plants and animals (Wright 2006). The duration an area remains submerged is a critical parameter that impacts the functionality of wetlands.

Historical records of precipitation were obtained from three rainfall stations located within St. Tammany Parish (Slidell, Abita Springs, and Covington, Louisiana). These stations recorded data from 1900 to 2010, with a common period of 1973 to 2010. A statistical analysis on the rainfall data was performed (see Figure 4-6). Based on the available records, the average monthly rainfall for the St. Tammany area is approximately 5.2 inches. A typical month during the growing season with an average precipitation of 5.2 inches was selected to investigate the impact of each alternative alignment on the inundation (ponding) pattern of the surrounding wetland areas.

The inundation of wetland areas were analyzed for the existing conditions and compared to each alternative alignment. Figure 4-7 illustrates how each alignment may impact the wetland inundation. Ponding was defined as areas inundated for three consecutive days with a depth greater than one inch. The change (expressed in acreage) to the inundated areas is used to express the impact of a given alignment. As shown in Figure 4-7, the comparison between the existing

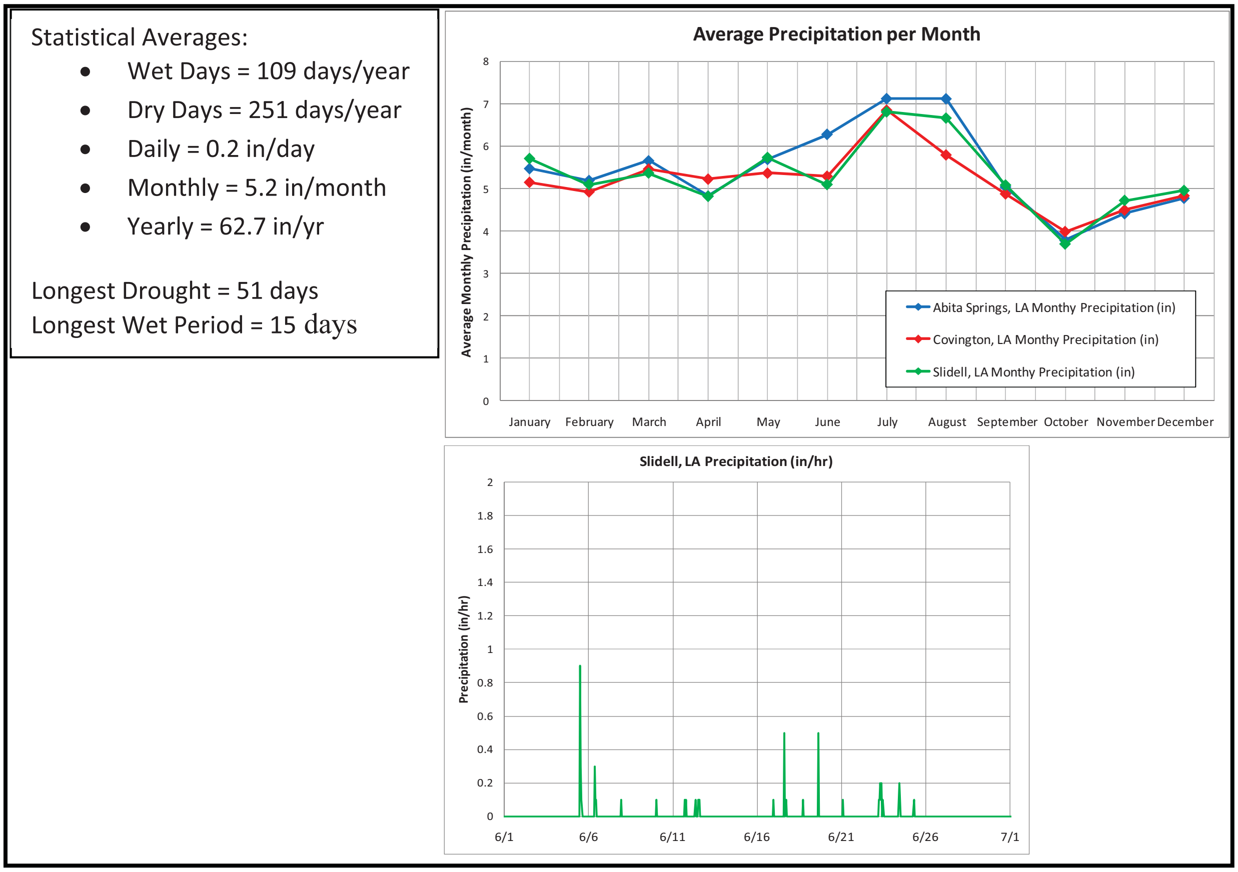


Figure 4-6. Precipitation statistics and average monthly precipitation

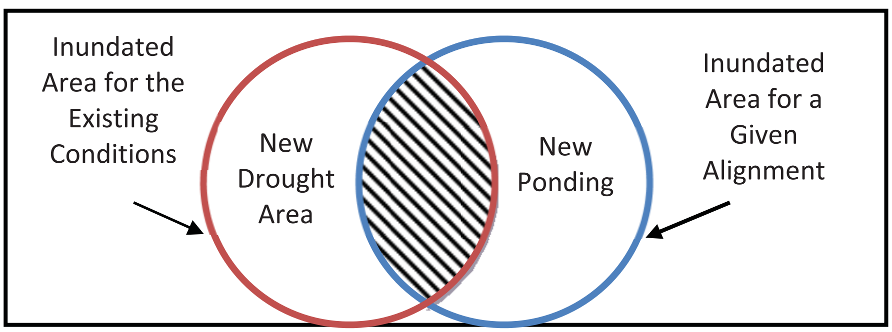


Figure 4-7. Schematic of how the impact on ponding and drought was computed

conditions and a given alignment reveals areas that have not been impacted, new inundated areas, and areas that have been drained as a result of constructing a given alignment. This analysis was repeated with adjusting the definition of ponding to five days and seven days.

Wetland functions and services and the plant and animal communities that inhabit it are largely determined by hydrology (CWP 2006). Wetland functions include water storage, transformation of nutrients, growth of living matter, and wildlife habitat. Construction of the roadway could impede channel and overland flow resulting in oversaturated and ponded areas in adjacent wetlands. A vegetative shift could be observed with increased duration of ponding from upland to more wetland tolerant plants. An increase in ponding duration could cause a natural population decline of less water-tolerant species and an increase in species more adaptive to a wet environment. This shift in vegetative complex could directly impact the pine flatwood wetlands throughout the project area. Pine flatwoods in the area could decline in coverage and be replaced with bayhead swamp species (see Section 3.4.1.1). Local university wetland scientists and researchers were consulted to determine the critical duration that would alter the functionality of a wetland. An exact duration was not agreed on among the scientists, and ranged from three to seven days.

The results for the three, five, and seven-day inundation analyses are summarized in Table 4-8, Table 4-9, and Table 4-10, respectively. Figure 4-8 shows the areas where the wetland inundation (ponding) has been impacted. In Figure 4-8, the inundation duration used was seven days. Maps with inundation durations defined as three and five days can be found in Appendix G. Overall, the analysis shows that the ponding duration is not a critical factor in terms of identifying the acreage of wetlands impacted.

Long-term moderate indirect adverse impacts to wetlands as a result of ponding duration could occur under the Build Alternatives. Changes to hydrology could reduce the ability of wetlands to provide existing functions and services. Impacts to wetland hydrology could degrade water quality, constrict flows, increase flooding, increase peak flows, increase water level fluctuations, and reduce water storage capacity.

Table 4-8.
Inundation impact: 3 days inundation duration

Alternative	Increase in Wetland Inundation (acres)
Alternative B/O	427
Alternative J	406
Alternative P	240
Alternative Q	290

Table 4-9.
Inundation impact: 5 days inundation duration

Alternative	Increase in Wetland Inundation (acres)
Alternative B/O	477
Alternative J	396
Alternative P	264
Alternative Q	268

Table 4-10.
Inundation impact: 7 days inundation duration

Alternative	Increase in Wetland Inundation (acres)
Alternative B/O	385
Alternative J	438
Alternative P	297
Alternative Q	307

4.3.2.2.4 *Hydrologic Drought Impact Analysis*

Hydrologic drought events are defined as wetland areas that remain dry for three consecutive days. To investigate the sensitivity of the results to the duration of the drought used herein, the same analysis used for inundation impacts was repeated with adjusting the drought duration to five days and seven days.

The hydrologic drought areas identified in this analysis represent the areas that showed reduced surface water retention. Potential impacts that could occur due to hydrologic drought include ecological shifts both within plant and animal species. Pathways for the movement of water-dependent species may also be compromised by decreases in surface water retention. Additionally, depending on the duration of the dry-out changes to the soil moisture content could occur which subsequently impact the runoff and groundwater levels (depending on depth of water table).

Higher peak flows and improved drainage could result in a wider fluctuation of water levels in adjacent wetlands. Those fluctuations would return to baseline conditions more quickly than in an undeveloped wetland area (CWP 2006). When the seasonal water level fluctuation is altered in a wetland, mortality of existing plant communities could occur in response to the new hydroperiod and change the ecosystem type. An increase in drought events could result in a natural vegetative shift from water-tolerant vegetative species to those species more adapted to an upland environment. This change in vegetative complex could reduce the amount of wetlands throughout the study area, especially those located in the vicinity of the new roadway.

The hydrologic drought analysis identified the acres of wetlands experiencing hydrologic drought as a result of a given alignment compared to the existing conditions as summarized in Tables 4-11 through 4-13. Figure 4-9 shows wetland areas experiencing seven-day drought for all four proposed alignments. As can be seen, the drought areas are primarily located along the alignments. Appendix G provides maps with drought durations defined as three and five days.

Long-term moderate indirect adverse impacts to wetlands as a result of drought could occur under the Build Alternatives. Changes to hydrology could reduce the ability of wetlands to provide existing functions and services. Impacts to wetland hydrology could degrade water quality, constrict flows, increase flooding, increase peak flows, increase water level fluctuations, and reduce water storage capacity.

Table 4-11.
Hydrologic drought impact: 3 days hydrologic drought duration

Alternative	Increase in Wetland Drought (acres)
Alternative B/O	238
Alternative J	261
Alternative P	149
Alternative Q	126

Table 4-12.
Hydrologic drought impact: 5 days hydrologic drought duration

Alternative	Increase in Wetland Drought (acres)
Alternative B/O	181
Alternative J	239
Alternative P	134
Alternative Q	124

Table 4-13.
Hydrologic drought impact: 7 days hydrologic drought duration

Alternative	Increase in Wetland Drought (acres)
Alternative B/O	184
Alternative J	243
Alternative P	129
Alternative Q	135

4.3.2.2.5 *Water Level Fluctuations Impact Analysis*

Water level fluctuation (WLF) is the difference between maximum and minimum water levels in a wetland for a given period of time. This is often used to quantify a wetland's hydroperiod (Wright 2006). Water level typically increases in response to moderate or large storm events but quickly returns to base levels. These changes in water level are commonly referred to as the *bounce* in water levels during and after a storm event. Research has shown that changes in WLF on wetlands have caused a consistent decline in diversity and often an increase in invasive species (Wright 2006).

Stream capacity is directly related to channel characteristics such as geometry and slope, and without survey data the impacts to stream capacity could not be quantified. However, potential impacts may occur when channel slopes or geometry are changed due to construction, channel mining, or erosion. These impacts could increase or decrease stream capacity depending on the types and extent of channel geometry changes. In addition, highways tend to act as debris and refuse collectors and there is the potential for latent capacity reductions caused by this debris buildup.

Flooding potential along laterals would not significantly change due to structure crossing design parameters. Culverts were designed for a 50-year storm event and bridges were designed for a 100-year storm event. Culverts have the tendency to fill in over their design life and there is always the potential for storm-specific debris and timber buildup, particularly following tropical weather events. A detailed assessment of such variable conditions was beyond the scope of this project and might be considered in the final evaluation and design. Also, a base flood impact analysis during the design phase is required by FEMA for all structure crossings.

Figure 4-8 Inundation Impact Analysis

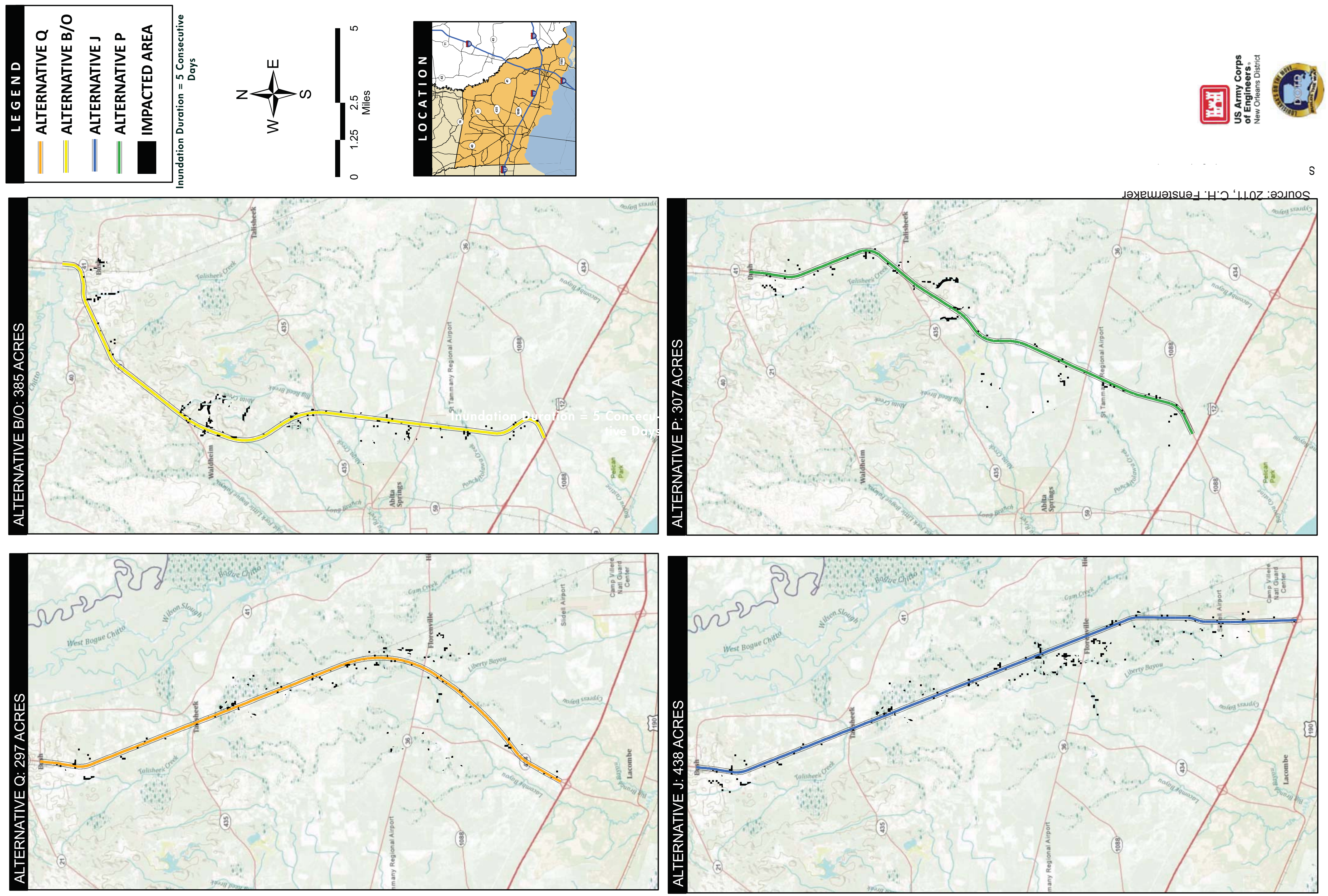
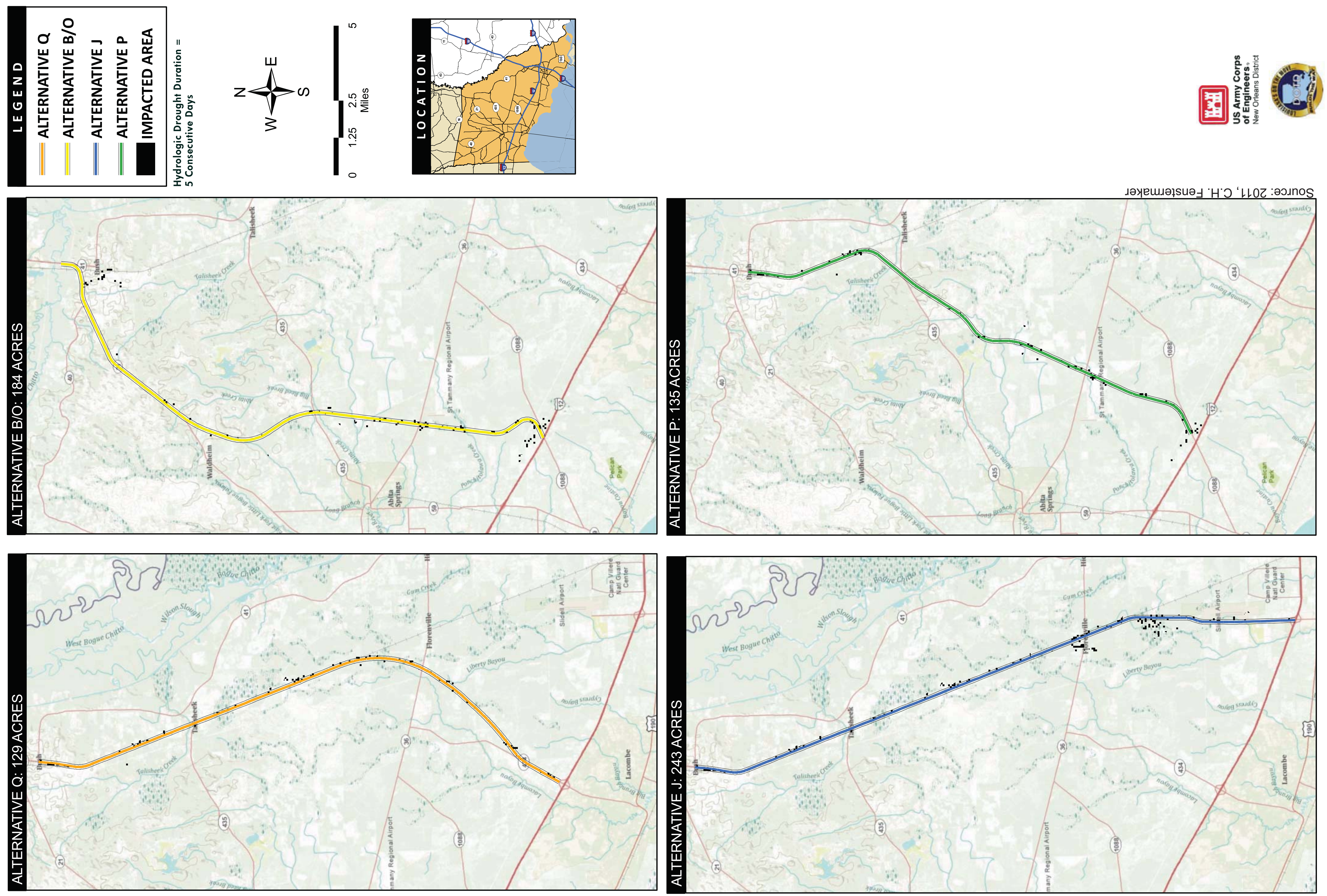


Figure 4-9 Hydrologic Drought Impact Analysis



Overland sheet flow fluctuations due to roadway placement were examined in predefined wetland areas. An increase in flood potential is typically expected upstream of proposed roadways, and a decrease is expected downstream. The Build Alternatives would impede natural overland drainage patterns; however, equalizer pipes and other drainage structures were placed a maximum 1,250 feet apart to limit overland sheet flow interruptions. Headwater cutting was not examined, as it requires a velocity analysis. Velocities are sensitive to channel geometries and survey data was not collected.

The WLF impact analysis was performed for the 2, 25, and 100-year storm events. Table 4-14 presents the total rainfall accumulations for each storm frequency. The tailwater values at the outlet of the drainage basins were estimated using the St. Tammany Parish Preliminary FEMA FIS profile data.

Table 4-14.
Frequency storm precipitation

Frequency Storm	Rainfall Depth Inches
2-Year	4.8
25-Year	9.6
100-Year	12.6

Changes to the WLF patterns between the existing conditions and each alternative were determined. A change in the WLF was registered only if it exceeded an increase or decrease of one inch. The total area registering such a change was tallied up for each alternative. This tolerance was set based on the resolution and sensitivity of the numerical model. Tables 4-15 through 4-17 provides the wetland areas that experienced a change in the WLF. Figure 4-10 shows the wetland areas that experienced changes in WLF for the 2-year storm event. Appendix G provides similar maps for the 25-year and 100-year storm events.

Table 4-15.
Water level fluctuations impact for the 100-year storm

Alternative	WLF Impacted Wetland Areas (acres)
Alternative B/O	2,353
Alternative J	3,685
Alternative P	2,408
Alternative Q	2,302

Table 4-16.
Water level fluctuations impact for the 25-year storm

Alternative	WLF Impacted Wetland Areas (acres)
Alternative B/O	1,773
Alternative J	2,700
Alternative P	1,534
Alternative Q	1,626

Table 4-17.
Water level fluctuations impact for the 2-year storm

Alternative	WLF Impacted Wetland Areas (acres)
Alternative B/O	1,128
Alternative J	1,838
Alternative P	860
Alternative Q	1,237

4.3.2.2.6 *Flow Constrictions Impact Analysis*

The most common type of flow constriction is caused by the placement of hydrologic structures to convey water underneath a roadway. The hydrologic changes associated with flow constrictions contribute to increase in ponding, drought, and water level fluctuations both upstream and downstream of the hydraulic structures (Wright 2006). The loss of capacity of these hydrologic structures overtime is mainly a result of sediment accumulation due to a lack of routine maintenance. If the structures are cleaned out on a routine maintenance schedule, impacts to flow would be expected to be minimal as compared to if the structures are not maintained.

All road crossings were designed according to LADOTD standards for the 50-year storm event (future conditions) with a one foot allowable differential head. Detailed road crossing analysis was done and presented in Appendix G.

4.3.2.2.7 *Summary of Indirect Wetland Impacts*

Three primary indicators of hydrologic stress were analyzed for each alternative. They included (2-YR WLF), increased ponding (7 day inundation), and decreased ponding (7 day drought), as defined previously. It should be noted that a wetland area could be affected by more than one stressor. The total indirect wetland impacted area was determined by merging the impacted wetland areas for the seven day inundation duration and drought periods and the areas that showed change in WLF for the 2-year storm event. The total indirect wetland impacted area was calculated using GIS. The total area was the union of the three separate stress indicators. A summary table of the total indirect wetland impacted acreage can be found in Table 4-18. A map showing the areas where indirect wetland impacts occurred can be found in Figure 4-11.

Table 4-18.
Indirect wetland impacts acreages

Alternative	Total Indirect Wetland Impacts (acres)
B/O	642
J	787
P	509
Q	577

Long-term direct major adverse impacts to sensitive natural communities as a result of hydrologic changes in the project area would be expected under the Build Alternatives. Pine flatwoods and savannas are sensitive habitats that may be removed and converted to roadway. Those areas provide habitat for several species being considered for listing as threatened or endangered, including Bachman's sparrow, diamondback rattlesnake, flatwoods salamander, gopher frog, pine snake, and southern hognose snake. Less mobile birds, amphibians, and reptiles inhabiting the areas where staging or construction would occur could be displaced or killed if this alternative was implemented. Pine flatwoods are also known for their richness in vegetation diversity with orchids, insectivorous plants, and other vegetation endemic only to this habitat. Loss of this habitat could subsequently result in the loss of rare plants including parrot pitcher plant (*Sarracenia psittancina*) and spreading pogonai (*Cleistes bifaria*) found only in pine flatwoods and savannas.

Indirect impacts to mitigation banks, pine wetlands, flatwoods, and savannas could occur under the Build Alternative. Disturbed hydrology in those habitats increases susceptibility of pine communities to invasive vegetation including Chinese tallow and cogon grass. Old-field weed species may germinate following disturbances which could reduce fire frequency and encourage hardwood growth.

4.3.2.3 Water Quality Impact Analysis

Impacts to water quality as a result of changes in sedimentation and nutrient loading within channels may occur as a result of urbanization and other alterations to a natural wetland system. These changes are directly tied to velocities and other hydraulic parameters within the streams. Since no channel surveys are available at this phase, it is not possible to quantify the indirect impacts to water quality due to sediment deposition, pollutant accumulation, or nutrient discharges. As such, impacts to water quality are described below in qualitative terms.

In general, the greater the amount of construction activities near drainage pathways the greater the potential for sediment and erosion related problems. Some examples include failed silt fencing, construction tracking, cross drain washouts, prolonged de-watering activities, and violent runoff from impermeable surfaces. Increased hydrocarbon concentrations and turbidity as a result of traffic and construction staging areas could also pose a threat to the environment. General trash accumulation could also potentially increase as a function of the length of roadway, and the amount of development that the roadway attracts.

Sedimentation could degrade water quality by increasing turbidity, suspended solids, and pollutants. Sediment deposition could also reduce floodwater storage capacity, change water depths and flow patterns, and block water inflow or outflow paths. Additionally, large volumes of sediment could adversely impact vegetative species by cutting off oxygen to their roots, and could bury the eggs of aquatic organisms that use streams in the project area for breeding purposes.

Suspended solids in stormwater increase turbidity and transport other pollutants adsorbed to sediment and long-term accumulation of sediment reduces storage capacities of ponds, lakes, and wetlands. Heavy metals are toxic to many aquatic organisms and bioaccumulate in tissues which could pose human health risks to humans. Introducing increased levels of nutrients into a nutrient poor habitat could result in a vegetative shift. Rapid increases in those populations deplete oxygen levels to the extent that fish and other aerobic organisms die off. Bioaccumulation of pesticides in fish and sediment may kill off aquatic organisms after long periods or pose human health risks. PAHs include compounds found in petroleum products that are known to be carcinogenic. Those compounds pose human health risks if drinking water sources or fish become contaminated with them. PAHs in streams in lakes adhere to sediment and bioaccumulate in stream bottoms which could impact benthic organisms and bottom feeders (CEMVN 2008).

Short-term localized direct minor adverse impacts to water quality and aquatic organisms could be expected during construction of the Build Alternatives. Roadway construction would leave large areas of earth unprotected and sloping work could increase the potential for erosion of the surface material during storm events. Roadside ditches would be constructed in non-wetland areas and these ditches could carry eroded material from the construction site down-slope entering downstream wetlands or waterways where sediment would be deposited. Turbid water interferes with respiration and filter-feeding behavior of macroinvertebrates as well as reduces fish feeding success due to visual impairment. Turbidity also decreases photosynthesis for primary producers. Sediment deposition fills pools and interstitial spaces in the stream bottom, choking out aquatic vegetation, and reduces survival rates for macroinvertebrates and juvenile fishes. Turbidity resulting from sediment could reduce light penetration for submerged aquatic vegetation critical to stream health and could increase stream temperatures through energy generated from light reflected off suspended sediments. Sediment could physically alter habitat by destroying the riffle-pool structure in stream systems, and smothering benthic organisms such as clams and mussels. Finally, sediment transports many other pollutants that could affect aquatic organisms in receiving streams. Increased nutrients and hydrocarbons in the receiving streams could create algal blooms that deplete oxygen from the water to low levels which could become toxic to aquatic life (CEMVN 2008). BMPs would be employed to minimize sediment from entering receiving streams.

Figure 4-10 Wetland Areas that Experienced Changes in Water Level Fluctuations for the 2 yr Storm Event

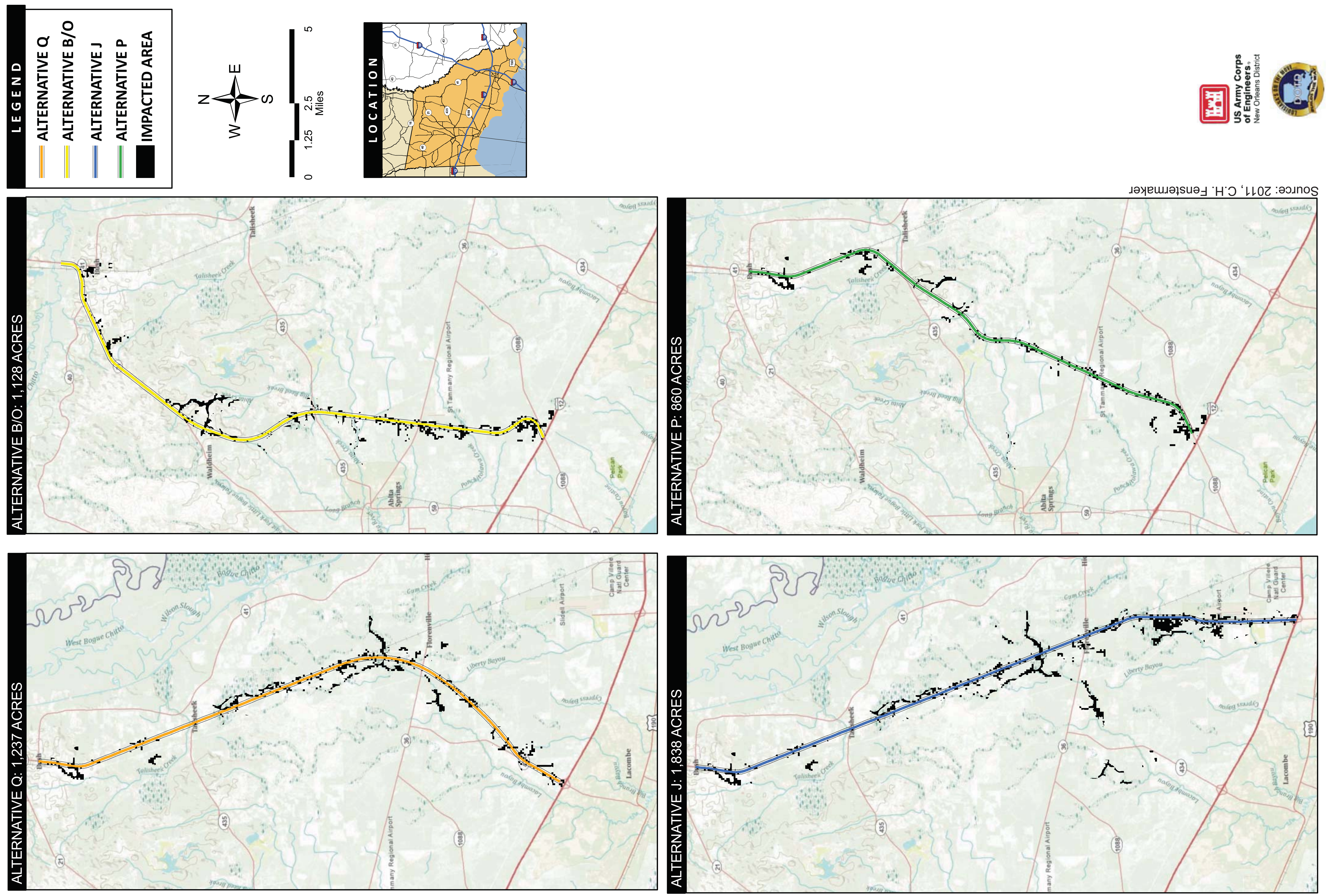
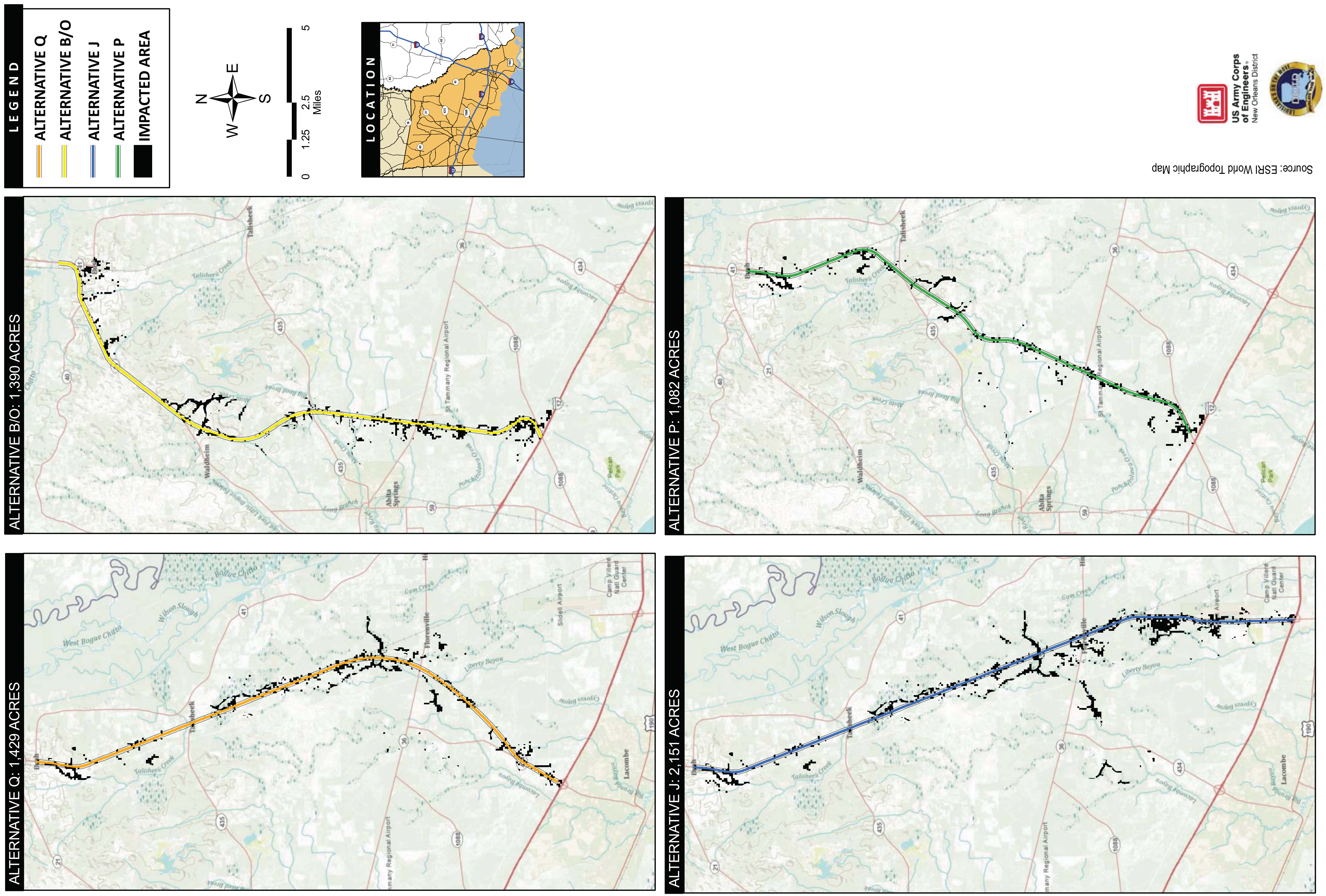


Figure 4-11 Indirect Wetland Impacts[1]



4.3.2.4 Groundwater Impacts

Groundwater recharge and discharge impacts due to roadway placement cannot be fully quantified at this time, but are discussed qualitatively. Local base flow depths generally decrease with the channel improvements and re-alignments that accompany a typical roadway project. Culverts also may potentially become blocked, thereby reducing the base flow downstream while increasing the ponding levels upstream of the roadway. In general, groundwater recharge is a function of soil permeability which would be altered by the proposed roadway due to placement of impermeable materials, changes in ground slope, and soil compaction. The impact extents are thought to be minimal on a large, aquifer-size scale. Groundwater discharge is a function of soil permeability and porosity which may be affected by the proposed roadway. This potential disruption of near surface groundwater discharge may affect the base flow in nearby streams, particularly evident during periods of low flow. Hillside bogs may be adversely impacted since they are sensitive to variations in overland and groundwater discharge. Baseflow impacts typically occur when there are changes to land use or physical characteristics of the overland topography and channel geometry. Additional information would be needed to quantify these impacts.

4.4 ECOLOGICAL RESOURCES

4.4.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to ecological resources within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.4.2 Build Alternatives

Direct and indirect impacts to ecological resources would be expected to be similar for each of the Build Alternatives as described below. Differences in ecological resources impacts between alternatives are described in Sections 4.4.2.1 through 4.4.2.4.

Direct Impacts to Ecological Resources

Each of the Build Alternatives has a maximum ROW width of 250 feet and would fragment existing ecosystems intersecting the alignment. Ecosystem fragmentation creates a less biologically diverse edge condition and reduces the amount of interior space available for wildlife. Forested land (including forested wetlands, pine plantations, and bottomland hardwood forests) would be replaced with grassy or shrub-dominated habitat along the roadway in the ROW and become simplified habitat occupied by grassland species and less-habitat-specific species. Structural diversity of higher elevation habitats would be removed, reducing species diversity, especially birds, in the ROW and along the edges of forested habitat (USEPA 1994).

Short-term direct localized adverse impacts to ecological resources could be expected during project construction. Erosion from construction activities could generate increased levels of turbidity, suspended sediment, lower BOD5 and dissolved oxygen concentrations and slight increases in water temperature of receiving streams in the vicinity of the alternative alignment. Sediment from construction sites could be entrained in stormwater and drain from the site which would increase the turbidity and level of suspended sediments as stormwater runoff drains to receiving streams. With increased turbidity and suspended organic and inorganic sediments, BOD5 could increase and dissolved oxygen levels could decrease from bacteria consuming organic sediments. Increases in suspended sediment could also increase sunlight reflection and generate heat, resulting in slight increases in temperature of receiving streams. Those impacts would be temporary and localized during construction and would be reduced if exposed soils are properly revegetated and erosion control devices are installed where appropriate. All construction activities are required to obtain a Louisiana Pollutant Discharge Elimination System (LPDES) General Permit for *Discharges of Storm Water from Construction Activities 5 Acres or More* (General Permit for Construction Activities). Each permit application requires the submittal and maintenance of a SWP3 which could reduce erosion on the construction site and minimize the amount of sediment and potential pollution entering receiving streams.

Land Cover. Long-term direct major adverse impacts would be expected to occur to existing land cover under the Build Alternatives. Long-term localized impacts from construction activities would be expected and would include removal of trees, shrubs, and structures accompanied by leveling operations, altering the original topography and soil structure. Staging areas would be within the proposed ROW during construction. If the project is fully funded, it is estimated that the construction duration would be approximately four years. However, funding limitations may require the project to be segmented for up to six construction projects, which could extend the construction of the project to a 12-year period.

Long-term direct major adverse impacts would result in loss of habitat and conversion to impervious cover, while a simplified grassland habitat would replace the existing land cover within the limits of construction. Although some native vegetation may be preserved within the limits of construction, the original natural characteristics would be removed within the roadway alignment and disturbed along adjacent roadsides and ditches. LADOTD-approved grasses and wildflowers would be established and trees could be planted in the ROW and median if they meet LADOTD specifications for visibility and safety. Seed mixtures approved by LADOTD include the following species: hulled Bermuda (*Cynodon spp*), unhulled Bermuda, crimson clover (*Trifolium incarnatum L.*)*,* Kentucky 31 fescue (*Festuca arundinacea*), Pensacola bahia (*Paspalum notatum*) vetch (*Visia sp.*), and annual rye (*Lolium multiflorum*).

Wildlife. Short-term localized direct adverse impacts would be expected to wildlife before and during roadway construction. Wildlife inhabiting this area prior to construction include white-tailed deer, red fox, feral pig, gray squirrel, fox squirrel, eastern cottontail rabbit, swamp rabbit, opossum, raccoon, muskrat, and smaller rodents such as moles, shrews, skunks, and weasels. Clearing the ROW would cause localized and temporary dispersal impacts, but wildlife would be expected to return to adjacent areas after construction is complete and the area is revegetated.

Short-term localized direct minor adverse impacts to aquatic life could be expected during construction of the Build Alternatives. Roadway construction would leave large areas of earth unprotected and sloping work could increase the potential for erosion of the surface material during storm events. Roadside ditches would be constructed in non-wetland areas and these ditches could carry eroded material from the construction site down-slope entering downstream wetlands or waterways where sediment would be deposited. Turbid water interferes with respiration and filter-feeding behavior of macroinvertebrates as well as reduces fish feeding success due to visual impairment. Turbidity also decreases photosynthesis for primary producers. Sediment deposition fills pools and interstitial spaces in the stream bottom, choking out aquatic vegetation and reduces survival rates for macroinvertebrates and juvenile fishes. Turbidity resulting from sediment could reduce light penetration for submerged aquatic vegetation critical to stream health and could increase stream temperatures through energy generated from light reflected off suspended sediments. Sediment could physically alter habitat by destroying the riffle-pool structure in stream systems, and smothering benthic organisms such as clams and mussels. Finally, sediment transports many other pollutants that could affect aquatic organisms in receiving streams. Increased nutrients and hydrocarbons in the receiving streams could create algal blooms that deplete oxygen from the water to low levels which could become toxic to aquatic life (CEMVN 2008). BMPs would be employed to minimize sediment from entering receiving streams.

Long-term direct adverse impacts, ranging from moderate to major, to aquatic species could occur under the Build Alternatives. Increased stormwater drainage efficiency from roadsides via ditches could affect surrounding wetlands, reducing the length of time surface water would be stored. Aquatic species found in those seasonally flooded systems have adapted life cycles that allow successful breeding and rearing of young to adulthood in normal rainfall years. If the inundation depth and duration is shortened, aquatic species may not be able to complete life cycles in adjacent wetlands and flatwoods.

Additional short-term direct minor adverse impacts could be expected from noise and lights from construction activities and use of this alternative alignment. Light and noise could affect migration, breeding, and nesting of wildlife in the vicinity of the roadway (CEMVN 2008).

Short-term direct minor adverse impacts to wildlife species during project construction could include temporary disturbances to nesting and annual migration patterns of birds passing over or stopping in St. Tammany Parish en route to Lake Pontchartrain. The project area is in the Mississippi flyway and the eastern portion of Louisiana is one of the principal routes for migratory birds (Birdnature 2001). Migratory birds rely on wetlands in St. Tammany for foraging, breeding, and nesting habitat including northern pintail, green-winged teal, canvasback, ring-necked, greater and lesser scaup, bufflehead northern cormorant, common loon, pied-billed grebe, and horned grebe (CWP 2006). Land clearing and noise during construction could disrupt bird stopovers, but those impacts would be temporary and localized during construction.

Threatened and Endangered Species and Habitats. No direct impacts to any T&E species would be expected under the Build Alternatives. Field surveys were conducted for these species identified as potentially occurring in the project area: red-cockaded woodpecker, Louisiana quillwort, gopher tortoise, and ringed map turtle.

During field surveys of the proposed alternative alignments in March, April, May, and September 2010, red-cockaded woodpeckers and cavity trees were not observed within or in the vicinity of the 250-ft ROW.

No quillwort was observed during any field surveys and critical habitat was not identified in the 250-ft ROW of any alternative but appropriate habitat exists in the project area.

The sandy soils and herbaceous understory of the upland longleaf pine forests are known as suitable habitat for the gopher tortoise. Gopher tortoise and burrows were not observed during any of the field surveys. No critical habitat has been identified for gopher tortoise in the 250-ft ROW of the alignments but appropriate habitat exists in the project area. In 2001, the EPA Endangered Species Protection Program identified two locations of potential gopher tortoise critical habitat. Detailed surveys of those areas were performed in February 2011 but did not identify critical habitat or observe gopher tortoise or burrows.

Ringed map turtle was not observed during any of the field surveys. No critical habitat has been identified for the ringed map turtle in the 250-ft ROW of any alternative. The nearest identified habitat is in the vicinity of the Bogue Chitto River, outside of the project area (NatureServe 2009).

Bachman's sparrow, a candidate for T&E listing, is a resident of pine woodlands and prefers open pine woods in transition to forest. Clearing of timber areas could displace this songbird to other remaining pine woodlands (National Audubon Society 2010a). Henslow's sparrow is a winter migratory species that could be impacted by the Build Alternatives through fragmentation of pine savanna habitat and loss of pitcher plant bogs. This species prefers those types of habitats along the southeastern coastal states and fragmentation or loss of those habitats would reduce winter habitat (National Audubon Society 2010b).

Sensitive Terrestrial and Aquatic Habitats. Long-term direct major adverse impacts to sensitive natural communities would be expected under the Build Alternatives. Pine flatwoods and savannas are sensitive habitats that may be impacted under the Build Alternatives. Those areas provide habitat for several species being considered for listing as threatened or endangered, including Bachman's sparrow, diamondback rattlesnake, flatwoods salamander, pine snake, and southern hognose snake. Less mobile birds, amphibians, and reptiles inhabiting the areas where staging or construction would occur could be displaced or killed if this alternative was implemented. Pine flatwoods are also known for their richness in vegetation diversity with orchids, insectivorous plants, and other vegetation endemic only to this habitat. Loss of this habitat could subsequently result in the loss of rare plants including parrot pitcher plant (*Sarracenia psittancina*) and spreading pogonai (*Cleistes bifaria*) found only in pine flatwoods and savannas.

Other sensitive terrestrial and aquatic habitats include the five mitigation banks in the project area: Dolly-T, Talisheek Pine Wetlands, Abita Creek Flatwoods, Bayou Lacombe and Mossy Hill. Impacts to each mitigation bank vary depending on the location of the alignment to the mitigation bank.

Wetlands. Long-term direct major adverse impacts to wetlands would be expected under the Build Alternatives. Wetlands in the proposed 250-ft ROW of each alternative alignment would be permanently lost to construction, clearing, and filling activities. Portions of wetlands would be converted to impervious roadway and grassy ROW. Appendix I provides detailed figures illustrating the wetland types directly impacted by the Build Alternatives.

Indirect Impacts to Ecological Resources

Long-term indirect minor adverse impacts to ecological resources could be expected post-construction from routine vehicle traffic, roadway maintenance, and vehicle accidents and spills. Routine maintenance activities such as roadway paving and patching; roadside blading and litter collection; vegetation management; cleaning, painting, and repair of roadside structures; street cleaning; equipment cleaning and hazardous material handling and storage could lead to degradation of water quality, including increased suspended solids, temperature, and concentrations of heavy metals, nutrients, pesticides, and hydrocarbons from roadside runoff and alterations in hydrology from road construction (USEPA 1994).

Suspended solids in stormwater increase turbidity and transport other pollutants adsorbed to sediment and long-term accumulation of sediment reduces storage capacities of ponds, lakes, and wetlands. Heavy metals are toxic to many aquatic organisms and bioaccumulate in tissues which could pose human health risks to humans. Introducing increased levels of nutrients into a nutrient poor habitat could result in a vegetative shift. Rapid increases in those populations deplete oxygen levels to the extent that fish and other aerobic organisms die off. Bioaccumulation of pesticides in fish and sediment may kill off aquatic organisms after long periods or pose human health risks. PAHs include compounds found in petroleum products that are known to be carcinogenic. Those compounds pose human health risks if drinking water sources or fish become contaminated with them. PAHs in streams and lakes adhere to sediment and bioaccumulate in stream bottoms which could impact benthic organisms and bottom feeders (CEMVN 2008).

Long-term indirect adverse impacts to natural hydrology, fire regimes, animal migration patterns, and competitor and predator-prey relationships could occur under this alternative (USEPA 1994).

Natural linkages formed by riverine habitat would be impacted, affecting natural hydrology and reducing the ability of wildlife to move from one area to another (CEMVN 2008). Habitats for several bird species require prescribed burns to maintain suitable habitat including Northern Bobwhite quail, American woodcock, Bachman's sparrow, and Henslow's sparrow (LDWF 2008, National Audubon Society 2010a, 2010b, Olinde 2010). Safety issues associated with highway operations could preclude fire management activities near the roadway and in most cases would limit it in the general vicinity except during favorable wind conditions (CEMVN 2008).

Invasive species including Chinese tallow (*Triadica sebifera*), cogon grass (*Imperata cylindrical)*, and kudzu (*Pueraria montana*) could spread in disturbed areas along the roadway. Chinese tallow is a prolific invasive tree prevalent along disturbed forest edges and swamps. Cogon grass is known to occur in St. Tammany and Washington Parishes and prefers disturbed uncultivated areas with sandy soils and low nutrients, especially areas along highways and is known to be spread by mowing equipment that has not been washed and treated. Cogon grass will also outcompete native vegetation and becomes very difficult to control once established. Kudzu is an aggressive exotic vine occurring throughout the area that is known to rapidly overtake large swaths of existing vegetation, reducing the native plant's ability to absorb sunlight for photosynthesis, which eventually kills the plant (Tulane/Xavier 2010). Other invasive species observed in the region during field surveys include Japanese climbing fern (*Lygodium japonicum*), tungoil tree (*Aleurites fordii*), and privet (*Ligustrum spp.*).

Red imported fire ants (*Solenopsis invicta*) were accidentally introduced to Mobile, Alabama in 1933 and have spread throughout the southern United States. Fire ant infestations could spread in the project area through fill, mulch, gravel, or sod brought in from outside the project area that contain fire ant mounds or on vehicles traveling along the highway (Tulane/Xavier 2010).

The southern pine beetle (*Dendroctonus frontalis* Zimmerman) is a destructive insect throughout the Southern United States, Mexico, and Central America and affects all pines but primarily impacts loblolly and shortleaf pine trees. Infestations occur in stands where trees have been crowded and vigor is low. Pine stands weakened by drought, flooding, and logging are more susceptible to infestations and if beetle populations are large enough, they could spread from the weakened stands and infest and overtake healthy trees. Road construction could weaken pine trees through soil compaction and erosion and could make trees susceptible to beetle infestation. To minimize outbreaks, roadways should be constructed to minimize erosion, flooding, and changes in the water table (USDA 1997).

Land Cover. Long-term indirect moderate adverse impacts could be expected to land cover. Highway development could indirectly induce secondary development along the alignment or at intersections with other roadways which could destroy, fragment, and degrade existing ecosystems in a similar manner. New developments could require clearing of vegetation which could remove or fragment existing habitats and construction could degrade surrounding ecosystems through increased sediment loading of receiving streams. After construction is complete, water quality would be expected to return to preconstruction conditions.

Wildlife. Long-term indirect minor adverse impacts could be expected from the fragmentation of habitat under the Build Alternatives, including mortality of native species, physiological stress and decreased reproduction, disruption of normal behavior and activities, segmentation of interbreeding populations, modified species interactions, and invasion of exotic species (USEPA 1994). Increased light penetration and wind into forests alter the microclimate and could impact species diversity and density along the forested edge. Natural animal migration patterns and the relationships among competitors and between predators and prey are an essential part of ecosystem integrity. Some predator species would benefit with the introduction of new prey species, but less adaptable species would be adversely affected by the presence of new competitors or predators.

Long-term indirect major adverse impacts could be expected under the Build Alternatives. The roadway would introduce a physiological barrier between contiguous pine habitat and wetlands, which could inhibit wildlife migration across the roadway and breeding and nesting in the vicinity of the roadway. Wildlife mortality as a result of collisions with vehicles could increase as wildlife cross the roadway.

Threatened and Endangered Species and Habitats. Indirect impacts are alignment specific and described in Sections 4.4.2.1 through 4.4.2.4.

Wetlands. Long-term moderate indirect adverse impacts could be expected under the Build Alternatives. Changes to hydrology could reduce the ability of wetlands to provide existing functions and services. Impacts to wetland hydrology could degrade water quality, constrict flows, increase flooding, increase peak flows, increase water level fluctuations, and reduce water storage capacity.

Wetland functions and services and the types of plants and animals that inhabit it are largely determined by hydrology (CWP 2006). Wetland functions include water storage, transformation of nutrients, growth of living matter, and wildlife habitat. Construction of the alignment could impede channel and overland flow resulting in oversaturated and ponded areas in adjacent wetlands. Since majority of the project area has little to no slope, water tends to move via overland flow. Culverts allow surface flows to move under the roadway, however, over time culverts are the most common cause of flow constriction because of long-term loss in hydraulic capacity from sedimentation and increased peak flows (CWP 2006).

Stormwater runoff from impervious road surfaces and compacted soils could degrade water quality by increasing sediment deposition and pollutant accumulation in adjacent wetlands. Increased sedimentation could reduce light availability, temperature, and oxygen levels in the soil needed for seedling germination. Over time, increased pollutant and nutrient concentrations could reduce the ability of a wetland to break down nutrients and other pollutants in the soil causing the wetland to become a source of contamination.

Higher peak flows and improved drainage could result in a wider fluctuation of water levels in adjacent wetlands. Those fluctuations would return to baseline conditions more quickly than in an undeveloped wetland area (CWP 2006). When the seasonal water level fluctuation is altered in a wetland, mortality of existing plant communities could occur in response to the new hydroperiod and change the wetland type.

Reduced storage capacity from wetland loss could increase the frequency and magnitude of stormwater runoff and the increased volume of water carried by area streams could result in flows beyond the *critical erosive velocity*. The increased energy resulting from more frequent bank full flow events could result in erosion, enlargement of the stream channel, and consequent habitat degradation. Reduced surface water storage capacity of wetlands could not only increase the rate of stormwater runoff during storm events, but also reduce available, near surface groundwater which is important in maintaining base stream flow during drier periods. The decline in the physical habitat of the stream, coupled with lower base flows and higher stormwater pollutant loads, could also have a severe impact on the aquatic community.

To quantify the indirect impacts to wetlands outside of the Build Alternatives ROW, models were run to evaluate the impact on inundation (ponding), hydrologic drought, and water level fluctuations. Ponding was defined as areas inundated for three consecutive days with a water depth greater than one inch. Hydrologic drought events are defined as wetland areas that remain dry for three consecutive days. Water level fluctuations are defined as the difference in maximum and minimum water levels in a wetland for a given period of time and are used to quantify a wetland's hydroperiod. For modeling purposes, analysis was performed for the 2, 25, and 100-year storm events, and a change in water level was noted only if it exceeded one inch. Results of the model analysis show that ponding duration is not a critical factor in terms of identifying the acreage of wetland impacted. In addition, no significant drought would be caused by construction of any of the alternatives.

4.4.2.1 Alternative B/O

Direct Impacts to Ecological Resources

Land Cover. Long-term significant direct adverse impacts to land cover would occur under Alternative B/O. Approximately 513 acres of existing land cover would be replaced with impervious road surfaces and a simplified habitat of grasses and herbaceous material in the 250-ft ROW. Table 4-19 lists land cover directly impacted in the 250-ft ROW for Alternative B/O.

Table 4-19.
Alternative B/O land cover converted to highway

Land Use	Area (acres)
Cultivated Crops	1.45
Emergent Herbaceous Wetlands	1.66
Evergreen Forest	260.67
Grassland/Herbaceous	14.96
Mixed Forest	0.87
Open Water	1.42
Pasture/Hay	10.60
Shrub/Scrub	151.93
Forested Wetlands	69.71

Source: U.S. Department of Interior 2007

Wildlife. No additional impacts to wildlife would be expected beyond the direct impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. No direct impacts to potential red-cockaded woodpecker habitat would be expected under this alternative. During field surveys of the proposed alternative alignments in March, April, May, and September 2010, red-cockaded woodpeckers and cavity trees were not observed within the 250-ft ROW, or vicinity of, Alternative B/O. Potential suitable habitat was observed in the vicinity of the ROW along Alternative B/O, but additional detailed surveys performed in February 2011 did not identify locations along Alternative B/O that would support suitable foraging or nesting habitat. Appendix C provides details of the survey in the Threatened and Endangered Species Report.

No direct impacts to the Louisiana quillwort would be expected. Three locations for the Louisiana quillwort have been mapped along the northern portion of LA 21 where LA 21 would be widened as part of the new alignment; however no quillwort was observed during any field surveys.

Sensitive Terrestrial and Aquatic Habitats. Long-term direct major adverse impacts to sensitive natural communities would be expected under Alternative B/O. Approximately 225 acres of pine flatwoods habitat within the 250-ft ROW would be permanently lost and converted to impervious cover and simplified grassland habitat.

Approximately 30 acres of upland longleaf pine habitat within the 250-ft ROW would be lost and converted to roadway and simplified grassland habitat. The 30 acres is part of a 372-acre upland longleaf pine area which would be bisected by the alignment. Upland longleaf pine habitat is approximately 2.5 miles south of LA 21 where Alternative B/O turns southward. This longleaf pine habitat is currently in a degraded state with dense woody understory but mechanical and chemical controls to remove the underbrush and prescribed burns could restore the functions of the community (LDWF 2010).

Wetlands. Long-term direct major adverse impacts to wetlands would be expected under Alternative B/O. Approximately 384 acres of wetlands in the proposed 250-ft ROW would be permanently lost to construction, clearing, and filling activities. The wetland types directly impacted are listed in Table 4-20. Detailed figures illustrating the wetland types directly impacted by Alternative B/O are provided in Appendix I.

Table 4-20.
Direct wetland impacts for alternative B/O

Wetland Type	Area (acres)
Pine flatwoods (less intensively managed)	194.0
Pine savanna (or areas in early succession)	91.0
Bayhead or hardwood flats along stream channels	50.4
Slash pine/pond cypress flats	30.2
Degraded primary and secondary habitats	18.4

Indirect Impacts to Ecological Resources

Land Cover. No additional impacts to land cover would be expected beyond the indirect impacts listed in Section 4.4.2.

Wildlife. No additional impacts to wildlife would be expected beyond the indirect impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. Long-term indirect negligible impacts to habitat for the Louisiana quillwort could occur by the widening of LA 21 under this alternative. Widening of LA 21 near the mapped locations for Louisiana quillwort may alter hydrology and water quality and adversely impact native habitat through higher and lower flows and increased turbidity, temperature, and sedimentation of wetlands and receiving streams.

Sensitive Terrestrial and Aquatic Habitats. No additional impacts to sensitive terrestrial and aquatic habitats would be expected beyond the indirect impacts listed in Section 4.4.2.

Wetlands. To minimize flow constrictions, 23 major culverts, 67 equalizer culverts, and 7 bridges are proposed over the 30 waterways crossed by this alternative (see Section 4.3). Since majority of the project area has little to no slope, water tends to move via overland flow. Modeling indicates Abita Creek and the associated wetlands north of LA 435 could experience the greatest amount of flow constriction and water impounding under this alternative.

Table 4-21 provides a summary of the model results for indirect wetland impacts for Alternative B/O. Section 4.3 provides further detail regarding the direct and indirect impacts to water resources, and hydrology and hydraulics.

Table 4-21. Alternative B/O indirect wetland impacts

Indirect Wetland Impact	Acres Impacted
Pine flatwoods (less intensively managed)	407.9
Pine savanna (or areas in early succession)	143.2
Bayhead or hardwood flats along stream channels	44.8
Slash pine/pond cypress flats	44.5
Degraded primary and secondary habitats	1.9

4.4.2.2 Alternative J

Direct Impacts to Ecological Resources

Land Cover. Long-term significant direct adverse impacts to land cover would occur under Alternative J. Impervious surfaces and grasses and herbaceous material in the 250 foot ROW would replace approximately 573 acres of existing land cover on the proposed alignment. Table 4-22 lists the land cover permanently lost and converted to roadway under this alternative.

**Table 4-22.
Alternative J land cover converted to highway**

Land Use	Area (acres)
Cultivated Crops	8.07
Emergent Herbaceous Wetlands	0.41
Evergreen Forest	178.06
Grassland/Herbaceous	22.83
Mixed Forest	0.92
Open Water	0.08
Pasture/Hay	13.51
Shrub/Scrub	272.86
Forested Wetlands	76.30

Source: U.S. Department of Interior 2007

Wildlife. No additional impacts to wildlife would be expected beyond the direct impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. No direct impacts to potential red-cockaded woodpecker habitat would be expected under this alternative. Suitable foraging or nesting habitat was not observed during surveys along Alternative J; however, a goal of mitigation banks in the project area is to restore suitable habitat for this species, which could be negatively affected by the loss of bank lands and the inability to properly manage these banks.

Suitable gopher tortoise habitat has been mapped and identified along the northern section of the alignment east of and adjacent to the abandoned Gulf Mobile and Ohio Railroad. Gopher tortoise and burrows were not observed during any of the field surveys. No designated critical habitat has been identified for gopher tortoise in or in the vicinity of the Alternative J 250-ft ROW. In 2001, the EPA Endangered Species Protection Program identified two locations of potential gopher tortoise critical habitat, which are outside of the 250 foot ROW (USEPA 2001). Appendix C provides details of February 2011 surveys of those two areas, which did not identify critical habitat, gopher tortoise, or burrows.

Sensitive Terrestrial and Aquatic Habitats. Long-term direct major adverse impacts to sensitive natural communities would be expected under Alternative J. Alternative J would directly impact two mitigation banks in the project area. Direct long-term major adverse impacts would be expected to Mossy Hill Mitigation Bank (Figure 4-12) and Dolly-T Mitigation Bank (Figure 4-13). At Mossy Hill Mitigation Bank, approximately 35 acres of wet pine savanna would be removed and fragment the bank into one large 2,073 acre parcel and two smaller parcels, one approximately 108 acres and the other 536 acres. Alternative J would also impact the Dolly-T Mitigation Bank. The bank consists of 1,624 acres of pine wetland habitat. Approximately 25 acres of the mitigation bank would be lost and converted to highway and ditches in the 250-foot ROW. Additionally, the road would fragment an additional 10 acres from the main parcel, reducing the bank to approximately 1,589 acres. The fragmentation of this mitigation bank could lead to land management issues, as management of those areas close to the roadway may be limited when prescribed burning for habitat improvement occurs. Smoke from the prescribed burns could impact the visibility and safety of vehicles traversing the roadway and limit how these areas of the mitigation bank can be managed. The loss of wet pine savanna habitat could also impact restoration activities planned for the gopher tortoise and overall restoration efforts to re-establish habitat for red cockaded woodpecker, Bachman's sparrow, mud salamander, pitcher plants, pine woods lily, and bog flame flower (EIP 2010).

Wetlands. Long-term direct major adverse impacts to wetlands would be expected with this alternative. Approximately 373 acres of wetlands in the proposed 250-ft ROW would be permanently lost to construction, clearing, and filling activities. The wetland types directly impacted are listed in Table 4-23. Detailed figures illustrating the wetland types directly impacted by Alternative J are provided in Appendix I.

Table 4-23.
Direct wetland impacts for Alternative J

Wetland Type	Area (acres)
Pine flatwoods (less intensively managed)	16.7
Pine flatwoods (intensively managed)	223.7
Pine savanna (or areas in early succession)	94.2
Bayhead or hardwood flats along stream channels	13.8
Slash pine/pond cypress flats	20.5
Degraded primary and secondary habitats	3.7

In the northern portion of the alignment, approximately 2,000 feet south of the intersection LA 40 in Bush, Louisiana, a section of Little Brushy Branch is proposed to be channelized along the road for approximately 2,465 linear feet. In this area, approximately 14 of the 373 acres of wetlands would be removed or disturbed by road construction and channel realignment.

Figure 4-12 Alt J+Q Direct Impacts to Mossy Hill Mitigation Bank

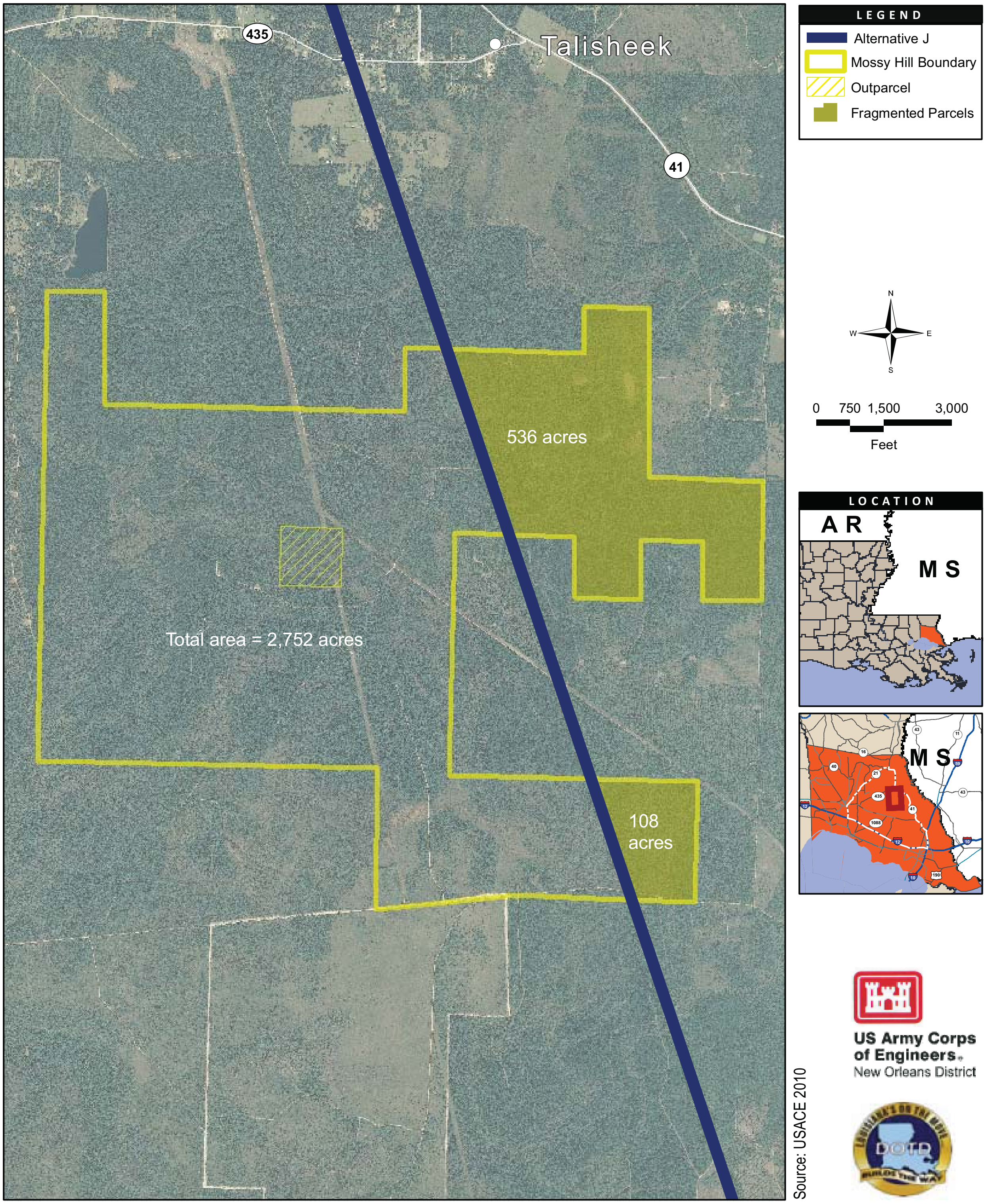
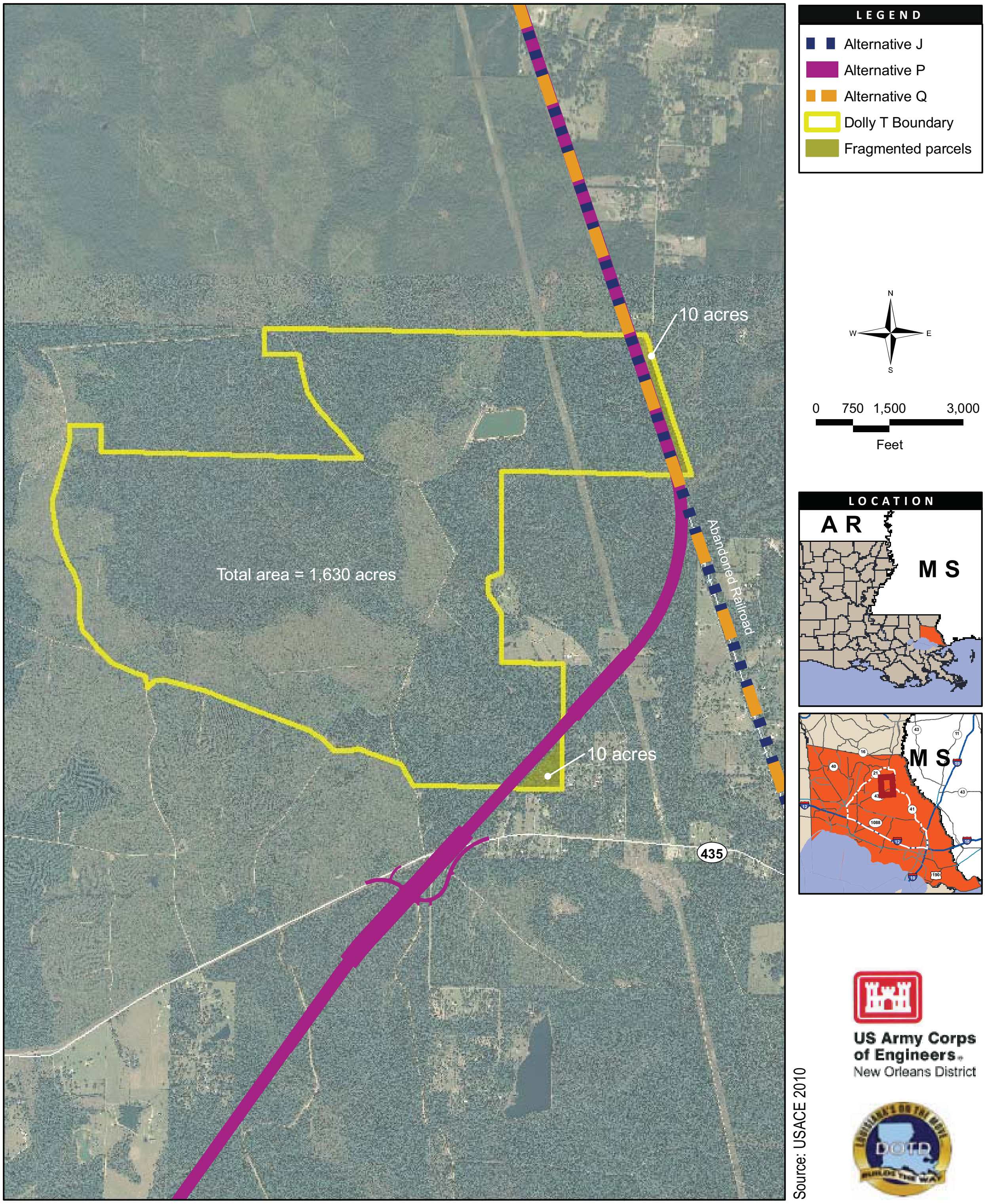


Figure 4-13 Alt J+P+Q Direct Impacts to Dolly T Mitigation Bank



Source: USACE 2010

Indirect Impacts to Ecological Resources

Land Cover. No additional impacts to land cover would be expected beyond the indirect impacts listed in Section 4.4.2.

Wildlife. No additional impacts to wildlife would be expected beyond the indirect impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. Fragmentation of the Mossy Hill and Dolly-T Mitigation Banks could impact the ability of the bank to restore habitat for the threatened gopher tortoise or the rare Bachman's sparrow, mud salamander, pitcher plants, pine woods lily, and bog flame flower.

Rehabilitation and management of red-cockaded woodpecker habitat relies on prescribed burning of pine forest communities which also directly benefits other pine woodland bird species such as Bachman's sparrow, brown-headed nuthatch, pine warbler, prairie warbler, and red-cockaded woodpeckers (USFWS 2003). Construction of this alternative could limit or preclude prescribed burns in wetland mitigation banks in the vicinity of the roadway. Smoke could reduce visibility along the roadway and burns could be restricted unless wind and weather conditions are favorable to minimize road hazards.

The management of habitat for red-cockaded woodpeckers could be indirectly impacted for Dolly-T Mitigation Bank and Talisheek Pine Wetlands Mitigation Bank. Both Dolly-T and Talisheek Pine Wetlands mitigation banks provide nesting and foraging habitat for the red-cockaded woodpecker and prescribed burns could be precluded with construction and operation of the proposed alignment. Impacts would be similar to those described in the paragraph above for pine forest communities.

Sensitive Terrestrial and Aquatic Habitats. Indirect impacts to mitigation banks, pine wetlands, flatwoods, and savannas could occur under this alternative. Disturbed hydrology in those habitats increases susceptibility of pine communities to invasive vegetation including Chinese tallow and cogon grass. Old-field weed species may germinate following disturbances which could reduce fire frequency and encourage hardwood growth.

Indirect impacts could also be expected to Talisheek Pine Wetlands, Mossy Hill Mitigation Bank, and Dolly-T Mitigation Bank under this alternative. Those mitigation banks are adjacent to and west of Alternative J in the northern section of the alignment. This alternative would be constructed over an existing abandoned railroad corridor which would have less indirect hydrological impacts to the surrounding ecosystems than a new alignment in an undisturbed area. However, enhancement activities, management, and maintenance of the mitigation bank may be impacted by affecting prescribed burn schedules for the area.

Additionally, safety issues associated with highway operations could prevent fire management activities near the roadway and generally limit any prescribed burns in the vicinity except under favorable wind conditions. Pine flatwood savanna mitigation banks rely on fire management as the principal tool to enhance and maintain bank lands and accrue credits to replace adverse impacts associated with department of the Army permits. The loss of ability to conduct prescribed burns could reduce the credit potential of those banks.

Wetlands. In the northern portion of Alternative J, a section of Little Brushy Branch is proposed to be channelized along the alignment for approximately 2,465 linear feet. In this area, approximately 14 acres of wooded wetlands could be indirectly impacted by channelization. Channelization of a stream could result in draining adjacent wetlands through more efficient drainage, which could increase stormwater flows downstream, reduce baseline flows, and alter the existing wetland plant community.

To minimize flow constrictions along the alignment, 24 major culverts, 78 equalizer culverts, and 6 bridges are proposed by this alternative (see Section 4.3). Table 4-24 presents a summary of the indirect wetland impacts for Alternative J, and Section 4.3 provides additional detail regarding the direct and indirect impacts on water resources, as well as hydrology and hydraulics.

Table 4-24.
Alternative J indirect wetland impacts

Indirect Wetland Impact	Acres Impacted
Pine flatwoods (less intensively managed)	43.4
Pine flatwoods (intensively managed)	565.7
Pine savanna (or areas in early succession)	102.5
Bayhead or hardwood flats along stream channels	34.5
Slash pine/pond cypress flats	39.5
Degraded primary and secondary habitats	0.6

In addition, Alternative J would be expected to have long-term, major adverse indirect impacts to the Talisheek Pine Wetlands Mitigation Bank, Dolly-T Mitigation Bank, and Mossy Hill Mitigation Bank. The indirect impacts to these mitigation banks focus on two main issues – fire and future management and reduced functionality of wetlands.

The primary tool to manage the pine flatwoods/savanna wetlands in the mitigation banks is prescribed burning. This ecosystem requires prescribed burning nearly every year to be effectively maintained and managed in accordance with the goals of the mitigation banks. Currently, strict guidelines are in place to conduct prescribed burns in a way to minimize smoke impacts, particularly those areas near existing roadways, neighboring homes, businesses, and communities. The construction of Alternative J would impact the fire management of these mitigation banks due to smoke management related issues, and result in increased management costs or reduced mitigation quality if areas cannot be burned as necessary. Changes in the mitigation banks' fire management program would reduce the number of opportune burn days and increase the use of herbicides and mechanical cutting to effectively control underbrush.

Functionality of the wetlands would be impacted as Alternative J would fragment the mitigation bank. Fragmentation could reduce biodiversity of the ecosystem by impacting the hydrologic regime, introducing highway noise, or introducing invasive non-native species, particularly cogon grass. The impacts due to fragmentation could reduce the value of wetland credits in the mitigation bank and increase the management costs of the system.

4.4.2.3 Alternative P

Direct Impacts to Ecological Resources

Land Cover. Long-term significant adverse direct impacts would occur under Alternative P. Approximately 507 acres of existing land cover would be permanently lost by conversion to highway and associated ditches in the 250-ft ROW limit of construction. Table 4-25 lists the land cover types that would be directly impacted under this alternative.

Table 4-25.
Alternative P land cover converted to highway

Land Use	Area (acres)
Cultivated Crops	6.20
Evergreen Forest	275.54
Grassland/Herbaceous	23.77
Mixed Forest	1.19
Pasture/Hay	32.75
Shrub/Scrub	102.57
Forested Wetlands	65.44

Source: U.S. Department of Interior 2007

Wildlife. No additional impacts to wildlife would be expected beyond the direct impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. Long-term direct minor adverse impacts to potential red-cockaded woodpecker habitat would be expected under this alternative. Potential suitable habitat was observed in the vicinity of the ROW in along two locations along Alternative P. Detailed surveys of potential suitable habitat were performed in February 2011. One location along the northern portion of Alternative P was observed to have suitable foraging habitat, but no suitable nesting habitat. The location along the southern portion of Alternative P was observed to have suitable nesting and foraging habitat, but no cavities formed by red-cockaded woodpeckers. Appendix C provides details of the surveys.

Sensitive Terrestrial and Aquatic Habitats. This alternative would cross the southwestern and western edges of the Dolly-T mitigation bank (Figure 4-13). The bank consists of 1,624 acres of pine wetland and associated community habitat. Approximately 35 acres of the mitigation bank would be lost and converted to highway and ditches in the 250-foot ROW. The mitigation bank would be fragmented into two 10-acre parcels, reducing the original size of the mitigation bank to 1,569 acres. The fragmentation of this mitigation bank could lead to land management issues, as those areas close to the roadway may be limited when prescribed burning for habitat improvement occurs. Smoke from the prescribed burns could impact the visibility and safety of vehicles traversing the roadway and limit how these areas of the mitigation bank can be managed.

Wetlands. Long-term direct major adverse impacts to wetlands would be expected under this alternative. Approximately 358 acres of wetlands in the proposed ROW would be permanently lost to construction, clearing, and filling activities. The wetland types directly impacted are listed in Table 4-26. Detailed figures illustrating the wetland types directly impacted by Alternative P are provided in Appendix I.

Table 4-26.
Direct wetland impacts for Alternative P

Wetland Type	Area (acres)
Pine flatwoods (less intensively managed)	164.7
Pine savanna (or areas in early succession)	73.6
Bayhead or hardwood flats along stream channels	11.7
Slash pine/pond cypress flats	101.6
Degraded primary and secondary habitats	6.3

Indirect Impacts to Ecological Resources

Land Cover. No additional impacts to land cover would be expected beyond the indirect impacts listed in Section 4.4.2.

Wildlife. No additional impacts to wildlife would be expected beyond the indirect impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. Rehabilitation and management of red-cockaded woodpecker habitat relies on prescribed burning of pine forest communities which also directly benefits other pine woodland bird species such as Bachman's sparrow, brown-headed nuthatch, pine warbler, prairie warbler, and red-headed woodpeckers (USFWS 2003). Construction of this alternative could limit or preclude prescribed burns in wetland mitigation banks in the vicinity of the roadway. Smoke could reduce visibility along the roadway and burns could be restricted unless wind and weather conditions are favorable and minimize road hazards.

The management of habitat for red-cockaded woodpeckers could be indirectly impacted for Dolly-T Mitigation Bank and Talisheek Pine Wetlands Mitigation Bank. Both Dolly-T and Talisheek Pine Wetlands mitigation banks provide nesting and foraging habitat for the red-cockaded woodpecker and prescribed burns could be precluded with construction and operation of the proposed alignment. Impacts would be similar to those described in the paragraph above for pine forest communities.

Sensitive Terrestrial and Aquatic Habitats. Dolly-T Mitigation Bank is a pine wetland community that could be indirectly impacted under this alternative. The existing ecosystem would be fragmented and would reduce the amount of available credits for the bank and could hinder restoration efforts for the mitigation bank.

Indirect impacts could also be expected to Talisheek Pine Wetlands Under this alternative. This mitigation bank is adjacent to and west of Alternative P and north and adjacent to Dolly-T Mitigation Bank. This alternative would be constructed over an existing abandoned railroad corridor which would have less indirect hydrological impacts to the surrounding ecosystems than a new alignment in an undisturbed area. However, rehabilitation and maintenance of the mitigation bank may be impacted by affecting prescribed burn schedules for the area.

Wetlands. The northern 4 miles of Alternative P overlap with the northern 4 miles of Alternative J. Along the northern portion of Alternatives J and P, a section of Little Brushy Branch is proposed to be channelized along the alignment for approximately 2,465 linear feet. In this area, approximately 14 acres of wooded wetlands could be indirectly impacted by channelization. Channelization of a stream could result in draining adjacent wetlands through more efficient drainage which could increase stormwater flows downstream, reduce baseline flows, and alter the existing wetland plant community.

To minimize flow constrictions through streams and wetlands, 23 major culverts, 54 equalizer culverts, and 7 bridges are proposed to cross 33 waterways by this alternative (see Section 4.3).

Table 4-27 provides a summary of the model results for indirect wetland impacts for Alternative P, and Section 4.3 provides further detail regarding the direct and indirect impacts on water resources, and hydrology and hydraulics.

Table 4-27.
Alternative P indirect wetland impacts

Indirect Wetland Impact	Acres Impacted
Pine flatwoods (less intensively managed)	230.6
Pine savanna (or areas in early succession)	89.9
Bayhead or hardwood flats along stream channels	21.1
Slash pine/pond cypress flats	150.1
Degraded primary and secondary habitats	17.1

Indirect impacts to the wetland mitigation banks in the project area would be similar to those described for Alternative J.

4.4.2.4 Alternative Q

Direct Impacts to Ecological Resources

Land Cover. Long-term significant direct adverse impacts would occur under Alternative Q. Approximately 530 acres of existing land cover types would be converted to highway and associated ditches in the 250-ft ROW limit of construction. Table 4-28 lists the land cover types that would be directly impacted.

Table 4-28.
Alternative Q land cover converted to highway

Land Use	Area (acres)
Cultivated Crops	7.53
Evergreen Forest	177.85
Grassland/Herbaceous	14.66
Mixed Forest	0.87
Pasture/Hay	11.47
Shrub/Scrub	265.04
Forested Wetlands	51.40
Emergent Herbaceous Wetlands	1.22

Source: U.S. Department of Interior 2007

Wildlife. No additional impacts to wildlife would be expected beyond the direct impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. No direct impacts on red-cockaded woodpeckers or their habitat would be expected under this alternative. In February 2011 detailed surveys of potential suitable habitat identified no locations along Alternatives Q to support suitable foraging or nesting habitat. The mitigation banks Dolly-T, Talisheek Pine Wetlands, and Mossy Hill, which are adjacent to Alignment Q, were established to restore suitable habitat for this species. Loss of bank lands and the inability to properly manage these banks could negatively affect this goal.

The northern 4 miles of Alternative Q overlap with the northern 4 miles of Alternative Alignments J and P. Gopher tortoise and burrows were not observed during any of the field surveys. No critical habitat has been identified for gopher tortoise in or in the vicinity of the Alternative Q 250-ft ROW. In 2001, the EPA Endangered Species Protection Program identified two locations of potential gopher tortoise critical habitat (USEPA 2001), which are outside the ROW along the northern section of this alignment. In February 2011 detailed surveys of those two areas did not identify critical habitat or observation of gopher tortoise or burrows.

Sensitive Terrestrial and Aquatic Habitats. Bayou Lacombe is designated as a Scenic River and the alignment was designed to ensure Alternative Q did not cross or impact this sensitive area.

Alternative Q would directly impact two mitigation banks in the project area. Direct long-term major adverse impacts would be expected to Mossy Hill Mitigation Bank (Figure 4-12) and Dolly-T Mitigation Bank (Figure 4-13). Approximately 35 acres of wet pine savanna in Mossy Hill Mitigation bank would be removed by the road alignment and fragment the bank into one large 2,073 acre parcel and two smaller parcels, one approximately 108 acres and the other 536 acres. Dolly-T mitigation bank would be fragmented on the western edge by the alignment, removing 25 acres of wetlands for the ROW. The mitigation bank would be fragmented into a 10-acre parcel and reduce the original size of the bank to 1,589 acres. The fragmentation of those mitigation banks could lead to land management issues, as management of those areas close to the roadway may be limited when prescribed burning for habitat improvement occurs. Smoke from the prescribed burns could impact the visibility and safety of vehicles traversing the roadway and limit how these areas of the mitigation bank can be managed. The loss of wet pine savanna habitat could also impact restoration activities planned for the gopher tortoise and overall restoration efforts to re-establish habitat for red cockaded woodpecker, Bachman's sparrow, mud salamander, pitcher plants, pine woods lily, and bog flame flower (EIP 2010).

Wetlands. Long-term direct major adverse impacts to wetlands would be expected under this alternative. Approximately 305 acres of wetlands in the proposed ROW would be permanently lost to construction, clearing, and filling activities. Portions of wetlands would be converted to impervious roadway and grassy ROW. The wetland types directly impacted are listed in Table 4-29. Detailed figures illustrating the wetland types directly impacted by Alternative Q are provided in Appendix I.

Table 4-29.
Direct wetland impacts for alternative Q

Wetland Type	Area (acres)
Pine flatwoods (intensively managed)	198.5
Pine savanna (or areas in early succession)	68.3
Bayhead/hardwood flats along stream channels	7.8
Slash pine/pond cypress flats	30.2
Degraded primary and secondary habitats	0.3

Indirect Impacts to Ecological Resources

Land Cover. No additional impacts to land cover would be expected beyond the indirect impacts listed in Section 4.4.2.

Wildlife. No additional impacts to wildlife would be expected beyond the indirect impacts listed in Section 4.4.2.

Threatened and Endangered Species and Habitats. Fragmentation of Mossy Hill Mitigation Bank could impact the ability of the bank to restore habitat for the threatened gopher tortoise or the rare Bachman's sparrow, mud salamander, pitcher plants, pine woods lily, and bog flame flower. Rehabilitation and management of red-cockaded woodpecker habitat relies on prescribed burning of pine forest communities which also directly benefits other pine woodland bird species such as Bachman's sparrow, brown-headed nuthatch, pine warbler, prairie warbler, and red-headed woodpeckers (USFWS 2003). This alternative could limit or preclude prescribed burns in wetland mitigation banks in the vicinity of the roadway. Smoke could reduce visibility along the roadway and burns would be restricted unless wind and weather conditions are favorable and minimize road hazards.

The management of habitat for red-cockaded woodpeckers could be indirectly impacted for Dolly-T Mitigation Bank and Talisheek Pine Wetlands Mitigation Bank. Both Dolly-T and Talisheek Pine Wetlands mitigation banks provide nesting and foraging habitat for the red-cockaded woodpecker and prescribed burns could be precluded with construction and operation of the proposed alignment. Impacts would be similar to those described in the paragraph above for pine forest communities.

Additionally, safety issues associated with highway operations could prevent fire management activities near the roadway and generally limit any prescribed burns in the vicinity except under favorable wind conditions. Pine savanna mitigation banks rely on fire management as the principal tool to enhance and maintain bank lands and accrue credits to replace adverse impacts associated with department of the Army permits. The loss of ability to conduct prescribed burns could reduce the credit potential of those banks.

Sensitive Terrestrial and Aquatic Habitats. Indirect impacts could also be expected to Talisheek Pine Wetlands, Mossy Hill Mitigation Bank, and Dolly-T Mitigation Bank under this alternative. Those mitigation banks are adjacent to and west of Alternative Q in the northern section of the alignment. This alternative would be constructed over an existing abandoned railroad corridor which would have less indirect hydrological impacts to the surrounding ecosystems than a new alignment in an undisturbed area. However, rehabilitation and maintenance of the mitigation bank may be impacted by affecting prescribed burn schedules for the area.

Wetlands. The northern 4 miles of Alternative Q overlap with the northern 4 miles of Alternatives Alignment J and P. Along the northern portion of Alternative Q, a section of Little Brush Branch is proposed to be channelized along this alignment for approximately 2,465 linear feet. In this area, approximately 14 acres of wooded wetlands could be indirectly impacted by channelization. Channelization of a stream could result in draining adjacent wetlands through more efficient drainage which could increase stormwater flows downstream, reduce baseline flows, and alter the existing wetland plant community.

To minimize flow constrictions in wetlands and streams, 22 major culverts, 71 equalizer culverts, and 3 bridges are proposed to cross 25 channels by this alternative (see Section 4.3).

Table 4-30 provides a summary of the model results for the indirect wetland impacts for Alternative Q, and Section 4.3 provides further detail regarding the direct and indirect impacts on water resources, and hydrology and hydraulics.

Table 4-30.
Alternative Q indirect wetland impacts

Indirect Wetland Impact	Acres Impacted
Pine flatwoods (intensively managed)	414.2
Pine savanna (or areas in early succession)	63.1
Bayhead/hardwood flats along stream channels	10.1
Slash pine/pond cypress flats	89.2

Indirect impacts to the wetland mitigation banks in the project area would be similar to those described for Alternative J.

4.5 GEOLOGY AND SOILS

4.5.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to geology and soils within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.5.2 Build Alternatives

Direct and indirect impacts to geology and soils would be expected to be similar for each of the Build Alternatives as described below. Differences in geology and soil impacts between alternatives are described in Sections 4.5.2.1 through 4.5.2.4.

Direct Impacts to Geology and Soils
Long-term direct major adverse impacts would result from implementation of the Build Alternatives. Removal of surface material and placement of borrow material would directly impact soils in the project area during the construction of the new roadway. The excavation and deposition of fill material would alter natural contours and elevations, increasing slopes along the entire length of the proposed project. Additionally, native soil profiles would be altered by the redistribution of area soils and the introduction of foreign soils to the area. Compaction of the substrate would occur during the construction phase and continue over time with project use. Soil compaction would decrease surface and substrate porosity forming barriers to surface and subsurface water flow.

Short-term and long-term direct minor impacts could result from surface runoff associated with the construction of the roadway. Short-term direct impacts could occur from runoff of exposed soil during the construction phase. Construction of the proposed alternative would expose bare soil and could increase erosion along the alignment. Sediment could be entrained in stormwater and drain from the site, which could increase turbidity and level of suspended sediments as stormwater runoff drains to receiving streams. With increased turbidity and suspended organic and inorganic sediments, BOD5 could increase and dissolved oxygen levels could decrease from bacteria consuming organic sediments. Increases in suspended sediment could also increase sunlight reflection and generate heat, resulting in slight increases in temperature of receiving streams. Those impacts would be temporary and localized and would be expected to return to preconstruction levels after construction is complete and bare soils are revegetated. All construction activities are required to obtain an LPDES General Permit for Construction

Activities. Each permit application requires the submittal and maintenance of a SWP3 which is intended to minimize erosion on the construction site and reduce the amount of sediment and potential pollution entering receiving streams.

The excavated material would be expected to consist mostly of sandy clay loam having a low fertility and high levels of exchangeable aluminum. Because of limited gas exchange within hydric soils, this material would be primarily anaerobic. Excavation of the drainage ditches and adjacent wetlands substrate would result in modifications to the physical condition and chemical composition of the existing soil profile. Removal of the upper soil layers would expose the underlying clay substrata and because clay has binding and colloidal properties different from organic particles, localized changes in soil chemistry would be expected to occur. Soil chemistry would also be affected by the direct exposure of the anaerobic substrata to water and/or air. Most substrate elements and compounds under anaerobic conditions exist in a chemically reduced state. Interaction with the oxygenated environment would result in the conversion of soil chemicals to an oxidized state, affecting pH, redox potential, and overall chemical nature of the existing substrate (CEMVN 2008).

Indirect Impacts to Geology and Soils

Short-term and long-term moderate indirect impacts could result from the increased area of impervious surfaces affecting runoff in the project area. Degradation of receiving streams can typically be observed with less than 10 percent impervious coverage. Runoff from the roadway and compacted soils could increase the concentration of sediment, turbidity, nutrients, and temperature of receiving streams. Higher temperatures of impervious road surfaces could increase the temperature of stormwater runoff and increased concentrations of suspended sediment could absorb more sunlight energy and slightly increase temperatures in the receiving stream.

Highways are also a direct means of transport for pollution from leaking vehicle fluids, vehicle wear and tear, and particulates from pavement breakdown. This could result in the increased concentration of hydrocarbons (PAHs and oil and grease) and heavy metals (copper, lead, and zinc) (CWP 2006) from emissions and wear and tear of vehicle parts including brake linings and leaking fluids such as antifreeze (NHDES 2008, Woodward-Clyde 1994) in soils adjacent to the ROW.

4.5.2.1 Alternative B/O

Direct and Indirect Impacts to Geology and Soils

Appendix J provides the Line and Grade Study for Alternative B/O, which estimates the removal of 19,937 square yards of surface material and the installation of 2,525,719 cubic yards of borrow material.

4.5.2.2 Alternative J

Direct and Indirect Impacts to Geology and Soils

Appendix J provides the Line and Grade Study for Alternative J, which estimates the removal of 26,333 square yards of surface material and the installation of 952,556 cubic yards of borrow material.

4.5.2.3 Alternative P

Direct and Indirect Impacts to Geology and Soils

Appendix J provides the Line and Grade Study for Alternative P, which estimates the removal of 18,933 square yards of surface material and the installation of 2,129,061 cubic yards of borrow material.

4.5.2.4 Alternative Q

Direct and Indirect Impacts to Geology and Soils

Appendix J provides the Line and Grade Study for Alternative Q, which estimates the removal of 34,713 square yards of surface material and the installation of 1,885,625 cubic yards of borrow material.

4.6 AIR QUALITY

4.6.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to air quality within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.6.2 Build Alternatives

Direct and indirect impacts to air quality would be expected to be similar for each of the Build Alternatives as described below.

Direct and Indirect Impacts to Air Quality

Short- and long-term minor adverse impacts to air quality would be expected from implementing any of the Build Alternatives. Short-term impacts would be primarily due to construction of the proposed highway. Long-term impacts would be due to the increase in traffic in the study area and rerouting of traffic to areas where previously there was none.

Construction would require the use of equipment that would emit small amounts of criteria pollutants and greenhouse gases (GHG). In addition, there would be emissions from the use of heavy trucks, fugitive particles from surface disturbance, and workers' commutes. The quantities of pollutants emitted by construction activities would be small and would not contribute to violations of any federal, state, or local air regulation. It is expected that GHG emissions from construction activities would be well below the CEQ presumptive effects threshold.

Air emissions from those activities would be short lived and would cease upon the completion of the construction activities. All construction would be accomplished in full compliance with the Louisiana Regulations for the Control and Abatement of Air Pollution, particularly Title 33 Part III. Chapters of relevance are as follows:

- Chapter 11, Control of Emissions of Smoke
- Chapter 13, Emission Standards for Particulate Matter
- Chapter 21, Control of Emissions of Organic Compounds

In addition BMPs during construction could be required. Those requirements could include:

- Reducing visible emissions and fugitive dust and emissions though watering
- Using BMPs during asphalt paving operations

- Limiting or restricting open burning activities
- Appropriate use of portable fuel containers
- Meeting new engine standards for non-road vehicles
- Using low VOC architectural, industrial, and maintenance coatings

Gasoline contains 2,421 grams carbon per gallon and diesel contains 2,778 grams carbon per gallon (40 CFR 600.113), equating to 19.4 pounds of CO_2 emissions for every gallon of gasoline burned and 22.2 pounds of CO_2 emissions for every gallon of diesel. The average speed of travel would be 42 mph under the existing conditions, and between 65-66 mph depending on the alternative. Because the efficiency of a vehicle is highest at 55 miles per hour and decreases rapidly at higher speeds, the fuel economy would be between 25 and 30 miles per gallon before and after the proposed actions regardless of the alternative (USDOE 2011). In addition, the overall distance traveled between Bush and points along route I-12 would remain between 25 and 30 miles. It is expected that GHG emissions from vehicles would remain approximately the same before and after the proposed actions regardless of the alternative.

The removal of vegetation along the proposed right-of-way would cause a decrease in carbon sinks. The biomass and storage time associated with grasslands, cultivated crops, and scrubland is relatively small. However, forested land uses can sequester as much as 4.69 metric tons per acre of CO_2 per year. Depending on which alternative is ultimately selected, between 230 to 342 acres of forested land would be converted to highway. This would equate to a net reduction in carbon sinks of 1,079 and 1,604 metric tons of CO_2 per year. Regardless of which alternative was ultimately chosen, the overall changes in GHG emissions (sources-sinks) would be well below the CEQ presumptive effects threshold of 25,000 metric tons per year.

4.7 NOISE

4.7.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Long-term negligible adverse effects on the noise environment would be expected with the implementation of the No Build Alternative. The effects would primarily be due to the natural increase in traffic in the study area.

Noise levels were modeled for future traffic conditions with and without the proposed alternatives. Each roadway was modeled, assuming no special noise abatement measures would be incorporated, and the roadway sections were assumed at-grade. Future noise predictions are for the traffic conditions during 2035. It was assumed that the peak-hour volumes and corresponding speeds for trucks and automobiles would result in the noisiest conditions. Noise predictions of $L_{eq}(h)$ for representative receptors within one mile of each proposed alternative's right-of-way are outlined in Table 4-31. Notably, Table 4-31 outlines estimated noise from roadways in the area with the future levels of traffic, but without the proposed control of access highway. Under the No Build Alternative, there would be only a slight increase in the level of traffic noise for receptors within one mile of the proposed Control of Access highways. No residences or other land uses identified equal or exceed the NAC for category B of 66 dBA. No identified receptors would experience a greater than 10 dBA increase.

Table 4-31.
Sound levels - No Build Alternative (2035)

Right-of-Way Considered	Number of receptors within one mile of the proposed right-of-way		Existing L_{eq}[1hr]		No Build L_{eq}[1hr]		Number of Receptors Above 66 dBA
			A.M.	P.M.	A.M.	P.M.	
B/O	477	Maximum	33.7	33.7	34.5	34.9	0
		Minimum	28.8	28.5	30.0	30.1	
		Median	30.4	30.3	31.6	31.7	
J	94	Maximum	34.2	33.9	36.1	34.4	0
		Minimum	30.2	30.0	31.8	31.0	
		Median	31.4	31.1	33.1	31.8	
P	268	Maximum	56.8	56.7	56.7	56.9	0
		Minimum	30.0	29.9	31.4	31.0	
		Median	31.1	31.0	32.6	32.1	
Q	112	Maximum	56.6	56.6	56.6	56.7	0
		Minimum	30.2	30.0	31.8	31.0	
		Median	31.6	31.3	33.4	32.1	

4.7.2 Build Alternatives

Direct and indirect impacts to noise levels would be expected to be similar for each of the Build Alternatives as described below. Sections 4.7.2.1 through 4.7.2.4 describe differences in noise level impacts between alternatives.

Direct Impacts to Noise Levels

A noise study (Appendix D) evaluated impacts to noise sensitive sites along each alternative alignment extend from Bush, Louisiana to I-12. All Build Alternatives would have short-term minor and long-term significant adverse impacts to the noise environment. Short-term impacts would be due to construction activities.

Regardless of alternative, a relatively small number of receptors (between 29 and 124) were identified that would experience a greater than 10 dBA in noise during at least one peak traffic period under future conditions. All receptors identified along the proposed highways are in low-density areas and the distance between the proposed highway and the receptors is relatively large. Regardless of which alternative was ultimately selected, noise barriers would be unreasonable, as the bare minimum cost would be greater than $25,000 per receptor.

Short-term direct impacts would occur from construction activities. As with any major construction project, areas around the construction site are likely to experience varied periods and degrees of noise. Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet (FHWA 2006). Table 4-32 presents typical noise levels (dBA at 50 feet) that the EPA has estimated for the main phases of outdoor construction.

Table 4-32.
Noise levels associated with outdoor construction

Construction Phase	L_{eq} (dBA) at 50 feet from Source
Ground Clearing	84
Excavation, Grading	89
Foundations	78
Structural	85
Finishing	89

Source: USEPA 1974

With multiple pieces of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction sites. The zone of relatively high construction noise levels typically extends to distances of 400 to 800 feet from the site of major construction operations. Locations within 800 feet would experience appreciable levels of heavy equipment noise. Because construction activities would be confined primarily to daytime hours, noise at nearby receptors may be clearly audible, but would not likely be highly annoying.

Highway construction activities would cause temporary localized noise, and would normally be conducted during daytime hours. At certain locations where traffic and/or road-use restrictions would affect the schedule, those activities would proceed during evening hours. Equipment would not be fixed in one location for long durations, but would progress along the ROW, and noise would be temporary and subside at any particular location as the highway construction progresses to subsequent segments. Those impacts would be temporary, and minor.

Indirect Impacts to Noise Levels. Noise levels were modeled for 2035 traffic conditions under each of the Build Alternatives. Table 4-33 outlines noise predictions of L_{eq}(h) for representative receptors near roadways of interest in the study area.

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Table 4-33.
Sound levels for all alternatives

Alternative	Number of Receptors[1]		Leq[1hr] [dBA]						Number of Receptors Above 66 dBA	Change from Existing Leq[1hr]		Number of Receptors Increase by Greater than 10 dBA
			Existing		No Build (2035)		With Alternative (2035)					
			A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.	
B/O	477	Maximum	33.7	33.7	34.5	34.9	66.8	67.0	1	36.8	37.1	124
		Minimum	28.8	28.5	30.0	30.1	33.1	33.5		3.3	3.4	
		Median	30.4	30.3	31.6	31.7	37.1	37.6		6.4	7.0	
J	94	Maximum	34.2	33.9	36.1	34.4	67.6	69.9	1	35.7	38.1	43
		Minimum	30.2	30.0	31.8	31.0	35.5	35.1		1.3	1.2	
		Median	31.4	31.1	33.1	31.8	38.9	40.9		7.0	9.4	
P	268	Maximum	56.8	56.7	56.7	56.9	65.4	64.7	0	34.4	33.7	110
		Minimum	30.0	29.9	31.4	31.0	36.1	35.6		0.1	0.1	
		Median	31.1	31.0	32.6	32.1	40.3	39.9		9.1	8.8	
Q	112	Maximum	56.6	56.6	56.6	56.7	58.2	58.2	0	27.3	27.5	29
		Minimum	30.2	30.0	31.8	31.0	36.5	35.7		-2.7	-2.7	
		Median	31.6	31.3	33.4	32.1	40.1	39.9		7.2	7.3	

[1] Number of receptors within one mile of the proposed Control of Access highways

Long-term moderate adverse indirect impacts to the noise environment would be expected with the implementation of the Build Alternatives. Long-term indirect impacts would be due to changes in traffic noise throughout the study area. Those areas rural in nature currently do not support high levels of through traffic; subsequently, they would have the greatest increase in noise when compared to current levels.

4.7.2.1 Alternative B/O

Direct Impacts to Noise Levels

No additional direct impacts to noise levels would be expected beyond the direct impacts listed in Section 4.7.2.

Indirect Impacts to Noise Levels

A noticeable increase in the level of traffic noise (>3 dBA) would be expected for all receptors within approximately one mile of the proposed Control of Access highways proposed under Alternative B/O. Beyond this distance the change in noise would be barely perceptible. There would be an appreciable increase in the level of traffic noise (>10 dBA) for all receptors within approximately ½ mile of the proposed highways proposed under Alternative B/O.

One residence would exceed the NAC for category B of 66 dBA, and 124 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions (Figure 4-14).

4.7.2.2 Alternative J

Direct Impacts to Noise Levels

No additional direct impacts to noise levels would be expected beyond the direct impacts listed in Section 4.7.2.

Indirect Impacts to Noise Levels

A noticeable increase in the level of traffic noise (>3 dBA) would be expected for all receptors within approximately one mile of the proposed Control of Access highways. Beyond this distance the change in noise would be barely perceptible. There would be an appreciable increase in the level of traffic noise (>10 dBA) for all receptors within approximately ½ mile of the proposed highways proposed under Alternative J. One residence would exceed the NAC for category B of 66 dBA, and 43 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions (Figure 4-15).

4.7.2.3 Alternative P

Direct Impacts to Noise Levels

No additional impacts to noise levels would be expected beyond the direct impacts listed in Section 4.7.2.

Indirect Impacts to Noise Levels

A noticeable increase in the level of traffic noise (>3 dBA) would be expected for all receptors within approximately one mile of the proposed Control of Access highways. Beyond this distance the change in noise would be barely perceptible. There would be an appreciable increase in the level of traffic noise (>10 dBA) for all receptors within approximately ½ mile of the proposed highways proposed under Alternative P. No receptors would exceed the NAC for category B of 66 dBA, but 110 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions (Figure 4-16).

Figure 4-14 Alt B/O - Increased Noise Levels >10dBA

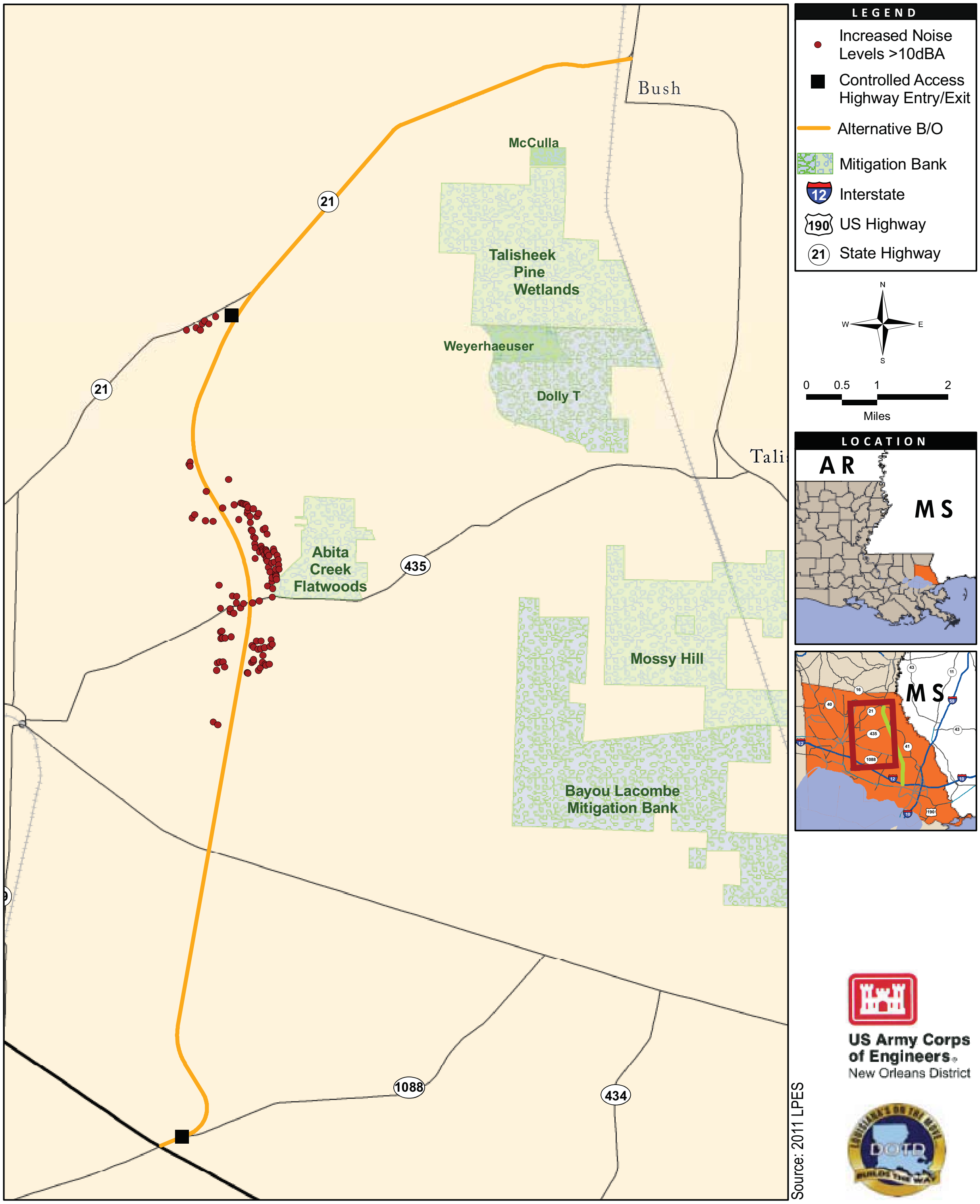

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Figure 4-15 Alt J - Increased Noise Levels >10dBA

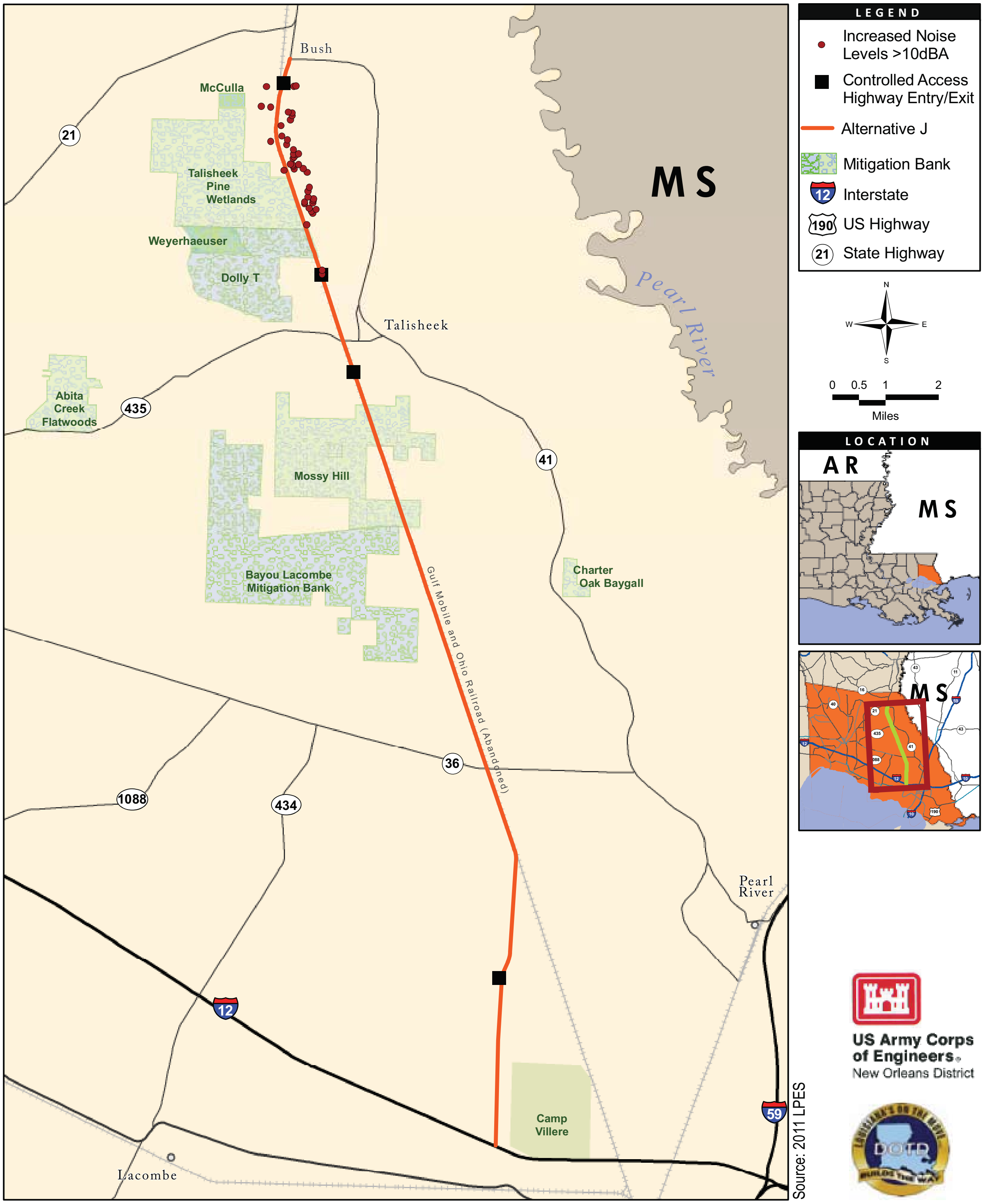
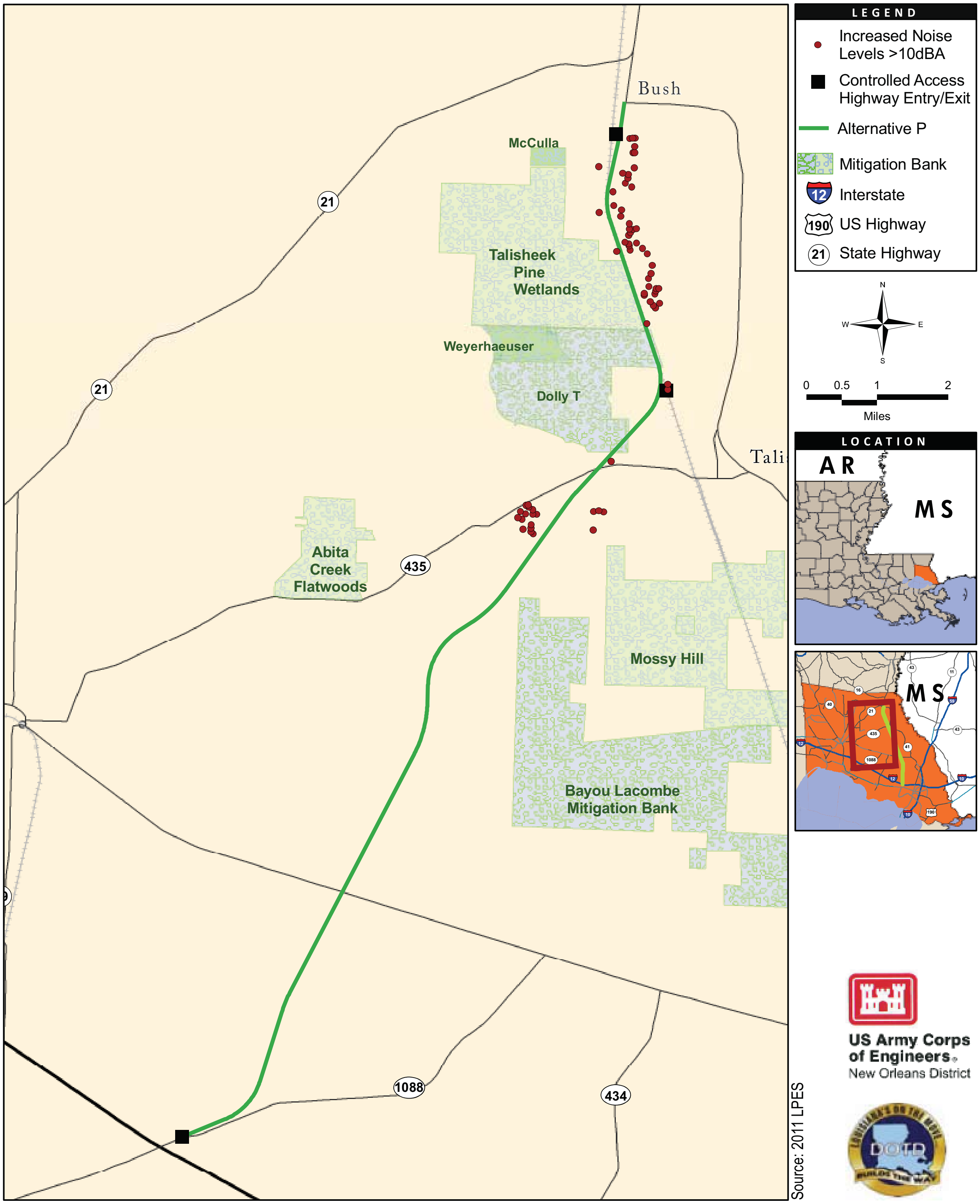


Figure 4-16 Alt P - Increased Noise Levels >10dBA



4.7.2.4 Alternative Q

Direct Impacts to Noise Levels

No additional impacts to noise levels would be expected beyond the direct impacts listed in Section 4.7.2.

Indirect Impacts to Noise Levels

Under Alternative Q, a noticeable increase in the level of traffic noise (>3 dBA) would be expected for all receptors within approximately one mile of the proposed Control of Access highways. Beyond this distance the change in noise would be barely perceptible. There would be an appreciable increase in the level of traffic noise (>10 dBA) for all receptors within approximately one-half mile of the proposed highways. No receptors would exceed the NAC for category B or C of 66 dBA, but 29 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions (Figure 4-17).

4.8 RECREATION RESOURCES

4.8.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to recreation resources within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.8.2 Build Alternatives

Direct and indirect impacts to recreation resources would be expected to be similar for each of the Build Alternatives as described below. Differences in recreation resources impacts between alternatives are described in Sections 4.8.2.1 through 4.8.2.4.

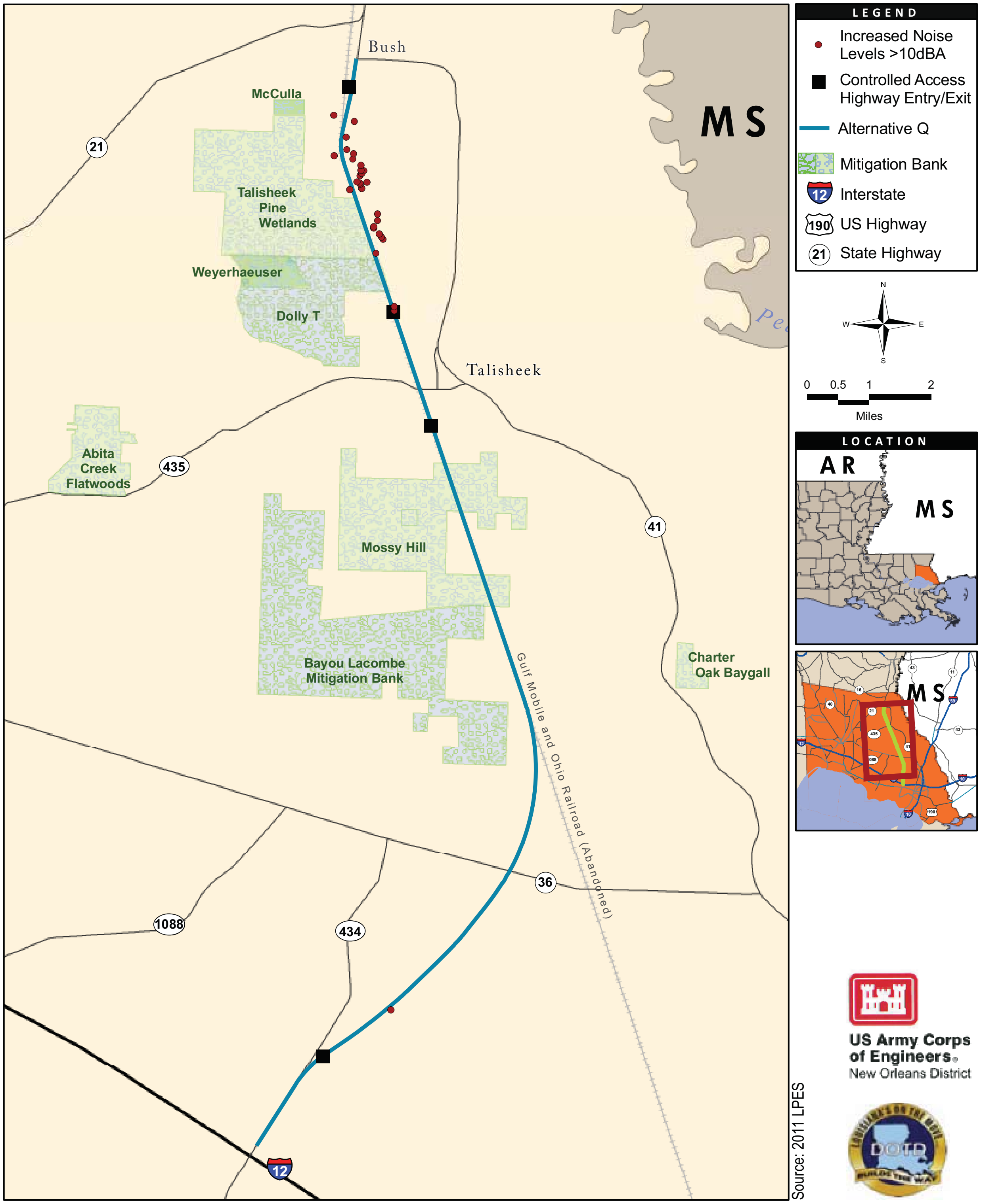
Direct Impacts to Recreational Resources

Long-term direct moderate adverse impacts to recreational resources could result from the implementation of the Build Alternatives. The clearing of undeveloped land to construct new sections of the alignment could result in the loss or degradation of fish and wildlife habitat that are used for nature-based recreation. People traveling to the area for bird watching, hunting and fishing, and other nature-based recreational opportunities could see a decrease in the available natural areas that play host to these opportunities.

Indirect Impacts to Recreational Resources

Short-term and long-term indirect minor adverse impacts to recreational resources could result from the Build Alternatives. Increased runoff and erosion could result from construction activities over the short-term, as well as an increase in impervious surfaces associated with development over the long-term. Increases in runoff and erosion could impact areas used for nature-based recreation by affecting the quality of the fish and wildlife habitat. Additionally, a long-term indirect beneficial impact could result from the implementation of this alternative as increased access opens up the area to more recreational users.

Figure 4-17 Alt Q - Increased Noise Levels >10dBA



Source: 2011 LPES

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A control-of-access highway could reduce accessibility to some areas. Forest roads and some parish roads would be crossed where access would be blocked making it more difficult to access the other side of the new highway except by a circuitous route. In addition, the abandoned railroad corridor provides access to a large area with multiple landowners and hunting clubs. The proposed highway could limit access to these areas impacting hunting, bird watching, and other recreational activities in the area.

4.8.2.1 Alternative B/O

Direct and Indirect Impacts to Recreational Resources

In addition to the impacts to recreational resources listed in Section 4.8.2, the use of Lowe Davis Road as a cycling and jogging route could be impacted. Alternative B/O would bisect Lowe Davis Road, potentially limiting the use of the road for recreational purposes due to safety concerns from increased traffic volumes and high-speed vehicles.

4.8.2.2 Alternative J

Direct and Indirect Impacts to Recreational Resources

The abandoned railroad currently provides access to a large area with multiple land owners and access to recreational resources in this area would be limited by construction of Alternative J. The Recreation District #2 baseball field complex less than one-half mile south of LA 41 would be indirectly impacted by the proposed alignment. Alternative J would run adjacent to the east end of the outfields of the baseball field complex, but would not directly impact use of the complex.

4.8.2.3 Alternative P

Direct and Indirect Impacts to Recreational Resources

The abandoned railroad currently provides access to a large area with multiple land owners and access to recreational resources in this area would be limited by construction of Alternative P. The Recreation District #2 baseball field complex less than one-half mile south of LA 41 would be indirectly impacted by the proposed alignment. Alternative P would run adjacent to the east end of the outfields of the baseball field complex, but would not directly impact use of the complex.

4.8.2.4 Alternative Q

Direct and Indirect Impacts to Recreational Resources

The abandoned railroad currently provides access to a large area with multiple land owners and access to recreational resources in this area would be limited by construction of Alternative Q. The Recreation District #2 baseball field complex less than one-half mile south of LA 41 would be indirectly impacted by the proposed alignment. Alternative Q would run adjacent to the east end of the outfields of the baseball field complex, but would not directly impact use of the complex.

4.9 TRAFFIC AND TRANSPORTATION

A traffic study was prepared to evaluate whether the four alternatives (B/O, P, Q, and J) connecting I-12 to LA 21 met the project purpose and need, in terms of the impact on traffic conditions. The impacts were measured using the volumes of the traffic expected to be diverted from existing routes to the new alignments, the expected LOS and delay conditions compared to those in the existing congested areas, and the difference in travel times between the alternatives and the existing routes. Appendix E provides the full Traffic Study, including detailed methodology and results.

4.9.1 Travel Time Analysis

4.9.1.1 Existing Routes

Three origin/destinations were chosen along I-12 to represent existing travel routes between I-12 and Bush:

- An eastern location, the I-12 at US 11 interchange, that would provide connectivity to Slidell and areas north, south, and east of the study area via the I-12/ I-59/I-10 interchange.
- A western location, the I-12 at US 190 interchange, that would provide access to New Orleans via the Lake Pontchartrain Causeway and also to areas west of the study area.
- A central location, the I-12 at LA 434 interchange, that would provide access to points south of I-12 within St. Tammany Parish and also service trips east and west of the study area between US 190 and US 11.

Based on existing traffic volume data and roadway connectivity, six existing routes were determined to be the major travel routes between Bush and I-12 at the US 190, LA 434, and US 11 interchanges. Figure 4-18 presents these existing routes.

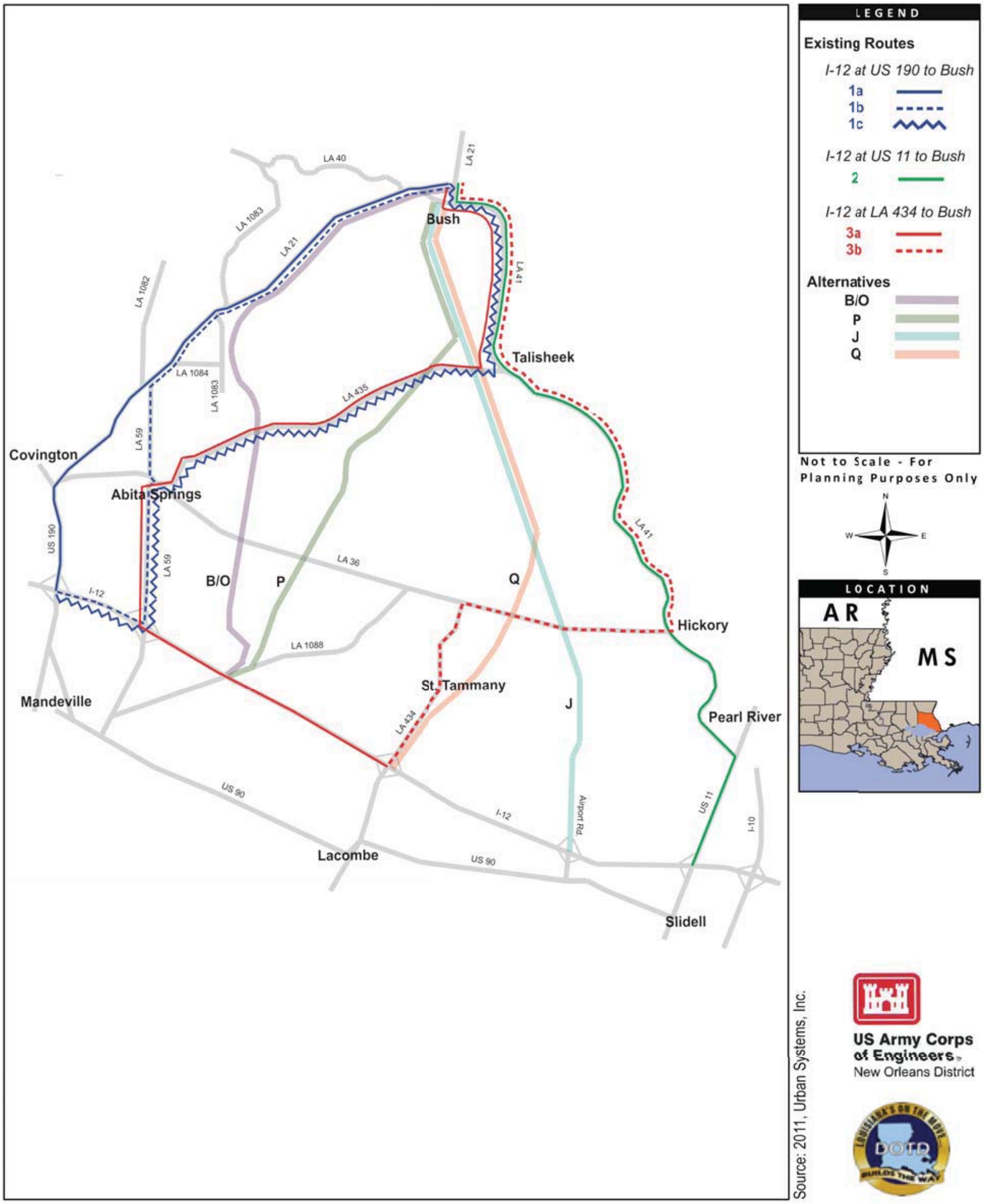
Based on distance and speed, travel times were estimated for the proposed alternative routes B/O, P, Q, and J between Bush and the selected origin/destinations on I-12. The estimations included not only the travel time on the new roadway, but also that on I-12 to reach each of the three origin/destination points.

Travel time-savings for each alternative were calculated based on the existing critical peak direction travel times obtained from the travel time runs. Table 2-1 presents the critical peak direction travel times, estimated travel times, and travel time-savings for each alternative.

A review of Table 2-1 indicates that all four of the alternatives would be expected to provide travel time savings versus at least one of the existing routes based on the three origin-destinations (I-12 to Bush) that were studied; however, the order of magnitude varies greatly.

Alternatives B/O and P would be expected to provide travel time-savings versus existing routes between Bush and both US 190 and LA 434. Alternatives J and Q would be expected to provide travel time-savings versus an existing route between Bush and LA 434. The four alternatives are not expected to provide significant travel time-savings versus the existing route on LA 41 to US 11.

Figure 4-18 Existing Traffic Routes & Alternatives



4.9.2 No Build Alternative Analysis

4.9.2.1 Traffic Assignment and Forecasting

AM and PM peak hour traffic volumes were projected for the 2015 and 2035 No Build conditions for the study area. The following resources were consulted in the development of the traffic volume projections:

- Existing traffic volume data
- Regional Planning Commission's (RPC) Southeast Louisiana (SELA) Travel Forecasting Model in TransCAD version 5.0 r2 Build 1695
- Tetra Tech, Inc.'s REMI model socioeconomic output
- Previous studies and planned projects

TransCAD uses geographic information, population figures, socioeconomic data, and vehicular origin/destination areas within regional areas to project future traffic volumes. Proposed model modifications to the RPC TransCAD model provided to the RPC included adding roadway links and coding associated attributes, changing roadway link attributes, and changing Traffic Analysis Zone population and employment data. Changes were made based on previous studies and known projects. The output used included average daily traffic volumes and intersection peak period traffic volumes. Appendix E includes further details regarding the traffic modeling.

4.9.2.2 Capacity Analysis

4.9.2.2.1 Roadway Segment Capacity Analysis

A roadway segment capacity analysis was conducted for all study roadway segments for the AM and PM peaks based on the projected No Build volumes and the existing roadway geometry. Figures 4-19 and 4-20 present the No Build projected volumes for 2015, and Figures 4-21 and 4-22 present the volumes for 2035.

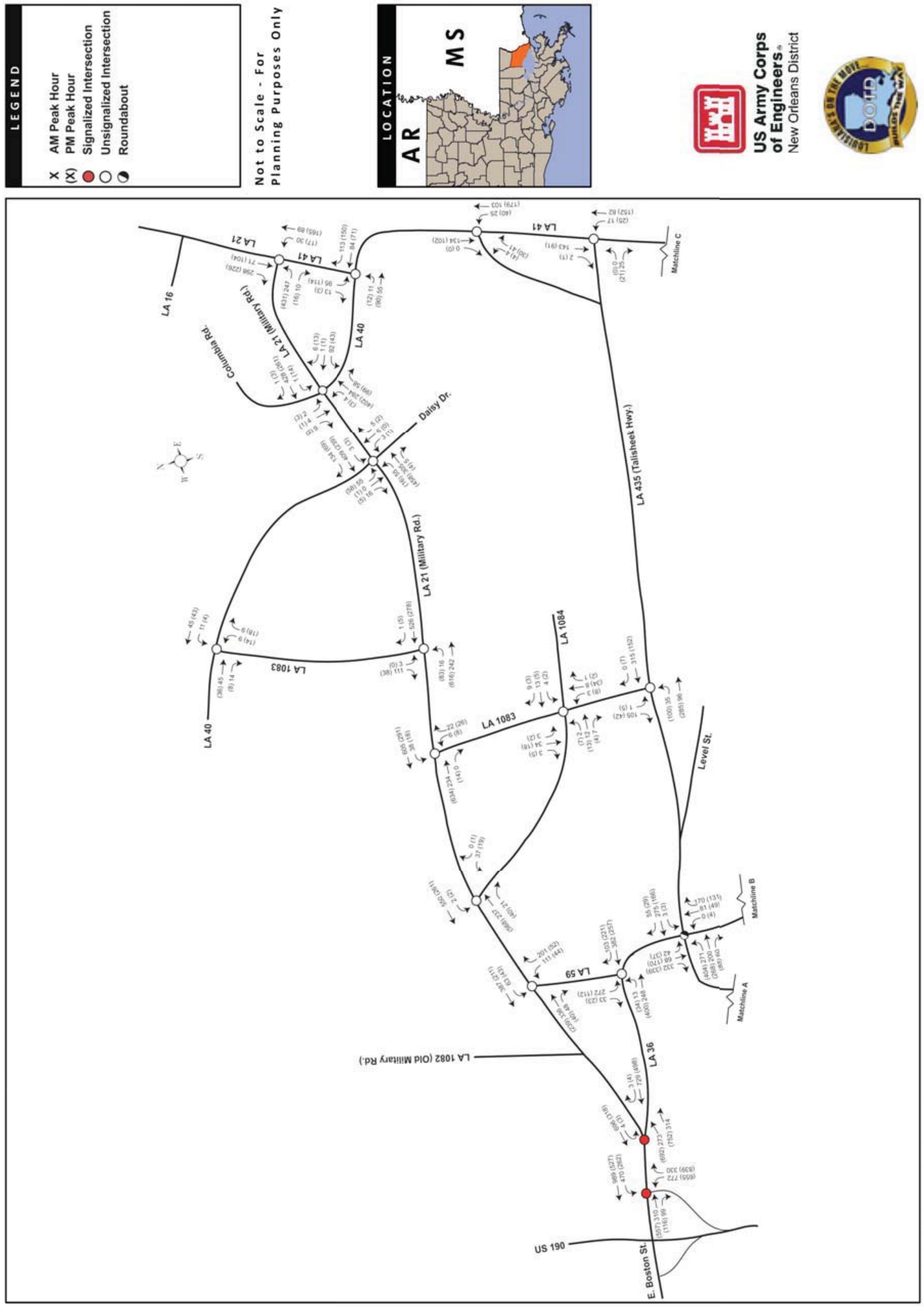
Table 4-34 presents a comparison of the 2010 base conditions to the 2015 and 2035 No Build projected conditions LOS and delay for the roadway segments in the AM and PM peaks. The appendix to the Traffic Study in Appendix E includes the roadway segment analysis reports.

4.9.2.2.2 Intersection Capacity Analysis

An intersection capacity analysis was conducted for all study intersections for the AM and PM peaks based on the projected No Build volumes and the existing intersection geometry. Although the timing could be modified over time to service the increased traffic volumes, cycle lengths and timing were kept constant in the analysis.

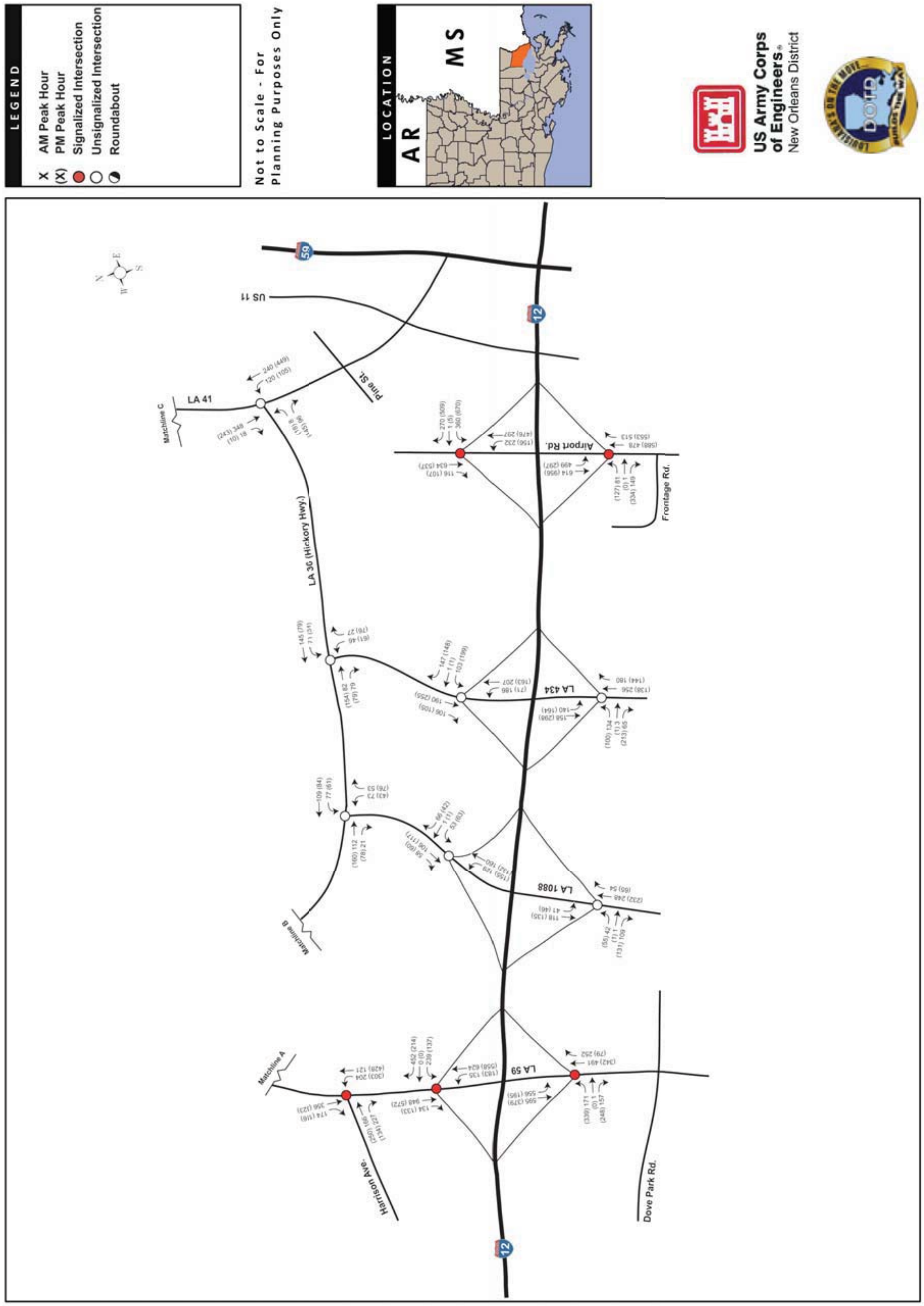
Tables 4-35 and 4-36 present a comparison of the 2010 base conditions to the 2015 and 2035 No Build projected conditions LOS and delay for the intersections in the AM and PM peaks, respectively. The appendix to the Traffic Study in Appendix E includes the intersection analysis reports.

Figure 4-19 2015 Projected Traffic Volumes -No Build (north)



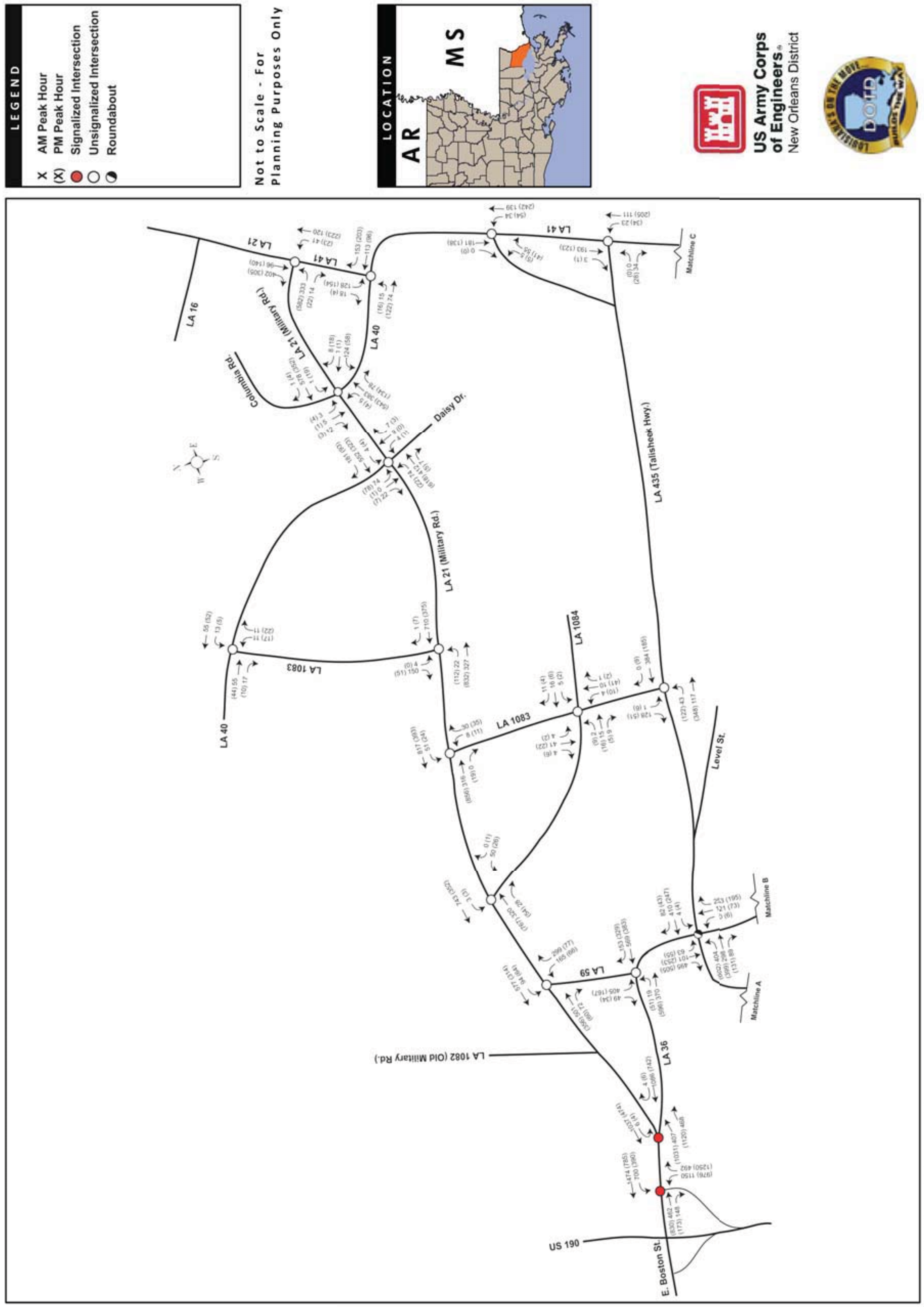
Source: 2011, Urban Systems, Inc.

Figure 4-20 2015 Projected Traffic Volumes - No Build (south)



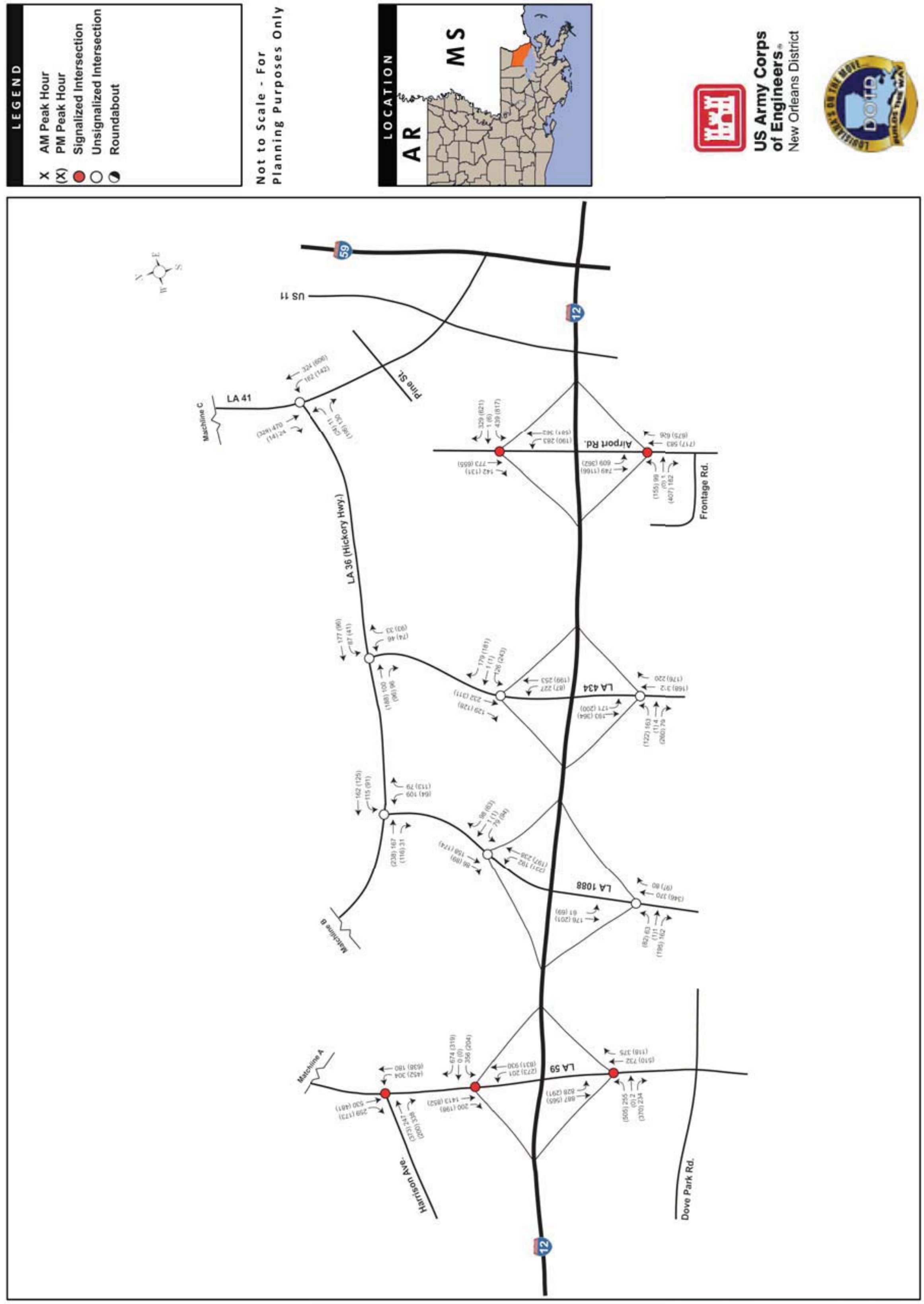
Source: 2011, Urban Systems, Inc.

Figure 4.21 2035 Projected Traffic Volumes -No Build (north)



Source: 2011, Urban Systems, Inc.

Figure 4-22 2035 Projected Traffic Volumes -No Build (south)



Source: 2011, Urban Systems, Inc.

Table 4-34.
Roadway Segments - LOS and capacity analysis results, base and no build conditions

Peak	Roadway Segment	2010		2015 No Build		2035 No Build	
		Base Conditions		Future Conditions		Future Conditions	
		LOS	v/c	LOS	v/c	LOS	v/c
AM	LA 40 between LA 1083 and LA 21	D	0.05	D	0.06	D	0.08
	LA 41 between LA 40 and LA 435	C	0.09	C	0.10	C	0.13
	LA 21 between LA 40 and LA 1083	D	0.27	D	0.29	D	0.39
	LA 21 between LA 1084 and LA 1083	D	0.28	D	0.30	E	0.41
	LA 21 between LA 59 and LA 1084	D	0.30	D	0.32	D	0.43
	LA 21 between LA 36 and LA 1082	D	0.30	D	0.32	E	0.43
	LA 59 between LA 21 and LA 36	D	0.12	D	0.13	D	0.19
	LA 59 between LA 36 and I-12	E	0.42	E	0.46	E	0.68
	LA 435 between LA 1083 and Peg Keller	D	0.11	D	0.11	D	0.14
	LA 435 between White Oaks and LA 41	C	0.04	C	0.04	D	0.05
	LA 1083 between LA 1084 and LA 435	C	0.04	C	0.04	C	0.05
	LA 1083 between LA 21 and LA 1084	C	0.03	C	0.03	C	0.04
	LA 1084 between LA 21 and LA 1083	C	0.03	D	0.03	D	0.04
	LA 36 between LA 21 and LA 59	E	0.27	E	0.28	E	0.34
	LA 36 between LA 435 and LA 1088	C	0.08	C	0.08	C	0.10
	LA 36 between LA 434 and LA 41	C	0.10	C	0.11	D	0.13
	LA 36 between LA 1088 and LA 434	C	0.10	C	0.11	D	0.13
	LA 1088 between LA 36 and I-12	C	0.05	D	0.16	D	0.24
	LA 434 between LA 36 and I-12	D	0.12	D	0.13	D	0.15
	Airport Rd north of I-12	E	0.39	E	0.41	E	0.50
PM	LA 40 between LA 1083 and LA 21	D	0.04	D	0.04	D	0.06
	LA 41 between LA 40 and LA 435	C	0.12	C	0.13	D	0.17
	LA 21 between LA 40 and LA 1083	D	0.25	D	0.27	D	0.37
	LA 21 between LA 1084 and LA 1083	D	0.31	D	0.33	E	0.44
	LA 21 between LA 59 and LA 1084	D	0.31	D	0.33	D	0.45
	LA 21 between LA 36 and LA 1082	D	0.28	D	0.30	E	0.41
	LA 59 between LA 21 and LA 36	D	0.16	D	0.17	D	0.26
	LA 59 between LA 36 and I-12	E	0.54	E	0.59	F	0.88
	LA 435 between LA 1083 and Peg Keller	D	0.13	D	0.14	D	0.17
	LA 435 between White Oaks and LA 41	C	0.04	C	0.04	C	0.05
	LA 1083 between LA 1084 and LA 435	C	0.03	C	0.04	C	0.04
	LA 1083 between LA 21 and LA 1084	C	0.02	C	0.02	C	0.03
	LA 1084 between LA 21 and LA 1083	D	0.03	D	0.03	D	0.04
	LA 36 between LA 21 and LA 59	E	0.35	E	0.37	E	0.45
	LA 36 between LA 435 and LA 1088	C	0.09	C	0.09	C	0.11
	LA 36 between LA 434 and LA 41	C	0.11	C	0.11	D	0.14
	LA 36 between LA 1088 and LA 434	C	0.10	C	0.10	D	0.12
	LA 1088 between LA 36 and I-12	C	0.04	D	0.16	D	0.23
	LA 434 between LA 36 and I-12	D	0.12	D	0.13	D	0.16
	Airport Rd north of I-12	E	0.54	E	0.57	E	0.69

Legend
Capacity constrained (LOS E or worse)

Table 4-35. Intersections - LOS and capacity analysis results, base and no build conditions: AM peak

Intersection	Direction	2010 Base Conditions		2015 No Build Future Conditions		2035 No Build Future Conditions	
		LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)
LA 21 at LA 40 (west int.)	Overall	*	*	*	*	*	*
	Northbound	C	21.1	C	23.7	F	52.7
	Southbound	D	30.4	E	39.2	F	328.6
	Eastbound	A	9.0	A	9.2	B	10.4
	Westbound	A	8.0	A	8.1	A	8.5
LA 21 at LA 40 (east int.)	Overall	*	*	*	*	*	*
	Northbound	D	25.4	D	31.7	F	179.9
	Southbound	B	14.3	B	14.9	C	20.4
	Eastbound	A	8.2	A	8.3	A	8.8
	Westbound	A	8.1	A	8.2	A	8.7
LA 21 at LA 41	Overall	*	*	*	*	*	*
	Northbound	A	7.5	A	7.5	A	7.6
	Southbound						
	Eastbound	C	16.5	C	18.2	E	44.2
	Westbound						
LA 21 at LA 1084	Overall	*	*	*	*	*	*
	Southbound	A	7.9	A	8.0	A	8.3
	Westbound	C	19.1	C	21.3	E	43.2
LA 21 at LA 36	**Overall**	**D**	**49.8**	**F**	**95.1**	**F**	**287.9**
	Northbound	B	15.7	B	16.1	C	20.6
	Southbound	E	64.0	F	121.8	F	367.1
	Westbound	D	51.3	F	104.5	F	329.4
US 190 at LA 21 (east int.)	**Overall**	**D**	**47.4**	**E**	**64.0**	**F**	**183.6**
	Northbound	F	136.5	F	187.2	F	475.7
	Eastbound	C	23.2	C	24.6	D	54.7
	Westbound	A	8.1	B	10.8	E	64.8
LA 435/LA 59 at LA 36**	**Overall**	**B**	**12.1**	**B**	**15.0**	**F**	**125.8**
	Northbound	B	13.6	C	20.1	F	302.2
	Southbound	B	13.4	C	16.5	F	129.9
	Eastbound	B	10.5	B	11.2	E	52.7
	Westbound	B	12.0	C	15.5	F	110.4
LA 36 at LA 59	Overall	*	*	*	*	*	*
	Southbound	E	44.2	F	81.6	F	769.6
	Eastbound	A	8.5	A	8.6	A	9.7
LA 21 at LA 59	Overall	*	*	*	*	*	*
	Northbound	F	236.1	F	399.5	F	2273.0
	Westbound	A	8.7	A	8.9	B	10.6
LA 59 at Harrison Ave.	**Overall**	**C**	**31.3**	**D**	**36.6**	**F**	**84.7**
	Northbound	A	5.7	A	6.1	B	14.1
	Southbound	B	16.1	B	17.3	C	32.7
	Eastbound	E	75.6	F	91.4	F	222.4
I-12 at LA 59 (WB)	**Overall**	**C**	**30.4**	**C**	**31.0**	**F**	**84.0**
	Northbound	A	7.5	A	7.2	B	10.8
	Southbound	B	18.3	B	19.5	D	52.5
	Westbound	E	76.4	F	82.6	F	235.6
I-12 at LA 59 (EB)	**Overall**	**D**	**37.9**	**D**	**40.7**	**F**	**179.4**
	Northbound	B	14.2	B	12.6	B	15.9
	Southbound	E	60.5	E	62.0	F	328.9
	Eastbound	C	33.6	C	32.0	D	42.5
I-12 at LA 434 (WB)	Overall	*	*	*	*	*	*
	Northbound	A	8.1	A	8.2	A	8.5
	Southbound						
	Westbound	B	14.0	C	17.0	E	42.2
I-12 at LA 434 (EB)	Overall	*	*	*	*	*	*
	Northbound						
	Southbound	A	8.2	A	8.3	A	8.7
	Eastbound	C	23.6	D	27.9	F	80.3
I-12 at Airport Rd. (WB)	**Overall**	**D**	**42.6**	**D**	**48.0**	**E**	**79.3**
	Northbound	A	8.1	A	8.9	C	22.3
	Southbound	B	17.3	B	17.6	B	19.5
	Westbound	F	106.8	F	122.8	F	207.7
I-12 at Airport Rd. (EB)	**Overall**	**C**	**21.1**	**C**	**22.7**	**D**	**41.4**
	Northbound	C	25.1	C	25.9	C	32.2
	Southbound	B	16.7	B	18.8	D	46.1
	Eastbound	C	34.5	C	34.7	D	35.9
LA 36 at LA 1088	Overall	*	*	*	*	*	*
	Northbound	B	10.6	C	16.8	F	72.7
	Westbound	A	7.6	A	7.9	A	8.3
LA 36 at LA 41	Overall	*	*	*	*	*	*
	Northbound	A	8.6	A	8.7	A	9.7
	Eastbound	B	13.0	B	13.9	C	22.2
LA 3241 at LA 435	Overall						
	Northbound						
	Southbound						
	Eastbound						
	Westbound						

Legend
- (pink) Capacity constrained (LOS E or worse)
- (grey) Intersection or intersection approach does not exist or uncontrolled approach with the right-of-way and

* Overall LOS not available for two-way stop-controlled intersections.

** Roundabout analysis in SIDRA.

Table 4-36. Intersections - LOS and capacity analysis results, base and no build conditions: PM Peak

Intersection	Direction	2010 Base Conditions LOS	2010 Base Conditions Delay (s/veh)	2015 No Build Future Conditions LOS	2015 No Build Future Conditions Delay (s/veh)	2035 No Build Future Conditions LOS	2035 No Build Future Conditions Delay (s/veh)
LA 21 at LA 40 (west int.)	**Overall**	*	*	*	*	*	*
	Northbound	C	21.1	C	23.7	F	52.7
	Southbound	D	30.4	E	39.2	F	328.6
	Eastbound	A	9.0	A	9.2	B	10.4
	Westbound	A	8.0	A	8.1	A	8.5
LA 21 at LA 40 (east int.)	**Overall**	*	*	*	*	*	*
	Northbound	D	25.4	D	31.7	F	179.9
	Southbound	B	14.3	B	14.9	C	20.4
	Eastbound	A	8.2	A	8.3	A	8.8
	Westbound	A	8.1	A	8.2	A	8.7
LA 21 at LA 41	**Overall**	*	*	*	*	*	*
	Northbound	A	7.5	A	7.5	A	7.6
	Southbound						
	Eastbound	C	16.5	C	18.2	E	44.2
	Westbound						
LA 21 at LA 1084	**Overall**	*	*	*	*	*	*
	Southbound	A	7.9	A	8.0	A	8.3
	Westbound	C	19.1	C	21.3	E	43.2
LA 21 at LA 36	**Overall**	**D**	**49.8**	**F**	**95.1**	**F**	**287.9**
	Northbound	B	15.7	B	16.1	C	20.6
	Southbound	E	64.0	F	121.8	F	367.1
	Westbound	D	51.3	F	104.5	F	329.4
US 190 at LA 21 (east int.)	**Overall**	**D**	**47.4**	**E**	**64.0**	**F**	**183.6**
	Northbound	F	136.5	F	187.2	F	475.7
	Eastbound	C	23.2	C	24.6	D	54.7
	Westbound	A	8.1	B	10.8	E	64.8
LA 435/LA 59 at LA 36**	**Overall**	**B**	**12.1**	**B**	**15.0**	**F**	**125.8**
	Northbound	B	13.6	C	20.1	F	302.2
	Southbound	B	13.4	C	16.5	F	129.9
	Eastbound	B	10.5	B	11.2	E	52.7
	Westbound	B	12.0	C	15.5	F	110.4
LA 36 at LA 59	**Overall**	*	*	*	*	*	*
	Southbound	E	44.2	F	81.6	F	769.6
	Eastbound	A	8.5	A	8.6	A	9.7
LA 21 at LA 59	**Overall**	*	*	*	*	*	*
	Northbound	F	236.1	F	399.5	F	2273.0
	Westbound	A	8.7	A	8.9	B	10.6
LA 59 at Harrison Ave.	**Overall**	**C**	**31.3**	**D**	**36.6**	**F**	**84.7**
	Northbound	A	5.7	A	6.1	B	14.1
	Southbound	B	16.1	B	17.3	C	32.7
	Eastbound	E	75.6	F	91.4	F	222.4
I-12 at LA 59 (WB)	**Overall**	**C**	**30.4**	**C**	**31.0**	**F**	**84.0**
	Northbound	A	7.5	A	7.2	B	10.8
	Southbound	B	18.3	B	19.5	D	52.5
	Westbound	E	76.4	F	82.6	F	235.6
I-12 at LA 59 (EB)	**Overall**	**D**	**37.9**	**D**	**40.7**	**F**	**179.4**
	Northbound	B	14.2	B	12.6	B	15.9
	Southbound	E	60.5	E	62.0	F	328.9
	Eastbound	C	33.6	C	32.0	D	42.5
I-12 at LA 434 (WB)	**Overall**	*	*	*	*	*	*
	Northbound	A	8.1	A	8.2	A	8.5
	Southbound						
	Westbound	B	14.0	C	17.0	E	42.2
I-12 at LA 434 (EB)	**Overall**	*	*	*	*	*	*
	Northbound						
	Southbound	A	8.2	A	8.3	A	8.7
	Eastbound	C	23.6	D	27.9	F	80.3
I-12 at Airport Rd. (WB)	**Overall**	**D**	**42.6**	**D**	**48.0**	**E**	**79.3**
	Northbound	A	8.1	A	8.9	C	22.3
	Southbound	B	17.3	B	17.6	B	19.5
	Westbound	F	106.8	F	122.8	F	207.7
I-12 at Airport Rd. (EB)	**Overall**	**C**	**21.1**	**C**	**22.7**	**D**	**41.4**
	Northbound	C	25.1	C	25.9	C	32.2
	Southbound	B	16.7	B	18.8	D	46.1
	Eastbound	C	34.5	C	34.7	D	35.9
LA 36 at LA 1088	**Overall**	*	*	*	*	*	*
	Northbound	B	10.6	C	16.8	F	72.7
	Westbound	A	7.6	A	7.9	A	8.3
LA 36 at LA 41	**Overall**	*	*	*	*	*	*
	Northbound	A	8.6	A	8.7	A	9.7
	Eastbound	B	13.0	B	13.9	C	22.2
LA 3241 at LA 435	**Overall**						
	Northbound						
	Southbound						
	Eastbound						
	Westbound						

Legend

(pink) Capacity constrained (LOS E or worse)

(gray) Intersection or intersection approach does not exist or uncontrolled approach with the right-of-way and

* Overall LOS not available for two-way stop-controlled intersections.

** Roundabout analysis in SIDRA.

4.9.2.2.3 *Summary of Results*

A review of Tables 4-34, 4-35, and 4-36 indicates the conditions in the study area would be expected to worsen between 2015 and 2035 without improvements or the introduction of an alternate route. In 2015, capacity constraints would be expected primarily on the LA 21 and LA 59 corridors and to be concentrated in the northern and western portions of the study area, with the exception of the increased delays at the I-12 at Airport Road interchange. Existing areas of delay or congestion would be expected to worsen and expand to additional locations. In 2035, capacity constraints would be expected not only in the northern and western portions of the study area and at the I-12 at Airport Road interchange, but also to include additional intersections on LA 21 and LA 59.

Figure 4-23 illustrates where capacity constraints would be expected for the 2035 Projected No Build conditions.

4.9.3 Build Alternatives Analysis

4.9.3.1 Traffic Assignment and Forecasting

AM and PM peak hour traffic volumes were projected for the 2015 and 2035 Build Alternatives. In addition to the resources consulted in the development of the No Build volume projections, preliminary line and grade plans were used to develop link geometry and determine appropriate link attributes in the TransCAD model.

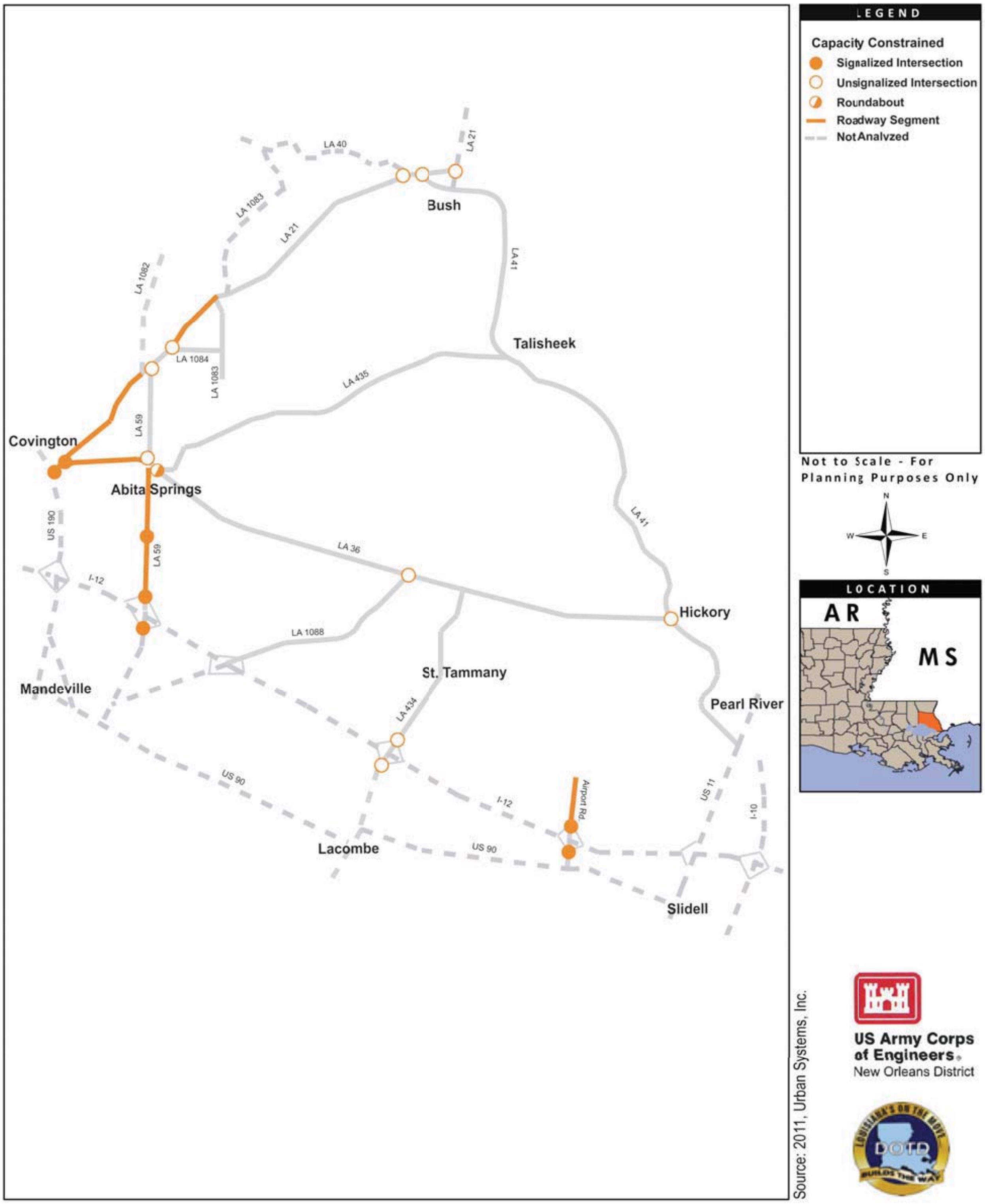
The 2035 Build scenarios were created first to assist the project team in determining overall design parameters for the proposed alignments. The 2035 No Build model scenario was used to create the 2035 Build Alternative B/O, J, P, and Q model scenarios. Appendix E includes further details regarding the traffic modeling.

The TransCAD ADT and intersection peak period traffic volume output were reviewed to determine the impact of the Build Alternative alignments in terms of redistributing traffic in the study network. Alternatives B/O and P are connected to the western portion of the study area (where existing congestion is concentrated) and the model indicated significant traffic from both LA 21 and LA 59 would divert to the new routes. Alternatives Q and J are connected to the eastern portion of the study area and the model indicated mainly traffic from LA 41 would divert to the new routes. The TransCAD modeling results were translated into the 2015 and 2035 design hour turning movement volumes.

The analysis of all study area intersections for the No Build conditions established where existing congestion is present and where it is expected in the future. Each alternative is not expected to affect all study area intersections. Therefore, specific intersections were selected for each alternative to capture the impact of the new alignment on expected LOS and delay conditions. For each alternative, the intersections along the alignment were analyzed, as were intersections expected to experience the greatest change in demand due to rerouting to the new roadway.

Appendix E presents the projected Build Alternative volumes for the selected intersections for each alternative.

Figure 4-23 2035 Projected No Build Capacity Constraints



4.9.3.2 Intersection Capacity Analysis

The initial assumption for the capacity analysis conducted for the intersections along each alternative was a four-lane divided roadway with stop control on the side streets. Existing roadways were assumed to "T" into the alignments to give the right of way to the through movements on the new roadway.

When unsignalized analysis with the 2015 and 2035 Build design hour volumes, four-lane roadway section, and existing cross street sections did not indicate acceptable operating conditions, improvements were developed to include additional lanes and/or signalization. At the selected signalized intersections associated with each alternative, improvements were developed where needed to indicate acceptable operating conditions, including additional lanes and changes to signal operation.

Table 4-37 presents the resulting recommended traffic control and improvements, where applicable, in addition to the basic four-lane undivided roadway for the selected intersections for each Build Alternative under 2015 and 2035 projected traffic demand.

Results of the initial capacity analyses of the intersections along the 2015 Build Alternative alignments indicated 2035 Build signalization and additional lanes may not be needed initially at certain locations and could be installed or constructed when demand increases.

For the study intersections not on the alternatives, intersection capacity analysis was conducted based on the projected Build Alternative volumes and the existing intersection geometry. Although the timing would potentially be modified over time to service the increased traffic volumes, cycle lengths and timing were kept constant in the analysis.

Tables 4-38 and 4-39 present a summary of the AM and PM peak LOS and delay estimates for the selected Build study intersections, based on the proposed geometry and traffic control, respectively. The appendix to the Traffic Study in Appendix E includes the intersection analysis reports.

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Table 4-37.
Build alternative intersection recommendations

Intersection	2015 Recommendations	2035 Recommendations
Alt B/O at LA 21/LA 41	LA 41 to "T" into LA B/O / LA 21. Provide separate right and left turn lanes and stop control on the LA 41 approach.	
Alt B/O / LA 21 at LA 40 (east intersection)	Stop control on side street approaches.	
Alt B/O / LA 21 at LA 40 (west intersection)	Stop control on side street approaches.	
Alt B/O at LA 21	Stop control on side approaches or a roundabout could be considered.	
Alt B/O at LA 435	Stop control on side street approaches.	
Alt B/O at LA 36	Add an exclusive EBL lane on LA 36. Stop control on side street approaches.	Add an exclusive EBL lane on LA 36. Signalize the intersection.
Alt B/O at LA 36	Add an exclusive EBL lane on LA 36. Stop control on side street approaches.	
Alt B/O at LA 1088	Stop control on side street approaches.	
Alt B/O: I-12 WB ramp at LA 1088	Stop control on side street approaches.	Signalize the intersection.
Alt B/O: I-12 EB ramp at LA 1088	Stop control on side street approaches.	Signalize the intersection.
Alt J at LA 21/LA 41	Stop control on side street approaches.	
Alt J at LA 435	Stop control on side street approaches.	
Alt J at LA 36	Stop control on side approaches or a roundabout could be considered.	Signalize the intersection or a roundabout could be considered.
Alt J: I-12 ramps at Airport Rd	Widen Airport Road to provide an additional NBT lane. At the WB ramp intersection, provide a second WBR lane. At the EB ramp intersection, provide a second exclusive SBL lane.	Widen Airport Road to provide an additional NBT lane. At the WB ramp intersection, provide a second WBR lane and an exclusive SBR lane. At the EB ramp intersection, provide a second EBL lane and a second exclusive SBL lane.
	Or construction of the single point urban interchange (SPUI) configuration as specified in the *I-12 @ Airport Rd Single Point Urban Interchange Stage 0 Feasibility Study* (Buchart Horn, Inc., January 2011) with a second WBR lane at the off-ramp may be considered.	
Alt P at LA 21/LA 41	Stop control on side street approaches.	
Alt P at LA 435	Stop control on side street approaches.	
Alt P at LA 36	Signalize the intersection.	
Alt P at LA 1088	Stop control on side street approaches.	Provide exclusive WBL and WBR lanes on LA 1088. Stop control on side approaches.
Alt P: I-12 WB ramp at LA 1088	Stop control on side street approaches.	Signalize the intersection.
Alt P: I-12 EB ramp at LA 1088	Signalize the intersection.	Add a second SBL lane and signalize the intersection.
Alt Q at LA 21/LA 41	Stop control on side street approaches.	
Alt Q at LA 435	Stop control on side street approaches.	
Alt Q at LA 36	Stop control on side street approaches.	Provide an exclusive WBL lane on LA 36. Stop control on side approaches.
Alt Q at LA 434	Stop control on side street approaches.	
Alt Q: I-12 WB ramp at LA 434	Stop control on side street approaches.	Signalize the intersection.
Alt Q: I-12 EB ramp at LA 434	Signalize the intersection.	

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Table 4-38. Intersections - LOS and capacity analysis results: AM peak

Intersection	Direction	2010		2015 No Build		2015 Build								2035 No Build		2035 Build					
		Base Conditions		Future Conditions		Alternative B/O		Alternative J		Alternative P		Alternative Q		Future Conditions		Alternative B/O		Alternative J		Alternative P		Alternative Q	
		LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)
LA 21 at LA 40 (west int.)	Overall	*	*	*	*	*	*							*	*	*	*						
	Northbound	C	21.1	C	23.7	C	15.1							F	52.7	C	20.6						
	Southbound	D	30.4	E	39.2	C	17.3							F	328.6	D	28.4						
	Eastbound	A	9.0	A	9.2	A	9.3							B	10.4	B	10.7						
	Westbound	A	8.0	A	8.1	A	8.0							A	8.5	A	8.4						
LA 21 at LA 40 (east int.)	Overall	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	D	25.4	D	31.7	C	16.1	C	21.7	B	12.4	C	19.6	F	179.9	C	21.4	F	69.1	C	18.4	E	48.7
	Southbound	B	14.3	B	14.9	B	11.6	B	13.7	B	10.3	B	12.5	C	20.4	B	13.2	C	17.5	B	11.9	C	15.5
	Eastbound	A	8.2	A	8.3	A	8.5	A	7.9	A	7.6	A	8.0	A	8.8	A	9.0	A	8.3	A	7.8	A	8.3
	Westbound	A	8.1	A	8.2	A	8.1	A	8.1	A	7.7	A	8.0	A	8.7	A	8.5	A	8.5	A	8.0	A	8.3
LA 21 at LA 41	Overall	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	A	7.5	A	7.5			A	7.9	A	8.6	A	7.9	A	7.6			A	8.2	A	9.0	A	8.2
	Southbound					A	8.0									A	8.4						
	Eastbound	C	16.5	C	18.2			C	20.1	B	12.1	C	17.8	E	44.2			F	55.6	C	16.3	E	36.9
	Westbound					B	10.5									B	11.7						
LA 21 at LA 1084	Overall	*	*	*	*									*	*								
	Southbound	A	7.9	A	8.0									A	8.3								
	Westbound	C	19.1	C	21.3									E	43.2								
LA 21 at LA 36	Overall	D	49.8	F	95.1	E	66.3	E	67.2	E	68.0	E	70.1	F	287.9	F	215.7	F	233.6	F	213.7	F	293.3
	Northbound	B	15.7	B	16.1	B	16.1	B	15.8	B	13.6	B	15.5	C	20.6	B	18.6	B	19.7	B	14.7	B	18.5
	Southbound	E	64.0	F	121.8	C	30.7	D	52.0	C	24.8	E	58.0	F	367.1	F	160.7	F	255.3	F	134.0	F	263.3
	Westbound	D	51.3	F	104.5	F	109.9	F	100.0	F	100.0	F	100.0	F	329.4	F	324.6	F	302.8	F	302.8	F	302.8
US 190 at LA 21 (east int.)	Overall	D	47.4	E	64.0	E	66.0	E	65.1	E	69.3	E	64.8	F	183.6	F	165.5	F	181.5	F	178.4	F	181.7
	Northbound	F	136.5	F	187.2	F	187.2	F	187.2	F	187.2	F	187.2	F	475.7	F	475.7	F	475.7	F	475.7	F	475.7
	Eastbound	C	23.2	C	24.6	C	24.3	C	24.6	C	21.2	C	23.8	D	54.7	D	50.9	D	54.7	C	28.3	D	54.7
	Westbound	A	8.1	B	10.8	A	6.4	A	9.4	A	6.3	A	9.2	E	64.8	B	15.8	E	55.0	C	33.7	E	56.1
LA 435/LA 59 at LA 36**	Overall	B	12.1	B	15.0	B	17.3	B	14.9	B	10.7	B	12.4	F	125.8	F	91.4	F	106.7	E	57.3	E	69.7
	Northbound	B	13.6	C	20.1	C	20.3	C	19.1	B	11.8	C	15.2	F	302.2	F	100.6	F	159.5	E	55.1	F	151.1
	Southbound	B	13.4	C	16.5	B	15.6	B	14.1	B	10.7	B	12.8	F	129.9	F	85.5	F	133.3	E	59.4	F	83.3
	Eastbound	B	10.5	B	11.2	C	16.8	B	14.6	B	10.6	B	10.8	E	52.7	F	108.8	F	93.9	D	44.1	C	31.4
	Westbound	B	12.0	C	15.5	C	17.1	B	13.6	B	10.2	B	12.5	F	110.4	E	68.0	E	55.2	E	73.6	E	55.9
LA 36 at LA 59	Overall	*	*	*	*									*	*								
	Southbound	E	44.2	F	81.6									F	769.6								
	Eastbound	A	8.5	A	8.6									A	9.7								
LA 21 at LA 59	Overall	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	F	236.1	F	399.5	F	62.8	F	240.6	C	24.9	F	148.8	F	2273.0	F	601.9	F	1533.0	F	435.4	F	1143.0
	Westbound	A	8.7	A	8.9	A	8.4	A	8.7	A	7.9	A	8.5	B	10.6	A	9.3	B	10.1	A	8.7	A	9.6
LA 59 at Harrison Ave.	Overall	C	31.3	D	36.6									F	84.7								
	Northbound	A	5.7	A	6.1									B	14.1								
	Southbound	B	16.1	B	17.3									C	32.7								
	Eastbound	E	75.6	F	91.4									F	222.4								
I-12 at LA 59 (WB)	Overall	C	30.4	C	31.0	C	24.2	C	31.1	C	24.3	C	32.4	F	84.0	E	64.7	F	83.3	E	64.3	F	86.9
	Northbound	A	7.5	A	7.2	A	6.8	A	6.9	A	6.7	A	6.9	B	10.8	B	12.0	B	12.1	B	12.1	B	12.2
	Southbound	B	18.3	B	19.5	B	17.8	B	18.3	B	17.5	B	18.5	D	52.5	C	24.8	C	34.4	C	28.7	C	34.8
	Westbound	E	76.4	F	82.6	E	58.3	E	79.9	E	57.8	F	82.9	F	235.6	F	193.4	F	245.7	F	189.5	F	251.1
I-12 at LA 59 (EB)	Overall	D	37.9	D	40.7	C	29.3	C	32.4	C	27.0	D	40.1	F	179.4	F	133.3	F	156.7	F	146.2	F	157.3
	Northbound	B	14.2	B	12.6	B	12.7	B	12.6	B	12.7	B	12.7	B	15.9	B	16.1	B	16.0	B	16.1	B	16.2
	Southbound	E	60.5	E	62.0	D	40.9	D	46.1	D	36.7	E	60.8	F	328.9	F	255.9	F	288.2	F	275.7	F	289.6
	Eastbound	C	33.6	C	32.0	C	31.6	C	31.9	C	31.2	C	32.0	D	42.5	D	39.7	D	42.0	D	38.0	D	42.5
I-12 at LA 434 (WB)	Overall	*	*	*	*							*	*	*	*	B	13.8			B	14.0	B	17.5
	Northbound	A	8.1	A	8.2	A	8.2			A	8.1	A	8.5	A	8.5	A	9.2			A	9.2	B	10.8
	Southbound															B	17.0			B	17.1	C	22.7
	Westbound	B	14.0	C	17.0	C	17.2			C	17.3	C	24.8	E	42.2	B	19.3			B	19.4	C	20.5
I-12 at LA 434 (EB)	Overall	*	*	*	*	*	*			*	*	B	18.8	*	*	C	24.3			C	24.4	C	30.3
	Northbound											B	19.6			C	32.6			C	32.6	C	29.0
	Southbound	A	8.2	A	8.3	A	8.3			A	8.3	B	11.2	A	8.7	B	11.1			B	11.9	B	15.2
	Eastbound	C	23.6	D	27.9	D	25.4			C	24.7	C	26.9	F	80.3	C	23.3			C	22.8	D	49.2
I-12 at Airport Rd. (WB)	Overall	D	42.6	D	48.0			C	31.3					E	79.3			C	32.5				
	Northbound	A	8.1	A	8.9			C	20.3					C	22.3			C	24.2				
	Southbound	B	17.3	B	17.6			D	35.2					B	19.5			C	31.1				
	Westbound	F	106.8	F	122.8			C	34.3					F	207.7			D	41.4				
I-12 at Airport Rd. (EB)	Overall	C	21.1	C	22.7			B	19.3					D	41.4			C	22.0				
	Northbound	C	25.1	C	25.9			C	22.6					C	32.2			C	26.3				
	Southbound	B	16.7	B	18.8			B	14.4					D	46.1			B	17.0				
	Eastbound	C	34.5	C	34.7			C	34.9					D	35.9			C	35.0				
LA 36 at LA 1088	Overall	*	*	*	*									*	*								
	Northbound	B	10.6	C	16.8									F	72.7								
	Westbound	A	7.6	A	7.9									A	8.3								
LA 36 at LA 41	Overall	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	A	8.6	A	8.7	A	8.6	A	8.0	A	8.1	A	8.7	A	9.7	A	9.3	A	8.5	A	8.7	B	10.1
	Eastbound	B	13.0	B	13.9	B	12.3	B	12.4	B	11.3	C	15.4	C	22.2	C	16.1	C	17.3	B	14.4	E	43.5
LA 3241 at LA 435	Overall					*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*
	Northbound					A	7.9	A	7.9	A	9.2	A	8.0			A	8.3	A	8.1	A	9.8	A	8.4
	Southbound					A	7.4	A	7.5	A	8.0	A	7.6			A	7.5	A	7.5	A	8.2	A	7.8
	Eastbound					B	12.4	B	11.0	B	15.0	B	10.8			C	16.1	B	12.0	C	18.2	B	11.8
	Westbound					C	17.4	B	10.8	C	20.7	B	13.9			E	36.8	B	11.6	D	27.9	C	16.7

Note
* Overall LOS not available for two-way stop-controlled intersections.
** Roundabout analysis in SIDRA.

Table 4-39. Intersections - LOS and capacity analysis results: PM peak

Intersection	Direction	2010		2015 No Build		2015 Build								2035 No Build		2035 Build							
		Base Conditions		Future Conditions		Alternative B/O		Alternative J		Alternative P		Alternative Q		Future Conditions		Alternative B/O		Alternative J		Alternative P		Alternative Q	
		LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)
LA 21 at LA 40 (west int.)	**Overall**	*	*	*	*	*	*							*	*	*	*						
	Northbound	C	15.5	C	16.6	B	12.1							C	22.1	B	13.4						
	Southbound	C	22.8	D	26.6	B	13.9							F	95.4	C	18.2						
	Eastbound	A	8.1	A	8.2	A	8.0							A	8.7	A	8.4						
	Westbound	A	8.3	A	8.4	A	8.5							A	9.0	A	9.1						
LA 21 at LA 40 (east int.)	**Overall**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	C	18.0	C	19.9	B	13.4	C	15.6	B	11.5	B	13.4	E	44.5	C	16.6	C	24.7	B	14.8	C	18.1
	Southbound	C	15.8	C	17.0	B	10.7	B	14.0	B	11.1	B	12.7	C	23.8	B	11.9	C	17.9	B	13.0	C	15.2
	Eastbound	A	7.8	A	7.9	A	7.9	A	7.7	A	7.5	A	7.7	A	8.2	A	8.2	A	7.9	A	7.6	A	7.8
	Westbound	A	8.5	A	8.7	A	8.7	A	8.4	A	7.8	A	8.0	A	9.4	A	9.5	A	9.0	A	8.2	A	8.4
LA 21 at LA 41	**Overall**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	A	7.6	A	7.6			A	7.9	A	8.2	A	7.9	A	7.7			A	8.1	A	8.5	A	8.1
	Southbound					A	8.9									B	10.0						
	Eastbound	D	28.5	E	38.6			D	31.6	C	18.1	C	17.6	F	201.6			F	169.2	E	48.9	E	40.9
	Westbound					B	11.7									B	14.3						
LA 21 at LA 1084	**Overall**	*	*	*	*									*	*								
	Southbound	A	8.8	A	9.0									A	9.9								
	Westbound	C	17.2	C	18.6									D	30.8								
LA 21 at LA 36	**Overall**	**C**	**23.1**	**C**	**25.9**	**C**	**22.5**	**C**	**25.4**	**C**	**23.9**	**C**	**23.9**	**F**	**101.9**	**E**	**58.6**	**F**	**94.7**	**E**	**70.7**	**E**	**72.7**
	Northbound	C	21.7	C	24.8	B	18.3	C	22.8	B	17.3	B	18.9	F	116.4	C	34.2	F	95.4	C	32.9	D	44.8
	Southbound	B	14.6	B	14.9	B	13.9	B	14.2	B	13.6	B	14.3	B	17.1	B	15.2	B	15.9	B	15.1	B	16.1
	Westbound	C	30.1	C	33.9	C	31.1	C	33.9	C	33.9	C	33.9	F	132.8	F	105.4	F	132.8	F	132.8	F	132.8
US 190 at LA 21 (east int.)	**Overall**	**C**	**25.3**	**C**	**29.9**	**C**	**26.2**	**C**	**28.6**	**C**	**24.3**	**C**	**25.3**	**F**	**101.0**	**F**	**80.2**	**F**	**93.9**	**E**	**70.7**	**F**	**83.9**
	Northbound	C	27.0	C	27.9	C	27.9	C	27.9	C	27.9	C	27.9	D	38.2	D	38.2	D	38.2	D	38.2	D	38.2
	Eastbound	D	38.5	D	49.0	D	39.9	D	46.4	C	34.4	D	37.4	F	209.7	F	167.4	F	201.3	F	139.5	F	156.8
	Westbound	B	14.5	B	17.8	B	14.3	B	15.3	B	13.4	B	14.7	E	72.6	D	51.8	E	59.3	D	50.3	E	72.5
LA 435/LA 59 at LA 36**	**Overall**	**B**	**14.4**	**D**	**36.1**	**C**	**23.9**	**C**	**22.9**	**B**	**19.1**	**C**	**26.1**	**F**	**201.7**	**F**	**191.4**	**F**	**177.3**	**F**	**175.8**	**F**	**180.4**
	Northbound	C	17.1	C	22.1	E	58.3	C	20.8	B	15.0	C	19.8	D	30.3	D	31.3	C	25.8	C	17.9	C	21.8
	Southbound	B	9.5	B	10.9	B	10.0	B	9.5	B	9.4	B	10.5	F	80.5	C	19.1	D	45.5	D	41.8	E	50.6
	Eastbound	C	17.9	E	62.4	B	15.8	D	35.6	C	29.8	D	41.8	F	370.4	F	438.3	F	348.6	F	355.2	F	347.6
	Westbound	B	11.0	B	11.5	B	13.2	B	11.3	B	11.0	B	11.3	B	13.8	B	14.0	B	12.2	B	12.2	B	12.4
LA 36 at LA 59	**Overall**	*	*	*	*									*	*								
	Southbound	D	27.0	E	37.2									F	498.8								
	Eastbound	A	8.5	A	8.7									A	9.8								
LA 21 at LA 59	**Overall**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	B	14.6	C	16.2	B	10.8	B	14.2	B	10.3	B	12.2	F	76.4	B	13.3	D	32.9	B	14.5	C	18.8
	Westbound	A	8.1	A	8.2	A	7.6	A	8.1	A	7.5	A	7.7	A	9.1	A	7.9	A	8.7	A	7.9	A	8.1
LA 59 at Harrison Ave.	**Overall**	**C**	**23.2**	**C**	**25.8**									**E**	**76.1**								
	Northbound	B	10.9	B	12.6									D	54.1								
	Southbound	C	31.5	D	36.0									D	35.9								
	Eastbound	C	34.1	D	36.6									F	146.3								
I-12 at LA 59 (WB)	**Overall**	**B**	**15.5**	**B**	**14.3**	**B**	**13.6**	**B**	**14.0**	**B**	**12.7**	**B**	**14.7**	**C**	**30.1**	**C**	**21.2**	**C**	**27.4**	**C**	**23.7**	**C**	**29.8**
	Northbound	A	9.7	A	7.9	A	7.1	A	7.5	A	7.1	A	7.6	C	30.7	B	17.5	C	26.8	C	23.1	C	27.2
	Southbound	B	11.7	B	12.1	B	11.5	B	11.9	B	11.6	B	11.9	B	15.5	B	13.2	B	14.7	B	14.1	B	14.7
	Westbound	D	37.3	D	35.8	C	34.2	D	35.2	C	32.4	D	36.4	E	62.8	D	46.6	E	56.2	D	47.0	E	66.6
I-12 at LA 59 (EB)	**Overall**	**C**	**31.0**	**D**	**36.7**	**C**	**31.9**	**C**	**29.8**	**C**	**25.5**	**D**	**36.9**	**F**	**94.8**	**F**	**81.9**	**F**	**82.5**	**E**	**73.7**	**F**	**95.1**
	Northbound	B	11.1	B	10.6	B	10.2	B	10.6	B	10.6	B	10.6	B	11.7	B	11.1	B	11.7	B	11.8	B	11.8
	Southbound	A	6.1	A	6.0	A	5.4	A	5.9	A	5.8	A	5.9	B	11.3	A	7.2	B	10.3	A	9.6	B	10.6
	Eastbound	E	75.7	F	93.0	E	74.1	E	74.1	E	60.2	F	93.0	F	258.4	F	206.0	F	224.3	F	199.2	F	258.4
I-12 at LA 434 (WB)	**Overall**	*	*	*	*	*	*			*	*	*	*	*	*	**B**	**17.8**			**B**	**16.8**	**C**	**18.4**
	Northbound	A	8.1	A	8.2	A	8.0			A	8.1	A	8.2	A	8.5	A	9.3			B	10.2	B	12.8
	Southbound															B	19.8			B	19.1	C	23.5
	Westbound	C	21.5	D	27.7	C	23.9			C	24.6	D	30.4	F	80.1	C	21.2			B	18.9	B	19.1
I-12 at LA 434 (EB)	**Overall**	*	*	*	*	*	*			*	*	**B**	**18.6**	*	*	**B**	**18.9**			**B**	**19.2**	**C**	**29.9**
	Northbound											B	18.8			C	21.7			C	21.7	C	21.9
	Southbound	A	8.0	A	8.1	A	8.0			A	8.1	B	10.8	A	8.4	B	12.9			B	14.0	B	12.1
	Eastbound	D	33.3	F	50.6	E	40.4			E	37.0	C	24.7	F	200.4	C	24.4			C	24.5	D	47.1
I-12 at Airport Rd. (WB)	**Overall**	**F**	**171.2**	**F**	**188.0**			**C**	**28.0**					**F**	**266.2**			**D**	**35.8**				
	Northbound	A	7.0	A	7.2			B	16.6					A	8.3			B	17.7				
	Southbound	B	16.2	B	16.4			C	31.3					B	17.4			C	28.6				
	Westbound	F	359.5	F	396.2			C	32.7					F	565.9			D	52.7				
I-12 at Airport Rd. (EB)	**Overall**	**C**	**29.7**	**C**	**33.9**			**C**	**25.5**					**E**	**64.0**			**C**	**32.0**				
	Northbound	D	43.7	D	52.3			C	32.9					F	120.9			D	45.2				
	Southbound	B	12.5	B	13.2			B	17.6					B	17.5			B	18.9				
	Eastbound	E	59.8	E	68.2			C	32.8					F	116.8			D	42.5				
LA 36 at LA 1088	**Overall**	*	*	*	*									*	*								
	Northbound	A	10.0	B	13.4									D	25.4								
	Westbound	A	7.7	A	8.1									A	8.7								
LA 36 at LA 41	**Overall**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Northbound	A	8.1	A	8.2	A	8.1	A	7.7	A	7.8	A	8.5	A	8.7	A	8.6	A	8.0	A	8.2	A	9.3
	Eastbound	B	14.7	C	16.0	C	15.3	B	11.7	B	12.2	C	24.9	E	42.2	D	32.9	C	15.6	C	17.4	F	194.7
LA 3241 at LA 435	**Overall**					*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*
	Northbound					A	7.6	A	7.7	A	8.1	A	7.7			A	7.8	A	7.9	A	8.4	A	7.9
	Southbound					A	7.8	A	7.8	A	8.4	A	8.1			A	8.1	A	8	A	8.6	A	8.4
	Eastbound					B	14.3	A	9.5	B	14.9	B	11.0			C	22.0	A	10	C	17.4	B	11.8
	Westbound					C	16.8	B	10.1	C	16.1	B	13.4			D	33.1	B	10.9	C	20.1	C	15.6

Note
* Overall LOS not available for two-way stop-controlled intersections.
** Roundabout analysis in SIDRA.

A review of Tables 4-38 and 4-39 indicates that in general, compared to No Build conditions, intersection operations would be expected to improve overall or stay the same in the study area with the proposed alternatives. When comparing expected LOS and delay conditions at intersections between the various alternatives, the following greatly influences the results:

- Diverted traffic from existing routes would result in improved LOS and delay conditions; however, the more traffic that is diverted, the more volume the alternative services and increased delay is expected at the intersections along the new route. For example, Alternatives B/O and P would expected to service more traffic along the route and, therefore, delays are estimated to be greater than those along the Alternative J and Q routes.
- Proposed improvements at intersections along the route or at the associated interchange intersections result in better LOS and delay conditions than the expected No Build conditions. For example, extensive improvements at the Airport Road interchange for Alternative J indicate significantly improved conditions over the No Build.
- Traffic diverting to the alternatives through intersections along other routes may cause increases in the expected delays, such as at the LA 435/LA 59 at LA 36 roundabout for all alternatives.

A comparison of the No Build and Build conditions also indicates improvements may be needed on existing intersections not on the alternatives whether or not an alternative route is provided. While the alternatives would be expected to provide improvements in LOS and/or delay on the congested LA 21 and LA 59 corridors, unacceptable LOS are still expected at many of the intersections in the design year 2035.

Without any geometric or operational improvements proposed, the expected conditions at the LA 21 and LA 36 intersection and at the LA 59 interchange improve most significantly with Alternatives B/O and P due to the expected significant diversion of traffic from LA 21 and LA 59. This is a result of these alternatives providing access to the western portion of the study area. Alternatives B/O and P are also expected to decrease delays at the LA 434 interchange without requiring improvements to the intersections by re-routing trips to the LA 1088 interchange.

Alternative Q is expected to improve delay conditions at the LA 434 interchange, but mainly due to improvements required to handle the additional demand. Similarly, the improvements predicted by Alternative J at the Airport Road interchange are due to the extensive improvements proposed.

4.9.3.3 Other Considerations

A roundabout is a road junction in which traffic moves in one direction around a central island. Roundabouts were considered at the following intersections:

- Alternative B/O at LA 21
- Alternative J at LA 36

According to *Engineering Directives and Standards Manual* (EDSM) VI.1.1.5, justification and approval for installing a roundabout require that a study be conducted in which, “comprehensive investigation and report of traffic conditions and physical characteristics shall be made of the location.” The appendix to the traffic study in Appendix E provides the initial capacity analyses with 2035 critical peak volumes for the roundabouts.

On January 31, 2011 RPC provided the *I-12 @ Airport Rd Single Point Urban Interchange Stage 0 Feasibility Study* (Buchart Horn, Inc., 2011). The appendix to the traffic study in Appendix E provides an initial capacity analysis for the signalized approaches of the SPUI concept with 2035 critical peak volumes for Alternative J. Although not shown in Tables 4-38 and 4-39, the analysis indicated similar LOS compared to the analyzed recommended intersection geometry and control for Alternative J at the I-12 eastbound and westbound ramps.

4.9.3.4 Summary of Build Alternatives Direct and Indirect Impacts

Direct and indirect impacts to traffic and transportation would be expected to be similar for each of the Build Alternatives as described below. Differences in impacts between alternatives are described in Sections 4.9.3.4.1 through 4.9.3.4.4.

The high-speed, controlled access Build Alternatives would be expected to provide travel time savings in comparison to existing routes between I-12 and Bush, which could attract motorists to reroute to the new alignments. As a result, through traffic volumes would be expected to generally decrease on the existing highways, thereby reducing conflict with motorists attempting to access residential and commercial developments from the existing routes. Approximately 70 to 85% of the traffic volumes expected for the 2035 Build Alternatives would be expected to use the new routes in 2015. Thus, a majority of traffic is expected to use the Build Alternatives in the implementation year. The remaining 15 to 30% would be expected as a result of the growth between 2015 and 2035.

Diverted traffic from existing routes would result in improved LOS and delay conditions; however, the more traffic that is diverted, the more volume the Build Alternative services and increased delay is expected at the intersections along the new route. For example, Alternatives B/O and P would be expected to service more traffic along the route and, therefore, delays are estimated to be greater than those along the Alternative J and Q routes. Proposed improvements at intersections along the route or at the associated interchange intersections result in better LOS and delay conditions than the expected No Build conditions. For example, extensive improvements at the Airport Road interchange for Alternative J indicate significantly improved conditions over the No Build. Traffic diverting to the Build Alternatives through intersections along other routes may cause increases in the expected delays, such as at the LA 435/LA 59 at LA 36 roundabout for all Build Alternatives.

The Build Alternatives divided roadway with controlled access is expected to provide greater safety benefits than the existing two-lane undivided highways with numerous access points. A raised median with limited access points decreases the number of conflict points.

4.9.3.4.1 *Alternative B/O*

Alternative B/O is expected to divert traffic mainly from the southwest portion of LA 21 and from LA 59 due to its location within the study area and connection points to the existing street network.

The SELA transportation model estimated that in the design year, Alternative B/O would divert approximately 35% of the daily traffic on LA 21 southwest of its connection, 20% of the daily traffic on LA 59, and 15% of the daily traffic on LA 41 to the new roadway. The 2035 ADTs on these roadways were estimated to be 16,300 vehicles per day (vpd) on LA 21, 25,100 vpd on LA 59, and 5,400 vpd on LA 41, resulting in a rough estimation of 11,535 vpd diverted. Both of these routes were identified in the Existing and No Build analysis as capacity constraints. In fact, the areas where the most traffic relief is expected from Alternative B/O are those with the greatest expected congestion. The only exception is Airport Road which is not expected to be significantly impacted by Alternative B/O.

The travel time savings expected with Alternative B/O improves compared to existing routes involving LA 21 and LA 59. The greatest savings in travel time is expected versus existing routes between Bush and the I-12 at US 190 and I-12 at LA 434 interchanges at 19.7 and 23.3 minutes per vehicle, respectively. Improvements may be needed on existing intersections not on Alternative B/O whether or not this alternative is constructed. While Alternative B/O is expected to provide improvements in LOS and/or delay on the congested LA 21 and LA 59 corridors, unacceptable LOS are still expected at many of the intersections in the design year 2035. Capacity analysis for the implementation and design years indicates excess capacity at the intersections in the western portion of the project area. How long beneficial effects at intersections on existing routes depend on whether improvements are provided to existing intersections and when the improvements are implemented.

Improvements were identified at the LA 1088 interchange to accommodate the added traffic demand with an estimated cost of $500,000 (see Appendix J) in addition to the cost of constructing the new alignment itself.

4.9.3.4.2 *Alternative J*

Alternative J is expected to divert traffic mainly from LA 41 with minor diversion of traffic from LA 21 and LA 59, due to its location within the study area and connection points to the existing street network. The majority of the traffic diverted to Alternative J would access I-12 via Airport Road, a corridor with documented congestion problems and existing capacity needs.

The SELA transportation model estimated that in the design year, Alternative J would divert approximately 75% of the daily traffic on LA 41, 16% of the daily traffic on LA 21, and 6% of the daily traffic on LA 59 to the new roadway. The 2035 ADTs on these roadways were estimated to be 5,400 vpd on LA 41, 16,300 vpd on LA 21, and 25,100 vpd on LA 59 resulting in a rough estimation of 8,170 vpd diverted. In the Existing and No Build analysis, only intersections inversely affected by the new alignment on LA 41 were identified as capacity constraints. Alternative J is expected to provide improvements in LOS and/or delay on the congested LA 21 and LA 59 corridors; however, the reductions in delay are less than that provided by Alternatives B/O and P. For example, Alternative J is expected to provide an approximate 33% reduction in delay for the LA 59 northbound approach in the AM peak at the intersection of LA 21 at LA 59, whereas Alternatives B/O and P would be expected to provide approximately 74% and 81% in reductions, respectively.

The area where the most traffic relief is expected is where excess capacity exists on LA 41. The congestion at Airport Road would be expected to worsen or require additional improvements to accommodate the both the existing needs and significant increase in traffic demand as a result of Alternative J.

The travel time savings expected with Alternative J improves compared to existing routes involving LA 41. The greatest savings in travel time is expected versus existing routes between Bush and the I-12 at US 11 and I-12 at LA 434 interchanges at 11.4 and 19.8 minutes per vehicle, respectively.

Improvements were identified at the Airport Road interchange to accommodate the added traffic demand with an estimated cost of $23,200,000 (see Appendix J) in addition to the cost of constructing the new alignment itself; most of the improvements are required to relieve existing congestion.

4.9.3.4.3 *Alternative P*

Alternative P is also expected to divert traffic mainly from LA 21 and from LA 59 due to its location within the study area and connection points to the existing street network.

The SELA transportation model estimated that in the design year, Alternative P would divert approximately 40% of the daily traffic on LA 21, 16% of the daily traffic on LA 59, and 46% of the daily traffic on LA 41 to the new roadway. The 2035 ADTs on these roadways were estimated to be 16,300 vpd on LA 21, 25,100 vpd on LA 59, and 5,400 vpd on LA 41, resulting in a rough estimation of 13,020 vpd diverted. Both of these routes were identified in the Existing and No Build analysis as capacity constraints. In fact, Alternative P is expected to provide the most traffic relief to the routes with the greatest expected congestion except Airport Road, which would not be significantly impacted.

The travel time savings expected with Alternative P improves compared to existing routes involving LA 21 and LA 59. The greatest savings in travel time is expected versus existing routes between Bush and the I-12 at US 190 and I-12 at LA 434 interchanges at 20.0 and 23.6 minutes per vehicle, respectively. Improvements may be needed on existing intersections not on Alternative P whether or not this alternative is constructed. While Alternative P is expected to provide improvements in LOS and/or delay on the congested LA 21 and LA 59 corridors, unacceptable LOS are still expected at many of the intersections in the design year 2035. Capacity analysis for the implementation and design years indicates excess capacity at the intersections in the western portion of the project area. How long beneficial effects at intersections on existing routes depend on whether improvements are provided to existing intersections and when the improvements are implemented.

Improvements were identified at the LA 1088 interchange to accommodate the added traffic demand with an estimated cost of $600,000 (see Appendix J) in addition to the cost of constructing the new alignment itself.

4.9.3.4.4 Alternative Q

Alternative Q is also expected to divert traffic mainly from LA 41 and also from both LA 21 and LA 59 due to its location within the study area and connection points to the existing street network.

The SELA transportation model estimated that in the design year, Alternative Q would divert approximately 70% of the daily traffic on LA 41, 18% of the daily traffic on LA 21, and 6% of the daily traffic on LA 59 to the new roadway. The 2035 ADTs on these roadways were estimated to be 5,400 vpd on LA 41, 16,300 vpd on LA 21, and 25,100 vpd on LA 59, resulting in a rough estimation of 8,220 vpd diverted. LA 41 was not identified as needing additional capacity, while both LA 21 and LA 59 were. While Alternative Q is expected to provide some improvements in LOS and/or delay on the congested LA 21 and LA 59 corridors, unacceptable LOS are still expected at many of the intersections in the design year 2035. Capacity analysis for the implementation and design years indicates excess capacity at the intersections in the western portion of the project area. How long beneficial effects at intersections on existing routes depend on whether improvements are provided to existing intersections and when the improvements are implemented.

The travel time savings expected with Alternative Q improves compared to the existing routes involving LA 41, LA 21 and LA 59. Alternative Q is expected to provide improvements in LOS and/or delay on the congested LA 21 and LA 59 corridors; however, the reductions in delay are less than that provided by Alternatives B/O and P. For example, Alternative Q is expected to provide an approximate 50% reduction in delay for the LA 59 northbound approach in the AM peak at the intersection of LA 21 at LA 59, whereas Alternatives B/O and P would be expected to provide approximately 74% and 81% in reductions, respectively.

The greatest savings in travel time is expected versus existing routes between Bush and the I-12 at US 190 and I-12 at LA 434 interchanges at 13.2 and 26.6 minutes per vehicle, respectively.

Improvements were identified at the LA 434 interchange to accommodate the added traffic demand with an estimated cost of $400,000 (see Appendix J) in addition to the cost of constructing the new alignment itself.

In addition to the projected travel time savings, there could be direct and indirect, short-term, major impacts to traffic traveling to and from the Louisiana Medical Center and Heart Hospital located on LA 434. Highway construction would directly affect all ambulance services in the area as they transport patients to the hospital. Also, construction activities could delay the emergency response times of any fire trucks stationed at St. Tammany Parish Fire Protection District #3 Station 21 located just north of the hospital.

4.9.4 Safety Analysis

A safety analysis was performed by LADOTD to assist in quantifying the potential safety benefits provided by each alternative alignment. The analysis assumed that traffic diverted from existing roadways with lesser design standards to one of the proposed alternative alignments with higher design standards would result in a reduction in traffic accidents. The Highway Safety Manual predictive method by way of Interactive Highway Safety Design Model software was utilized to estimate the number of crashes expected in 2035 for the study area road network for each alternative alignment (Table 4-40).

Table 4-40.
Predicted number of crashes in 2035

Route	Control Section	No Build	Alternative B/O	Alternative J	Alternative P	Alternative Q
US 190	013-11	478.44	463.41	468.03	464.58	472.14
US 190-x	013-10	27.54	26.17	26.33	26.25	26.84
LA 21	030-01	88.49	97.14	67.84	46.16	70.52
LA 59	281-03	84.7	70.77	80.64	76.07	80.66
LA 59	852-09	17	11.84	14.32	12.76	11.68
LA 36	280-01	16.37	15.76	15.44	15.2	15.28
LA 36	280-03	10.11	9.9	12.02	10.93	24.43
LA 435	281-04	29.31	26.29	28.86	41.24	30.57
US 11	018-04	28.69	27.89	25.72	27.42	27.63
LA 41	058-01	91.38	81.12	36.64	61.64	50.74
LA 41	058-02	28.98	24.62	3.22	2.98	3.18
LA 434	852-12	7.09	4.45	5.6	5.24	5.43
Total Network Crashes		908.1	902.94	828.16	820.84	851.6
Reduction in Crashes		-	5.16	79.94	87.26	56.5

Source: LADOTD 2012

Assumptions for the safety analysis included:

1. Existing conditions remain unchanged throughout the analysis year.

2. Interstates and roundabouts were excluded from the analysis because the predictive method of the HSM does not include safety performance functions for these facilities.

3. Design speed for IHSDM input was assumed to be 10 mph over the posted speed limit.

4. The cost of each crash type was developed by the Louisiana Highway Safety Research Group from "The Economic Impact of Motor Vehicle Crashes 2000" and updated by the CPI.

5. Existing crash rates for segments were calculated using non-intersection crashes only.

Based on the modeled data, Alternative P has the greatest reduction in crashes in 2035, followed by Alternative J, Alternative Q, and Alternative B/O. Interpreting the modeled data leads to the conclusion that there could be a reduction in the severity of crashes, and an assumed reduction in the costs associated with these accidents.

4.10 UTILITIES

4.10.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to utilities within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.10.2 Build Alternatives

Direct and indirect impacts to utilities would be expected to be similar for each of the Build Alternatives as described below. Sections 4.10.2.1 through 4.10.2.4 describe differences in utilities impacts between alternatives.

Direct and Indirect Impacts to Utilities

Short-term direct impacts to utilities would be expected under the Build Alternatives. There are multiple utilities located under the alternatives, including major gas and electric transmission lines. No long-term impacts would be expected to utilities. For pipeline crossings, the road profile was raised so that the lines would not have to be relocated. However, electrical transmission lines would have to be relocated for highway construction. After the alignment is constructed, no additional impacts to utilities would be anticipated.

Short-term negligible adverse impacts to the majority of the service-oriented facilities, such as water, sewer, and gas, would be anticipated. Existing utility lines within the ROW may be relocated during construction. Relocation may temporarily disrupt water, gas, and telecommunication services during project construction but would be expected to return to pre-existing operating conditions after construction is complete.

4.10.2.1 Alternative B/O

Direct and Indirect Impacts to Utilities

Existing electrical, telephone, and cable lines located on overhead poles would be expected to be relocated along the ROW where Alternative B/O would overlap with LA 21 and at each intersection crossing. Substations located in the project area would be avoided. Estimated utility relocation costs for Alternative B/O are $5 million.

4.10.2.2 Alternative J

Direct and Indirect Impacts to Utilities

Existing electrical, telephone, and cable lines located on overhead poles would be expected to be relocated along the ROW where Alternative J would overlap with Airport Road and at each intersection crossing. Substations located in the project area would be avoided. Estimated utility relocation costs for Alternative J are $6 million.

4.10.2.3 Alternative P

Direct and Indirect Impacts to Utilities

Existing electrical, telephone, and cable lines located on overhead poles would be expected to be relocated along the ROW where Alternative P would cross major intersections including LA 36 and LA 435. Substations located in the project area would be avoided. Estimated utility relocation costs for Alternative P are $2 million.

4.10.2.4 Alternative Q

Direct and Indirect Impacts to Utilities

Existing electrical, telephone, and cable lines located on overhead poles would be expected to be relocated along the ROW where Alternative Q would overlap with LA 434 and at each intersection crossing. Substations located in the project area would be avoided. Estimated utility relocation costs for Alternative Q are $3 million.

4.11 SOCIOECONOMICS

This section presents the projected baseline values for each of four socioeconomic variables studied: population, employment, regional GDP, and real personal income for a forty-year period, 2010 to 2050. Section 3.11 discusses baseline values for those variables.

This section also presents the findings of the potential socioeconomic impacts from pre-construction and construction activities of the various alternative alignments for the I-12 to Bush highway project. The construction of a new highway or improvements to existing highways, regardless of the particular alignment selected is expected to have similar socioeconomic impacts. Analysis of the socioeconomic environment in the two-parish ROI considered changes to demography (population) and economic measures (employment, regional GDP, and real personal income). The Community Infrastructure and Public Services subsections below discuss potential changes to community infrastructure (housing) and public services (education, public safety, fire protection and law enforcement, and health care).

Appendix F details the *Economic Study Report* prepared as part of the EIS, which is summarized in this section. The report provides information on a parish base, identifies a more specific trend analysis by time-period, and examines potential costs for two phases of the proposed project—pre-construction activities and construction that would be required to implement any of several construction alternatives. Pre-construction activities include project planning and engineering and the acquisition of ROWs. In addition, the effects of current national and regional economic recession[12] have been built in to the forecasted values of all the studied socioeconomic variables.

The analysis is based on certain assumptions about the start and end dates of the pre-construction and construction phases of the proposed project and the costs associated with each phase. Those assumptions are:

1. Pre-construction activities (planning, engineering, and ROW acquisition) starts at the beginning of the third quarter (Q3) 2015 (July 1); activities are completed at the end of the fourth quarter (Q4) 2018 (December 31); and total pre-construction costs (excluding any

[12] A recession is a business cycle contraction, a general slowdown in economic activity over a period of time. A recession is characterized as a period of high unemployment rate, a low rate of inflation, and low rate of economic growth.

wetland mitigation costs) are about $35 million (in 2010 dollars), of which $20.2 million is in acquisition of ROW costs.

2. Construction starts at the beginning of first quarter (Q1) 2019 (January 1); activities are completed by the end of fourth quarter (Q4) 2030 (December 31); and total construction costs are $210 million (in 2010 dollars).[13]

The analysis of possible indirect or secondary residential, commercial, or industrial development in the ROI resulting from proximity to highway access from the Proposed Action could not be quantified and is unlikely to be computed even with further research.

4.11.1 No Build Alternative

The No Build Alternative would not result in any project-related direct or indirect socioeconomic impacts with respect to population, community infrastructure and/or public services, employment, regional GDP, or real personal income. Baseline values for each of these variables are discussed below.

4.11.1.1 Demography

Population

Population in the socioeconomic ROI would continue to expand under the No Build Alternative from 2010 to 2050. Under the No Build Alternative, however, there would be no project-related increase in population. St. Tammany Parish is expected to experience an annual population growth rate of about 2 percent until 2020. This rate is about twice the expected national increase in population. From 2020 to 2050, the nation would grow at about 0.9% annually, while St. Tammany would likely have a higher population growth rate. St. Tammany Parish is also expected to grow at more than twice the rate of Washington Parish until about 2030. Washington Parish is expected to gain population at a faster rate than the nation until 2015, fall below national rates until 2040, and then grow at a rate equal to or slightly exceeding the national rate of population growth from 2045 to 2050. Table 4-41 presents information about the baseline population in the ROI and the annual change in population, as a percentage.

Community Infrastructure and Public Services

Project-related impacts to a community's infrastructure and public services are the result of increases in population. There would be no project-related deviations from the projected baseline population values with the No Build alternative. Therefore, there would be no project-related stress on the region's community infrastructure, including its housing inventory, or on its public services, which includes education, law enforcement, fire protection, and health care. Section 3.11 discusses current community infrastructure and public services in the ROI.

4.11.1.2 Economic Measures

Employment, regional GDP, and real personal income are variables that can be used to analyze the economic health of a community. These economic measures in the socioeconomic ROI would continue to expand under the No Build Alternative from 2010 to 2050.

[13] The estimated start and end dates of both pre-construction and construction and the estimated cost of each phase represent the best information available at the time this report was published. If an Action Alternative is executed on a different time frame or experience different costs than presented in this document, the magnitude and timing could differ.

Table 4-41.
No build alternative - baseline population in the ROI (2010 to 2050)

Population	*Baseline Population in ROI*								
	2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
ROI	293,841	328,967	360,959	389,899	415,449	438,017	460,036	484,509	512,978
St. Tammany Parish	247,296	279,893	309,769	336,905	360,886	381,821	401,767	423,474	448,478
Washington Parish	46,545	49,074	51,189	52,994	54,562	56,196	58,270	61,035	64,500

	Annual Change in Baseline Population of ROI							
	2010 to 2015	**2015 to 2020**	**2020 to 2025**	**2025 to 2030**	**2030 to 2035**	**2035 to 2040**	**2040 to 2045**	**2045 to 2050**
ROI	2.3%	1.9%	1.5%	1.3%	1.1%	1.0%	1.0%	1.1%
St. Tammany Parish	2.5%	2.0%	1.7%	1.4%	1.1%	1.0%	1.1%	1.1%
Washington Parish	1.1%	0.8%	0.7%	0.6%	0.6%	0.7%	0.9%	1.1%
USA	1.0%	1.0%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%

Values may not sum because of rounding.
Source: REMI 2010

Employment

Baseline employment opportunities in the ROI would continue to expand from 2010 to 2050. Employment comprises estimates of the number of full-time and part-time jobs. There would be no project-related deviations from projected baseline employment values under the No Build Alternative. A phenomenon that should be noted is with rapid increases in baseline population but slower rates of growth in the baseline number of jobs, many residents of the ROI would be expected to accept employment opportunities in surrounding parishes or in a neighboring state.

In particular, Washington Parish is expected to experience a very slow rate of growth in the number of employment opportunities until 2035. The sectors that serve as the Washington Parish employment base - government and government enterprises (particularly state and local government), retail trade, and construction - are not expected to grow as fast as many other sectors (BLS 2009). Working Washington Parish residents are likely to commute to a job site in neighboring parishes or state. The expected increase in the number of jobs is much slower than the rate of increase in parish population until about 2030.

The projected rate of increase in the number of jobs in St. Tammany Parish, until about 2035, is also slower than the corresponding rate of increase in population during that period. However, the expansion of jobs is at a rate markedly higher than the rate of job growth nationally. The sectors that serve as the St. Tammany Parish employment base - professional and business services and the health care and social services - would be expected to be among the industries with the fastest growing employment opportunities. Communities that experience a faster rate of growth in population than in job opportunities are likely to grow as bedroom communities, particularly in this case, for the New Orleans metro area.

Table 4-42 presents information about the baseline line employment in the ROI and the annual change in employment, as a percentage.

Table 4-42.
Baseline employment in the ROI (2010 to 2050)

	Baseline Employment in ROI								
Employment	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
ROI	123,527	131,402	137,340	142,419	148,177	154,611	162,469	172,093	184,006
St. Tammany Parish	106,941	114,685	120,603	125,621	131,095	136,954	143,904	152,385	163,000
Washington Parish	16,587	16,718	16,738	16,798	17,082	17,657	18,565	19,708	21,006

	Annual Change in Baseline Employment of ROI							
Employment	**2010 to 2015**	**2015 to 2020**	**2020 to 2025**	**2025 to 2030**	**2030 to 2035**	**2035 to 2040**	**2040 to 2045**	**2045 to 2050**
ROI	1.2%	0.9%	0.7%	0.8%	0.9%	1.0%	1.2%	1.3%
St. Tammany Parish	1.4%	1.0%	0.8%	0.9%	0.9%	1.0%	1.2%	1.4%
Washington Parish	0.2%	0.0%	0.1%	0.3%	0.7%	1.0%	1.2%	1.3%
USA	0.8%	0.6%	0.4%	0.6%	0.8%	0.9%	0.9%	1.0%

Values may not sum because of rounding.
Source: REMI 2010

GDP

As discussed in Population and Employment sections above, the ROI is expected to experience growth in the applicable baselines in all years from 2010 to 2050. The annual increase in population and annual increase in the number of jobs would result in an annual increase in the regional GDP. There would no project-related impact to GDP under the No Build Alternative because there is no project-related increase in population and no project-related increase in the number of jobs.

GDP can be measured by summing: Consumption (expenditures by households) + Investment (expenditures by businesses) + Government (expenditures by all levels of government) + Net exports (the value of exports – the value of imports). GDP is the value of all final goods and services produced in an area within a given year.

Real Personal Income

Real personal income is income received by persons from all sources. That is, it includes income received as wages, proprietor's income, commissions, bonuses as well as government and business transfer payments (dividends, unemployment compensation, and social security for example). Real personal income per capita is derived by dividing the personal income of a community by the number of persons living in the community.

There would be no project-related change to real personal income, or real personal income per capita under the No Build Alternative because there would be no change in project-related population or employment. Baseline real personal income is expected to increase in the ROI in the period 2010 to 2050. Real personal income per capita is affected by changes in real personal income and/or changes in population. For example, an increase in PCI could be caused by an increase in real personal income or a decrease in population. In 2010, PCI in the ROI was about

$41,000; it was about $43,700 in St. Tammany Parish and about $26,800 in Washington Parish. The national PCI was $39,600 in 2010 (REMI 2010). Until about 2025, the ROI's annual rate of increase in real personal income per capita is less than the forecasted rate of growth at the national level. This is because the rate of job growth in the ROI is so much less than the ROI's population rate of growth.

There is a marked difference in the real personal income per capita in St. Tammany Parish and in Washington Parish. As displayed in Table 4-43, the 2010 per capita income in Washington Parish is about 61 percent of the per capita income of St. Tammany Parish; the baseline ratio between the two parishes is expected to narrow slightly over the forty-year study period.

Table 4-43.
Baseline real personal income per capita in ROI (2010 to 2050)

	Baseline Real Personal Income per Capita in ROI (2010 dollars)								
Real Personal per Capita Income (PCI)	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
ROI	41,042	43,141	45,434	47,995	51,366	55,595	60,859	67,243	75,347
St. Tammany Parish	43,730	45,697	47,950	50,526	53,978	58,344	63,781	70,410	78,919
Washington Parish	26,764	28,558	30,213	31,906	34,091	36,920	40,714	45,274	50,510

	Annual Change in Baseline Real Personal Income per Capita of ROI							
Real Personal per Capita Income (PCI)	**2010 to 2015**	**2015 to 2020**	**2020 to 2025**	**2025 to 2030**	**2030 to 2035**	**2035 to 2040**	**2040 to 2045**	**2045 to 2050**
ROI	1.0%	1.0%	1.1%	1.4%	1.6%	1.8%	2.0%	2.3%
St. Tammany Parish	0.9%	1.0%	1.1%	1.3%	1.6%	1.8%	2.0%	2.3%
Washington Parish	1.3%	1.1%	1.1%	1.3%	1.6%	2.0%	2.1%	2.2%
USA	1.6%	1.4%	1.2%	1.4%	1.6%	1.7%	1.8%	1.9%

Source: REMI 2010

Real personal income per capita in St. Tammany Parish, Washington Parish, and the nation is expected to increase at similar rates from 2015 until 2050. Residents of Washington Parish would likely experience a faster rate of growth in real personal income between 2010 and 2015 then the residents of St. Tammany Parish. However, in absolute dollars, the real personal per capita income in Washington Parish would remain at less than 65 percent of real personal income per capita in St. Tammany Parish for the entire study period. St. Tammany Parish real personal income, primarily wages, has been less affected by the current national recession than other areas because so many jobs are tied to the relatively robust health care, social assistance, professional, scientific, and technical services industries. In addition in December 2010, the unemployment rate in St Tammany Parish of 5.2 percent (BLS 2011b) was much smaller than the unemployment rate in Washington Parish or the national rate unemployment rate of 9.1 percent (BLS 2011a and BLS 2011b).

4.11.1.3 Summary of the No Build Alternative

Under the No Build Alternative, the population in the ROI would increase, the number of jobs would grow, regional GDP would expand, and real personal income would enlarge each year of the 2010 to 2050 study period. However, the growth of those variables is a naturally occurring phenomenon, a projected baseline, and not related to the proposed project. Hence, baseline values for the socioeconomic variables analyzed in this EIS are identical to the value of the variables under the No Build Alternative.

4.11.2 Build Alternatives

The discussion in this section focuses on project-related changes in population, employment, regional Gross Regional Product, and real personal income resulting from the Proposed Action. Changes to the ROI's community infrastructure and public services are also discussed. Changes are the deviations (changes above or below) from a projected baseline for each variable. Baseline values in the ROI for the period 2010 to 2050 for demography (population) and the economic measures (employment, regional GDP, and real personal income) are discussed above in Section 4.11.1. The construction of a new highway or improvements to existing highways, regardless of the particular alternative alignment selected, would be expected to have similar socioeconomic impacts. Therefore, the discussion in the following sections applies to all four build alternative alignments.

4.11.2.1 Demography

Population

Construction of the proposed highway from I-12 to Bush, regardless of the alternative alignment selected, would minimally impact the projected population in the ROI. The very small increases in population would be temporary and of short duration and be unlikely to result in any in-migration of workers or their families.

The ROI would experience an increase in population over the naturally occurring baseline population of less than 0.01 percent during pre-construction. A project-related increase in the peak year of change to population during pre-construction, 2018, represents 15 people over the projected regional baseline population of 348,517 people.

St. Tammany Parish is expected to absorb virtually all the project-related increase in population during pre-construction. In the peak year of project-related increases in population, 13 of the projected 15 new ROI residents would reside in St. Tammany Parish, with the remaining 2 people expected to live in Washington Parish.

It is noted that of the 15 project-related new ROI residents during pre-construction, 3 would be school-aged children (REMI 2010). All the school-age children would be expected to live in St. Tammany Parish. In the 2007–2008 school year, 51,816 children were in public and private educational institutes in the ROI.

Table 4-44 details expected projected-related changes in the ROI population during pre-construction, in both absolute numbers and in percentages over the baseline, for the period 2015 to 2018, and for reference the year 2010. The economic impact of project-related changes in population is reflected in changes in the regional GDP and in changes to real personal income. Changes to both these variables are discussed below in GDP and Real Personal Income. The ROI would experience an increase over the naturally occurring baseline population of 0.01 percent or less during construction. A project-related increase of 0.01 percent, in the peak year of

Table 4-44.
Project-related changes in population in the ROI, pre-construction (2015 to 2018)

Baseline Population	2010	2015	2016	2017	2018
ROI	293,841	328,967	335,630	342,133	348,517
St. Tammany Parish	247,296	279,893	286,106	292,175	298,137
Washington Parish	46,545	49,074	49,524	49,959	50,380
Build Alternatives Population					
Population	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	293,841	328,970	335,637	342,145	348,532
St. Tammany Parish	247,296	279,896	286,112	292,185	298,151
Washington Parish	46,545	49,074	49,525	49,960	50,381
Baseline vs. Build Alternatives, Absolute Change in Population					
Population	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0	3	7	11	15
St. Tammany Parish	0	2	7	10	13
Washington Parish	0	0	1	1	2
Baseline vs. Build Alternatives, Percent Change in Population					
Population	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0.00%	0.00%	0.00%	0.00%	0.00%
St. Tammany Parish	0.00%	0.00%	0.00%	0.00%	0.00%
Washington Parish	0.00%	0.00%	0.00%	0.00%	0.00%

Values may not sum because of rounding.
Source: REMI 2010

construction, 2030, represents a project-related increase in the ROI of 45 people over the projected baseline population of 415,449. The project-related increase in population in the ROI during construction drops to fewer than 20 people by the year 2036 and to 10 or fewer people by the year 2040. Unlike much larger construction projects, the ROI is not expected to experience a much slower rate of growth in population at the conclusion of construction.

St. Tammany Parish is expected to absorb virtually all the project-related increase in population during construction. In the peak year of project-related increases in population, 2030, 39 of the projected 45 new ROI residents would reside in St. Tammany Parish and the remaining 6 people would be expected to reside in Washington Parish.

It is noted that of the 45 project-related new ROI residents, 11 would be school-aged children. Of the 11 school-age children, 10 would be expected to live in St. Tammany Parish and 1 in Washington Parish. Table 4-45 details expected projected-related changes in the ROI population during construction and in the immediate post-construction period, in both absolute numbers and in percentages over the baseline, for the period 2020 to 2045.

Table 4-45.
Project-related changes in population in ROI, construction and post-construction (2020 to 2045)

Base line Population	2020	2025	2030	2035	2040	2045
ROI	360,959	389,899	415,449	438,017	460,036	484,509
St. Tammany Parish	309,769	336,905	360,886	381,821	401,767	423,474
Washington Parish	51,189	52,994	54,562	56,196	58,270	61,035
Build Alternatives Population						
Population	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	360,984	389,940	415,493	438,039	460,046	484,513
St. Tammany Parish	309,792	336,941	360,926	381,839	401,775	423,477
Washington Parish	51,192	52,999	54,568	56,200	58,272	61,036
Baseline vs. Build Alternatives, Absolute Change in Population						
Population	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	25	40	45	22	10	4
St. Tammany Parish	23	36	39	18	8	3
Washington Parish	3	5	6	3	2	1
Baseline vs. Build Alternatives, Percent Change in Population						
Population	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
St. Tammany Parish	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
Washington Parish	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%

Values may not sum because of rounding.
Source: REMI 2010

Community Infrastructure and Public Services

Project-related impacts to the community infrastructure and level of public services are driven by project-related changes in population. Project-related related increases in population, during both pre-construction and construction would be about 0.01 percent or less. Therefore, project-related impacts to the region's community infrastructure, including its housing inventory, during re-construction and construction would be virtually undetectable. Project related changes to public services, including education, law enforcement, fire protection, and health care services would also be largely insignificant.

4.11.2.2 Economic Measures

Economic development impacts related to the construction of any of the alternative alignments would include a temporary increase in direct employment, increase in indirect employment, an increase the regional per capita income, and an increase in regional GDP. The economic impacts would be similar for each of the alignments.

Employment

In 2008, about 12,600 persons (BEA 2010b, 2010c) in the ROI were employed in the construction industry. Construction and maintenance of any of the alternative alignments would require skilled and unskilled labor. In December 2010, the unemployment rate in St. Tammany Parish was 5.2 percent and 9.1 percent in Washington Parish (BLS 2011b). The size of the region's construction labor pool and unemployment rate suggest that there would be no short-term labor shortages during the construction regardless of the alternative selected. Therefore, no regional in-migration of workers or their families would be expected.

Construction and roadway improvements would result in an increase in regional employment opportunities. However, pre-construction activities and construction of the proposed highway between I-12 and Bush, regardless of the alternative alignment selected, would have a very small impact on employment in the ROI, even during the construction period itself.

As Table 4-46 shows, in the peak years of employment during pre-construction, 2016 and 2017, the number of jobs in the ROI would increase by 103 positions because of construction related activities. Those additional positions represent about 0.08 percent of the baseline ROI employment in that year. Virtually all the jobs, 102 or 99 percent, would be created in St. Tammany Parish. Project-related jobs include positions created as a direct and indirect result of pre-construction activities (planning and engineering), and induced effects (resulting from the spending of monies received for land acquired ROWs).

Table 4-46.
Project-related changes in employment in ROI, pre-construction (2015 to 2018)

Baseline Population	2010	2015	2016	2017	2018
ROI	123,527	131,402	132,728	133,891	135,190
St. Tammany Parish	106,941	114,685	116,007	117,173	118,454
Washington Parish	16,587	16,718	16,721	16,718	16,735
Build Alternatives Population					
Population	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	123,527	131,454	132,832	133,994	135,291
St. Tammany Parish	106,941	114,736	116,110	117,275	118,554
Washington Parish	16,587	16,718	16,722	16,719	16,736
Baseline vs. Build Alternatives, Absolute Change in Population					
Population	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0	52	103	103	101
St. Tammany Parish	0	52	102	102	100
Washington Parish	0	0	1	1	1
Baseline vs. Build Alternatives, Percent Change in Population					
Population	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0.00%	0.04%	0.08%	0.08%	0.07%
St. Tammany Parish	0.00%	0.04%	0.09%	0.09%	0.08%
Washington Parish	0.00%	0.00%	0.01%	0.01%	0.01%

Values may not sum because of rounding.
Source: REMI 2010

The economic impact of project-related changes in employment during pre-construction is reflected in changes in the regional GDP and in changes to real personal income. Changes to both of those variables are discussed below in *GDP* and *Real Personal Income*.

Table 4-47 displays information about the creation of project-related positions during the construction and in the immediate post-construction period. In all years during construction and in the 20 years post construction, changes in employment levels in the ROI and in the parishes individually represent less than 0.14 percent of the baseline employment. Note that the loss of positions in the post 2031 period represents a slower rate of growth in new positions in the ROI rather than an absolute loss of positions (see Table 4-41 baseline employment).

The economic impact of project-related changes in employment during construction is reflected in changes in the regional GDP and in changes to real personal income. Changes to of both those variables are discussed below in *GDP* and *Real Personal Income*.

Table 4-47.
Project-related changes in employment in ROI, construction and post-construction (2020 to 2045)

Baseline Population	2020	2025	2030	2035	2040	2045
ROI	137,340	142,419	148,177	154,611	162,469	172,093
St. Tammany Parish	120,603	125,621	131,095	136,954	143,904	152,385
Washington Parish	16,738	16,798	17,082	17,657	18,565	19,708
Build Alternatives Employment						
Population	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	137,493	142,552	148,295	154,594	162,461	172,089
St. Tammany Parish	120,754	125,753	131,212	136,937	143,895	152,381
Washington Parish	16,739	16,800	17,083	17,657	18,565	19,708
Baseline vs. Build Alternatives, Absolute Change in Employment						
Population	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	153	133	118	-17	-9	-4
St. Tammany Parish	151	132	117	- 17	-9	-4
Washington Parish	2	1	1	0	0	0
Baseline vs. Build Alternatives, Percent Change in Employment						
Population	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	0.11%	0.09%	0.08%	-0.01%	-0.01%	0.00%
St. Tammany Parish	0.13%	0.10%	0.09%	-0.01%	-0.01%	0.00%
Washington Parish	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%

Values may not sum because of rounding.
Source: REMI 2010

GDP

Noting project-related changes in the region's GDP are a helpful way to assess the economic impact of a project. Project-related impacts to GDP would occur primarily during construction activities. Changes in GDP occur with changes in productivity and spending. New jobs create wages that are spent (increasing consumption expenditures) and taxes paid (increasing government expenditures). The increased spending of wages also results in additional business spending (increasing Investment as commercial entities expand offerings to meet the demands of consumers). Intermediate goods purchased for construction activities also increase Investment.

Pre-construction activities associated with the proposed project, regardless of the alternative alignment selected, would cause a small increase over the baseline GDP. As shown in Table 4-48,

Table 4-48.
Project-related changes in regional GDP in ROI, pre-construction (2015 to 2018)

Baseline GDP	2010	2015	2016	2017	2018
ROI	6.61	7.77	8.01	8.23	8.47
St. Tammany Parish	5.91	6.99	7.21	7.42	7.65
Washington Parish	0.70	0.78	0.79	0.81	0.83
Build Alternatives					
GDP	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	6.61	7.77	8.01	8.24	8.48
St. Tammany Parish	5.91	6.99	7.22	7.43	7.65
Washington Parish	0.70	0.78	0.79	0.81	0.83
Baseline vs. Build Alternatives, Absolute Change in GDP					
GDP	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0.0000	0.0024	0.0049	0.0049	0.0049
St. Tammany Parish	0.0000	0.0024	0.0049	0.0049	0.0049
Washington Parish	0.0000	0.0000	0.0000	0.0000	0.0000
Baseline vs. Build Alternatives, Percent Change in GDP					
GDP	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0.00%	0.03%	0.06%	0.06%	0.06%
St. Tammany Parish	0.00%	0.04%	0.07%	0.07%	0.06%
Washington Parish	0.00%	0.00%	0.00%	0.00%	0.00%

Values may not sum because of rounding.
[1] Dollar values expressed in billions of 2010 fixed (not adjusted of inflation) dollars.
Source: REMI 2010

the changes would occur in years 2015 to 2018. The increase over in the baseline is 0.06 percent or less in the ROI. Changes to GDP in the ROI would peak at 0.06 percent 2016, 2017, and 2018.

The economic impact of project-related changes during both pre-construction and construction to the applicable baseline of GDP is generally positive, but very small. In the peak year of project-related changes to regional GDP during construction, 2019, regional GDP would be expected to increase by $9 million or less than 0.1 percent. The increase in the region's GDP during construction would be an annual average of about $7.0 million. Table 4-49 summarizes project-related changes during construction and in the immediate post-construction period.

Table 4-49.
Project-related changes in regional GDP in ROI, construction (2020 to 2045)

Baseline GDP	2020	2025	2030	2035	2040	2045
ROI	8.96	10.30	11.92	13.84	16.21	19.17
St. Tammany Parish	8.10	9.35	10.83	12.59	14.75	17.44
Washington Parish	0.86	0.96	1.08	1.25	1.46	1.73
Build Alternatives						
GDP	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	8.97	10.31	11.92	13.84	16.21	19.17
St. Tammany Parish	8.11	9.35	10.84	12.59	14.75	17.44
Washington Parish	0.86	0.96	1.08	1.25	1.46	1.73
Baseline vs. Build Alternatives, Absolute Change in GDP						
GDP	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	0.0073	0.0073	0.0061	-0.0012	0.0000	-0.0012
St. Tammany Parish	0.0073	0.0073	0.0061	-0.0012	0.0000	0.0000
Washington Parish	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Baseline vs. Build Alternatives, Percent Change in GDP						
GDP	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	0.09%	0.07%	0.06%	-0.01%	0.00%	0.00%
St. Tammany Parish	0.09%	0.08%	0.06%	-0.01%	0.00%	0.00%
Washington Parish	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%

Values may not sum because of rounding.
[1] Dollar value expressed in billions of fixed (not adjusted for inflation) 2010 dollars.
Source: REMI 2010

A very small slowing in the rate of growth in GDP in the ROI would be expected because of a reduction in project-related activities in the period 2031 to 2039. The slower growth rate amounts to about 0.01 percent. The slower rate of growth in regional GDP from project-related activities during that period amounts to about an annual average of $1.2 million. Those increases over the baseline regional GDP values from 2015 to 2030 and the slowing from 2031 to 2039 are not meaningful because they are a small percentage of the region's GDP. The economic impact from project-related activities to GDP in St. Tammany and Washington Parish would be negligible.

Real Personal Income

Project-related activities during pre-construction and construction would have very little economic impact on the real personal income per capita of ROI residents. In the peak year of project-related impacts during either pre-construction or construction, 2019, residents in the ROI would see PCI improve by about $17, or about four-hundredths of one percent (0.04 percent). The small changes, increases above the baseline, are most evident in the construction period. In the immediate post-construction period, there would be a very small slowing of growth in the real personal income per capita, less than $5 per year, until about 2043. Table 4-50 displays information about changes to regional real personal per capita during pre-construction, and for comparison, in 2010. Table 4-51 presents information about changes to PCI during construction, and immediate post-construction periods.

Table 4-50.
Project-related changes in real personal per capita income in ROI, pre-construction (2015 to 2018)

Baseline Real Personal Per Capita Income (in dollars)	2010	2015	2016	2017	2018
ROI	41,042	43,141	43,622	44,055	44,553
St. Tammany Parish	43,730	45,697	46,163	46,583	47,080
Washington Parish	26,764	28,558	28,940	29,268	29,606
Build Alternatives					
Real Personal Per Capita Income (in dollars)	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	41,042	43,148	43,634	44,066	44,564
St. Tammany Parish	43,730	45,704	46,177	46,596	47,092
Washington Parish	26,764	28,559	28,941	29,269	29,607
Baseline vs. Build Alternatives, Absolute Change in PCI					
Real Personal Per Capita Income (in dollars)	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0	6	12	11	11
St. Tammany Parish	0	7	13	13	12
Washington Parish	0	1	1	1	1
Baseline vs. Build Alternatives, Percent Change in PCI					
Real Personal Per Capita Income	**2010**	**2015**	**2016**	**2017**	**2018**
ROI	0.00%	0.01%	0.03%	0.03%	0.02%
St. Tammany Parish	0.00%	0.02%	0.03%	0.03%	0.03%
Washington Parish	0.00%	0.00%	0.00%	0.00%	0.00%

Values may not sum because of rounding.

[1] Dollar values are expressed in fixed (not adjusted for inflation) 2010 dollars.

Source: REMI 2010

Table 4-51.
Project-related changes in real personal per capita income in ROI, construction (2020 to 2045)

Baseline Real Personal Per Capita Income (in dollars)	2020	2025	2030	2035	2040	2045
ROI	45,434	47,995	51,366	55,595	60,859	67,243
St. Tammany Parish	47,950	50,526	53,978	58,344	63,781	70,410
Washington Parish	30,213	31,906	34,091	36,920	40,714	45,274
Build Alternatives						
Real Personal Per Capita Income (in dollars)	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	45,450	48,008	51,377	55,591	60,857	67,243
St. Tammany Parish	47,968	50,541	53,990	58,339	63,779	70,410
Washington Parish	30,216	31,907	34,091	36,919	40,712	45,274
Baseline vs. Build Alternatives, Absolute Change in PCI						
Real Personal Per Capita Income (in dollars)	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	16	13	11	-4	-1	0
St. Tammany Parish	18	15	12	-5	-1	0
Washington Parish	2	1	0	-1	-1	0
Baseline vs. Build Alternatives, Percent Change in PCI						
Real Personal Per Capita Income	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
ROI	0.04%	0.03%	0.02%	-0.01%	0.00%	0.00%
St. Tammany Parish	0.04%	0.03%	0.02%	-0.01%	0.00%	0.00%
Washington Parish	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%

Values may not sum because of rounding.
[1] Dollar values are expressed in fixed (not adjusted for inflation) 2010 dollars.
Source: REMI 2010

4.11.3 Socioeconomic Summary of Build Alternatives

St. Tammany Parish dominates the two-parish ROI in terms of the four analyzed socioeconomic variables: population, number of jobs (employment), the regional GDP, and real personal income. In 2010, before beginning pre-construction activities or construction start of any of the alternatives for the proposed project, St. Tammany Parish housed 84 percent of the population, provided 87 percent of the jobs, and generated 89 percent of the region's GDP. In 2010 the real personal income per capita in St. Tammany Parish is estimated to be about 163 percent of the real personal income per capita in Washington Parish. Most of the project-related changes to those socioeconomic variables would be expected in St. Tammany Parish.

In the peak year of project-related impacts, 2030 for changes in population and 2019 for changes in employment, regional GDP, and real personal income, St. Tammany Parish would host 39 of the 45 (about 87 percent) of the new project-related residents in the ROI and provide 154 of the 155 new project-related jobs (about 99 percent). Project-related effects on the GDP would be nearly undetectable in Washington Parish but represent an increase of $7.3 million over the baseline in St. Tammany Parish in 2019. Residents of St. Tammany Parish could experience an increase of $19 in their real personal income while residents of Washington Parish could see a project-related increase of $2 in their real personal income per capita. Therefore, absolute changes and changes as a percentage over/under the baseline values for those socioeconomic variables in St. Tammany Parish broadly reflect the changes to the study area, the ROI.

Regardless of the alternative alignment selected, the economic impact of project-related activities would be expected to be very small. In all years 2010 to 2050 and in the ROI as a whole and in St. Tammany and Washington parishes individually, the project-related impacts, the annual changes over/under the applicable baselines, would be less than 0.14 percent. In Washington Parish, the project-related changes to each of the four analyzed socioeconomic variables during the applicable peak year (the year when changes reflect the greatest magnitude) would be less than two one-hundredths of one percent (less than 0.02 percent). In St. Tammany Parish, maximum changes to population would be about 0.01 percent, to GDP about 0.1 percent, and to PCI about 0.04 percent. Changes to employment would be about 0.13 percent. At construction completion, the ROI socioeconomic variables would continue to grow, but at a very slightly (0.01 percent) slower rate for about 10 years (until about 2040).

The economic impact in the ROI of the proposed project to the regional population, employment, GDP, and real personal income is positive, but not statistically significant. Differences in community infrastructure impacted by the Build Alternatives are discussed in Sections 4.11.3.1 to 4.11.3.4.

4.11.3.1 Alternative B/O

Under Alternative B/O, existing development in the proposed ROW would be relocated or removed. An estimated 14 families would be displaced and all are owner-occupants. Five businesses would also be displaced including: three service stations, one Dollar General store, and one insurance company. Those businesses and home owners would be required to be relocated. All acquisitions of property, including homes and businesses, will adhere to Title VI of the Civil Rights Act of 1964, the Housing and Urban Development Act of 1974, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended 1987).

Fifth Ward Jr. High School would qualify for functional replacement. Twelve classrooms, a gymnasium, and the administrative offices would be directly impacted and would take approximately two years to replace (C.H. Fenstermaker 2011).The Functional Replacement Program allows for publicly owned and publicly used facilities to be replaced with a functionally new or existing facility (C.H. Fenstermaker 2011). The program was initially developed by the FHWA and adopted by the LADOTD as a method to provide an alternative method of acquiring real property for any highway or highway related projects, and to compensate public agencies for publicly owned property needed to provide essential public services. Examples are schools, police and fire stations, local parks, etc. Functional Replacement does not apply to real property owned by utilities and railroads, and it also excludes Federal lands. In order to qualify for functional replacement:

- The property must be in public ownership and use.
- The replacement facility must also be in public ownership and continue the public use function of the acquired facility.
- The State must inform the agency owning the property of its right to an estimate of just compensation based on an appraisal of fair market value and of the option to choose either just compensation or functional replacement.

4.11.3.2 Alternative J

Under Alternative J, existing development in the proposed ROW would be relocated or removed. Construction of Alternative J would displace an estimated 51 families. Of these families, 26 are owner-occupants and 25 are apartment tenants. Fifteen families occupy mobile homes which are considered movable, but owner occupied. Approximately 14 businesses would also be displaced (C.H. Fenstermaker 2011). All acquisitions of property, including homes and businesses, will adhere to Title VI of the Civil Rights Act of 1964, the Housing and Urban Development Act of 1974, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended 1987).

The Slidell Head-start building would be impacted under Alternative J. The building appears to be publicly owned and used by the public, therefore it would qualify for functional replacement. The Functional Replacement Program allows for publicly owned and publicly used facilities to be replaced with a functionally new or existing facility (C.H. Fenstermaker 2011).

4.11.3.3 Alternative P

Under Alternative P, existing development in the proposed ROW would be relocated or removed and would displace approximately six families. Two of the six families occupy mobile homes and only replacement sites would be required. No businesses or facilities would be expected to be displaced (C.H. Fenstermaker 2011). All acquisitions of property, including homes and businesses, will adhere to Title VI of the Civil Rights Act of 1964, the Housing and Urban Development Act of 1974, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended 1987).

4.11.3.4 Alternative Q

Under Alternative Q, existing development in the proposed right-of-way would displace approximately 19 families. Of those 19 families, 15 occupy mobile homes and replacement sites for those homes would be required (C.H. Fenstermaker 2011). All acquisitions of property, including homes and businesses, will adhere to Title VI of the Civil Rights Act of 1964, the Housing and Urban Development Act of 1974, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended 1987). St. Tammany Parish Fire Protection District #3 Station 21 would qualify under the Functional Replacement Program if the station is moved due to the construction of Alternative Q.

4.11.4 Travel Demand Summary of Build Alternatives

The construction and subsequent availability of travel on a highway from I-12 to Bush would result in changes to socioeconomic variables and to travel demand variables in Washington Parish and in St. Tammany Parish. Utilizing input data of the existing travel patterns in the parishes, the economic modeling software, REMI TranSight, was employed to generate likely impacts associated with motorized vehicles utilizing the proposed roadway. Estimated travel demand and socioeconomic impacts resulting specifically from Alternatives B/O, J, P, and Q, in each parish, for each of three representative years are summarized here. The year 2025 was included as representative of the construction period, year 2030 is reflective of the immediate post-construction period, and year 2035 represents likely impacts in the post-construction period as area commuters incorporate new travel options.

Variables reviewed include changes in population and employment; changes in air and water emissions caused by vehicle operation; changes in travel time and delays; traffic safety, including crashes and severity of crashes; changes in vehicle operating expenses (gas and oil); changes in vehicle operating expenses (maintenance and repair).

4.11.4.1 Alternative B/O

Impacts under the Alternative B/O nearly mirror the impacts that would be expected under Alternative P (see Section 4.11.4.3) in terms of percentage of magnitude, in both Washington Parish and St. Tammany Parish, for both the reviewed socioeconomic variables and the travel demand variables (Table 4-52).

Table 4-52.
Alternative B/O costs/savings resulting from changes in travel demand

	2025	2030	2035
St. Tammany Parish			
Socioeconomic Variables			
Employment (jobs)	-996	-1176	-1376
Population	-822	-1198	-1561
Travel Demand Variables			
Emissions (Air and Water)	-$1,000	$0	$1,000
Travel Time Savings	$770,000	$1,137,000	$1,503,000
Safety	-$2,000	$30,000	$61,000
Vehicle Operating Cost (Gas and Oil)	-$8,000	-$45,000	-$71,000
Vehicle Operating Cost (Repair & Maint.)	-$1,000	-$13,000	-$25,000
Washington Parish			
Socioeconomic Variables			
Employment (jobs)	54	96	148
Population	588	1126	1720
Travel Demand Variables			
Emissions (Air and Water)	$38,000	$65,000	$92,000
Travel Time Savings	$11,772,000	$17,705,000	$23,556,000
Safety	$850,000	$1,473,000	$2,096,000
Vehicle Operating Cost (Gas and Oil)	-$1,046,000	-$1,496,000	-$2,040,000
Vehicle Operating Cost (Repair & Maintenance)	-$299,000	-$520,000	-$741,000

Source: REMI TransSight v3.1, *Construction with TD 2*

4.11.4.2 Alternative J

Alternative J would result in a small change in the number of jobs in both St. Tammany and Washington Parishes (Table 4-53). The change from the employment baseline represents less than 0.5% in St. Tammany Parish for all three study years, less than 1% in Washington Parish for year 2025 and 2030, about 1.5% in 2035. Changes from the population baseline are less than 0.3% in St. Tammany Parish, but increasingly large in Washington Parish; about 2% in 2025, 3.7% in 2030 and rising to 5.4% by 2035. The population increase in Washington Parish would put pressures in housing stock and community infrastructure, but would result in an increase in parish GDP of about 1% and an increase in residents' personal income of about 2% by 2035. St. Tammany Parish would experience very small cost/savings from changes in the studied travel demand variables, in all study years. Washington Parish's experience would be different. Residents of the parish would benefit from very small savings in emissions, small savings in safety related issues, and notable savings in the reduction of travel time and delays - up to $41.8 million in 2035. Savings in travel time would be offset slightly by increased costs associated with additional vehicle operating expenses, both in gasoline/oil and in repair/maintenance categories. Changes to GDP and personal income are not notable in either Washington Parish or St. Tammany Parish.

Table 4-53.
Alternative J costs/savings resulting from changes in travel demand

	2025	2030	2035
St. Tammany Parish			
Socioeconomic Variables			
Employment (jobs)	395	509	624
Population	516	688	883
Travel Demand Variables			
Emissions (Air and Water)	$12,000	$14,000	$16,000
Travel Time Savings	$1,131,000	$1,567,000	$2,002,000
Safety	-$16,000	$28,000	$72,000
Vehicle Operating Cost (Gas and Oil)	$43,000	-$1,000	-$45,000
Vehicle Operating Cost (Repair & Maintenance)	$24,000	$8,000	-$8,000
Washington Parish			
Socioeconomic Variables			
Employment (jobs)	103	176	264
Population	1130	2043	3038
Travel Demand Variables			
Emissions (Air and Water)	$32,000	$47,000	$62,000
Travel Time Savings	$21,387,000	$31,617,000	$41,763,000
Safety	$464,000	$818,000	$1,173,000
Vehicle Operating Cost (Gas and Oil)	-$1,232,000	-$1,684,000	-$2,096,000
Vehicle Operating Cost (Repair & Maintenance)	-$147,000	-$273,000	-$399,000

Source: REMI TransSight v3.1, *Construction with TD 2*

4.11.4.3 Alternative P

Alternative P would result in a modest number of absolute new jobs within Washington Parish, jobs which represent less than 1% of the number of baseline positions in the parish (Table 4-54). There would be a large loss of (unrealized) absolute positions in St. Tammany Parish. These unrealized jobs represent less than 1% of the St. Tammany Parish baseline estimated jobs in all years, however. If Alternative P were built, commuters would have less reason to stop in St. Tammany Parish and purchase goods and services from convenience stores, service stations, and other vendors. In addition, the savings in travel time would make Washington Parish a more attractive residential venue for commuters. As a result, the Washington Parish population would increase. Much of the increase in Washington Parish population, an increase of about 1.2% to 2.8% from the baseline, would come at the expense of St. Tammany Parish.

Residents of Washington Parish would experience modest savings in the reduction of air and water emissions and in safety benefits. Washington Parish commuters would benefit from a large reduction in travel time and travel delays, $15.1 million in 2030 and $19.6 million in 2035, for example. Commuters would incur greater costs associated with operating vehicles including expenses for gasoline, oil, repair and maintenance. This alternative would result in a deviation from the baseline of less than 1% of the parish residents' personal income and an impact to GDP of about 0.5% in the year with the greatest impact (2035).

Residents of St. Tammany Parish would be benefit from a much smaller savings in travel time than would those living in Washington Parish. St. Tammany residents would also experience a small reduction in road safety during construction and the immediate post-construction period. Total expenditures within the parish for gas, oil, vehicle repair, and maintenance would drop (as these expenditures increased in Washington Parish). The impact of changes in socioeconomic variables and travel demand variable would be manifested in less than a 0.7% change in parish baseline GDP and about 0.3% in baseline personal income.

Table 4-54.
Alternative P costs/savings resulting from changes in travel demand

	2025	2030	2035
St. Tammany Parish			
Socioeconomic Variables			
Employment (jobs)	-813	-964	-1133
Population	-621	-929	-1229
Travel Demand Variables			
Emissions (Air and Water)	-$7,000	-$3,000	$0
Travel Time Savings	$1,232,000	$1,589,000	$1,945,000
Safety	-$173,000	-$97,000	-$22,000
Vehicle Operating Cost (Gas and Oil)	$124,000	$57,000	-$10,000
Vehicle Operating Cost (Repair & Maintenance)	$62,000	$36,000	$9,000
Washington Parish			
Socioeconomic Variables			
Employment (jobs)	71	110	157
Population	608	1067	1559
Travel Demand Variables			
Emissions (Air and Water)	$26,000	$52,000	$79,000
Travel Time Savings	$10,614,000	$15,128,000	$19,561,000
Safety	$683,000	$1,332,000	$1,980,000
Vehicle Operating Cost (Gas and Oil)	-$902,000	-$1,331,000	-$1,850,000
Vehicle Operating Cost (Repair & Maintenance)	-$246,000	-$479,000	-$712,000

Source: REMI TransSight v3.1, *Construction with TD 2*

4.11.4.4 Alternative Q

In terms of jobs, neither Washington Parish nor St. Tammany Parish would benefit from Alternative Q (Table 4-55). There would be virtually no change in the number of jobs in Washington Parish, while St. Tammany Parish would experience a slower growth in the number of jobs. However, the slower growth represents less than 1% of the employment baseline in St.

Tammany Parish. Both Washington Parish and St. Tammany Parish would have a slower rate of population growth if Alternative Q were implemented. Because the current population in Washington Parish is so small, the impact to that parish, about 2% of the baseline, would be much more marked than the impact in St. Tammany Parish, about 0.5% of the baseline.

Residents of Washington Parish would benefit from very small savings in air and water emissions and from small savings in safety benefits. Alternative Q would result in opportunity travel time costs of nearly the same magnitude of savings in travel time benefits available under Alternative P ($13.5 million in 2030 and $18.4 million in 2035, for example). Washington Parish commuters would also incur a modest increase in expenditures associated with the purchase of gasoline, oil, and repairs and maintenance services. In aggregate, impacts to GDP and personal income, variables that are broadly representative of a parish's economic health, would be about 0.1% of the GDP baseline and about 0.6% of the personal income baseline.

Residents of St. Tammany Parish would benefit from very small savings in emissions, a small savings in vehicle operating expenses, but commuters would bear a small increase in the loss of vehicle safety. St. Tammany Parish commuters would benefit from modest savings in travel time. In aggregate, the GDP of the parish and the residents' personal income would experience impacts representing less than 1% of the expected baseline value.

Table 4-55.
Alternative Q costs/savings resulting from changes in travel demand

	2025	2030	2035
St. Tammany Parish			
Socioeconomic Variables			
Employment (jobs)	-1295	-1199	-1127
Population	-1448	-1697	-1806
Travel Demand Variables			
Emissions (Air and Water)	$2,000	$2,000	$2,000
Travel Time Savings	$555,000	$715,000	$875,000
Safety	-$135,000	-$121,000	-$108,000
Vehicle Operating Cost (Gas and Oil)	$107,000	$78,000	$64,000
Vehicle Operating Cost (Repair & Maintenance)	$59,000	$53,000	$47,000
Washington Parish			
Socioeconomic Variables			
Employment (jobs)	10	-8	-32
Population	-377	-705	-1069
Travel Demand Variables			
Emissions (Air and Water)	$39,000	$61,000	$83,000
Travel Time Savings	$8,710,000	$13,527,000	$18,433,000
Safety	$650,000	$1,238,000	$1,825,000
Vehicle Operating Cost (Gas and Oil)	$1,000	-$327,000	-$580,000
Vehicle Operating Cost (Repair & Maintenance)	-$214,000	-$427,000	-$641,000

Source: REMI TransSight v3.1, *Construction with TD 2*

4.12 ENVIRONMENTAL JUSTICE

EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* is designed to focus the attention of federal agencies on human health and environmental conditions in minority communities and low-income communities. Environmental justice analyses are performed to identify potential disproportionately high and adverse effects on minority communities or to low-income communities from proposed actions and to identify alternatives that might mitigate those impacts.

Population data from the 2000 Census, specifically census tract data from those census tracts in St. Tammany and Washington Parish, were used for this analysis.[14] Racial minority populations included in the 2000 Census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, and Other. Ethnic minority populations include persons of Hispanic or Latino origin. Persons of Hispanic or Latino origin may be of any race, and are also included in applicable racial classifications. Poverty status, used in this EIS to define low-income status, is reported as the percentage of persons with a family unit income below the poverty level. This analysis was performed prior to the availability of the 2010 census data; however, no meaningful changes in the rates of minorities, nor persons living in poverty, nor in the residential location of those populations has occurred since the 2000 census. Use of the 2010 census tract data would not alter the conclusions reached here based on the 2000 census tract data.

The 2000 Census defines the poverty level as an annual income of $8,794 or less for an individual, and an annual income of $17,603 or less for a family unit of four persons (USCB 2000b). Concentrations of minority or lower income populations were those geographical areas (census tracts) where the number of minority or low income persons exceeds 50 percent or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population of other appropriate unit of geographic areas, in this case Louisiana. Tables 3-65, 3-66, and 3-67 in Section 3.11 provide detailed information about the percentages of minority persons and low-income persons in Louisiana and each of the census tracts in St. Tammany and Washington Parishes. Two census tracts are in St. Tammany Parish with concentrations of minorities, expressed as a percentage of the total parish population, that is meaningfully greater that the percentage of minorities in Louisiana, census tracts 405.01 (Covington) and 409 (NE of Slidell). Two census tracts are in Washington Parish with concentrations of minorities at a rate that exceeds 50 percent of the total parish population, census tract 9503 (North of Franklinton) and census tract 9508 (Bogalusa). One census tract exists with a meaningful greater rate of minorities than in Louisiana, census tract 9509 (Bogalusa). Two census tracts are in St. Tammany Parish that have a rate of poverty meaningfully greater than that in Louisiana, census tract 405.01 and 411.03 (NW of Slidell). Three census tracts in Washington Parish have a rate of poverty meaningfully greater than that in Louisiana, census tracts 9503, 9508, and 9509 (Bogalusa). Project-related socioeconomic and other environmental impacts would be expected to be very small; therefore, no high and adverse effects on minority populations or low-income populations would be expected.

As shown in Table 3-65, each parish individually, had a lower percentage of racial minority residents than Louisiana. In 2000, St. Tammany Parish had a slightly higher percentage of persons of Hispanic or Latino origin than Louisiana. Persons of Hispanic or Latino origin

[14] Census Tracts are small, statistical subdivisions of a county or equivalent entity. Census tracts generally have a population size between 1,200 and 8,000 people. The spatial size of census tracts varies widely depending on the density of settlement.

represented a smaller percentage of the Washington Parish population than persons of Hispanic or Latino origin in the state.

In 2000, approximately 12.4 percent of the residents of the ROI were living in poverty compared to a rate of 19.6 percent in Louisiana that year. In 2000, 9.7 percent of St. Tammany Parish residents were living in poverty and 24.7 percent of the residents of Washington Parish were classified as living in poverty.

No disproportionately high and adverse health or environmental impacts to racial or ethnic minorities or to low-income populations would be expected from the No Build Alternative or from any of the four Action Alternative alignments analyzed in this EIS.

4.12.1 No Build Alternative

There are no environmental justice impacts to any population under the No Build Alternative.

4.12.2 Build Alternatives

The socioeconomic and other environmental impacts during pre-construction and construction, regardless of the alternative alignment selected, are similar, small, and generally beneficial in that temporary and permanent jobs would be created. There are no adverse environmental justice impacts expected during the pre-construction or construction period to any population. There are no adverse socioeconomic or other environmental justice impacts expected during the post construction period. There are no high and adverse environmental justice impacts expected during the pre-construction, construction, or post-construction period to any population. Minority populations and low-income populations could benefit from the project-related economic development because of increases in employment opportunities, the improved real personal income, and the growth in regional GDP.

4.13 CHILDREN'S ENVIRONMENTAL HEALTH AND SAFEY RISKS

4.13.1 No Build Alternative

No adverse impacts on the health and safety of the children would be expected in the ROI under the No Build Alternative. The No Build Alternative would not change the current status of children in the region, hence, children's health and safety in the region would not be affected.

4.13.2 Build Alternatives

Project-related changes to the ROI population, regardless of the Build Alternative selected, include children (aged 0 – 19 years). During the peak year of pre-construction activities, the estimated project-induced change in population of 15 persons includes 5 children (aged 0–19 years). During the peak period of impacts during construction activity, 2030, about 45 project-related new residents would migrate to the region. Approximately 15 of those residents would be children.

4.13.2.1 Alternative B/O

One existing public school, Fifth Ward Junior High School, with an enrollment of 531 students in 2008/09 school year (NCES undated) is within the 250-ft ROW Alternative B/O. There are no plans to relocate the school should this alternative be selected. Should this alternative be selected, short-term minor adverse impacts on the protection of children would be expected. Because construction sites could be enticing to children, construction activity could pose an increased safety risk. During construction, the safety measures stated in 29 CFR Part 1926, *Safety and Health Regulations for Construction*, would be followed to protect the health and safety of the children and other nearby residents and construction workers. For example, barriers and "No Trespassing" signs could be placed around construction sites to deter children from playing in the areas and that construction vehicles and equipment be secured when not in use. In addition, permanent, appropriate safety devices/measures could be installed and implemented to mitigate the risks associated with the expected increase in vehicle traffic volume.

4.13.2.2 Alternative J

No adverse environmental consequences would be expected for the health and safety of the children in the region under the Alternative J.

4.13.2.3 Alternative P

No adverse environmental consequences would be expected for the health and safety of the children in the region under the Alternative.

4.13.2.4 Alternative Q

No adverse environmental consequences would be expected for the health and safety of the children in the region under the Alternative Q.

4.13.3 Summary of Impacts to Children's Health and Safety

The potential environmental health impacts and safety risks from pre-construction activities, the construction, and operation of three (Alternatives J, P, and Q) of the four Alternatives would not be expected to disproportionately affect children. No significant environmental health and safety impacts would be expected on any population identified in this document.

Alternative B/O could affect the health and safety of children in the vicinity of Fifth Ward Junior High School. Appropriate measures to mitigate health and safety risks to children would be undertaken if this alternative alignment is selected.

4.14 AESTHETIC AND VISUAL RESOURCES

4.14.1 No Build Alternative

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to aesthetic and visual resources within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.14.2 Build Alternatives

Direct and indirect impacts to aesthetic and visual resources would be expected to be similar for each of the Build Alternatives as described below.

Direct Impacts to Aesthetics and Visual Resources

Short-term direct minor adverse impacts would be experienced during construction. The clearing of land and the use and storage of construction equipment on site could temporarily decrease the aesthetic and visual value of the project area. The areas outside of the ROW would be allowed to return to their natural condition after project construction is complete.

Short-term direct minor adverse impacts during construction could affect aesthetics and visual resources in the vicinity of this alternative with erosion and sedimentation of receiving streams. During construction of the alternative, erosion from construction activities would likely increase turbidity in receiving streams, degrading the visual appeal of waterways in the project area. An LPDES General Construction Permit is required for all construction activities, and BMPs would be employed to minimize erosion and sedimentation or silting of receiving streams.

Indirect Impacts to Aesthetics and Visual Resources

Long-term indirect moderate adverse impacts could be expected to reduce the overall rural atmosphere of the communities along any of the proposed alignments as more traffic is introduced in the project area.

4.15 CULTURAL RESOURCES

A Phase I cultural resources survey was conducted for each alternative alignment between April and October 2010. A previous cultural resources investigation associated with EA for this project was completed and combined with the most current survey. The results of the survey and potential impacts are discussed below.

The Choctaw Nation of Oklahoma was contacted and responded that they concur with the findings in the Cultural Resources Survey Report and have no additional comments.

4.15.1 No Build Alternative

Direct and Indirect Impacts to Cultural Resources

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts to cultural resources within the ROW, or vicinity of, any of the alternative alignment's corridors.

4.15.2 Build Alternatives

4.15.2.1 Alternative B/O

Direct and Indirect Impacts to Cultural Resources

Under this alternative, cultural resources would not be directly or indirectly impacted. No archaeological sites were recorded during the survey of Alternative B/O. A total of 12 standing structures are located adjacent to this alternative; however, none of the structures are considered eligible for nomination to the NRHP.

If any archaeological cultural resources are encountered during project activities, work would cease and the SHPO would be consulted immediately.

4.15.2.2 Alternative J

Direct and Indirect Impacts to Cultural Resources

Under this alternative, cultural resources would not be directly or indirectly impacted. One site, an old railroad alignment of the New Orleans Great Northern Railroad and 9 standing structures were documented during site investigations. None of these are considered eligible for nomination to the NRHP.

No indirect impacts to cultural resources would be expected. If any archaeological cultural resources are encountered during project activities, work would cease, and the SHPO would be consulted immediately.

4.15.2.3 Alternative P

Direct and Indirect Impacts to Cultural Resources

Direct adverse impacts could occur under this alternative. Four new archaeological sites were recorded during the survey of the alternative. Of the four recorded sites, one is the historic alignment of the New Orleans Great Northern Railroad that extends through a portion of Alternative P. The railway was abandoned in the late-20th century, and within the surveyed alternatives, majority of the railroad has been destroyed. Most of the alignment is now used as a logging road. None of the newly recorded sites is considered eligible for nomination to the NRHP.

The previously recorded Gum Swamp site is within this alternative. The site is eligible for nomination to the NRHP and should be avoided during all phases of highway construction. If this site cannot be avoided, archaeological mitigation should be undertaken.

Seven standing structures are located adjacent to Alternative P. None of these structures is considered eligible for nomination to the NRHP; however, construction of Alternative P would adversely affect one historic resource.

No indirect impacts to cultural resources would be expected. If any archaeological cultural resources are encountered during project activities, work would cease, and the SHPO would be consulted immediately.

4.15.2.4 Alternative Q

Direct and Indirect Impacts to Cultural Resources

Direct and indirect impacts would not be expected to cultural resources under this alternative. The only site identified affected by this alignment is the New Orleans Great Northern Railroad. The railway was abandoned in the late-twentieth century, and within the surveyed alternatives, majority of the railroad has been destroyed and most of the alignment is now used as a logging road. Additionally, nine standing structures greater than 50 years of age were identified along Alternative Q. None of the newly recorded sites is considered eligible for nomination to the NRHP.

If any archaeological cultural resources are encountered during project activities, work would cease and the SHPO would be consulted immediately.

4.16 HAZARDOUS AND TOXIC SUBSTANCES AND POLLUTION

4.16.1 No Build Alternative

Direct and Indirect Impacts from Hazardous and Toxic Substances and Pollution

Under the No Build Alternative, construction of the proposed roadway from I-12 to Bush would not be undertaken. Consequently, there would be no direct or indirect impacts on this resource area in the ROW or vicinity of any of the alternative alignment's corridors.

4.16.2 Build Alternatives

Direct Impacts from Hazardous and Toxic Substances and Pollution

Short-term minor adverse impacts would be expected from hazardous materials used and wastes generated during construction under this alternative. The use of these materials and generated wastes could create a potential for hazardous spills. Construction contractors would be required to comply with all local, state, and federal regulations pertaining to the handling and management of hazardous materials waste.

Additionally, construction, ground clearing, leveling, and excavation could reveal hazardous materials stored in underground storage tanks or reveal historic spills. If such conditions are discovered during construction, construction contractors should take appropriate measures to remediate the area and remove any existing soil, surface water, or groundwater contamination in accordance with state and federal environmental regulations. If an alternative alignment is selected, a new Phase I ESA would need to be prepared to determine the environmental conditions. If environmentally affected areas are identified, appropriate measures would be implemented before construction.

Homes and buildings that would be acquired as part of the ROW could be demolished and could generate short-term minor adverse impacts. The contract should investigate each building for the presence of asbestos siding and lead-based paint and ensure that demolition and debris disposal is conducted in accordance with state and federal regulations. Notification to EPA is required under 40 CFR 60.145, *Standard for Demolition and Renovation*.

Indirect Impacts from Hazardous and Toxic Substances and Pollution

Long-term indirect minor adverse impacts on the environment from hazardous and toxic substances and pollution are possible. Commercial vehicles can transport hazardous materials and fuel, hazardous, and toxic spills might occur. Any hazardous spill must be reported in accordance with 49 CFR 171.15. Each hazardous waste transporter is required to develop a spill contingency plan in accordance with 33 Louisiana Administrative Code (LAC) section 1315.

4.17 SUMMARY OF CONSEQUENCES

A summary of the potential environmental and socioeconomic consequences of the No Build Alternative and Preferred Alternative are presented in Table 4-56.

4.18 CUMULATIVE IMPACTS

To define cumulative impacts, it is necessary to determine the appropriate scope of analysis for the project. The determination of scope of analysis is guided by the USACE's NEPA regulations, specifically 33 CFR Part 325, Appendix B paragraph 7.b.(1). In some circumstances, the USACE's NEPA scope of analysis may be expanded beyond the limits of the USACE's regulatory jurisdiction (i.e., the waters of the United States) to address upland portions of the larger project area. Within the I-12 to Bush project area, as defined in Section 1.1, CEMVN has on file a total of 188 permits for projects outside the 250-ft ROW of any alternative alignment. Effects on waters of the United States from those projects could indirectly affect waters of the United States for the I-12 to Bush roadway. If the government exercises *federal control and responsibility* over both the permitted activity and the other activity occurring upland, those activities are sufficiently interrelated to be included in the NEPA scope of analysis pursuant to the guidance provided by Appendix B. As a result, it is necessary to include those upland projects when considering cumulative effects in the project area.

CEQ regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). The USACE considers a reasonably foreseeable action to be a future action for which there is a realistic expectation that the action should occur. Actions in the project area that pose the potential for cumulative impacts, that is, environmental or

Table 4-56. Summary of potential physical, natural, and social environmental consequences

Resource Area	No Build Alternative		Alternative B/O		Alternative J		Alternative P		Alternative Q	
	Direct Impacts	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***
Land Use	None	None	Long-term major adverse; Short-term minor adverse	Long-term major adverse	Long-term major adverse; Short-term minor adverse	Long-term major adverse	Long-term major adverse; Short-term minor adverse	Long-term major adverse	Long-term major adverse; Short-term minor adverse	Long-term major adverse
Water Resources	None	None	Long-term major and moderate adverse	Long-term major and moderate adverse	Long-term major and moderate adverse	Long-term major and moderate adverse	Long-term major and moderate adverse	Long-term major and moderate adverse	Long-term major and moderate adverse	Long-term major and moderate adverse
Ecological Resources										
Land Cover	None	None	Long-term major adverse	Long-term moderate adverse	Long-term major adverse	Long-term moderate adverse	Long-term major adverse	Long-term moderate adverse	Long-term major adverse	Long-term moderate adverse
Wildlife	None	None	Long-term major adverse	Short-term minor adverse	Long-term major adverse	Short-term minor adverse	Long-term major adverse	Short-term minor adverse	Long-term major adverse	Short-term minor adverse
Sensitive Habitats	None	None	Long-term major adverse	Short-term minor adverse	Long-term major adverse	Short-term and Long-term minor adverse	Long-term major adverse	Short-term minor adverse	Long-term major adverse	Short-term minor adverse
T&E Species	None	None	None	Long-term negligible	None	Long-term minor adverse	Long-term minor adverse	Long-term minor adverse	None	Long-term minor adverse
Wetlands	None	None	Long-term major adverse	Long-term moderate adverse	Long-term major adverse	Long-term moderate adverse	Long-term major adverse	Long-term moderate adverse	Long-term major adverse	Long-term moderate adverse
Geology and Soils	None	None	Long-term major adverse	Short-term and long-term moderate adverse	Long-term major adverse	Short-term and long-term moderate adverse	Long-term major adverse	Short-term and long-term moderate adverse	Long-term major adverse	Short-term and long-term moderate adverse

Table 4-56.
(continued)

Resource Area	No Build Alternative		Alternative B/O		Alternative J		Alternative P		Alternative Q	
	Direct Impacts	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***	***Direct Impacts***	***Indirect Impacts***
Air Quality	None	None	Short-term and long-term minor adverse	Short-term and long-term minor adverse	Short-term and long-term minor adverse	Short-term and long-term minor adverse	Short-term and long-term minor adverse	Short-term and long-term minor adverse	Short-term and long-term minor adverse	Short-term and long-term minor adverse
Noise	None	None	Short-term minor adverse	Long-term moderate adverse	Short-term minor adverse	Long-term moderate adverse	Short-term minor adverse	Long-term moderate adverse	Short-term minor adverse	Long-term moderate adverse
Recreational Resources	None	None	Long-term moderate adverse	Short-term and long-term minor adverse	Long-term moderate adverse	Short-term and long-term minor adverse	Long-term moderate adverse	Short-term and long-term minor adverse	Long-term moderate adverse	Short-term and long-term minor adverse
Traffic and Transportation	None	None	Long-term moderate beneficial	Long-term moderate beneficial	Long-term moderate beneficial	Long-term moderate beneficial	Long-term moderate beneficial	Long-term moderate beneficial	Long-term moderate beneficial	Long-term moderate beneficial
Utilities	None	None	Short-term negligible	Long-term negligible	Short-term negligible	Long-term negligible	Short-term negligible	Long-term negligible	Short-term negligible	Long-term negligible
Socioeconomics	None	None	Short-term minor beneficial	Long-term minor beneficial	Short-term minor beneficial	Long-term minor beneficial	Short-term minor beneficial	Long-term minor beneficial	Short-term minor beneficial	Long-term minor beneficial
Aesthetic and Visual Resources	None	None	Short-term minor adverse and long-term major adverse	Short-term minor adverse	Short-term minor adverse and long-term major adverse	Short-term minor adverse	Short-term minor adverse and long-term major adverse	Short-term minor adverse	Short-term minor adverse and long-term major adverse	Short-term minor adverse
Cultural Resources	None	None	None	None	None	None	Long-term major adverse	None	None	None
Hazardous & Toxic Substances	None	None	Short-term minor adverse	Long-term minor adverse	Short-term minor adverse	Long-term minor adverse	Short-term minor adverse	Long-term minor adverse	Short-term minor adverse	Long-term minor adverse

socioeconomic impacts when considered in combination with implementing the proposed action, include the following:

- Construction of the interchange at I-12 and LA 1088
- Construction of a road connecting US 11 to Airport Road north of I-12
- Proposed future TND developments at LA 1088 and LA 36, and LA 36 at the abandoned Gulf Mobile and Ohio Railroad corridor
- Future proposed developments at I-12 and LA 1088, LA 36 and LA 1088, I-12 and LA 434, and LA 21 and LA 41 near Bush (St. Tammany Parish Government 2010)
- Other future developments within the 43,500 acre area bounded by I-12, LA 59, LA 435, and LA 41

In addition, the *New Directions 2025* comprehensive plan identifies the best potential locations for business parks. Those locations include the LA 1077/I-12 interchange, LA 434/I-12 interchange, LA 1088/I-12 interchange, and US 190/I-12 interchange in Slidell. Potential locations of regional retailing were also identified and include the LA 22/I-12 interchange in Covington, LA 434/I-12 interchange, and LA 1088/I-12 interchange. Those locations were recommended for potential development, but it should be noted that business and retail development is not restricted to those locations, which could occur throughout the parish. Alternatives B/O and P would service development at the LA 1088/I-12 interchange, and Alternative Q would service development at the LA 434/I-12 interchange.

The activities or proposed developments listed above are relevant to this EIS because they result in, or support, the continued development of St. Tammany Parish. Further, those actions indicate that there is a realistic expectation for development to continue along the northshore of Lake Pontchartrain, and throughout central St. Tammany Parish.

The strategic growth guidelines developed by St. Tammany Parish seek to continue the economic growth of the region while still maintaining the integrity of the communities and rural areas. As one of the fastest growing areas in Louisiana for the past two decades, St. Tammany Parish continues to face challenges associated with an accelerated growth rate. The comprehensive plan for St. Tammany Parish, *New Directions 2025*, was initiated in December 1998. The comprehensive parish-wide planning and zoning indicates an intent to build a sustainable local economy, protect sensitive environmental areas, create housing for a broad cross-section of employees, and a regional transportation network to alleviate traffic congestion, provide mass transit, and recreational biking and pedestrian opportunities.

When considered alongside the direct and indirect impacts analyzed in this EIS, the continued development of St. Tammany Parish could have environmental and socioeconomic cumulative impacts for the area. In this section, cumulative impacts are discussed primarily on a qualitative basis as many of the environmental and socioeconomic parameters of future development are unknown, but their aspects are estimated and quantified where sufficient data is available.

4.18.1 Land Use

Direct Cumulative Impacts to Land Use

Long-term direct major adverse cumulative impacts to land use would occur as a result of current and future developments in the project area. Construction of an interchange at I-12 and LA 1088 was completed in April 2011 and converted 102 acres of open space, including 18.67 acres of pine wetlands, to developed roadway.

In January 2011, St. Tammany Parish submitted a permit application proposing to construct a 4.6 mile connector road with culverts and open ditch drainage from Airport Road to US 11, primarily for the purpose of providing residents north of I-12 with an emergency evacuation route to US 11 and I-12 (USACE 2011). Approximately 22.2 acres of pine flatwood/savanna habitat and 3.0 acres of Waters of the United States would be impacted by this road. The remaining 27 acres are non-wetland. Those habitats would be lost and converted to roadway.

As St. Tammany Parish continues to grow, there is a potential for land prices to increase. As such, land could become more valuable to develop for commercial and residential use and less likely for timber production, wildlife habitat, or other conservation purposes. Conflicts with existing state, parish, or local land use plans, policies, or controls would be anticipated to occur. Areas zoned as suburban, estate, industrial, and single-family residential could be converted and existing homes and commercial buildings could be acquired and converted to roadway.

Indirect Cumulative Impacts to Land Use

Long-term indirect moderate adverse cumulative impacts to land use could occur during and after construction activities of proposed developments and roadway improvements. Development could indirectly induce secondary development in the project area. New developments including residential and commercial areas, lodging, and convenience stores could occur as a result of future development. Secondary development is limited to some extent in St. Tammany Parish through zoning. A parish-wide zoning plan has been developed to concentrate industrial, commercial, and business growth along existing major roads near I-12 and limit majority of the project area to suburban development. The ND 2025 plan identifies the best locations for business parks and regional retail facilities to be in the vicinity of intersections of local roadways with I-12. As development and population in the parish increase, it could be expected to see additional changes in land use from open space and natural settings to developed.

4.18.2 Water Resources

Direct and Indirect Cumulative Impacts to Water Resources

Long-term direct and indirect major and moderate cumulative impacts to water resources could occur as a result of future developments or transportation improvements in the project area. Similar to the proposed action, future roadway improvements would be designed to minimize impacts to overland and channel flow in the project area. The LADOTD Hydraulics Analysis of Culverts (HYDR1120) and Open Channel Flow (HYDR1140) would be used to properly size culverts and bridges associated with new transportation projects.

Indirect cumulative impacts to wetlands could occur from future development or transportation improvements in the project area. Wetlands with jurisdictional status are waters of the U.S. as defined by Section 404 of the Clean Water Act and are regulated by the USACE and EPA. A permit would be required prior to any dredge or fill activities in wetlands and mitigation may be required to ensure no net loss of wetlands in the project area. Any unavoidable impacts to wetlands would require mitigation per USACE regulations.

4.18.3 Ecological Resources

Direct and Indirect Cumulative Impacts to Ecological Resources

Short- and long-term direct moderate adverse cumulative impacts to ecological resources would occur as a result of current and future developments or transportation improvements in the project area. Construction of an interchange at I-12 and LA 1088 was completed in April 2011. This interchange was constructed as a separate LADOTD project. Approximately 102 acres total of managed timber, including 18.67 acres of wetland habitat, was converted to developed roadway.

Construction of connector road from Airport Road to US 11 would impact 3.0 acres of wetlands; however no impacts to threatened or endangered species or their habitat would be expected.

Short and long-term direct moderate adverse cumulative impacts to ecological resources could occur from planned development and areas zoned for development at major highway intersections in the project area. Adverse impacts to ecological resources could be expected to occur. Timber production areas and wetlands would be developed into residential, commercial, and mixed use developments which would consist of parking lots, homes, retail buildings, and public parks. Some areas would be temporarily cleared for staging but would be returned to their natural state after construction. Long-term, habitat could be lost and fragmented and the edges created from fragmented habitat would be expected to become biologically simplified, diminishing the value of the remaining habitat (CEMVN 2008).

Land Cover. Long-term direct adverse impacts to land use would be expected to occur from future developments. Timber and wetlands in the project area would be developed into residential, commercial, and mixed use developments which would consist of parking lots, homes, retail buildings, and public parks. Development is proposed south of LA 36 on portions of approximately 43,500 acres in the project boundaries and generally contained within I-12, LA 59, LA 41, and south of LA 435 (Slifer 2010). Current zoning for St. Tammany indicates a proposed TND at the intersection of LA 1088 and LA 36, and another at the intersection of LA 36 with the abandoned Gulf Mobile and Ohio Railroad corridor. Future land use indicates mixed use developments at the intersections of I-12 and LA 1088, LA 36 and LA 1088, I-12 and LA 434, and LA 21 and LA 41 near Bush (St. Tammany Parish Government 2010).

Construction of residential and commercial areas would expose bare soil and could increase erosion on the construction site, temporarily degrading land cover in the drainage area. Those impacts would be temporary and localized, and could degrade the quality of surrounding land cover but would be expected to return to preconstruction levels after construction is complete and bare soils are revegetated. Additionally, all construction activities are required to obtain an LPDES General Permit for Construction Activities. Each General Permit requires the submittal and maintenance of a SWP3, which is intended to reduce erosion on the construction site and minimize the amount of sediment and potential pollution entering receiving streams.

Long-term indirect moderate adverse cumulative impacts to land cover could occur through an increase in impervious coverage. Impacts from impervious development could increase water pollution in the drainage area and degrade existing land uses and land cover types over time. Degradation of receiving streams can typically be observed with less than 10 percent impervious coverage. Runoff from impervious surfaces including roofs of homes and commercial buildings, parking lots, sidewalks, and compacted soils could increase the concentration of sediment, turbidity, nutrients, and temperature of receiving streams. In commercial and residential areas, fertilizers are used more heavily and could result in leaching of nitrogen and phosphorus in stormwater runoff. Nutrients are typically adsorbed to particulate matter and sediment from roofs, roads, sidewalks, and erosion would increase turbidity and suspended sediments in stormwater runoff. Higher temperatures of impervious surfaces such as roofs, roads, and sidewalks could increase the temperature of stormwater runoff and increased concentrations of suspended sediment could absorb more sunlight energy and slightly increase temperatures in the receiving stream. Impacts to water quality from land use conversion could be minimized through implementation of BMPs to minimize erosion and control sediments from entering receiving streams in stormwater runoff.

Wildlife. Short-term localized direct and indirect adverse cumulative impacts to wildlife could be expected. Clearing and grubbing activities for construction of proposed developments and future roadway improvements would temporarily displace wildlife inhabiting the area and could limit future habitat because of lack of tree and shrub cover. Wildlife expected to inhabit areas prior to construction include gray squirrel, fox squirrel, eastern cottontail rabbit, swamp rabbit, opossum, raccoon, muskrat, and smaller rodents such as moles, shrews, skunks, and weasels. Those wildlife species would be able to avoid the project area during construction and could be expected to return after construction is complete. White-tailed deer, red fox, and feral pigs could pass through the area after project construction is complete, but they would not be expected to re-inhabit this area because of lack of vegetative cover. Bachman's sparrow is a resident species of pine woodlands and prefers open pine woods in transition to forest. Clearing of timber areas could displace this songbird to other remaining pine woodlands (National Audubon Society 2010a).

Threatened and Endangered Species and Habitats. Threatened and endangered species or their habitats have not been identified in the project area for the I-12/LA 1088 interchange or the connector road from Airport Road to US 11. These projects would not be expected to impact threatened or endangered species or their habitat.

Indirect impacts to threatened and endangered species or habitat could occur as a result of future developments or transportation improvements. Proposed development occurring in the project area could impact potential habitat or threatened or endangered species; however consultation is required with USFWS for any development that proposes to take a threatened or endangered species or their habitat.

Sensitive Terrestrial and Aquatic Habitats. Sensitive terrestrial and aquatic habitats such as pine flatwoods and savannas or other designated sensitive areas could be impacted as a result of future developments and transportation improvements. Impacts to semi-permanently flooded wetlands in the project area could adversely impact those aquatic species that are partially or totally dependent upon wetlands for survival. Impacts to aquatic organism populations would be minor and localized and construction activities would avoid waterbodies present on the site. The most mobile aquatic species would be expected to disperse during project construction; however benthic organisms would be impacted by construction. Impacts would be expected to be short-term and localized, with minor long-term adverse impacts to the local aquatic ecosystem.

Approximately 22.2 acres of pine flatwood/savanna would be directly impacted and removed under the connector road from Airport Road to US 11 and of those 22.2 acres, 3.0 acres are wetlands. Those areas are sensitive habitats and adjacent communities could be impacted during construction from runoff that could impact surrounding aquatic habitat and the aquatic and benthic community. Those impacts would be expected to be short-term and localized, with long-term minor adverse impacts to adjacent wetlands and streams. Zoning for St. Tammany Parish does not designate conservation areas to preserve habitats identified in this area.

Wetlands. Direct impacts to 18.67 acres of jurisdictional wetlands and indirect impacts to adjacent wetlands occurred during the LA 1088 to I-12 interchange project. The project could contribute to the indirect degradation of similar wetland habitat in the Bayou Chinchuba drainage basin in St. Tammany Parish through changes in hydrology from removal of existing wetlands. Dominant vegetation in the jurisdictional wetlands includes loblolly and slash pine, sweetbay magnolia, water oak, blackgum, red maple, and sweetgum (USACE 2009).

Direct impacts to 3.0 acres of wetland pine flatwood/savanna would occur during construction of the connector road from Airport Road to US 11. Those wetlands would be removed and mitigation would occur through purchase of wetlands through a mitigation bank.

Indirect cumulative impacts to wetlands could occur from future development in the project area. Wetlands with jurisdictional status are waters of the U.S. as defined by Section 404 of the Clean Water Act and are regulated by the USACE and EPA. A permit would be required prior to any dredge or fill activities in wetlands and mitigation may be required to ensure no net loss of wetlands in the project area.

4.18.4 Geology and Soils

Direct Cumulative Impacts to Geology and Soils

Long-term direct moderate adverse cumulative impacts to geology and soils would occur as a result of current and future developments and transportation improvements. Construction of an interchange at I-12 and LA 1088 was completed in April 2011, disturbing more than 100 acres of soils and substrate. Additionally, undeveloped areas are proposed to be developed into residential, commercial, and mixed use developments, which would consist of parking lots, homes, retail buildings, and public parks.

Proposed developments could include excavation of existing soils and potentially hauled-in fill material of unspecified quality, quantity and source. Because of the low soil strengths and wetness of hydric soils in the project area, it is likely that a certain amount of excavation would be required to remove overburden material and replace it with higher strength soils. The excavation and deposition of fill material would alter natural contours in each project area. Native soil profiles would be altered and redistribution of areas soils and compaction of the substrate would occur over time. Soil compaction would decrease substrate porosity creating barriers to surface and subsurface water flow.

Indirect Cumulative Impacts to Geology and Soils

Short-term indirect minor adverse cumulative impacts to geology and soils could occur during construction activities for future developments in the project area. Construction of residential and commercial areas would expose bare soil and could increase erosion on the construction site. Sediment from construction sites could be entrained in stormwater and drain from the site which could increase the turbidity and level of suspended sediments as stormwater runoff drains to receiving streams. With increased turbidity and suspended organic and inorganic sediments, BOD5 could increase and dissolved oxygen levels could decrease from bacteria consuming organic sediments. Increases in suspended sediment could also increase sunlight reflection and generate heat, resulting in slight increases in temperature of receiving streams. Those impacts would be temporary and localized and would be expected to return to preconstruction levels after construction is complete and bare soils are revegetated. Additionally, all construction activities are required to obtain LPDES General Permit for Construction Activities and each General Permit requires the submittal and maintenance of a SWP3 which is intended to reduce erosion on the construction site and minimize the amount of sediment and potential pollution entering receiving streams.

4.18.5 Air Quality

Direct and Indirect Cumulative Impacts to Air Quality

Long-term negligible adverse cumulative impacts to air quality would be expected as a result of future developments and transportation improvements. The effects would primarily be due to the natural increase in traffic in the study area. Changes in air-quality when compared to existing conditions would be minimal.

The action would have short- and long-term negligible adverse cumulative impacts to air quality. By directly inventorying all emission in a nonattainment region and monitoring concentrations of criteria pollutants in attainment regions, the state of Louisiana takes into account the impacts of all past, present, and reasonably foreseeable emissions in the state. This is done by putting a regulatory structure in place designed to prevent air quality deterioration for areas that are in attainment with the NAAQS and to reduce common or criteria pollutants emitted in nonattainment areas to levels that will achieve compliance with the NAAQS. This structure of rules and regulations are contained in the SIP. SIPs are the regulations and other materials for meeting clean air standards and associated CAA requirements. SIPs include:

- State regulations that EPA has approved;
- State-issued, EPA-approved orders requiring pollution control at individual companies;
- Planning documents such as area-specific compilations of emissions estimates and computer simulations (modeling analyses) demonstrating that the regulatory limits assure that the air will meet air quality standards (USEPA 2010a).

The SIP process includes either specifically or indirectly all activities in the region. No large-scale projects or proposals have been identified that when combined with the proposed action would threaten the attainment status of the region, would have substantial GHG emissions, or would lead to a violation of any federal, state, or local air regulation.

The states specifically account for all significant stationary, area, and mobile emission sources in nonattainment areas within the SIPs, and indirectly accounts for all emission sources in attainment areas though physically monitoring areas that are in attainment. There are no new appreciable sources of direct or indirect emissions associated with any of the proposed developments.

4.18.6 Noise

Direct and Indirect Cumulative Impacts to Noise

Long-term minor adverse cumulative impacts to the noise environment would be expected as a result of future developments and transportation improvements. The impacts would primarily be due to the natural increase in traffic and population in the project area.

4.18.7 Recreation Resources

Direct Cumulative Impacts to Recreational Resources

Long-term direct minor adverse cumulative impacts to recreational resources could occur as a result of future developments and transportation improvements. Undeveloped areas would be developed into residential, commercial, and mixed use developments which would consist of parking lots, homes, retail buildings, and public parks. Development of these areas would result in the loss of fish and wildlife habitat that are used for nature-based recreation. People traveling to the area for bird watching, hunting and fishing, and other nature-based recreational opportunities would see a decrease in the available natural areas that play host to these opportunities.

Indirect Cumulative Impacts to Recreational Resources

Short-term and long-term indirect minor adverse cumulative impacts to recreational resources could occur as a result of future developments and roadway improvements. Increased runoff and erosion could result from construction activities over the short-term, as well as an increase in impervious surfaces associated with development over the long-term. Increases in runoff and erosion could impact areas used for nature-based recreation by affecting the quality of the fish and wildlife habitat.

4.18.8 Traffic and Transportation

Direct and Indirect Cumulative Impacts to Traffic and Transportation

As described in Section 4.9, construction of the proposed roadway would be expected to provide travel time savings between I-12 and Bush when compared to existing travel routes. Once the new roadway is constructed, it would be expected that traffic would be diverted from the existing routes improving the LOS and delay conditions on these routes. Although, it should be noted that the more traffic diverted to the new roadway, more volume would be created on the roadway, which could lead to increased delays at the intersections along the new route. It could be expected that the traffic volume on the existing routes and new roadway would continue to increase as the population in St. Tammany Parish increases as projected. As a result, it could be expected that additional transportation improvement projects, after the new roadway is constructed, would be necessary as the LOS in the transportation network is exceeded. These new transportation improvement projects would be expected to have a long-term moderate beneficial cumulative impact to the transportation network.

4.18.9 Utilities

Direct and Indirect Cumulative Impacts to Utilities

Proposed future developments and roadway improvements would have negligible cumulative impacts on utilities. Proposed and current developments may require relocation or temporary suspension of water, gas, and electric lines, but no long-term suspension of any of these utilities would be anticipated.

4.18.10 Socioeconomic Impacts

Direct and Indirect Cumulative Impacts to Socioeconomics

Short-term minor beneficial cumulative socioeconomic effects would be expected upon implementation of the proposed action. In the short-term, the expenditures associated with construction of the proposed roadway would increase ROI economic variables including employment opportunities, regional Gross Domestic Product and real personal income. The vendors and laborers in the construction industry would particularly benefit from the proposed action. A regional benefit of any type of development is the construction spending, especially if local labor and materials are used, although the direct economic benefits would be short-term, lasting for the duration of the construction period. On the basis of the size of the ROI, the size of its labor force, and the unemployment rate in the ROI, there should be a sufficient labor within the ROI to fill the construction jobs. The money spent during the construction phase would be cycled through the local economy through subsequent business spending, including taxes, and wages spent locally, further creating indirect and induced economic benefits. Construction and operation of the proposed highway would have a very small impact to employment, real personal income, regional GDP, and population. These impacts would be very small for the entire ROI, or St. Tammany and Washington Parishes, individually (REMI 2010).

Construction of the proposed highway could make land previously inaccessible for development available for future growth. Secondary development along a new roadway, in the form of gas stations, convenience stores, etc., could result in future growth in the project area. An increase in development could also lead to a shift in residential growth from single-family homes on large lots to more dense neighborhoods.

Additionally, the population of St. Tammany Parish is expected to continue growing over the next 10 years at a rate higher than the U.S. average, unrelated to the proposed project. The population growth during the last few years can be attributed to St. Tammany's location as a bedroom community of greater New Orleans. Washington Parish is expected to grow at a similar rate than the national rate until 2015, fall below national rates until 2040, and then grow at a rate equal to or slightly faster than the national rate from 2045 to 2050.

TNDs and other mixed use developments are proposed within the project area. Current planning documents for St. Tammany indicate a proposed TND at the intersection of LA 1088 and LA 36, and another at the intersection of LA 36 with the abandoned Gulf Mobile and Ohio Railroad corridor. Future land use plans indicate mixed use developments at the intersections of I-12 and LA 1088, LA 36 and LA 1088, I-12 and LA 434, and LA 21 and LA 41 near Bush (St. Tammany Parish Government 2010). Similar to the proposed roadway, these projects would have short-term beneficial impacts to some socioeconomic variables through the use of local labor and vendors lasting for the duration of the construction period. In addition, long-term beneficial impacts could be expected as the new developments would likely include businesses that would employ the local population, generating local income and advancing economic development in the region.

These future residential, commercial, and industrial developments, combined with the expected impacts from the proposed roadway, would have beneficial and adverse cumulative impacts on the ROI. These actions would benefit the ROI by contributing to the projected economic growth in regional employment, real personal income, and Gross Domestic Product. An adverse impact could result from the sustained demand of the increased population on the region's infrastructure and the local government's ability to expand to meet the demand for community and public services. The strategic growth plan for St. Tammany Parish anticipates continued development and has management goals in place to counter strains on public resources.

4.18.11 Aesthetic and Visual Resources

Direct and Indirect Cumulative Impacts to Aesthetics and Visual Resources

Proposed future developments and roadway improvements would have impacts to aesthetics and visual resources. Aesthetic values of the project area would be permanently impacted due to visual, auditory and physical changes resulting from conversion of forested and rural areas to mixed-use developments. Impacts from the proposed developments would be expected to be minor, localized and long-term.

4.19 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are environmental impacts beyond which could be reduced through mitigation. The principal unavoidable adverse impacts on the environment are summarized below.

4.19.1 Land Use and Land Cover

As St. Tammany Parish continues to grow, there is a potential for land prices to increase. As such, land could become more valuable to develop for commercial and residential use and less likely for timber production, wildlife habitat, or other conservation purposes. Permanent changes in land use and land cover would result from construction of the proposed roadway and future transportation improvement projects. Existing land use, land cover, or habitat would be replaced with impervious road surfaces and a simplified habitat of grasses and herbaceous material.

4.19.2 Ecological Resources

Construction of the proposed roadway would result in unavoidable loss of sensitive habitats in the project area, particularly those wetlands located outside the 250-ft ROW of the alternative alignment. Other habitats directly impacted, specifically pine flatwood/savanna areas, could result in impacts to wildlife and other sensitive species as described in Section 4.4. Once the new roadway is constructed there could be permanent changes to surface water flows in the area. Also, use of the roadway could lead to introduction of nutrients and exotic species that are not easily eradicated. Permanent changes in land use could reduce the amount of available habitat for wildlife and aquatic species. These habitat impacts could be offset through mitigation efforts as described in Section 4.21.

4.19.3 Aesthetic and Visual Resources

Some loss of scenic attractiveness and scenic integrity would be associated with the construction of the proposed roadway. The proposed roadway would replace rural, forested areas with impervious road surfaces and a simplified habitat of grasses and herbaceous material in the 250-ft ROW.

4.20 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitment of resources would be expected to result directly from construction of the proposed roadway because these resources would be expended in a way that could not be recovered once committed to the proposed project. They are:

1. A commitment of wetland resources with associated changes in drainage patterns that would be difficult to reverse or retrieve.
2. Irreversible and irretrievable commitment of financial resources.
3. An undetermined volume of fuel, as well as other types of energy resources, would be expended during the construction of the proposed facilities
4. Permanent changes to aesthetic and visual resources in the project area would be expected.

4.21 MITIGATION SUMMARY

Mitigation is an important component of the NEPA process that is used to avoid, minimize, or compensate for adverse environmental impacts associated with the proposed action. Mitigation actions are considered throughout the NEPA process to develop the proposed action and alternatives. The types of mitigation enumerated by the CEQ are compatible with the requirements of the CWA section 404(b)(1) guidelines; however, as a practical matter, they can be combined to form three general types: avoidance, minimization and compensatory mitigation (USEPA 1990).

4.21.1 Avoidance

4.21.1.1 Ecological Resources

During the first stages of screening analysis, four alternatives were removed from further consideration to avoid impacts to wetland mitigation banks. Those four alternatives would have directly impacted Talisheek Pine Wetland Mitigation Bank and Bayou Lacombe Mitigation Bank. All credits available for both mitigation banks have been purchased and direct loss of protected land would not have been feasible.

Wetlands were avoided where possible to minimize direct and indirect impacts. A portion of Alternative B/O overlapped with existing LA 20 and portions of alignments J, P, and Q are proposed to lay over an abandoned railroad track to minimize impacts to ecological resources.

Bayou Lacombe is designated as a Scenic River and Alternative Q alignment was adjusted to avoid crossing this channel. Alternative Q also avoids an area near the intersection of LA 36 and Horseshoe Island Road proposed as critical habitat for the federally listed endangered Mississippi gopher frog.

4.21.2 Minimization

4.21.2.1 Land Use

Impacts to land use were minimized by reducing the overall ROW width for the alignments to a maximum of 250 feet. This minimized direct impacts to existing land use, minimizing the amount of land converted to impervious road surfaces and a simplified habitat of grasses and herbaceous material.

4.21.2.2 Water Resources

Impacts to the water resources were minimized by reducing the overall ROW width for the alignments to a maximum of 250 feet. This minimized direct impacts to aquatic habitats, wetlands, and hydrology along each alternative's ROW.

LADOTD's recommendations were used as the basis for the design because of generally flat channel slopes in the project area. For major culvert crossings, the guidelines recommend a maximum allowable differential head of one foot with consideration for future land development. Additionally, a standard uniform slope of 0.1% (0.001 ft/ft) was used for all major culverts and culverts would be designed on the same slope as the natural streambed slope. A complete survey would be conducted during the design phase of this project, and major culverts would be reevaluated using the updated channel slope data. Structures with high outlet velocities (greater than 9 feet/second) will require discharge erosion protection at the time of final design.

Bridges were proposed over major stream crossings where drainage basins are greater than 2,000 acres to minimize impacts to stream flows. Minor cross drain culverts are proposed to be installed every 1,500 feet on long continuous grades as recommended by the LADOTD Hydraulics Manual. Equalizers would be 24-inch diameter pipes or round equivalent pipe arches at zero percent slopes. Those equalizer pipes would distribute flow between channels on either side of the road to allow water to move via sheet flow to mimic water flows in the project area. Table 4-57 describes the number of bridges, equalizer culverts, and major culverts proposed for each alternative.

Table 4-57.
Bridge and culvert crossings for the build alternatives

	Alternative B/O	Alternative J	Alternative P	Alternative Q
Bridges	7	6	7	3
Equalizer Culverts	67	78	54	71
Major Culverts	23	24	23	22

BMPs would be used before, during, and after construction to minimize environmental impacts. BMPs are tools designed to minimize environmental impacts by timing construction activities, using certain construction methods, or methods to protect resources. During construction, BMPs would be employed to minimize erosion and sedimentation in the project area and prevent sediment and other pollutants from being released and entering receiving streams and wetlands.

All construction activities are required to obtain an LPDES General Permit for Construction Activities. Each permit application requires the preparation of an SWP3 45 days prior to the beginning of construction and it is submitted to the Louisiana Department of Environmental Quality. Typically, this plan is used to prepare the erosion control table, which delineates the type and location of the required erosion control measures. BMPs belong to one of the ten following categories:

- Minimize disturbed area and protect natural features and soil
- Phase construction activity
- Control stormwater flowing onto and through the project
- Stabilize slopes
- Protect slopes
- Protect storm drain inlets
- Establish perimeter controls and sediment barriers
- Retain sediment on-site and control dewatering practices
- Establish stabilized construction exits
- Any additional BMPs

LADOTD also requires temporary and permanent erosion control during roadway construction. Details for these BMP are in LADOTD's Roadway Design Procedures, Section 4.5.2. Temporary erosion control items include:

- Bales
- Settling basins
- Temporary seeding
- Check dams
- Embankment drains
- Silt fencing
- Embankment berms

Permanent erosion control items consist of:

- Seeding
- Vegetative mulch
- Flexible or rigid revetment
- Energy dissipaters
- Erosion control matting

The 2006 edition of the *Louisiana Standard Specification for Roads and Bridges* includes construction guidance for erosion control devices including rip rap, revetments, sodding, mulch and soil retention blankets.

4.21.2.3 Ecological Resources

BMPs would be implemented to protect ecological resources during construction as described above for Water Resources.

Where wetlands could not be avoided, additional impacts were minimized by removing roadside ditches in the roadway design in wetland areas. A potential exists for roadside ditches to drain wetlands in an undesirable manner and create additional impacts. The typical roadway cross section in wetland areas would be elevated above the wetlands and constructed with equalizer pipes to minimize the disturbance of sheet flow of waters crossing the ROW.

4.21.2.4 Geology and Soils

BMPs would be implemented to minimize impacts to geology and soils during construction as described above for Water Resources.

Impacts to geology and soils were minimized by reducing the overall ROW width for the alignments to a maximum of 250 feet. Staging areas would be placed in the existing ROW to minimize site disturbance.

4.21.2.5 Air Quality

Construction would require the use of equipment that would emit small amounts of criteria pollutants and GHG. There would be emissions from the use of heavy trucks, fugitive particles from surface disturbance, and workers' commutes. The quantities of pollutants emitted by construction activities would be small and would not contribute to violations of any federal, state, or local air regulation. Air emissions from those activities would be short lived and would cease upon the completion of the construction activities. All construction would be accomplished in full compliance with the Louisiana Regulations for the Control and Abatement of Air Pollution, particularly Title 33 Part III. Chapters of relevance are as follows:

- Chapter 11, Control of Emissions of Smoke
- Chapter 13, Emission Standards for Particulate Matter
- Chapter 21, Control of Emissions of Organic Compounds

BMPs to minimize impacts to air quality could be required during construction. Those requirements could include:

- Reducing visible emissions and fugitive dust and emissions though watering
- Using BMPs during asphalt paving operations
- Limiting or restricting open burning activities
- Appropriate use of portable fuel containers
- Meeting new engine standards for non-road vehicles
- Using low VOC architectural, industrial, and maintenance coatings

LAC 33, Chapter 11 authorizes outdoor burning from such area in land clearing and ROW maintenance operations if the following conditions are met:

- Prevailing winds at the time of the burning must be away from any city or town, the ambient air of which may be affected by smoke from the burning
- The location of the burning must be at least 1,000 feet from any dwelling other than a dwelling or structure located on the property on which the burning is conducted;
- Care must be used to minimize the amount of dirt on the material being burned
- Heavy oils, asphaltic materials, items containing natural or synthetic rubber, or any materials other than plant growth which produce unreasonable amounts of smoke may not be burned; nor may these substances be used to start a fire
- The burning may be conducted only between the hours of 8 a.m. and 5 p.m. Piles of combustible material should be of such size to allow complete reduction in this time interval

Traffic hazards are prohibited by Chapter 11. The emission of smoke, suspended particulate matter or uncombined water or any air contaminants or combinations thereof which passes onto or across a public road and creates a traffic hazard by *impairment of visibility*, as defined in LAC 33:III.111, or intensifies an existing traffic hazard condition is prohibited.

LAC Title 33, Chapter 13, Subchapter A requires all reasonable precautions shall be taken to prevent particulate matter from becoming airborne. These precautions include:

- Use of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land
- Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which could give rise to airborne dusts
- Installation and use of dust collectors to enclose and vent the handling of dusty materials. Adequate containment methods shall be employed during sandblasting or other similar operations
- Open-bodied trucks transporting materials likely to give rise to airborne dust shall be covered at all times when in motion
- Conducting agricultural practices such as tilling of land, application of fertilizers and insecticides in such a manner as to prevent dust from becoming airborne
- Paving roadways and maintaining the roadways in a clean condition
- The prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water or other means.

Chapter 21 discusses best practical housekeeping and maintenance practices to reduce the quantity of organic compounds emissions. Emission of organic compounds must be reduced wherever feasible. Good housekeeping practices include:

- Spills of volatile organic compounds shall be avoided and clean up of such spills shall employ procedures that reduce or eliminate the emission of volatile organic compounds
- Containers of volatile organic compounds shall not be left open and the contents allowed to evaporate
- Waste materials that contain volatile organic compounds shall be stored and disposed of in a manner that reduces or eliminates the emission of volatile organic compounds
- Each facility shall develop a written plan for housekeeping and maintenance that places emphasis on the prevention or reduction of volatile organic compound emissions from the facility. This plan shall be submitted to the Office of Environmental Services upon request
- A copy shall be kept at the facility, if practical, or at an alternate site approved by the department
- Good housekeeping shall be determined by compliance with LAC 33:III.2121 (Fugitive Emission Control) and the maintenance and the housekeeping plan required by LAC 33:III.2113.A.4.

4.21.2.6 Noise

Alternative B/O

Since 124 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions, noise abatement measures for reducing or eliminating the noise impacts have been considered for Alternative B/O.

Highway alignment modification was not considered practical, as the highway alignment has been designed to reduce human and environmental impact to the maximum extent practicable while meeting DOTD design guidelines. The use of insulation as a noise abatement measure is only a consideration for public use or nonprofit institutional structures and is normally limited to public use structures such as schools and hospitals. No such facilities were identified along the new highway portions of Alternative B/O.

Noise barriers are most often used on high-speed, limited-access facilities where noise levels are high and adequate space is available for continuous barriers. For a noise barrier to provide sufficient noise reduction, it must be high enough and long enough to shield receptors from sizeable sections of the noise-producing roadway. Access openings in a barrier created by driveways or intersections severely reduce the effectiveness. Therefore, ground-mounted barriers in locations that would require multiple access openings for cross streets and driveways were not included in the analysis. In addition, LADOTD only considers noise barriers for new control of access facilities for state funded projects such as this project.

Barriers are not an economical noise abatement method for individual or dispersed receptors. LADOTD Traffic Noise Policy requires that a barrier be both *feasible* and *reasonable*. For low-density residential receptors, *reasonableness* is the primary determining factor for noise barrier analysis. The policy states that to be reasonable the cost of the abatement measure should not exceed $25,000 per benefited receptor. A benefited receptor is defined as a sensitive receptor, whether impacted or not, receiving a noise reduction of at least 5 dBA as a result of the proposed abatement measure.

The receptors identified as potential for noise barriers are in low-density areas and the distance between the proposed highway and the receptors is relatively large. A bounded analysis was performed to determine the potential reasonableness for noise barriers along the Control of Access Portion of the highway near receptors with a 10 or greater dBA increase in traffic noise. For analysis purposes it was assumed that all receptors might receive a 5-dBA reduction from a 10-foot tall, ground mounted noise barrier. Because some receptors would not receive this benefit, and noise barriers would need to be taller than 10-feet, the actual cost per benefited receptor would be greater than those described herein. The bare minimum cost for noise barriers would be greater than $25,000 per receptor, ranging from $40,966 to $217,800 per receptor (Table 4-58). Therefore, the receptors are too wide spread along the Control of Access portions of Alternative B/O to make a noise barrier reasonable regardless of the height of the barrier or the overall benefit per receptor. No noise barrier location was found to be both reasonable and feasible on the basis of all established criteria considered.

Table 4-58.
Minimum cost for noise barriers - Alternative B/O

Location	Minimum Length of Barrier [miles]	Number of Receptors	Minimum Cost Per Receptor
South of LA21 / North of LA435 East of proposed highway	1.5	58	$40,966
South of LA435 / North of LA36 East of proposed highway	0.9	22	$64,800
South of LA21 / North of LA435 West of proposed highway	1.1	8	$217,800

Even with refinements to the alignment or additional precision to the noise modeling, it is not expected that the overall number of receptors with a greater than 10 dBA increase in noise or the minimum length of the noise barrier required would change appreciably. Therefore, noise barriers would not become reasonable with those refinements.

Alternative J

Since 43 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions, noise abatement measures for reducing or eliminating the noise impacts have been considered. As with Alternative B/O, and for similar reasons, highway alignment modification was not considered practical, as the highway alignment has been designed to reduce human and environmental impact to the maximum extent practicable while meeting DOTD design guidelines. In addition, no public use or nonprofit institutional facilities were identified along the new highway portions of Alternative J.

As with Alternative B/O, the receptors identified as potential for noise barriers are in low-density areas and the distance between the proposed highway and the receptors is relatively large. A bounded analysis was performed to determine the potential reasonableness for noise barriers along the Control of Access Portion of the highway near receptors with a 10 or greater dBA increase in traffic noise. The bare minimum cost for noise barriers would be greater than $25,000 per receptor, ranging from $105,600 to $475,200 per receptor (Table 4-59). Therefore, the

Table 4-59.
Minimum cost for noise barriers - Alternative J

Location	Length of Barrier [miles]	Number of Receptors	Minimum Cost Per Receptor
South of Bush / North of Talisheek East of proposed highway	2.4	36	$105,600
South of Bush / North of Talisheek West of proposed highway	1.5	5	$475,200

receptors are too wide spread along the Control of Access portions of Alternative J to make a noise barrier *reasonable* regardless of the height of the barrier or the overall benefit per receptor.

Even with refinements to the alignment or additional precision to the noise modeling, it is not expected that the overall number of receptors with a greater than 10 dBA increase in noise or the minimum length of the noise barrier required would change appreciably. Therefore, noise barriers would not become reasonable with those refinements.

Alternative P

Since 110 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions, noise abatement measures for reducing or eliminating the noise impacts have been considered. As with Alternative B/O, and for similar reasons, highway alignment modification was not considered practical, as the highway alignment has been designed to reduce human and environmental impact to the maximum extent practicable while meeting LADOTD design guidelines. In addition, no public use or nonprofit institutional facilities were identified along the new highway portions of Alternative P.

As with Alternative B/O, the receptors identified as potential for noise barriers are in low-density areas and the distance between the proposed highway and the receptors is relatively large. A bounded analysis was performed to determine the potential reasonableness for noise barriers along the Control of Access Portion of the highway near receptors with a 10 or greater dBA increase in traffic noise. The bare minimum cost for noise barriers would be greater than $25,000 per receptor, ranging from $99,460 to $792,000 per receptor (Table 4-60). Therefore, the receptors are too wide spread along the Control of Access portions of Alternative P to make a noise barrier *reasonable* regardless of the height of the barrier or the overall benefit per receptor.

Table 4-60.
Minimum cost for noise barriers - Alternative P

Location	Minimum Length of Barrier [miles]	Number of Receptors	Minimum Cost Per Receptor
South of Bush / North of Talisheek East of proposed highway	2.7	43	$99,460
South of Bush / North of Talisheek West of proposed highway	1.5	3	$792,000
South of Talisheek / North of LA36 East of proposed highway	2.45	30	$129,360
South of Talisheek / North of LA36 West of proposed highway	2.14	22	$154,080

Even with refinements to the alignment or additional precision to the noise modeling, it is not expected that the overall number of receptors with a greater than 10 dBA increase in noise or the minimum length of the noise barrier required would change appreciably. Therefore, noise barriers would not become reasonable with these refinements.

Alternative Q

Since 29 identified receptors would experience a greater than 10 dBA increase when compared to existing conditions, noise abatement measures for reducing or eliminating the noise impacts have been considered. As with Alternative B/O, and for similar reasons, highway alignment modification was not considered practical, as the highway alignment has been designed to reduce human and environmental impact to the maximum extent practicable while meeting LADOTD design guidelines. In addition, no public use or nonprofit institutional facilities were identified along the new highway portions of Alternative Q.

As with Alternative B/O, the receptors identified as potential for noise barriers are in low-density areas and the distance between the proposed highway and the receptors is relatively large. A bounded analysis was performed to determine the potential reasonableness for noise barriers along the Control of Access Portion of the highway near receptors with a 10 or greater dBA increase in traffic noise. The bare minimum cost for noise barriers would be greater than $25,000 per receptor, ranging from $172,000 to $792,000 per receptor (Table 4-61). Therefore, the receptors are too wide spread along the Control of Access portions of Alternative Q to make a noise barrier *reasonable* regardless of the height of the barrier or the overall benefit per receptor.

Table 4-61.
Minimum cost for noise barriers - Alternative Q

Location	Minimum Length of Barrier [miles]	Number of Receptors	Minimum Cost Per Receptor
South of Bush / North of Talisheek East of proposed highway	2.4	22	$172,800
South of Bush / North of Talisheek West of proposed highway	1.5	3	$792,000

Even with refinements to the alignment or additional precision to the noise modeling, it is not expected that the overall number of receptors with a greater than 10 dBA increase in noise or the minimum length of the noise barrier required would change appreciably. Therefore, noise barriers would not become reasonable with these refinements.

4.21.2.7 Utilities

Impacts to the utilities were minimized by reducing the overall ROW width for the alignments to a maximum of 250 feet. This minimized direct impacts to utilities and pipelines along or crossing each alternative's ROW.

4.21.2.8 Socioeconomics

Impacts to the socioeconomic environment were minimized by reducing the overall ROW width for the alignments to a maximum of 250 feet. This minimized direct impacts to housing units and businesses along each alternative's ROW.

4.21.2.9 Children's Environmental Health and Safety Risks

One existing public school, Fifth Ward Junior High School, with an enrollment of 531 students in 2008/09 school year (NCES undated) is within the 250 ft right-of-way Alternative B/O. There are no plans to relocate the school should this alternative be selected. Should this alternative be selected, short-term minor adverse impacts on the protection of children would be expected. Because construction sites can be enticing to children, construction activity could pose an increased safety risk. During construction, the safety measures stated in 29 CFR Part 1926, *Safety and Health Regulations for Construction*, would be followed to protect the health and safety of the children and other nearby residents and construction workers. For example, barriers and "No Trespassing" signs could be placed around construction sites to deter children from playing in these areas and that construction vehicles and equipment be secured when not in use. In addition, permanent, appropriate safety devices/measures could be installed and implemented to mitigate the risks associated with the expected increase in vehicle traffic volume.

4.21.2.10Aesthetic and Visual Resources

Impacts to the natural environment were minimized by reducing the overall ROW width for the alignments to a maximum of 250 feet. This minimized direct impacts to aesthetic and visual resources along each alternative's ROW.

4.21.2.11Cultural Resources

A Phase I cultural resources survey was conducted for each alternative alignment between April and October 2010. The previously recorded Gum Swamp site is within Alternative P. The site is eligible for nomination to the NRHP and should be avoided during all phases of highway construction. If this site cannot be avoided, archaeological mitigation should be undertaken.

Should any additional archaeological cultural resources be encountered during project activities, work shall cease in the immediate area and the SHPO consulted immediately to minimize impacts to the resource.

4.21.2.12Hazardous and Toxic Substances and Pollution

Short-term minor adverse impacts would be expected from hazardous materials used and wastes generated during construction. The use of these materials and generated wastes could create a potential for hazardous spills. Construction contractors would be required to comply with all local, state, and federal regulations pertaining to the handling and management of hazardous materials waste to minimize impacts to the environment.

4.21.3 Compensation

4.21.3.1 Ecological Resources

Significant direct and indirect adverse impacts would be expected to wetlands for all alignments. The number of mitigation credits required for each alignment was calculated using the Modified Charleston Method (MCM) developed by the USACE. The MCM is an assessment model based on evaluation criteria weighted by their importance used to calculate the required amount of compensatory mitigation to offset project impacts. Table 4-62 lists the mitigation credits required for each alternative. It should be noted that these credits are preliminary and could increase or decrease based on final engineering design of the roadway and environmental conditions.

In addition, it should be noted that indirect impacts to adjacent wetland mitigation banks as described in Section 4.4.2 have not been quantified at this time. Once final design of the project is complete, the indirect impacts will be quantified, and mitigation of these impacts will be required as part of the compensatory mitigation plan.

According to the 2008 DA and EPA regulations regarding compensatory mitigation for losses of aquatic resources, a final mitigation plan must be approved by the District Engineer prior to issuance of a permit for this project. The mitigation plan would be prepared by LADOTD and submitted to the CEMVN and EPA for approval. LADOTD recognizes that insufficient credits are available from existing mitigation banks in the affected watershed. Therefore, LADOTD

Table 4-62.
Direct and indirect wetland mitigation acreage

Alternati ve	Direct wetland impact (acres)	Preliminary MCM direct impact credits	Indirect wetland impacts (acres)[a]	Preliminary MCM indirect impact credits	Preliminary Total MCM credits
B/O	385	7930.5	253	2714.4	10,644.9
J	373	6722.2	292	2297.0	9019.2
P	358	7272.4	208	2107.7	9380.1
Q	305	4945.8	231	1924.0	6869.8

[a]includes only drought and ponding indirect impacts

would use permittee-responsible mitigation to mitigate the project's impacts. LADOTD would mitigate the impacts by utilizing a combination of options that may include, but not limited to, the following:

- In-kind mitigation within the impacted watersheds.
    - The bulk of the project area is within HUC 08090201. A small portion of the project area to the north is within HUC 03180004. A very small portion of the project area along LA 21 at north end of project area is within HUC 03180005.
- Purchase of mitigation credits from established mitigation banks in the project area.
- Restoration, enhancement, and preservation of wetlands.
    - LADOTD would partner with and enter into agreements with other entities to accomplish the required mitigation. Such entities may include, but are not limited to, local governments such as St. Tammany Parish, state and federal agencies, such as LDWF and USFWS, non-profits, such as the Nature Conservancy, and operators of existing mitigation banks in the project area.
    - LADOTD would target large tracts of suitable properties for restoration, enhancement, or preservation.
    - To the extent practicable, LADOTD would target tracts adjacent to existing mitigation banks, wildlife management areas, refuges, public parks, and streams to enhance the benefits and improve the habitat connectivity.
    - LADOTD or its partnering entities may purchase property, conservation servitudes, or other rights in properties as part of the overall mitigation plan.
    - LADOTD may enter into agreements with mitigation banks or property owners to acquire mitigation credits resulting from restoration, enhancement or preservation efforts performed on their properties.
- Operation and management of mitigation sites.
    - LADOTD is not in a position to maintain, operate or manage mitigation sites. Therefore, LADOTD would enter into agreements whereby maintenance, operation and management of sites are assigned to other entities. Examples of such entities include state or federal agencies, local governments, and non-profit organizations.

4.21.3.2 Socioeconomics

Under Alternative B/O, existing development in the proposed ROW would be relocated or removed. An estimated 14 families would be displaced and all are owner-occupants. Five businesses would also be displaced including: three service stations, one Dollar General store, and one insurance company. Those businesses and home owners would be required to be relocated. Fifth Ward Jr. High School could qualify for functional replacement. Twelve classrooms, a gymnasium, and the administrative offices would be directly impacted and would take approximately two years to replace (C.H. Fenstermaker 2011). The Functional Replacement Program allows for publicly owned and publicly used facilities to be replaced with a functionally new or existing facility (C.H. Fenstermaker 2011).

The Slidell Head-start building would be impacted under Alternative J. The building appears to be publicly owned and used by the public, therefore it would qualify for functional replacement. The Functional Replacement Program allows for publicly owned and publicly used facilities to be replaced with a functionally new or existing facility (C.H. Fenstermaker 2011).

Under Alternative P, existing development in the proposed ROW would be relocated or removed and would displace approximately six families. Two of the six families occupy mobile homes and only replacement sites would be required. No businesses or facilities would be expected to be displaced (C.H. Fenstermaker 2011).

Under Alternative Q, existing development in the proposed right-of-way would displace approximately 19 families. Fifteen of the 19 families occupy mobile homes and replacement sites for those homes would be required (C.H. Fenstermaker 2011).

Estimated compensation for each alignment is presented in Tables 4-63 through 4-66. Compensation costs include moving costs, replacement housing costs (RHP), services, and fees.

Table 4-63.
Alternative B/O relocation cost summary

Residential/Non Residential	Moving Cost	RHP	Services	Fees
Mobile Homes (4)	$7,600	$40,000	$4,000	$28,800
Single Family Dwellings (10)	$18,200	$225,000	$10,000	$86,400
Businesses (5)	$250,000	$0	$5,000	$43,200
Personality Only (4)	$75,000	$0	$4,000	$9,600
Functional Replacement	$50,000	$0	$1,000	$7,200
Subtotal	**$400,800**	**$265,000**	**$24,000**	**$175,200**
Total Relocation Cost $865,000				

Table 4-64.
Alternative J relocation cost summary

Residential/Non Residential	Moving Cost	RHP	Services	Fees
Mobile Homes (15)	$27,200	$150,000	$15,000	$108,000
Apartments (25)	$37,500	$131,250	$25,000	$192,960
Single Family Dwellings (5)	$8,700	$112,500	$5,000	$43,200
Multiple Family Dwellings (6)	$9,000	$135,000	$6,000	$51,840
Businesses (14)	$605,000	$0	$14,000	$120,960
Personality Only (1)	$10,000	$0	$1,000	$2,400
Functional Replacement (1)	$50,000	$0	$1,000	$7,200
Subtotal	**$687,000**	**$528,750**	**$67,000**	**$526,560**
Total Relocation Cost $1,809,710				

Table 4-65.
Alternative P relocation cost summary

Residential/Non Residential	Moving Cost	RHP	Services	Fees
Mobile Homes (2)	$3,800	$20,000	$2,000	$14,400
Single Family Dwellings (4)	$7,400	$90,000	$4,000	$34,560
Businesses	$0	$0	$0	$0
Personality Only (1)	$12,000	$0	$1,000	$24,000
Functional Replacement	$0	$0	$0	$0
Subtotal	**$23,200**	**$110,000**	**$7,000**	**$72,960**
Total Relocation Cost $213,160				

Table 4-66.
Alternative Q relocation cost summary

Residential/Non Residential	Moving Cost	RHP	Services	Fees
Mobile Homes (15)	$28,100	$150,000	$15,000	$108,000
Single Family Dwellings (4)	$6,800	$90,000	$4,000	$34,560
Businesses	$0	$0	$0	$0
Personality Only (1)	$0	$0	$0	$0
Functional Replacement	$0	$0	$0	$0
Subtotal	**$34,900**	**$240,000**	**$19,000**	**$142,560**
Total Relocation Cost $436,460				

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