Draft Environmental Impact Statement: Replacement Robley Rex VA Medical Center Louisville, Kentucky

U.S. Department of Veterans Affairs

Louisville VA Medical Center

October 2016

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.

ABSTRACT

LEAD AGENCY: U.S. Department of Veterans Affairs (VA), Robley Rex VA Medical Center (VAMC)

COOPERATING AGENCIES: None

TITLE OF PROPOSAL: Replacement Robley Rex VA Medical Center, Louisville, Kentucky

AFFECTED JURISDICTION: Western Kentucky, Southern Indiana

POINT OF CONTACT: Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206; LouisvilleReplacementHospitalComments@va.gov; or Judy Williams, Public Affairs Officer, at the same address; (502) 287-4000, ext. 55502; Judy Williams@va.gov.

PROPONENT: Louisville VA Medical Center

DOCUMENT DESIGNATION: Draft Environmental Impact Statement (EIS)

VA proposes to site, construct, and operate a VA Medical Center (VAMC) and regional Veterans Benefits Administration (VBA) office to replace the existing Robley Rex VAMC, a leased VBA office, and three of eight regional community-based outpatient clinics. The facilities to be replaced have reached the end of their serviceable lives. The replacement campus is needed to provide sufficient capacity to meet the current and projected future healthcare needs of Veterans in the Louisville service area. This EIS analyzes the potential impacts of three alternatives for the replacement VAMC.

Alternative A proposes construction and operation of a replacement VAMC campus at the Brownsboro Site at 4906 Brownsboro Road, Louisville, Kentucky. Alternative B would construct and operate a replacement VAMC campus at the St. Joseph site on a parcel located east of I-265 and south of Factory Lane in Louisville. Alternative C is the No Action alternative, which is required by the National Environmental Policy Act and its regulations and also provides a baseline for comparing potential impacts from the action alternatives.

VA's preferred alternative is Alternative A, the proposed construction and operation of a replacement VAMC campus at the Brownsboro Site at 4906 Brownsboro Road, Louisville. VA would relocate medical facility operations to the Brownsboro Site from Zorn Avenue and a later process would evaluate the future use or disposition of the Zorn Avenue property. Leases would not be renewed for three community-based outpatient clinics and the existing VBA regional office.

The EIS describes mitigation measures for the potential impacts to environmental resources that are identified in the impact analysis. Unavoidable adverse impacts include effects to air quality, aesthetics, noise, land use, solid waste and hazardous materials, utilities, and transportation and traffic. With the exception of aesthetics and land use, implementation of specified mitigation measures would substantially decrease the magnitude of these impacts.

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
APCD	Louisville Metro Air Pollution Control District
APE	area of potential effect
AST	aboveground storage tank
BMP	best management practice
BTU	British thermal unit
CARES	Capital Asset Realignment for Enhanced Services
CBOC	community-based outpatient clinic
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations

dB	decibel
dBA	A-weighted decibel
EA	environmental assessment
EIS	environmental impact statement
EMS	emergency medical services
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	flood insurance rate map
FONSI	finding of no significant impact
FTEE	full-time employee equivalent
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GHG	greenhouse gas
GPP	groundwater protection plan
HAP	hazardous air pollutant
hp	horsepower
I	interstate
IGSHPA	International Ground Source Heat Pump Association
JCPS	Jefferson County Public Schools
KDEP	Kentucky Department for Environmental Protection
kW	kilowatt
KYTC	Kentucky Transportation Cabinet
L_{dn}	day-night sound level
LEED	Leadership in Energy and Environmental Design
L_{eq}	equivalent continuous sound level
LG&E	Louisville Gas & Electric
LiDAR	light detection and ranging
L_{max}	maximum sound level
L_{min}	minimum sound level
LOS	level of service
Louisville Metro	Louisville-Jefferson County Metro Government
Louisville MSA	Louisville-Jefferson County, Kentucky-Indiana Metropolitan Statistical Area
LWC	Louisville Water Company
MSA	metropolitan statistical area
MSD	Louisville and Jefferson County Metropolitan Sewer District
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	notice of availability
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

NSR	new source review
NWI	National Wetlands Inventory
PCBs	polychlorinated biphenyls
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
RCRA	Resource Conservation and Recovery Act
ROD	record of decision
SARA	Superfund Amendment and Reauthorization Act
SHPO	state historic preservation officer
SPUI	single-point urban interchange
SSPP	strategic sustainability performance plan
TARC	Transportation Authority of River City
t $CO_{2\ eq}$	metric tons of carbon dioxide equivalents
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
UST	underground storage tank
VA	U.S. Department of Veterans Affairs
VAMC	VA medical center
VBA	Veterans Benefits Administration

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EXECUTIVE SUMMARY

As required by the National Environmental Policy Act (NEPA), the U.S. Department of Veterans Affairs (VA) identifies, analyzes, and documents the potential physical, environmental, cultural, and socioeconomic impacts associated with a replacement VA Medical Center (VAMC) in Louisville, Kentucky.

The ***purpose*** of VA's proposal is to construct and operate a 104-bed hospital, diagnostic and treatment facilities, VBA regional office, and required site amenities and improvements on a new campus. This proposed project would replace the existing Robley Rex VAMC, three community-based outpatient clinics, and the existing VBA regional office with new facilities of sufficient capacity to meet the current and projected future healthcare needs of Veterans in the Louisville service area.

The proposed project is ***needed*** because the existing Louisville VAMC facilities at 800 Zorn Avenue in Louisville have reached the end of their serviceable lives. The building conditions and site configuration at the existing 63-year old VAMC are inadequate to effectively and efficiently meet the expanding needs of VA's healthcare mission and VBA services in the region. Within the Louisville service area, 60,943 Veterans were enrolled to receive care in fiscal year 2014. Enrollment is expected to increase to more than 68,000 by fiscal year 2024. During this same time period, outpatient clinic stops are expected to increase from 762,104 to over 963,000. Given the increase in the number of patients as well as the need for improvements to the physical plant, the existing Louisville VAMC facility is insufficient to meet either the current or the increasing future needs of VA's healthcare mission in the region.

VA has identified three alternatives that are analyzed in detail in this EIS:

- Alternative A: construction and operation of a replacement VAMC campus at the Brownsboro Site at 4906 Brownsboro Road, Louisville, Kentucky. VA would relocate medical facility operations to the Brownsboro Site from Zorn Avenue. Leases would not be renewed for three community-based outpatient clinics and the existing VBA regional office.
- Alternative B: construction and operation of a replacement VAMC campus at the St. Joseph site on a parcel located east of I-265 and south of Factory Lane in Louisville. VA would relocate medical facility operations to the St. Joseph site from Zorn Avenue. Leases would not be renewed for three community-based outpatient clinics and the existing VBA regional office.
- Alternative C: No Action – continued operation of the existing Robley Rex VAMC at the Zorn Avenue location.

Under alternatives A and B, a later process would evaluate the future use or disposition of the Zorn Avenue property, regardless of where the replacement facility is located.

Alternative A is VA's preferred alternative. Alternative C is the environmentally preferable alternative.

The following table summarizes the potential environmental impacts of the alternatives.

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Table: Summary of Impact Analysis

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Meets purpose of and need for action	Yes	Yes	No
Aesthetics	During early stages of construction, presence of heavy equipment and unfinished stages of site preparation and building construction would temporarily impact visual quality. Over the long term, the VAMC would create a noticeable contrast to the existing landscape, obstruct or detract from what some observers would consider a scenic view, or introduce visual elements that some observers would consider out of scale or character with the surrounding area. The extent of these adverse effects would range from negligible to major, depending on the observer.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.
Air Quality	Construction and operation emissions would comply with all permit requirements and regulations. Particulate emissions during construction are below the *de minimis* threshold level. Air quality impacts would be negligible.	Impacts similar to Alternative A.	No construction impacts at Zorn Avenue site. Operation impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Cultural Resources	No adverse effects to archaeological features or historic properties.	No adverse effects to archaeological features or historic properties.	No adverse effects to archaeological features or historic properties.
Geology and Soils	Construction-related impacts to geology and soils would be minor and short-term. Adherence to vibration standards and requirements of the Kentucky Revised Statute 350.430 for blasting operations (if any) would avoid damage to nearby buildings and houses. Loss of prime farmland soil would not be significant. Erosion and sedimentation impacts would be minimized through implementing construction best management practices and conforming with permit requirements. No operation-related impacts would occur.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Hydrology and Water Quality	Potential construction impacts to surface water quality and groundwater are predicted to be localized and negligible with implementation of the required control and protection plans. Site wide stormwater management would meet predevelopment discharge rates for the 2-, 10-, 25-, and 100-year storm events in accordance with the Metropolitan Sewer District Design Manual and should therefore have minimal adverse effects on the hydrology of the project site and adjacent properties, surface water quality, and the rate of groundwater recharge.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Wildlife and Habitat	Negligible impact to common wildlife species (displacement of individuals). Nesting bird survey would identify migratory birds to be protected if construction begins between April and July. To avoid impacts to roosting northern long-eared bats, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of any northern long-eared bats from the site. No other listed species or critical habitat onsite.	Negligible impact to common wildlife species (displacement of individuals). Nesting bird survey would identify migratory birds to be protected if construction begins between April and July. To avoid impacts to roosting Indiana or northern long-eared bats, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of any northern long-eared bats from the site. Land disturbance for construction would be preceded by a site survey for running buffalo clover and any appropriate mitigation in consultation with the U.S. Fish and Wildlife Service, including a management plan to avoid impact during operations. No other listed species or critical habitat onsite.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Noise	Construction-related noise and vibration impacts would be adverse, short-term, and potentially moderate in magnitude (approaching EPA threshold levels), depending on the receptor type and proximity to the project location. Operation-related noise impacts would be minor.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in construction-related impacts similar to Alternatives A and B, while operation-related impacts would depend on the specific type of development.
Land Use	Temporary disturbances to access to adjacent land uses could occur during construction. The conceptual design for building setbacks, perimeter fence, and landscape buffer would be compatible with the existing zoning. The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations in existing zoning, and would therefore be an adverse impact to adjacent land use.	Temporary disturbances to access to adjacent land uses could occur during construction. The conceptual design for building setbacks, perimeter fence, and landscape buffer would be compatible with the existing zoning. The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations of the zoning of the northeastern part of the site, and would therefore be considered an adverse impact to the adjacent residential land use.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B within existing or similar zoning requirements.
Floodplains and Wetlands	No impacts	No impacts to floodplains. Small onsite wetland areas would require coordination with U.S. Army Corps of Engineers to ensure no impacts or mitigate impacts.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Socioeconomics	Short-term beneficial effects to local economy during construction and operation. No long-term adverse effects to property values or local crime rates are expected.	Impacts similar to Alternative A.	No impacts.
Community Services	Negligible impacts during construction, no impacts from operation.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.
Solid Waste and Hazardous Materials	Short-term negligible impact due to increased presence and use of petroleum and hazardous substances during construction, minimized through best management practices and regulatory compliance. Negligible adverse long-term impacts during operation as solid waste and hazardous materials would be managed in accordance with VA policies and federal, state, and local regulations.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Impacts from development of Brownsboro and St. Joseph sites by others would depend on the specific type of development.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Transportation and Traffic	Construction contractors would provide a plan to manage site use, including limited onsite parking during construction; the approved plan may also mitigate impacts to local traffic to the extent it decreases the number of construction worker vehicles commuting to the site. Would not significantly contribute to the degradation of levels of service at the intersection of US 42 at KY 22 (Brownsboro Road at Northfield Drive), which will operate at LOS E with the VAMC and LOS F without the VAMC at this location. With interchange improvements at Watterson Expressway (I-264) and US 42, the levels of service would be acceptable (LOS C) at the entrance to and exit from the VAMC campus (KY 22 at I-264 eastbound ramp split). Travel times and intersection delays would be significantly improved by the planned construction of the single-point urban interchange. Travel times and intersection delays would be comparable for either Alternative A or a similar mixed use development that would be anticipated to locate at the Brownsboro Site.	The start of construction would create the possible need for the addition of a signalized intersection where one does not currently exist (at the proposed VAMC entrance on Factory Lane). There are overall major travel time impacts under Alternative B compared to future conditions without the VAMC, particularly for VAMC traffic exiting the site and going to the I-265 interchange at LaGrange Road.	Negligible impacts. Traffic at the existing VAMC at the Zorn Avenue location would increase over time commensurate with projected future background traffic growth on Zorn Avenue.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Utilities	Sufficient capacity exists and connections can be developed without significant environmental impacts for utility services to be provided to the site.	Sufficient capacity exists and connections can be developed without significant environmental impacts for utility services to be provided to the site.	No impacts.
Environmental Justice	No impacts.	No impacts.	No impacts.

Cumulative impacts from the incremental impact of the action alternatives when added to other past, present, or reasonably foreseeable actions in the Louisville service area are expected to be non-existent, negligible or minor for aesthetics, air quality, cultural resources, geology and soils, hydrology and water quality, wildlife and habitat, noise, floodplains and wetlands, socioeconomics, community services, solid waste and hazardous materials, utilities, and environmental justice. Any impacts to these resources would be similar to those from current VA operations or to other new private and commercial developments that may occur within the service area, and would include mitigation measures to minimize impacts. There are potential cumulative effects related to land use and traffic.

VA published a Notice of Availability (NOA) of this Draft EIS in the Federal Register, inviting public comments on the content of the document. VA announced a 45-day comment period that officially started when the NOA for the Draft EIS was published by the Environmental Protection Agency in the Federal Register. VA will host afternoon and evening public comment meetings in Louisville during the 45-day comment period. Responses to comments received during the comment period will be addressed in the Final EIS. After a 30-day review period for the Final EIS, VA will publish a record of decision that states the alternative selected for implementation and identifies associated mitigation commitments.

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1.0 INTRODUCTION, INCLUDING PURPOSE AND NEED

The United States (U.S.) Department of Veterans Affairs (VA) announced in May 2011 their determination of a need to replace the existing Robley Rex VA Medical Center (VAMC) in Louisville, Kentucky, to meet the current and future needs of VA's healthcare mission in the region. In this environmental impact statement (EIS), VA identifies, analyzes, and documents the potential physical, environmental, cultural, and socioeconomic impacts associated with siting, constructing, and operating a replacement 104-bed hospital, diagnostic and treatment facilities, Veterans Benefits Administration (VBA) regional office, and required site amenities and improvements on a new campus.

This EIS is conducted in accordance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [U.S.C.] 4321 et seq.), the Council on Environmental Quality's (CEQ's) regulations for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), VA's NEPA regulations titled "Environmental Effects of the Department of Veterans Affairs Actions" (38 CFR Part 26), and VA's "NEPA Interim Guidance for Projects" (VA 2010). NEPA and these regulations require that VA, as a federal agency, must evaluate the potential environmental impacts of the agency's major actions significantly affecting the quality of the human environment.

The potential environmental impacts of three alternatives are analyzed in this EIS. Alternatives A and B evaluate different locations for a replacement VAMC. Alternative C is the No Action alternative, which is required by NEPA and its regulations and also provides a baseline for comparing potential impacts from the action alternatives.

1.1 Robley Rex Veterans Affairs Medical Center

1.1.1 Veterans in the Louisville Service Area

The Robley Rex VAMC and its eight community-based outpatient clinics (CBOCs) serve approximately 168,000 U.S. Veterans within the Louisville service area, which includes 35 counties in western Kentucky and southern Indiana.

Currently, 59,000 Veterans in the Louisville service area are enrolled to receive care annually. Enrollment is expected to increase to more than 65,000 in the next 10 years, with annual visits increasing from 610,000 to 753,000 during the same time period.

1.1.2 Services and Facilities

VA provides inpatient and outpatient medical services to Veterans at the existing VAMC at 800 Zorn Avenue, in Louisville, Jefferson County, Kentucky, and eight CBOCs in leased space the Louisville area (Figure 1-1).

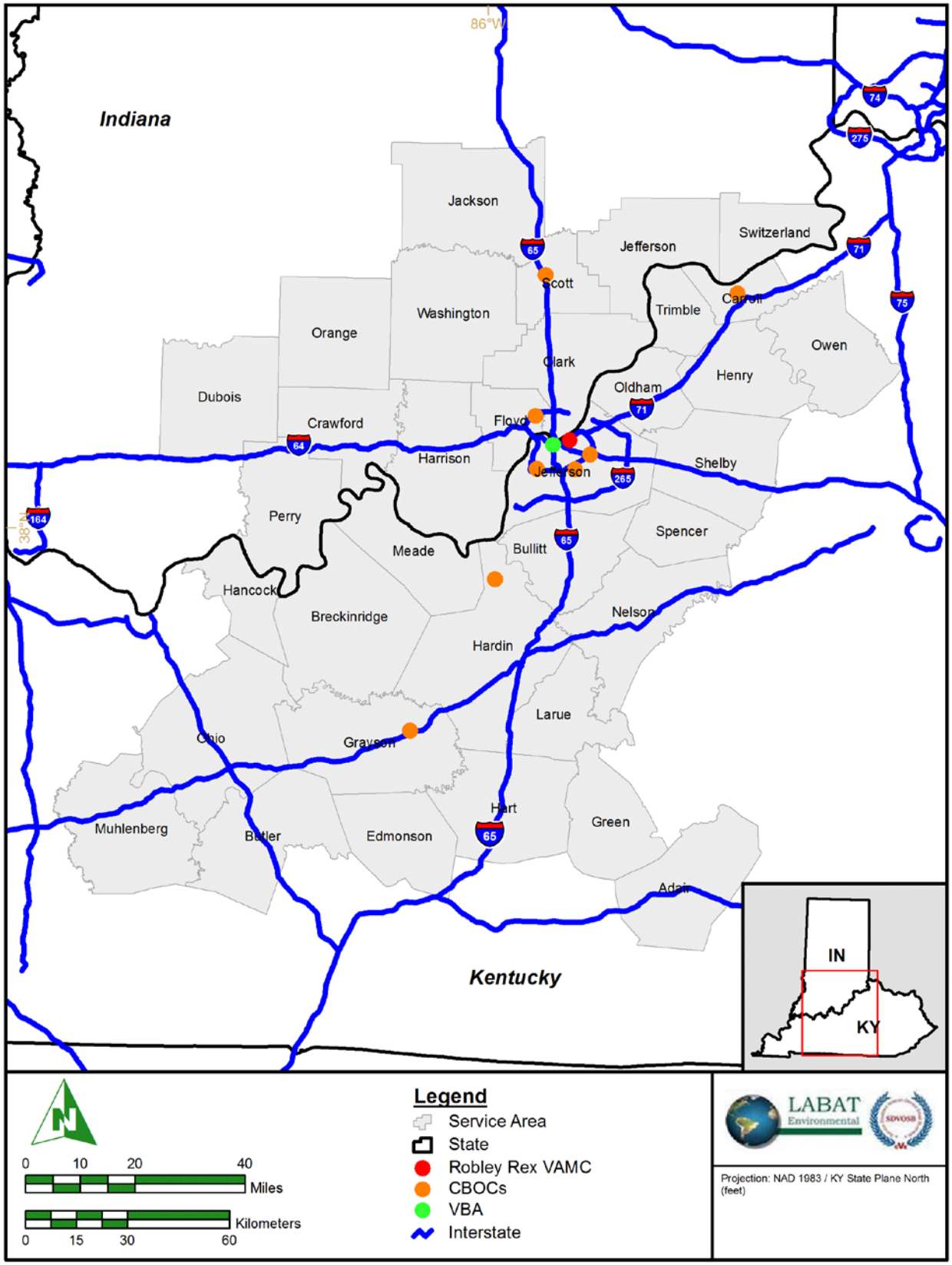

Figure 1-1. Existing VA Facilities in 35-County Louisville Service Area.

Services provided by VA at the Robley Rex VAMC on Zorn Avenue include the following:

Primary care	Dental
Emergency care	Pharmacy
Behavioral and mental health	Optometry
Women's healthcare	Substance abuse residential treatment program
Tele-health	Hospice and palliative care
Social work	Geriatric care
Inpatient care	Extended care
Surgery	Home-based primary care
Specialty care	Substance abuse outpatient treatment program
Research	

There are 123 inpatient beds: 60 medical/surgical beds, 25 intensive care unit/surgical intensive care beds, 22 inpatient mental health beds, and 16 beds for the substance abuse residential treatment program.

The eight CBOCs are located at:

- 4010 Dupont Circle, Louisville
- 3430 Newburg Road, Louisville
- 3934 North Dixie Highway, Louisville
- 1911 US Highway 227, Carrollton, Kentucky
- 619 Elizabethtown Road, Clarkson, Kentucky
- 851 Ireland Loop, Ft. Knox, Kentucky
- 811 Northgate Boulevard, New Albany, Indiana
- 1467 Scott Valley Drive, Scottsburg, Indiana

All eight CBOCs provide primary care. The Dupont Circle, US Highway 227, and Scott Valley Drive locations also offer mental health services; and the North Dixie Highway location houses the VA Women's Healthcare Center, which provides gender-specific preventive care.

VA provides benefits services to over 380,000 Veterans at the existing Louisville Regional Benefit Office, located in leased space at 321 West Main Street in Louisville. This VBA regional office administers a variety of benefits and services, including compensation; education; insurance; loan guaranty; pension; fiduciary services; vocational rehabilitation and employment for Veterans, service members, their families and survivors in Kentucky; counseling about eligibility for VA benefits and how to apply; information about VA health care and memorial benefits; outreach to Veterans—including those who are homeless or at risk for homelessness—and older, minority, and women Veterans; and public affairs.

1.2 Purpose of and Need for a Replacement Facility

The ***purpose*** of the proposed project is to provide Louisville area Veterans with facilities of sufficient capacity to meet their current and projected future healthcare needs. These facilities would include a full-service (inpatient and outpatient) hospital, associated CBOCs, and a VBA regional office. Within the Louisville service area, 60,943 Veterans were enrolled to receive care in Fiscal Year 2014. Enrollment is expected to increase to more than 68,000 (more than 11 percent) by FY 2024. During this same time period, outpatient clinic stops are expected to increase from 762,104 to over 963,000 (a 26 percent increase). Increased capacity is required to, at minimum, keep pace with increased enrollment and clinic stops while maintaining current levels of service and, optimally, improve service levels by

accommodating expanded diagnostic services and where possible decreasing wait times for appointments. The increased capacity and services provided by the new VAMC would be expected to streamline and enhance the patient experience for users of the facility.

The proposed project is ***needed*** because the current hospital and CBOCs are operating at maximum capacity and are unable to accommodate the projected increase in the regional Veteran population. The configuration and condition of the existing 63-year-old Louisville VAMC facility offers limited options to expand to meet these needs. In addition, parking at the Zorn Avenue VAMC is insufficient. Because VBA functions exceed the physical capacities of its existing regional office location in leased space at 321 West Main Street, Suite 390, Louisville, the existing VBA regional office also requires relocation. These insufficient facilities challenge VA's ability to safely, economically, and consistently provide high-quality, integrated health care and services to the region's Veterans.

Between 1998 and 2004, VA completed a nationwide Capital Asset Realignment for Enhanced Services (CARES) study to identify the demand for VA care and assess into the future appropriate function, size, and location for VA facilities. The CARES study confirmed that the Louisville VAMC has significant space issues. VA subsequently determined that new facilities constructed on a new site would be best suited to meet future needs. The specific factors that contributed to this determination of need and that preclude renovating or making major additions to the existing VAMC include the following:

- Hospital infrastructure does not allow renovations to meet current design criteria:
  - The distance between structural columns limits open space utilization, and floor to floor heights are minimal for today’s standards.
  - The primary electrical distribution system is at capacity and cannot accommodate additional high power requirements.
  - The heating, ventilation, and air conditioning infrastructure does not meet room air exchange criteria in many hospital areas, affecting patient comfort.
  - There are no dedicated patient transport elevators. The existing elevators cannot accommodate new beds.
- There is no appreciable vacant space on the campus for expansion:
  - The facility is 200,000 square feet short of the space needed for the current workload.
  - Providing services at maximum capacity results in very little available transitional space from the time of service until discharge.
  - There is no space available for expansion of diagnostic services, which affects workload and operational efficiency.
- Parking is limited to 1,200 spaces with no place to expand. The construction phase for an onsite parking garage would preclude use of a substantial portion of the existing parking spaces that would fall within a new parking facility footprint as well as for materials laydown, a situation that the already constricted campus could not feasibly accommodate even for a very short period of time.

1.3 Related NEPA Documents and Scope of this EIS

Based on the findings of the CARES Study, VA prepared an environmental assessment (EA) that evaluated the environmental effects of selecting and acquiring a site for the construction and operation of a replacement VAMC, and issued a finding of no significant impact (FONSI) on June 15, 2012. The EA

was titled *Final Programmatic Environmental Assessment of the Proposed Site Selection, Construction, and Operation of a Replacement Louisville VA Medical Center* (VA 2012b Final PEA, VA 2012c PEA FONSI). The 2012 EA analyzed the effects of transferring operations from the existing VAMC to a replacement VAMC at either of two alternative sites—the Brownsboro Site (preferred) or the St. Joseph Site—and the No Action alternative of continuing operations at the existing Zorn Avenue location. The FONSI stated that VA had determined there would be no significant environmental impacts associated with either location provided that VA (1) implemented the mitigation, avoidance, and minimization measures identified in the final 2012 EA; and (2) completed a subsequent tiered EA to analyze the potential environmental effects of the construction and operation of the VAMC on the selected site, with this tiered EA incorporating and more fully developing the identified mitigation, avoidance, and minimization measures.

VA purchased the Brownsboro Road property on July 10, 2012. The master plan and concept phase began immediately thereafter to develop the project features and details that would be evaluated in the subsequent tiered EA for construction and operation of the proposed replacement VAMC. The master plan and initial conceptual design for the proposed replacement VAMC were completed in April 2013, with a revised conceptual design prepared in June 2013. VA subsequently reevaluated and revised the conceptual design and selected the Atrium concept, completed in March 2014, for development into schematic designs.

In December 2014, VA published for public comment a draft tiered EA evaluating the proposed action to construct and operate a replacement Robley Rex VAMC campus, including a regional VBA office, using the Atrium concept at 4906 Brownsboro Road in Louisville, Jefferson County, Kentucky (VA 2014 Draft SEA). The No Action alternative in the tiered EA was to continue operations at the existing Zorn Avenue location. However, upon further review, VA concluded that an EIS was the appropriate level of NEPA documentation for evaluating the potential for adverse impacts from constructing and operating a replacement campus.

This EIS evaluates the entire scope of VA's proposed action to replace the existing Robley Rex VAMC, including impacts associated with the proposed and alternative location(s), campus and facility construction, and VAMC and VBA operation; and identifies mitigation measures to address environmental impacts. This EIS incorporates relevant information from the previous EAs and further expands upon and refines this information based on the project development and evaluation that has subsequently followed. Where the conclusions of the previous EAs and this EIS differ, the conclusions in this EIS are VA's current considerations for decision-making, as they are based on the most recent and best available data and analysis.

The Brownsboro Site has not been improved or developed by VA and could be used by VA for another purpose or sold should VA choose another site for the proposed VAMC.

1.4 Relevant Federal Statutes, Regulations, and Executive Orders

National Environmental Policy Act

NEPA requires federal agencies to consider the potential impacts of projects, policies, programs, funding decisions and other agency actions on the environment. NEPA integrates environmental planning requirements into agency decision-making.

Council on Environmental Quality (CEQ) Regulations for Implementing NEPA

CEQ, within the Executive Office of the President, coordinates federal environmental policy by working closely with agencies and other executive offices. The Chair of CEQ acts as the top

environmental policy advisor to the President. Congress established CEQ through NEPA to ensure federal agencies meet their obligations under the Act. CEQ developed regulations for implementing NEPA (40 CFR Parts 1500 - 1508) and publishes guidance documents to assist agencies with NEPA compliance.

Clean Air Act

The Clean Air Act is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 109 directs the Environmental Protection Agency (EPA) to set national ambient air quality standards (NAAQS) for criteria pollutants. EPA has identified and set NAAQS for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead (40 CFR Part 50). Section 111 of the Act requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants. Section 160 requires that specific emission increases be evaluated prior to permit approval to prevent significant deterioration of air quality. Section 112 requires specific standards for releases of hazardous air pollutants. Section 118 requires that each federal agency with jurisdiction over any property or facility engaged in any activity that might result in the discharge of air pollutants comply with "all federal, state, interstate, and local requirements" regarding the control and abatement of air pollution.

Clean Water Act

The Clean Water Act, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act requires all branches of the federal government engaged in any activity— including sanitary system wastewater effluents, storm water runoff, and surface water discharges that might result in a discharge or runoff of pollutants to surface waters—to comply with federal, state, interstate, and local requirements. Section 404 of the Clean Water Act gives the U.S. Army Corps of Engineers permitting authority over activities that discharge dredge or fill materials into waters of the United States, including wetlands.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA provides, among other things: (1) a program for emergency response to and reporting of a release or threat of a release of a hazardous substance to the environment; and (2) a statutory framework for remediation of hazardous substance releases from private, state, and federal sites. Using the Hazard Ranking System, contaminated sites are ranked and may be included on the National Priorities List. Section 120 of CERCLA specifies requirements for investigation, remediation, and natural resource restoration, as necessary, at federal facilities, and also provides requirements for hazardous substance contamination on properties to be transferred. CERCLA, commonly referred to as "Superfund," also provides cleanup funds and assessment requirements for inactive waste sites. Amendments to CERCLA under the Superfund Amendments and Reauthorization Act (SARA) require reporting in the event of a reportable quantity release.

Emergency Planning and Community Right to Know Act (EPCRA)

Title III of SARA, also known as EPCRA, establishes emergency planning requirements for federal, state, and local governments and industry. EPCRA ensures that communities are informed of potential hazards including the type and location of large quantities of toxic chemicals used and stored by facilities in or near the community. EPCRA specifically mandates that chemical information be made available to local emergency response organizations, such as fire departments and hospitals. Any inadvertent release must be reported to appropriate state and local authorities. All subsequent reports must be made accessible to the public.

Endangered Species Act

This Act is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. Section 7 of the Act requires federal agencies that have reason to believe that a prospective action may affect an endangered or threatened species or its habitat to consult with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service to ensure the action does not jeopardize the species or destroy its habitat. If, despite reasonable and prudent measures to avoid or minimize such impacts, the species or its habitat would be jeopardized by the action, a review process is specified to determine whether the action may proceed as an incidental taking (50 CFR Part 17).

Farmland Protection Policy Act (FPPA)

The FPPA is contained in subtitle I of Title XV of the Agriculture and Food Act of 1981. The FPPA is intended to minimize the impact of federal programs on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that to the extent possible federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land. An agency coordinates with the Natural Resources Conservation Service to establish a farmland conversion impact rating score for proposed federal projects. This score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level.

Migratory Bird Treaty Act

The Act prevents the taking, possession, killing, transportation, or importation of migratory birds, their eggs, parts, or nests. It is intended to protect birds that follow common migration patterns across the United States, Canada, Mexico, Japan, and Russia. It regulates the harvest of migratory birds by specifying conditions such as mode of harvest, hunting seasons, and bag limits.

National Historic Preservation Act

The National Historic Preservation Act declared that it is the policy of the federal government to, among other goals, “Administer federally owned, administered, or controlled prehistoric and historic resources in a spirit of stewardship for the inspiration and benefit of present and future generations.” The most relevant provisions of the Act for this EIS are Sections 106 and 110.

Section 106 requires all federal agencies to review the effects of actions permitted or funded directly or indirectly by the federal government (“an undertaking”) on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places, and to take those effects into account as part of the assessment of the project. While such undertakings are often necessary to fulfill the mission of an agency, this section ensures that the agency considers cultural resources in the planning of such projects, and seeks to avoid, minimize, or mitigate adverse effects to the cultural resources in its decisions and agreements. The implementing regulations for the Section 106 process are provided at 36 CFR Part 800: Protection of Historic Properties.

Section 110 ensures that historic preservation is fully integrated into the ongoing programs of all federal agencies. Among its requirements are for each agency to establish a preservation program to identify, evaluate, nominate to the National Register, and protect historic properties; consult with other federal, state, and local agencies, tribes, and other parties on its historic preservation planning activities; and minimize harm from its undertakings to National Historic Landmarks. Section 110 states that “Prior to acquiring, constructing, or leasing buildings for purposes of carrying out agency responsibilities, each federal agency shall use, to the maximum extent feasible, historic properties available to the agency in accordance with Executive Order No. 13006.” This executive order is titled *Locating Federal Facilities*

on Historic Properties in our Nation's Central Cities, and states "the Federal Government shall utilize and maintain, wherever operationally appropriate and economically prudent, historic properties and districts, especially those located in our central business areas."

Safe Drinking Water Act

The primary objective of the Safe Drinking Water Act is to protect the quality of public drinking water supplies and sources. The Act authorizes EPA to set national standards for drinking water sources, treatment systems, and water distribution. Other programs established by the Act include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program. In addition, the Act protects underground sources of drinking water from contaminated releases and spills.

Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments

The Solid Waste Disposal Act governs the transportation, treatment, storage, and disposal of hazardous waste and nonhazardous waste (that is, municipal solid waste). Under RCRA, EPA defines and identifies hazardous waste; establishes standards for its transportation, treatment, storage, and disposal; and requires permits for persons engaged in certain hazardous waste activities (40 CFR Parts 260 through 283). Regulations imposed on a generator or on a treatment, storage, or disposal facility vary according to the type and quantity of hazardous waste generated, treated, stored, or disposed of and the methods of treatment, storage, and disposal.

Executive Order 11988 – Floodplain Management

Federal agencies are required to avoid actions that adversely impact floodplains where there are practicable alternatives and to minimize environmental harm. Each federal agency must evaluate the potential effects of an action in a floodplain and ensure planning programs and budget requests consider flood hazards and floodplain management.

Executive Order 11990 – Protection of Wetlands

Each federal agency must take action to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the values of wetlands in carrying out agency responsibilities. An agency must follow this order when acquiring, managing, and disposing of federal lands and facilities; financing, constructing, or assisting in construction and improvements; and conducting federal activities and programs affecting land use. The order does not apply to permits, licenses, or other activities involving wetlands on non-federal property. Each agency must allow the public to review plans or proposals for new construction in wetlands early in the planning process.

Executive Order 12898 – Environmental Justice

Executive Order 12898 directs each federal agency to make environmental justice part of its mission. A federal agency will identify and address the human health or environmental effects of its actions on minority and low-income populations.

Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments

This order supplements the Executive Memorandum (dated April 29, 1994) entitled, "Government-to-Government Relations with Tribal Governments," and states that each executive branch department and agency shall consult with tribal governments on, and assess the impacts of, federal plans, projects, programs, and activities that may affect tribal resources.

Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management

This order instructs federal agencies to conduct their environmental, transportation, and energy-related activities in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.

Executive Order 13693 – Planning for Federal Sustainability in the Next Decade

This 2015 order sets policy and goals for federal agencies to maintain federal leadership in sustainability and greenhouse gas emission reductions. Through a combination of more efficient federal operations as detailed in the order, agencies are directed to reduce direct greenhouse gas emissions by at least 40 percent over the next decade while at the same time fostering innovation, reducing spending, and strengthening the communities in which federal facilities operate. The order also includes specific sustainability goals related to building energy conservation, efficiency, and management; using renewable and alternative sources for electrical energy, with specific goals for clean energy use by year; improving water use efficiency and management, including stormwater management; improving fleet and vehicle efficiency and management; use of recycled and sustainably produced materials; advancing waste prevention and pollution prevention; and promoting electronics stewardship.

Appendix A lists environmental permits potentially required to implement the project proposal.

1.5 Organization of this Environmental Impact Statement

This EIS is organized in the format recommended by CEQ (40 CFR 1502.10) and includes:

- Cover Sheet, Executive Summary, Table of Contents, and Acronyms and Abbreviations.
- **Chapter 1: Introduction, including Purpose and Need** presents background information and the purpose and need for proposing to construct and operate a replacement Robley Rex VAMC.
- **Chapter 2: Alternatives** describes each of the alternatives evaluated, including taking no action, and summarizes alternatives that were considered but not evaluated in detail.
- **Chapter 3: Affected Environment** describes the natural and human environment within the area that could be affected by the proposal.
- **Chapter 4: Environmental Consequences** is the assessment of the potential environmental impacts of the alternatives.
- **Chapter 5: Mitigation** discusses the measures identified to minimize, avoid, or otherwise mitigate the adverse impacts identified in Chapter 4.
- **Chapter 6: Public Involvement and Agency Coordination** summarizes the process to involve the public and the input received during scoping and, in the Final EIS, comments received on the Draft EIS. This chapter also summarizes coordination with federal, state, and local agencies.
- **Chapter 7: List of Preparers** provides the names, education, and experience of the individuals involved in the preparation of the EIS.
- **Chapter 8: References** lists the references cited in the EIS.
- **Chapter 9: Glossary** provides definitions of the technical terminology used in the EIS.

- **Appendices:**
  - A. Permits
  - B. Traffic Study
  - C. Summary of Public Scoping
  - D. Agency and Tribal Correspondence
  - E. Draft EIS Comments and Responses (in Final EIS)

2.0 ALTERNATIVES

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality's and Department of Veterans Affairs (VA's) NEPA regulations require rigorous exploration and objective evaluation of all reasonable alternatives for implementing a proposal. This environmental impact statement (EIS) evaluates the potential environmental consequences of three alternatives including No Action. This chapter describes the development of the alternatives, the details of the alternatives, and other alternatives identified but eliminated from detailed analysis.

2.1 Development of Alternatives

VA undertook a sequential planning and screening process, seeking reasonable alternatives for meeting the current and projected future healthcare needs of Veterans in the Louisville service area. In 2009, a VA study (VA 2009) concluded that feasible alternatives ranged from new construction and renovation at the existing Louisville VA Medical Center (VAMC) to constructing a replacement VAMC at the existing site or a new site in the Louisville area, although each alternative presented specific challenges and advantages. The 2009 study did not identify any specific new site, but rather evaluated a generic new site's feasibility compared to reconfiguring the existing Zorn Avenue facility.

In April 2010, following standard agency procedure for identifying potential new sites, VA's Real Property Service publicly advertised (VA 2010) for expressions of interest from potential offerors of previously undeveloped property that might satisfy its need. VA received more than 20 responses and a multi-disciplinary board of VA employees used the following criteria to screen the initial set of previously undeveloped (referred to as "greenfield") site options:

- **Location**: VA established a geographic area that would be accessible to most of the Veterans to be served by the facility, and specified that the site needs to be within an approximate 15-mile radius of the University of Louisville Healthcare Center in downtown Louisville to facilitate collaboration between that facility and the VAMC
- **Size:** The site needs to be able to provide dedicated space for a full-service hospital, approximately 2,700 parking spaces, and other amenities. Based on VA's requirements, the site needs to have at least 25 acres of developable land.
- **Access:** The site needs to have ready access from a primary road and not be located on a congested or narrow secondary road that would make access difficult. Equally, the site must be easily accessible by handicapped Veterans. The site must also meet VA's security and setback requirements.
- **Utilities:** For cost savings purposes, the site needs to have all utilities readily available, including water, sanitary sewer, natural gas, electric, telecommunications, and fiber optics.
- **Cost:** The site needs to be able to be developed to suit VA's needs in a cost effective manner.
- **Availability:** The site should be available to allow for the design and construction of the replacement facility within a reasonable period of time.
- **Environmental**: The site must be relatively free from environmental concerns, such as hazardous waste contamination, asbestos, lead-based paint, wetlands, floodplain or flooding issues, geotechnical, cultural or biological concerns, or other regulated environmental resource.

Of the sites offered for VA's purchase, those referred to as the Brownsboro Site, the St. Joseph Site, and the Fegenbush Site scored the highest of those submitted in response to the advertisement based on the

screening criteria. VA also identified the Downtown Site (offered by the University of Louisville and the City of Louisville) and the potential to reconfigure the existing Louisville VAMC site as candidate sites for the replacement VAMC.

In 2011, VA subjected each of these initial five candidate sites to a more rigorous second round of screening, including Phase I environmental site assessments, American Land Title Association surveys, geotechnical investigations (except Downtown Site), and additional onsite environmental investigations. In addition, VA contacted federal, state, and local regulatory agencies concerning the potential to develop a replacement VAMC at each of these five sites. Table 2-1 provides a comparative summary of the five sites' characteristics based on this second round of screening.

Table 2-1. Summary of Site Characteristics of Initial Alternatives.

Characteristic	Brownsboro	St. Joseph	Fegenbush	Downtown	Existing VAMC
Size (acres)	36	99	51	29	48 (22 developable)
Zoning	Planned development. Likely compatible with VAMC.	Residential and commercial. Likely compatible with VAMC.	Residential and commercial. Likely compatible with VAMC.	Commercial, manufacturing, office/residential. Likely compatible with VAMC.	Residential. Likely compatible with VAMC.
Current use	Fallow agricultural land with scattered trees.	Mostly agricultural land.	Mostly agricultural land with strips of woods.	Commercial, retail, institutional, church, parking lots.	Louisville VAMC.
Current buildings	None	Remnants of farmstead buildings	Remnants of farm buildings	Approximately 20: mostly commercial, church, and a residence	Nine-story VA hospital and support buildings
Surrounding land uses	Suburban area. Commercial north; residential neighborhoods east and south; I-264 west.	Suburban area. Undeveloped land and scattered residences north; pasture, church, and school east; unimproved land, residential neighborhood, Jewish Hospital Medical Center south; I-265 and residences west.	Suburban area. School, golf course, farmland north; undeveloped land and scattered residences east and south; GE Appliance Park west.	Urban area. University of Louisville Hospital north and west; residential neighborhoods and commercial properties east and south; battered women's shelter east.	Suburban area. Undeveloped land and I-71 north; residential neighborhoods east, south and west.
Topography	Level.	Central and southern portions mostly level, northern portion slopes to north.	Mostly level, moderate slope to south in southern portion.	Level.	Central and western portions level; southern, eastern, and northeastern portions steeply sloping.

Characteristic	Brownsboro	St. Joseph	Fegenbush	Downtown	Existing VAMC
National Register of Historic Places (NRHP) historic resources	No NRHP historic districts or eligible structures onsite or immediately adjacent.	No NRHP historic districts or eligible structures onsite or immediately adjacent.	No NRHP historic districts or eligible structures onsite or immediately adjacent.	Phoenix Hill National Register District, eight site structures contribute to district or individually eligible; Green Street Baptist Church, a Louisville landmark and NRHP-listed structure, onsite.	Existing hospital NRHP eligible, in viewshed of Louisville Water Pump Station 31 (historic landmark).
Archaeological resources	None known.	None known.	Two sites identified, not assessed.	None known.	None known.
Karst conditions	High karst potential area.	High karst potential area.	High karst potential area.	Not in a high karst potential area.	Known karst area, sinkholes onsite.
Depth (feet) to bedrock	7 to 19	7 to 15	4 to 11	40 or more	20 or more in developed area
Soils	Classified prime farmland.	Classified prime farmland.	Classified prime farmland.	Not prime farmland.	Not prime farmland.
Surface water	None onsite or near site.	Stream crosses northern portion of site.	Intermittent stream near east site boundary, leads to Fern Creek (500 feet east).	None onsite or near site.	Stream (VA ditch) crosses eastern portion of site, outside of development area.
Wetlands	No potential wetlands onsite.	One small pond identified on National Wetlands Inventory near stream; two small wetlands in eastern and southern portions of the site.	City identified potential wetland in western portion of site; not on National Wetlands Inventory.	No potential wetlands onsite.	No potential wetlands onsite.
Floodplains	Not located in 100- or 500-year floodplain.	Not located in 100- or 500-year floodplain.	Not located in 100- or 500-year floodplain.	Southeastern portion of site is in 100-year floodplain.	Eastern portion of site, outside development area, is in 100-year floodplain.
Threatened and endangered species	In range of known Indiana bat maternity colony. Site does not contain suitable roost trees; development would not likely affect bats.	Within potential Indiana bat habitat range. Site habitat may support running buffalo clover and Kentucky glade cress.	Within potential Indiana bat habitat range. Site habitat may support running buffalo clover and Kentucky glade cress.	None identified.	Within potential Indiana bat habitat range. Site habitat may support running buffalo clover and Kentucky glade cress.

Characteristic	Brownsboro	St. Joseph	Fegenbush	Downtown	Existing VAMC
Hazardous building materials	None.	None.	None.	Likely considerable asbestos and lead-based paint in buildings.	Asbestos known and lead-based paint possible in buildings.
Soil and groundwater contamination	None known or likely.	None known or likely.	None known or likely.	Includes several current and historic operations of concern (gas stations, auto repair shops, dry cleaners, industrial operations. Known lead-impacted soil in northern portion. Current and historic above-ground and underground storage tanks.	A 2,000-gallon heating oil underground storage tank was removed in 1986 with no sampling.
Traffic	The KY 22/I-264 interchange is congested, even after recent improvements. (At time of screening, it was concluded that transportation infrastructure may be adequate for VAMC with minimal improvements in addition to those that have now been completed.)	Transportation infrastructure around site unlikely to be adequate. Improvements to roads and intersection may be necessary.	Transportation infrastructure is likely adequate with improvements to the site entry and exit points.	Transportation infrastructure is likely adequate with improvements to the site entry and exit points.	Transportation infrastructure is likely adequate with improvements to the site entry and exit points.
Utilities	Primary electrical feed has capacity for VAMC and could be upgraded easily with new transformer. Backup feed would require a new substation.	Primary electrical feed would be available for the proposed VAMC. Backup feed would require a second transformer not yet installed.	Primary electrical feed would be available for proposed VAMC. Backup feed would require extensive reworking of existing lines and additional right of way.	Primary electrical feed to the proposed VAMC would require a new substation.	Services already available and likely adequate with minor upgrades.

Characteristic	Brownsboro	St. Joseph	Fegenbush	Downtown	Existing VAMC
Property under control for acquisition	At time of screening, yes. Has since been acquired by VA.	At time of screening, yes.	At time of screening, yes.	At time of screening, partially. Site assemblage consists of 80 parcels and 20 property owners. Green Street Baptist Church had indicated desire to remain at current location.	Owned by VA.

As a result of this process, VA determined that the sites that best satisfied VA's needs to provide timely healthcare to Veterans with the least potential impact on the surrounding environment were the Brownsboro Site (located at 4906 Brownsboro Road) and the St. Joseph Site (located at 13508, 13605, and 13615 Factory Lane) (Figure 2-1). VA identified the Brownsboro Site as the preferred site (Alternative A) and the St. Joseph Site as the secondary site (Alternative B). Continuing operations from the existing location at 800 Zorn Avenue is evaluated in this EIS as Alternative C, No Action. The Fegenbush Site, the Downtown Site, and reconfiguration of the existing VAMC were not evaluated in detail, as discussed in Section 2.3.

As site acquisition details for the preferred Brownsboro Site were being finalized in 2012, VA determined that it would be advantageous to co-locate functions of the Veterans Benefits Administration (VBA) regional office on the proposed new campus. In addition to improving VBA efficiency through new facilities, co-locating VBA services with the VAMC would centralize Veterans services in a single location. VA has incorporated a VBA regional office building into the final design concept evaluated in this EIS.

The master planning process for the proposed replacement VAMC campus was completed in April 2013 (Oculus 2013). The master plan's goal was to propose a layout for campus facilities and structures to ensure optimal function and site use of the Brownsboro Site. This layout was furthered developed through the conceptual design process, which had two primary objectives:

- To develop viable conceptual design options, one of which would be selected by the VA team to proceed through the schematic design phase
- To facilitate an objective evaluation of those designs through development and use of a tool that identifies key scoring and selection criteria, prioritized by the VA team during the concept phase

An evaluation criteria matrix was applied to evaluate possible design concepts. Specific criteria within the following categories were analyzed for each concept:

Optimize Patient Experience and Satisfaction
Optimize Staff Experience and Satisfaction
Departmental Adjacencies
Neighborhood Experience
Overall Building Footprint and Siting
Building Form
Engineering
Economics

The Atrium Concept, described in Section 2.2.1, was selected by VA for development into schematics and is proposed for eventual design, construction, and operation in the action alternatives in this EIS.

Three other conceptual designs for the proposed replacement VAMC were identified, but are not evaluated in detail in this EIS, as discussed in Section 2.3.4.

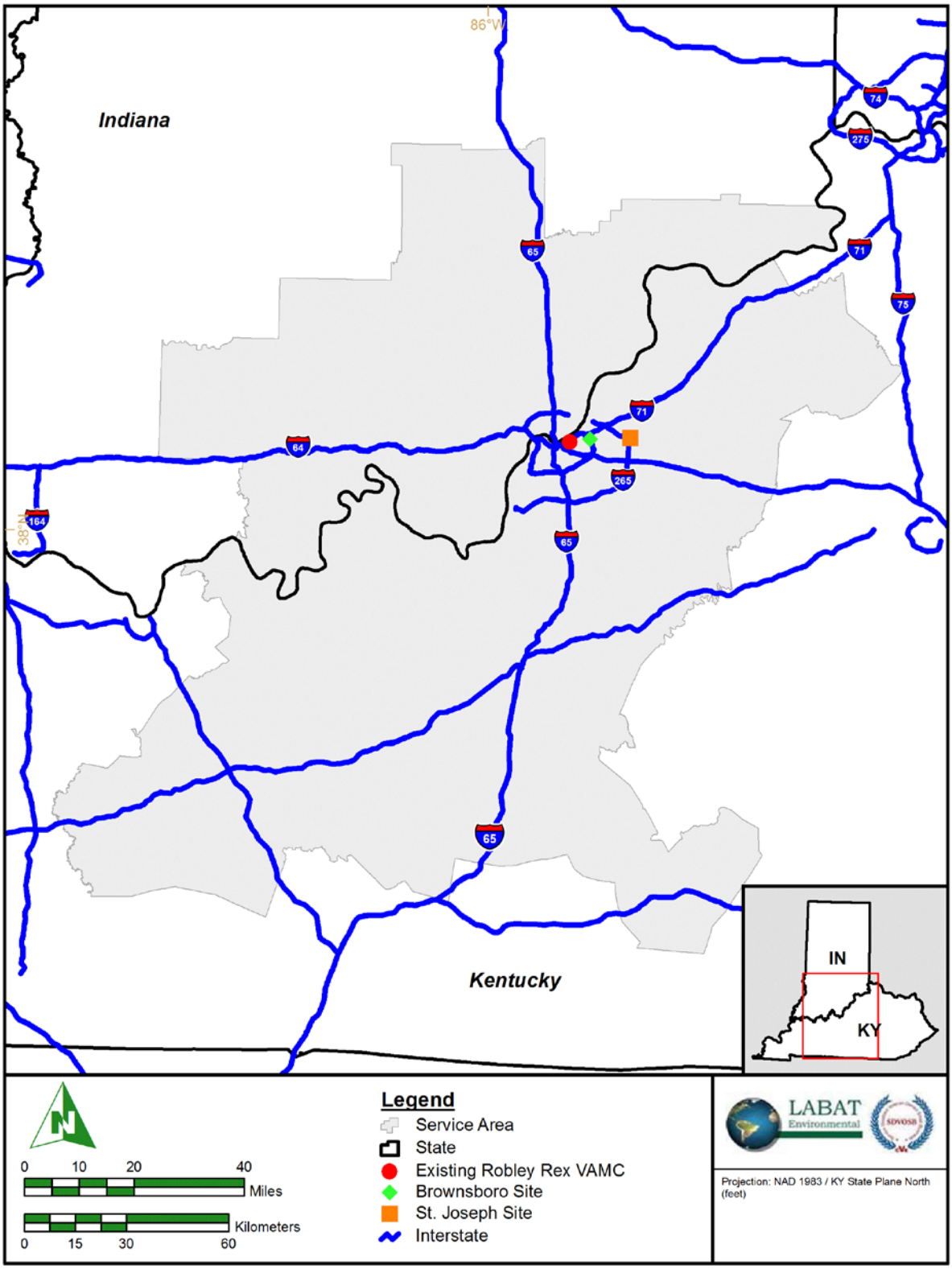

Figure 2-1. Locations of Alternatives Evaluated in Detail.

2.2 Description of the Alternatives

The alternatives evaluated in this EIS are Alternative A, construct a replacement VAMC at the Brownsboro Site; Alternative B, construct a replacement VAMC at the St. Joseph Site; and Alternative C, continue operating from the existing VAMC on Zorn Avenue (No Action). Alternative C also serves as the baseline for identifying the impacts from the action alternatives (A and B).

2.2.1 Alternative A – Replacement VAMC at Brownsboro Site

Under Alternative A, VA would construct and operate a new replacement medical center and VBA regional office following the Atrium conceptual design (Figure 2-2) at the Brownsboro Site in Louisville, Kentucky (Figure 2-3). The 34.9-acre site is located at 4906 Brownsboro Road in the Holiday Manor area, approximately seven miles east of downtown Louisville. The property is located on the south side of Brownsboro Road near its intersection with U.S. Highway 42 (US 42). The property is currently vacant, undeveloped, and predominantly grass-covered. VA purchased the Brownsboro Road property on July 10, 2012. The Brownsboro Site has not been improved or developed by VA and could be used by VA for another purpose or sold should VA chose another site for the proposed VAMC.

Figure 2-2. Major Components of Atrium Concept for Replacement Louisville VAMC.

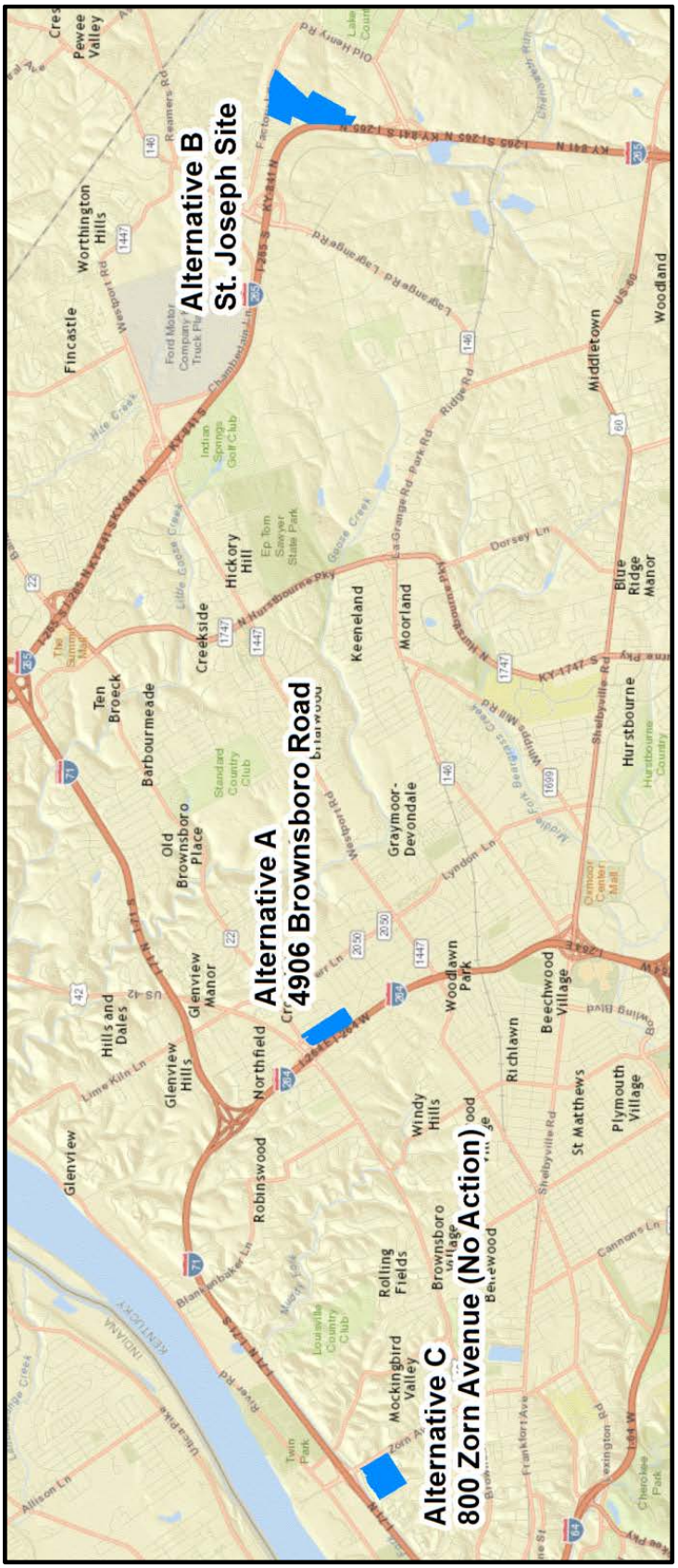

Figure 2-3. Locations of Alternatives A, B, and C.

The proposed campus for Alternative A would include:

- Full service (inpatient/outpatient) 104-bed VA hospital with diagnostic and treatment facilities
- VBA regional office
- Central utility plant
- Geothermal system for heating and cooling the VBA regional office building
- Laundry facility
- Site lighting
- Parking decks for 3,000 vehicles
- Roads, sidewalks, and access (entrance/exit) points
- Stormwater management
- Above-ground potable water storage (water tower)
- Subsurface utility distribution systems
- Landscaping
- Other required site amenities and improvements

The full-service VA hospital includes the departments listed in Table 2-2. The site plan for the proposed concept under Alternative A is presented in Figure 2-4. The conceptual design may be revised to respond to new information and details on site function and operation requirements, mission priorities, mitigation measures to address potential environmental impacts, funding constraints, or other factors.

The following sections summarize the buildings and campus features of the replacement VAMC campus under Alternative A, based on concept descriptions prepared by URS/SmithGroup (2014a, 2014b).

Table 2-2. Departments and Areas (Square Feet) Proposed for Replacement Louisville VAMC.

Department	Net Area	Gross Area
1 - AFGE	540	702
2 - AMBULATORY CARE - MEDICAL SURGICAL SPECIALTY CLINIC(262)	38,150	62,948
3 - AMMS: ADMINISTRATION (284)	2,290	2,977
4 - AMMS: WAREHOUSE (291)	20,990	23,089
5 - AUDIOLOGY AND SPEECH PATHOLOGY SERVICE (204)	4,810	7,456
6 - BUSINESS OFFICE HEALTH ADMINISTRATION SERVICE (246)	7,860	10,218
7 - CARDIOVASCULAR LABORATORIES (210)	9,730	14,595
8 - CHAPLAIN SERVICE (208)	2,470	3,211
9 - CLINICAL SERVICES ADMINISTRATION (214)	7,400	9,620
10 - COMPENSATION AND PENSION PROGRAM	6,000	9,000
11 - CREDIT UNION (220)	505	657
12 - DENTAL SERVICE (222)	6,615	10,253
13 - DIGESTIVE DISEASES PROGRAM - ENDOSCOPY SUITE (287)	7,820	11,730
14 - EDUCATIONAL FACILITIES (402)	5,170	6,721
15 - ELECTROENCEPHALOGRAPHY (EEG) LABORATORY NEW (226) GF	1,955	2,933
16 - EMS: SUPPORT / ADMINISTRATION (406)	4,080	4,896
17 - EMS: LAUNDRY AND LINEN OPERATION (408)	13,024	14,978
18 - EMS: LOCKERS, LOUNGES, TOILETS, AND SHOWERS (410)	1,260	1,512
19 - ENGINEERING SERVICE (230)	9,071	11,792
20 - ENT	2,160	2,808
21 - EYE CLINIC NEW (233) GF	6,255	10,008
22 - FISCAL SERVICE (234)	3,160	4,108
23 - GERIATRICS AND EXTENDED CARE SERVICE (261)	5,290	7,671
24 - HUMAN RESOURCES MANAGEMENT (266)	3,310	4,303
25 - INTENSIVE CARE NURSING UNITS (102)	13,290	21,929
26 - LIBRARY SERVICE (400)	2,220	2,664
27 - LOBBY (244)	955	1,146
28 - MAGNETIC RESONANCE IMAGING (275)	2,755	4,408
29 - MEDICAL / SURGICAL INPATIENT UNITS (100)	27,050	44,633
30 - MEDICAL CENTER DIRECTOR SUITE (238)	7,920	10,296
31 - MEDICAL MEDIA SERVICE (248)	2,010	2,613
32 - MENTAL HEALTH AND BEHAVIORAL PATIENT CARE UNITS (110)	9,180	15,147
33 - MENTAL HEALTH CLINIC (260)	17,270	24,178
34 - NUCLEAR MEDICINE SERVICE (252)	6,450	9,675
35 - NURSING SERVICE ADMINISTRATION (254)	2,430	3,159
36 - NUTRITION AND FOOD SERVICE (224)	6,167	7,709
37 - OBSERVATION/INPATIENT UNITS (100)	1,500	2,475
38 - OFFICE OF INFORMATION & TECHNOLOGY (232)	9,315	12,110
39 - PACT PRIMARY CARE CLINIC (PPCC) (262)	32,990	53,114
40 - PATHOLOGY AND LABORATORY MEDICINE SERVICE (240)	16,500	23,100
41 - PHARMACY SERVICE (268)	13,320	17,316
42 - PHYSICAL MEDICINE AND REHABILITATION SERVICE (270)	9,440	12,744
43 - POLICE AND SECURITY SERVICE (279)	2,048	2,662

(continued on next page)

Table 2-2. Departments and Areas (Square Feet) Proposed for Replacement Louisville VAMC (continued)

Department	Net Area	Gross Area
44 - POLYTRAUMA REHABILITATION CENTER (111)	2,430	4,010
45 - PROSTHETIC AND SENSORY AIDS SERVICE (308)	5,435	6,794
46 - PULMONARY MEDICINE (212)	6,080	9,120
47 - QUALITY/STRATEGIC MANAGEMENT SERVICE	2,560	3,328
48 - QUARTERS, ON-CALL (274)	1,295	1,684
49 - RADIOLOGY SERVICE (276)	14,905	23,848
50 - RESEARCH AND DEVELOPMENT (278)	9,615	12,500
51 - SARRTP (312)	6,892	10,683
52 - SOCIAL WORK SERVICE (282)	4,150	5,395
53 - SUBSTANCE ABUSE CLINIC (202)	4,180	5,852
54 - SUPPLY PROCESSING AND DISTRIBUTION - SPD (285)	8,270	10,751
55 - SURGICAL SERVICE (286)	23,010	39,117
56 - VETERANS CANTEEN SERVICE (206)	17,174	20,609
57 - VOLUNTARY SERVICE/SERVICE ORGANIZATIONS (290)	2,130	2,556

Total Departmental Net Area: 460,851
Total Departmental Gross Area: 665,505
Total Building Gross Area 898,432

Source: VA 2014.

Source: URS/SmithGroup 2014a.

Figure 2-4. Proposed Site Plan for Alternative A.

2.2.1.1 Site Organization and Appearance

The Atrium concept and site plan (Figures 2-2 and 2-4) for the replacement VAMC campus consists of a four-story east bar and a five-story west bar, separated by a central atrium and courtyard.

- The VBA building, medical center administration and support, and inpatient units would comprise most of the east bar.
- The west bar, closer to the Watterson Expressway, would primarily house outpatient clinics and diagnostic and treatment spaces.
- An enclosed atrium, illustrated in Figure 2-5, would be placed between the west bar and the medical center portion of the east bar. Where the atrium ends, this central space would continue as an outdoor courtyard between the VBA building and the north parking structure.
- Service functions would be located along the Watterson Expressway on the west, including the ambulance entrance, loading docks, central utility plant, laundry, and water tower.
- A basement would extend beneath the west bar. Service and utility tunnels would connect the basement to small service and support areas below the east bar and the VBA building.
- Each bar would have a mechanical penthouse, and the west bar would have an additional electrical penthouse. The total height of the east and west bars, including penthouses, would be approximately 102 and 162 feet, respectively.
- Two parking structures would accommodate parking for a total of 3,000 vehicles, at the north and south ends of the site. Both structures would have rooftop solar panels.
- A small (1,600-square-foot) maintenance/service outbuilding for servicing fleet vehicles may be added to the site plan depicted in Figure 2-4 (Pozolo 2014).
- The site layout allows for future hospital expansion to the south, if needed, in the area between the VAMC and the south parking structure.

In response to updated projections of the expected VAMC workload, VA downsized the proposed facility by 21 percent compared to initial design concepts shared with the public. This reduced the north-south length of the Atrium concept by about 95 feet, reduced the height of the east bar by nearly 40 feet and the west bar by nearly 20 feet, and decreased the required parking structure capacity. Reducing the size of the facility allowed VA to modify the site plan to locate taller buildings and service components at the north and west edges of the site, away from residential areas. The VBA building was re-located to the north and the higher parking structure re-located closest to Brownsboro Road.

With a design goal of achieving the Leadership in Energy and Environmental Design (LEED) rating of Silver, the building would utilize innovative energy recovery systems, proactive stormwater management, exterior building materials and design, and heat island and light reduction strategies that respect the neighborhood and its environs.

Figure 2-6 shows the proposed exterior appearance of the four-story east bar, which would contain the main entrances and face the adjacent residential neighborhood to the east.

Figure 2-5. Atrium and Courtyard.

Source: URS/SmithGroup 2014a.

Figure 2-6. Proposed Exterior Concept for Front Elevation (East Bar).

2.2.1.2 VA Medical Center

The VAMC facilities would occupy approximately 898,500 square feet in both the west and east bars (URS/SmithGroup 2014b).

The medical center would employ approximately 1,750 persons when operating at full capacity, including staff from the existing facility and new hires. The inpatient areas (capacity of 104 beds) would operate 24 hours every day. Most administrative, outpatient diagnostic and treatment, and facility support activities would operate primarily during general business hours: Monday through Friday except holidays, from approximately 8 a.m. to 4 p.m.

2.2.1.3 VBA Regional Office Building

The VBA regional office building would occupy approximately 132,000 square feet in the east bar (URS/SmithGroup 2014b). The building would provide office space for 400 individuals, consisting of an estimated 357 VA employees and 43 Veterans service organization representatives (URS/SmithGroup 2014c). The VBA building would have a rectangular-shaped footprint with four floors and a partial lower level.

2.2.1.4 Central Utility Plant

A central utility plant would be separate from and located immediately southwest of the medical center building, and would contain the equipment to power, heat, and cool the VAMC facilities. It would provide the following utility services to the hospital basement through a direct-connecting utility corridor (URS/SmithGroup 2014a):

- Chilled water
- Heating water
- Medium pressure steam for hospital kitchen equipment
- Steam condensate return system
- Domestic cold water
- Domestic soft cold water
- Domestic hot water
- Domestic hot water recirculation
- Medical compressed air
- Medical vacuum
- Oxygen
- Fire protection water
- Emergency power generation
- Normal/redundant power source

The central utility plant would be buffered from the residential properties to the east by distance, other structures, and landscaping. Options are being evaluated to provide services to the non-mission critical VBA building both as systems tied into the VAMC central utility plant or separate systems at the VBA; details would be developed as the design for the proposed facility progresses.

To provide emergency backup in the case of loss of electrical power from the municipal utility, the power plant for the VAMC would house five 2.5-megawatt diesel generators and automatic switching equipment to provide standby generator capacity to support the mission critical facilities onsite during utility power failure (estimated to require just over 9 megawatts total capacity, with one additional generator and associated switchgear to meet the VA's electrical design requirements) (URS/SmithGroup 2014a; Oculus 2013).

Dual-fuel (natural gas / #2 fuel oil) condensing water boilers would provide the heating water to be distributed throughout the hospital to serve perimeter heating systems, heating coils at the air handling units, reheat coils at the air terminal units, and cabinet unit heaters at the vestibules and stair towers. Dual-fuel steam boilers would generate steam to supply the laundry (as needed, see Section 2.2.1.6), domestic water heating plant, humidification, nutrition services/canteen, and sterile processing department; the steam system is expected to be efficient for these locations due to their fairly even year-round load profile and close proximity of these areas to the central utility plant (URS/SmithGroup 2014a).

The physical plant would also house a chilled water generation plant, with four 1,000-ton water-cooled centrifugal chillers (three operating and one standby) plus space for expansion (URS/SmithGroup 2014a). Four double-cell, induced-draft cooling towers will be installed on the roof of the chilled water plant to support the four chillers.

The standby generators and dual-fuel steam and water boilers combined requirement for #2 fuel oil to supply mission critical requirements is the amount required to operate the equipment for 10 days in January (URS/SmithGroup 2014a). This fuel would be stored in five 40,000-gallon underground storage tanks adjacent to the southwest corner of the central utility plant.

2.2.1.5 Geothermal System for VBA Building

A geothermal heat pump system is proposed to serve the VBA regional office building. A geothermal heat pump system, also called a ground source heat pump or geoexchange system, is an electrically powered system that utilizes the ground as a large heat source or heat sink. The system takes advantage of

the constant ground temperature and thermal mass of a site's underlying geology. The system utilizes the Earth as a heat source in the winter as a heat sink in the summer.

The system proposed for the VBA building is a vertical bore closed loop system. A closed loop system does not extract nor come into direct contact with groundwater. Instead, a bore hole contains piping that is grouted into place. A heat transfer fluid, in this case consisting of water with small amounts of additives, would be circulated within the piping through the underground bores and back to the surface. A chemical shot feeder system would provide antimicrobial treatment, pH buffering, and corrosion inhibition for the heat transfer fluid in the closed loop system. The temperature of the fluid changes as it loops through the underground system. The warmed or cooled fluid, depending on the season, exchanges its heat in an above-ground refrigerant loop system, heating or cooling forced air that is ducted throughout the building.

It is estimated that 150 geothermal bores extending 400 feet deep are required to fully serve the VBA building. Each bore requires 400 square feet of surface space, on a 20-foot by 20-foot grid spacing, to provide a sufficient heat sink / heat source capacity. The preliminary site plan places the proposed geothermal bores in two groupings, one north of the VBA building and the other north of the north parking deck, both within the perimeter drive. A sample test bore would likely be drilled in each of these two areas during the design development phase, to more specifically determine thermal conductivity of the bores and to help refine the depth recommended for the field.

2.2.1.6 Laundry

The laundry would be located at the southwest corner of the west bar, accessible to the medical center and the central utility plant. Steam could be supplied by the adjacent central utility plant, but the design team is evaluating options to reduce the requirement for steam equipment in the laundry in support of achieving LEED Silver certification.

2.2.1.7 Site Lighting

Lighting designs would be dictated in part by safety and security requirements. The design concept states that lighting fixtures planned along the perimeter of the campus should be the same style as other neighborhood site lighting fixtures. Exterior lighting would be controlled to reduce light pollution (URS/SmithGroup 2013).

2.2.1.8 Parking Decks

The Atrium concept includes two parking structures, one each at the north and south ends of the campus, with a total capacity for 3,000 vehicles. The north deck would have nine levels; it would be primarily for use by patients, VAMC visitors, and those using VBA regional office services. The south deck would have six levels; it would be primarily for staff parking, but also available for use by patients and visitors.

Almost all of the campus parking would be provided in these two parking decks. The additional small amount of surface parking would include 15 spaces in a surface parking lot at the southwest corner of the site, 4 parking spaces for recreational vehicles west of the north parking deck, and 4 vehicle inspection spaces located near the security gate at the main entrance.

2.2.1.9 Site Access and Circulation

Vehicular

Vehicles would enter and exit the campus from Brownsboro Road at the north edge of the site. Ambulances and service, delivery, and maintenance vehicles would use a right-turn-only lane upon entering the campus and continue to the three-lane western perimeter road that services the ambulance entrance, loading docks, central utility plant, laundry, and other maintenance functions. Two other entrance lanes would continue along the eastern side of the campus to access the north parking garage, main patient/visitor drop-off entrance, and the south parking garage. The eastern perimeter road would be a divided drive with turnarounds and a traffic circle at the south end. Two exit lanes to Brownsboro Road and Northfield Drive would be part of the main entrance configuration.

An emergency access drive from Carlimar Lane would be located at the south edge of the property. This entry would be gated, locked, and accessible only when emergency vehicles could not access the main entrance on Brownsboro Road (such as in the case of a traffic accident or other road blockage).

Transit and Pedestrian

The Transit Authority of River City (TARC) provides public transportation through the area adjacent to the site. TARC Route 15 Market runs along Brownsboro Road and Northfield Road. The master plan for the replacement VAMC recommended that this route be realigned to enter the site from Brownsboro Road and serve both the VBA regional office and the medical center. If the bus route is extended into the site, a bus stop would be located between the VBA and main hospital entrances. Buses would then be able to head south to the traffic circle to turn around and exit the site.

Pedestrian access to the campus would be co-located with the vehicle entrance from Brownsboro Road. Sidewalks would provide pedestrian connections to Brownsboro Road, parking decks, and campus facilities. Canopies and covered sidewalks at drop-off locations and between parking decks and entry lobbies would be provided for user comfort and safety. Sidewalks would be constructed to meet *Architectural Barriers Act* guidelines and VA standards. The installation of pedestrian crossing facilities outside of the VA campus, such as signals, ramps, and pavement markings at the vehicle entrance from Brownsboro Road, would be subject to state and municipal plans in conjunction with improvements of the I-264 interchange at Brownsboro Road. Pedestrian access to Carlimar Lane is not planned.

2.2.1.10 Service / Deliveries

The loading dock for deliveries and shipping would be located along the western side of the campus between the west bar and the expressway. It would include 10 to 14 bays with recessed docks. These bays would be sized to accommodate full-sized tractor trailers. Loading docks would be covered and connected with an at-grade walk to the hospital and the laundry.

2.2.1.11 Physical Security Measures

An eight-foot or higher perimeter fence would meet VA standards for mission critical facilities. Located along the property line, the fence is envisioned to be a nine-foot tall black ornamental metal picket fence around the entire perimeter.

2.2.1.12 Stormwater Management

Approximately 65 percent of the site would be covered with impervious surfaces (buildings, roads, sidewalks). The Louisville and Jefferson County Metropolitan Sewer District (MSD) requires that site stormwater discharges be limited to the pre-development rates. Stormwater collection would be provided by a combination of surface and sub-surface detention basins.

Three surface dry-type detention basins and four subsurface storage tanks would temporarily impound water for gradual discharge. Two surface detention basins would be located at the north end of the site, and one at the south end. Three subsurface tanks would be placed along the west side of the site and one in the southeast corner

Water detained in the basins and subsurface tanks would be discharged at the allowed discharge rates. Stormwater discharge from the site would be directed toward the storm sewer system ditch maintained by the Kentucky Transportation Cabinet (KYTC) along Watterson Expressway, along the western property boundary.

2.2.1.13 Utilities

Utilities would be routed from off site to the central utility plant and then to each of the buildings on campus through an underground tunnel.

Sanitary Sewer

The MSD has stated that the sanitary sewer system has sufficient capacity to accept discharge from the new facility, subject to Department of Water approval, based on an average daily flow of 170,500 gallons and a peak flow of 875,000 gallons per day. The connection to the MSD sewer system would be at the southwest corner of the site at an existing manhole within the Carlimar Lane right-of-way.

An underground sanitary sewerage holding tank would be installed in the southwest corner of the site, to store a minimum of four days of hospital flows and seven days of “disaster-mode” central utility plant flows (the minimum required for a mission critical facility). The sewerage holding tank would have a capacity of 565,000 gallons, and would be approximately 90 feet in diameter and about 15 feet deep. Once sewer service is restored, an exterior dual pump lift station would lift the stored sewerage, allowing the contents to empty by gravity into an onsite manhole and into the MSD system.

Water

Domestic and fire protection water service would be provided by the Louisville Water Company (LWC), who has indicated there is adequate system looping and capacity to serve the new medical center. There would be two points of connection to the city system to ensure continuous service. Connections would be to the water mains in Brownsboro Road and Carlimar Lane. These two source mains would connect to the water tower (see below) and provide for site distribution via a 12-inch main along the west side and a 10-inch main along the east side of the property, connecting to 8-inch east-west water service lines serving the facilities. A fire hydrant would be located at least every 300 feet, in accordance with VA requirements.

A water tower would be located in the northwest section of the site. The water tower capacity would be based on the VA requirements to hold a minimum of 96 hours of domestic water use (approximately 674,000 gallons, allowing for 25 percent future expansion) plus 120,000 gallons of fire suppression water (URS/SmithGroup 2014a). The water tower design could be multi-column, composite or hydropillar, or

fluted pillar; a multi-column tower is the current recommendation of the VA's design consultant, based on cost considerations for a tank of the required size.

Natural Gas

Natural gas would be provided by the Louisville Gas and Electric Company (LG&E). Natural gas primary service would be extended from LG&E's natural gas main along Brownsboro Road to the central utility plant. Separate connections and metering for the VBA would be provided from this primary service extension. A second, redundant service would also be required to serve the central utility plant and medical center as mission critical facilities. This second service would be coordinated with LG&E, and could possibly come from the highway right-of-way.

Communications

Telecommunications and data would be provided by AT&T Kentucky. Service connections would be along Brownsboro Road. The hospital would require redundant service in a separate distribution separated by at least 100 feet. The primary service would be routed from Brownsboro Road to the hospital, and the redundant service may come from either the highway right-of-way or from Carlimar Lane. The VBA would have separate telecommunication/data service from Brownsboro Road. Distribution to other buildings would come from the hospital.

Electricity

Electrical service would be provided by LG&E. There is no nearby electrical source capable of serving this site. However, there are three possible locations from which primary and secondary services can be extended to the campus. To accommodate the dual and independent service needs of the medical center as a mission critical facility, service would need to be provided from two separate sources. The three potential source locations are:

1. Taylor Substation: This substation is approximately one mile west of the site along Brownsboro Road. Minor upgrades to this facility would be required and it would have the ability to serve approximately six megawatts of power along a new circuit extension from the substation to the site along Brownsboro Road.
2. Lyndon Substation: This substation is located approximately 3.5 miles from the site, at Ormsby Road and Railroad Road. The substation currently has no capacity to service this site. It would require a substation expansion (limited space) and a 3.5-mile extension of a single circuit to accommodate the campus.
3. New Substation: LG&E has purchased property at the southwest corner of the I-71 interchange with US 42. This site can have a new substation built to meet the capacity needs of the new medical center campus, and a new circuit can be extended approximately 1.5 miles to the site.

LG&E has stated their commitment to providing service to the new medical center, and once their analysis is complete, they are confident they would be able to provide a single service source to the site at its cost. A separate dual service feed would be at the VA's expense. Under any of the three options, the two sources to the site would be brought in from the north along Brownsboro Road. The primary line would be brought to two locations, and a primary switch gear at each location would allow extension to the central utility plant along separate routes.

Each primary and redundant service site would require a minimum of 100 feet separation. Each would be routed to the central utility plant in concrete-encased duct banks along the east and west perimeter roads. Electrical distribution would come from the central utility plant and be routed to each location requiring service. The hospital, as a mission critical facility, would require two service leads: primary service routed in concrete-encased ducts and redundant service routed through the utility tunnel from the central utility plant.

In accordance with the VA's intention to achieve a LEED Silver certification, photovoltaic (solar) panels for additional electrical energy generation would be installed on the roofs of the two parking decks, as well as the roof of the VBA building (URS/SmithGroup 2014a).

2.2.1.14 Site Landscaping

There would be approximately 13.6 acres of green space on the site. Landscape materials would be appropriate to the climate, consider maintenance, and include a mixture of lawn, ground cover/perennials, shrubs, and trees. Landscaping on the site would be based on site use patterns and would follow the Concentric Plant Zones guidance as identified in the VA's *Site Development Design Manual* (VA 2013):

- Inner Plant Zone – close proximity to high use and high visibility areas, such as drop-offs and building entries. Plantings in this area would include landscape beds with four-season interest, ornamental trees, and some shade trees. Low water irrigation would be used in this zone.
- Intermediate Plant Zone – parking areas, access drives, and areas between buildings and other areas that would not be as visible or heavily used. Lower levels of landscape could include ornamental trees at focal points and significant intersections, shade trees along the boulevard and other roads, and shade trees along sidewalks for user comfort in hot summer months. Irrigation would not be provided in these zones.
- Outer Plant Zone – areas at the perimeter of the site. Where screening is not needed, the lowest amount of landscape materials would be installed in this zone, and would typically focus on shade trees in lawn areas. Along the expressway, evergreen screening trees would be installed to minimize views and buffer sound. To provide some screening between the VA facilities and the residential neighborhoods on the east and south sides, a combination of shade and ornamental trees would be planted, to form a row within the perimeter fence.

"Crime Prevention Through Environmental Design and Unobstructed Space" principles, particularly for visibility, would be followed in the landscaping of all areas of the campus (URS/SmithGroup 2014a). Lighting, video surveillance, emergency telephones, intrusion detection systems, and VA police operations will also contribute to the site security measures.

Roof gardens with low maintenance plant materials and rain harvesting strategies for irrigation are included in the design, as well as the potential for a terraced community garden in a courtyard south of the atrium (URS/SmithGroup 2014a).

2.2.1.15 Construction and Operation Milestones

All potential scheduling for the proposed construction and operation of the replacement Louisville VAMC is subject to change, due to factors such as the timing and availability of federal budget actions and appropriations, adjustments to construction planning and phasing, and construction interruptions or delays due to unforeseen events. The sequence of milestones in Table 2-3 can be used as a general reference for the timing of activities related to Alternative A, subject to these external factors.

Table 2-3. Proposed Milestones for Construction and Operation (Preliminary*).

2017—Early Winter: EIS Record of Decision Published		
2017—Spring: Final design complete		
2017—Fall: Construction begins (Phase 1)		
	Central utility plant	
	Hospital	
	Site work: blasting (if needed) underground utilities water and sanitary storage stormwater management	circulation roads surface parking rough grade earthwork
2019—Spring: Construction continues (Phase 2)		
	VBA	
	Parking decks	
	Laundry	
	Site work: finish grading walks plazas plantings	site lighting landscape site furnishing other site finishes
2022–Construction complete		
Late 2022/Early 2023–Replacement VAMC campus opens		

*Subject to budget/appropriations, further construction planning/schedules, unforeseen events.

In accordance with current Congressional requirements and VA policy, the U.S. Army Corps of Engineers (USACE) will provide project support including review, comment and coordination through the design development phase; will take responsibility for design management through completion of construction documents; and will provide solicitation, award, and management of the construction contract. Thus, throughout this EIS, where the text states that "VA" would undertake a construction-related action, it is understood that USACE may undertake the action on behalf of VA. Also, where VA policies or specifications are cited related to construction activities, a comparable USACE policy or specification may be applied, achieving a comparable level of environmental protection.

2.2.1.16 Mitigation Measures and Best Management Practices

Alternative A includes mitigation measures to avoid, minimize, or compensate for adverse impacts; and best management practices (BMPs). Chapter 5, Mitigation, provides a consolidated list of the mitigation measures and BMPs that are incorporated into Alternative A. VA would also comply with all applicable federal, state, and local regulations during construction and operation.

2.2.2 Alternative B – Replacement VAMC at St. Joseph Site

Under Alternative B, VA would construct and operate a new replacement medical center and VBA regional office following the Atrium conceptual design (Figure 2-2) at the St. Joseph Site in Louisville, Kentucky, approximately 10.8 miles east of the existing Louisville VAMC. The approximately 99-acre site is located east of I-265 and south of Factory Lane in Louisville, spanning street addresses 13508, 13605, and 13615 Factory Lane. The property is mostly unimproved, agricultural land with abandoned farmstead outbuildings in the northwestern portion of the site. The southern and central portions of the site are relatively level; the northern portion slopes downward to a creek that crosses the northern portion of the property.

The site organization, details of facilities, and design concept would be similar to those described for Alternative A, adjusted as needed to accommodate site-specific features. These details are presented in Sections 2.2.1 through 2.2.14. A general representation of the same site plan on the St. Joseph Site is provided in Figure 2-7. Some site-specific differences would include the following:

- Vehicles would enter and exit the campus from Factory Lane at the north edge of the site. Ambulances and service, delivery, and maintenance vehicles would use a right-turn-only lane upon entering the campus and continue to the three-lane western perimeter road that services the ambulance entrance, loading docks, central utility plant, laundry, and other maintenance functions. Two other entrance lanes would continue along the eastern side of the campus to access the north parking garage, main patient/visitor drop-off entrance, and the south parking garage. The eastern perimeter road would be a divided drive with turnarounds and a traffic circle at the south end. Two exit lanes to Factory Lane would be part of the main entrance configuration.
- Secondary and/or emergency access drive(s) would be located at Bush Farm Road (eastern boundary) and/or Terra Crossing Boulevard (southern boundary). If designated as emergency access only, the entry would be gated, locked, and accessible only when emergency vehicles could not access the main entrance on Factory Lane (such as in the case of a traffic accident or other road blockage).
- TARC does not currently provide public transportation to the site. Route 31 is the nearest bus route, providing infrequent bus service (6:40 a.m., 7:06 a.m., 8:44 a.m., 3:28 p.m., 4:12 p.m. and 5:02 p.m.) to O'Bannon Station Way in the Eastpoint area, which is on the west (opposite of the site) side of I-265. This bus stop is about 2.2 miles by road from the St. Joseph Site. VA could consider operating a shuttle between this bus stop and a replacement VAMC campus, but this schedule would be more helpful to commuting employees than to Veterans whose appointments could occur throughout the day.
- Pedestrian access to the campus would be co-located with the vehicle entrance from Factory Lane. Sidewalks would provide pedestrian connections to Factory Lane, parking decks, and campus facilities. Canopies and covered sidewalks at drop-off locations and between parking decks and entry lobbies would be provided for user comfort and safety. Sidewalks would be constructed to meet Architectural Barriers Act guidelines and VA standards. Pedestrian crossing facilities outside of the VA campus, such as signals, ramps, and pavement markings at the vehicle entrance from Factory Lane, would be subject to state and municipal plans, but as this is not currently a pedestrian-intensive area, any such improvements would be unlikely. Pedestrian access at a secondary entrance at Bush Farm Road and/or Terra Crossing Boulevard could be considered, but would not be provided at an entrance designated for emergency access only.
- Approximately 23 percent of the site would be covered with impervious surfaces (buildings, roads, sidewalks). MSD requires that site stormwater discharges be limited to the pre-

development rates. Stormwater collection would be provided by a combination of surface and sub-surface detention basins. A combination of surface dry-type detention basins and subsurface storage tanks would temporarily impound water for gradual discharge, with their locations and discharge details to be determined should VA select this site for the replacement VAMC. Water detained in the basins and subsurface tanks would be discharged at the allowed discharge rates.

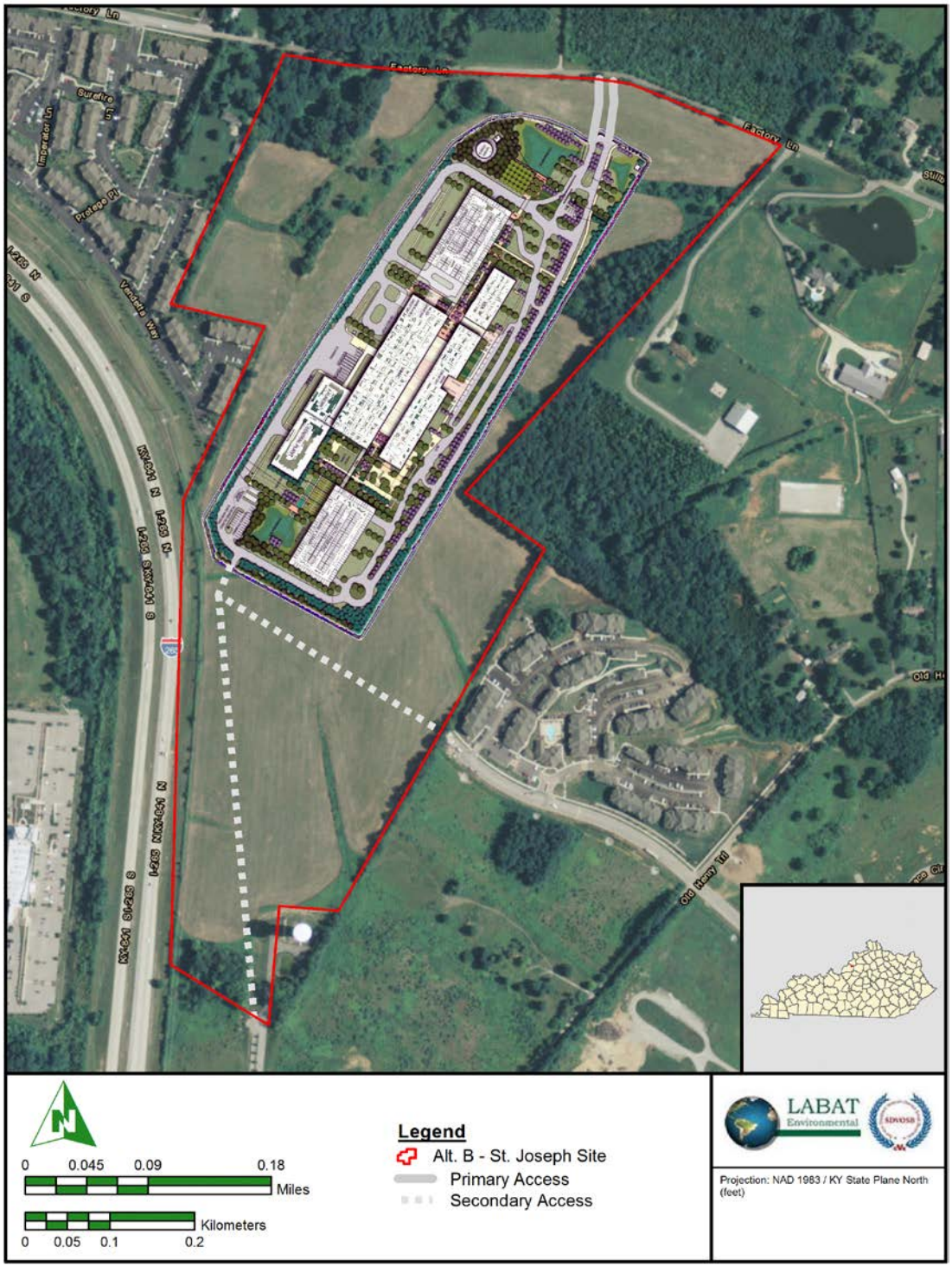

Figure 2-7. Site Plan Representative Illustration at St. Joseph Site

- LWC supplies potable water to the St. Joseph Site. LWC indicated that it can provide water supply to the St. Joseph Site along the northern boundary (Factory Lane) where there is an existing 12-inch water main. A one-million-gallon municipal water supply tower stands outside of the southern boundary of the St. Joseph Site.
- MSD supplies stormwater and sanitary sewer service to the St. Joseph Site. MSD also stated that the Floyds Fork Treatment Plant was recently expanded and has ample capacity to accept new inflow from a VAMC at the St. Joseph Site.
- LG&E supplies the natural gas and electrical services to the St. Joseph Site. LG&E stated that natural gas and electric services are available for the proposed development.
- AT&T provides telecommunication services to the St. Joseph Site.
- There would be approximately 78 acres of green space on the site.

2.2.3 Alternative C – Continue Operating from Existing VAMC (No Action)

No Action consists of not constructing and operating a replacement VAMC and VBA regional office. VA would continue to operate the existing Louisville VAMC at 800 Zorn Avenue, all eight CBOCs, and the VBA regional office at 321 West Main Street, as illustrated in Figure 1-1.

The existing VAMC is more than 60 years old. It is an 816,000-square-foot hospital located on a 47-acre suburban site approximately five miles east of downtown Louisville. The existing VAMC site contains approximately 22 acres of land in the central and northwestern portions of the site that are fully developed with the eight-story to nine-story main hospital building, several smaller buildings, and approximately 1,200 surface-level parking spaces. Areas of the site to the south, east, and northeast of the developed areas steeply slope down from the developed areas and are heavily wooded (Figure 2-8). More than 1,600 employees provide specialized hospital-based and outpatient care to Veterans living in the Louisville service area.

The No Action Alternative would challenge VA's ability to safely, economically, and consistently provide high-quality, integrated healthcare and services to the region's Veterans and, therefore, would not meet the purpose of and need for action.

Figure 2-8. Existing Louisville VAMC Campus.

2.3 Alternatives Identified but Not Evaluated in Detail

Two additional potential sites for a replacement VAMC campus were initially considered by VA: the Fegenbush Site and the Downtown Site. These two sites were eliminated from further consideration and thus not further evaluated in this EIS for the reasons summarized below.

2.3.1 Fegenbush Site

The Fegenbush Site is located east of Fegenbush Lane and north of South Hurstbourne Parkway, approximately 8.0 miles southeast of the existing Louisville VAMC. This site consists of approximately 51 acres of unimproved, mostly agricultural land. The majority of the property is relatively level, with a moderate slope to the south in the southern portion of the property. Strips of wooded land separate agricultural tracts in the central portion, and there are remnants of farm buildings in this portion. The southwestern portion is wooded land. A possible wetland area is located in the western portion of the site. Table 2-1 in Section 2.1 includes a summary of additional characteristics of the Fegenbush Site.

Feasibility and environmental review of the Fegenbush Site identified the following factors that indicated the Fegenbush Site is not a reasonable alternative:

- Two archaeological sites are known to be located onsite but have not been assessed. Archaeological survey and further consultation with the State Historic Preservation Officer under Section 106 of the National Historic Preservation Act would be required to determine suitability of the site for construction. The availability of other site options did not support investment in further site assessment to determine suitability.
- Biological surveys would also have been required because the site is within potential Indiana bat habitat range and site habitat may support running buffalo clover and Kentucky glade cress.
- Although a primary electrical feed would be available for the proposed VAMC, installation of the mandatory backup feed would require extensive reworking of existing lines and additional right of way.
- The location also has fewer local amenities (such as shopping and restaurants) and is farther from the nearest major highway (two miles north of I-265 and three miles east of I-65) compared to the other greenfield sites.

Due to these issues, the Fegenbush Site was eliminated from further consideration.

2.3.2 Downtown Site

The Downtown Site is just to the southeast of the University of Louisville Healthcare Center, approximately 3.0 miles southwest of the existing Louisville VAMC. It is generally bounded by South Jackson Street to the west, East Madison Street to the north, South Clay Street to the east, and East Broadway Street to the south. This site includes approximately 29 acres and encompasses five city blocks with associated roads and alleys. The Downtown Site is an assemblage of 80 parcels owned by 20 property owners. It is developed with several commercial and retail buildings and parking lots. Table 2-1 in Section 2.1 includes a summary of additional characteristics of the Downtown Site.

Feasibility and environmental review of the Downtown Site identified the following factors that indicated the Downtown Site is not a reasonable alternative:

- The site assemblage contains part of Phoenix Hill Historic District, including eight structures that contribute to the historic district or are individually eligible for listing on the NRHP, and Green Street Baptist Church, which is listed on the NRHP. Further consultation under Section 106 of the National Historic Preservation Act would be required.
- Green Street Baptist Church, a Louisville landmark and historic African American Baptist Church that predates emancipation, has repeatedly reiterated their desire to resist relocation.
- The site includes several current and historic operations of environmental concern: gas stations, auto repair shops, dry cleaners, and industrial operations. A thorough Phase II environmental site assessment and asbestos survey would be required. Soil in the northern portion of the site is contaminated with lead. Approximately 20 older buildings onsite likely contain asbestos. Remediation (at minimum, underground storage tank removal and proper handling of soils) and asbestos abatement would be required, coordinated with the Kentucky Department for Environmental Protection and the City of Louisville.
- Rush hour traffic in the site area is high, although the transportation infrastructure is likely adequate for a new VAMC with minimal improvements.
- The primary electrical feed to the proposed VAMC would require a new substation.

Due to these issues, the Downtown Site was eliminated from further consideration.

2.3.3 Reconfiguration of Existing VAMC

Reconfiguration (consisting of renovation and expansion) of the existing Robley Rex VAMC was deemed not feasible. As further detailed in Section 1.2, the specific factors that preclude renovating or making major additions to the existing VAMC are:

- Hospital infrastructure that does not allow renovations to meet current design criteria
- No appreciable vacant space on the campus for expansion
- Parking that is limited to 1,200 spaces with no place to expand.

Additional considerations that would have to be addressed to accommodate a reconfiguration include the following:

- The VAMC is within range of a known Indiana bat maternity colony and site habitat may support running buffalo clover; both the Indiana bat and the running buffalo clover are protected under federal (Endangered Species Act) and state law. Habitat values are moderate to high in the eastern, non-developable portion of the site. Surveys would be needed because noise and vibration from construction activities could indirectly affect the Indiana bat. Coordination with the U.S. Fish and Wildlife Service would be required, possibly including formal consultation under Section 7 of the Endangered Species Act.
- The existing VAMC hospital was built in 1952 and is eligible for listing on the NRHP. Consultation with the State Historic Preservation Office under Section 106 of the National Historic Preservation Act would be required before any renovations or changes to the facility.
- The site is located in a high karst potential area with known sinkholes. Rock blasting and extra building foundation efforts would likely be required for any new construction.

Reconfiguring the existing VAMC would significantly impair Veteran medical care for the duration of construction and was eliminated from further consideration.

2.3.4 Alternative Site Concepts

Three other conceptual designs for the Brownsboro Road campus were evaluated, as illustrated in the thumbnail sketches below:

The Interlock concept (upper left) was initially selected as the preferred design option. However, subsequent review of the criteria suggested that critical departmental adjacencies and other factors were not properly prioritized and weighted, and that the evaluation criteria needed to be modified accordingly. Once VA and its design team agreed on the revised criteria, the concepts were reevaluated against the modified criteria; the design team also developed the new Atrium concept which was evaluated against the modified criteria. The Wave (right), Interlock, and Campus (lower left) concepts were all discarded and the new Atrium concept was ultimately selected as the preferred concept in late 2013. Its design and layout was determined to be more functional and efficient than the other concepts.

2.3.5 Alternatives not within Scope

Several scoping comments were received recommending that the VA-owned Brownsboro Site not be developed as a replacement VAMC, but instead be used as an expansion area for the Zachary Taylor National Cemetery. This would not meet the purpose of and need for action to address the inadequacy of the conditions and configuration at the existing Louisville VAMC facilities, which have reached the end of their serviceable lives and are inadequate to effectively and efficiently meet the expanding needs of VA's healthcare mission and VBA services in the region. This suggestion was not further evaluated in this EIS.

A scoping comment suggested that Veterans should be able to go to any doctor or hospital they wish and carry a Veteran insurance card that directly billed to the VA. The nationwide Veterans Choice Program (www.va.gov/opa/choiceact/) has made such an option available to Veterans who choose to receive care from community providers. However, this program has not replaced the VA system of Veterans healthcare facilities. At this time, such a program does not meet the purpose of and need for the current project.

2.4 Comparison of Environmental Impacts of Alternatives

Table 2-4, beginning on the following page, summarizes the potential environmental impacts of the evaluated alternatives by environmental resource based on the analysis presented in Chapter 4 of this EIS

2.5 VA's Preferred Alternative

VA's preferred alternative is Alternative A, which would construct and operate a new replacement medical center and VBA regional office at the Brownsboro Road site in Louisville, Kentucky. Alternative A would meet the purpose of and need for action. The Brownsboro site is considered to be a better location given its easy interstate access, and its more central location to downtown Louisville, including closer proximity to the partner hospital at the University of Louisville. Site acquisition and development challenges were also minimized given a single owner and single parcel of land that could accommodate the entire facility.

2.6 Environmentally Preferable Alternative

Based on the potential environmental impacts identified in Chapter 4 and the available mitigation identified in Chapter 5, the environmentally preferable alternative is Alternative C, No Action. Alternative C would have negligible or no effects to any of the resource evaluated in this EIS, whereas effects for Alternatives A and B range from none to major, depending on the resource (see table summarizing impacts by alternative in the Executive Summary; see also detailed discussions in Chapter 4). However, Alternative C does not meet the purpose of and need for action.

Table 2-4. Summary of Impact Analysis.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Meets purpose of and need for action	Yes	Yes	No
Aesthetics	During early stages of construction, presence of heavy equipment and unfinished stages of site preparation and building construction would temporarily impact visual quality. Over the long term, the VAMC would create a noticeable contrast to the existing landscape, obstruct or detract from what some observers would consider a scenic view, or introduce visual elements that some observers would consider out of scale or character with the surrounding area. The extent of these adverse effects would range from negligible to major, depending on the observer.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.
Air Quality	Construction and operation emissions would comply with all permit requirements and regulations. Particulate emissions during construction are below the *de minimis* threshold level. Air quality impacts would be negligible.	Impacts similar to Alternative A.	No construction impacts at Zorn Avenue site. Operation impacts similar to Alternatives A and B.
Cultural Resources	No adverse effects to archaeological features or historic properties.	No adverse effects to archaeological features or historic properties.	No adverse effects to archaeological features or historic properties.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Geology and Soils	Construction-related impacts to geology and soils would be minor and short-term. Adherence to vibration standards and requirements of the Kentucky Revised Statute 350.430 for blasting operations (if any) would avoid damage to nearby buildings and houses. Loss of prime farmland soil would not be significant. Erosion and sedimentation impacts would be minimized through implementing construction best management practices and conforming with permit requirements. No operation-related impacts would occur.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.
Hydrology and Water Quality	Potential construction impacts to surface water quality and groundwater are predicted to be localized and negligible with implementation of the required control and protection plans. Site wide stormwater management would meet predevelopment discharge rates for the 2-, 10-, 25-, and 100-year storm events in accordance with the Metropolitan Sewer District Design Manual and should therefore have minimal adverse effects on the hydrology of the project site and adjacent properties, surface water quality, and the rate of groundwater recharge.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Wildlife and Habitat	Negligible impact to common wildlife species (displacement of individuals). Nesting bird survey would identify migratory birds to be protected if construction begins between April and July. To avoid impacts to roosting northern long-eared bats, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of any northern long-eared bats from the site. No other listed species or critical habitat onsite.	Negligible impact to common wildlife species (displacement of individuals). Nesting bird survey would identify migratory birds to be protected if construction begins between April and July. To avoid impacts to roosting Indiana or northern long-eared bats, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of any northern long-eared bats from the site. Land disturbance for construction would be preceded by a site survey for running buffalo clover and any appropriate mitigation in consultation with the U.S. Fish and Wildlife Service, including a management plan to avoid impact during operations. No other listed species or critical habitat onsite.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Noise	Construction-related noise and vibration impacts would be adverse, short-term, and potentially moderate in magnitude (approaching EPA threshold levels), depending on the receptor type and proximity to the project location. Operation-related noise impacts would be minor.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in construction-related impacts similar to Alternatives A and B, while operation-related impacts would depend on the specific type of development.
Land Use	Temporary disturbances to access to adjacent land uses could occur during construction. The conceptual design for building setbacks, perimeter fence, and landscape buffer would be compatible with the existing zoning. The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations in existing zoning, and would therefore be an adverse impact to adjacent land use.	Temporary disturbances to access to adjacent land uses could occur during construction. The conceptual design for building setbacks, perimeter fence, and landscape buffer would be compatible with the existing zoning. The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations of the zoning of the northeastern part of the site, and would therefore be considered an adverse impact to the adjacent residential land use.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B within existing or similar zoning requirements.
Floodplains and Wetlands	No impacts	No impacts to floodplains. Small onsite wetland areas would require coordination with U.S. Army Corps of Engineers to ensure no impacts or mitigate impacts.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Socioeconomics	Short-term beneficial effects to local economy during construction and operation. No long-term adverse effects to property values or local crime rates are expected.	Impacts similar to Alternative A.	No impacts.
Community Services	Negligible impacts during construction, no impacts from operation.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Development of Brownsboro and St. Joseph sites by others would result in impacts similar to Alternatives A and B.
Solid Waste and Hazardous Materials	Short-term negligible impact due to increased presence and use of petroleum and hazardous substances during construction, minimized through best management practices and regulatory compliance. Negligible adverse long-term impacts during operation as solid waste and hazardous materials would be managed in accordance with VA policies and federal, state, and local regulations.	Impacts similar to Alternative A.	No impacts at Zorn Avenue location. Impacts from development at Brownsboro and St. Joseph sites by others would depend on the specific type of development.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Transportation and Traffic	Construction contractors would provide a plan to manage site use, including limited onsite parking during construction; the approved plan may also mitigate impacts to local traffic to the extent it decreases the number of construction worker vehicles commuting to the site. Would not significantly contribute to the degradation of levels of service at the intersection of US 42 at KY 22 (Brownsboro Road at Northfield Drive), which will operate at LOS E with the VAMC and LOS F without the VAMC at this location. With interchange improvements at Watterson Expressway (I-264) and US 42, the levels of service would be acceptable (LOS C) at the entrance to and exit from the VAMC campus (KY 22 at I-264 eastbound ramp split). Travel times and intersection delays would be significantly improved by the planned construction of the single-point urban interchange. Travel times and intersection delays would be comparable for either Alternative A or a similar mixed use development that would be anticipated to locate at the Brownsboro Site.	The start of construction would create the possible need for the addition of a signalized intersection where one does not currently exist (at the proposed VAMC entrance on Factory Lane). There are overall major travel time impacts under Alternative B compared to future conditions without the VAMC, particularly for VAMC traffic exiting the site and going to the I-265 interchange at LaGrange Road.	Negligible impacts. Traffic at the existing VAMC at the Zorn Avenue location would increase over time commensurate with projected future background traffic growth on Zorn Avenue.

Resource / Issue	A – Replacement VAMC at Brownsboro Site	B – Replacement VAMC at St. Joseph Site	C – No Action
Utilities	Sufficient capacity exists and connections can be developed without significant environmental impacts for utility services to be provided to the site.	Sufficient capacity exists and connections can be developed without significant environmental impacts for utility services to be provided to the site.	No impacts.
Environmental Justice	No impacts.	No impacts.	No impacts.

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3.0 AFFECTED ENVIRONMENT

Each section of this chapter addresses one of the 15 environmental resources or issues for which impacts are assessed in this environmental impact statement (EIS):

- Aesthetics
- Air quality
- Cultural resources and historic properties
- Geology and soils
- Hydrology and water quality
- Wildlife and habitat
- Noise
- Land use
- Floodplains and wetlands
- Socioeconomics
- Community services
- Solid waste and hazardous materials
- Transportation and parking
- Utilities
- Environmental justice

The regulatory and policy framework relevant to each resource is summarized, and the existing conditions are described; these discussions provide a current baseline for analyzing potential impacts. The last subsection of this chapter lists the projects and activities ongoing or proposed in the area near each alternative, regardless of who is implementing them, that could contribute to cumulative impacts with the Department of Veterans Affairs' (VA's) proposal.

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3.1 Aesthetics

Aesthetics include the physical (natural and manmade) and biological features of the landscape that contribute to the visual character or scenic quality of an area. Scenic quality is a measure of the visual appeal of the landscape, which is subjective and varies among observers.

3.1.1 Regulatory and Policy Framework

There are no federal standards relating to aesthetics or visual resources that apply to Department of Veterans Affairs (VA) actions. Consideration is given to local codes and ordinances even if VA is not legally required to comply with them.

3.1.1.1 VA Guidance

The VA Site Development Design Manual (VA 2013) addresses a wide range of issues, including the aesthetic value of incorporating natural and manmade landscapes in the planning and designing of VA facilities. This guidance addresses the development and use of landscape plans, orientation and layout of building functions, and management of stormwater to create aesthetically pleasing facilities.

3.1.1.2 Local Design Standards

The Louisville-Jefferson County Land Development Code (LMG 2006) compiles the regulations that implement the goals and objectives within the Cornerstone 2020 Comprehensive Plan (LJCPC 2000). The Land Development Code contains standards related to maintaining and improving the aesthetic qualities of different land use, building and site design, landscaping, and signage. The standards for building setbacks and heights, landscaping, exterior lighting, and building facades contribute to aesthetic quality.

3.1.2 Current Conditions

3.1.2.1 Brownsboro Site

The Brownsboro Site is a vacant parcel of 34.9 acres within a suburban area. Features surrounding the site that contribute to the visual character and scenic quality of the area include the Watterson Expressway (Interstate 264 [I-264]), commercial and office buildings, and power poles with overhead transmission wires.

The Brownsboro Site is visible to drivers northbound on Watterson Expressway and drivers exiting east onto Brownsboro Road at U.S. Highway 42 and Kentucky Route 22, occupants of the office building off the northeast corner of the site, and users of the three to five retail and commercial business on the north side of Brownsboro Road directly across from the site. The site is also visible to the residents located along the north and south site boundaries, with visibility varying based on the density of the trees lining the site and the landscaping maintained by the residents.

The short segment (approximately 675 feet) of Brownsboro Road along the north boundary of the site is part of a scenic corridor designated by the Cornerstone 2020 Comprehensive Plan. Commercial uses and power poles with overhead transmission wires front this segment of Brownsboro Road. Approximately half of the segment has been cut off from the site by the slip ramp exit from Watterson Expressway.

Sources of nighttime light in the area surrounding the Brownsboro Site include security lights for the parking lot and office building off the northeast corner of the site and businesses on the north side of

Brownsboro Road, along with the street lights along Brownsboro Road, the Watterson Expressway, and at intersections.

3.1.2.2 St. Joseph Site

The St. Joseph Site is a vacant parcel of approximately 100 acres within a suburban area. Features surrounding the site that contribute to the visual character and scenic quality of the area include the Gene Snyder Freeway (I-265), multiple-family residential units, a municipal water tower, wooded areas, agricultural fields and pasture, natural drainages and wetlands, and power poles with overhead transmission wires.

The St. Joseph Site is visible to drivers on the Gene Snyder Freeway (west of site) and on Factory Lane (north of site), and occupants on the upper floors of the medical building (southwest of site) located west of the freeway. The site is also visible to the residents of the multiple-family units located adjacent to the west and east site boundaries, with visibility varying based on the density of the trees along the edge of the site.

Sources of nighttime light in the area surrounding the St. Joseph Site include security lights for the parking lot and medical building west of the site and for the residential units on the west and east side of the site, along with the street lights along Gene Snyder Freeway.

3.1.2.3 Existing Zorn Avenue VAMC

The Robley Rex VA Medical Center (VAMC) campus on Zorn Avenue is a parcel of approximately 100 acres within a suburban area. The VAMC sits atop a bluff overlooking the Ohio River to the north. Features on and surrounding the site that contribute to the visual character and scenic quality of the area include the VAMC buildings, the I-71 freeway, single- and multiple-family residential units, a water tower, wooded draws and drainages, and power poles with overhead transmission wires.

The Zorn Avenue site has limited visibility to drivers on I-71 (north of the site) or Zorn Avenue (east of the site). The hospital building and water tower are visible to the residents of the single- and multiple-family units located to the west and east, with visibility varying based on the density of the trees and the elevation.

Sources of nighttime light in the area surrounding the Zorn Avenue VAMC include security lights on the VAMC campus and street lights along I-71 and Zorn Avenue.

3.2 Air Quality

This section describes the air quality regulations applicable to the proposed action and the regional air quality in the Louisville metropolitan area. The region of influence for the evaluation of air quality impacts includes the project site and immediate surroundings, extending to the project county and neighboring counties for regulatory compliance.

3.2.1 Regulatory and Policy Framework

3.2.1.1 National Ambient Air Quality Standards

As required by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) set National Ambient Air Quality Standards (NAAQS) for selected criteria pollutants considered harmful to public health and the environment: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM), and lead (40 Code of Federal Regulations [CFR] Part 50), with an averaging time and data form for determining compliance specific to each standard. Primary NAAQS are limits set to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary NAAQS protect public welfare, including protection against visibility impairment and damage to animals, crops, vegetation, and buildings.

Based upon ambient air quality monitoring data, EPA designates areas within each state as one of the following:

- In attainment for those NAAQS that are being met
- In non-attainment for any NAAQS that are being exceeded
- In maintenance if the area was reclassified from non-attainment to attainment and is therefore subject to an EPA-approved maintenance plan
- Unclassified if no determination has been made

For areas of non-attainment, a federally enforceable state implementation plan is implemented with the goal of achieving attainment.

"General conformity" requirements apply to all federal actions (EPA 2015a). The purpose of the General Conformity Rule is to ensure that:

- Federal activities do not cause or contribute to a new violation of a NAAQS
- Actions do not cause additional or worsen existing violations of or contribute to new violations of the NAAQS
- Attainment of the NAAQSs is not delayed

The general conformity regulations (40 CFR 93 Subpart B) establish *de minimis* thresholds for criteria pollutants and precursors. A "conformity determination" is required for each criteria pollutant or precursor where the total of direct and indirect emissions of the criteria pollutant or precursor in a nonattainment or maintenance area caused by a federal action would equal or exceed any of the *de minimis* thresholds (40 CFR 93.153(b)).

3.2.1.2 Clean Air Act Title V Operating Permit Requirements

Title V of the Clean Air Act regulates emissions of 188 specific hazardous air pollutants (HAPs) (40 CFR Part 70). Sources that meet the definition of a "major source" of either the criteria pollutants (regulated by the NAAQS) or HAPs must apply for and obtain a Title V operating permit. For HAPs, a major source is one that has the potential to emit more than 10 tons per year of any individual HAP, or 25 tons per year of any combination of HAPs. For criteria pollutants, the definition of a major source depends on the region's attainment status: in an attainment area, a major source is one that has a potential to emit more than 100 tons per year of any criteria pollutant, with more restricted levels at various classifications of non-attainment for some criteria pollutants (40 CFR 70.2).

The Louisville Metro Air Pollution Control District (APCD) issued a Title V permit for the existing Louisville VA Medical Center (VAMC), Permit No. 29112-12-O/C (APCD 2012). Units covered by the Title V permit are described in Table 3.2-1.

Table 3.2-1. Description of Title V Permitted Units.

Unit	Description	Maximum Operating Rate
U1	Three emergency generators E1 – Caterpillar/3406 E2 – Cummins/DFGB-5670308 E3 – Caterpillar/3412	E1 – 400 kW/500 hp, 100 hours per year (non-emergency) E2 – 600 kW/900 hp, 100 hours per year (non-emergency) E3 – 668 kW/896 hp, 100 hours per year (non-emergency)
U2	Three boilers E4 – Johnston/PFTA350-4LG2005 E5 – Johnston/PFTA350-4LG2005 E6 – Johnston/PFTA350-4LG2005	14.33 million BTU per hour heat input Natural gas fired, #2 fuel oil backup
U3	Refueling system IA1 – 10,000-gallon fuel storage tank IA2 – E-85 refueling operation	IA1 – 10,000-gallon storage IA2 – 13.7 gallons per hour

Key: BTU = British thermal units; hp = horsepower; kW = kilowatt.
Source: APCD 2012.

3.2.1.3 New Source Review

The New Source Review (NSR) permitting program, under Title I of the Clean Air Act, is a preconstruction permitting program that assures that air quality is not degraded by new stationary emission sources or modified old sources. There are three types of permits issued under this program:

- "Prevention of Significant Deterioration" NSR permits are required for new major sources or a major source making a major modification in an attainment area or unclassified area.
- Nonattainment NSR permits are required for new major sources or major sources making a major modification in a nonattainment area.
- Minor source NSR permits are for new construction or modifications with emissions that do not meet the thresholds of major sources.

3.2.1.4 State and Local Regulations and Coordination

The Louisville Metro APCD implements the federal Clean Air Act in the Louisville metropolitan area and works in partnership with EPA, the Kentucky Department for Environmental Protection – Division for Air Quality, and the Indiana Department of Environmental Management. States may establish air quality standards that are more stringent than the federal standards (40 CFR 50.2); Kentucky has adopted the federal standards. Air quality regulations are included in Kentucky Administrative Regulations, Title 401, Energy and Environment Cabinet – Department for Environmental Protection.

3.2.2 Current Conditions

3.2.2.1 Regional Climate

The climate of the Louisville region is classified as humid subtropical according to the Koppen climate system and is characterized as mild, with no dry season, and hot summers (NWS 2015). Average minimum and maximum temperatures measured at the Louisville International Airport are 26.8 and 43.0 degrees Fahrenheit (°F) in January and 69.9 and 88.7 °F in July. The average annual precipitation is 44.9 inches. Monthly precipitation is generally constant and non-seasonal, ranging from 3.05 to 5.27 inches, with a low annual average of 12.5 inches of snowfall occurring from October to April (NCDC 2015). Prevailing winds are from the south, with average wind speeds less than10 miles per hour (Weather 2015).

3.2.2.2 Regional Attainment Status for National Ambient Air Quality Standards

All three alternative locations are within Jefferson County, Kentucky. The St. Joseph Site is near Jefferson County's border with Oldham and Shelby Counties. Jefferson County was previously designated as a non-attainment area for $PM_{2.5}$ (PM less than 2.5 micrometers in diameter). EPA subsequently determined that the area was in attainment with the 1997 $PM_{2.5}$ NAAQS by the attainment date of April 5, 2010 (Federal Register 76(173):55544, September 7, 2011).

EPA continues to list Jefferson County as a nonattainment area for $PM_{2.5}$ under the 1997 standard (EPA 2015b). The Kentucky Energy and Environment Cabinet submitted a revised state implementation plan and maintenance plan to EPA to designate Jefferson County as in attainment for $PM_{2.5}$ in 2012 (EEC 2012). EPA lowered the standard in 2013, and the state again recommended the designation of Jefferson County as attainment/unclassified with the lower $PM_{2.5}$ standard (EEC 2013). The state provided additional data and again recommended designation of Jefferson County as in attainment in 2015 (EEC 2015). EPA has not yet acted on the recommendations.

A portion of southwestern Jefferson County (outside of the project areas) is currently a non-attainment area for sulfur dioxide (EPA 2015b).

3.2.2.3 Emission Sources

Regional Sources

The National Emission Inventory provides estimates of criteria and hazardous air pollutant emissions from all air emissions sources. The latest available National Emissions Inventory is from 2011. At the time of this writing, the 2014 inventory, the next inventory to be completed in the three-year cycle, is not yet available (EPA 2015c). Economic sectors emitting more than 100 tons per year of a pollutant in Jefferson County are shown in Table 3.2-2.

Louisville VAMC Facility Emissions

Fuel combustion at the Louisville VAMC produces air emissions. Specifically, three boiler units (primarily fed with natural gas), three emergency generators, and a refueling system are permitted under Title V Air Quality Permit Number 29112-12-O/C (APCD 2012).

Operation and maintenance vehicles supporting the VAMC also produce air emissions, including total suspended particulate and fuel combustion by-products. These mobile sources are not individually

permitted, and their operation is not continuous. Proper equipment maintenance prevents unacceptable emissions from these mobile sources.

Greenhouse gas (GHG) emissions attributable to existing Robley Rex VAMC operations can be estimated using accounting tools developed by the GHG Protocol. Three scopes of GHG emissions are defined as follows (WRI 2004):

- Scope 1: Direct GHG Emissions – GHG emissions from sources that are owned or controlled by the reporting entity, including fuel consumption and operation of fleet vehicles.
- Scope 2: Electricity Indirect GHG Emissions – GHG emissions from the generation of purchased electricity consumed by the reporting entity.
- Scope 3: Other Indirect GHG Emissions – GHG emissions from activities of the reporting entity but from sources not owned or controlled by the reporting entity, including employee commuting, use of services, and waste transportation and disposal.

Scope 1: Direct GHG emissions from operation of the existing Robley Rex VAMC predominantly include the consumption of natural gas and #2 fuel oil. In fiscal year (FY) 2015, VAMC operations consumed 51,847,200 cubic feet of natural gas and 22,654 gallons of #2 fuel oil (VA 2015). Operation of fleet vehicles for landscaping and facility maintenance also account for GHG emissions; however, such GHG emissions were assumed to be negligible when compared to GHG emissions from natural gas and #2 fuel oil consumption and were not included in the facility estimate.

The Scope 1 GHG emissions calculation tool developed for the service sector by the GHG Protocol was used to estimate direct GHG emissions (WRI 2016). FY 2015 Scope 1 GHG emissions from existing Robley Rex VAMC operations are calculated at 3,006 metric tons of carbon dioxide equivalents (t $CO_{2\ eq}$) (LEI 2016a).

Scope 2: In FY 2015, VAMC operations consumed 17,596,715 kilowatt-hours of electricity supplied by Louisville Gas and Electric. The Scope 2 GHG emissions calculation tool developed for the service sector by the GHG Protocol was used to estimate electricity indirect GHG emissions (WRI 2016). FY 2015 Scope 2 GHG emissions from existing Robley Rex VAMC operations are calculated at 14,521 t $CO_{2\ eq}$ (LEI 2016b).

Table 3.2-2. 2011 National Emissions Inventory Data.

Pollutant	Economic Sectors Emitting More than 100 Tons per Year in Jefferson County (aggregated for all sources in county)
2,2,4-Trimethylpentane	bulk gasoline terminals, natural gas combustion, oil and gas production, mobile sources
Acetaldehyde	biogenics (vegetation and soil), commercial cooking, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Ammonia	fertilizer application, livestock waste, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, mobile sources, solvent use, waste disposal
Benzene	bulk gasoline terminals, commercial cooking, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, gas stations, cement manufacturing, chemical manufacturing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Carbon dioxide	prescribed fire, wildfire, mobile sources

Pollutant	Economic Sectors Emitting More than 100 Tons per Year in Jefferson County (aggregated for all sources in county)
Carbon monoxide	biogenics (vegetation and soil), commercial cooking, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Ethyl Benzene	bulk gasoline terminals, commercial cooking, electric generation, industrial boilers, commercial and residential fuel combustion, gas stations, cement manufacturing, chemical manufacturing, metal processing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Ethylene Glycol	chemical manufacturing, solvent use, waste disposal
Formaldehyde	biogenics (vegetation and soil), commercial cooking, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Hexane	bulk gasoline terminals, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, gas stations, cement manufacturing, chemical manufacturing, oil and gas production, mobile sources, solvent use, waste disposal
Hydrochloric acid	electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, pulp and paper, solvent use, waste disposal
Methane	prescribed fire, wildfire, mobile sources
Methanol	biogenics (vegetation and soil), electric generation, industrial boilers, chemical manufacturing, oil and gas production, mobile sources, solvent use, waste disposal
Methyl isobutyl ketone	electric generation, commercial fuel combustion, chemical manufacturing, solvent use, waste disposal
Nitrogen oxides	biogenics (vegetation and soil), agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Nitrous oxide	mobile sources
PM_{10}	agriculture, commercial cooking, construction, dust from paved roads, dust from unpaved roads, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, mining, pulp and paper, solvent use, waste disposal
$PM_{2.5}$	agriculture, commercial cooking, construction, dust from paved roads, dust from unpaved roads, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, mining, pulp and paper, solvent use, waste disposal
Sulfur dioxide	agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, cement manufacturing, chemical manufacturing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Toluene	bulk gasoline terminals, commercial cooking, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, gas stations, cement manufacturing, chemical manufacturing, metal processing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Volatile organic compounds	biogenics (vegetation and soil), bulk gasoline terminals, commercial cooking, agricultural field burning, prescribed fire, wildfire, electric generation, industrial boilers, commercial and residential fuel combustion, gas stations, cement manufacturing, chemical manufacturing, metal processing, oil and gas production, pulp and paper, mobile sources, solvent use, waste disposal
Xylenes (mixed isomers)	bulk gasoline terminals, electric generation, industrial boilers, commercial and residential fuel combustion, gas stations, cement manufacturing, chemical manufacturing, metal processing, oil and gas production, mobile sources, solvent use, waste disposal

Source: EPA 2015c.

Scope 3: Other indirect GHG emissions predominantly include vehicular emissions from commuting VAMC employees and vehicular emissions from patient use of VAMC services. Transportation and ultimate disposal of VAMC-generated wastes were assumed to be negligible when compared to GHG emissions from other transportation sources and were not included in the facility estimate.

The Scope 3 GHG emissions calculation tool developed for the service sector by the GHG Protocol was used to estimate other indirect GHG emissions (WRI 2016), using the following assumptions:

- Employee Transportation – 1,763 full-time equivalent employees, 1 passenger car per employee, 250 work days per year, 20-mile round trip commuting distance.
- Patient Transportation – 610,000 annual visits, 1 passenger car per patient visit, 20-mile round trip commuting distance.

FY 2015 Scope 3 GHG emissions from existing Robley Rex VAMC operations are calculated at 8,286 t $CO_{2\ eq}$ (LEI 2016c).

The total FY 2015 GHG emissions from existing Robley Rex VAMC operations are estimated at 25,813 t $CO_{2\ eq}$, or approximately 0.016 percent of the total GHG emissions for the state of Kentucky (CAIT 2016). Of the sources of GHG emissions inventoried and estimated, the generation of electricity purchased and consumed by the existing Robley Rex VAMC results in the most GHG emissions.

3.3 Cultural Resources

Cultural resources include both historic and prehistoric archaeological resources, as well as historic structures in the built environment.

3.3.1 Regulatory and Policy Framework

For purposes of analysis under the National Environmental Policy Act (NEPA), cultural resources encompass "historic properties" as defined in the National Historic Preservation Act (NHPA), "archaeological resources" as defined in the Archaeological Resources Protection Act, and "cultural items" as defined in the Native American Graves Protection and Repatriation Act. NEPA provides an overarching consideration of the human environment to address these cultural, historic, and archaeological resources, properties, and items (collectively referred to as "cultural resources" in this EIS).

Section 106 of the NHPA requires federal agencies to consider the effects of an undertaking on historic properties. "Historic properties" defined by the NHPA are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. A historic property may include artifacts, records, and remains related to and located within the property, and properties of traditional religious and cultural importance to a Native American tribe that meet the NRHP criteria.

3.3.2 Current Conditions

3.3.2.1 Brownsboro Site

The project area is located in northeastern Jefferson County, approximately 3.6 miles south of where Harrods Creek meets the Ohio River. The project area itself is a former farmstead, currently an empty field with no above-ground historic resources. Modern development surrounds the project area, from busy roads and highways (including Brownsboro Road and US 42 to the north and I-264 to the west) to shopping centers and subdivisions. Historic resources in the vicinity include several houses and other remnants of early nineteenth century farmsteads, now engulfed by mid-twentieth century residential, commercial, and ecclesiastical development.

In February 2012, the Brownsboro Road site, consisting of 13.6 hectares (34.2 acres), was surveyed in its entirety by a pedestrian survey supplemented with screened shovel testing (Eberwine et al. 2012a). The purpose of the survey was to identify and evaluate any archaeological resources that might be adversely affected by the proposed undertaking. Shovel tests were excavated every 20 meters in transects spaced 20 meters apart. A total of 369 shovel tests were excavated. One new archaeological site, 15Jf809, was documented during the survey.

Site 15Jf809 was at the location of a historic farm/residence and a prehistoric open habitation without mounds. It consisted of a low density scatter of early twentieth century historic artifacts and temporally undiagnostic prehistoric artifacts; however, one of the prehistoric artifacts was tentatively assigned to the Early Archaic Kirk Corner-Notched Cluster. The site was located where a previously documented but no longer extant historic structure (JF 486) once stood. The building was recorded as an early twentieth century residence. Shovel tests revealed prehistoric artifacts (one flake and one hafted biface) and historic materials (domestic refuse and architectural debris). The site was recommended as not eligible for listing on the NRHP because it was not considered to have the potential to provide important information about local or regional history or prehistory.

A historic resource survey in April 2014 documented above-ground resources 50 years of age or older located in or within 1,000 feet of the Brownsboro Site (Martinolich 2014). Fifteen cultural historic sites were identified within this area: two previously surveyed sites (JF 487 and 394), eight previously unrecorded sites (JF 2761–2768), and five previously unrecorded neighborhoods (JF 028–032). One previously recorded site within the project area was found to be demolished (JF 486). The individually recorded sites were two nineteenth century residences, two mid-twentieth century churches, a Ranch house, and five mid-twentieth century commercial buildings. The neighborhoods are all mid-twentieth century subdivisions featuring a combination of Ranch and Neocolonial style residences.

For a property to be eligible for listing in the NRHP, it must be at least 50 years old and possess both historic significance and integrity. Significance may be found in three aspects of American history recognized by these NRHP criteria:

A. association with historic events or activities,
B. association with important persons, or
C. distinctive design or physical characteristics.

A fourth criterion, D, which is the potential to yield important information in prehistory or history, is typically not used for above-ground resources. A property must meet at least one of the criteria for listing. Integrity must also be evident through historic qualities, including location, design, setting, materials, workmanship, feeling, and association.

Sites JF 487 and JF 2761–2768, and neighborhoods JF 028–032 were concluded to be not eligible for listing in the NRHP under Criterion A, B, or C due to lack of significant associations or a lack of integrity resulting from unsympathetic alterations. JF 394, the George Herr House, was listed in the NRHP in 1976 as part of the Herr-Rudy Family Houses nomination. The house remains eligible for NRHP listing for its associations with settlement patterns and early settlers in the area, and as an excellent example of an early Federal style residence.

In addition to these 15 documented properties, the Metro Louisville Historic Preservation Officer identified four other NRHP or National Historic Landmark sites located in the vicinity of the project but beyond 1,000 feet from the proposed project. These sites are JF 527, the Zachary Taylor House; JF 528, the Zachary Taylor National Cemetery; JF 593, the Taylor-Oldham-Herr House; and JF 395, the Taylor-Herr House, each of which was considered in the final evaluation of effects of the project. Figure 3.3-1 shows the location of these resources in relation to the Brownsboro Site.

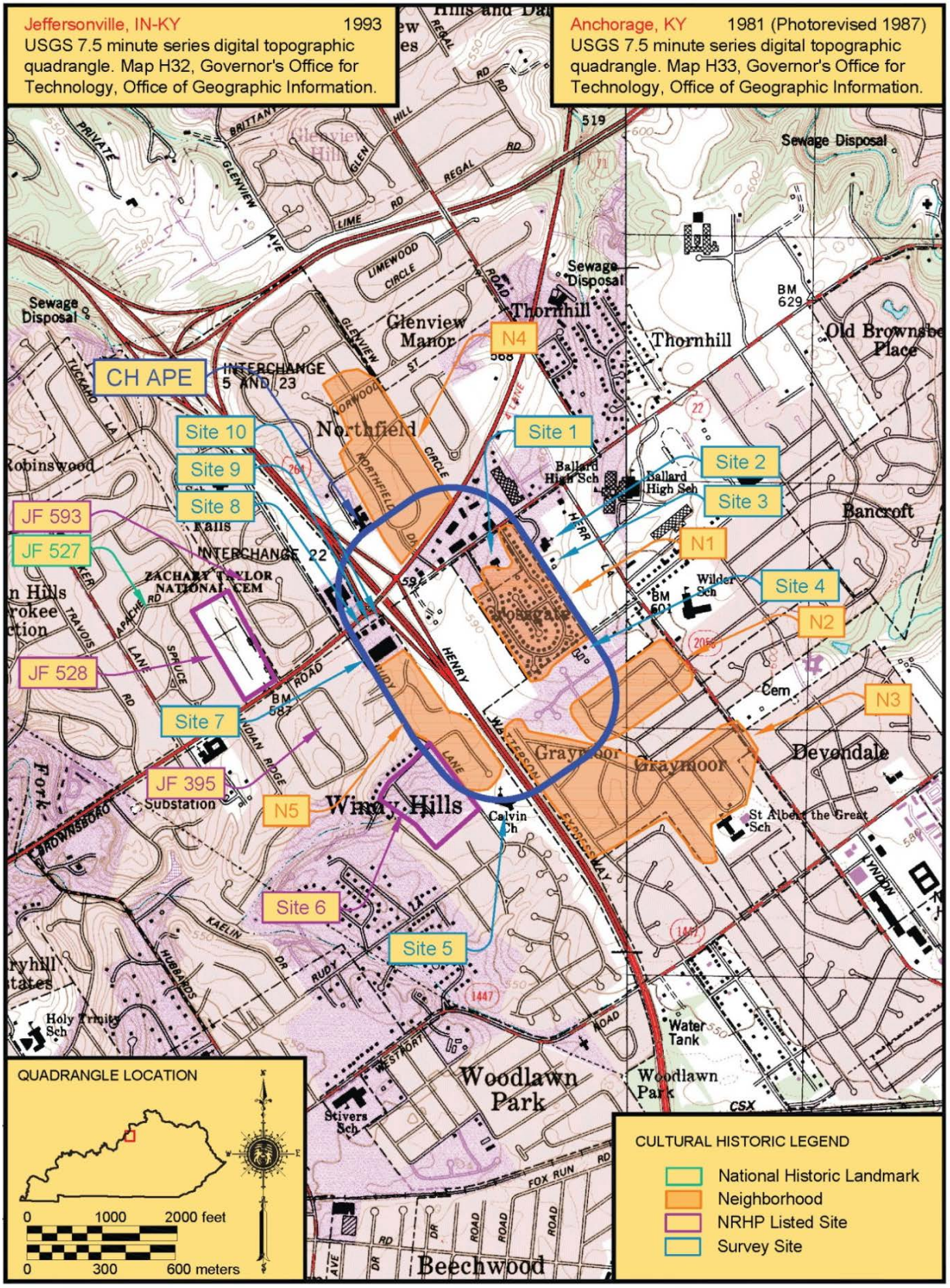


Figure 3.3-1. Historic Resources in the Vicinity of the Brownsboro Site.

3.3.2.2 St. Joseph Site

The St. Joseph Site is located in eastern Jefferson County, near the borders of both Oldham and Shelby Counties, which are 0.75 miles northeast and 1.5 miles east, respectively. The site is approximately 1.25 miles west-northwest of Floyds Fork, a tributary of the Salt River. The project area itself previously contained an early twentieth century residence in its northern half (demolished since 2010); it is mostly unimproved agricultural land with abandoned farmstead outbuildings in the northwestern portion. Development surrounding the site is typical of outer suburban areas, with a medical facility and municipal water tower to the south, an interstate expressway and multifamily residential development to the west, agricultural fields on the other side of Factory Lane to the north, and a church, apartment complex, and agricultural land to the east. Historic resources in the vicinity include two historic districts, five individual houses, and several other resources for which NRHP eligibility has not been assessed; see Figure 3.3-2.

A Phase I archaeological inventory survey of the site was conducted in 2012 (Eberwine et al. 2012b), consisting of a combination of controlled interval (grid) and judgmental subsurface testing, and site reconnaissance. The survey identified two cultural resources at the St. Joseph Site: one cultural resource locus (which does not qualify as an archaeological site) and one archaeological site. It was concluded that these cultural resources do not possess the qualities of significance defined by the National Register Criteria for Evaluation and do not present research potential. Thus, the survey report concluded that the St. Joseph Site does not contain cultural resources listed or eligible for listing in the NRHP, and no further investigations were recommended.

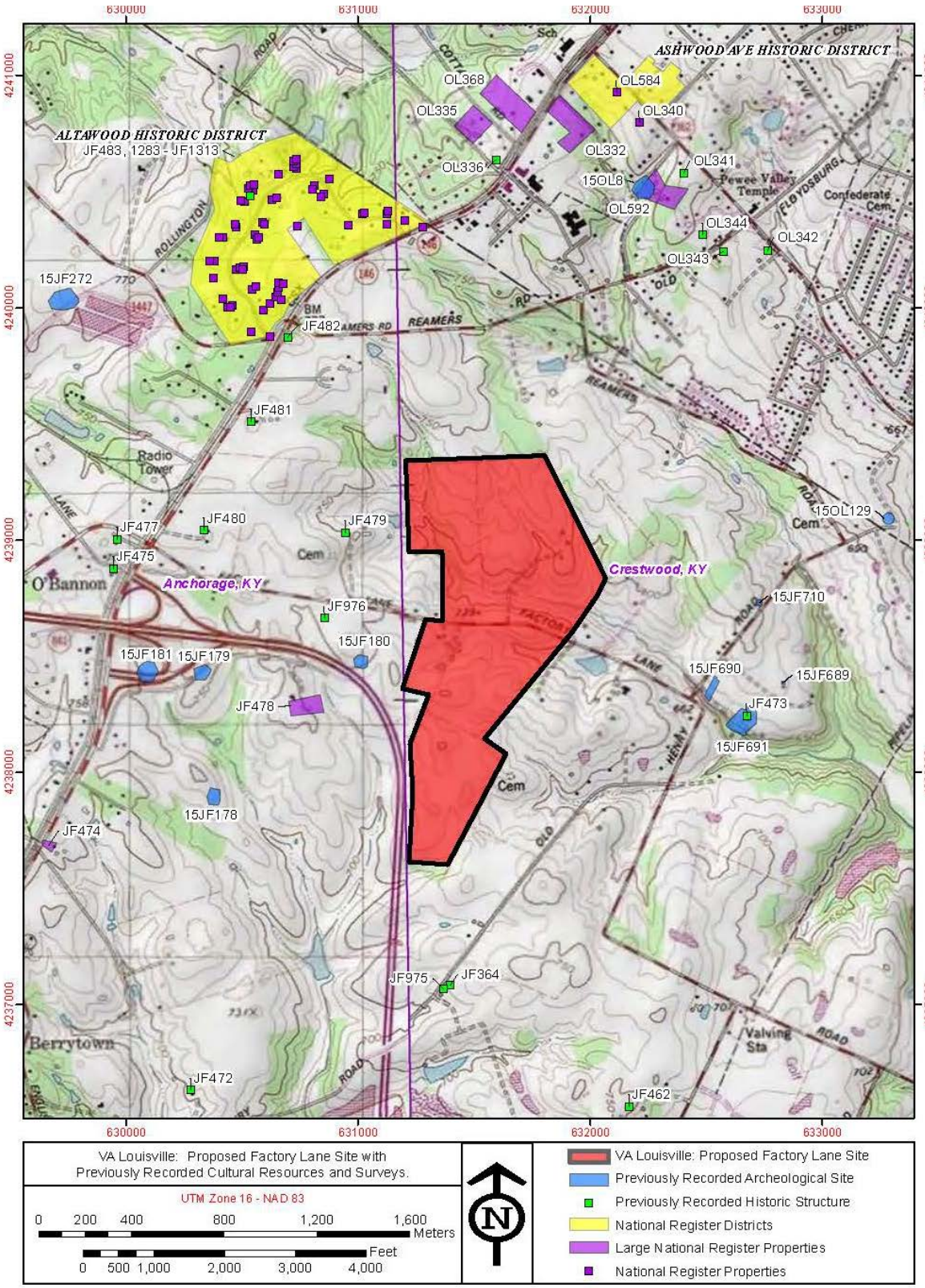
As summarized in Eberwine et al. (2012b), a total of 12 archaeological sites were identified within 1.2 miles of the St. Joseph Site. One of these, known as Evans Mound, was listed as destroyed (likely due to amateur collections) and no evidence of the site remains. Prehistoric and historic artifacts were recovered from at least eight sites of these sites. Of the 11 existing sites, 3 were determined as not eligible for the NRHP and the eligibility of the other 8 has not been assessed.

Seven properties listed on the NRHP were identified within 1.2 miles of the St. Joseph Site; all are more than one-half mile away. These properties consist of two historic districts and five individual properties:

- The Altawood Historic District encompasses 80 buildings, of which 61 are considered contributing elements.
- The Ashwood Avenue Historic District encompasses nine buildings, of which seven are considered to be contributing elements.

The five individual properties listed on the National Register are single residences:

- The Bondurant-Hustin House is a two-story, wood-framed house built around 1885.
- The Forrester-Duval House was constructed around 1908 and is one of the few larger houses that reflects the Craftsman style in Pewee Valley.
- Tuliphurst represents the best extant Gothic Revival residence within Oldham County.
- The William Alexander Smith House is a single dwelling constructed in the Italianate style in approximately 1860.
- The Otto F. Eitel House, a Bungalow/Craftsman-style home, was built in 1907.



Note: The St. Joseph Site as evaluated in this EIS comprises only the portion of the parcel south of Factory Lane in this figure.

Figure 3.3-2. Historic Resources in the Vicinity of the St. Joseph Site.

Eberwine et al. (2012b) noted that the two historic districts, located approximately 1 to 1.5 miles north of the St. Joseph Site, may be within the viewshed of the St. Joseph Site. However, site reconnaissance in 2015, after construction of an elevated municipal water tower just outside the southern end of the parcel. That water tower was not visible from any street within either historic district.

A total of 19 additional previously recorded structures greater than 50 years in age were identified by Eberwine et al. (2012b) within 1.2 miles of the St. Joseph Site. Fourteen of the structures were within Jefferson County, while the remaining five buildings fell within Oldham County. These resources included 15 residential structures, a barn, a church, a commercial building, and a farm complex. The NRHP eligibility had been assessed for only one of the identified buildings: the early nineteenth century Dorsey-O'Bannon House was previously listed on the NRHP. It subsequently was removed from the NRHP in 1991, as a result of being moved to a different location.

A follow-up check of the Kentucky SHPO files in September 2015 did not reveal any newly added historic resources within a half-mile radius in addition to those described above.

3.3.2.3 Existing Zorn Avenue VAMC

The existing Robley Rex VAMC campus on Zorn Avenue is one of many third generation U.S. Veterans hospitals. Its evaluation for NRHP eligibility is not final but indications are that the site is eligible. The campus itself is not known to contain any archaeological resources but no specific onsite surveys were reported.

The Zorn Avenue campus is about 0.25 miles south-southeast of the Louisville Water Company Pumping Station, a National Historic Landmark; about 0.2 miles west of the Mockingbird Valley Historic District, a residential neighborhood; and about 0.7 miles north of the Clifton and Crescent Hills Historic Districts, also residential neighborhoods. Two potential sites of archaeological resources were identified within a half-mile radius of the campus. Several individual NRHP-listed properties are just outside of a half-mile radius, including L&N Steam Locomotive #152 to the west, Repton (house) and Selema Hall to the south, and the Carrie Gaulbert Cox & Attilla Cox House (Ledgelawn) to the east. Additional historic structures that have not been evaluated for NRHP eligibility are in the vicinity. Figure 3.3-3 depicts the historic resources near the Zorn Avenue campus.

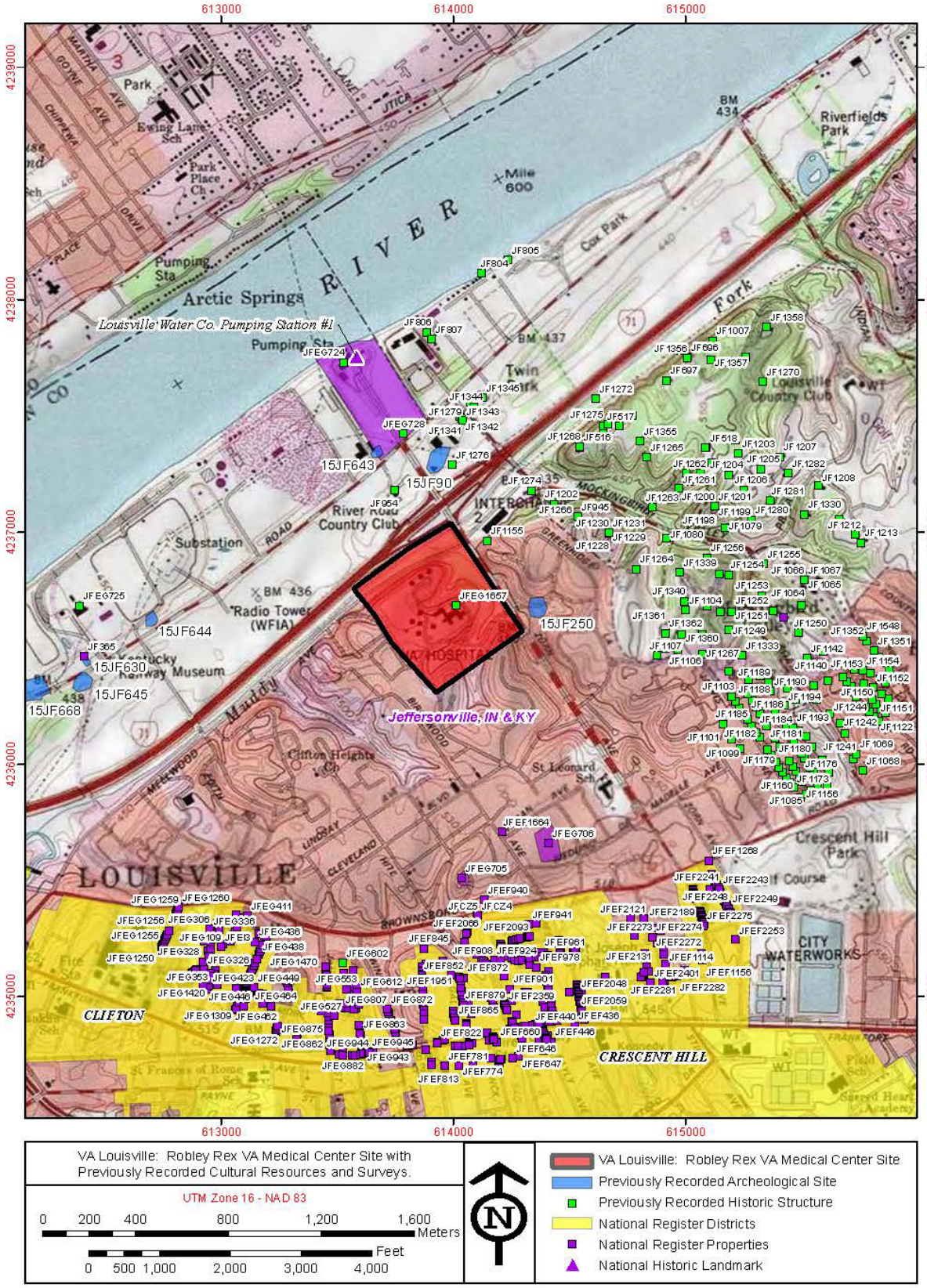


Figure 3.3-3. Historic Resources in the Vicinity of the Existing Robley Rex VAMC on Zorn Avenue.

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3.4 Geology and Soils

Geological resources consist of surface and subsurface materials. Within a given physiographic province, geologic resources are described in terms of topography and physiography, geology, soils, and, where applicable, geologic hazards.

Topography and physiography relate to the shape and arrangement of a land surface, including elevation and the position of natural and human-made features.

Geology is the study of the physical and dynamic history of the Earth and provides information on the structure and configuration of surface and subsurface features. Geologic data are based on field observations of the surface and borings to identify subsurface composition.

Soils are the unconsolidated materials overlying bedrock or other parent material. Soils are described by their type, slope, and physical characteristics. In some cases, soil properties must be examined for their compatibility with particular construction activities or types of land use.

The region of influence for the evaluation of impacts to geology and soils primarily includes the project site footprint.

3.4.1 Regulatory and Policy Framework

The Clean Water Act includes provisions that regulate soil erosion and stormwater runoff to navigable waters. The Act and its applicability to the proposed project is described in greater detail in Section 3.5, Hydrology and Water Quality.

The Earthquake Hazards Reduction Act was enacted to “reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program.” The act established the National Earthquake Hazards Reduction Program, led by the Federal Emergency Management Agency.

The Farmland Protection Policy Act was enacted to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Farmland includes prime farmland, unique farmland, and land of statewide or local importance. Land subject to the requirements of the Act do not have to be currently used for cropland, but can include forest land, pastureland, and cropland (NRCS n.d.).

Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, requires federal agencies to ensure that buildings (including both new construction and leases) are designed and constructed in accordance with appropriate seismic design and construction standards.

Executive Order 12941, Seismic Safety of Existing Federally Owned or Leased Buildings, adopted standards for assessing the seismic safety of owned and leased buildings and mitigating unacceptable seismic risks in those buildings.

The International Building Code provides minimum standards to protect the public safety, health, and welfare in regard to building construction. The Code was developed to consolidate existing building codes into one uniform code, and includes specifications related to soils and foundations.

VA Directive 7512, Seismic Safety of VA Buildings, establishes policy regarding the seismic safety of VA buildings and incorporates requirements established by Executive Orders 12699 and 12941.

The Louisville Metro Government Land Development Code (Chapter 4, Part 9) guides development on land within a karst-prone area, including geologic assessments conducted by a geologist or engineer licensed in Kentucky. Karstification is the creation of the cavities due to water dissolving carbonate rock (limestone) and may result in the formation of sinkholes.

3.4.2 Current Conditions

3.4.2.1 Regional Physiology and Seismicity

The Louisville area is located in the Outer Bluegrass physiographic region, which is characterized by deeper valleys with little flat land, as the bedrock is primarily composed of interbedded Ordovician limestones and shales that are more easily eroded (KGS 2012). The Outer Bluegrass region typically has low to moderate relief and soils that range from thick over limestones to thin over shales (USGS 2001).

Peak ground accelerations—an indicator of seismic event effects—in the Louisville area are relatively low (a two percent probability over 50 years of exceeding approximately 0.08 to 0.09 times the standard acceleration of gravity) (USGS 2014). Earthquakes have been relatively uncommon in most of Kentucky, with the majority of events occurring in westernmost Kentucky, associated with the New Madrid seismic zone (USGS 2001). Figure 3.4-1 depicts the regional locations of earthquakes (USGS 2012).

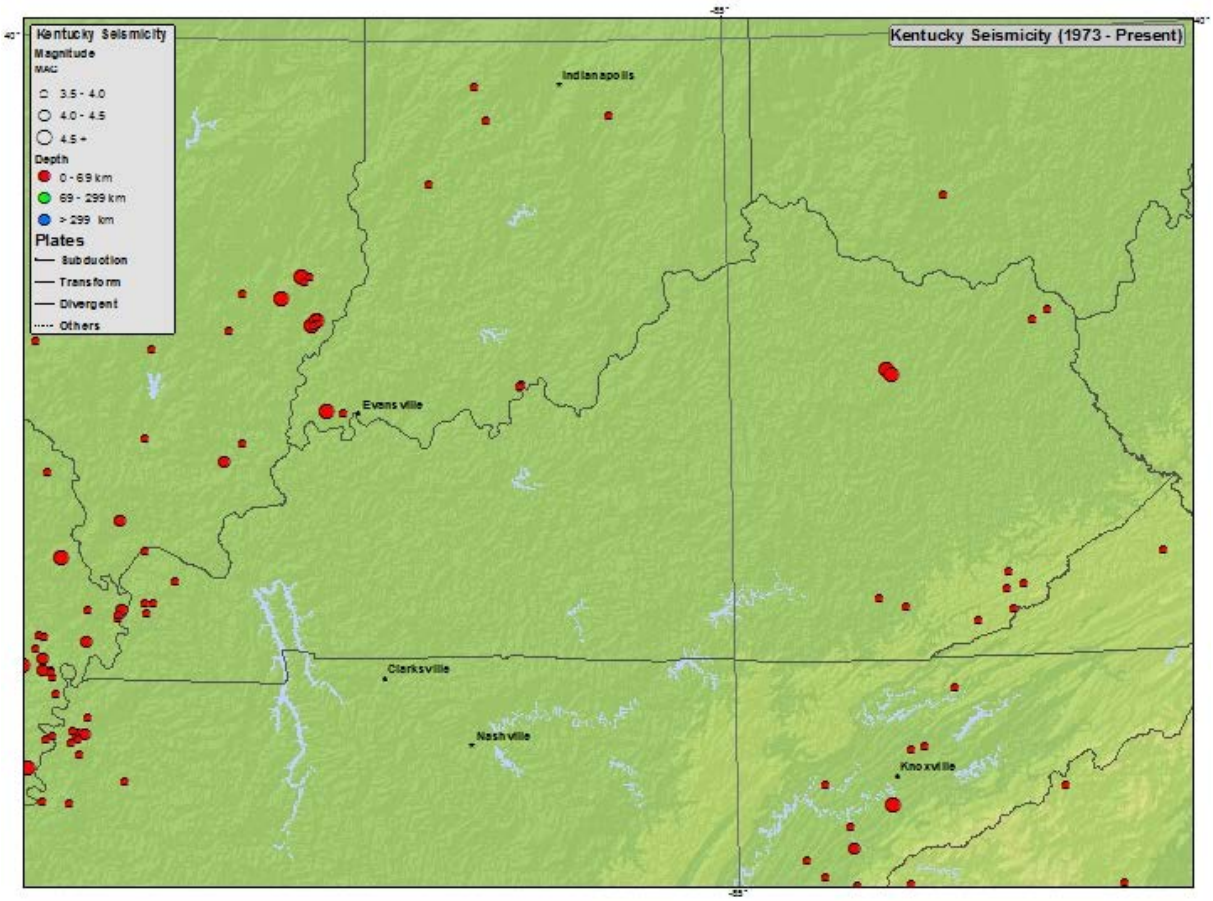


Figure 3.4-1. Earthquakes in Kentucky

3.4.2.2 Brownsboro Site

The Brownsboro Site is generally level with an elevation of approximately 585 to 595 feet above mean sea level (AMEC 2014). The topography of the site gently slopes from the north and east to the south and west (see Figure 3.4-2).

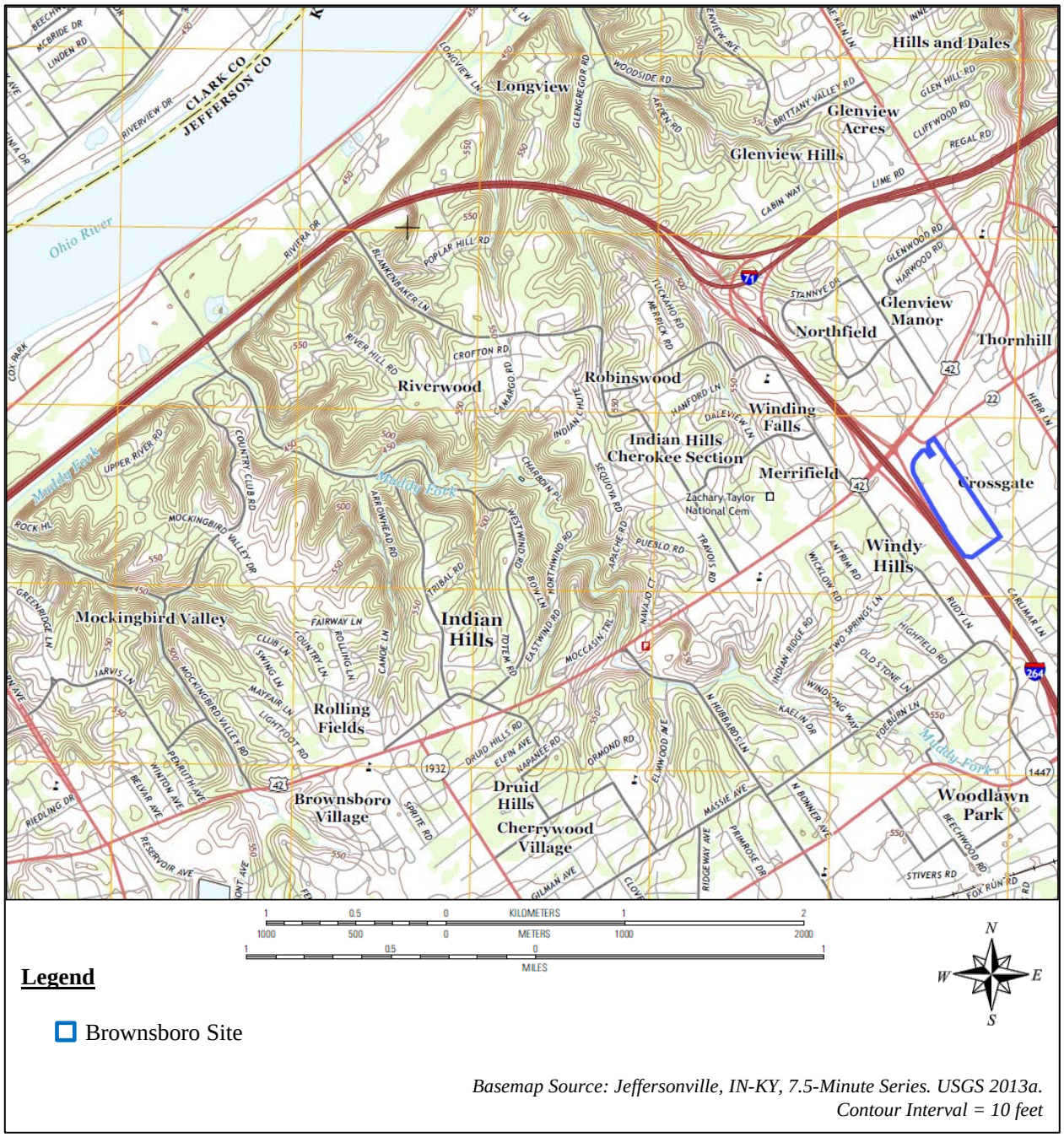


Figure 3.4-2. Topography: Brownsboro Site.

The geologic unit present at the Brownsboro Site is Devonian-aged Sellersburg and Jeffersonville Limestone (Figure 3.4-3, Geologic Code Dsj) (Kepferle 1974, KGS 2014). Based on the results of

geotechnical borings across the project site, the soil layer depth where bedrock was encountered was from 5.3 to 18.5 feet below ground surface, with typical depths of 8 to 12 feet (AMEC 2014). The top of rock elevation ranged from 574 to 584 feet, with an average elevation between 577 and 578 feet (AMEC 2014).

The Sellersburg and Jeffersonville Limestone geologic unit is characterized by a relatively high potential for karst, indicating that the limestone units may contain a high percentage of soluble minerals. Locations of potential sinkholes were derived from light detection and ranging (LiDAR) data by the Kentucky Geological Survey (KGS 2015). Figure 3.4-3 depicts the location of a potential sinkhole within the project site boundary. Traditional soil borings, refraction microtremor testing, and a visual reconnaissance of the project site in 2013 indicated minor karst features in isolated locations (URS/SmithGroup 2014). A few small diameter depressions located within the drainage swale in the northern portion of the site appeared to be surface indications of underlying karstic activity in the underlying rock formations (AMEC 2014). Karstic features include fractures within the rock that can create areas for soil to migrate from above the rock into fractures, causing sinkholes or collapse of the overlying soils and surface.

The project site is underlain by Crider silt loam, Bedford silt loam, and Lawrence silt loam (USDA 2015a). Crider silt loam is a well-drained soil weathered from limestone and dolomite, having a moderately high permeability and a high moisture capacity. Bedford silt loam is a moderately well-drained soil formed from noncalcereous loess over clayey residuum, having a low to moderately high permeability and a low moisture capacity. Lawrence silt loam is a somewhat poorly drained soil formed from thin fine-silty loess over clayey residuum weathered from limestone and dolomite, having a low permeability and low moisture content.

Figure 3.4-4 depicts the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey for the Brownsboro Site. Table 3.4-1 presents the area associated with each soil type.

Table 3.4-1. Soils: Brownsboro Site

Soil Map Unit	Soil Name	Acres	Percent
CrA	Crider silt loam, 0 to 2 percent slopes	27.4	79.3
LaB	Lawrence silt loam, 2 to 6 percent slopes	2.1	6.1
NnB	Bedford silt loam, 2 to 6 percent slopes	4.5	13.0
Ua	Urban land	0.2	0.4
UakF	Urban land-Udorthents complex, smoothed, 0 to 50 percent slopes	0.2	0.6
UmC	Urban land-Alfic Udarents-Crider complex, 0 to 12 percent slopes	0.2	0.5

Source: USDA 2015a.

Prime farmland soil types are important in meeting the U.S. needs for food and fiber. Crider silt loam and Bedford silt loam are considered prime farmland soils, and Lawrence silt loam is considered prime farmland soil if drained. The Brownsboro Site is not currently farmed.

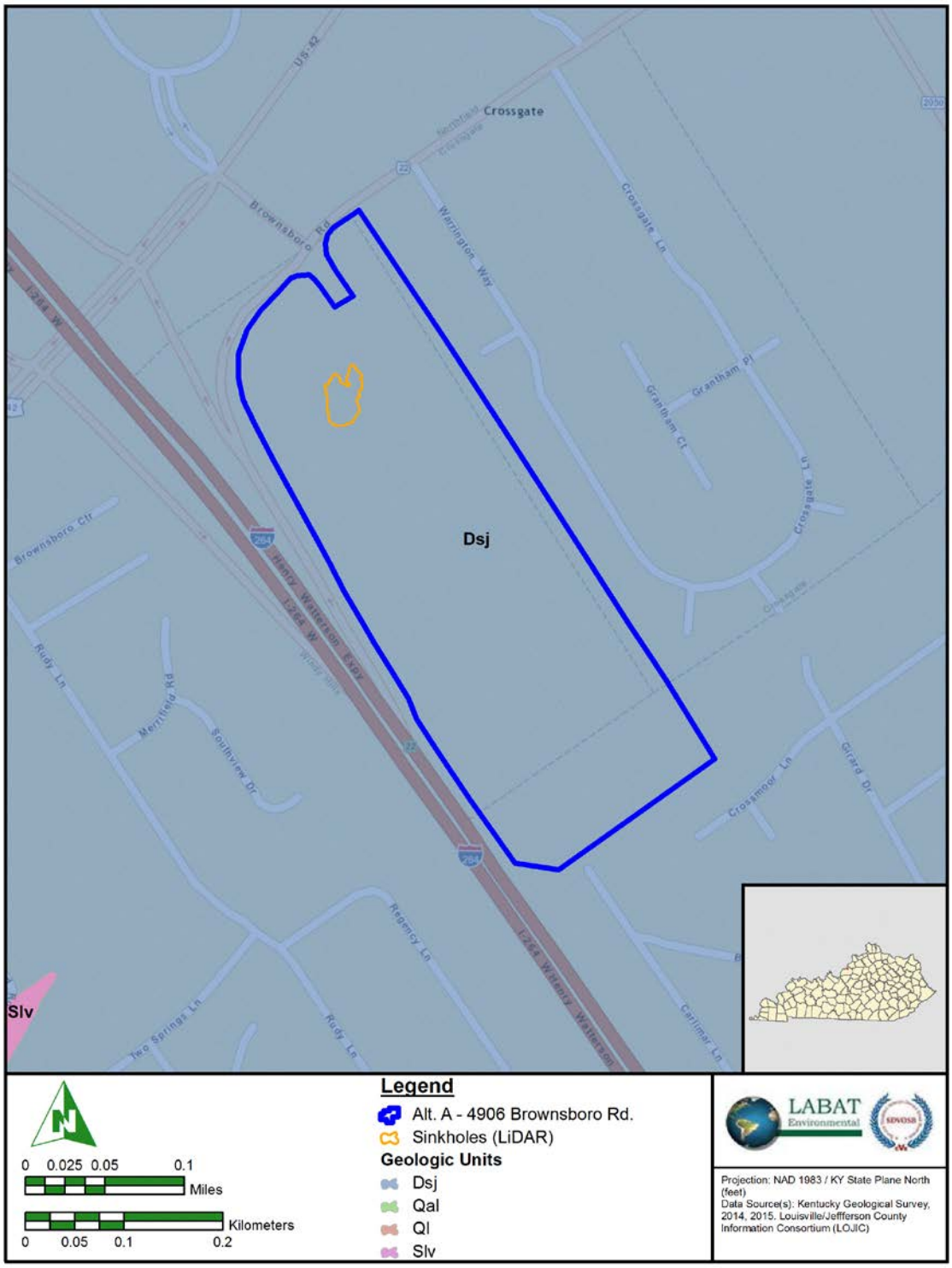


Figure 3.4-3. Geology: Brownsboro Site.

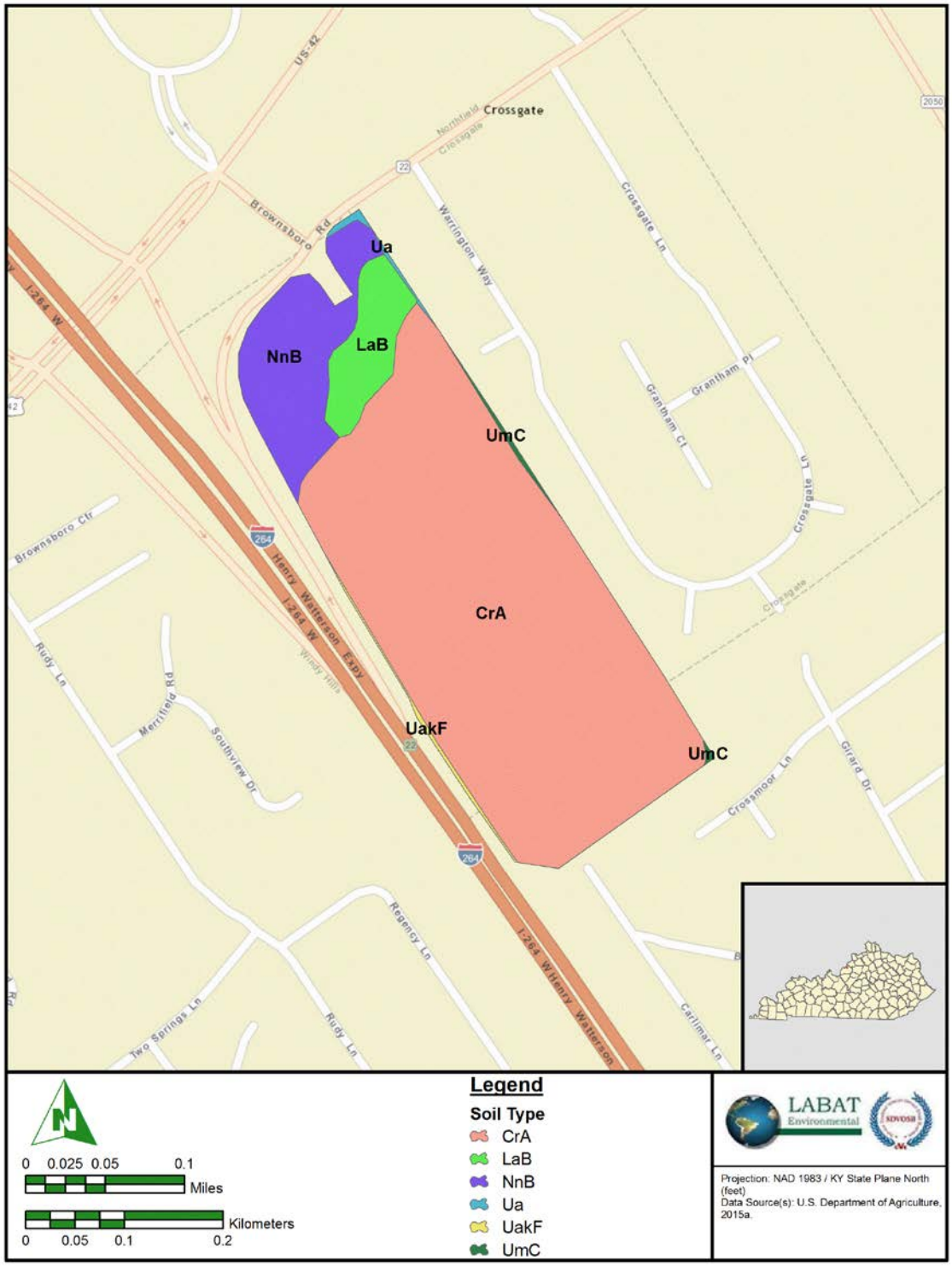
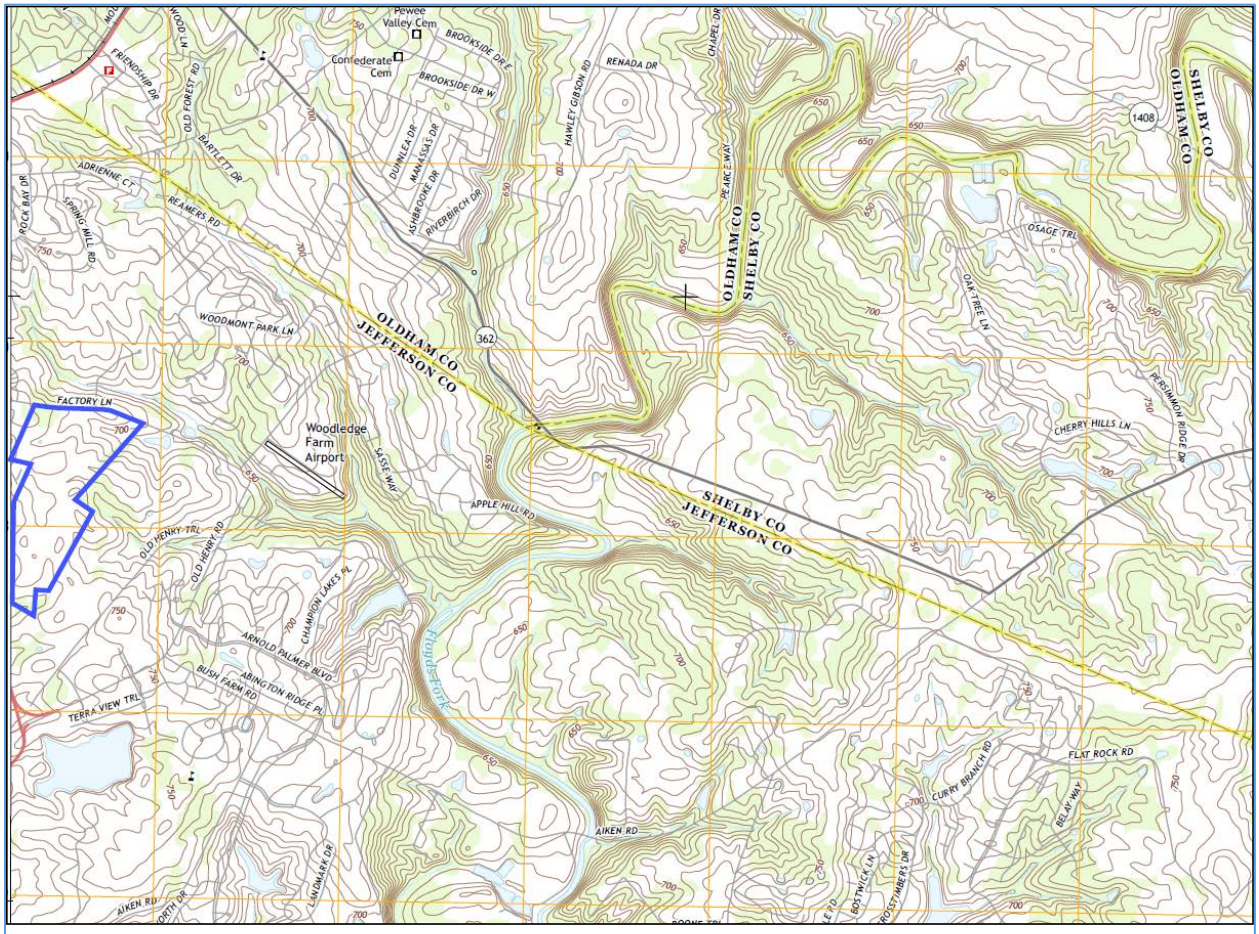


Figure 3.4-4. Soils: Brownsboro Site.

3.4.2.3 St. Joseph Site

The topography at the St. Joseph Site is undulating, but relatively level in its central and southern portions, with an elevation of approximately 740 to 750 feet above mean sea level (VA 2012). The site generally slopes downward toward drainages to the north and east (see Figure 3.4-5).



Legend

St. Joseph Site

Basemap Source: Crestwood, KY, 7.5-Minute Series. USGS 2013b.
Contour Interval = 10 feet

Figure 3.4-5. Topography: St. Joseph Site

The geologic unit present at the St. Joseph Site is Silurian-aged Louisville Limestone (Figure 3.4-6, Geologic Code Slv) (Kepferle 1976, KGS 2014). Based on the results of geotechnical borings across the project site, the soil layer depth where bedrock was encountered was from 2 to 15 feet below ground surface, with typical depths of 11 to 15 feet in the southern portion and 7 to 10 feet in the northern portion (VA 2012).

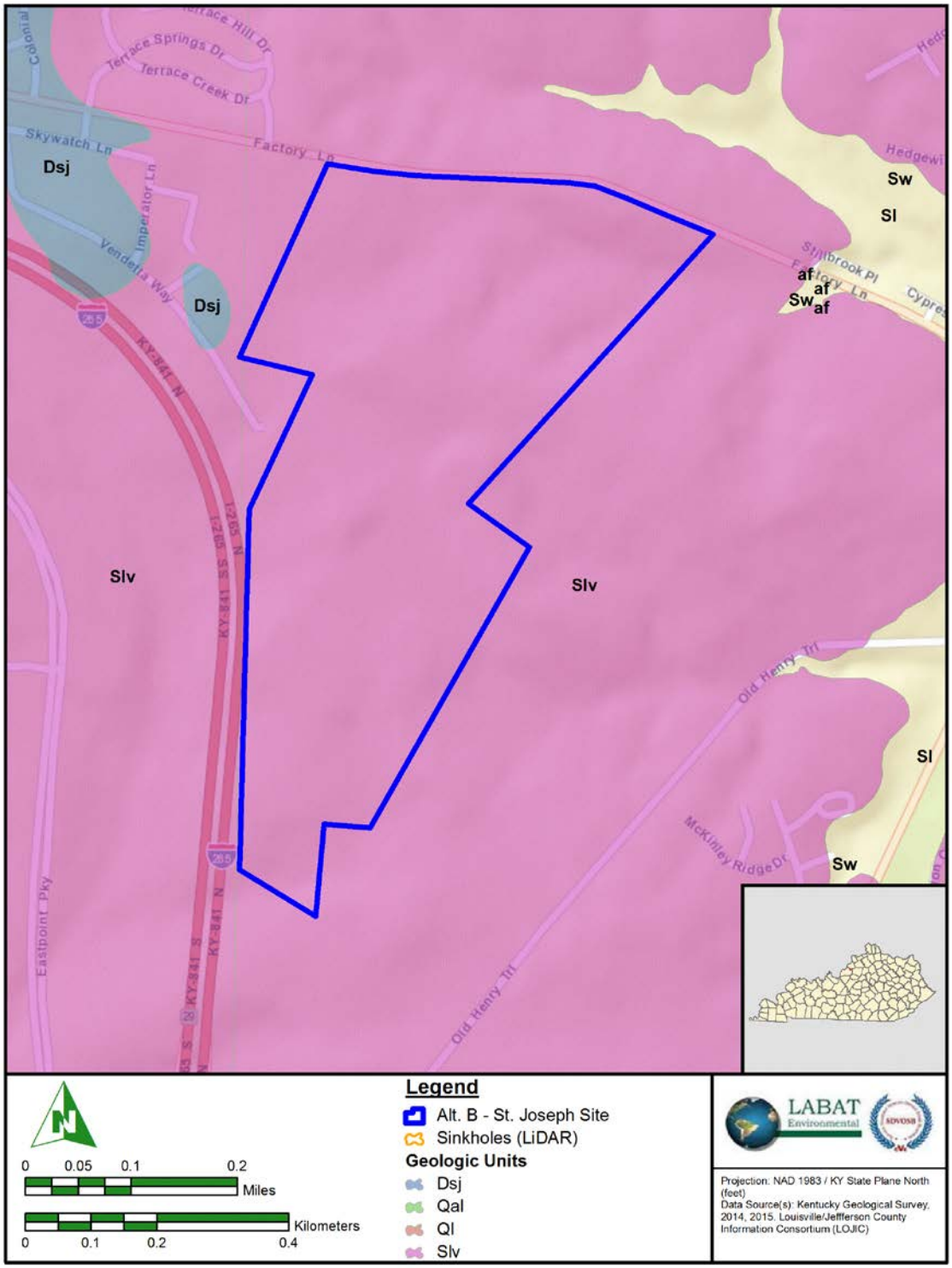


Figure 3.4-6. Geology: St. Joseph Site.

The Louisville Limestone geologic unit is characterized by a moderate potential for karst. Locations of potential sinkholes were derived from LiDAR data by the Kentucky Geological Survey (KGS 2015); no potential sinkholes within the project site boundary were identified.

The project site is underlain by Crider silt loam, Bedford silt loam, Lindside silt loam, Caneyville silt loam, Nicholson silt loam, and Beasley silt loam (USDA 2015b). Crider silt loam is a well-drained soil weathered from limestone and dolomite, having a moderately high permeability and a high moisture capacity. Bedford silt loam is a moderately well-drained soil formed from noncalcereous loess over clayey residuum, having a low to moderately high permeability and a low moisture capacity. Lindside silt loam is a moderately well-drained soil formed from mixed fine-silty alluvium, having a moderately high permeability and very high moisture content. Caneyville silt loam is a well-drained soil formed from clayey residuum weathered from limestone, having a moderately low permeability and low moisture content. Nicholson silt loam is a moderately well-drained soil formed from thin fine-silty loess over clayey residuum weathered from limestone, having a low permeability and low moisture content. Beasley silt loam is a well-drained soil formed from clayey residuum weathered from calcareous shale and/or calcareous siltstone, having a moderately low permeability and moderate moisture content.

Figure 3.4-7 depicts the U.S. Department of Agriculture, NRCS National Cooperative Soil Survey for the St. Joseph Site. Table 3.4-2 presents the area associated with each soil type.

Table 3.4-2. Soils: St. Joseph Site.

Soil Map Unit	Soil Name	Acres	Percent
BeC	Beasley silt loam, 6 to 12 percent slopes	1.1	1.1
CaD2	Caneyville silt loam, 12 to 25 percent slopes, eroded, very rocky	4.4	4.4
CrA	Crider silt loam, 0 to 2 percent slopes	0.9	0.9
CrB	Crider silt loam, 2 to 6 percent slopes	61.5	60.8
CrC	Crider silt loam, 6 to 12 percent slopes	10.8	10.6
Ld	Lindside silt loam, occasionally flooded	7.1	7.0
NnB	Bedford silt loam, 2 to 6 percent slopes	11.5	11.3
NnC	Nicholson silt loam, 6 to 12 percent slopes	1.8	1.8
UahC	Urban land-Udorthents complex, 0 to 12 percent slopes	0.8	0.7
UakF	Urban land-Udorthents complex, smoothed, 0 to 50 percent slopes	1.2	1.2
W	Water	0.3	0.3

Source: USDA 2015b.

Crider silt loam, Bedford silt loam, and Lindside silt loam are considered prime farmland soils, and Lawrence silt loam is considered prime farmland soil if drained. Nicholson silt loam and Beasley silt loam are farmland soils of statewide importance. The St. Joseph Site is currently farmed.

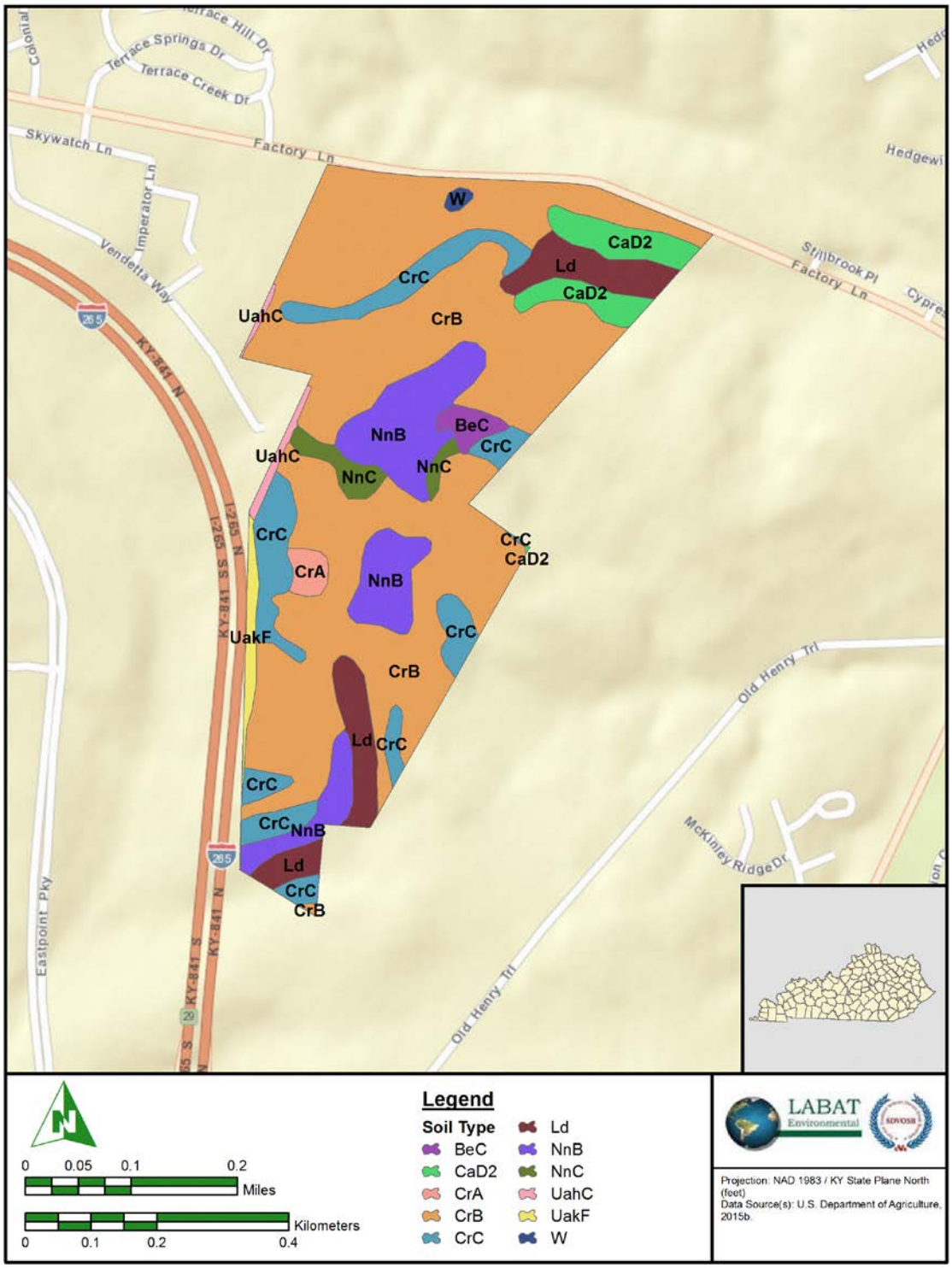
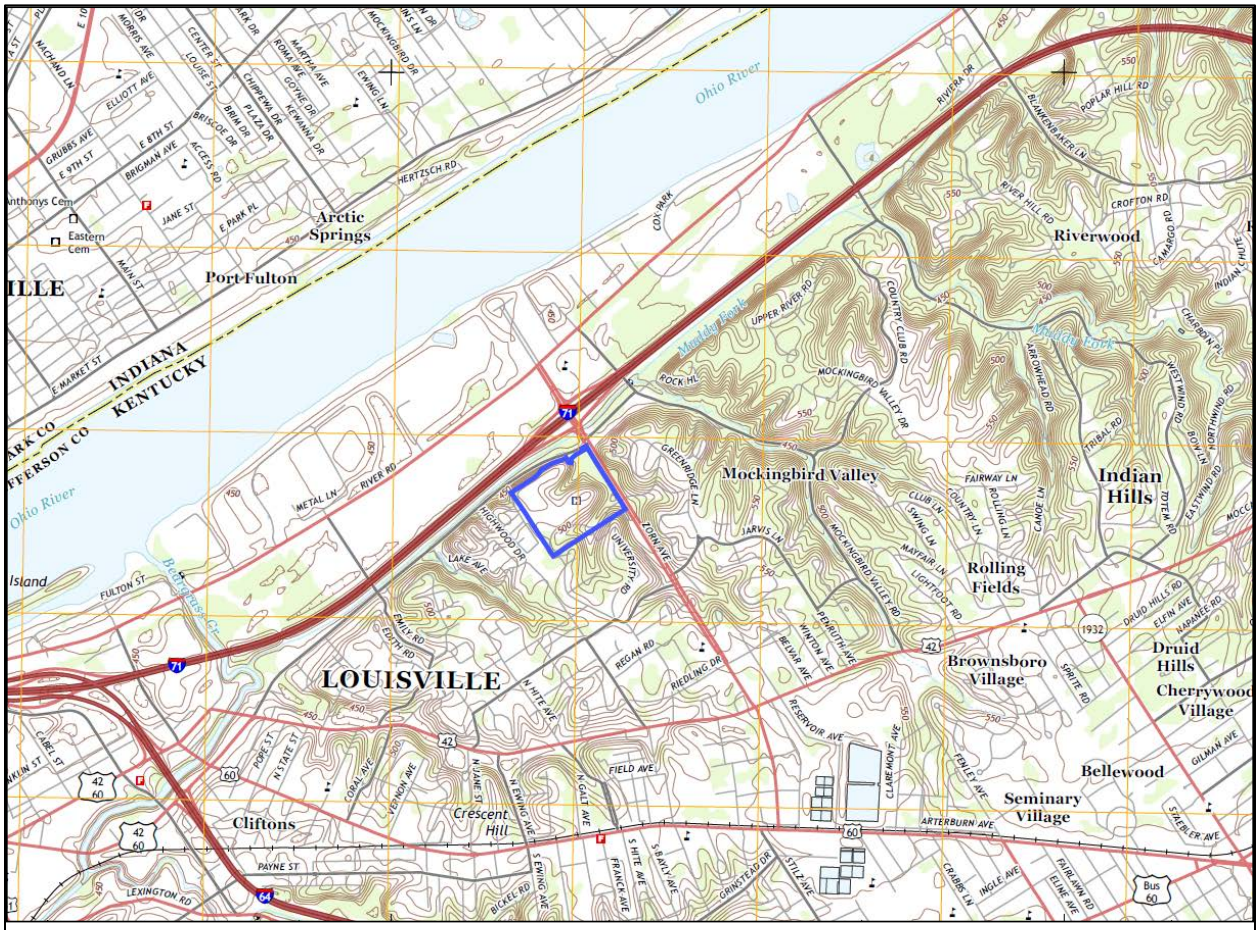


Figure 3.4-7. Soils: St. Joseph Site.

3.4.2.4 Existing Zorn Avenue Facility

The Zorn Avenue VA medical center (VAMC) is in an overall area of moderate topographic relief with areas of significant relief that prohibit development. The site elevation in the developable portion of the site is approximately 520 to 530 feet above mean sea level. The site generally slopes towards the northeast (see Figure 3.4-8).



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Zorn Avenue Site

Basemap Source: Jeffersonville, IN-KY, 7.5-Minute Series. USGS 2013a.
Contour Interval = 10 feet

Figure 3.4-8. Topography: Zorn Avenue VAMC Campus.

The geologic units primarily present in the developable portions of the Zorn Avenue campus are Devonian-aged Sellersburg and Jeffersonville Limestone and Quaternary-aged Loess and eolian sand (Figure 3.4-9, Geologic Codes Dsj and Ql respectively) (Kepferle 1974, KGS 2014). Other geologic units present include Silurian-aged Louisville Limestone and Quaternary-aged Alluvium.

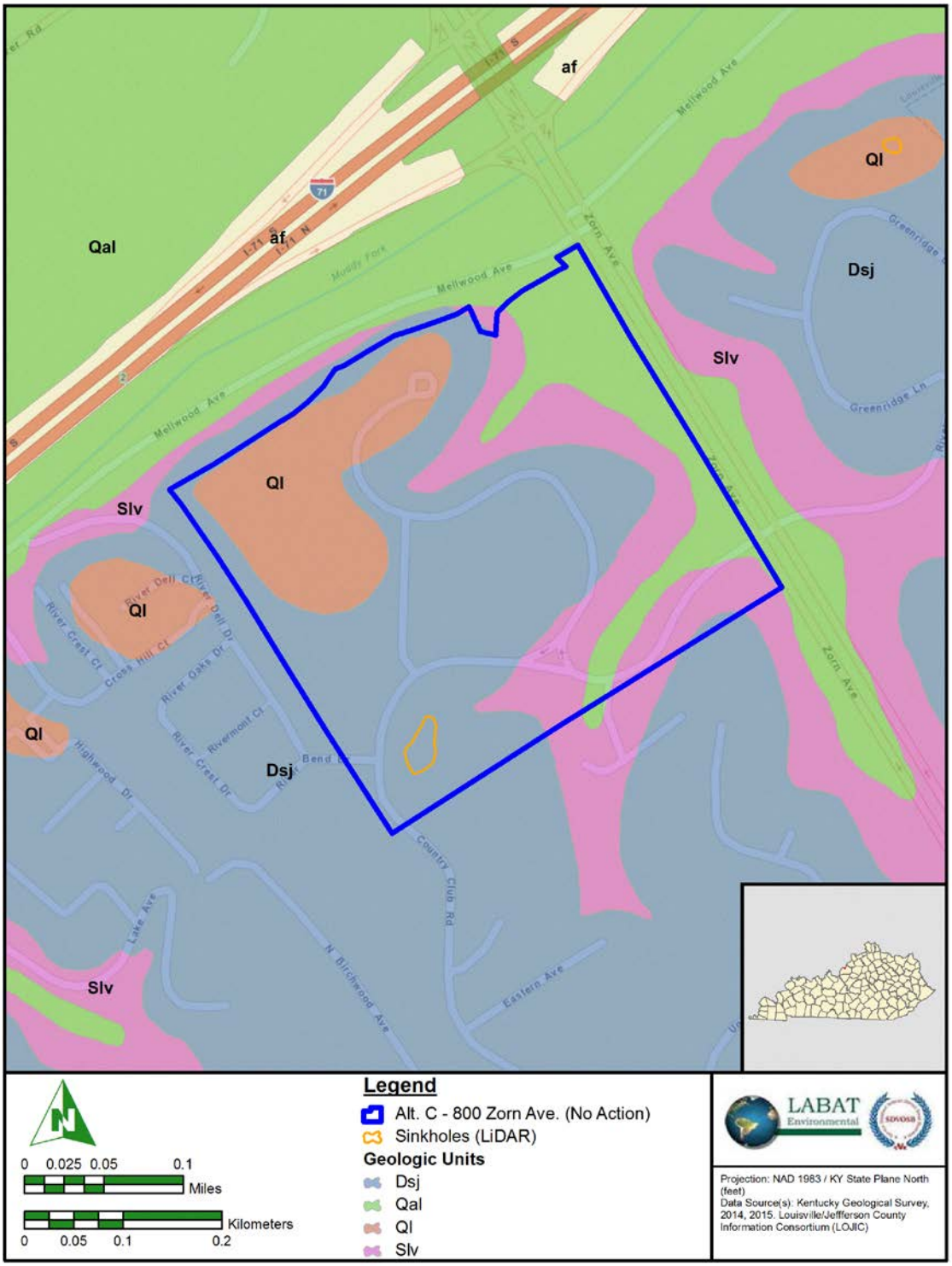

Figure 3.4-9. Geology: Zorn Avenue Site.

The Sellersburg and Jeffersonville Limestone geologic unit is characterized by a relatively high potential for karst. Locations of potential sinkholes were derived from LiDAR data by the Kentucky Geological Survey (KGS 2015). Figure 3.4-9 depicts the location of a potential sinkhole within the site boundary.

The project site is underlain by Crider silt loam and Caneyville-Rock outcrop complex (USDA 2015c). Crider silt loam is a well-drained soil weathered from limestone and dolomite, having a moderately high permeability and a high moisture capacity. Caneyville-Rock outcrop complex is a well-drained soil formed from clayey residuum weathered from limestone, having a moderately low permeability and low moisture content.

Figure 3.4-10 depicts the U.S. Department of Agriculture, NRCS National Cooperative Soil Survey for the Zorn Avenue VAMC location. Table 3.4-3 presents the area associated with each soil type.

Table 3.4-3. Soils: Existing Zorn Avenue VAMC Campus.

Soil Map Unit	Soil Name	Acres	Percent
CcF2	Caneyville-Rock outcrop complex, 12 to 60 percent slopes, eroded	4.8	10.2
Ua	Urban land	28.9	60.7
UagB	Urban land-Udarents complex, wet substratum, 0 to 6 percent slopes, rarely flooded	2.5	5.3
UahC	Urban land-Udorthents complex, 0 to 12 percent slopes	8.0	16.8
UakF	Urban land-Udorthents complex, smoothed, 0 to 50 percent slopes	0.0	0.0
UmC	Urban land-Alfic Udarents-Crider complex, 0 to 12 percent slopes	1.0	2.1
UmD	Urban land-Alfic Udarents-Crider complex, 12 to 25 percent slopes	2.4	5.0

Source: USDA 2015c.

The Zorn Avenue campus is currently developed and therefore was not evaluated for the presence of prime farmland.

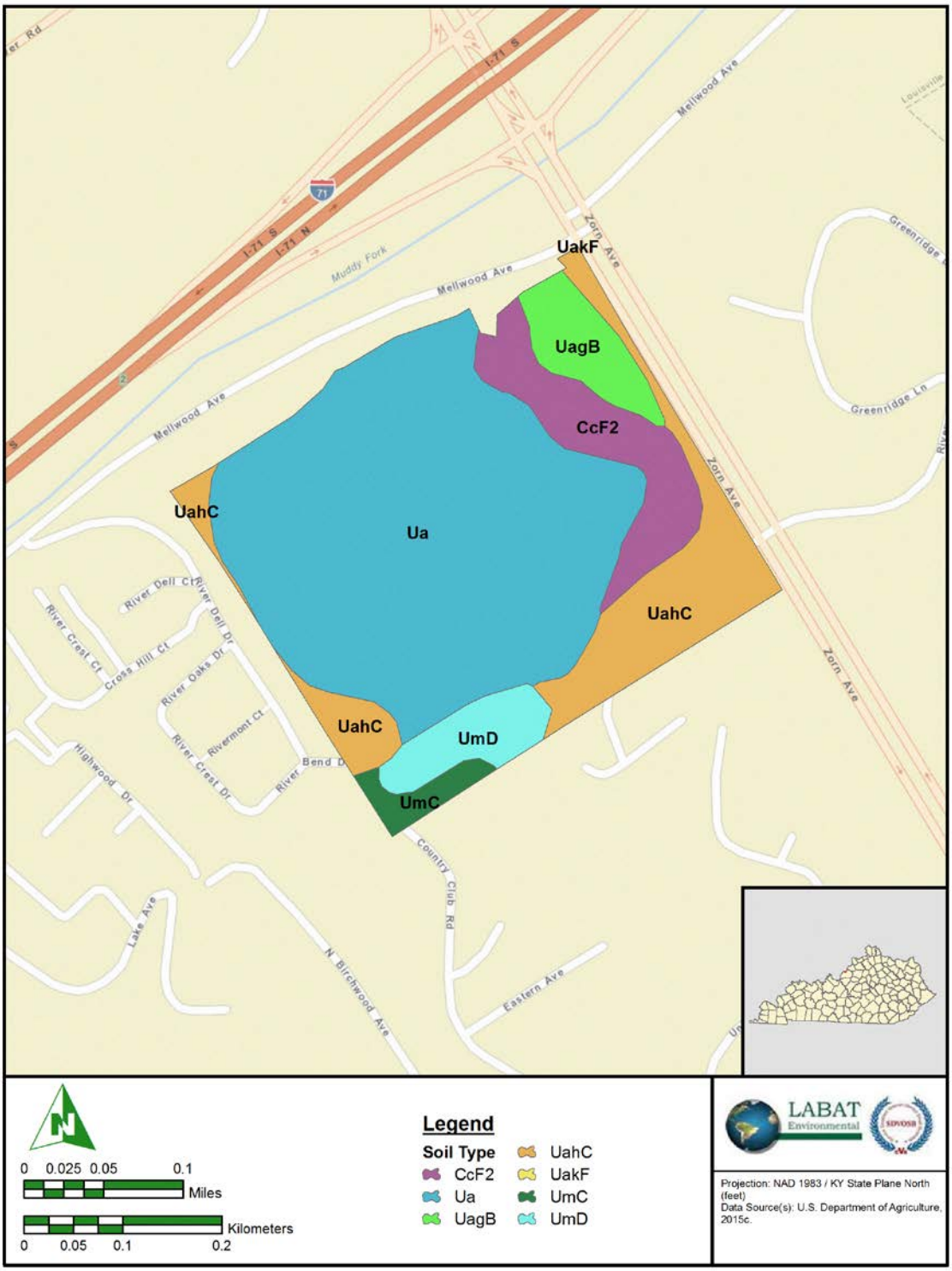

Figure 3.4-10. Soils: Existing Zorn Avenue VAMC Campus.

3.5 Hydrology and Water Quality

The hydrologic setting of a project includes both surface water and groundwater, and the quantity and quality of each. Local climates are also useful in describing and understanding the local hydrologic setting; the local climate is described in Section 3.2.2. Although they are related to hydrology, floodplains and wetlands are discussed separately in Section 3.9.

Surface water resources typically consist of rivers, streams, lakes, and wetlands. Groundwater consists of subsurface hydrologic resources, and is an essential resource that functions to recharge surface water and is often used for potable water consumption, agricultural irrigation, and industrial applications. Surface water and groundwater resources are important contributors to the economic, ecological, recreational, and human health of a region.

The region of influence for the evaluation of hydrology and water quality impacts primarily includes the project site, underlying groundwater resources, and hydraulically connected offsite drainages and downstream surface waters.

3.5.1 Regulatory Framework

3.5.1.1 Clean Water Act

The Clean Water Act of 1977 gave the U.S. Environmental Protection Agency (EPA) the authority to set effluent standards on an industry-by-industry basis, and continued the requirements to set water quality standards for contaminants in surface waters by requiring each state to adopt water quality standards for receiving water bodies (Section 303). Section 402 of the Act requires the discharge of any pollutant from a point source into navigable waters to be authorized by a permit obtained under the National Pollutant Discharge Elimination System (NPDES). The NPDES establishes limits on specific pollutants in order to restore and maintain the chemical, physical, and biological integrity of the surface water resource. The NPDES also regulates discharge of non-point sources of water pollution, such as stormwater. The Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water implements the NPDES stormwater permitting program in Kentucky.

Section 303 of the Clean Water Act requires states to adopt water quality standards for all surface waters based on the designated beneficial use. The Kentucky Division of Water's 2012 Integrated Report identifies impaired water bodies within Kentucky that require water quality standards (KEEC 2013).

Section 404 of the Clean Water Act regulates the discharge of dredge or fill material into waters of the U.S., which includes wetlands (see Section 3.9).

3.5.1.2 Energy Independence and Security Act

Section 438 of the 2007 Energy Independence and Security Act established new stormwater design requirements for federal development and redevelopment projects to reduce the impacts of stormwater runoff. Specifically, construction projects that disturb more than 5,000 square feet must maintain or restore the predevelopment hydrology to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow.

3.5.1.3 Local Regulations

Development of a site under Alternative A or B would be subject to the stormwater discharge regulations enforced by the Metropolitan Sewer District (MSD) to maintain compliance with the Kentucky Division of Water MS4 stormwater quality permit. These regulations address the core requirement of the MS4 permit to use onsite "green infrastructure" or "green management practices" to control and treat stormwater runoff.

As developed by the Louisville Planning and Design Department, the Land Development Code (Chapter 4, Appendix 4H) requires a plan to control erosion and sedimentation for development and other land-disturbing activities to conserve, preserve, and enhance the natural resources of Jefferson County and to comply with all applicable federal and state requirements for clean water, as well as to achieve other public purposes. In addition, the Land Development Code (Chapter 4, Part 8) requires the protection of waterways and wetlands and specifies buffer sizes along protected waterways and wetlands under the jurisdiction of the U.S. Army Corps of Engineers (VA 2012, LMPC 2006).

3.5.2 Current Conditions

The alternative sites are located within the Lower Ohio subregion, Lower Ohio-Salt accounting unit (the Ohio River Basin below the confluence with the Kentucky River Basin) (USGS 2015a). Kentucky is divided into five basin management units; the project sites are located within the Salt River-Licking River basin management unit (KEEC 2013).

According to the Groundwater Atlas of the United States, carbonate rocks of Devonian, Silurian, and Ordovician age, which are primarily limestone with some dolomite, are the principal aquifers in large areas of central Kentucky in the Interior Low Plateaus Province. The Ordovician rocks crop out and lie beneath Silurian, Devonian, and younger rocks. The carbonate rock aquifers consist of almost pure limestone and minor dolomite and are interlayered with confining units of shale and limestone. Where these aquifers are in the subsurface, they are overlain by and separated from the Mississippian aquifers by a confining unit of Upper Devonian shale. The depth of freshwater in the limestone and dolomite aquifers can vary greatly, but wells completed in these aquifers generally range from 50 to 200 feet deep in Kentucky (VA 2012).

3.5.2.1 Brownsboro Site

The Brownsboro Site is located in the upper reach of the Muddy Fork of the Beargrass Creek watershed (hydrologic unit 051401010904) (USGS 2015b), which is an urbanized watershed that covers approximately nine square miles of metropolitan Louisville. A relatively high percentage of this watershed is impervious (allowing little infiltration of precipitation into the soil and generating higher levels of runoff) because of intense development. A number of poorly performing septic tanks and considerable usage of lawn chemicals contribute to impaired water quality within the urban streams, and overall impacts to the watershed area are considered moderate to severe (MSD 2012a).

There are no intermittent or perennial flowing surface waters on the project site. The nearest surface water body is Goose Creek, located approximately one mile east of the site; Goose Creek ultimately drains into the Ohio River. The annual mean flow in Goose Creek east of the site is 9.81 cubic feet per second (USGS 2015c). Goose Creek in the vicinity of the Brownsboro Site is currently designated as an impaired water for primary contact recreation and warm water aquatic habitat uses (KEEC 2013).

Surface drainage (based on topographic elevations) on the north half of the site is generally toward the center of this half of the property, where stormwater ponds or collects before infiltrating or evaporating.

The south half of the site drains generally toward the southwest corner, where stormwater exits the property to a drainage ditch within the Watterson Expressway right of way. Stormwater from the office building parking lot located east of the site drains to a narrow concrete ditch that runs along the edge of the parking lot and then disperses onto the Brownsboro Site. Stormwater from the adjacent properties along the east border generally drains west towards the Brownsboro Site.

Shallow groundwater was encountered in only 2 of the 96 soil test borings drilled at the project site (AMEC 2014). The groundwater was between 11 and 13 feet below ground surface at an elevation of approximately 577 feet above mean sea level, which was about one foot above the bedrock in these borings. Published data indicate groundwater conditions in the area are related to either perched water or water confined within karst features in the upper portions of the underlying rock units. Two perennial springs (Taylor and Winding Hills) are located approximately one-third mile west of the site. The springs exit the ground surface at approximate elevations of 570 and 546 feet (AMEC 2014).

3.5.2.2 St. Joseph Site

The St. Joseph Site is located in the Brush Run-Floyds Fork Watershed (hydrologic unit 051401020806) (USGS 2015b). The MSD is recently completed construction of the Floyds Fork Water Quality Treatment Center just north of Interstate 64. This large treatment plant was intended to eliminate the less efficient small package plants and septic tanks from the most populated areas of the watershed (MSD 2012b; personal communication, J. Ashby of MSD, January 19, 2016).

Surface water in the northern portion of the site infiltrates into site soils and collects in two depressional wetlands and a perennial stream channel (a tributary to Floyds Fork), crossing the northern portion of the site from west to east. Both depressional wetlands are hydraulically connected to the Floyds Fork tributary. Wetlands are discussed in Section 3.9. The perennial stream appears to primarily be the result of shallow groundwater seepage; however, surface water runoff also contributes to its perennial state (VA 2012).

The perennial stream channel flows offsite to the east into a pond on the east adjoining property and further discharges to the river known as Floyds Fork, located approximately 1.2 miles east of the St. Joseph Site. Floyds Fork flows generally to the south-southwest and discharges into the Salt River approximately 22 miles south of the site. The Salt River flows an additional approximately 14 miles to the west and discharges into the Ohio River (VA 2012). The annual mean flow in Floyds Fork east of the site is 127.8 cubic feet per second (USGS 2015d). Floyds Fork in the vicinity of the St. Joseph Site is currently designated as an impaired water for primary contact recreation and warm water aquatic habitat uses (KEEC 2013).

Surface water in the central portion of the St. Joseph Site infiltrates into site soils, collects in a depressional wetland located in the central portion of the site, and flows offsite to the east in an intermittent drainage swale. An intermittent swale periodically discharges water from the depressional wetland in extreme water events (VA 2012).

Surface water in the southern portion of the St. Joseph Site infiltrates into site soils and collects in a low-lying area along the southern boundary of the site. A small perennial stream originates near the southern boundary of the site and flows from east to west. The perennial stream appears to primarily be the result of shallow groundwater seepage; however, surface water runoff also contributes to its perennial state (VA 2012).

Groundwater was not encountered in any of the geotechnical soil borings conducted at the St. Joseph Site, which were advanced to depths ranging from approximately 2 to 15 feet below ground surface. However, groundwater may be seasonally present at these depths (VA 2012).

3.5.2.3 Existing Zorn Avenue Facility

The existing Zorn Avenue VAMC campus is located in the lower portion of the Muddy Fork of the Beargrass Creek watershed (hydrologic unit 051401010904) (USGS 2015b), which is an urbanized watershed that covers approximately nine square miles of metropolitan Louisville. A relatively high percentage of this watershed is impervious because of intense development. A number of poorly performing septic tanks and considerable usage of lawn chemicals contribute to impaired water quality within the urban streams, and overall impacts to the watershed area are considered moderate to severe (MSD 2012a).

Drainages on the Zorn Avenue campus flow towards Muddy Fork of Beargrass Creek, located adjacent to the northwestern site boundary. Muddy Fork ultimately drains into the Ohio River. The annual mean flow in Muddy Fork northeast of the site is 9.79 cubic feet per second (USGS 2015e). Muddy Fork of Beargrass Creek in the vicinity of the Zorn Avenue VAMC campus is currently designated as an impaired water for primary contact recreation uses (KEEC 2013).

3.6 Wildlife and Habitat

The term "wildlife" collectively refers to terrestrial and aquatic species, including mammals, birds, reptiles, invertebrates, amphibians, and fish, and "habitat" is the set of ecological and physical factors that sustain wildlife species. Wildlife and habitat are interchangeably discussed as biological resources. This analysis also evaluates potential impacts to plant species in the environment, whether or not they provide habitat for wildlife.

3.6.1 Regulatory and Policy Framework

Certain wildlife and plant species are provided special protections under the Endangered Species Act of 1973 because of declining populations, loss of habitat, and inadequate conservation. Protected species fall under one of two classifications:

- Endangered species are in danger of extinction throughout all or a significant portion of their range.
- Threatened species are likely to become endangered within the foreseeable future.

A species that is being considered for protection as either endangered or threatened is described as "proposed" if a proposed regulation for its listing has been published in the Federal Register, or "candidate" if a proposed regulation has not been published. The Endangered Species Act is administered by the Department of the Interior's Fish and Wildlife Service (FWS) and, for marine resources, the Commerce Department's National Oceanic and Atmospheric Administration. Section 4 of the Endangered Species Act addresses the listing and recovery of species and designation of critical habitat, which is a defined geographic area that contains features essential to conserving a threatened or endangered species. Section 7 requires all federal agencies to ensure that any action they authorize, fund, or implement is not likely to jeopardize the continued existence of a federally protected species or result in destruction or adverse modification of its designated critical habitat. Section 9 prohibits the unauthorized "take" of federally protected species, which includes harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capture, or collection of a protected species, or the attempt to engage in any such conduct.

The Migratory Bird Treaty Act of 1918 and Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, require federal agencies to minimize or avoid impacts on migratory birds. If a federal action cannot avoid measurable negative impact on migratory birds, the responsible agency must develop and implement, within two years, a Memorandum of Understanding with the FWS to promote the conservation of migratory bird populations. Migratory birds are those that live, reproduce, or migrate within or across international borders during their annual life cycle. The Act prohibits the taking (hunting, wounding, killing, possessing, or transporting) of any migratory bird, their eggs, features, or nests.

The Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act provide continued federal protection for the bald eagle, which was removed from the federal list of endangered and threatened wildlife in 2007, although it may still be additionally protected where it is listed under state laws. National guidelines for bald eagle management have been developed (FWS 2007). Golden eagles received protection under the Eagle Act in 1962 due to the threat of their extinction, their similarity of appearance to bald eagles, and their value to agriculture as predators of rodents. Both species of eagles have special significance to Native American culture.

The Federal Noxious Weed Act mandates control of noxious weeds by limiting possible weed seed transport from infested areas to non-infested sites. Executive Order 13112, Invasive Species, requires

federal agencies to prevent the introduction of invasive species; provide for their control; minimize their economic, ecological, and human health impacts; and, to the extent practicable, not authorize, fund, or carry out management actions that are likely to cause the introduction or spread of invasive species.

The State of Kentucky's species of greatest wildlife conservation need are identified in the Kentucky Comprehensive Wildlife Conservation Strategy (KDFWR 2013). The Kentucky Rare Plant Database identifies plant species of conservation interest to the state (KSNPC 2014).

The Kentucky State Nature Preserves Commission publishes the County Report of Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky, which lists both federally and state protected species (KSNPC 2015). The listed species for Jefferson County are provided in Table 3.6-1.

Table 3.6-1. Federally and State Listed Species in Jefferson County, Kentucky.

Species	Common Name	Federal Status	State Status
Mammals			
Myotis grisescens	gray myotis	endangered	threatened
Myotis septentrionalis	northern long-eared bat	threatened	endangered
Myotis sodalis	Indiana bat	endangered	endangered
Nycticeius humeralis	evening bat	no Federal status	special concern
Birds			
Accipiter striatus	sharp-shinned hawk	no Federal status	special concern
Actitis macularius	spotted sandpiper	no Federal status	endangered
Ammodramus henslowii	Henslow's sparrow	no Federal status	special concern
Ardea alba	great egret	no Federal status	threatened
Chondestes grammacus	lark sparrow	no Federal status	threatened
Cistothorus platensis	sedge wren	no Federal status	special concern
Falco peregrinus	peregrine falcon	no Federal status	endangered
Haliaeetus leucocephalus	bald eagle	protected under Bald and Golden Eagle Protection Act	threatened
Lophodytes cucullatus	hooded merganser	no Federal status	threatened
Pandion haliaetus	osprey	no Federal status	special concern
Passerculus sandwichensis	savannah sparrow	no Federal status	special concern
Phalacrocorax auritus	double-crested cormorant	no Federal status	threatened
Sternula antillarum athalassos	interior least tern	endangered	endangered
Thryomanes bewickii	Bewick's wren	no Federal status	special concern
Tyto alba	barn owl	no Federal status	special concern
Reptiles			
Clonophis kirtlandii	Kirtland's snake	no Federal status	threatened
Ophisaurus attenuatus longicaudus	eastern slender glass lizard	no Federal status	threatened
Terrestrial Invertebrates			
Calephelis borealis	northern metalmark	no Federal status	threatened
Pseudanophthalmus troglodytes	Louisville cave beetle	candidate	threatened
Satyrium favonius ontario	northern oak hairstreak	no Federal status	special concern
Webbhelix multilineata	striped whitelip	no Federal status	threatened
Fish			
Acipenser fulvescens	lake sturgeon	no Federal status	endangered
Alosa alabamae	Alabama shad	no Federal status	endangered
Atractosteus spatula	alligator gar	no Federal status	endangered
Ictiobus niger	black buffalo	no Federal status	special concern
Lota	burbot	no Federal status	special concern

Species	Common Name	Federal Status	State Status
Noturus stigmosus	northern madtom	no Federal status	special concern
Percopsis omiscomaycus	trout-perch	no Federal status	special concern
Aquatic Invertebrates			
Leptoxis praerosa	onyx rocksnail	no Federal status	special concern
Lithasia verrucosa	varicose rocksnail	no Federal status	special concern
Cumberlandia monodonta	spectaclecase	endangered	endangered
Cyprogenia stegaria	fanshell	endangered	endangered
Lampsilis abrupta	pink mucket	endangered	endangered
Obovaria retusa	ring pink	endangered	endangered
Plethobasus cooperianus	orangefoot pimpleback	endangered	endangered
Plethobasus cyphyus	sheepnose	endangered	endangered
Pleurobema clava	clubshell	endangered	endangered
Potamilus capax	fat pocketbook	endangered	endangered
Quadrula cylindrica	rabbitsfoot	threatened	threatened
Simpsonaias ambigua	salamander mussel	no Federal status	threatened
Villosa lienosa	little spectaclecase	no Federal status	special concern
Gammarus bousfieldi	Bousfield's amphipod	no Federal status	endangered
Orconectes jeffersoni	Louisville crayfish	no Federal status	endangered
Plants			
Castanea pumila	Allegheny chinkapin	no Federal status	threatened
Dryopteris carthusiana	spinulose wood fern	no Federal status	special concern
Heteranthera dubia	grassleaf mud-plantain	no Federal status	special concern
Leavenworthia exigua var. *laciniata*	Kentucky glade cress	threatened	endangered
Podostemum ceratophyllum	threadfoot	no Federal status	special concern
Pontederia cordata	pickerel-weed	no Federal status	threatened
Potamogeton illinoensis	Illinois pondweed	no Federal status	special concern
Sagittaria graminea	grassleaf arrowhead	no Federal status	threatened
Stellaria longifolia	longleaf sitchwort	no Federal status	special concern
Trichostema setaceum	narrowleaved bluecurls	no Federal status	endangered
Trifolium stoloniferum	running buffalo clover	endangered	threatened
Vallisneria americana	eelgrass	no Federal status	special concern
Veratrum woodii	Wood's bunchflower	no Federal status	threatened
Viola septemloba var. *egglestonii*	Eggleston's violet	no Federal status	special concern
Vitis labrusca	northern fox grape	no Federal status	threatened

Sources: KSNPC 2015, FWS 2013, FWS 2015a.

3.6.2 Current Conditions

3.6.2.1 Brownsboro Site

The Brownsboro Site is a remnant cultivated field now covered predominantly by various grasses, clovers, and alfalfa, with a few large deciduous trees. The vegetation is maintained by periodic mowing. This type of habitat surrounded by development can typically support wildlife common in urban settings, such as rodents, rabbits, and various songbirds. No aquatic habitat or species are present on the site.

In 2011, the FWS stated that wildlife and plant species that are currently federally listed as threatened or endangered have the potential to occur in the area: Indiana bat, running buffalo clover, and Kentucky glade cress (then a candidate species, now listed as threatened) (FWS 2011a):

- Although the Brownsboro Site is within the home range of a known Indiana bat maternity colony, the remaining trees on the site are not suitable roost trees for the bat (FWS 2011b). The Indiana

bat winters in caves and mines, none of which are present on the site. However, in the late spring and summer, these bats migrate to wooded areas where Indiana bats roost under loose tree bark or in cracks and crevices on living or dead trees with at least a five-inch diameter at breast height.

- Running buffalo clover is found in partially shaded woodlots, mowed areas (parks, lawns, cemeteries), and along streams and trails; it does not tolerate full sun or severe disturbance. The Brownsboro Site has been severely disturbed by agricultural practices and is exposed to full sun. The clover is not known to occur in the vicinity of this site.
- Critical habitat for the glade cress is designated in specific areas south of I-265 and east of I-65 in Jefferson County (FWS 2014). The Brownsboro Site is not included in or near any designated critical habitat.

The northern long-eared bat was listed as threatened in 2015. FWS (2015b) stated that it appears there is no potential winter habitat for the northern long-eared bat on the Brownsboro Site, but that there is a possibility that any remaining trees on the site could serve as roost trees and recommended that the potential for the bat to use the site as maternity habitat be addressed. Northern long-eared bat roost trees typically contain peeling bark or cavities, similar to roost trees used by the Indiana bat, but can be as small as three inches diameter at breast height.

The Kentucky Department of Fish and Wildlife Resources stated that no listed species were identified for the Brownsboro Site, but noted that it is within range of Indiana bat summer maternity habitat (VA 2012).

3.6.2.2 St. Joseph Site

The St. Joseph Site is undeveloped and currently being used for agriculture, with a few acres of fragmented forest and scattered areas of grasses. A tree-lined tributary to Floyds Fork, with associated wetlands and ponds, crosses the northern portion of the site. The wildlife typically present on an undeveloped parcel in this outer suburban area in Jefferson County would include small to large mammals, likely including deer, coyote, fox, raccoon, skunk, and rodents; as well as birds, and some reptiles (turtles and snakes) and amphibians (frog and toads).

FWS (2011b) stated that the St. Joseph Site is located within potential Indiana bat habitat range and includes habitat that supports the presence of running buffalo clover. In response, VA contracted for biological surveys of the site (TTL 2012a, 2012b). The findings are summarized as follows:

- The St. Joseph Site includes areas that could provide foraging and roosting habitat for Indiana bats. The northwestern corner of the parcel and along the eastern site boundary (northern portion) are the most likely areas for Indiana bat activities due to the number of trees and available surrounding habitat. To a lesser extent, a wetland area in the central portion of the site supports foraging and roosting habitat for Indiana bats; however, its small size (approximately 0.34 acres) and the small number of available trees for roosting (three trees) would limit bat activities in this area. The southern portion of the eastern site boundary and two lone trees south of a wetland area in the northeast portion are not likely to support roosting activities by Indiana bats; however, due to their proximity to higher quality habitats, they would likely serve as foraging habitat if Indiana bats were present. Although the southernmost section of the site includes sufficiently sized trees for roosting and surrounding habitat that may be used for foraging, it is less likely to be an active location for Indiana bats due to its limited extent and adjacent human activity (water tower and I-265).
- The majority (approximately 80 percent) of the St. Joseph Site is cultivated agricultural land that is exposed to full sun. These conditions are not suitable running buffalo clover habitat. However,

several smaller areas that could potentially support the presence of this plant species were identified within the St. Joseph Site, including the edge areas of the tree lines along the eastern boundary, the Floyds Fork tributary, the three wetlands, Factory Lane, and the wooded area along the southern boundary. Although the habitat survey was conducted in late January/early February 2012, which is not ideal for identifying running buffalo clover, due to the unusually mild winter left remnants of short-growing herbaceous vegetation. Areas with suitable habitat for running buffalo clover were covered with invasive herbaceous species and no clover of any kind was observed. In May 2012, a survey of the St. Joseph Site specifically for running buffalo clover revealed significant populations of white clover (*Trifolium repens*) and red clover (*Trifolium pratense*), but no running buffalo clover. However, the protected species was identified in three separate locations offsite along the eastern boundary of the site's southern portion. Two of the locations included one individual each and the third location included two individuals.

The roosting and foraging habitat on the St. Joseph Site identified as suitable for the Indiana bat would also support the recently listed northern long-eared bat.

No critical habitat for Kentucky glade cress is located at or near the site (FWS 2014). The Kentucky Department of Fish and Wildlife Resources stated that no listed species were identified in the vicinity of the St. Joseph Site (VA 2012).

3.6.2.3 Existing Zorn Avenue VAMC

Approximately half of the 47-acre campus of the existing Robley Rex VAMC on Zorn Avenue is developed with buildings, parking, and roadways. The remaining land consists mainly of heavily wooded steep slopes within a larger suburban context. Wildlife that are present in the undeveloped campus areas would be well-adapted to human activity, and likely include a variety of small mammals, rodents, birds, reptiles, and amphibians.

FWS (2011a) stated that the existing campus is within the home range of a known Indiana bat maternity colony. The wooded areas of the campus are considered highly likely to support Indiana bats, and are thus likely to also provide habitat for the northern long-eared bat. FWS also stated that running buffalo clover could be present onsite. No critical habitat for Kentucky glade cress in located at or near the Zorn Avenue facility.

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3.7 Noise

Noise is defined as any sound that is undesired by the recipient and typically includes sounds not present in the natural environment, such as sounds emanating from aircraft; highways; and industrial, commercial, and residential sources. Noise generally interferes with normal activities or otherwise diminishes the quality of the natural environment. Noise may be intermittent or continuous, steady or impulsive, stationary or transient.

The standard measurement unit of sound is the decibel (dB), which represents the relationship between a measured sound pressure level and the minimum sound level a person with good hearing can detect reported on a logarithmic scale. A doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by three decibels, and a halving of the energy would result in a three-decibel decrease, both of which are barely perceptible to the human ear.

The human ear is not equally sensitive to all frequencies within the sound spectrum. Therefore, sound can be characterized by several methods. The most common method is the "A-weighted" sound level (dBA), which gives greater weight to the frequencies audible to the human ear by filtering out noise frequencies not audible to the human ear. Human judgments of the relative loudness or annoyance of a sound correlate well with the dBA levels of those sounds. Therefore, the dBA scale is used for measurements and standards involving the human perception of noise. Figure 3.7-1 provides common sounds and the corresponding sound levels to demonstrate human perception of the correlation of noise with acoustical energy.

Noise levels vary continuously with time, and various descriptions of noise are used to account for this variance with time, including L_{eq} (which is the equivalent continuous sound level), L_{min} and L_{max} (which are the minimum and maximum noise levels recorded during a monitoring period), and L_{dn} (which is the day-night average sound level).

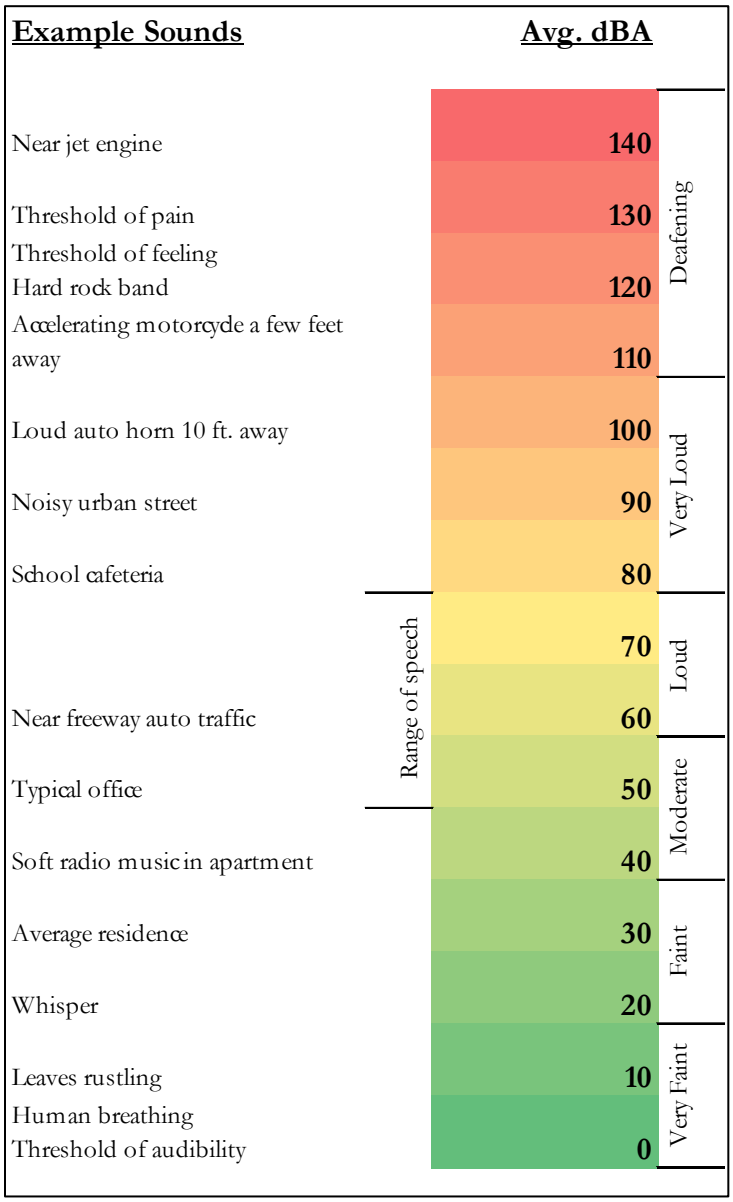
The construction and operation of new facilities generates noise. Construction-related noise is associated with the operation of construction equipment and vehicles, both in transit to/from and at the project site. Equipment noise levels also vary as a function of the usage factor or percentage of time the equipment is employed. Table 3.7-1 provides a list of noise levels associated with typical construction equipment.

The Roadway Construction Noise Model is a national noise screening model developed by the Federal Highway Administration to predict construction noise levels and determine compliance with regulatory noise limits.

The region of influence for the evaluation of noise impacts primarily includes the project site and surrounding areas within 0.5 miles, although sensitive receptors up to 2 miles from the project site were considered.

Ground-borne vibration is commonly associated with noise since vibration sources include many of the same sources (for example, construction equipment and vehicles) and may also interfere with normal activities or otherwise diminish the quality of the natural environment. Ground-borne vibration is not a common environmental problem, as it is unusual for vibration from sources such as road vehicles to be perceptible, even in locations close to major roads. Perceptible vibration sources for projects similar to that analyzed in this EIS include construction-related equipment (for example, heavy earth-moving equipment, pile-driving equipment, and blasting operations).

Ground-borne vibration is typically reported as the root mean square of the vibration velocity level in vibration decibels. The approximate threshold for human perception of vibration is 65 vibration decibels.



Source: HUD 2009.

Figure 3.7-1. Common Sounds and Corresponding Sound Levels.

Table 3.7-1. Noise Levels Associated with Typical Construction Equipment.

Equipment	Typical Noise Level 50 feet from source (dBA)	Typical Usage Factor (%)
Backhoe	80	40
Clam shovel (dropping)	93	20
Compactor (ground)	80	20
Compressor (air)	80	40
Concrete mixer truck	85	40
Concrete pump truck	82	20
Concrete saw	90	20
Crane	85	16
Dozer	85	40
Dump truck	84	40
Excavator	85	40
Flat bed truck	84	40
Front end loader	80	40
Generator	82	50
Grader	85	40
Jackhammer	85	20
Man lift	85	20
Pickup truck	55	40
Pneumatic tools	85	50
Pumps	77	50
Scraper	85	40
Tractor	84	40
Warning horn	85	5

Source: FHWA 2008.
Note: Typical construction equipment selected from Roadway Construction Noise Model default equipment list.

3.7.1 Regulatory Framework

3.7.1.1 Noise Control Act

The U.S. EPA Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. Upon its enactment, the office also implemented the Federal Noise Control Act of 1972, which established programs and guidelines to identify and address the effects of noise on public health and welfare and the environment. Table 3.7-2 summarizes guidelines for noise levels considered safe for community exposure without the risk of adverse effects to health or welfare (EPA 1974). To prevent hearing loss over the lifetime of a receptor, the yearly average L_{eq} should not exceed 70 dBA, and the L_{dn} should not exceed 55 dBA in outdoor activity areas or 45 dBA indoors to prevent interference and annoyance.

Table 3.7-2. Summary of EPA-Recommended Noise Level Standards

Effect	Level	Area
Hearing loss	$L_{eq(24)} \leq 70$ dB	All areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	$L_{eq(24)} \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards and playgrounds
Indoor activity interference and annoyance	$L_{dn} \leq 45$ dB	Indoor residential areas
	$L_{eq(24)} \leq 45$ dB	Other indoor areas with human activities such as schools

Source: EPA 1974.

In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at lower levels of government. Consequently, in 1982, responsibilities for regulating noise control policies were transferred to state and local governments. However, noise control guidelines and regulations contained in the rulings by EPA in prior years are still upheld by designated federal agencies, allowing more individualized control for specific issues by designated federal, state, and local government agencies. The Noise Control Act is applicable to the project insofar as it establishes general guidelines for acceptable noise levels perceived by adjacent or onsite receptors.

3.7.1.2 Federal Transit Authority Ground-Borne Vibration Guidelines

The Federal Transit Authority has established guidelines for maximum-acceptable vibration criteria for different land uses. Maximum acceptable vibration criteria based on the frequency of an event are applied to the different land uses to address the human response to ground-borne vibration (FTA 2006).

The Federal Transit Authority also established criteria addressing the potential for construction-caused vibration annoyance or interference. The primary concern related to construction vibration is the potential to cause structural damage to buildings by the operation of heavy-duty construction equipment. Situation-specific criteria address the level of vibration considered acceptable before it may result in damage to structures or different building types (FTA 2006).

3.7.1.3 Local Noise Control Ordinances

Title IX, Chapter 99, of the Louisville-Jefferson County Metro Government Regulations contains local regulations pertaining to noise. Specifically relevant to this project, “the use or operation of any vehicle in such manner as to produce any unreasonably loud, harsh or excessive noise, or to discharge into the open air the exhaust of any vehicle except through a muffler or other device which will effectively prevent any unreasonably loud, harsh or excessive noises therefrom” is considered to be “unreasonably loud, harsh or excessive noises in violation of this ordinance” (AmLegal 2015). Noises resulting from construction or demolition activity are exempt from the ordinance, provided such activity takes place between the hours of 7:00 A.M. and 9:00 P.M. (AmLegal 2015).

Kentucky Revised Statute Chapter 350.430, Explosives, establishes notification and recordkeeping requirements for use of explosives in blasting activities (KRS 2015).

3.7.2 Current Conditions

For each alternative, noise-sensitive land uses were identified within two miles of the site. Noise-sensitive land uses identified include:

- Cemeteries
- Hospitals
- Hotels/motels
- Libraries
- Public parks
- Schools

Baseline sound levels were measured at representative locations in the vicinity of each alternative site to determine the representative existing sound levels. These monitoring locations are shown in Figures 3.7-2 through 3.7-4 in the descriptions of current conditions at each site. Sound levels were measured using an Extech Instruments Model 407736 digital sound level meter, which meets American National Standards

Institute S1.4-1983 and International Electrotechnical Commission 60651 Type II standards. The meter's internal calibration feature was checked prior to obtaining measurements at each location, and the meter was operated on the A-weighting scale with slow response using a porous windscreen. Sound level measurements were taken at intervals over a recorded monitoring period at each location. Notes regarding monitoring conditions were recorded, and the L_{eq}, L_{min} L_{max}, and 10-, 50-, and 90-percentile (L_{10}, L_{50}, and L_{90}) values were determined (see Table 3.7-3). The measured daytime sound levels are characteristic of a typical urban to suburban area.

Table 3.7-3. Existing Sound Level Measurements

Site	Location	Date / Time	Sound Level [dBA]					
			L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{MIN}
M1	Louisville VAMC	9/2/2015 11:29 AM	53.1	57.4	56.6	52.1	51.0	50.6
M2	Brownsboro Site	9/2/2015 3:02 PM	54.3	56.5	56.2	54.1	52.1	51.8
M3	St. Joseph Site	9/3/2015 1:59 PM	53.2	59.2	53.5	51.8	50.9	50.8

Source: Data collected by Labat Environmental, Inc., September 2-3, 2015.
Key: L_{eq} = equivalent sound level, L_{MIN} = minimum sound level, L_{max} = maximum sound level, L_n = sound level exceeded n% of the specific time period.
Observation Notes:
Site 1: Calm/light breeze, cars passing in parking lot, personal conversations, wildlife.
Site 2: Light winds, cars passing on road approximately 50 ft. to north, Interstate traffic approx. 150 ft. to west.
Site 3: Calm winds, cars passing in parking lot, landscape maintenance activities, wildlife.

Noise-sensitive buildings are also commonly considered as vibration-sensitive receptors. Historic or lightweight buildings are considered most vulnerable to vibration disturbance or damage. Vibration due to passing vehicles or other activities was not noticeable during the collection of sound level measurements at any of the alternative site areas.

3.7.2.1 Brownsboro Site

The Brownsboro Site is generally consistent with an urban or suburban setting. As such, the predominant noise sources in the area include mobile sources (such as personal and commercial vehicles) and stationary sources (such as heating, ventilation, and air conditioning units attached to buildings). Vehicle traffic and associated noise is heaviest along I-264 (west of site) and Brownsboro Road (State Highway 22, north of site).

Noise-sensitive land uses in the Brownsboro Site area were identified and mapped (see Figure 3.7-2). Table 3.7-4 lists these receptors and their proximity to the Brownsboro Site. The nearest residential area to the Brownsboro Site is adjacent to the eastern and southern site boundary.

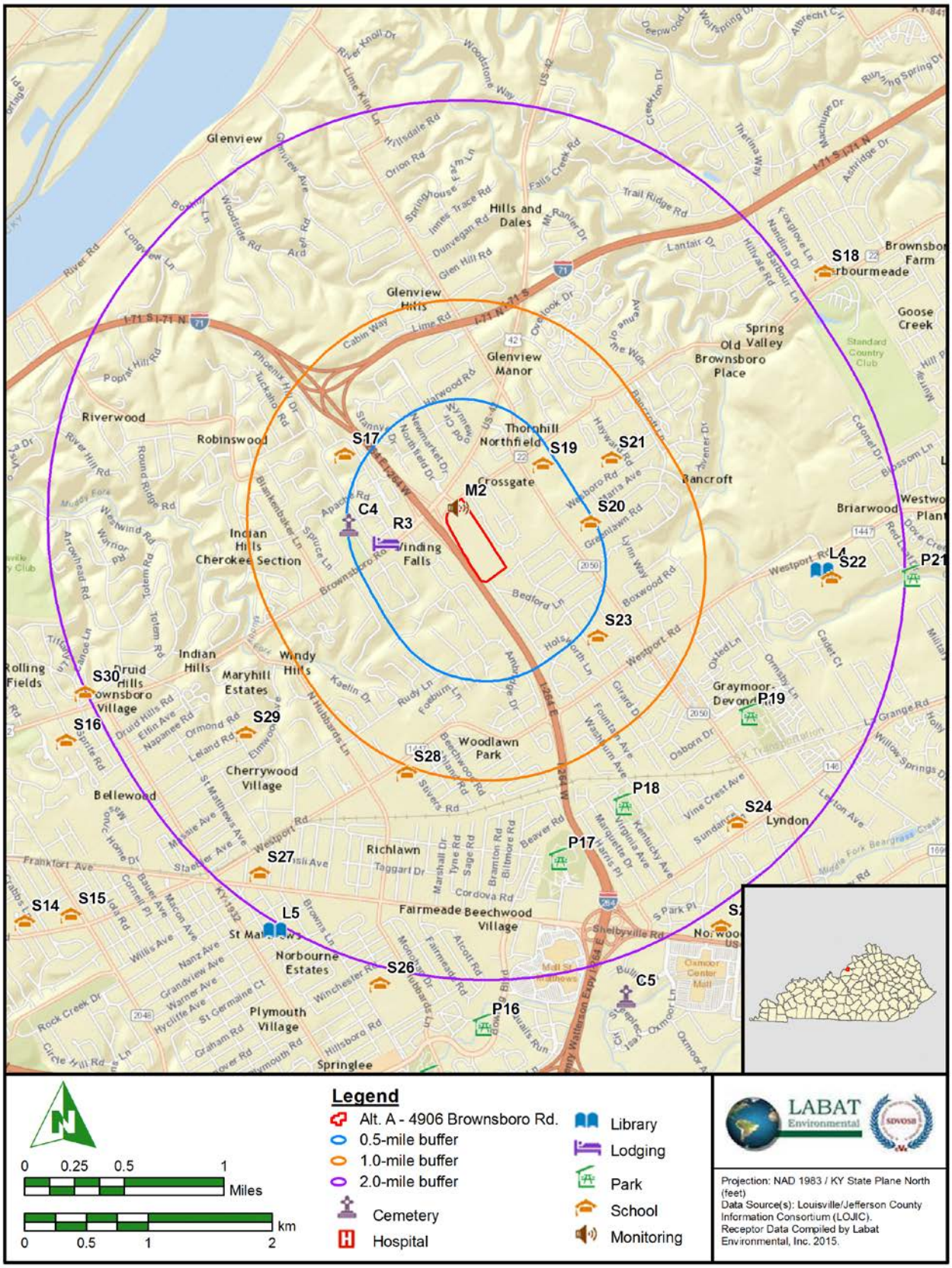


Figure 3.7-2. Brownsboro Site Area Noise-Sensitive Receptors.

Table 3.7-4. Noise-Sensitive Receptors in Brownsboro Site Area.

Receptors within 0.5 miles of Brownsboro Site: C4 – Zachary Taylor National Cemetery R3 – Brownsboro Inn S19 – Ballard High School S20 – Wilder Elementary
Receptors within 0.5 - 1.0 miles of Brownsboro Site: S17 – Dunn Elementary S21 – Kammerer Middle School S23 – St. Albert the Great Catholic School
Receptors within 1.0 - 2.0 miles of Brownsboro Site: L4 – Westport Library P17 – Community Park P18 – Warwick Park P19 – Robinson Park S22 – Westport Middle School S24 – Waldorf School of Louisville S27 – Trinity High School S28 – Walden School S29 – Holy Trinity Parish School S30 – Second Presbyterian School

3.7.2.2 St. Joseph Site

The St. Joseph Site is generally consistent with a suburban to rural setting. As such, the predominant noise sources in the area include mobile sources (such as personal and commercial vehicles). Vehicle traffic and associated noise is heaviest along I-265 (west of site) and Factory Lane (north of site).

Noise-sensitive land uses in the St. Joseph Site area were identified and mapped (see Figure 3.7-3). Table 3.7-5 lists the noise-sensitive receptors and their proximity to the site. The nearest residential area to the St. Joseph Site is adjacent to the northwestern site boundary.

Table 3.7-5. Noise-Sensitive Receptors in St. Joseph Site Area.

Receptors within 0.5 miles of St. Joseph Site: H7 S31 S36
Receptors within 0.5 - 1.0 miles of St. Joseph Site: S35 S38
Receptors 1.0 - 2.0 miles of St. Joseph Site: C9 – Confederate Cemetery C10 – Flat Rock Cemetery P24 – Berrytown Park S32 – Pewee Valley Junior Academy S33 – St. Aloysius School

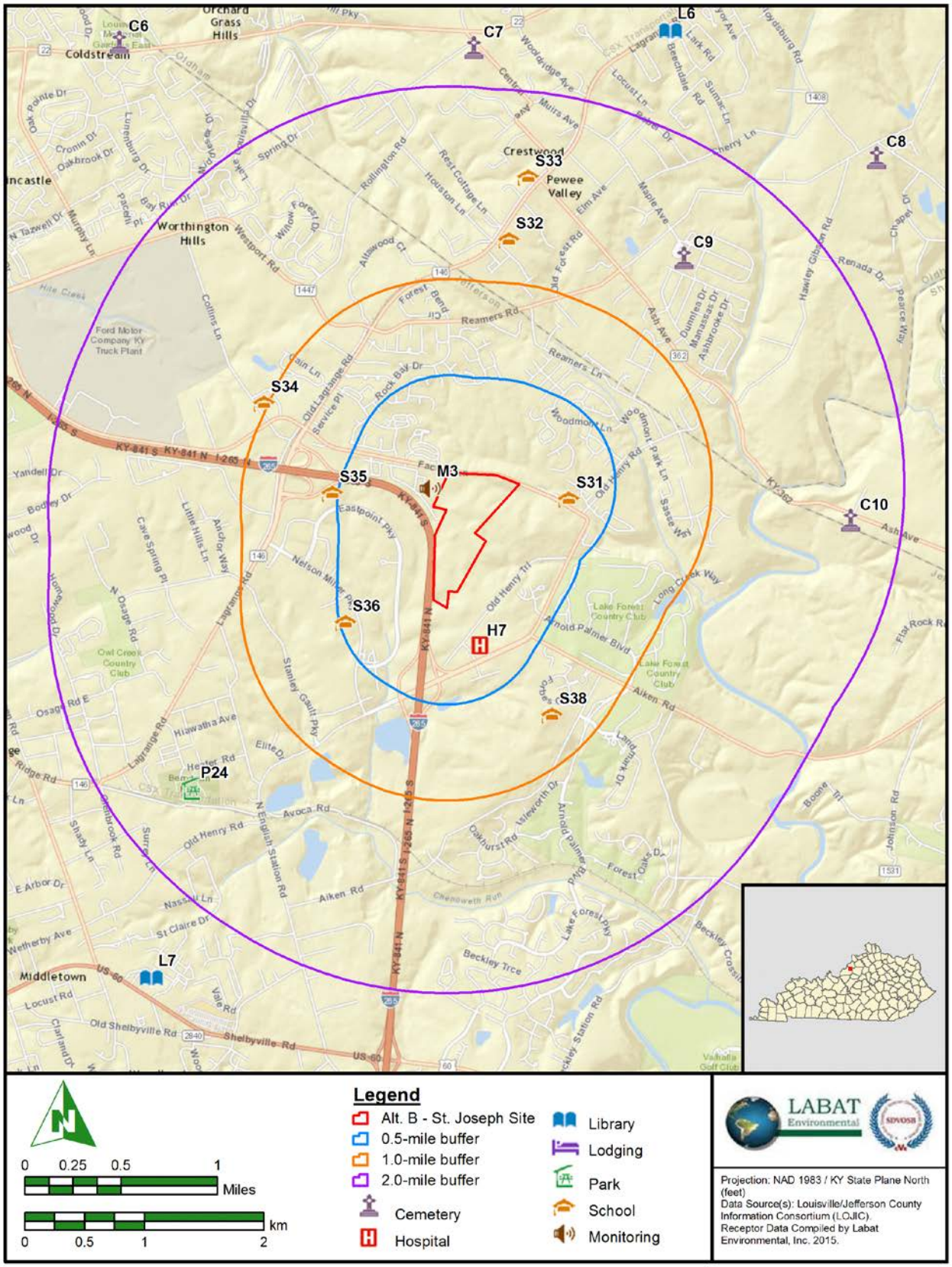


Figure 3.7-3. St. Joseph Site Area Noise-Sensitive Receptors.

3.7.2.3 Existing Zorn Avenue Facility

The Zorn Avenue location is generally consistent with an urban or suburban setting. As such, the predominant noise sources in the area include mobile sources (such as personal and commercial vehicles) and stationary sources (such as heating, ventilation, and air conditioning units attached to buildings). Vehicle traffic and associated noise is heaviest along I-71 (north of site) and Zorn Avenue (east of site).

Noise-sensitive land uses in the Zorn Avenue campus area were identified and mapped (see Figure 3.7-4). Table 3.7-6 lists the noise-sensitive receptors and their proximity to the Zorn Avenue site. The nearest residential area to the Zorn Avenue site is adjacent to the western and southern site boundary.

Table 3.7-6. Noise-Sensitive Receptors in Zorn Avenue Site Area.

Receptors within 0.5 miles of Zorn Avenue Site: H1 – Louisville VAMC P1 – Louisville Champions Park P2 – Louisville Water Tower Park R1 – Ramada Louisville North S1 – Webster University Louisville S2 – St. Leonard Catholic School
Receptors within 0.5 - 1.0 miles of Zorn Avenue Site: L3 – Louisville Free Public Library – Crescent Hill Branch P3 – Thurman Hutchins Park P4 – Carrie Gaulbert Cox Park P12 – Bingham Memorial Park
Receptors within 1.0 - 2.0 miles of Zorn Avenue Site: C1 – St. Anthony's Eastern Cemetery (IN) C2 – Cave Hill Cemetery L2 – Barr Library P5 – Perrin Family Park (IN) P6 – Wathen Park (IN) P7 – Memorial Park (IN) P8 – Eva Bandman Park P10 – Breslin Park P11 – Clifton Park P13 – Cherokee Park R2 – Legacy Hotel and Conferences S3 – Ewing Lane Elementary (IN) S4 – Bridgepoint Elementary (IN) S5 – Parkview Middle School (IN) S6 – Eastlawn Elementary (IN) S7 – Maple Elementary (IN) S8 – Washington School S9 – Kentucky School for the Blind S10 – Breckenridge Franklin Elementary S11 – Barret Traditional Middle School S12 – Southern Baptist Theological Seminary S13 – Field Elementary S14 – Sacred Heart Academy S15 – Holy Spirit School S16 – Chenowith Elementary S30 – Second Presbyterian School

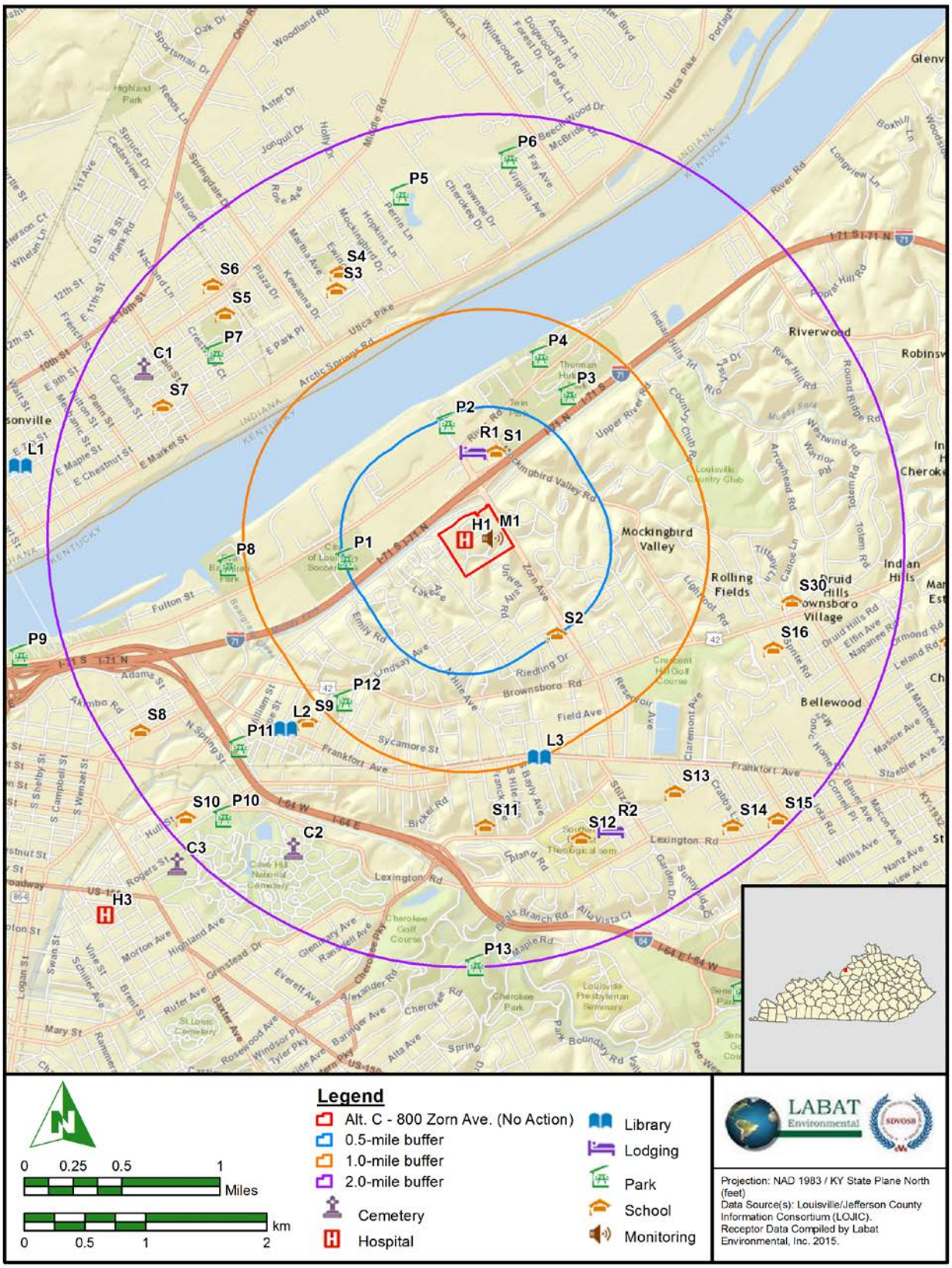


Figure 3.7-4. Zorn Avenue Site Area Noise-Sensitive Receptors.

3.8 Land Use

Land use is described by land activities, ownership, and the governing entities' management plans. Local zoning defines land use types and regulates development patterns.

3.8.1 Regulatory and Policy Framework

VA guidance addresses various aspects of siting and designing different types of VA health care facilities including land use sustainability, compatibility, and constraints. Consideration is given to local land use planning and zoning ordinances even if VA is not legally required to comply with them.

3.8.1.1 VA Guidance

The VA Site Development Design Manual (VA 2013) addresses a wide range of issues, and incorporates contemporary practices such as low-impact development and green building principles (LEED – Leadership in Energy and Environmental Design) into the design of VA facilities. This manual addresses sustainability, stormwater management, energy and water conservation, linkages to adjacent and proximal uses, solar orientation, pedestrian and bike paths, various benefits of and approaches to site landscaping, and other topics.

The VA Sustainable Locations Program (VA 2012) is the directive that facilitates compliance with the implementing instructions in planning sustainable federal facility locations (CEQ 2011). The implementing instructions and VA directive require a balanced consideration and evaluation of land use, the built environment, cost, security, mission need, and competition on facility location decision-making. The four principles for sustainable federal locations include:

1. Advance local and regional planning goals that include consideration of sites that are pedestrian-friendly, near existing employment centers, accessible to public transit, and emphasize existing central cities or planned town centers.
2. Seek location-efficient sites in central business districts and suburban town centers; that promote transportation choice; with surrounding business and services that are accessible by walking and biking; and that are accessible to a diverse range of employees and visitors.
3. Maximize use of existing resources with sites that are currently served by water, sewer and public infrastructure; promote infill development; and were previously used or underused sites, including historic districts.
4. Foster protection of the natural environment by avoiding development of green space, preserving functioning ecosystems, and promoting climate change adaptation planning.

3.8.1.2 Local Land Use Planning and Zoning

The Cornerstone 2020 Comprehensive Plan represents the vision of Louisville and Jefferson County for a more livable, attractive, mobile, efficient, and environmentally sensitive community (LMG 2000). The Cornerstone 2020 plan guides the use of land and protection of natural resources, and encourages economic growth while enhancing the character of neighborhoods (LMG 2000). The plan created 11 "form districts" as a further delineation of zoning, which govern the pattern and form of development within the delineated district.

The Land Development Code (LMG 2006) is the compilation of regulations to implement the goals and objectives within the Cornerstone 2020 Comprehensive Plan. The Land Development Code contains

several requirements related to zoning, form districts, land use, building and site design, transportation, landscaping, and signage.

Hospitals, clinics, and other medical facilities are defined by the Land Development Code as "conditional uses." These types of facilities may be allowed in any zoning or form district provided the use is compatible with the Cornerstone 2020 Comprehensive Plan and applicable form district development codes (LMG 2006).

3.8.2 Current Conditions

3.8.2.1 Brownsboro Site

The Brownsboro Site is vacant and undeveloped. The updated Cornerstone 2020 Comprehensive Plan land use map shows the site as Public Used and Owned and Semi-Public. Historic land use was a farmstead and agricultural fields. The farm buildings were removed and the fields have been fallow since approximately 2005. Adjacent land uses include single-family residential to the east and south, commercial business to the north and east, and industrial use (interstate and state road right of way) to the west and north.

The Brownsboro Site is zoned as a planned development (designated as PD in Figure 3.8-1) district (LOJIC 2015). Adjacent zoning includes right of way to the west, single-family residential (R-4 at 4.84 dwellings per acre and R-5 at 7.26 dwellings per acre) to the east and south, and commercial (C-1, C-2) to the north. The site is located in a town center (TC) form district, which is typically a compact area with a mixture of moderately intense land uses, including retail, office, service, entertainment, institutional, governmental, and public services (LMG 2000, 2006). These zoning designations are shown in Figure 3.8-1.

A planned development district promotes efficient and economic uses of land, diversifies and integrates new development that is compatible with existing development, and is consistent with the applicable form district (LMG 2006). The planned development zoning of the Brownsboro Site was to accommodate a proposed development (The Midlands) that was reported to have included 117 condominiums, 192 apartments, a 150-room six-story hotel, restaurants, offices, and 119,500 square feet of retail space (Courier-Journal 2007).

3.8.2.2 St. Joseph Site

The St. Joseph Site is vacant and undeveloped, but its current use is agricultural. The updated land use map for the Cornerstone 2020 Comprehensive Plan shows the site as Public Used and Owned and Semi-Public. Adjacent land uses include single- and multiple-family residential to the west and east, commercial businesses to the east and south, public use to the north, vacant land to the east, and industrial use (interstate right of way) to the west. A large portion of the commercial land use area to the east and south is undeveloped.

The site is zoned as R-4 (single-family residential at 4.84 dwellings per acre) (LOJIC 2015). Adjacent zoning includes R-4 and R-6 (multiple-family residential at 17.42 dwellings per acre) to the east, R-7 (multiple-family residential at 34.8 dwellings per acre) to the west, and planned employment center (PEC) to the south. The site is split by two form districts – suburban workplace (SW) encompasses the western and southern parts of the site, and neighborhood (N) encompasses the northeastern part of the site. The suburban workplace form district is typically a large-scale industrial and employment center buffered from potentially incompatible adjacent land uses (LMG 2000, 2006). The neighborhood form district is typically a compact residential area integrated with public spaces such as parks, schools, and shops at

certain intersections to serve the neighborhood (LMG 2000, 2006). These zoning designations are shown in Figure 3.8-2.

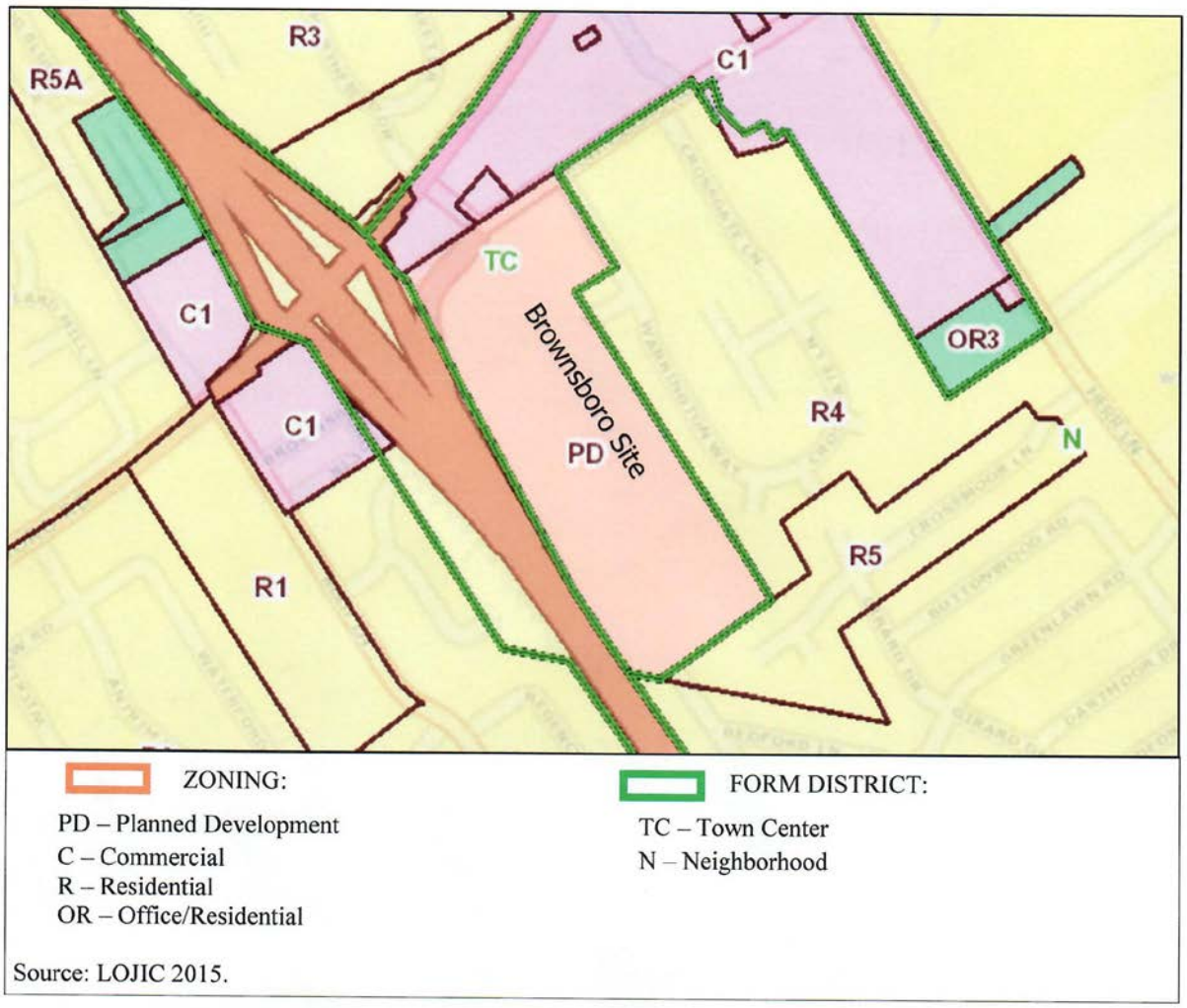


Figure 3.8-1. Zoning Designations, Brownsboro Site.

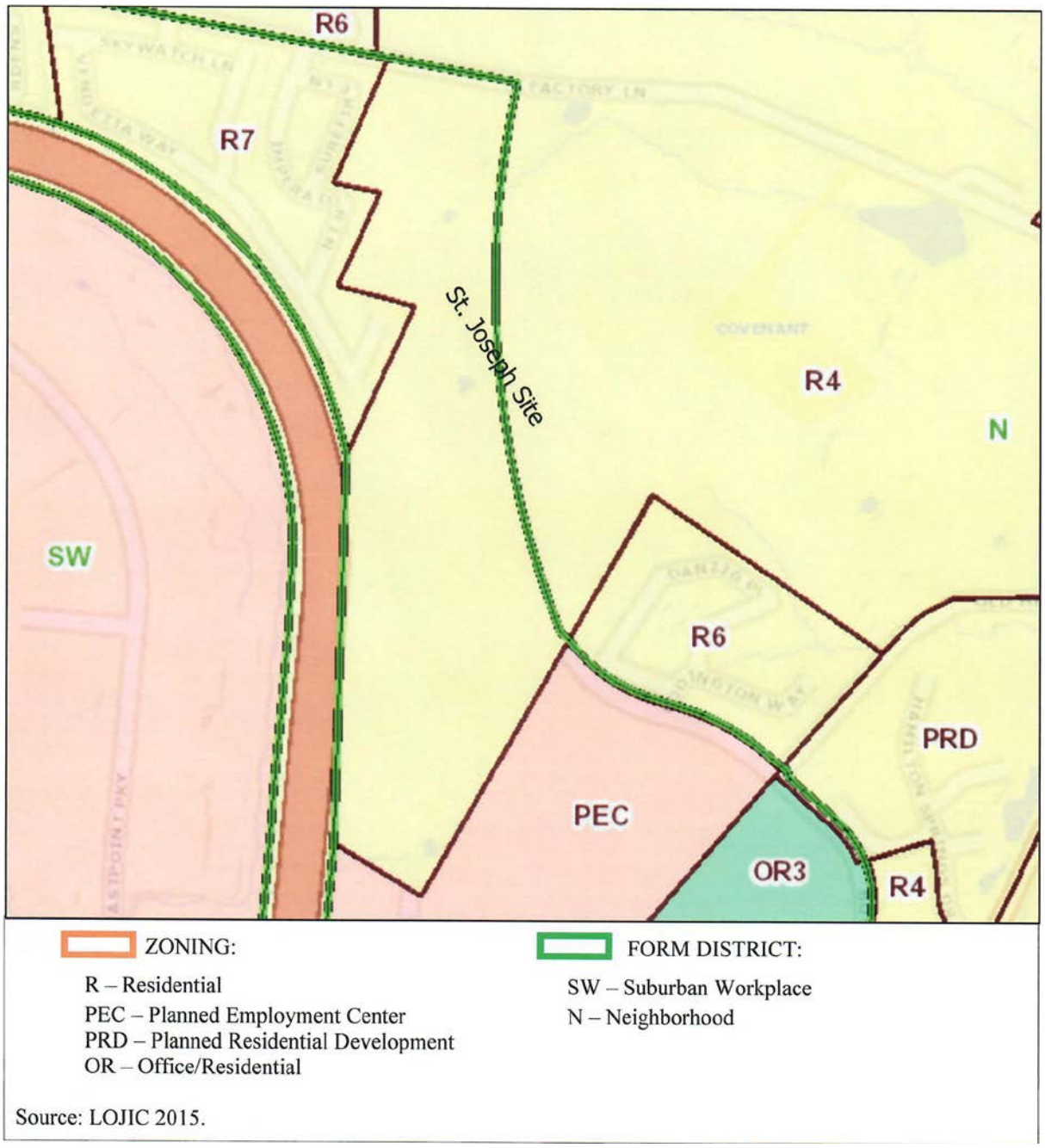


Figure 3.8-2. Zoning Designations, St. Joseph Site.

3.8.2.3 Existing Zorn Avenue Facility

The Zorn Avenue Site is occupied by the existing Robley Rex VAMC. The Cornerstone 2020 Comprehensive Plan updated land use map shows the site as Public Used and Owned and Semi-Public. Adjacent land uses to the west, east, and south are single- and multiple-family residential. A narrow band of commercial use (currently undeveloped) is to the north between the VAMC and the interstate right of way (industrial use).

The site is zoned as R-1 (single-family residential at 1.08 dwellings per acre) (LOJIC 2015), even though it is occupied by the VAMC. Adjacent zoning includes single-family residential (R-5) to the east, multiple-family residential (R-7) to the west and south, and office/residential (OR-3) to the south. The site is located in a neighborhood (N) form district, which is a compact residential area integrated with public spaces such as parks, schools, and shops at certain intersections to serve the neighborhood (LMG 2000, 2006). The zoning designations are shown in Figure 3.8-3.

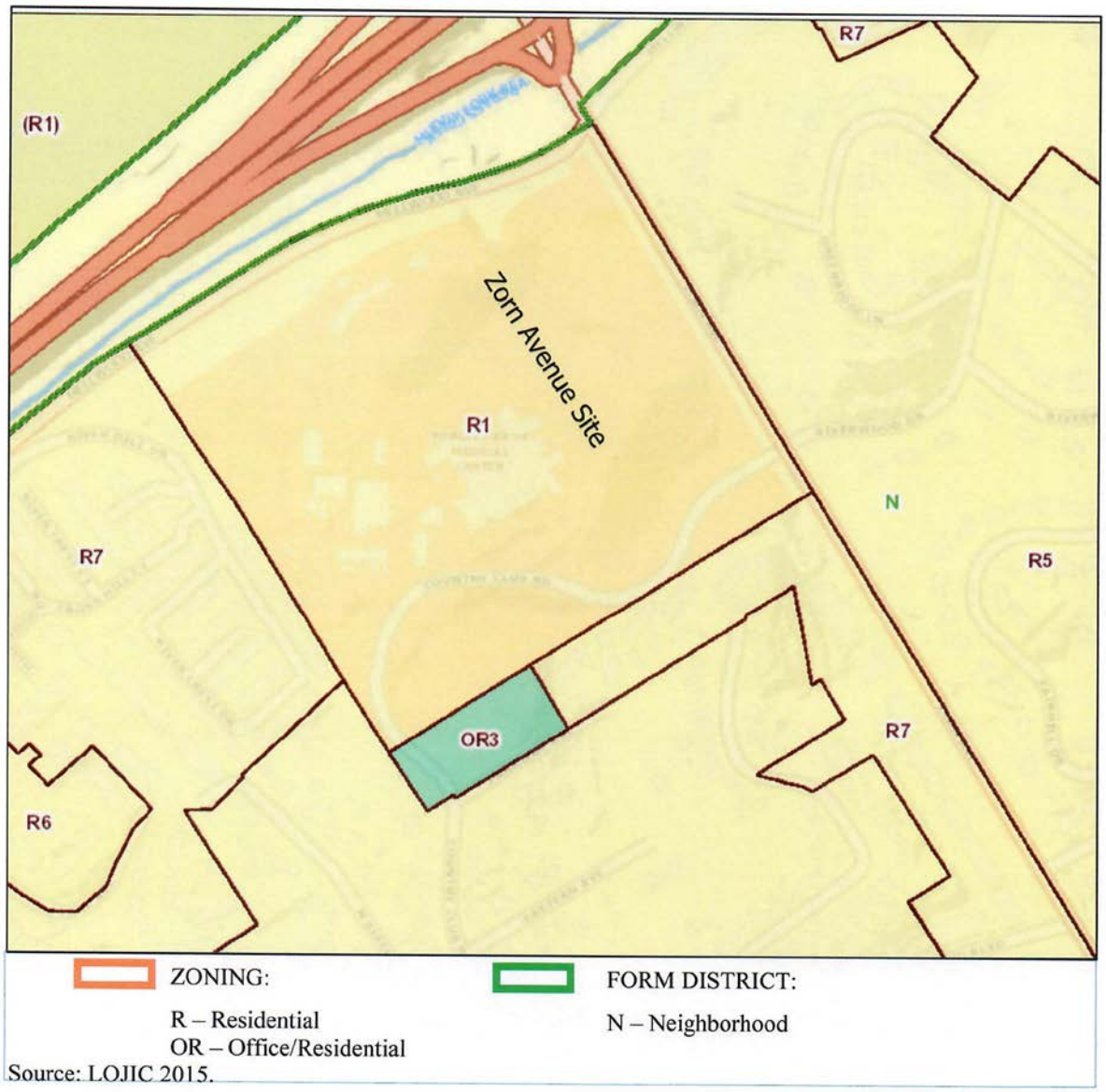


Figure 3.8-3. Zoning Designations, Zorn Avenue Site.

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3.9 Floodplains and Wetlands

A floodplain is the low-lying area adjacent to a river or stream that is periodically subject to flooding. The Federal Emergency Management Agency (FEMA) identifies areas predicted to be inundated by the 100-year and 500-year flood events and establishes special management and/or construction requirements for these areas.

A wetland is an area that is characterized by hydric soils and wetland hydrology and supports hydrophytic vegetation. The U.S. Army Corps of Engineers (USACE) regulates development in wetlands.

The National Coastal Zone Management Program provides the basis for protecting, restoring, and responsibly developing diverse coastal communities and resources. The State of Kentucky does not contain any coastal zones governed by the program (NOAA 2012). Coastal zones are not discussed further in this EIS.

The region of influence for the evaluation of floodplains and wetlands consists of the project site.

3.9.1 Regulatory and Policy Framework

Development in floodplains is regulated through the National Flood Insurance Program administered by FEMA and managed through mutual agreements with local governments. The program regulates development in special flood hazard areas to prevent flooding, protect human health and safety, and minimize property damage caused by flooding. Special flood hazard areas are those areas subject to inundation by the one percent annual chance flood (commonly referred to as the 100-year flood). FEMA models the flooding potential within communities and delineates special flood hazard zones (collectively referred to as the 100-year floodplain) and other flood areas, which are published on Flood Insurance Rate Maps (FIRMs). Development within designated flood-prone areas is locally regulated by the Louisville-Jefferson County Metro Government Floodplain Management Ordinance (Title XV: Land Usage, Chapter 157: Floodplain Management Ordinance) (AmLegal 2015).

Federal agencies are required to avoid or minimize actions that could adversely affect floodplains (Executive Order 11988, Floodplain Management). The VA Site Development Design Manual (VA 2013) provides direction for planning, siting, and designing VA facilities. The manual states that when siting a facility, floodplain functions should be protected by avoiding or limiting development within the 100-year floodplain. Development in floodplains should be limited to open spaces and recreation areas first, parking areas second, and structures only if absolutely necessary.

Development in wetlands is regulated under the Clean Water Act as administered by USACE, and by farmland conservation programs administered by the Natural Resources Conservation Service. Filling wetlands is regulated primarily to avoid damage to aquatic environments and to prevent degradation of water quality. Three indicators (hydric soil, hydrophytic vegetation, and wetland hydrology) must be present during some portion of the growing season to define an area as a wetland within the regulatory jurisdiction of the USACE. Although not all-encompassing, the National Wetland Inventory (NWI) maintained by the U.S. Fish and Wildlife Service provides location information on possible wetlands. Not all wetlands shown on the NWI would meet the criteria required to delineate a regulated wetland. Federal agencies are required to avoid filling or modifying wetlands to the extent practicable (Executive Order 11990, Protection of Wetlands).

3.9.2 Current Conditions

3.9.2.1 Brownsboro Site

The Brownsboro Site is generally level with an elevation of approximately 585 to 595 feet above mean sea level (AMEC 2014). The site is located in Flood Zone X (outside the 500-year flood zone) (FEMA FIRM Panel 21111C0029E; FEMA 2014). There is minimal flood risk with no rivers, streams, or other surface water bodies on the site. Figure 3.9-1 depicts the flood hazard areas in the vicinity of the Brownsboro Site.

There are no wetland areas identified by the NWI on the site (FWS 2015). The absence of wetland areas is consistent with a recent wetland delineation (TTL 2012a), which concluded that no wetlands are present at the Brownsboro Site. Figure 3.9-2 depicts the wetland areas identified by the NWI in the vicinity of the Brownsboro Site.

3.9.2.2 St. Joseph Site

The St. Joseph Site topography is undulating, but relatively level in its central and southern portions, with an elevation of approximately 740 to 750 feet above mean sea level (VA 2012). The site is located in Flood Zone X (outside the 500-year flood zone) (FEMA FIRM Panels 21111C0021E and 21111C0034E; FEMA 2014). There is minimal flood risk with no rivers or significant streams on the site. Figure 3.9-3 depicts the flood hazard areas in the vicinity of the St. Joseph Site.

One potential wetland area (approximately 0.18 acres) is identified by the NWI in the northern portion of the site (FWS 2015). A recent wetland delineation (TTL 2012b) identified three potential wetland areas onsite (W1 – approximately 0.08 acres, W2 – approximately 0.15 acres, and W3 – approximately 0.10 acres) and one offsite wetland area adjacent to the southwestern boundary. Figure 3.9-4 depicts the wetland areas identified by the NWI and the previous wetland delineation in the vicinity of the St. Joseph Site.

3.9.2.3 Existing Zorn Avenue Facility

The existing Zorn Avenue VAMC campus is in an area of moderate topographic relief with areas of significant relief (steep slopes) that prohibit additional development. The site elevation in the developable portion of the site is approximately 520 to 530 feet above mean sea level. The site is primarily located in Flood Zone X (outside the 500-year flood zone), although some areas in the northeastern portion of the site within drainages are located in the 100-year and 500-year flood zones (FEMA FIRM Panel 21111C0027E; FEMA 2014). There is minimal flood risk for the developable portion of the site. Figure 3.9-5 depicts the flood hazard areas in the vicinity of the existing Zorn Avenue facility.

There are no wetland areas identified by the NWI on the Zorn Avenue campus (FWS 2015). Figure 3.9-6 depicts the wetland areas identified by the NWI in the vicinity of the site.

Figure 3.9-1. Location of Flood-Prone Areas in Brownsboro Site Vicinity.

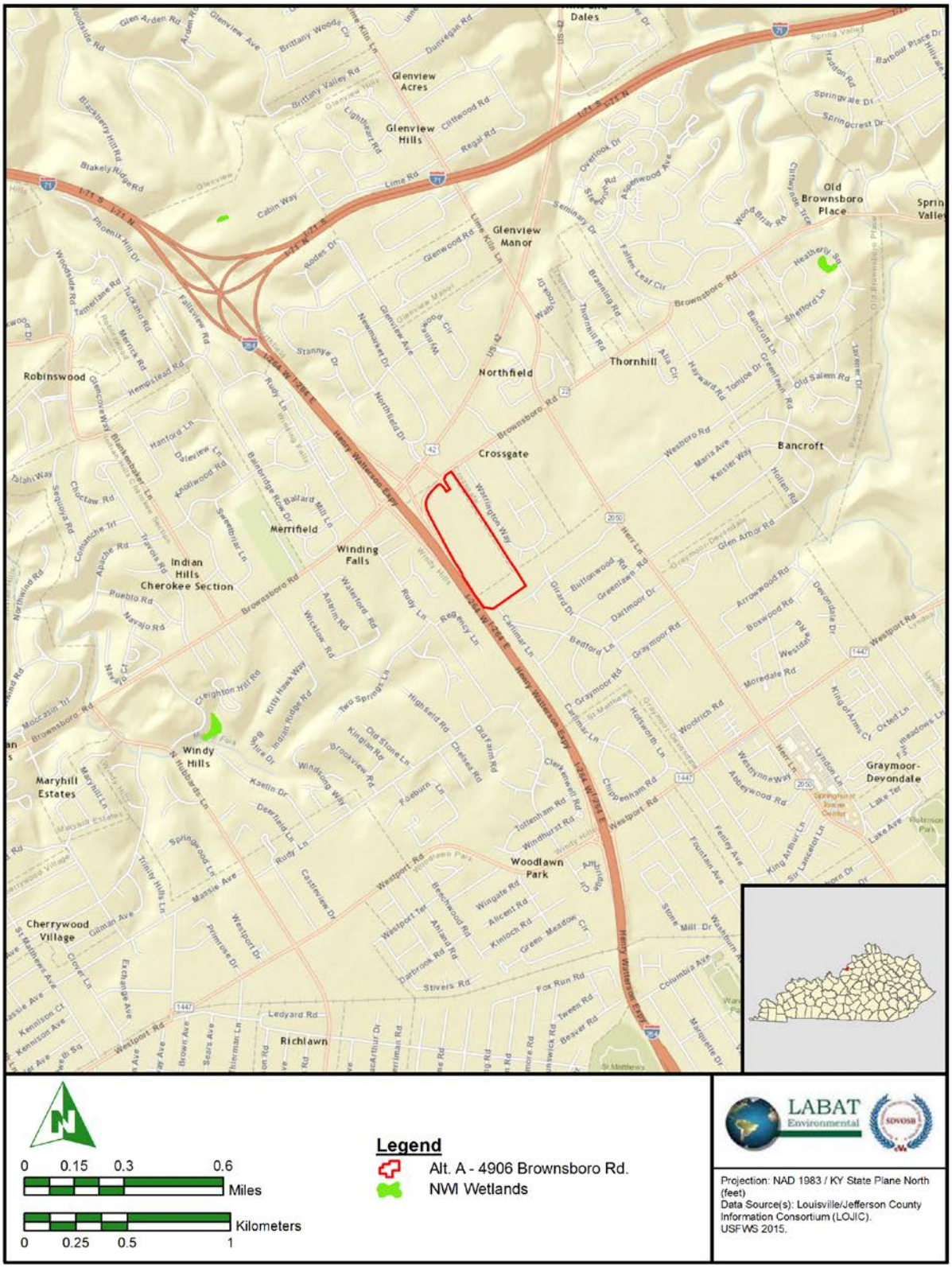

Figure 3.9-2. Location of Wetland Areas in Brownsboro Site Vicinity.

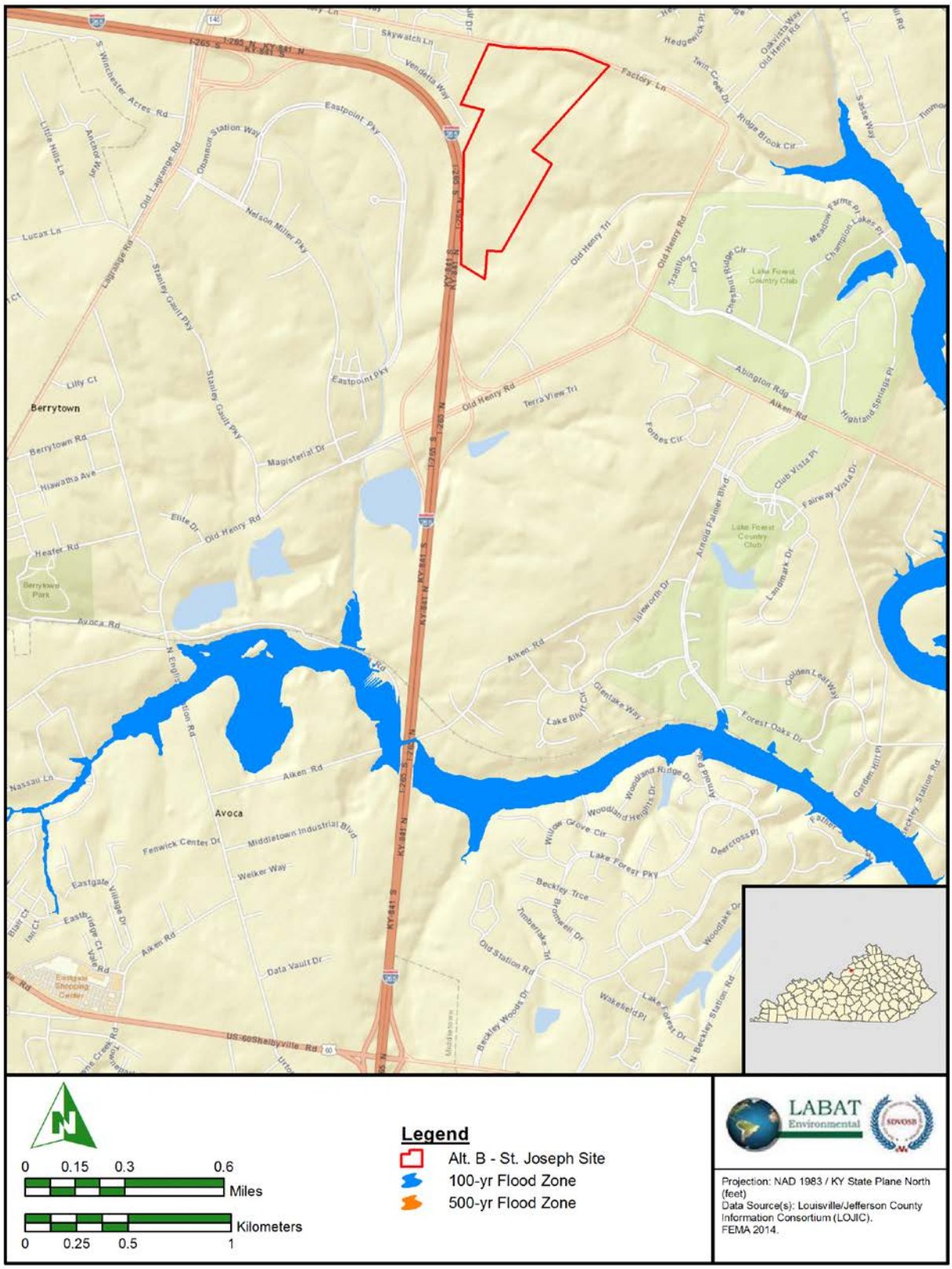

Figure 3.9-3. Location of Flood-Prone Areas in St. Joseph Site Vicinity.

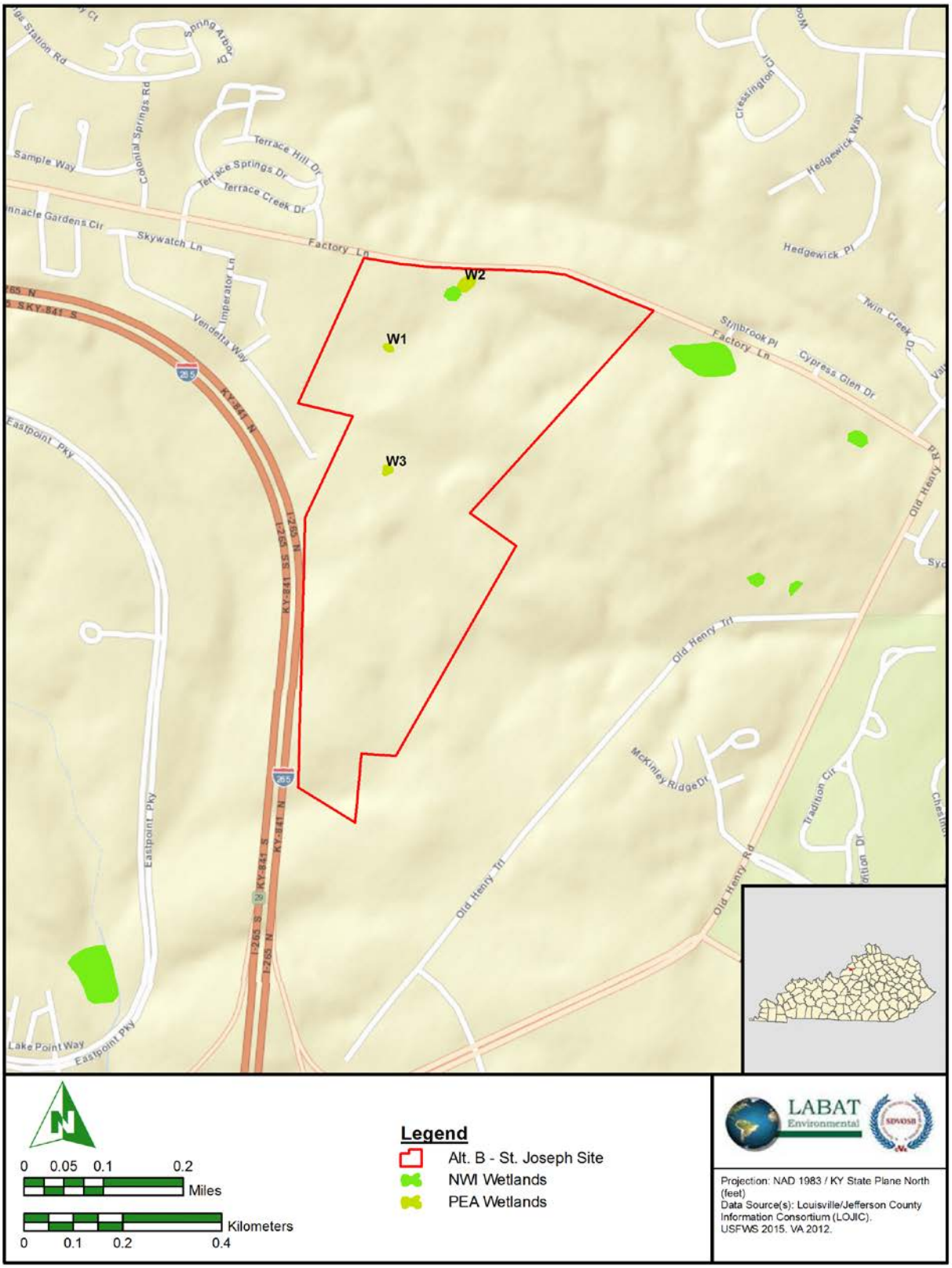

Figure 3.9-4. Location of Wetland Areas in St. Joseph Site Vicinity.

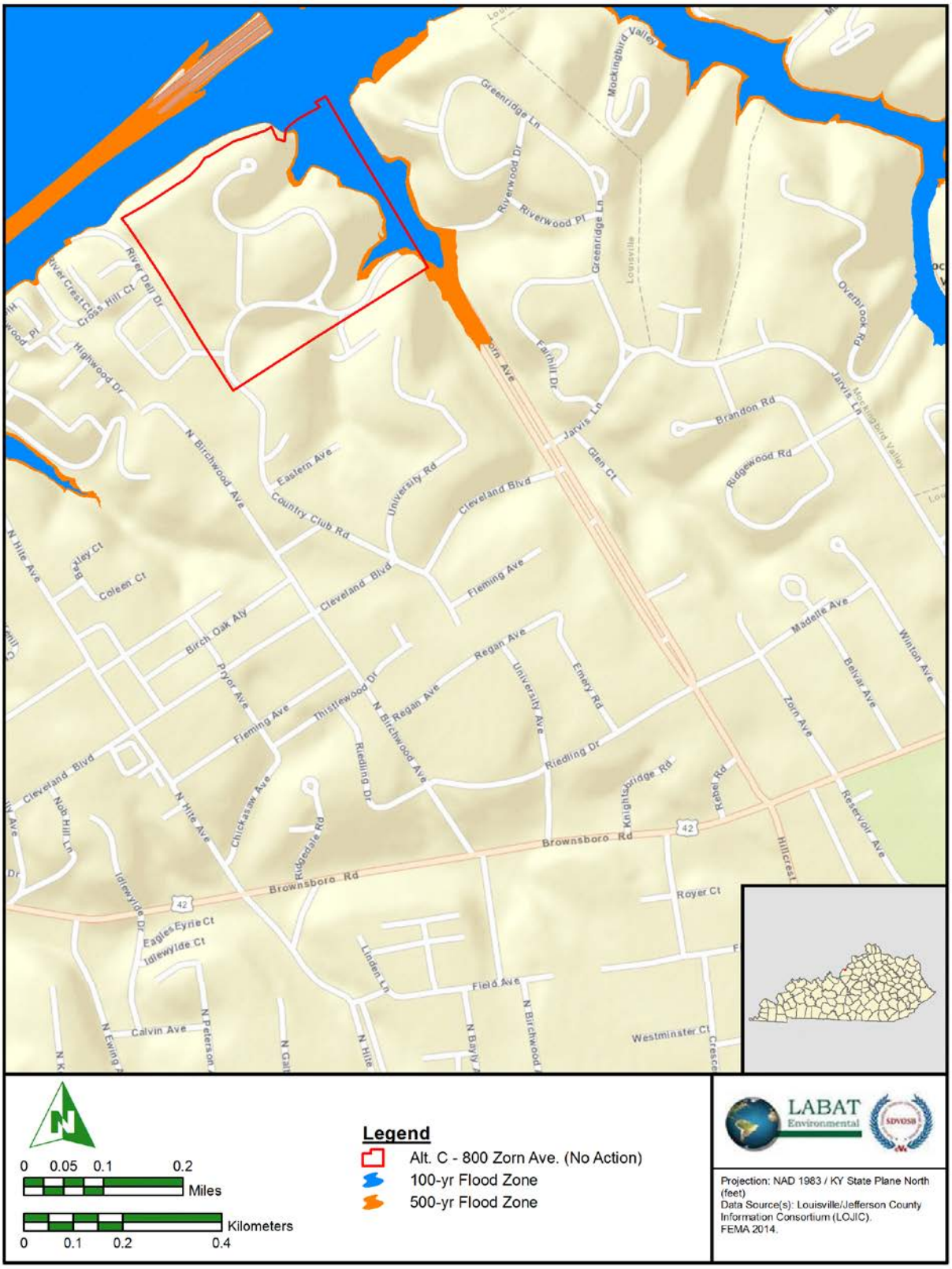

Figure 3.9-5. Location of Flood-Prone Areas in Zorn Avenue VAMC Vicinity.

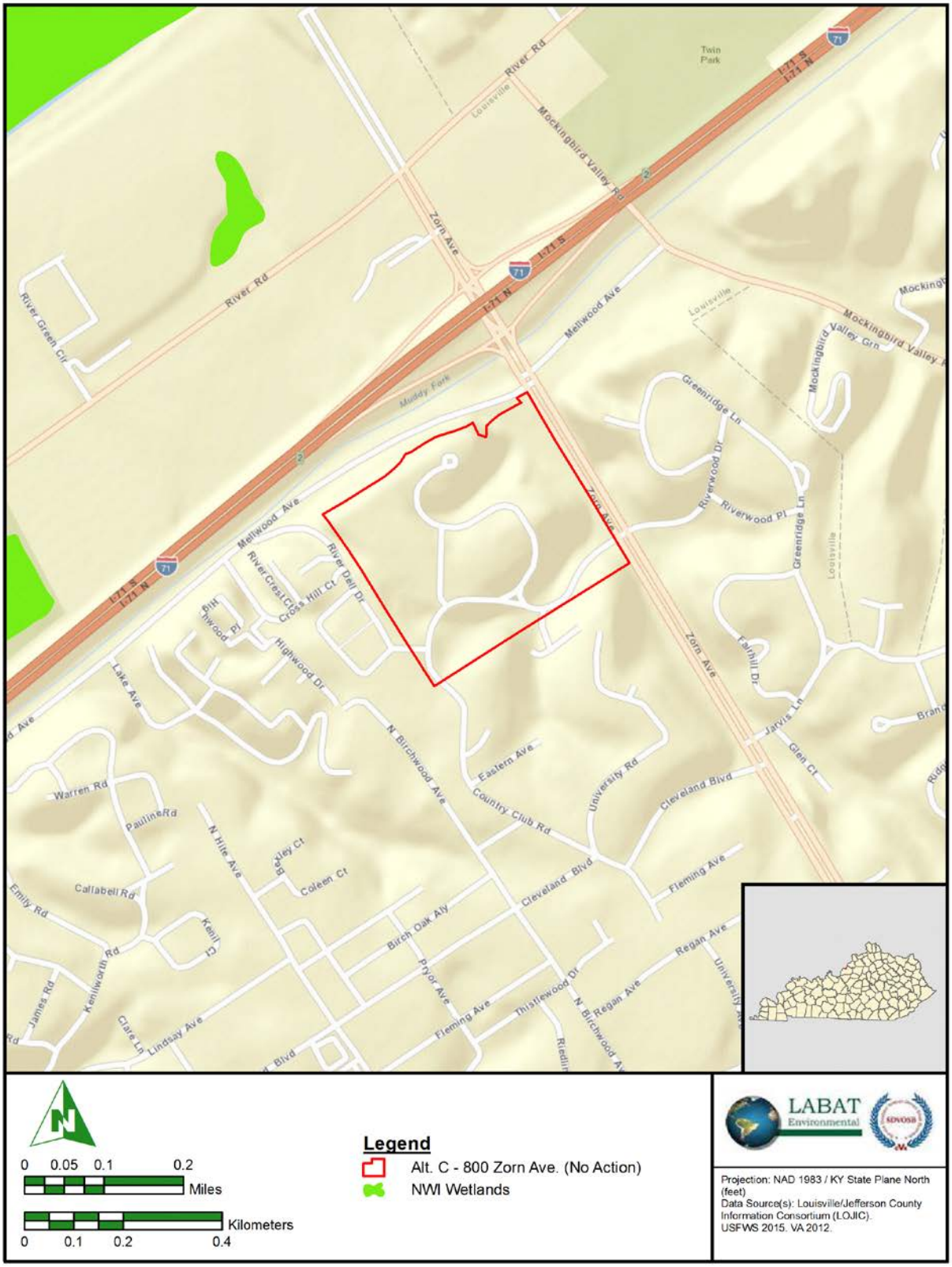

Figure 3.9-6. Location of Wetland Areas in Zorn Avenue VAMC Vicinity.

3.10 Socioeconomics

This section describes the existing physical environment and regulatory framework related to population, housing, employment, and income. In addition to general socioeconomic information, this section includes general discussions about property values and crime.

Socioeconomics are described using demographic and employment measures, as these measures influence the local economy and housing demand.

3.10.1 Regulatory Framework

There are no federal standards relating to socioeconomics that apply to VA, and no state or local requirements to address. The regulatory framework for addressing socioeconomics is in the context of the human environment referred to in NEPA and defined by the CEQ regulations implementing NEPA. Economic or social effects will be discussed in an EIS when interrelated with the natural and physical environment (40 CFR 1508.14).

3.10.2 Current Conditions

For the purposes of this analysis, current socioeconomic conditions are described by geographic areas that depend on the data set. The study area for socioeconomics consists of the Louisville-Jefferson County, Kentucky-Indiana Metropolitan Statistical Area (Louisville MSA). Other geographic areas used to describe socioeconomic conditions include the Louisville-Jefferson County Metro Government (Louisville Metro) and the State of Kentucky.

In 2003, the Jefferson County, Kentucky government merged with that of its largest city and county seat, the City of Louisville, forming a new entity referred to as the Louisville-Jefferson County Metro Government. All small cities within Jefferson County became part of the new Louisville Metro government while retaining their city governments, as well as the remaining unincorporated areas within Jefferson County. Prior to the merger, Louisville was the 65th largest city in the United States. Since the merger, the metro area represents the 18th largest U.S. city and the 43rd largest MSA. Thus, statistics provided herein are for the Louisville Metro area and not for individual cities or unincorporated areas because of the government merger.

An MSA has at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core, as measured by commuting ties (OMB 2013). The Louisville MSA encompasses eight counties in Kentucky and five counties in southern Indiana. The U.S. Office of Management and Budget defines the Louisville MSA as including Bullitt, Henry, Jefferson, Meade, Oldham, Shelby, Spencer, and Trimble counties in Kentucky; and Clark, Floyd, Harrison, Scott, and Washington counties in Indiana. The State of Indiana is included in this analysis for comparative purposes because five counties within the Louisville MSA are located in that state.

The information relating to population, housing, and employment is derived from the U.S. Census Bureau 2010 Decennial Census, which is the most recent comprehensive source of data. Labor force and unemployment statistics are from the U.S. Bureau of Labor Statistics.

3.10.2.1 Population

The catchment (service area) for the Robley Rex VAMC encompasses 35 counties in Kentucky and Indiana. Population estimates for the area are summarized in Table 3.10-1. The existing VAMC on Zorn

Avenue and the proposed replacement sites (Brownsboro and St. Joseph) are located within Louisville Metro, which has a total estimated population of 768,000 in 2015 (an approximate 10.7 percent increase from 2000). Data for Louisville Metro projects an increase in total population of 23.4 percent between 2000 and 2035. Between 2000 and 2035, the projected rate of population growth for Louisville Metro is less than that of Louisville MSA (36.8 percent), but similar to that of the State of Kentucky (25.3 percent). Overall the geographic area with the slowest projected rate of population growth is the State of Indiana (at 19.2 percent).

Table 3.10-1. Historical, Current, and Projected Population.

Study Area	Population							Change 2000-2035
	2000	2010	2015	2020	2025	2030	2035	
Louisville Metro	693,604	741,096	768,000	793,817	817,427	838,053	855,909	+23.4%
Louisville MSA	869,306	959,091	1,008,643	1,058,343	1,105,339	1,149,085	1,189,123	+36.8%
State of Kentucky	4,041,769	4,339,367	4,509,429	4,672,754	4,820,390	4,951,178	5,063,331	+25.3%
State of Indiana	6,080,485	6,483,802	6,677,751	6,852,121	7,011,039	7,143,795	7,248,772	+19.2%

Source: Indiana Business Research Center 2005; Kentucky State Data Center 2011; Census 2000, 2010a.

3.10.2.2 Veteran Population

The Veteran population in the Louisville catchment area for the fiscal year (FY) ending September 30, 2014 (FY 2014) was 150,061 Veterans. Table 3.10-2 shows the projected Veteran population through FY 2024 by the sectors in the catchment area, along with the percent change over this time period. The population projections are those developed by VA's National Center for Veteran Analysis and Statistics; these projections of county-level Veteran population changes are the basis for VA's nationwide services and facilities planning. This analysis was based on the most recent projections available, which were modeled using FY 2014 Veteran population estimates. Although the Veteran population is projected to increase across the 22 Kentucky counties by 4.69 percent by FY 2024, the Veteran population throughout the catchment area is projected to decrease overall by 8.30 percent. It should be noted that the Veteran population is different from the Veteran population enrolled to receive health care services, which is projected to increase during this same time period (see Section 1.1.1).

Table 3.10-2. Projected Veteran Population in Louisville Catchment Area.

Sectors in Louisville Catchment Area	Veteran Population			Change 2014–2024
	FY 2014	FY 2019	FY 2024	
Jefferson County, Kentucky	54,137	49,100	43,962	-18.79%
22 Kentucky counties	59,385	61,429	62,168	+4.69%
12 Indiana counties	36,539	33,958	31,474	-13.86%
Total	150,061	144,487	137,604	-8.30%

Source: VA 2015.

3.10.2.3 Housing

Table 3.10-3 shows the number of housing units and the occupancy rate in the study area between 2000 and 2010. A housing unit is defined by the U.S. Census Bureau as a house, apartment, mobile home or trailer, group of rooms, or a single room that is intended for occupancy as separate living quarters. The largest increase in housing units was in the Louisville MSA (486,939 to 559,837) at 15 percent. Louisville

Metro and the states of Kentucky and Indiana had a similar increase of 10.1 and 10.4 percent between 2000 and 2010. Although the number of housing units increased across the study area, the occupancy rate of those units decreased slightly. The Louisville MSA had the highest 2010 occupancy rate at 91.9 percent and the State of Kentucky had the lowest rate at 89.2 percent. The State of Indiana had the largest change in occupancy with a decrease of 3.0 percent.

Table 3.10-3. Housing Units and Occupancy Rate

Study Area	Housing Units		Occupancy Rate		Percent Change 2000-2010	
	2000	2010	2000	2010	Units	Rate
Louisville Metro	305,835	337,616	93.8%	91.6%	+10.4%	-2.3%
Louisville MSA	486,939	559,837	93.9%	91.9%	+15.0%	-2.1%
State of Kentucky	1,750,927	1,927,164	90.8%	89.2%	+10.1%	-1.8%
State of Indiana	2,532,319	2,795,541	92.3%	89.5%	+10.4%	-3.0%

Source: Census 2001, 2010a.

Table 3.10-4 shows the number of owner-occupied and renter-occupied housing units in the study area between 2000 and 2010. Both owner-occupied and renter-occupied units increased throughout the study area, with renter-occupied units increasing more than owner-occupied units. The Louisville MSA had the highest increase in both categories: 10.5 percent for owner-occupied units and 17.0 percent for renter-occupied units. Louisville Metro and the states of Kentucky and Indiana had similar increases of between 4.6 and 4.9 percent for owner-occupied housing units, and 13.0 to 15.8 percent for rented units.

Table 3.10-4. Owner-Occupied and Renter-Occupied Housing.

Study Area	Owner-Occupied		Renter-Occupied		Percent Change 2000-2010	
	2000	2010	2000	2010	Owner	Renter
Louisville Metro	186,387	194,997	100,625	114,178	+4.6%	+13.5%
Louisville MSA	317,264	350,540	139,876	163,674	+10.5%	+17.0%
State of Kentucky	1,125, 397	1,181,271	465,250	538,694	+4.9%	+15.8%
State of Indiana	1,669,162	1,747,975	667,144	754,179	+4.7%	+13.0%

Source: Census 2001, 2010a.

The median values of housing and contract rent increased throughout the study area between 2000 and 2010. Table 3.10-5 shows the largest increase in median housing value to be in the Louisville Metro area ($103,000 to $145,900) at 41.7 percent. Indiana had the lowest increase in housing value ($94,000 to $123,000) at 30.4 percent. Louisville Metro and the State of Kentucky both had the highest increase in median contract rent at 35 percent, and Indiana had the lowest increase at 31 percent. The median value of housing in 2010 was higher in Louisville Metro than in the States of Kentucky and Indiana. The median contract rent amounts were similar across the study area.

Table 3.10-5. Median Value of Housing and Median Contract Rent.

Study Area	Median Housing Value		Median Contract Rent		Percent Change 2000-2010	
	2000	2010	2000	2010	Housing	Rent
Louisville Metro	$103,000	$145,900	$494	$667	+41.7%	+35.0%
Louisville MSA	N/A[1]	$147,000[2]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

State of Kentucky	$86,700	$116,800	$445	$601	+34.7%	+35.0%
State of Indiana	$94,300	$123,000	$521	$683	+30.4%	+31.0%

1 N/A = Not available (dataset for Louisville MSA was not published by U.S. Census Bureau for 2000 or 2010; median housing value was available for 2010-2012).
2 Dataset for 2010-2012.
Source: Census 2000, 2003, 2010b.

3.10.2.4 Income

Median household and per capita income from the 2000 and 2010 census is used as a benchmark to evaluate income levels in the study area. Household income is the sum of the income of people 15 years and older living in the household. A household includes related family members and any unrelated people (such as foster children, wards, or employees) who share the housing unit. A person living alone in a housing unit, or a group of unrelated people sharing a housing unit, is also counted as a household. Per capita income is the mean income computed for every person in a particular group, and is derived by dividing the total income of a particular group by the total population.

Table 3.10-6 shows the change in estimated median income for the study area between 2000 and 2010. Median household and per capita income increased across the study area, generally in the range of 18.4 to 19.9 percent. The outliers included a slightly lower increase in median household income in Louisville Metro ($39,457 to $45,352) at 14.9 percent, and Indiana, which had the lowest increase overall at 7.3 percent for households and 11.8 percent for per capita income.

Table 3.10-6. Income Characteristics.

	Median Household Income		Median Per Capita Income		Population Below Poverty Level		Percent Change 2000-2010		
Study Area	2000	2010	2000	2010	2000	2010	Median Household Income	Median Per Capita Income	Population Below Poverty Level
Louisville Metro	$39,457	$45,352	$22,352	$26,473	12.4%	15.5%	+14.9%	+18.4%	+25.0%
Louisville MSA	$40,111	$47,798	$19,643	$23,539	9.9%	11.8%	+19.1%	+19.8%	+19.0%
State of Kentucky	$33,672	$40,062	$18,093	$21,706	15.8%	19.0%	+18.9%	+19.9%	+20.2%
State of Indiana	$41,567	$44,613	$20,397	$22,806	9.5%	15.3%	+7.3%	+11.8%	+61.0%

Note: Values are expressed in inflation-adjusted dollars for the year of the dataset (2000 or 2010).
Source: Census 2003, 2010b.

Following Office of Management and Budget Statistical Policy Directive 14, the Census Bureau uses a set of dollar value thresholds that vary by family size and composition to determine who is in poverty. If a family's total money income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds are updated annually for inflation using the Consumer Price Index. The thresholds do not vary geographically. For comparison purposes, the U.S. Department of Health and Human Services publishes annual guidelines regarding poverty in the Federal Register. According to these guidelines, a household of four would be living under the poverty line if its 2015 income was $24,250 or less (HHS 2015).

Table 3.10-6 also shows the percent of the population living below the poverty level in the study area in 2000 and 2010. In 2010, the State of Kentucky had the highest rate of poverty within the study area at 19.0 percent. The percent of the population in poverty increased across the study area from 2000 to 2010, with the smallest increase in the State of Kentucky at 20.2 percent, and the largest increase in the State of Indiana at 61.0 percent.

3.10.2.5 Labor Force and Employment Characteristics

The U.S. Bureau of Labor Statistics defines the labor force as civilians (not active duty military or institutionalized persons) 16 years and older who are employed, seeking employment, or unemployed and available to work. Table 3.10-7 shows the number of persons who were employed compared to the size of the labor force in the study area from 2010 through 2014. The labor force grew slightly in the Louisville MSA and the State of Indiana, and decreased in Louisville Metro and the State of Kentucky between 2000 and 2014. The labor force grew between 2000 and 2013, and decreased across the study area in 2014. In Kentucky, the labor force began contracting in 2013. Despite the labor force becoming smaller in 2014, the Louisville MSA and the State of Indiana still recorded a growth rate between 2010 and 2014 of 0.6 and 2.2 percent, respectively. The total number of persons employed increased throughout the study area, with the State of Indiana having the largest increase at 6.8 percent and the State of Kentucky having the smallest increase at 1.1 percent. While the number of persons employed increased from 2010 to 2014, employment dropped slightly from 2013 to 2014 in Louisville Metro and the State of Kentucky, which is to be expected because the labor force also dropped in 2014.

Table 3.10-7. Labor Force and Employment.

Study Area	Total Civilian Labor Force (Total) and Persons Employed (Empl)[1]									
	2010		2011		2012		2013		2014	
	Total	Empl	Total	Empl	Total	Empl	Total	Empl	Total	Empl
Louisville Metro	376,774	340,359	377,459	341,784	385,020	355,464	387,249	358,642	375,813	356,068
Louisville MSA	622,909	564,353	624,131	567,121	632,006	585,414	637,873	593,464	626,634	594,609
State of Kentucky	2,051,327	1,854,744	2,058,789	1,871,803	2,062,486	1,902,313	2,056,329	1,897,634	1,984,800	1,875,377
State of Indiana	3,163,948	2,863,615	3,200,437	2,912,048	3,161,412	2,917,269	3,195,063	2,976,340	3,234,319	3,057,989

1 As of September of each year.
Source: BLS 2015; Census 2010b.

Table 3.10-8 shows the number of unemployed persons in the study area along with the unemployment rate from 2010 to 2014. The entire study area had sizeable decreases in the number of unemployed persons, along with improvements (decreases) in the unemployment rate. In 2010, the unemployment rate across the study area ranged from 9.4 to 9.7 percent, and decreased annually through 2014, when it ranged from 5.1 to 5.5 percent. Louisville Metro and the Louisville MSA had very similar decreases in unemployed persons and unemployment rate, ranging from 45.3 to 45.8 percent. The State of Indiana had the smallest decreases in number of persons employed and unemployment rate at 39.2 and 42.1 percent, respectively.

Table 3.10-8. Unemployment and Unemployment Rate.

Study Area	Persons Unemployed (Unempl) and Unemployment Rate (Rate)[1]									
	2010		2011		2012		2013		2014	
	Unempl	Rate	Unempl	Rate	Unempl	Rate	Unempl	Rate	Unempl	Rate
Louisville Metro	36,415	9.7%	35,675	9.5%	29,556	7.7%	28,607	7.4%	19,745	5.3%
Louisville MSA	58,556	9.4%	57,010	9.1%	46,592	7.4%	44,409	7.0%	32,025	5.1%
State of Kentucky	196,583	9.6%	186,986	9.1%	160,173	7.8%	158,695	7.7%	109,423	5.5%
State of Indiana	300,333	9.5%	288,389	9.0%	244,143	7.7%	218,723	6.8%	182,480	5.5%

1 As of September of each year.
Source: BLS 2015; Census 2010b.

Table 3.10-9 summarizes the number of extablishments and employees across the different employment sectors. Employment in the State of Kentucky is largely centered on healthcare and social assistance, manufacturing, and retail trade, while the industries with the largest employment in Louisville Metro are transportation and warehousing and utilities, followed by retail trade, manufacturing, and accommodation and food services. Retail trade and healthcare and social assistance have the most establishments in the State of Kentucky, while in Louisville Metro the largest number of establishments is in the retail trade, professional, and healthcare and social assistance industries.

Table 3.10-9. Number of Establishments and Employees by Industry Sector for Louisville/Jefferson County Metro Government for 2013

Industry Sector	Establishments	Employees
Industry Total	*19,270*	*401,108*
Agriculture, forestry, fishing, hunting	6	39
Mining, quarrying, oil and gas extraction	4	115
Utilities	30	1,000 to 2,499
Construction	1,374	15,406
Manufacturing	699	40,532
Wholesale trade	1,160	19,358
Retail trade	2,699	41,944
Transportation and warehousing	519	45,000 to 49,999
Information	358	8,949
Finance and insurance	1,479	27,414
Real estate, rental and leasing	914	6,988
Professional, scientific, technical	2,168	22,426
Management of companies and enterprises	241	16,276
Administrative and support, waste management and remediation services	1,125	27,373
Educational services	243	8,495
Healthcare and social assistance	2,421	66,102
Arts, entertainment, recreation	292	5,975
Accommodation and food services	1,688	40,801
Other services (except public administration)	1,828	19,981
Industries Not Classified	*22*	*0 to 19*

Source: Census 2013.

Based upon a review of industry sector data for the Louisville MSA, the top ten industries (in 2013 based on employment numbers) were wholesale trade (29,915 employees), employment services (27,710

employees), real estate (27,165 employees), limited-service restaurants (24,732 employees), employment and payroll of local government/education (24,018 employees), hospitals (23,602 employees), full-service restaurants (23,559 employees), insurance carriers (20,637 employees), couriers and messengers (20,117 employees), and employment and payroll of local government/non-education (17,333 employees) (IMPLAN 2013).

3.10.2.6 VA Employment

As of FY 2015, there were 1,763 full-time equivalent VA employees, in addition to contractors, supporting the Robley Rex VAMC and the eight community-based outpatient clinics in the Louisville catchment area. One full-time equivalent employee represents either one full-time employee working 40 hours per week, or two or more part-time employees whose combined working hours total 40 hours per week.

3.10.2.7 Property Values

Property values (residential and commercial) in the Louisville Metro area have remained stable, and in many neighborhoods have been on a steady increase in recent years (Hancock 2015). The Jefferson County Property Valuation Administrator reports that the Louisville housing market has been increasing in recent years, and was the second fastest growing housing market in the U.S. in 2015 based on number of housing units built and sold. Commercial development in the Louisville Metro area has grown at a more moderate rate of three percent between 2014 and 2015. Generally, property values in the urban core areas of Louisville Metro have outpaced more suburban areas; however, property values have steadily increased since 2009 throughout the entire Louisville Metro (Hancock 2015).

3.10.2.8 Crime

Within the Louisville Metro area, crime statistics from the Louisville Metro Police Department, as reported in their 2014 Annual Report are provided in Table 3.10-10. Based upon this report, crime in the Louisville Metro area has decreased slightly from 2007 to 2014, from 5.42 percent Part 1 Crimes committed as a percentage of population (in 2007), to 4.79 percent of such crimes committed in 2014.

Table 3.10-10. Louisville Metro Area Crime Statistics from 2007 to 2014.

Year	Property Crime	Part I Crime[1]	Part I Crime[1] as Percent of Population
2007	29,569	33,800	5.42%
2008	29,417	33,723	5.36%
2009	26,908	30,676	4.86%
2010	29,551	33,285	5.22%
2011	31,949	36,035	5.42%
2012	28,606	32,595	4.89%
2013	28,780	32,424	4.83%
2014	28,351	32,400	4.79%

1 Part I Crime includes murder, rape, robbery, aggravated assault, burglary, larceny, and motor vehicle theft.
Source: Louisville Metro Police Department 2014.

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3.11 Community Services

Community services are provided by public agencies, non-profit agencies and organizations, and businesses to support and enhance the community. These services include health care (hospitals and clinics), emergency response (fire, rescue, medical), law enforcement, public schools, and consumer amenities (hotels and restaurants).

3.11.1 Regulatory and Policy Framework

Legislation, regulations, and plans govern local government responsibilities for providing community services. No state or local requirements related to community services apply to VA.

VA acts as its own building and fire protection official and "authority having jurisdiction". As such, VA (and, as appropriate during construction, the U.S. Army Corps of Engineers) reviews fire code requirements during the design and construction phases of a project. VA (and/or USACE on its behalf) also requires the designer of record to coordinate with local municipal fire and emergency response agencies on key aspects of design to ensure that the facility will accommodate the critical needs of those responding agencies in an emergency. VA may include dedicated fire response services in project plans when required to support VA medical facilities operating 24 hours a day in communities without full-time, 24-hour fire response staff. A police and security unit is staffed 24 hours a day at VA facilities operating 24 hours a day to provide physical security and monitor law enforcement activities for the protection of persons and VA property. VA Handbook 0730 *Security and Law Enforcement* (VA 2014) requires the establishment of a support agreement with local law enforcement agencies.

3.11.2 Current Conditions

3.11.2.1 Brownsboro Site

Health Care

The Louisville metropolitan area is home to the nation's largest collection of headquarters in nursing home, rehabilitation, assisted living, and home health administration (City of Louisville 2016a). Medical facility campuses of the Brook/Dupont, Baptist Health, and Norton Suburban hospitals and associated clinics are located approximately 3.5 miles south of the Brownsboro Site near the I-264/I-64 interchange. Medical facilities associated with the University of Louisville, Jewish Hospital, and Norton Hospital are located approximately 7.5 miles east of the Brownsboro Site near Chestnut Street and I-65 in "downtown" Louisville. The Baptist Health Urgent Care Clinic is located across Old Brownsboro Road north of the site in the Holiday Manor Center.

Emergency Response and Law Enforcement

The Brownsboro Site is within the Lyndon Fire Protection District. Lyndon Fire serves approximately 14 square miles with two engine companies and one ladder company operating from two stations located on New LaGrange Road and Westport Road. Both stations are approximately equal distance at less than three miles to the proposed entrance to the new VAMC. Lyndon Fire is staffed by both career and volunteer fire fighters (Lyndon Fire 2016). Career personnel (firefighters and emergency medical technicians) are on duty 24 hours a day at both stations and are supplemented by volunteer firefighters who provide additional emergency support whenever the need arises.

Louisville Metro Emergency Medical Service (EMS) is the primary 911 emergency and non-emergency medical care provider. It provides 24-hour emergency response and medical transport across 400 square miles of the urban, suburban, and rural communities throughout and surrounding Louisville (City of Louisville 2016b). Lyndon Fire responds with Louisville Metro EMS to provide emergency medical care within their service area prior to ambulance arrival.

The Brownsboro Site is located within the Eight Division of the Louisville Metro Police Department.

Public Schools

The Jefferson County Public Schools (JCPS) serve over 100,600 elementary through high school students in 173 schools (JCPS 2016). The elementary schools in the vicinity of the Brownsboro Site include Wilder Elementary on Herr Lane approximately one mile to the east and Dunn Elementary located on Rudy Lane approximately one mile to the west. Approximately one mile to the east of the Brownsboro Site is Kammerer Middle School located on Westboro Road and Ballard High School is located on Brownsboro Road. Enrollment data for the three school years from 2012-2015 indicate that Dunn Elementary has been at or near 98 percent program capacity and Wilder Elementary has been at approximately 92 percent program capacity (JCPS 2015). Enrollment at both the middle and high school has been at approximately 91 percent and 95 percent program capacity, respectively (JCPS 2015).

Consumer Amenities

The Brownsboro Site is located in a predominately suburban residential area with an adjacent business area of commercial, retail, and office uses. The business area supports over two dozen food and drink establishments, including fast food restaurants and table service dining restaurants. Many of the restaurants are within a short walking distance of the site. A larger selection of restaurants is located along Shelbyville Road approximately 2.5 miles south of the Brownsboro Site. Hotels are generally located along interstate interchanges near developed business areas. The nearest location of hotels to the Brownsboro Site is to the south approximately 3.5 miles near the I-264/I-64 interchange.

3.11.2.2 St. Joseph Site

Health Care

There are two medical services complexes very near the St. Joseph Site. The Jewish Hospital Medical Center Northeast is located at the southeast corner of the site near the Old Henry Road/I-265 interchange and the Baptist Health Eastpoint Hospital and Urgent Care Clinic are located west of the site across I-265. Other medical services complexes, including the Norton Brownsboro Hospital and Urgent Care Clinic and Kosair Medical Center Brownsboro, are located approximately six miles to the northwest from the St. Joseph Site near the I-265/I-71 interchange.

Emergency Response and Law Enforcement

The St. Joseph Site is within the Middletown Fire Protection District. Middletown Fire operates with four engine companies (three reserve/volunteer) and three ladder companies from three fire stations located on Urton Lane, Shelbyville Road, and Factory Lane (Middletown Fire 2016). Station #3 on Factory Lane is less than one-half mile from the proposed entrance to the new VAMC. Middletown Fire is staffed by both career and volunteer fire fighters (Middletown Fire 2016). Career personnel (firefighters and emergency medical technicians) are on duty 24 hours a day at the stations and are supplemented by volunteer firefighters who provide additional emergency support.

Louisville Metro EMS is the primary 911 emergency and non-emergency medical care provider. It provides 24-hour emergency response and medical transport throughout the Louisville area, including the St. Joseph Site.

The St. Joseph Site is located within the Eight Division of the Louisville Metro Police Department.

Public Schools

The elementary school in the vicinity of the St. Joseph Site is Stopher Elementary on Aiken Road approximately two miles to the southeast. Crosby Middle School is located on Gatehouse Lane approximately seven miles to the southwest of the St. Joseph Site. Eastern High School is located on Old Shelbyville Road approximately five miles to the southwest. Enrollment data for the three school years from 2012-2015 indicate that the elementary and middle schools have been at approximately 93 percent and 95 percent program capacity, respectively, whereas the high school has averaged 98 percent program capacity (JCPS 2015).

Consumer Amenities

The St. Joseph Site is located in a suburban residential area separated from a large developed business area by I-265. A small business area located approximately one mile from the site supports about a dozen food and drink establishments. A larger selection of restaurants is located along Westport Road near the I-265 interchange approximately 3.5 miles east of the St. Joseph Site. Hotels are also located near this interchange.

3.11.2.3 Existing Zorn Avenue VAMC

Health Care

The nearest community medical services complexes to the Robley Rex VAMC are those associated with the University of Louisville, Jewish Hospital, and Norton Hospital. These facilities are located east of Robley Rex VAMC approximately 4.5 miles near Chestnut Street and I-65 in “downtown” Louisville.

Emergency Response and Law Enforcement

Robley Rex VAMC is located within the Louisville Fire District 4, which serves the east end of the city. District 4 operates from five fire stations with the nearest station to the VAMC being Engine 4 on Frankfort Avenue located approximately two miles to the south. Career personnel (firefighters and emergency medical technicians) are on duty 24 hours a day at all stations.

Louisville Fire responds to two to three fire alarms a year at Robley Rex VAMC (Trebuna 2016). Louisville Fire responded three times over the past year to smoke detector and water flow alarms; none resulted in any fires (O’Brien 2016).

Louisville Metro EMS is the primary 911 emergency and non-emergency medical care provider. It provides 24-hour emergency response and medical transport throughout the Louisville area. Robley Rex VAMC maintains a contract with an ambulance company for medical transport of Veterans to and from the VAMC (Trebuna 2016).

Robley Rex VAMC is located within the Fifth Division of the Louisville Metro Police Department. VA maintains its own 24-hour police and security unit to provide law enforcement and security services for the safety and well-being of patients, staff, and visitors at the Robley Rex VAMC. The VA has a support agreement with the Louisville Metro Police Department for assistance, as needed, with law enforcement situations that could occur at the Robley Rex VAMC,

Public Schools

The elementary schools in the vicinity of Robley Rex VAMC are Chenoweth Elementary on Brownsboro Road approximately two miles to the southeast and Field Elementary on Sacred Heart Lane approximately two miles to the south. Meyzeek Middle School is located on South Jackson Street approximately six miles to the southwest of the existing VAMC. Waggener Traditional High School is located on Hubbards Lane approximately five miles to the southeast. Enrollment data for the three school years from 2012-2015 indicate that the elementary schools have ranged from 81 to 94 percent program capacity, and the middle school has been at approximately 94 percent program capacity (JCPS 2015). The high school has been at approximately 58 percent program capacity (JCPS 2015).

Consumer Amenities

The Robley Rex VAMC is located in a suburban residential area with limited nearby businesses. Less than a half dozen food and drink establishments and a hotel are located north of I-71 approximately one mile from the VAMC. A larger selection of restaurants is located along Frankfort Avenue over two miles from the VAMC. Other hotels are located in the downtown Louisville area approximately four miles east of the VAMC.

3.12 Solid Waste and Hazardous Materials

Hazardous material is defined (49 CFR 171.8) as a substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce. The term includes "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions" in 49 CFR Part 173. Transportation of hazardous materials is regulated by the U.S. Department of Transportation (49 CFR Parts 105–180).

Hazardous materials can also be defined as any substance with special characteristics that poses a health or safety hazard to people, plants, or animals when released. Specific types of solid and hazardous materials identified and evaluated in this EIS include:

- Solid (municipal) waste – solid material discarded by a community, including excess food, containers and packaging, residential garden wastes, other household discards, and light industrial debris (Lindeburg 2001).
- Asbestos-containing materials – used in many building materials prior to 1989, including floor tiles, textured ceilings, heating pipe insulation, and structural fire protection insulation.
- Lead-based paint – used in building paints prior to 1978.
- Polychlorinated biphenyls (PCBs) – includes dielectric fluids, heat-transfer fluids, and hydraulic fluids. Although no longer manufactured in the U.S., PCBs remain in products still in use and in contaminated media from spills and previously contacted surfaces.
- Hazardous waste – specific wastes regulated by the Resource Conservation and Recovery Act (RCRA), including characteristic wastes (wastes exhibiting ignitable, corrosive, reactive, or toxic properties) and listed wastes (specifically identified process and chemical wastes).
- Regulated medical waste – includes disposable equipment, instruments, utensils, human tissue, laboratory waste, blood specimens, or other substances that could carry pathogenic organisms.
- Hazardous materials stored in aboveground and underground storage tanks.

The region of influence for the evaluation of solid waste and hazardous material impacts primarily includes the project site and offsite waste disposal locations.

3.12.1 Regulatory Framework

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (commonly known as Superfund), enacted in 1980, provides a federal mechanism for cleaning up uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants. CERCLA imposes a tax on hazardous substances to create a fund (Superfund) so that EPA can clean up abandoned sites when potentially responsible parties cannot be identified or located, or when potentially responsible parties fail to act (IHMM 2002). Releases of hazardous substances to the environment in excess of reportable quantities are required to be reported to the National Response Center.

In 1986, the Superfund Amendments and Reauthorization Act (SARA) reauthorized CERCLA to continue cleanup activities around the country (IHMM 2002). Title III of this reauthorization act expanded chemical reporting requirements and is also known as the Emergency Planning and Community Right-to-Know Act. Title III also required each state to appoint a state emergency response commission, which in turn divided states into emergency planning districts managed by a local emergency planning

committee. Chemical use reports are made available to the public to aid in emergency planning and community awareness.

The Toxic Substances Control Act of 1976 provides a means to test, regulate, and screen all chemicals produced in or imported into the U.S. The Act has special provisions for the regulation of PCBs, asbestos, radon, lead-based paint, and dioxins (IHMM 2002).

Enacted in 1976, RCRA gave EPA the authority to regulate hazardous waste from "cradle-to-grave," which includes the generation, transport, treatment, storage, and disposal of hazardous waste (IHMM 2002). RCRA also provides a framework for managing nonhazardous solid wastes. The law set forth an intent to promote conservation of resources through reduced reliance on landfilling (ACHMM 2000). In Kentucky, oversight of hazardous waste has been delegated to the Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Waste Management.

The 1984 amendments to RCRA, known as the Hazardous and Solid Waste Amendments, required that land disposal of hazardous waste be phased out (IHMM 2002). The amendments also increased EPA's enforcement authority, provided more stringent hazardous waste management standards, and created a comprehensive underground storage tank program.

Through the 1975 Hazardous Materials Transportation Act and its regulations in 49 CFR, the U.S. Department of Transportation has authority over the safe transportation of hazardous materials. The regulation covers hazardous materials classification, hazard communication, packaging requirements, operational rules, and training (IHMM 2002).

Under the Pollution Prevention Act of 1990, preventing or reducing waste generation where it originates was made the national environmental policy of the U.S. The Act's purpose was to focus attention on reducing pollution through changes in production, operation, and hazardous material selection.

The Atomic Energy Act of 1954 governs the use, possession, and disposal of source, special nuclear, and byproduct materials for civilian and military uses (IHMM 2002). Medical facilities that may use nuclear materials for medical imaging or research purposes are subject to the regulations of the Act.

Several VA directives and handbooks provide guidance for managing solid and hazardous materials and waste, including:

- VA Directive 0057, VA Environmental Management Program (January 15, 2010) – establishes environmental policies within VA.
- VA Directive 0059 and VA Handbook 0059, VA Chemicals Management and Pollution Prevention (May 25, 2012) – prescribes the goals, policies, roles and responsibilities, and major requirements for chemicals management within VA, including reducing or eliminating the quantity of hazardous chemicals and materials acquired, generated, used, or disposed to the extent possible. The guidance also requires development of a chemical management and pollution prevention plan.
- VA Directive 0062 and VA Handbook 0062, Environmental Compliance Management (January 10, 2012) – prescribes the goals, policies, roles and responsibilities, and major requirements for environmental compliance management and reporting within VA, including continual improvement of environmental compliance and optimization through robust environmental management systems.

- VA Directive 0063 and VA Handbook 0063, Waste Prevention and Recycling Program (October 17, 2011) – establishes waste prevention and recycling program policy within VA, promoting source reduction as the most important approach for meeting waste prevention and recycling goals.

3.12.2 Current Conditions

3.12.2.1 Brownsboro Site

The Brownsboro Site is currently unimproved vacant, grassy land. No evidence of petroleum products or hazardous materials has been identified at the site, and a Phase I environmental site assessment did not identify any recognized environmental conditions associated with the Brownsboro Site (VA 2012).

3.12.2.2 St. Joseph Site

The St. Joseph Site is currently unimproved farmland. No evidence of petroleum products or hazardous materials has been identified at the site, and a Phase I environmental site assessment did not identify any recognized environmental conditions associated with the St. Joseph Site (VA 2012).

3.12.2.3 Existing Zorn Avenue Facility

The Robley Rex VAMC is currently located at the Zorn Avenue site. VA (2009) reported the following instance of past environmental contamination at the site:

> Report on Fuel Oil Spill, 22 March 1994, prepared by VA Medical Center. This report documents the occurrence of the release of approximately 6,500 gallons of fuel oil in 1994. The fuel oil flowed from the boiler house to a sinkhole located approximately 200 feet south of the boiler house… The report further states the fuel oil that entered the sinkhole emerged at an off-site location about 1/3 mile west of the sinkhole, near the intersection of Lake Drive and Mellwood Avenue.

VA has no knowledge of any other incidences of onsite contamination at this location.

Solid Waste

Solid waste is routinely generated through operations at the Louisville VAMC. For FY 2013-2015, the Louisville VAMC generated the following amounts of solid waste (VA 2015):

- FY2013 – 522.27 tons
- FY2014 – 518.01 tons
- FY2015 – 513.28 tons

Corrugated cardboard is compacted onsite. Solid waste is collected and transferred by a third party and disposed at the Outer Loop Recycling & Disposal Facility (see Figure 3.12-1). The Outer Loop Recycling & Disposal Facility (currently managed by Waste Management of Kentucky, L.L.C.) covers 782 acres and is authorized to receive construction and demolition waste. The landfill accepts approximately 787,700 tons of solid waste annually, and has a remaining permitted capacity of approximately 56,430,100 cubic yards (approximately 48 years of projected life remaining) (WM 2014).

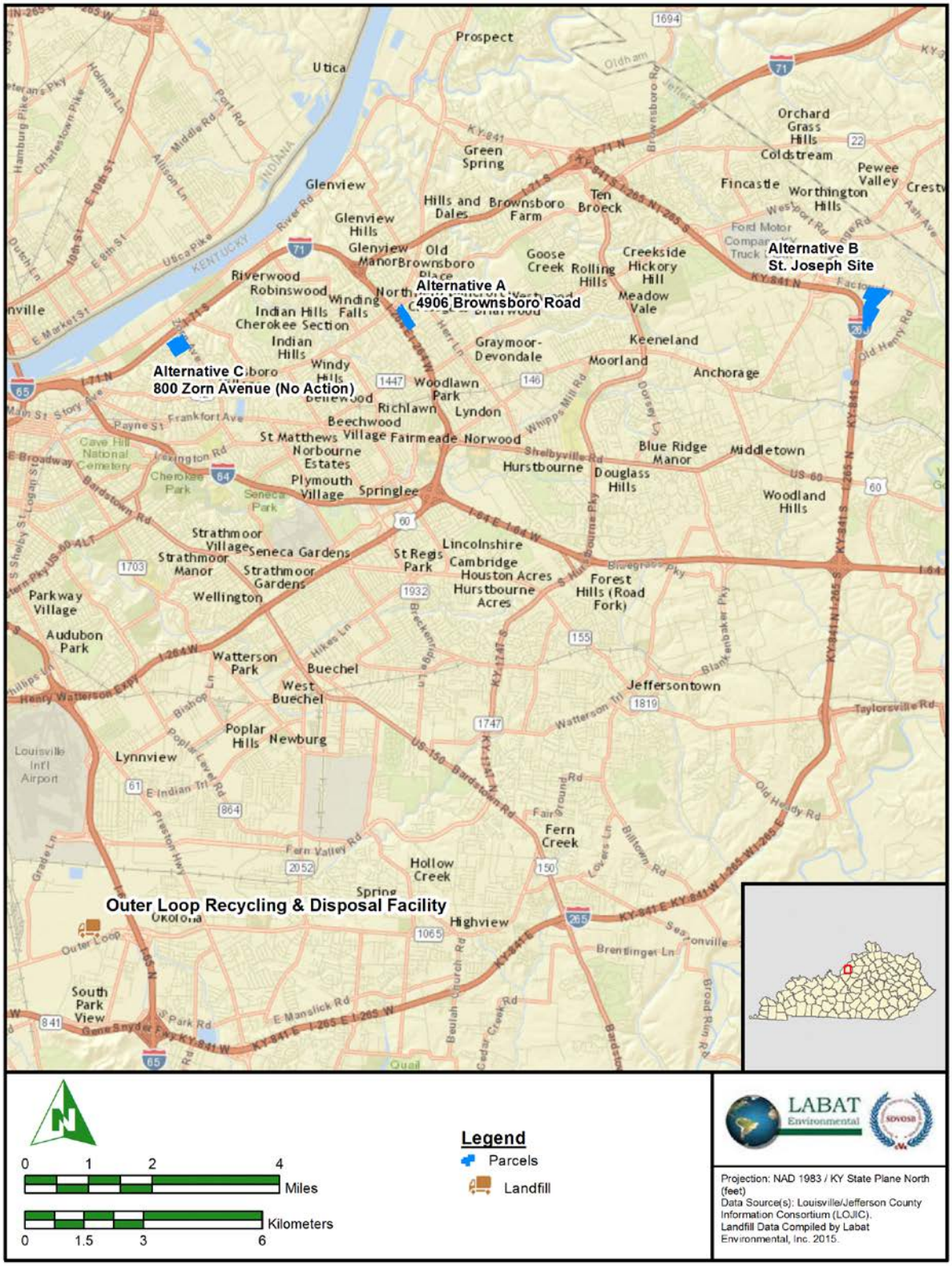

Figure 3.12-1. **Outer Loop Recycling & Disposal Facility**.

Medical Waste

Medical waste is routinely generated through operations at the Louisville VAMC. The facility uses a commercial system (San-i-Pak) to steam-sterilize regulated medical waste and sharps containers, which are then disposed of as municipal solid waste.

Hazardous Waste

The Louisville VAMC is classified as a RCRA small quantity generator of hazardous waste (EPA 2015). SQGs generate between 100 kilograms (220 pounds) and 1,000 kilograms (2,200 pounds) per month of hazardous waste. Additionally, small quantity generators may not accumulate more than 6,000 kilograms (13,200 pounds) of hazardous waste onsite at any time. All generated hazardous waste is contracted for transportation and disposal at authorized facilities. For FY 2014 and FY 2015, the Louisville VAMC generated the following amounts of hazardous waste (VA 2015):

- FY2014 – 6.14 tons
- FY2015 – 5.85 tons

Hazardous Materials

Hazardous materials stored and used in VA operations are tracked using a chemical inventory tracking system developed by the VA Center for Engineering and Occupational Safety and Health. Management of hazardous materials within VA is outlined in VA Directive 0059, VA Chemicals Management and Pollution Prevention.

Building Materials

Many uses of asbestos-containing materials were phased out or banned in a series of federal regulations from 1973 to 1990. Lead-based paint was used in many structures built or repainted before 1978. Due to the age of the facilities at the Louisville VAMC, asbestos-containing materials and lead-based paint are likely present in facility building materials.

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3.13 Transportation and Traffic

Transportation and parking address the roadway network and physical structures that move a population throughout a specific area. The availability of the transportation infrastructure and its capacity to support growth are generally regarded as essential to an area's economic growth.

> Traffic conditions are often characterized in terms of the **level of service**, or **LOS**.
>
> The LOS is a qualitative assessment of a road network's operating conditions, generally in terms of traffic speed, travel time or delays, congestion or maneuverability, interruptions, and convenience.
>
> An LOS of A through C represents desirable (acceptable) conditions and D represents tolerable conditions.
>
> Congestion and delays increase under LOS-E to a level that is considered at capacity, whereas LOS-F ranks as the least functional level of traffic movement and is considered serious congestion.
>
> LOS-D is often considered an acceptable level of service for urban roadways like US 42, and LOS-D can also be considered acceptable when the cost to improve operations to LOS-C is prohibitive.

3.13.1 Regulatory and Policy Framework

The non-interstate roadway systems surrounding the three alternative sites are all under the jurisdiction of and maintained by the Kentucky Transportation Cabinet (KYTC). Interstate (I)-71, I-264, and I-265 are all maintained by KYTC, but are also under the oversight of the Federal Highway Administration. Factory Lane at the St. Joseph Site and Country Club Drive at the Zorn Avenue campus are both under the jurisdiction of and maintained by the Louisville Metro government.

Improvements to KYTC-maintained roadways are made through inclusion in the "Six Year Highway Plan," which is developed into law by the Kentucky legislature and signed by the governor.

Internal circulation roads on the existing campus or on either the potential Brownsboro or St. Joseph sites are under the jurisdiction of and maintained by the VA.

3.13.2 Current Conditions

3.13.2.1 Brownsboro Site

The roadway network surrounding the Brownsboro Site includes the Watterson Expressway (I-264), US 42, and KY 22. The Brownsboro Site is located near the southeast corner of the Watterson Expressway and Brownsboro Road interchange (see Figure 3.13-1).

Watterson Expressway is a four-lane divided highway classified as an urban interstate in the project vicinity. It runs along the western boundary of the Brownsboro Site. US 42 (Brownsboro Road) is an undivided principal urban arterial with four basic lanes. KY 22 (Old Brownsboro Road) is a three-lane urban minor arterial. Access to the Brownsboro Site would be provided directly from KY 22 along the northern site boundary, which is intersected by a ramp split from eastbound I-264 to KY 22. Watterson Expressway, US 42, and KY 22 are part of the state system maintained by KYTC.

The interchange of Watterson Expressway with US 42 is classified as a compressed diamond. KYTC is designing an interchange congestion improvement project at this location (KYTC Item No. 5-804) in conjunction with widening I-264 from four to six lanes (KYTC Item No. 5-594). This reconstruction and widening project is planned for 2019 and will replace the diamond interchange. Five conceptual alternatives (single point urban interchange [SPUI], compressed diamond, double crossover diamond, split diamond, flyover) were studied, but the Interchange Modification Report (approved pending approval of the Categorical Exclusion document currently under review by the Federal Highway

Administration) ultimately recommended a SPUI, which will reconfigure the interchange to operate with a single traffic signal and will more efficiently move traffic through the area.

Public transportation is provided to the Brownsboro Site by the Transportation Authority of River City (TARC). Route 15 services US 42 and KY 22 in the project area. Additionally, Express Routes 68 and 49 service US 42 and KY 22, respectively, in the project area.

Traffic data have been collected and analyzed for a number of studies of the roadways and interchanges in the vicinity of the Brownsboro Site. Various improvements have changed traffic patterns and network capacity, including the ramp split that opened in late 2012 from Watterson Expressway at the US 42 eastbound off-ramp that provided a direct connection to KY 22.

The KYTC completed a traffic forecast and analysis of a number of different intersections for the Watterson Expressway (I-264) and US 42 interchange improvement project (KYTC 2016), which included anticipated traffic generated by the proposed VAMC. Since the completion of this forecast, the anticipated size of the VAMC has been reduced, thereby reducing the square-foot-based estimates of anticipated trips to the center. The 2016 KYTC forecast was used to complete an updated traffic impact study based on the currently proposed size of the VAMC (Palmer Engineering 2016; see Appendix B). The analysis methodology was consistent with KYTC policy. The traffic impact study evaluated AM and PM traffic conditions for the baseline 2015 conditions, including predictions of “level of service”, or LOS. LOS is a qualitative standard measurement that reflects the relative ease of traffic

Figure 3.13-1. Study Area – Brownsboro Site.

flow on a scale of A to F, with free-flow rated as LOS-A, and congested conditions rated at LOS-F. The analysis concluded that signalized intersections at baseline capacity (2015) were operating at an acceptable LOS, except the intersection of US 42 at KY 22 / Northfield Drive during the morning peak travel time. Although the overall intersections were at an acceptable LOS, certain turn movements were operating at a less than acceptable LOS. Table 3.13-1 shows the existing 2015 LOS and delay at intersections near the Brownsboro Site for peak morning and evening traffic.

Table 3.13-1. Current (2015) Level of Service and Delay at Signalized Intersections – Brownsboro Site.

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)
US 42 at Rudy Lane	C	24	D	43
US 42 at I-264 southbound ramp	D	35	C	33
US 42 at I-264 northbound ramp	C	25	C	26
US 42 at KY 22 / Northfield Drive	E	69	D	40
KY 22 at ramp split	C	20	C	32

As part of the 2016 VA study (Appendix B), simulation models were created using VISSIM to model the interaction of closely spaced signals and how congestion at one signal impacts the upstream signals. VISSIM is a behavior-based, microscopic simulation model software package that provides a graphic and numeric representation of lane geometry, driver behavior, signal timing, and traffic volumes. From these simulation models, travel time data for various routes along the corridor were collected. Simulations were run 10 times to obtain an average travel time measurement for each selected route. Table 3.13-2 shows the existing 2015 travel time results for selected routes near the project site for peak morning and evening traffic.

Table 3.13-2. Current (2015) Travel Time Results – Brownsboro Site.

Intersection	AM (minutes)	PM (minutes)
I-264 eastbound to Lime Kiln Lane	3.2	4.6
I-264 westbound to Lime Kiln Lane	3.1	3.0
US 42 westbound to I-264 westbound	3.4	3.1
KY 22 to I-264 westbound	3.7	3.4

In the traffic study (Appendix B), the Brownsboro Site is referred to as the Midlands Site.

3.13.2.2 St Joseph Site

The roadway network surrounding the St. Joseph Site includes the Gene Snyder Freeway (I-265), Old Henry Road (KY 3084), LaGrange Road (KY 146), and Factory Lane. The St. Joseph Site is located along the east side of I-265 (Gene Snyder Freeway), between the Old Henry Road (KY 3084) and LaGrange Road (KY 146) interchanges (see Figure 3.13-2).

The Gene Snyder Freeway is a four-lane divided highway classified as an urban interstate. It runs along the western boundary of the St. Joseph Site, but does not provide direct site access. Old Henry Road is an urban minor arterial road and is five lanes wide in the vicinity of the I-265 interchange. East of Bush Farm Road, Old Henry Road changes to a two-lane urban collector road. LaGrange Road is a five-lane urban minor arterial road. Factory Lane is a two-lane, urban minor arterial road that is approximately 1.5 miles long and connects LaGrange Road to the west with Old Henry Road to the east. Access to the St. Joseph Site would be provided directly from Factory Lane along the northern site boundary.

Gene Snyder Freeway, LaGrange Road, and a portion of Old Henry Road are part of the state system maintained by KYTC. Factory Lane and a portion of Old Henry Road are maintained by the City of Louisville.

KYTC is currently designing an interchange congestion improvement project with Old Henry Road at I-265 (KYTC Item No. 5-474.00) as well as a widening and improvement project along Old Henry Road (KYTC Item No. 5-367.20) to increase capacity out to KY 362 (Ash Avenue). The 5-474.00 project will improve and lengthen turn lanes along Old Henry Road in the interchange vicinity, as well as improve the ramp terminals. The 5-367.20 project will realign and widen Old Henry Road to a three-lane section between Bush Farm Road and KY 362. The route will have one lane in each direction and a center turn lane. The realignment will eliminate the 90-degree curve and three-way stop with Factory Lane. The new route will provide better access to the interchange for vehicles traveling from Oldham County, Shelby County, and far eastern Jefferson County. Both projects are anticipated to begin construction in 2016.

Public transportation is not currently provided to the St. Joseph Site. The nearest access point is located at the Baptist Eastpointe Hospital complex (Route 31), across I-265 to the west of the site.

VA collected traffic data to complete a traffic analysis of specific intersections near the St. Joseph Site (BTM Engineering 2012, Palmer Engineering 2016). The data collection and analysis methodology were consistent with KYTC policy. The traffic impact study evaluated AM and PM conditions for the baseline 2015 conditions. The analysis concluded that signalized intersections at baseline capacity (2015) were operating at a less than acceptable LOS, except the intersections of Old Henry Road at Bush Farm Road and Old Henry Road at I-265 northbound ramp in the evening peak travel time. Even with the intersections that operate at an acceptable LOS, certain turn movements operate at a less than acceptable LOS. Table 3.13-3 shows the existing 2015 LOS and delay at intersections near the St. Joseph Site for peak morning and evening traffic.

Table 3.13-3. Existing (2015) Level of Service and Delay at Signalized Intersections – St. Joseph Site.

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)
Old Henry Road at I-265 Northbound Ramp	F	141	C	34
Old Henry Road at Bush Farm Road	E	60	C	23
LaGrange Road at Factory Lane	F	174	E	74
LaGrange Road at I-265 Southbound Ramp	E	75	E	63

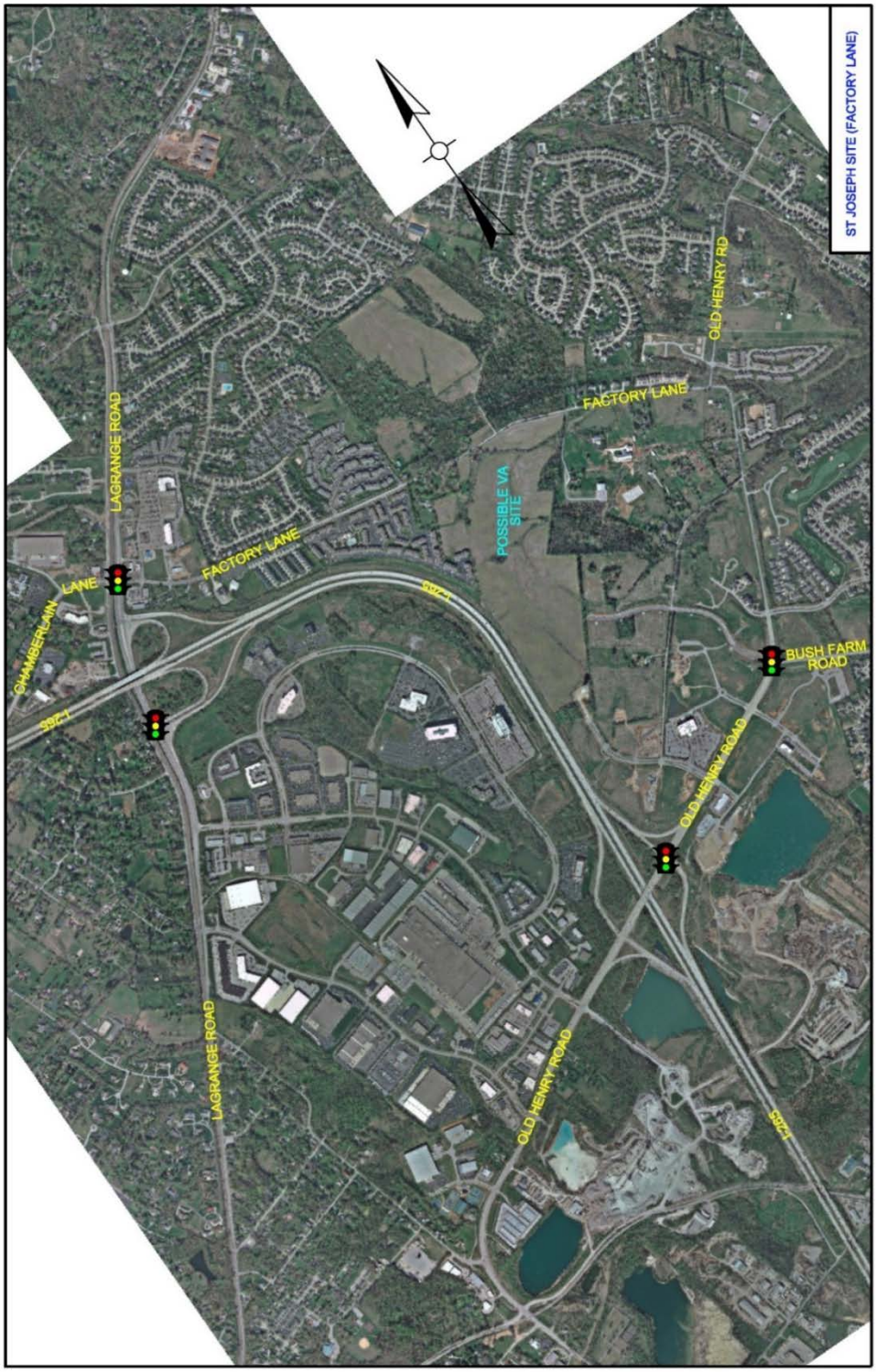

Figure 3.13-2. Study Area – St. Joseph Site.

As part of the 2016 VA Traffic Impact Study (see Appendix B), simulation models were created using VISSIM along the St. Joseph corridor to extract travel time data. Table 3.13-4 shows the existing 2015 travel time results for selected routes near the project site for peak morning and evening traffic.

Table 3.13-4. Existing (2015) Travel Time Results – St. Joseph Site.

Intersection	AM (minutes)	PM (minutes)
Southbound I-265 at LaGrange to VA	3.4	3.1
Northbound I-265 at LaGrange to VA	2.6	2.9
VA to southbound I-265 at LaGrange	4.6	4.1
VA to northbound I-265 at LaGrange	3.3	3.2
Northbound I-265 at Old Henry to VA	4.6	5.1
VA to northbound I-265 at Old Henry	4.3	4.0

3.13.2.3 Existing Zorn Avenue Facility

The roadway network surrounding the Zorn Avenue VAMC includes I-71, Zorn Avenue, and Country Club Drive. The campus is located to the south of the I-71 interchange with Zorn Avenue.

I-71 is a four-lane divided highway classified as an urban interstate. Zorn Avenue is classified as an urban minor arterial, connecting US 42 and I-71, and is a four-lane divided highway. Country Club Drive is a two-lane roadway classified as an urban local street. Access to the Zorn Avenue VAMC is provided by an entrance along Country Club Drive.

I-71 and Zorn Avenue are part of the state system maintained by KYTC. Country Club Drive is maintained by the City of Louisville.

TARC currently provides public transportation to the Robley Rex VAMC along Zorn Avenue. Route 15 operates along Zorn Avenue and provides direct access to the VAMC from Country Club Drive.

Traffic data were collected for a traffic analysis of specific intersections near the Zorn Avenue campus (see Appendix B). The data collection and analysis methodology were consistent with KYTC policy. The traffic impact study evaluated AM and PM conditions for the baseline 2015 conditions. The analysis concluded that signalized intersections at baseline capacity (2015) were operating at acceptable LOS, except the intersection of Zorn Avenue at the I-71 northbound ramp during the evening peak travel time. Although the overall intersections operate at an acceptable LOS, certain turn movements operate at a less than acceptable LOS. Table 3.13-5 shows the existing 2015 LOS and delay at intersections near the Zorn Avenue facility for peak morning and evening traffic.

Table 3.13-5. Existing (2015) Level of Service and Delay at Signalized Intersections – Existing Zorn Avenue Facility.

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)
Zorn Avenue at I-71 northbound ramp	C	29	F	91
Zorn Avenue at Country Club Road	C	25	B	20

As part of the traffic study, simulation models were created using VISSIM along the Zorn Avenue corridor to extract travel time data. Table 3.13-6 shows the existing 2015 travel time results for selected routes near the VAMC campus for peak morning and evening traffic.

Table 3.13-6. Current (2015) Travel Time Results – Existing Zorn Avenue Facility.

Intersection	AM (minutes)	PM (minutes)
Southbound I-71 to VA	1.8	1.8
Northbound I-71 to VA	1.3	1.3
VA to southbound I-71	2.0	2.2
VA to northbound I-71	1.5	1.5

Figure 3.13-3. Study Area – Zorn Avenue (Existing Facility) Site.

Parking at the existing Zorn Avenue facility is limited to 1,200 spaces, with no place to expand. VA currently leases offsite parking locations and operates shuttle buses to transport patients and visitors from these satellite parking areas to the Zorn Avenue VAMC.

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3.14 Utilities

Utilities are defined as services provided to the public, often but not always distributed by community-wide infrastructure. Specific utilities identified and evaluated in this EIS include:

- Water treatment and supply
- Wastewater treatment
- Electricity supply
- Heating supply (natural gas or heating oil)
- Communications (telephone and data)

The region of influence for the evaluation of utilities impacts includes the project site and associated utility corridors.

3.14.1 Regulatory and Policy Framework

Three Energy Policy Acts have been passed, which include provisions for conservation and energy development, use of alternative fuels, increased fuel economy requirements, biofuel development, and changes to indoor lighting, with grants and tax incentives for both renewable and non-renewable energy.

On March 19, 2015, the White House issued Executive Order 13693, Planning for Federal Sustainability in the Next Decade. This order stated that federal agencies should prioritize reducing energy use and cost, then on finding renewable or alternative energy solutions; propose greenhouse gas emission reduction targets; beginning in FY 2016, where life-cycle cost-effective, implement measures specified in the order related to building energy use, renewable energy sourcing, water use, decreasing fleet inventories and mobile source greenhouse gas emissions, use of recycled and sustainably produced materials; advance waste prevention and pollution prevention; and promote electronics stewardship. Agencies, including VA, were previously required to develop and implement strategic sustainability performance plans (SSPPs) in accordance with Executive Order 13514, which was revoked by Executive Order 13693. VA's existing SSPP identifies sustainability goals and defines strategies for achieving these goals, consistent with VA's Sustainability Management Policy. The SSPP includes goals for sustainable buildings, water use efficiency, greenhouse gas reductions, and renewable energy usage (VA 2014).

3.14.2 Current Conditions

3.14.2.1 Brownsboro Site

As an unimproved parcel, the Brownsboro Site does not currently have any utility connections.

The Louisville Water Company (LWC) would supply domestic and fire protection water service to the Brownsboro Road site. There is an existing 12-inch water main in Brownsboro Road just north of the site, and an 8-inch main in the right of way for Carlimar Lane, which runs to the southeast corner of the site.

Louisville Gas and Electric (LG&E) provides electricity service to approximately 400,000 customers and natural gas service to approximately 321,000 customers in Louisville and surrounding areas (LG&E 2015). LG&E supplies the natural gas and electrical services to the area of the Brownsboro Road site. There is a point of connection for natural gas service along Brownsboro Road but there is no existing nearby electrical source capable of serving the site.

The Louisville and Jefferson County Metropolitan Sewer District (MSD) provides wastewater service to more than 270,000 customers (MSD 2012). MSD is the approval authority for the storm sewer system design for the Brownsboro Road site. The KYTC Department of Transportation has a storm drainage system along the Watterson Expressway, which would be the receiving stormwater system for discharges from the proposed VAMC.

MSD also supplies sanitary sewer service to the site. A location to connect to the sanitary sewer system is available just south of the southern site property line, near the southeast corner of the site, where there is an existing manhole within the Carlimar Lane right of way.

AT&T Kentucky provides telecommunications service in the Louisville area, including the Brownsboro Road area. However, as the Louisville area is a large metropolitan area, a great number of telephone, television, and internet providers service the area, allowing consumers a choice among service providers. Communications services are available throughout the area.

3.14.2.2 St. Joseph Site

As an unimproved parcel, the St. Joseph Site does not currently have any utility connections.

LWC can provide water supply to the St. Joseph Site, provided the domestic and fire prevention flow requirements do not exceed the capacities of the water mains. Requirements for specific system improvement would be determined when detailed plans and information are available. LWC stated that a private fire hydrant loop would likely be required for the St. Joseph Site.

MSD indicated the existing sanitary system and sanitary services for the St. Joseph Site would likely be adequate for the Proposed Action.

LG&E stated that an electrical service feed would come from the Old Henry Substation; however, a backup feed would have to come from a second transformer that has not been installed.

AT&T stated that telecommunication services can be provided to the site.

3.14.2.3 Existing Zorn Avenue Facility

The Louisville Water Company supplies water to the existing Louisville VAMC. Water is supplied via a 12-inch water main to the water supply tower. Water is then transferred to four 2,500-gallon tanks, and ultimately to the VAMC facility. The Louisville VAMC maintains a three-day water contingency supply. Water consumption at the Louisville VAMC has averaged approximately four million gallons per month (VA 2015).

Wastewater generated at the existing Louisville VAMC is treated by MSD. Wastewater generation at the Louisville VAMC has averaged approximately three million gallons per month.

Electricity service at the existing Louisville VAMC is provided by LG&E. The Louisville VAMC consumed 17,118,786 kilowatt-hours in FY 2013 and 17,596,715 kilowatt-hours in FY 2014 (VA 2015).

Facilities at the existing Louisville VAMC are primarily heated by natural gas. Natural gas service is provided by LG&E. The Louisville VAMC consumed 50,887,900 cubic feet of natural gas in FY 2013 and 51,847,200 cubic feet in FY 2014 (VA 2015). Over the past two years, LG&E has requested the

Louisville VAMC to halt natural gas usage in the boiler plant and use fuel oil reserves during extreme cold temperatures. The Louisville VAMC consumed 22,654 gallons of #2 fuel oil in FY 2015 (VA 2015).

AT&T currently provides communications service to the existing Zorn Avenue VAMC.

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3.15 Environmental Justice

Environmental justice applies to potential adverse environmental impacts disproportionately borne by minority or low income populations. Environmental justice includes protection from health and safety risks if the potential for such risks are driven by an environmental impact. Related to environmental justice is any disproportionate risk to children, regardless of minority or income status, from environmental health and safety impacts.

3.15.1 Regulatory and Policy Framework

3.15.1.1 Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 requires each federal agency identify and address, as appropriate, the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The executive order is also intended to promote nondiscrimination in federal programs, policies, and activities that affect human health and the environment, and to provide minority and low-income communities with access to public information and public participation.

3.15.1.2 Council on Environmental Quality Guidance

The White House Council on Environmental Quality (CEQ) prepared *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997) for performing environmental justice analyses as part of the NEPA process. The guidance provides definitions, thresholds, and overall methodology for environmental justice analyses, including the following:

- ***Minority.*** Individuals who identify themselves as American Indian or Alaska Native, Hispanic or Latino, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, some other race, or member of two or more races. For purposes of this EIS, the definition has been updated from the population groups listed in CEQ (1997) to include groups currently listed on the U.S. Census form.
- ***Minority population.*** Minority populations should be identified in a NEPA document where either (a) the minority population of an affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. For purposes of this EIS, “meaningfully greater” is defined as more than 10 percentage points higher than the general population of the geographic unit of the Louisville VAMC service area in the states of Kentucky and Indiana.
- ***Low-income population.*** Low-income populations in an affected area are identified based on the annual statistical poverty thresholds from the U.S. Census Bureau’s Population Estimates Program. For purposes of this EIS, a “low-income population” is defined similarly to a minority population in terms of percentages of persons in the affected area.

3.15.1.3 Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

Under Executive Order 13045, each federal agency must identify and assess environmental health risks and safety risks that may disproportionately affect children, and ensure that its actions address disproportionate risks to children that result from environmental health risk or safety risks.

3.15.1.4 Interagency Environmental Justice Memorandum of Understanding and VA Strategy

In 2011, VA and 16 other federal agencies signed the *Memorandum of Understanding on Environmental Justice and Executive Order 12898* (Holder et al. 2011). Combined, Executive Order 12898 and the Memorandum of Understanding:

- Require each covered and participating agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."
- Declare the continued importance of identifying and addressing environmental justice considerations in agency programs, policies, and activities as provided in Executive Order 12898.
- Renew the process for agencies to provide environmental justice strategies and implementation progress reports.
- Establish structures and procedures to ensure that the Environmental Justice Interagency Working Group operates effectively and efficiently.
- Require development or review/update of each agency's environmental justice strategy.
- Require agencies to provide opportunities for the public to submit comments and recommendations relating to the agency's environmental justice strategy, annual implementation progress reports, and ongoing efforts to incorporate environmental justice principles into its programs, policies, and activities.

The VA Environmental Justice Strategy is a dynamic framework intended to be a living document. This strategy was drafted as an initial step in an ongoing effort to ensure integration of environmental justice objectives into VA's activities. VA has adopted the following three goals for its environmental justice strategy:

- Identify and address VA programs, policies, and activities that may have disproportionately high and adverse human health or environmental effects on minority, low-income, or tribal populations.
- Ensure transparent and accessible information sharing and promote public participation for programs, activities, and operations that have potential environmental justice implications.
- Identify areas to improve research and data collection methods.

3.15.2 Current Conditions

The affected area for identifying environmental justice populations based on minority and low-income status consists of the counties in the Louisville VAMC service area, which covers western Kentucky and southern Indiana (see Figure 1.1-1).

Data on populations of concern and poverty status for purpose of identifying minority and low-income composition in the affected area are from the 2010 U.S. Census. Poverty thresholds are updated annually for inflation by the U.S. Census Bureau and are used for calculating official poverty population statistics. The dollar value thresholds vary by family size and composition (adults and children), but do not vary geographically. The Census Bureau calculates a weighted average poverty threshold based on the relative

number of families in each size and composition. The weighted average provides a general sense of the poverty level. For purposes of this EIS, the census categories of "all families" and "all people" are used, along with the weighted average poverty threshold for one and four persons.

3.15.2.1 Demographic Conditions: Louisville VAMC Service Area in Kentucky

Table 3.15-1 presents demographic data for each of the counties in the Louisville VAMC service area in Kentucky. No counties with minority populations greater than 50 percent are identified (Census 2010).

As shown in the table, minority persons in the Louisville VAMC service area in Kentucky are approximately 20.7 percent of the population. No counties in the service area have a minority percentage that is meaningfully greater (10 percentage points higher) than the service area in Kentucky. For comparison, the number of minority persons in the State of Kentucky is approximately 13.7 percent of the total population.

The number of children, defined in the U.S. Census as persons 18 years and younger, varies among the counties. The percentage of children in the total population in the Louisville VAMC service area and the State of Kentucky is fairly similar, both at approximately 24 percent.

Table 3.15-1. Populations of Concern, Kentucky Counties in Louisville VAMC Service Area.

County	Total Population	Minority		Children	
		Number of Persons	Percent Total Population	Number of Persons	Percent Total Population
Adair	18,656	1,101	5.9%	4,198	22.5%
Breckinridge	20,059	923	4.6%	4,854	24.2%
Bullitt	74,319	2,973	4.0%	18,803	25.3%
Butler	12,690	508	4.0%	2,931	23.1%
Carroll	10,811	1,232	11.4%	2,714	25.1%
Edmonson	12,161	426	3.5%	2,651	21.8%
Grayson	25,746	850	3.3%	6,153	23.9%
Green	11,258	563	5.0%	2,544	22.6%
Hancock	8,565	283	3.3%	2,227	26.0%
Hardin	105,543	23,431	22.2%	27,441	26.0%
Hart	18,199	1,420	7.8%	4,550	25.0%
Henry	15,416	1,141	7.4%	3,823	24.8%
Jefferson	741,096	218,623	29.5%	171,934	23.2%
Larue	14,193	1,093	7.7%	3,378	23.8%
Meade	28,602	2,689	9.4%	7,808	27.3%
Muhlenberg	31,499	2,205	7.0%	6,835	21.7%
Nelson	43,437	3,953	9.1%	11,294	26.0%
Ohio	23,842	1,311	5.5%	5,937	24.9%
Oldham	60,316	6,514	10.8%	16,768	27.8%
Owen	10,841	477	4.4%	2,667	24.6%
Shelby	42,074	7,994	19.0%	10,434	24.8%
Spencer	17,061	785	4.6%	4,385	25.7%
Trimble	8,809	405	4.6%	2,211	25.1%
Total for Louisville VAMC service area in Kentucky	1,355,193	280,900	20.7%	326,540	24.1%
Kentucky	4,339,367	594,493	13.7%	1,024,091	23.6%

Source: Census 2010.

Table 3.15-2 shows the percentage of individuals living below the poverty level in the Kentucky counties in the Louisville VAMC service area. Butler and Carroll Counties have persons living below the poverty level at a meaningfully greater percentage (10 percentage points higher) than the Louisville VAMC service area in Kentucky, and the percentage in Carroll County is also meaningfully higher than that for the State of Kentucky. The average percentage of persons living below the poverty level in the Louisville VAMC service area in Kentucky is somewhat, but not meaningfully, less than the state's percentage.

Table 3.15-2. Poverty Information, Kentucky Counties in Louisville VAMC Service Area.

County	Persons Below Poverty Level
Adair	19.8%
Breckinridge	18.2%
Bullitt	10.8%
Butler	27.3%
Carroll	32.1%
Edmonson	16.8%
Grayson	23.2%
Green	21.1%
Hancock	16.0%
Hardin	14.9%
Hart	25.9%
Henry	17.6%
Jefferson	16.7%
Larue	17.9%
Meade	16.1%
Muhlenberg	21.2%
Nelson	17.3%
Ohio	22.2%
Oldham	6.5%
Owen	15.1%
Shelby	12.4%
Spencer	6.9%
Trimble	16.5%
Average for Louisville VAMC service area in Kentucky	16.3%
Kentucky	18.9%

Source: Census 2014.

3.15.2.2 Demographic Conditions: Louisville VAMC Service Area in Indiana

Table 3.15-3 presents demographic data for each of the counties in the Louisville VAMC service area in Indiana. No counties with minority populations greater than 50 percent are identified (Census 2010).

As shown in the table, minority persons in the Louisville VAMC service area in Indiana are approximately 8.4 percent of the population. No counties in the service area have a minority percentage that is meaningfully greater (10 percentage points higher) than the service area in Indiana. For comparison, the number of minority persons in the State of Indiana is approximately 18.5 percent of the total population.

The number of children, defined in the U.S. Census as persons 18 years and younger, varies among the counties. The percentage of children in the total population in the Louisville VAMC service area and the State of Indiana is fairly similar, both at approximately 24 to 25 percent.

Table 3.15-3. Populations of Concern, Indiana Counties in Louisville VAMC Service Area.

County	Total Population	Minority		Children	
		Number of Persons	Percent Total Population	Number of Persons	Percent Total Population
Clark	110,232	16,314	14.8%	26,125	23.7%
Crawford	10,713	321	3.0%	2,496	23.3%
Dubois	41,889	3,100	7.4%	10,682	25.5%
Floyd	74,578	8,054	10.8%	17,899	24.0%
Harrison	39,364	1,378	3.5%	9,290	23.6%
Jackson	42,376	3,560	8.4%	10,424	24.6%
Jefferson	32,428	1,978	6.1%	7,329	22.6%
Orange	19,840	694	3.5%	4,881	24.6%
Perry	19,338	909	4.7%	4,138	21.4%
Scott	24,181	701	2.9%	5,803	24.0%
Switzerland	10,613	297	2.8%	2,717	25.6%
Washington	28,262	735	2.6%	7,122	25.2%
Total for Louisville VAMC service area in Indiana	453,814	38,041	8.4%	108,906	24.0%
Indiana	6,482,802	1,199,503	18.5%	1,607,983	24.8%

Source: Census 2010.

Table 3.15-4 shows the percentage of individuals living below the poverty level in the Indiana counties in the Louisville VAMC service area. None have persons living below the poverty level at a meaningfully greater percentage (10 percentage points higher) than the Louisville VAMC service area in Indiana or the State of Indiana. The average percentage of persons living below the poverty level in the Louisville VAMC service area in Indiana is somewhat, but not meaningfully, less than the state's percentage.

Table 3.15-4. Poverty Information, Indiana Counties in Louisville VAMC Service Area.

County	Persons Below Poverty Level
Clark	11.6%
Crawford	17.8%
Dubois	8.8%
Floyd	12.8%
Harrison	12.4%
Jackson	14.1%
Jefferson	15.3%
Orange	18.4%
Perry	12.7%
Scott	19.7%
Switzerland	20.2%
Washington	15.2%
Average for Louisville VAMC service area in Indiana	13.5%
Indiana	15.5%

Source: Census 2014.

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3.16 Other Past, Present, and Reasonably Foreseeable Projects

This section identifies other past, present and reasonably foreseeable projects and actions that are considered in the evaluation of cumulative impacts. Employment in Jefferson County is projected to increase by 65 percent by 2035 (KIPDA 2014). Some of Jefferson County's highest employment growth is forecast throughout the county in areas in and near downtown Louisville, the UPS Worldport Hub, Bluegrass Commerce Park, Hurstbourne Green, Eastpoint Business Center, and Old Brownsboro Crossing (KIPDA 2014). The Old Brownsboro Crossing and Eastpoint Business Center are in the vicinity of the Brownsboro Site and St. Joseph Site, respectively. Data sources for identifying projects for cumulative impact analysis include:

- City of Louisville, Economic and Business Development
- Kentuckian Regional Planning and Development Agency
- Kentucky Transportation Cabinet
- Providence Point Commercial, LLC
- Courier Journal

The following projects in the Louisville area were identified:

- Providence Point proposed development of 312 residential condominiums and 138,000 square feet for mixed-use retail and offices, an approximately 19-acre area of currently unimproved land located approximately ¼ mile northeast of the Brownsboro Site along Herr Lane.
- Thorntons, Inc. Store Support Center: Warehouse facility of 92,500 square feet on Old Henry Road that will employ 110 people in eastern Jefferson County. Estimated start date 2016.
- Ford Motor Company Kentucky Truck Plant: Expansion of and upgrades to the truck plant located off Gene Snyder Freeway and west of Old Lagrange Road; creation of 2,000 additional jobs. Estimated start date 2016.
- Residential development north of Factory Lane: Ball Homes Inc. is developing a 406-home addition on the north side of Factory Lane, just across the road from the St. Joseph Site (Alternative B).
- Reconstruct I-264 (Henry Watterson Expressway) interchange at US 42 (Brownsboro Road). Estimated to open to public in 2020.
- Widen US 42 (Brownsboro Road) from 5 to 7 lanes from I-264 (Henry Watterson Expressway) to Seminary Drive. Estimated open to public year: 2021.
- Resurface KY 22 (Brownsboro Road) from Ten Broeck Way to Seminary Drive to US 42. Estimated to open to public in 2015.
- Widen KY 2050 (Herr Lane) from KY 1447 (Westport Road) to KY 22 (Brownsboro Road) adding turn lanes and operational improvements as necessary to reduce congestion and improve safety. Estimated to open to public in 2020.
- Intersection improvement on KY 22 (Brownsboro Road) at KY 2050 (Herr Lane) and the entrance to Ballard High School. Estimated to open to public in 2018.
- Reconstruct/widen I-264 (Henry Watterson Expressway) from Westport Road (KY 1447) to I-71 to 3 lanes in each direction. Estimated to open to public in 2021.

- Widen KY 1447 (Westport Road) from 2 to 5 lanes (5th lane will be a center turn lane) from Murphy Lane to Collins Lane. Estimated to open to public in 2021.
- Improve KY 1447 (Westport Road) intersections at Herr Land and Washburn Road. Estimated to open to public in 2020.
- Capacity improvements to the I-264 (Henry Watterson Expressway) eastbound off-ramp and construction of the slip ramp connecting to Old Brownsboro Road (KY 22). Completed October 2012.
- Reconstruct I-71 and I-264 interchange. Phase I design.
- Widen KY 146 (LaGrange Road) from 2 to 5 lanes (5th lane will be a center turn lane) from Factory Lane to Reamers Road. Estimated to open to public in 2021.
- Widen English Station Road from 2 to 3 lanes (3rd lane will be a center turn lane) to accommodate anticipated congestions from the Old Henry Road/I-265 interchange. Estimated open to public year: 2016.
- Add a left turn lane to northbound exit ramp from I-265 at Old Henry Road interchange. Estimated to open to public in 2017.
- Extend improvements on Old Henry Road to 3 lanes with left turn lanes from near the I-265 interchange to Ash Avenue (KY 362). Estimated to open to public in 2030.
- Construct new Ohio River Bridge in the 1-265 Corridor.
- Widen I-265 (Gene Snyder Freeway) from 4 to 6 lanes from I-64 to I-71. Planning phase 2040.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents the evaluation of the alternatives' direct, indirect, and cumulative environmental impacts. The sections of this chapter are organized by resource, with information presented in the same sequence as in Chapter 3 to provide a logical flow for the discussion. The baseline for determining potential impacts is the current condition described in Chapter 3. Each resource-specific section (Sections 4.1 through 4.15) provides (1) the evaluation criteria by which the analysis determined whether there is an adverse impact to the resource, and (2) the analysis of impacts to that resource from each of Alternatives A, B, and C. Potential impacts from each alternative are discussed separately for construction (short-term impacts) and operation (long-term impacts). The Impacts Summary Table in the Executive Summary summarizes the impacts of each alternative. Section 4.16 presents the cumulative impacts analysis. Section 4.17 discusses the proposal's potential for generating substantial controversy (required by the Department of Veterans Affairs' [VA's] interim National Environmental Policy Act [NEPA] guidance). Sections 4.18 through 4.20 provide specific analyses required by the Council on Environmental Quality's (CEQ's) NEPA regulations: unavoidable adverse impacts, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and irreversible or irretrievable commitments of resources.

Impact Terminology

An ***impact*** is defined as a modification of the existing environment that is brought about by an outside action. The terms ***effect*** and ***impact*** as used in this document are synonymous and could be beneficial or adverse.

Adverse impacts are defined in terms of context and intensity. ***Context*** relates to environmental circumstances at the location of the impact and its immediate vicinity, as well as other interests that are potentially affected. ***Intensity*** refers to the severity or extent of the impact or magnitude of change from existing conditions. Impact intensity is used in the determination of the severity and magnitude of an impact, and helps determine whether mitigation is needed to lessen the impact. The following terms are among those that are applied in this environmental impact statement (EIS) to describe the intensity of adverse impacts:

- None/no impact: No change from current conditions.
- Negligible impacts: No measurable or discernible change from current conditions.
- Minor impacts: Slight but detectable; there would be a small change. Effects are generally short-term and highly localized.
- Moderate impacts: Readily apparent; there would be a noticeable change that could result in major short-term or moderate long-term impacts.
- Major impacts: Large and highly noticeable; long-term or permanent.

The duration of the impact is important in evaluating its intensity:

- Short-term impacts occur only for a short time after implementation of a management action; for example, construction noise impacts from construction activities would be considered short-term in nature.
- Long-term impacts occur for an extended period after implementation of a management action; for example, operational noise during facility operations would be a long-term impact, as it would last for as long as the facility is in operation.

Direct effects are caused by the action and occur at the same time and place as the action. ***Indirect effects*** are caused by the action and occur later in time or further in distance, but are still reasonably foreseeable (40 Code of Federal Regulations [CFR] 1508.8).

Cumulative impacts are those effects resulting from the incremental impacts of an action when combined with other past, present, and reasonably foreseeable future actions (regardless of which agency or person undertakes such actions) (40 CFR 1508.7). Cumulative impacts could result from individually insignificant but collectively significant actions taking place over a period of time.

Mitigation Measures

The CEQ NEPA regulations (40 CFR 1508.20) state that ***mitigation*** includes:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

The alternatives identified in this EIS include compliance with federal, state, and local regulatory requirements; best management practices incorporated into an alternative; and additional VA-proposed mitigation measures. The record of decision (ROD) for an EIS binds an agency to implement specific mitigation commitments stated in the ROD. In addition, compliance with regulatory requirements is enforced by the respective regulatory agency. For example, compliance with air emissions permit conditions would be enforced by the Louisville Metro Air Pollution Control District (APCD). Where relevant for a particular alternative, mitigation measures summarized in Chapter 5 could reduce adverse impacts identified in this chapter.

4.1 Aesthetics

4.1.1 Evaluation Criteria

Federal agencies must consider local requirements for aesthetic qualities of new building construction (40 United States Code 619(b)), even though local governments cannot regulate activities of the federal government on federally owned land without a clear statutory waiver to the contrary. This concept is based upon the Supremacy Clause (Article VI) of the U.S. Constitution. (VA actions on non-federal land are subject to the regulatory jurisdiction of the landowner, including local plans or codes pertaining to aesthetics.)

An aesthetic or visual impact is the creation of an intrusion or noticeable contrast to the landscape that affects visual character or scenic quality. A visual effect can be considered adverse if an action obstructs what most observers would consider a scenic view or blocks or detracts from a significant feature of the landscape. The introduction of a visual element that is incompatible, out of scale, in great contrast, or out of character with the surrounding area can be an adverse visual impact. An action that eliminates open space can have an adverse effect on aesthetic or visual appeal of the area. Together with observers' attitudes, expectations, and perspectives, the extent of obstruction and the compatibility of introduced features within established views determine the subjective importance or intensity of the visual impact.

The Cornerstone 2020 Comprehensive Plan's requirements related to the scenic corridor designation for Brownsboro Road are discussed in Section 4.1.2, specific to the Brownsboro Site.

For purposes of this evaluation, an impact would be considered adverse if the action creates a visual contrast with the surrounding area or is not compatible with the land development codes for building setbacks and heights, landscaping, and exterior lighting.

4.1.2 Alternative A: Brownsboro Site

4.1.2.1 Construction

Construction activities would temporarily affect the visual quality of the Brownsboro Site and adjacent area because of the presence of heavy equipment and unfinished stages of site preparation and building construction. The visual quality impacts would change over the course of the phased construction as each task is completed, progressing toward being negligible in the later stages as landscaping is completed and work focuses on the interiors of completed structures.

Outdoor construction activities would cease at sunset so there would be no impact from the use of construction equipment lights for nighttime lighting. Security lighting would be required for construction staging areas, which would have a minor impact relative to existing nighttime light levels. Security lighting throughout the construction site would be directed downward to minimize light trespass onto adjacent residential areas.

4.1.2.2 Operation

The VA medical center (VAMC) campus buildings would vary in height, with the central utility plant and laundry at approximately 56 feet, the east bar buildings (Veterans Benefits Administration, inpatient, and medical center administration) at approximately 102 feet (4 stories and rooftop mechanical penthouse), the west bar building (outpatient, diagnostic, and treatment units) at approximately 162 feet (5 stories and rooftop mechanical and electrical penthouses), the south parking garage at approximately 83 feet (5 levels and rooftop solar panels), the north parking garage at approximately 115 feet (8 levels and rooftop solar

panels), and the water tower at approximately 160 feet. Figure 4.1-1 shows the proposed dimensional layout of the buildings on the Brownsboro Site.

Figure 4.1-1. Dimensional View and Layout of VAMC Buildings on the Brownsboro Site.

The VAMC campus buildings would create a noticeable contrast to the existing landscape and would have an adverse visual effect because the buildings would obstruct or detract from what some observers would consider a scenic view, or would introduce visual elements that some observers would consider out of scale or character with the surrounding area. Development of the site and change in the visual appearance would be expected by observers, as demonstrated by the previous landowner's development plan (mixed commercial, retail, and multi-family residential). Figures 4.1-2 through 4.1-4 simulate the change to the visual character of the landscape from the presence and appearance of the VAMC campus buildings. The extent of the impact would depend on the dominance and noticeability of the buildings in the landscape and the observers' attitudes and perspectives regarding the presence and purpose of the buildings. The extent of the aesthetic impact from the contrast to the existing landscape would range from negligible to major, depending on the observer.

Figure 4.1-2. View to North from Carlimar Lane at Intersection with Bedford Lane (existing on left, Alternative A on right).

Figure 4.1-3. View to South from Northfield Drive between Intersections with U.S. Highway 42 and Old Brownsboro Road (existing on left, Alternative A on right).

Figure 4.1-4. View to West within Crossgate Subdivision from Haverhill Road at Intersection with Warrington Way (existing on left, Alternative A on right).

The exterior façade of the buildings would be designed to meet the goal of Leadership in Energy and Environmental Design Silver certification for healthcare facilities. The design elements serve a dual purpose of energy performance and aesthetics. The aesthetic design emulates the form and flow of military ribbons, while the design function provides sun control for thermal comfort and energy efficiency. As stated in Section 2.2.1.1, the site layout and building façade of a VA facility are intended to promote a healing environment for the Veterans, and thus incorporate elements are deliberately intended to be perceived as calming, soothing, safe, restorative, clean, simple, and dignified. The acceptance of the visual appearance of the exterior façade would vary by observer based on attitude and perspective regarding the purpose of the buildings. The extent of the aesthetic impact from the visual appearance of the building façade would range from negligible to major, depending on the observer. Figures 4.1-5 through 4.1-7 present proposed architectural renderings of the exterior façade.

Figure 4.1-5. View from North of Veterans Benefits Administration Building and North Parking Garage.

Figure 4.1-6. View from West of West Bar Buildings (North Parking Garage, Diagnostics and Clinic).

Figure 4.1-7. View from East of East Bar Buildings (Patient Care and Administration).

Building setbacks and perimeter fences for the campus must conform to physical security and antiterrorism design requirements for mission critical VA facilities. The minimum setback for security is 50 feet from the property boundary, but wider setbacks would be designed to also address Land Development Code requirements for transitional zones (200 feet), noise (250 feet), and landscaping (35

feet). Perimeter fencing along the property boundaries would be nine-foot black metal pickets. Landscaping plans and materials (refer to Figure 2-4 and Section 2.2.1.14 Site Landscape) address security requirements, aesthetics, noise, and privacy.

The Cornerstone 2020 Comprehensive Plan's scenic corridor designation of Old Brownsboro Road subjects new development to specific setbacks, buffering, and landscape requirements along the road frontage. The Land Development Code establishes the minimum building setback for non-residential use at 40 feet from the property boundary adjacent to the scenic corridor (LMG 2006). Within that 40-foot setback is a buffer of 25 feet where landscaping must be installed. The building setbacks, transitional zones, and landscape buffers for the VAMC campus exceed the minimum Land Development Code requirements (refer to Section 4.8 Land Use) for a conditional use; therefore, the site layout adequately addresses aesthetic concerns associated with the scenic corridor designation of Old Brownsboro Road and would have no impact on the scenic corridor.

The building setbacks and landscape buffers for the VAMC campus at the Brownsboro Site more than meet the minimum Land Development Code requirements that address aesthetic issues associated with a "conditional use" (the land use category that includes hospitals and medical facilities) within a "town center form district." A form district is a further zoning delineation with regulations governing the pattern and form of development; town centers are "typically compact areas with a mixture of moderately intense uses that are developed around an identifiable core". Therefore, the site layout would have no visual impact that conflicts with these aspects of this land use designation.

Portions of the VAMC facility would stand up to 42 feet taller than the maximum (120 feet) for a town center form district, and another portion would exceed by up to 38 feet the height specified for the transition zone of this form district. Based on the visual impact criteria related to the zoning requirements, the building heights are identified as an adverse aesthetic impact. However, in developing the design concept for the site, VA determined that, on balance, the greater setbacks and more open space afforded by a somewhat taller facility resulted in an overall site design that was more visually pleasing compared to lower heights with a larger building footprint on the site. The visual impact of the building height can be considered negligible to major, depending on the observer. See Section 4.8 for further analysis of potential impacts specific to zoning and land use.

Exterior lighting of the campus would be controlled to minimize light trespass but would be designed to meet physical security requirements. The lighting system must provide sufficient illumination for perimeter surveillance cameras, sensitive inner areas, and access control points. The roadway lighting would provide enough intensity so that vehicle drivers, pedestrians, and bicyclists can identify directional signage, access gates, queuing lanes, and curbs. Light fixtures (or luminaires) would use the cutoff design that directs light downward and minimizes glare. Fixtures for the security fence would be a similar style as adjacent neighborhood fixtures provided that cutoff design requirements are met. The exterior lighting would be generally consistent with the Land Development Code; therefore, no aesthetic impacts associated with light trespass would be expected.

4.1.3 Alternative B: St. Joseph Site

4.1.3.1 Construction

Impacts from construction at the St. Joseph Site would be similar to the impacts described for the Brownsboro Site.

4.1.3.2 Operation

The layout and size of the VAMC campus buildings on the St. Joseph Site would be similar to those described for Alternative A. Figure 4.1-8 shows the possible dimensional layout of the buildings on the St. Joseph Site.

Figure 4.1-8. Dimensional View and Layout of VAMC Buildings on the St. Joseph Site.

The impact to visual quality of the St. Joseph Site would be similar to the impact described for Alternative A. The VAMC campus buildings would create a noticeable contrast to the existing landscape and would have an adverse visual effect because the buildings would obstruct or detract from what some observers would consider a scenic view. Some observers could consider the introduction of the visual elements of the VAMC out of scale or character with the surrounding area. The nearby presence of other medical facilities could lessen the extent of an adverse impact because of observers' expectations of future use of the area based on similar surrounding uses. Figures 4.1-9 and 4.1-10 simulate the change to the visual character of the landscape from the presence and appearance of the VAMC campus buildings. The extent of the impact would depend on the dominance and noticeability of the buildings in the landscape and the observers' attitudes and perspectives regarding the presence and purpose of the buildings. The extent of the aesthetic impact from the contrast to the existing landscape and the visual appearance of the façade would range from negligible to major, depending on the observer.

Figure 4.1-9. View to West from Bush Farm Road at Intersection with Old Henry Road (existing on left, Alternative B on right).

Figure 4.1-10. View to West from Factory Lane near Entrance Road to Covenant Classical Academy (existing on left, Alternative B on right).

The building setbacks, transitional zones, and landscape buffers for the VAMC campus at the St. Joseph Site more than meet the minimum Land Development Code requirements that address aesthetic issues associated with a "conditional use" within form districts specified as "suburban workplace" (large-scale industrial and employment uses in suburban locations) and "neighborhood" (described, in part, as appropriate and compatible integration of residential, civic, commercial, office and service uses that promotes close to home shopping and service opportunities). Therefore, the site layout would be compatible with these existing zoning designation standards.

Building height in the portion of the campus that would fall within the neighborhood form district could exceed the maximum height specified for that form district, but consistency can be improved for this form district with increased setback distance. Section 4.8.3.2 provides a detailed comparison of building height to the various height requirements for both of the form districts at the St. Joseph Site. The visual impact of the building height under Alternative B can be considered negligible to major, depending on the observer. See Section 4.8 for further analysis of potential impacts specific to zoning and land use.

Visual impacts from exterior lighting of the campus would be the same as described for Alternative A.

4.1.4 Alternative C: No Action

4.1.4.1 Construction

No construction is planned for the existing VAMC at the Zorn Avenue location; therefore, no construction-related impacts to visual quality or the aesthetics of the area would occur. If the new VAMC is not constructed at either the Brownsboro Site or St. Joseph Site, future development of those sites by others could have similar construction-related impacts to visual quality as described for Alternatives A and B.

4.1.4.2 Operation

Veterans health care services would continue at the existing Robley Rex VAMC; therefore, no operation-related impacts to visual quality or aesthetics of the area would occur. Future development of the Brownsboro Site or St. Joseph Site by others could have similar operation-related impacts to visual quality as described for Alternatives A and B.

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4.2 Air Quality

4.2.1 Evaluation Criteria

A "conformity applicability analysis" is provided in the following sections to determine if the construction and operation of the new VAMC campus are subject to the general conformity requirements of the Clean Air Act. A "conformity determination" is required if the total direct and indirect emissions equal or exceed the *de minimis* threshold of the criteria pollutant and any precursor, and to determine if the federal project could interfere with implementing the state implementation plan to achieve attainment status. The *de minimis* threshold for $PM_{2.5}$ is 100 tons per year (40 CFR 93.153 (b)(1)).

4.2.2 Alternative A: Brownsboro Site

4.2.2.1 Construction

Construction activities at the Brownsboro Site would generate both coarse and fine particulate emissions from grading the ground surface for site preparation, excavating and blasting (if needed) to install utilities and building foundations, operating heavy equipment (examples of which are provided in Section 4.7), and driving construction vehicles on paved and unpaved roads. The amount of particulate emissions from construction is based on the amount of ground surface exposed, type and intensity of the activity, soil type and conditions, wind speed, and dust control measures used. Total suspended particulates were calculated using the emission factor for heavy construction activity operations from AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995) to conservatively estimate emissions of PM_{10} and $PM_{2.5}$ (particulate matter smaller in diameter than 10 and 2.5 micrometers, respectively). As shown in Table 4.2-1, the conservative estimate of particulate emissions from construction of the replacement VAMC campus are below the *de minimis* threshold level of 100 tons per year. Therefore, the action is assumed to conform to the state implementation plan for $PM_{2.5}$ and would not contribute to a violation of the PM_{10} standard, and no further conformity applicability analysis or determination is necessary.

Table 4.2-1. Estimate of Annual Particulate Emissions from Construction.

Project Site (acres)	Exposed Area[1] (acres)	Duration (months)	Emission Factor[2,3] (tons/acre/month)	Control Efficiency (%)	Total Emissions (tons per year)
34.9	27.9	12	1.2	80	80.4

[1] Assumes 80 percent of project site is exposed for entire year; amount exposed would reduce as construction progresses.
[2] Total suspended particulates emission factor (EPA 1995).
[3] Use of this factor to estimate PM_{10} emissions will result in conservatively high estimates; therefore, it is also conservative for $PM_{2.5}$.

Construction activities would maintain compliance with APCD Regulation 1.14, Control of Fugitive Particulate Emissions (APCD 2015). A fugitive dust control plan may be required. Reasonable precautions for minimizing fugitive dust during construction activities include measures such as the following:

- Water or chemical dust suppression during construction activities
- Asphalt, oil, water, or chemicals on roads, material stockpiles, and other surfaces
- Covering open-bodied trucks transporting materials that may become airborne
- Proactive agricultural practices, including tilling and fertilizer application
- Maintaining roadways in a clean condition
- Vehicular speed limitation

Fuel combustion in construction worker commuter vehicles and in diesel-fueled heavy construction equipment would temporarily increase volatile organic compounds, nitrogen oxides, sulfur dioxide, $PM_{2.5}$, and carbon monoxide emissions in the area. However, because of updated vehicular emission controls and required fuel standards, these increases are expected to be temporary and negligible.

The estimated 80.4 tons of particulates emitted from construction activities would be a 0.5 percent increase in the approximately 15,900 tons per year of PM_{10} already emitted annually in Jefferson County (EPA 2015a). Thus, fugitive dust emissions from construction under Alternative A would have a negligible impact on regional air quality.

4.2.2.2 Operation

Operating the new VAMC campus would have long-term effects on air quality from pollutant emissions from stationary and mobile sources. The new campus would include a central utility plant for the boilers, cooling towers, and generators to power, heat, and cool the facilities. The following emissions rates were calculated for these units (URS/SmithGroup 2014):

- Nitrogen oxides – 44.91 tons per year
- Carbon monoxide – 78.24 tons per year
- Sulfur dioxide – 0.33 tons per year
- $PM_{2.5}$ – 39.23 tons per year
- Volatile organic compounds/non-methane hydrocarbons – 1.93 tons per year
- Formaldehyde – 9.44 tons per year

Air emissions would also be generated from underground and above-ground fuel storage tanks and fuel dispensing pumps. The primary fuel source for the boilers would be natural gas. Fuel oil would be stored in tanks as an emergency fuel source for the boilers and to power the emergency generators. Unleaded gasoline and diesel fuel would be stored for use in hospital and maintenance vehicles and equipment. The different items of equipment would be sources of nitrogen oxides, sulfur dioxide, volatile organic compounds, PM, carbon monoxide, and hazardous air pollutant emissions. Combustion of natural gas and fuel oil would also emit the greenhouse gases carbon dioxide and methane.

The construction or installation and operation of the emission source equipment would be subject to the Louisville Metro APCD permit requirements. APCD would review the design and manufacture information of the equipment; the type, rate, and potential quantity of emissions; and compliance monitoring and schedule. Based on the potential quantity of emissions, APCD would determine if the VAMC campus would operate as a major or minor source of emissions and identify the appropriate permit to implement and enforce. Because of the stringent design and manufacturing regulatory requirements to control air emissions, along with the permitting and monitoring requirements enforced by the Louisville Metro APCD, operating emission source equipment would not emit pollutants in a significant quantity that would result in regional exceedance of a NAAQS.

Gasoline dispensing equipment (storage tanks and nozzles) are considered non-emission sources for permitting purposes because emissions from the equipment are controlled by Stage I and Stage II vapor recovery systems. Although a permit from the Louisville Metro APCD would be required, the potential quantity of emissions does not need to be calculated and, therefore, the operation of this equipment would not emit pollutants in a significant quantity that would result in regional exceedance of a NAAQS.

Because the emission source equipment is subject to the Louisville Metro APCD permitting review and enforcement program, the emissions from operating the VAMC campus would be assumed to conform to

the state implementation plan; therefore, no further conformity applicability analysis or determination is necessary.

Fuel combustion in passenger and delivery vehicles and buses traveling to and from the replacement VAMC campus would increase volatile organic compounds, nitrogen oxides, sulfur dioxide, $PM_{2.5}$, and carbon monoxide emissions in the area. Because of updated vehicular emission controls and required fuel standards, and because these vehicle trips would replace those occurring to existing VA facilities throughout the metropolitan area, any increases in area-wide emissions are expected to be negligible.

According to the VAMC Traffic Impact Study (Appendix B), approximately 5,022 vehicles will enter/exit the facility daily, resulting in 10,044 one-way trips. Some of these vehicles will use the north parking garage and will not operate in the immediate vicinity of neighboring residences bordering the southeastern portion of the site. This compares to approximately 9,373 one-way trips if the Brownsboro Site were to be developed as a mixed-use facility (Palmer 2016). Therefore, development of the VAMC at the Brownsboro Site would only slightly increase vehicular air emissions as compared to the expected future scenario at the location without the VAMC. Additionally, operation of the existing Zorn Avenue VAMC has not resulted in the identification of increased air emissions resulting in adverse effects onsite or offsite. This is consistent with EPA's determination that vehicular air emissions from major roadways are generally reduced to near background levels within 500 to 600 feet of the source (EPA 2015b), and incorporating roadside landscaping and barriers further reduces ground-level pollutant concentrations downwind from the source. The proposed site layout—which locates truck traffic on the west side of the site, focuses employee (one trip per parking space per day) parking in the south garage, and includes landscape tree planting along the eastern site boundary—serves to reduce air quality impacts to neighboring residential receptors.

Greenhouse gas (GHG) emissions attributable to VAMC operations at the Brownsboro site can be estimated using accounting tools developed by the GHG Protocol. Three scopes of GHG emissions are defined in Section 3.2.2.3.

Scope 1: Direct GHG emissions from VAMC operations at the Brownsboro Site would predominantly include the consumption of natural gas and #2 fuel oil. Operation of fleet vehicles for landscaping and facility maintenance would also account for GHG emissions; however, such GHG emissions were assumed to be negligible when compared to GHG emissions from natural gas and #2 fuel oil consumption and were not included in the facility estimate.

For GHG emissions estimation purposes, natural gas and #2 fuel oil consumption are assumed to be a function of facility size. As a result, usage rates, and therefore GHG emissions rates, were scaled from estimates for the existing Robley Rex VAMC (26 percent increase). Scope 1 GHG emissions from VAMC operations at the Brownsboro Site are estimated at 3,796 metric tons of carbon dioxide equivalents (t $CO_{2\ eq}$). New equipment installed at the Brownsboro Site, combined with the objective of achieving a Leadership in Energy and Environmental Design (LEED) Silver rating for the new facility, would result in increased fuel efficiencies, and use of geothermal systems may also reduce fuel consumption. Therefore, the Scope 1 GHG emissions are likely overestimated.

Scope 2: For GHG emissions estimation purposes, electricity consumption is assumed to be a function of facility size. As a result, electricity usage rates were scaled from usage rates for the existing Robley Rex VAMC, resulting in a projected annual electricity usage of approximately 22,222,322 kilowatt-hours for the Brownsboro Site. Approximately one-third of the electrical demand, operating at an assumed 25 percent capacity factor, is to be supplied by solar (photovoltaic) generation, resulting in an 8 percent reduction in electricity purchased from Louisville Gas and Electric (LG&E).

The Scope 2 GHG emissions calculation tool developed for the service sector by the GHG Protocol was used to estimate electricity indirect GHG emissions (WRI 2016). Scope 2 GHG emissions from VAMC operations at the Brownsboro Site are estimated at 16,871 t $CO_{2\ eq}$ (LEI 2016). The estimated Scope 2 GHG emissions would be further reduced with the achievement of a LEED Silver rating for the new facility and the potential incorporation of co-generation facilities at the Brownsboro Site.

Scope 3: Other indirect GHG emissions predominantly include vehicular emissions from commuting VAMC employees and vehicular emissions from patient use of VAMC services. Transportation and ultimate disposal of VAMC-generated wastes were assumed to be negligible when compared to GHG emissions from other transportation sources and were not included in the facility estimate.

Increases in VAMC workforce and patient clinic stops would be realized regardless of the alternative selected. Additionally, the new facility would be located in the same general region as the existing facility, and assumptions pertaining to employee and patient transportation would be the same. Therefore, Scope 3 GHG emissions are estimated to be the same for all alternatives.

Based on the GHG emissions estimates above, total GHG emissions for facility operations at the Brownsboro Site would be approximately 12 percent greater than estimates for the existing Robley Rex facility (28,953 t $CO_{2\ eq}$, or approximately 0.017 percent of the total GHG emissions for the state of Kentucky) (CAIT 2016). However, as described above, the GHG emissions are likely overestimated because increased fuel efficiencies, achievement of LEED Silver certification, use of geothermal systems, and use of co-generation facilities would reduce the GHG emissions estimate for the Brownsboro Site. Therefore, GHG emissions are not predicted to significantly increase under Alternative A, and increases in GHG emissions are not likely to result in adverse environmental impacts such as changes in floodplains or regional water availability.

4.2.3 Alternative B: St. Joseph Site

4.2.3.1 Construction

Under Alternative B, the same proposed facility would be constructed at the St. Joseph Site. Therefore, the predicted air quality impacts from construction activities would be the same as those described above for Alternative A: offsite health impacts would also be negligible at the St. Joseph Site.

4.2.3.2 Operation

Under Alternative B, the same proposed facility would be operated at the St. Joseph site. Therefore, the predicted air quality impacts from facility operation would be the same or less than those described above for Alternative A: offsite health impacts would also be negligible at the St. Joseph Site.

4.2.4 Alternative C: No Action

4.2.4.1 Construction

Under No Action, construction activities would not occur, and there would be no construction-related air quality impacts.

4.2.4.2 Operation

Under No Action, use of the existing facilities would continue. Air emissions from existing equipment would continue, under the minor source permit issued by the Louisville Metro APCD. Continued

compliance with permit conditions would be expected. Thus, no effects to air quality would be anticipated.

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4.3 Cultural Resources

4.3.1 Evaluation Criteria

This analysis applies the Criteria of Adverse Effect as described in the regulations for implementing the National Historic Preservation Act Section 106 process (36 CFR 800.5). The regulations define an undertaking (action) as having an adverse effect on historic properties if the undertaking would alter, directly or indirectly, any of the characteristics that qualify a property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Examples of adverse effects include but are not limited to (36 CFR 800.5):

(i) Physical destruction of or damage to all or part of the property;

(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines;

(iii) Removal of the property from its historic location;

(iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;

(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an

(vii) Indian tribe or Native Hawaiian organization; and

(viii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

The resources analyzed for potential effects are those within the area of potential effect (APE) of each site. Each APE was established in consideration of the scale, nature, and setting of each alternative location to account for direct effects resulting from construction activities and indirect effects, primarily visual in nature, resulting from the construction and operation of the VAMC.

4.3.2 Alternative A: Brownsboro Site

The APE for the Brownsboro Site extends 1,000 feet from the parcel boundary, encompassing all areas from which the parcel would be visible. The APE was defined in consultation with the Kentucky Heritage Council (State Historic Preservation Office [SHPO]) and the Louisville Metro Historic Preservation Officer. The APE was established in consideration of the scale, nature, and setting of the proposed project in order to account for direct effects resulting from construction activities and indirect effects, primarily visual in nature, resulting from the construction and operation of the proposed VAMC.

4.3.2.1 Construction

No historic properties were identified on the Brownsboro Site. Therefore, the proposed construction of a replacement VAMC at the Brownsboro Site would result in no direct effects to historic properties.

4.3.2.2 Operation

One historic property, the NRHP-listed George Herr House (JF 394) was identified within the APE. The house itself falls outside the APE, but the historic property boundary falls within 1,000 feet of the proposed project site. Because the property is hemmed in by both trees and the Windy Hills subdivision, sightlines in all directions are interrupted by the house's surroundings. It is unlikely that the proposed VAMC would be visible from the property, and, given the distance between the property and the Brownsboro Site, there is no potential for any other sort of indirect effects resulting from the project. Thus, there would be minimal, if any, noticeable effects from the proposed project on the historic residence.

Four significant historic sites located outside the APE were assessed for potential impacts from the project, at the request of Cynthia Johnson, Louisville Historic Preservation Officer. All four sites are listed on the NRHP, and one is also designated a National Historic Landmark. All are located west of the APE, and on the west side of the Watterson Expressway (I-264).

- JF 527, the Zachary Taylor House, is located on Apache Road and is approximately 0.68 miles west of the Brownsboro Site. It is a National Historic Landmark. The house is entirely surrounded by a subdivision, including many mature trees. Because of the surrounding residences and trees and the distance between the residence and the Brownsboro Site, it is anticipated that the proposed VAMC would have no effect on the Zachary Taylor House.
- JF 528, the Zachary Taylor National Cemetery, is located on Brownsboro Road, approximately 0.5 miles west of the Brownsboro Site. The cemetery is surrounded on the west, north, and east by subdivisions, and more subdivisions and busy streets (including Brownsboro Road and the Watterson Expressway) are located between the cemetery and the Brownsboro Site. Mature trees are scattered through the cemetery and surrounding neighborhoods. Because of the surrounding residences and trees and the distance between the cemetery and the Brownsboro Site, it is anticipated that the proposed VAMC would have no effect on the Zachary Taylor National Cemetery.
- JF 593, the Taylor-Oldham-Herr House, is located on Ballard Mill Lane, approximately 0.4 miles west-northwest of the Brownsboro Site. The house is entirely surrounded by a subdivision, including many mature trees around the house and throughout the neighborhood. Because of the surrounding residences and trees and the distance between the residence and the Brownsboro Site, it is anticipated that the proposed VAMC would have no effect on the Taylor-Oldham-Herr House.
- JF 395, the Taylor-Herr House, is located on Waterford Road, approximately 0.38 miles west of the proposed project location. The house is entirely surrounded by the Wexford Hills subdivision, including many mature trees around the house and throughout the neighborhood. Because of the surrounding residences and trees and the distance between the residence and the Brownsboro Site, it is anticipated that the proposed VAMC would have no effect on the Taylor-Herr House.

The proposed construction and operation of a replacement VAMC at the Brownsboro Site would result in no adverse effects to historic properties at or near the Brownsboro Site.

Under Alternative A, VA's plans for disposition of the potentially NRHP-eligible existing Zorn Avenue VAMC have not been determined and would be the subject of a future reutilization feasibility study, NEPA analysis, and consultation under Section 106 of the National Historic Preservation Act, as appropriate.

4.3.3 Alternative B: St. Joseph Site

The APE for the Brownsboro Site extends one-half mile from the parcel boundary. There are no NRHP-listed sites within this radius.

4.3.3.1 Construction

No historic properties were identified on the St. Joseph Site. No archaeological resources that were considered significant were identified on the parcel. Therefore, the proposed construction of a replacement VAMC at the St. Joseph Site would result in no direct effects to historic properties or cultural resources.

4.3.3.2 Operation

No historic districts or eligible structures are located on or immediately adjacent to the St. Joseph Site. Eberwine et al. (2012) noted that two historic districts, located approximately 1 to 1.5 miles north of the site may be within its viewshed. However, follow-up reconnaissance was conducted in 2015, after construction of an elevated municipal water tower just outside the southern end of the parcel. That water tower was not visible from any street within either historic district. Thus, no structures on a potential VAMC campus on the St. Joseph Site would be expected to be visible from these or other historic properties and no effects to historic or cultural resources would occur.

Under Alternative B, VA's plans for disposition of the potentially NRHP-eligible existing Zorn Avenue VAMC have not been determined and would be the subject of a future reutilization feasibility study, NEPA analysis, and consultation under Section 106 of the National Historic Preservation Act, as appropriate.

4.3.4 Alternative C: No Action

No construction would occur under Alternative C. The existing Robley Rex VAMC on Zorn Avenue would continue to operate. There would be no effects to historic or cultural resources.

Neither the Brownsboro Site nor the St. Joseph Site would be used by VA for a replacement medical center campus. No significant cultural resources were identified at either site. As such, should either of these sites be developed by others, negligible adverse cultural resources impacts would occur.

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4.4 Geology and Soils

4.4.1 Evaluation Criteria

The potential effects related to geology and soils were evaluated through a qualitative assessment of geologic hazards and the potential for severe erosion or liquefaction, including both construction- and operation-related activities. An alternative would be considered to result in an adverse impact related to geology and soils if it was associated with any of the following characteristics or outcomes:

- Exposure of people or structures to potential substantial adverse seismic effects, including the risk of loss, injury, or death involving strong seismic ground shaking, or seismic-related ground failure, including liquefaction or landslides
- Location on a geologic unit or soil that is unstable or would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse
- Location on expansive soil creating substantial risks to life or property

The Louisville Metro Government Land Development Code (Chapter 4, Part 9) guides development on land within a karst-prone area, including geologic assessments conducted by a geologist or engineer licensed in Kentucky. For purposes of this evaluation, an adverse impact would be identified if the results of the geological assessment found the project site unsuitable for construction, or if construction activities could disrupt karst features so as to cause property damage or safety concerns.

The Farmland Protection Policy Act requires VA, as the lead federal agency, to ensure its actions would not unnecessarily convert farmland designated as prime, unique, or of statewide importance to nonagricultural uses. For purposes of this evaluation, an adverse impact would be identified if the irreversible conversion of prime farmland is not compatible with local farmland protection policies.

4.4.2 Alternative A: Brownsboro Site

4.4.2.1 Construction

Under Alternative A, construction activities would include site grading and preparation, which would disturb exposed subsurface soils. Approximately 35 acres could be disturbed at the Brownsboro Site. Exposed soils would be susceptible to erosion from wind and stormwater runoff from the construction sites. Preliminary grading plans indicate the topography (elevation) of the site would be raised by approximately 10 to 12 feet to a finished floor elevation of 600 feet for the east bar buildings and north parking deck, and would be excavated approximately 6 feet for a basement elevation of 583 feet for the west bar buildings and 588 feet for the south parking deck. In addition to onsite cut materials, fill material would be imported to raise the site elevation for construction. Bedrock would be encountered in some areas during excavation for utilities, for basement floor elevations, and foundations. Figure 4.4-1 is a schematic of the subsurface soil and bedrock conditions of the project site showing the proposed building elevations (AMEC 2014).

Drainage changes resulting from changes to site topography are anticipated to be minimal and would be monitored for erosion potential through routine site stormwater management practices. Wind erosion could temporarily increase airborne particulate matter in the area, resulting in short-term health, visibility, and aesthetics impacts. Temporary increases in sedimentation in stormwater drainages could occur as a result of surface runoff erosion.

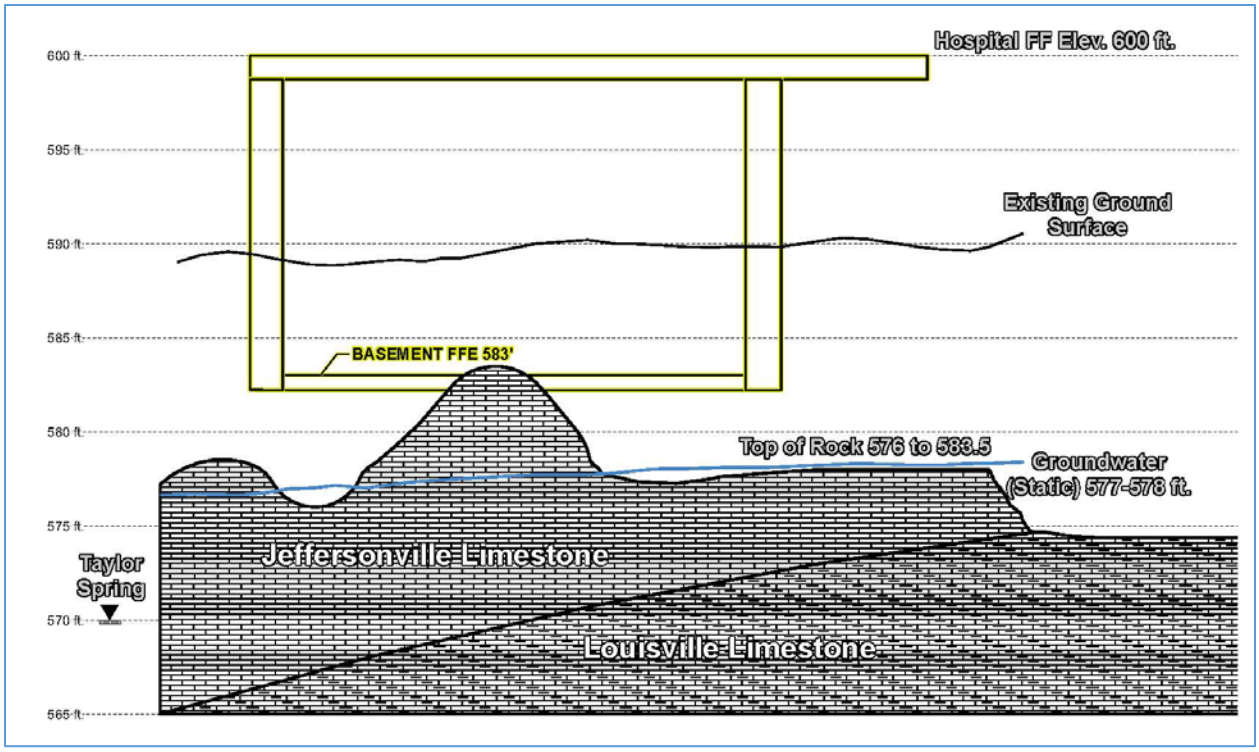

Figure 4.4-1. Schematic of Brownsboro Site Subsurface Soil and Bedrock Conditions.

The building foundation systems are anticipated to consist of drilled pier (or "caissons") bearing on the relatively shallow bedrock. Risk from karst activity at the site can be split into two concerns; existing voids that could form small sinkholes and voids that will be formed over time due to groundwater dissolving the limestone. Procedures would be taken during construction to discover the existing voids. Simply removing the existing vegetation on the surface is likely to reveal them, but beyond that proofrolling will be utilized to further test the soils for underlying voids. The development of voids due to dissolving rock cannot be stopped. However, this occurs on a geologic time scale over thousands if not tens of thousands of years (URS/SmithGroup 2014). During construction, a geotechnical engineer would be present to observe the excavation and rock removal to determine treatment methods to minimize the potential for karstic activity.

There is a low risk of soil dropouts developing over previously undetected sinkholes in areas of karst activity similar to the project site, based on experience in this part of Jefferson County (AMEC 2014). Site development planning in karst areas must weigh the cost of site development and risk reduction measures with the risk of future sinkhole activity. Development of other similar sites in Jefferson County with both deep and shallow foundation support has been successfully performed in the past. The risk from development of this site does not appear to be any greater than development in other similar areas of Jefferson County (AMEC 2014); thus, the presence of karst features would not be associated with an adverse effect under Alternative A.

Bedrock in confined areas (utility trenches and foundation footings) would be removed using ripping tools and pneumatic hammers; however, it is possible that blasting may also be required to efficiently remove resistant bedrock and large boulders. Vibration standards and damage criteria from blasting are based on years of research and legal proceedings – ground vibration or peak particle velocity (PPV) limited to 0.5 inches per second would avoid offsite damage (ODOT 2014). This PPV would feel like a loaded truck or bus going by 50 to 100 feet away. Two primary factors affecting ground vibration levels from blasting are weight of the explosive fired and distance from blast to point of concern, such as a

house. To maintain the PPV standard and avoid damage if blasting is required, fewer explosives would be used as a blast hole gets closer to a point of concern. Adherence to this standard and the requirements of the Kentucky Revised Statute 350.430 for possible blasting operations would minimize impacts and avoid damage to nearby buildings and houses.

As with any other commercial development, if needed, the building would be constructed to incorporate a radon mitigation system in compliance with all applicable design and construction standards, if such a system is required to ensure that building occupants would not be exposed to radon in excess of 4 picocuries per liter.

The Natural Resources Conservation Service (NRCS) determined that the Brownsboro Site contains approximately 34.9 acres of prime and unique farmland, which would be irreversibly converted. The Farmland Conversion Impact Rating form (Form AD-1006) completed jointly by VA and NRCS assigned a relative value and site assessment score of 100 points to the Brownsboro Site. Because the total score was less than 160 points, the site does not require further consideration for protection, and the impact to prime and unique farmland is considered to be minor.

Contractor selection and bore drilling procedures for the geothermal system would follow the requirements and best practices detailed in VA's *Master Construction Specification, Division 23 81 49, Ground-Source Heat Pumps*. This specification requires (1) the contractor is accredited by the International Ground Source Heat Pump Association (IGSHPA) or an equivalent nationally recognized association, (2) loops are constructed in accordance with specific IGSHPA configurations, and (3) specific borehole construction and grouting practices are utilized to protect hydrogeological resources. Placement of geothermal bores would be based on information from test bores during the detailed design phase and ensure negligible impacts from construction in potentially karstic geology.

In summary, construction-related impacts to geology and soils would be minor and short-term. Erosion and sedimentation impacts would be minimized through implementing construction best management practices and conforming with permit requirements.

4.4.2.2 Operation

Operation of the proposed VAMC campus at the Brownsboro Site is not expected to result in adverse impacts to geology and soils. Landscape vegetation would be installed and maintained, thereby minimizing exposed soils and any resulting erosion potential.

4.4.3 Alternative B: St. Joseph Site

4.4.3.1 Construction

Under Alternative B, construction activities would include site grading and preparation, which would disturb exposed subsurface soils. Approximately 35 acres could be disturbed at the St. Joseph Site, although a greater area could be disturbed due to the larger size of the St. Joseph Site and potential differences in site layout, access drives, and total area landscaped.

In general, construction activities would be similar to those described for Alternative A (with site-specific geologic differences taken into account) and would result in similar impacts. Potential impacts to soils due to erosion from wind and stormwater runoff from the construction site are predicted to be localized and negligible with implementation of the required control plans.

Development of the St. Joseph Site could impact prime, unique, statewide, or local important farmlands protected by the Farmland Protection Policy Act. A Farmland Conversion Impact Rating form (Form AD-1006) would be completed by VA and submitted to the local NRCS office for a determination of whether the site contains prime, unique, statewide, or local important farmland and the level of impacts. Preliminary review using the criteria of Form AD-1006, and estimating the input that would be provided by NRCS, resulted in an expectation that the St. Joseph Site would be assigned a total score less than 160 points. Therefore, Alternative B is not expected to require further consideration for protection and the impact to prime and unique farmland would be minor (VA 2016).

Construction-related impacts would be minor and short-term. Erosion and sedimentation impacts would be minimized through implementing construction best management practices and conforming with permit requirements.

4.4.3.2 Operation

Operation of the proposed VAMC campus at the St. Joseph Site is not expected to result in adverse impacts to geology and soils. Landscape vegetation would be installed and maintained, thereby minimizing exposed soils and any resulting erosion potential.

4.4.4 Alternative C: No Action

4.4.4.1 Construction

No construction activities would occur under Alternative C. There would be no construction-related adverse impacts to geology and soils.

4.4.4.2 Operation

Continuing use of the existing facilities would have no impacts to geology and soils.

4.5 Hydrology and Water Quality

4.5.1 Evaluation Criteria

The potential effects related to hydrology and water quality were evaluated through a qualitative assessment of potential project-related drainage alterations, increased impervious areas, water quality degradation, or groundwater depletion, including both construction- and operation-related activities. An alternative would be considered to result in an adverse impact related to hydrology and water quality if it would result in any of the following:

- violate existing water quality standards or otherwise substantially degrade water quality
- result in substantial water quality changes that would adversely affect beneficial uses
- result in substantive groundwater depletion

Section 438 of the Energy Independence and Security Act of 2007 requires federal agencies to reduce stormwater runoff from federal development projects to protect water resources. Facilities with footprints exceeding 5,000 square feet must be designed in a manner that maintains or restores the predevelopment site hydrology to the maximum extent technically feasible. Development of the project site is also subject to the stormwater discharge regulations enforced by the Metropolitan Sewer District (MSD) to maintain compliance with the Kentucky Division of Water MS4 stormwater quality permit. These regulations address the core requirement of the MS4 permit to use onsite “green infrastructure” or “green management practices” to control and treat stormwater runoff. For purposes of this evaluation, an alternative would be considered to result in an adverse impact if the VAMC campus cannot be designed so that stormwater retention onsite meets the federal and MSD requirements.

4.5.2 Alternative A: Brownsboro Site

4.5.2.1 Construction

Under Alternative A, construction activities would include site grading and preparation, which would disturb exposed subsurface soils. Approximately 35 acres could be disturbed at the Brownsboro Site. Exposed soils would be susceptible to erosion from stormwater runoff from the construction site. Drainage changes resulting from changes to site topography and installation of impervious surfaces are anticipated to be minimal and would be monitored for erosion potential through routine site stormwater management practices. Temporary increases in sedimentation in stormwater drainages could occur as a result of surface runoff erosion.

Because the amount of ground surface that would be disturbed is greater than one acre, a Notice of Intent application with the Kentucky Division of Water for the Construction General Permit for stormwater runoff from the project site must be completed, and a Stormwater Pollution Prevention Plan outlining measures to be used during construction to minimize runoff from the site must be prepared. In addition, a site disturbance permit must be obtained from the MSD, and an Erosion Prevention and Sediment Control Plan must be prepared that details measures to trap 80 percent of the total suspended solids that could come from the project site during construction.

Potential impacts to water quality due to stormwater runoff from the construction site are predicted to be localized and negligible with implementation of the required control plans.

Blasting may be needed (but this is not certain) to remove bedrock for construction of foundations and other below grade structures. Studies have shown that extensive fracturing in the rock around a blast hole that could affect groundwater is generally limited to a distance of 20 to 40 blast hole diameters (ODOT

2014). Thus, for the typical 3½ inch drill hole, the zone of damage would generally be 6 to 12 feet. Studies have also concluded that there are little to no significant long-term mechanical changes in an aquifer that could be attributed to blasts detonated at distances greater than 500 feet from an observation well (ODOT 2014). Because there are no existing groundwater wells in close proximity to the project site, blasting (if needed) would not be expected to impact groundwater.

Before drilling any geothermal bores, a groundwater protection plan (GPP) would be prepared in accordance with Kentucky Administrative Regulation (Title 40, Chapter 5:037). A GPP establishes the minimum acceptable groundwater protection practices for such construction. Kentucky Division of Water has generic GPPs for public use, which would be modified with site-specific information for the proposed geothermal bores at the new campus (URS 2014). A state-certified water supply well driller would construct the geothermal bores; the driller would provide project-specific details in the GPP, identifying the construction practices that would be implemented to protect groundwater for this specific project, such as full-depth grouting for each borehole to prevent shallow, often lower-quality groundwater from reaching deeper groundwater. The Kentucky Division of Water recommends that the GPP be retained in the drill rig(s) or contractor vehicle(s) that would be present onsite during the drilling. The rock and soil material removed during borehole construction would be temporarily stored onsite, and may be either used as clean fill or disposed offsite in accordance with local regulations, depending on the need for fill on the project site the nature and properties of the removed material. The Erosion Prevention and Sediment Control Plan required for sitewide construction would include provisions that would minimize or eliminate erosion sediment in runoff from drilling areas and from temporary onsite soil/rock storage locations.

Potential impacts to groundwater due to construction activities are predicted to be negligible with implementation of the GPP.

4.5.2.2 Operation

The proposed design of the VAMC campus under Alternative A would result in approximately 65 percent impervious surfaces on the Brownsboro Site that would impact the amount and rate of stormwater discharge from the site. Stormwater would be managed to meet predevelopment discharge rates for the 2-, 10-, 25-, and 100-year storm events in accordance with the MSD Design Manual (MSD 2015), and should therefore have minimal adverse effects on the hydrology of the project site and adjacent properties, surface water quality, and the rate of groundwater recharge.

Stormwater management would include a combination of surface and subsurface detention basins. The surface basins would be of the “green dry” type (see Figure 4.5-1) (MSD 2015), with wet meadow vegetation over highly permeable topsoil that is underlain by drain aggregate and perforated pipe. The 2- and 10-year storm events would infiltrate through the permeable topsoil and aggregate into the perforated pipe. This design allows for extended detention (length of time that stormwater would pond or remain in the basin) of about 48 hours (MSD 2015). The surface basins would not likely be a breeding source for mosquitoes because it takes approximately 7 to 10 days for larvae to enter the pupal stage. If a water source evaporates before the larvae and pupae within it transform into adult mosquitoes, those young life stages typically will die (Orkin 2015).

Figure 4.5-1. Example of a Green Dry Basin.

An outlet control structure would collect drainage from the perforated pipes and control the discharge rate and flow from the detention basins into the surface drainage ditch in the Watterson Parkway right of way along the western edge of the Brownsboro Site. Green dry detention basins would be designed for the north end of the project site and the southwest corner of the site.

The subsurface detention basins would be located along the west side and in the southeast corner of the site. These would be concrete tanks or structures installed below grade to collect runoff primarily from roads, building roof drains, and parking areas. A bioswale would be constructed along the east edge of the site to collect drainage from adjacent properties and runoff from the onsite driveway. A bioswale is a shallow vegetated ditch with highly permeable topsoil underlain by drain aggregate and perforated pipe. The bioswale would be sloped to direct the drainage to the subsurface detention structure in the southeast corner of the project site. The stormwater would be pumped or gravity-drained from the structures and conveyed through storm sewer pipes to discharge to the surface drainage ditch in the Watterson Parkway right of way. Discharge from the subsurface structures would be controlled to emulate the predevelopment rate and volume of the particular storm event, so as not to affect hydrology, surface water quality, and the rate of groundwater recharge.

Groundwater-bearing strata would likely be exposed in excavations, which could produce widely varying seepage durations and rates, depending on recent rainfall activity and other hydrogeologic characteristics. These perched groundwater sources are often not linked to the more continuous relatively stable groundwater table that typically occurs at greater depths (AMEC 2014), so facility construction and operation would not adversely affect groundwater quality. However, the building foundations would likely require dewatering of the perched groundwater and saturated soil conditions during and after construction. A temporary pump system would be used to dewater the foundation shafts before pouring concrete. A passive subsoil drainage system of perforated drainage tile on aggregate and sump pumps would be installed to remove seepage from around the installed foundation piers and other below-grade structures such as elevator pits. Groundwater that collects in the sump would be conveyed to the storm sewer system pipes and discharged to the surface drainage ditch in the Watterson Parkway right of way. The discharge of groundwater to surface water would be permitted in accordance with the Kentucky Pollutant Discharge Elimination System and would be monitored to ensure water quality standards are maintained to prevent adverse impacts from occurring.

All potable water needs would be supplied by the Louisville Water Company, which has indicated there is sufficient system capacity to support the replacement VAMC campus.

VA's Master Construction Specification, Division 23 81 49, Ground-Source Heat Pumps specifies strict requirements related to the chemical and physical properties and limits on the toxicity of the heat transfer fluid used in closed loop geothermal systems at VA facilities. The specification also requires installation of an Underwriter Laboratories-listed leak detection system with a sensor probe, control panel, and LED indicators. Adherence to these requirements would ensure no significant impact to groundwater due to operation of the geothermal system.

4.5.3 Alternative B: St. Joseph Site

4.5.3.1 Construction

Under Alternative B, construction activities would include site grading and preparation, which would disturb exposed subsurface soils. Approximately 35 acres could be disturbed at the St. Joseph Site, although greater area could be disturbed due to the larger size of the St. Joseph Site and potential differences in site layout and access.

In general, protection of stormwater and groundwater resources would be similar to that described for Alternative A and would result in similar impacts. Potential impacts to water quality due to stormwater runoff from the construction site are predicted to be localized and negligible with implementation of the required control plans. Blasting activities, if needed, would not be expected to impact groundwater resources, and impacts to groundwater resources resulting from construction of geothermal bores would be negligible.

4.5.3.2 Operation

Under Alternative B, operation of a facility similar to that in Alternative A would occur. Impervious surfaces would increase compared to existing site conditions, requiring management of increased stormwater flows. The larger size of the St. Joseph Site (compared to the Brownsboro Site) would accommodate the development of surface and subsurface detention basins similar to those described for Alternative A, protecting existing site drainages and offsite hydrology. Impacts to groundwater resources would be negligible, consistent with the descriptions provided for Alternative A.

4.5.4 Alternative C: No Action

4.5.4.1 Construction

No construction activities would occur under Alternative C. There would be no construction-related adverse impacts to hydrology and water quality.

4.5.4.2 Operation

Continuing use of the existing facilities would have no impacts to hydrology and water quality.

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4.6 Wildlife and Habitat

4.6.1 Evaluation Criteria

Impacts to wildlife and habitat are based on (1) the legal, commercial, recreational, ecological, or scientific importance of the resource; (2) the proportion of the resource that would be affected relative to its occurrence in the region; (3) the sensitivity of the resource to the proposed activities; and (4) the duration of ecological effects. An adverse impact to wildlife or habitat would be identified in the case of a violation of the laws and regulations pertaining to biological resources, if species or habitats of high concern are adversely affected over relatively large areas, or if disturbances cause reductions in population size or distribution of a species of special concern. A habitat perspective is used to provide a framework for analysis of general classes of effects such as those caused by due to removal of critical habitat, noise, or human disturbance.

Section 7 of the Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service (FWS) to ensure that a federal action is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. For purposes of this evaluation, an impact would be significant if the viability of protected species or habitat is altered, migratory birds are harmed, or the abundance or distribution of common wildlife and habitat is substantially changed.

Ground disturbance and noise associated with construction of a new VAMC might directly or indirectly cause potential effects on wildlife and habitat. Direct effects from ground disturbance were evaluated by identifying the types of potential ground-disturbing activities and area affected in comparison to the extent of existing resources. Mortality of individuals, habitat removal, and damage or degradation of habitats are impacts that might be associated with ground-disturbing activities. By itself, noise associated with these alternatives is not likely to be of sufficient magnitude to result in the direct loss of individuals or reduce reproductive output. Effects assessment considered the number of individuals or protected species involved, amount of habitat affected, relationship of the area of potential effect to total available habitat within the region, type of stressors involved, and magnitude of the effects.

To evaluate effects to biological resources, the alternatives are reviewed with respect to the following criteria to determine whether any activities have the potential to directly or indirectly result in the following:

- Cause displacement of terrestrial or aquatic communities or loss of habitat
- Diminish the value of habitat for wildlife or plants
- Interfere with the movement of native resident or migratory wildlife species
- Conflict with applicable management plans for terrestrial, avian and aquatic species and their habitat
- Cause the introduction of noxious or invasive plant species
- Diminish the value of habitat for fish species
- Cause a decline in native fish populations
- Affect or displace endangered, threatened, or other special status species
- Cause encroachment on or affect designated critical habitat of a federally listed species

4.6.2 Alternative A: Brownsboro Site

4.6.2.1 Construction

Construction activities would displace common wildlife that inhabit or use the Brownsboro Site for nesting, foraging, or cover and potentially cause direct mortality of less mobile subterranean species, such as moles. The typical terrestrial wildlife species that could be impacted are widely distributed; thus, loss of some individuals and habitat would not measurably impact population abundance or distribution throughout their range.

Surface disturbance and construction activities could facilitate the establishment of non-native noxious weeds, such as thistles and foxtail. Aggressive noxious weed species could become established on disturbed, bare ground surfaces but could be controlled with best management practices. Measures that would be employed to minimize wind erosion would also avoid noxious weed infestations, such as minimizing the amount of exposed soils at any given time during construction activities, quickly revegetating disturbed areas following completion of activities, and maintaining landscaping during the campus operation. Monitoring and eradication will also be implemented, as needed, to reduce noxious weeds from invading the project site after ground disturbance occurs and before landscaping is installed.

If clearing the site to begin proposed construction was scheduled to occur during bird breeding season (generally April through July), any migratory bird found nesting on the project site could be impacted. To protect migratory birds if construction is scheduled to begin between April and July, the project site will be surveyed by a qualified biologist to confirm the absence of nests and nesting activity. If found, active nests (containing eggs or young) will be avoided until they are no longer active or the young birds have fledged. The Kentucky Department of Fish and Wildlife Resources will be contacted for guidance on appropriate avoidance measures for specific species and distances to keep away from active nests.

As described in Section 3.6.2.1, the Brownsboro Site does not contain suitable habitat for the Indiana bat, running buffalo clover, or Kentucky glade cress, and thus there would be no impacts to these federally protected species from construction of the proposed VAMC. However, the recently listed northern long-eared bat can roost in much smaller trees than those utilized by the Indiana bat, and the few trees on the site could potentially provide roosting habitat for the northern long-eared bat. To avoid impacts to roosting northern long-eared bats, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of any northern long-eared bats from the site. These actions would be coordinated in consultation with the Kentucky Ecological Services field office of the FWS.

4.6.2.2 Operation

No impacts to wildlife and habitat specific to the operation of a replacement Louisville VAMC at the Brownsboro Site are expected.

4.6.3 Alternative B: St. Joseph Site

4.6.3.1 Construction

Construction activities would displace common wildlife that inhabit or use the St Joseph Site for nesting, foraging, or cover and potentially cause direct mortality of less mobile subterranean species, such as moles. The typical terrestrial wildlife species that could be impacted are widely distributed; thus, loss of some individuals and habitat would not measurably impact population abundance or distribution throughout their range.

Surface disturbance and construction activities could facilitate the establishment of non-native noxious weeds, such as thistles and foxtail. Aggressive noxious weed species could become established on disturbed, bare ground surfaces but could be controlled with best management practices. Measures that would be employed to minimize wind erosion would also avoid noxious weed infestations, such as minimizing the amount of exposed soils at any given time during construction activities, quickly revegetating disturbed areas following completion of activities, and maintaining landscaping during the campus operation. Monitoring and eradication will also be implemented, as needed, to reduce noxious weeds from invading the project site after ground disturbance occurs and before landscaping is installed.

If clearing the site to begin proposed construction was scheduled to occur during bird breeding season (generally April through July), any migratory bird found nesting on the project site could be impacted. To protect migratory birds if construction is scheduled to begin between April and July, the project site will be surveyed by a qualified biologist to confirm the absence of nests and nesting activity. If found, active nests (containing eggs or young) will be avoided until they are no longer active or the young birds have fledged. The Kentucky Department of Fish and Wildlife Resources will be contacted for guidance on appropriate avoidance measures for specific species and distances to keep away from active nests.

As described in Section 3.6.2.1, the St. Joseph Site contains suitable habitat for the Indiana bat and northern long-eared bat. To avoid impacts to roosting Indiana or northern long-eared bats, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of protected bat species from the site. These actions would be coordinated in consultation with the Kentucky Ecological Services field office of the FWS.

As directed by FWS (2011), alteration of habitat at the St. Joseph Site would require an onsite inspection for the presence of running buffalo clover. A 2012 field survey did not find this species onsite, but did identify it in three locations just offsite (TTL 2012). Due to the intervening time, a new field survey for running buffalo clover would be conducted prior to site clearing under Alternative B. VA would coordinate and consult with the Kentucky Ecological Services field office of the FWS on field methods for the survey and specific requirements to fully comply with Section 7 of the Endangered Species Act if this plant species is identified onsite in areas proposed for disturbance.

The St. Joseph Site does not contain critical habitat for Kentucky glade cress; see Section 3.6.2.2. Thus, there is no potential for adverse effects to this plant species.

4.6.3.2 Operation

If the pre-construction field survey identified running buffalo clover onsite and/or continued presence in adjacent areas, VA would develop and implement a management plan to ensure ongoing site operation would not affect any individuals of this plant species remaining onsite or adjacent. The plan would address, at minimum, procedures to be followed during any future clearing of undisturbed areas, measures to be followed during landscape management in perimeter areas adjacent to undisturbed areas, and procedures to be followed during broadcast (include turf management) or targeted herbicide treatments to ensure no drift/overspray to undisturbed areas that may provide habitat for running buffalo clover. The plan and related consultation would be coordinated with the Kentucky Ecological Services field office of the FWS to ensure VA compliance with Section 7 of the Endangered Species Act.

No other potential impacts to wildlife and habitat specific to the operation of a replacement Louisville VAMC at the St. Joseph Site are expected.

4.6.4 Alternative C: No Action

4.6.4.1 Construction

No construction-related impacts would occur under Alternative C, as there would be no construction at the Zorn Avenue location. Future development by others of either the Brownsboro Site or St. Joseph Site would be associated with similar potential impacts to wildlife and habitat as identified for VA development under Alternatives A and B.

4.6.4.2 Operation

There would be no impact to wildlife or habitat as a result of continuing operation of the existing Robley Rex VAMC on Zorn Avenue under the No Action alternative. Impacts from operation of future development by others of either the Brownsboro Site or St. Joseph Site would depend on the type of development and, in particular, could be associated with a potential for impacts to running buffalo clover at the St. Joseph Site.

4.7 Noise

To assess the potential short-term noise impacts from construction, sensitive receptors and their relative levels of exposure were identified. Construction noise was predicted using the Roadway Construction Noise Model (FHWA 2008). Noise levels of specific construction equipment and resulting noise levels at representative locations were calculated.

Default values for equipment specification sound levels and usage factors were used in modeling predicted noise levels. It was assumed that all equipment is in use simultaneously (a conservative assumption overestimating predicted noise levels) and the construction site is surrounded by a noise barrier with some gaps (providing an estimated noise shielding of five A-weighted decibels [dBA]). Outdoor noise levels were predicted at distances from the source equipment of 100 feet and 500 feet. Figures 4.7-1 through 4.7-4 provide the model results.

For construction activities, the following pieces of equipment were assumed to potentially be in use:

Backhoe	Flat bed truck
Compactor (ground)	Front end loader
Compressor (air)	Generator
Concrete mixer truck	Grader
Concrete pump truck	Man lift
Concrete saw	Pickup truck
Crane	Pneumatic tools
Dozer	Pumps
Dump truck	Scraper
Excavator	Warning horn

The predicted equivalent continuous noise level (Leq) for construction activities at a distance of 100 feet is 81.0 dBA and at a distance of 500 feet is 67.0 dBA.

At distances from the noise-generating activities of greater than 2,000 feet (0.38 miles), predicted noise levels are not significantly above measured background sound levels and would not likely have an adverse impact on receptors.

Ground-borne vibration impacts from construction activities were assessed based on existing documentation (such as for vibration levels produced by specific construction equipment operations) and the distance of sensitive receptors from the given source. Vibration levels were predicted, and impacts were evaluated against the established thresholds.

4.7.1 Evaluation Criteria

An alternative was considered to result in an adverse impact related to noise if it resulted in either of the following:

- the exposure of receptors to construction noise levels in excess of U.S. Environmental Protection Agency (EPA) standards, as listed in Table 3.7-2 in Section 3.7.1.1
- exposure of persons or structures to excessive ground-borne vibration

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/4/2015
Case Description: Louisville VAMC EIS - Construction Activities

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Brownsboro @ 100 ft	Residential	54.3	40	35

Equipment Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40	80		100	5
Compactor (ground)	No	20	80		100	5
Compressor (air)	No	40	80		100	5
Concrete Mixer Truck	No	40	85		100	5
Concrete Pump Truck	No	20	82		100	5
Concrete Saw	No	20	90		100	5
Crane	No	16	85		100	5
Dozer	No	40	85		100	5
Dump Truck	No	40	84		100	5
Excavator	No	40	85		100	5
Flat Bed Truck	No	40	84		100	5
Front End Loader	No	40	80		100	5
Generator	No	50	82		100	5
Grader	No	40	85		100	5
Man Lift	No	20	85		100	5
Pickup Truck	No	40	55		100	5
Pneumatic Tools	No	50	85		100	5
Pumps	No	50	77		100	5
Scraper	No	40	85		100	5
Warning Horn	No	5	85		100	5

Results

Equipment	Calculated (dBA) *Lmax	Calculated (dBA) Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Backhoe	69	65	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compactor (ground)	69	62	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compressor (air)	69	65	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Mixer Truck	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Pump Truck	71	64	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Saw	79	72	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Crane	74	66	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dozer	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dump Truck	73	69	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Excavator	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Flat Bed Truck	73	69	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Front End Loader	69	65	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Generator	71	68	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Grader	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Man Lift	74	67	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pickup Truck	44	40	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pneumatic Tools	74	71	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pumps	66	63	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Scraper	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Warning Horn	74	61	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Total	79	81	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Key: dBA = A-weighted decibel. L_{eq} = equivalent continuous noise level. L_{max} = maximum noise level.

Figure 4.7-1. Brownsboro Site Construction Noise Estimates at 100 Feet from Source.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/4/2015
Case Description: Louisville VAMC EIS - Construction Activities

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Brownsboro @ 500 ft	Residential	54.3	40	35

Description	Impact Device	Usage (%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40	80		500	5
Compactor (ground)	No	20	80		500	5
Compressor (air)	No	40	80		500	5
Concrete Mixer Truck	No	40	85		500	5
Concrete Pump Truck	No	20	82		500	5
Concrete Saw	No	20	90		500	5
Crane	No	16	85		500	5
Dozer	No	40	85		500	5
Dump Truck	No	40	84		500	5
Excavator	No	40	85		500	5
Flat Bed Truck	No	40	84		500	5
Front End Loader	No	40	80		500	5
Generator	No	50	82		500	5
Grader	No	40	85		500	5
Man Lift	No	20	85		500	5
Pickup Truck	No	40	55		500	5
Pneumatic Tools	No	50	85		500	5
Pumps	No	50	77		500	5
Scraper	No	40	85		500	5
Warning Horn	No	5	85		500	5

Results

Equipment		Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Backhoe		55	51	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compactor (ground)		55	48	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compressor (air)		55	51	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Mixer Truck		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Pump Truck		57	50	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Saw		65	58	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Crane		60	52	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dozer		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dump Truck		59	55	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Excavator		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Flat Bed Truck		59	55	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Front End Loader		55	51	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Generator		57	54	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Grader		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Man Lift		60	53	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pickup Truck		30	26	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pneumatic Tools		60	57	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pumps		52	49	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Scraper		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Warning Horn		60	47	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
	Total	65	67	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Key: dBA = A-weighted decibel. L_{eq} = equivalent continuous noise level. L_{max} = maximum noise level.

Figure 4.7-2. Brownsboro Site Construction Noise Estimates at 500 Feet from Source.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/4/2015
Case Description: Louisville VAMC EIS - Construction Activities

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
St. Joseph @ 100 ft	Residential	53.2	40	35

Description	Impact Device	Usage (%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40	80		100	5
Compactor (ground)	No	20	80		100	5
Compressor (air)	No	40	80		100	5
Concrete Mixer Truck	No	40	85		100	5
Concrete Pump Truck	No	20	82		100	5
Concrete Saw	No	20	90		100	5
Crane	No	16	85		100	5
Dozer	No	40	85		100	5
Dump Truck	No	40	84		100	5
Excavator	No	40	85		100	5
Flat Bed Truck	No	40	84		100	5
Front End Loader	No	40	80		100	5
Generator	No	50	82		100	5
Grader	No	40	85		100	5
Man Lift	No	20	85		100	5
Pickup Truck	No	40	55		100	5
Pneumatic Tools	No	50	85		100	5
Pumps	No	50	77		100	5
Scraper	No	40	85		100	5
Warning Horn	No	5	85		100	5

Results

Equipment	Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Backhoe	69	65	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compactor (ground)	69	62	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compressor (air)	69	65	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Mixer Truck	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Pump Truck	71	64	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Saw	79	72	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Crane	74	66	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dozer	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dump Truck	73	69	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Excavator	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Flat Bed Truck	73	69	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Front End Loader	69	65	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Generator	71	68	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Grader	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Man Lift	74	67	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pickup Truck	44	40	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pneumatic Tools	74	71	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pumps	66	63	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Scraper	74	70	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Warning Horn	74	61	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Total	79	81	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Key: dBA = A-weighted decibel. L_{eq} = equivalent continuous noise level. L_{max} = maximum noise level.

Figure 4.7-3. St. Joseph Site Construction Noise Estimates at 100 Feet from Source.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/4/2015
Case Description: Louisville VAMC EIS - Construction Activities

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
St. Joseph @ 500 ft	Residential	53.2	40	35

Description	Impact Device	Usage (%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40	80		500	5
Compactor (ground)	No	20	80		500	5
Compressor (air)	No	40	80		500	5
Concrete Mixer Truck	No	40	85		500	5
Concrete Pump Truck	No	20	82		500	5
Concrete Saw	No	20	90		500	5
Crane	No	16	85		500	5
Dozer	No	40	85		500	5
Dump Truck	No	40	84		500	5
Excavator	No	40	85		500	5
Flat Bed Truck	No	40	84		500	5
Front End Loader	No	40	80		500	5
Generator	No	50	82		500	5
Grader	No	40	85		500	5
Man Lift	No	20	85		500	5
Pickup Truck	No	40	55		500	5
Pneumatic Tools	No	50	85		500	5
Pumps	No	50	77		500	5
Scraper	No	40	85		500	5
Warning Horn	No	5	85		500	5

Results

Equipment		Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Backhoe		55	51	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compactor (ground)		55	48	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Compressor (air)		55	51	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Mixer Truck		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Pump Truck		57	50	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Concrete Saw		65	58	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Crane		60	52	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dozer		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Dump Truck		59	55	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Excavator		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Flat Bed Truck		59	55	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Front End Loader		55	51	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Generator		57	54	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Grader		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Man Lift		60	53	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pickup Truck		30	26	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pneumatic Tools		60	57	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Pumps		52	49	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Scraper		60	56	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
Warning Horn		60	47	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A
	Total	65	67	90	90	N/A	N/A	N/A	N/A	None	None	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Key: dBA = A-weighted decibel. L_{eq} = equivalent continuous noise level. L_{max} = maximum noise level.

Figure 4.7-4. St. Joseph Site Construction Noise Estimates at 500 Feet from Source.

4.7.2 Alternative A: Brownsboro Site

4.7.2.1 Construction

Under Alternative A, construction activities associated with the construction of a new VAMC at the Brownsboro Site would occur. These activities would be accompanied by a conservatively predicted short-term noise level increase to approximately 81.0 dBA at 100 feet from the source and 67.0 dBA at 500 feet from the source (comparable to traffic sound levels from a nearby freeway). The increase in noise levels in the vicinity of the construction activities would be short-term but noticeable. As the distance from the source is increased, the noise levels attributable to the construction activities would continue to decrease as they approach existing background sound levels.

Construction would be phased based on general industry practices and federal planning. The first phase would be rough grading, site preparation, rock removal, and geothermal bore installation. The mass removal of rock would be needed in most areas to install utilities, provide subgrade, and construct foundations. The central utility plant would be the first structure built, followed by the main hospital and the laundry facility. The Veterans Benefits Administration building, parking garages, and site improvements (landscaping, perimeter security fence) would be part of the second phase of construction.

The perceived impacts from the increase in noise levels would depend on the receptor and site-specific conditions (including distance from the source and sound shielding). The predicted increases in noise levels would be consistent with typical urban construction projects. Outdoor activities would be scheduled to cease at sunset, and proper equipment maintenance and noise shielding would minimize noise level increases from construction activities. Sound levels in the immediate vicinity of the construction activities averaged over an entire day may approach the EPA-recommended noise level standards.

Construction activities would include vibration-producing activities (such as blasting [if needed], excavation, grading, basement excavation, and clearing). Depending on the specific construction equipment used and operations involved, short-term increases in ground vibration may result. The increase in vibration levels in the vicinity of the construction activities would be short-term but noticeable. Outdoor activities would be cease at sunset and would be anticipated to be a generally minor but occasionally moderate disturbance to neighboring receptors.

Impact pile driving and, if needed, blasting noise consist of a series of peak noise events. A blasting event would produce a short noise like a thunderclap (120 dBA) that could be audible at greater distances. The amount of noise generated by the blast depends primarily on the amount of explosives used, but is typically around 94 dBA and could be as high as 126 dBA at 50 feet from the blast. Blasting might possibly be needed for rock removal; in that case, the requirements of Kentucky Revised Statute 350.430 pertaining to explosives would be followed. Any possible blasting activities may cause an adverse noise impact to nearby receptors. If blasting is determined to be needed, receptors would be notified in advance of the blasting schedule (in accordance with the statute) to minimize the startle effect of the blast noise, and to offer possible precautions, such as staying indoors, that receptors could take to minimize temporary adverse noise impacts.

The daily commute of construction workers and deliveries of construction materials to the project site would add to traffic noise in the area. The size of the workforce would vary throughout the construction schedule based on the types of construction activities; upwards of 1,500 workers could be commuting to the project site on a given day. Temporary increases in traffic noise would vary in location based on the travel routes of construction workers and delivery vehicles. It is likely that most construction-related vehicles would access the project site from Watterson Expressway, thereby limiting most traffic noise

increases to the commercial business area at the Brownsboro Road/US 42 interchange. The increase in traffic from construction-related vehicles would not likely increase ambient noise levels by more than 3 dBA, which would not be perceptible to the human ear and therefore would not exceed typical noise thresholds.

Construction-related noise impacts would be adverse, short-term, and potentially moderate in magnitude (approaching EPA threshold levels), depending on the receptor type and proximity to the project location. Construction-related vibration impacts would also be adverse, short-term, and potentially moderate in magnitude, depending on the receptor type and proximity to the project location.

4.7.2.2 Operation

Routine operation of the new VAMC facility would not significantly increase sound levels from existing background levels – background sound level measurements at the existing Zorn Avenue VAMC are similar to background sound levels at the Brownsboro Site.

Traffic-related noise levels may increase in the vicinity of the proposed new facilities, but would not be expected to increase disproportionately from current levels typical of urban settings. Traffic circulation for passenger and delivery vehicles on the VAMC campus is designed to minimize noise near the residential areas to the east and south of the project site. Delivery trucks, which are the louder vehicle noise sources, would likely access the campus from Watterson Expressway and be routed to the west side of the campus. Passenger vehicles and TARC and other shuttle buses would be routed along the east side (refer to Figure 2-4, Proposed Site Plan for Alternative A). Parking structures can be a source of annoyance to neighboring uses due to automobile engine start-ups and acceleration, and the potential activation of car alarms. The north parking garage is anticipated to be more heavily used by visiting patients, while the south parking garage is anticipated to be used by the site workforce (only one vehicle trip per day per parking space). As such, the location of the higher-turnover north parking garage farther away from adjacent residential areas will reduce the potential noise impacts from the parking garages. Also, the landscaping (trees) adjacent to the residential areas could attenuate traffic noise. Overall, adverse noise impacts to offsite receptors from onsite traffic would be minor to moderate.

Stationary sources of noise would primarily be the equipment associated with the central utility plant and laundry facility. These buildings would be located along the west side of the project site closest to Watterson Expressway. Any equipment not inside the buildings would be shielded from residential areas by other buildings and could also be attenuated by landscaping and thus would not adversely affect receptors.

Operation-related noise impacts would be minor. Operation-related vibration impacts would not be expected.

4.7.3 Alternative B: St. Joseph Site

4.7.3.1 Construction

Under Alternative B, construction activities associated with the construction of a new VAMC at the St. Joseph Site would occur. These activities would be accompanied by a conservatively predicted short-term noise level increase to approximately 81.0 dBA at 100 feet from the source and 67.0 dBA at 500 feet from the source (comparable to traffic sound levels from a nearby freeway). The increase in noise levels in the vicinity of the construction activities would be short-term but noticeable. As the distance from the source

is increased, the noise levels attributable to the construction activities continue to decrease as they approach existing background sound levels.

Construction-related noise impacts would be similar to those described for Alternative A. The St. Joseph Site is a larger parcel, and the facility could be positioned to increase the distance between the facility and neighboring residential receptors. Construction-related noise impacts would be adverse, short-term, and potentially moderate in magnitude (approaching EPA threshold levels), depending on the receptor type and proximity to the project location. Construction-related vibration impacts would also be adverse, short-term, and potentially moderate in magnitude, depending on the receptor type and proximity to the project location.

4.7.3.2 Operation

Routine operation of the new VAMC facility would not significantly increase sound levels from existing background levels – background sound level measurements at the existing Zorn Avenue VAMC are similar to background sound levels at the St. Joseph Site. Operation-related noise impacts would be similar to those described for Alternative A. Operation-related vibration impacts would not be expected.

4.7.4 Alternative C: No Action

4.7.4.1 Construction

Under the No Action alternative, VA would not conduct any construction and thus would not cause any construction-related noise impacts. If a new VAMC is not constructed at the Brownsboro Site or the St. Joseph Site, future development by others could have similar construction noise impacts as described for Alternative A or B.

4.7.2.2 Operation

Veterans health care services would continue at the existing Robley Rex VAMC; therefore, no operation-related impacts to current noise levels would occur. Future development by others of the Brownsboro Site or St. Joseph Site could have operational noise impacts, depending on the specific type of development.

4.8 Land Use

4.8.1 Evaluation Criteria

Federal agencies must consider local zoning laws for new building construction (40 United States Code 619(b)), even though local governments cannot regulate activities of the federal government on federally owned land without a clear statutory waiver to the contrary. This concept is based upon the Supremacy Clause (Article VI) of the U.S. Constitution. (VA actions that would occur on non-federal land are subject to the regulatory requirements of the landowner, including local plans and ordinances pertaining to land use and zoning.)

The evaluation of land use impacts focuses on current land use plans and zoning. General compatibility with existing and future land use designations and zoning design standards is the basis to indicate the potential for land use impacts. Adverse land use impacts are identified if the construction and operation of a new VAMC would:

- Be inconsistent with current or planned future land uses and community goals for land use
- Alter the character and use of the land in relation to surrounding uses
- Conflict with zoning designations or design standards

4.8.2 Alternative A: Brownsboro Site

4.8.2.1 Construction

Construction of the proposed VAMC facilities could cause temporary disturbances to adjacent land uses and users. Construction for entrance road access and for installing or upgrading utilities in roadways leading to the site could temporarily affect access to nearby retail and commercial businesses and residential areas, which could be inconvenient for customers and residents. The intensity of any adverse impact would depend on the extent and duration of the inconvenience. Effects, if any, on access to nearby locations during utility upgrades or entrance road construction would be temporary.

4.8.2.2 Operation

The rezoning of the vacant Brownsboro Site as a planned development district to accommodate The Midlands proposed development would have introduced mixed land uses, including multiple-family residential buildings, retail and office buildings, and a hotel; therefore, future change to the existing vacant land use in relation to surrounding uses was to be expected. The proposed VAMC would result in a similar change from vacant, undeveloped land to full development of the Brownsboro Site. Although the impact of altering the character and use of a vacant site to full development use would be major, the impact would be expected with or without the proposed VAMC, and whether or not VA was the entity developing the site.

During the conceptual design phase of the new VAMC campus, the length and height of the buildings were reduced and the location and orientation of structures on the Brownsboro Site were modified to be less intrusive compared to adjacent land uses. The taller buildings were placed along the north and west sides of the site, farthest from residential areas. Traffic circulation for service vehicles and ambulances follows the north and west sides to also be farther from the residential areas along the east and south sides of the site. The downsizing of the buildings provided more flexibility and options for landscaping plans that meet setback requirements for transitional zones, noise, and security.

Hospitals, clinics, and other medical facilities are conditional land uses within residential, commercial, and industrial zoning districts. The Land Development Code requirements for these types of medical facilities include a minimum building setback of 30 feet from the property boundary. Other provisions of a conditional use include compatibility with form district transition zone design standards and landscaping. The transition zone of a town center form district adjacent to a neighborhood form district covers a linear distance of 200 feet from the property boundary.

The proposed VAMC buildings would be set back from the property boundary approximately 200 feet and 100 feet along the residential areas to the east and south, respectively (see Figures 3.8-1 and 4.1-1), which is consistent with the Land Development Code by exceeding the minimum setback requirements of 25 feet for adjacent R-4 and R-5 zoning and 30 feet for a conditional use. The conceptual design for the VAMC campus shows landscape buffers extending a minimum of 35 feet inside the perimeter fence adjacent to residential areas, which would be comparable to the transition zone standard of 25 to 35 feet for landscaping in a town center form district. A perimeter fence and landscaping are considered compatible design standards for the buffer between residential uses and the more intense uses of a town center form district (LMG 2000, 2006). Thus, the conceptual design for building setbacks, perimeter fence, and landscape buffer would be compatible with the existing town center form district zoning of the site.

Maximum building height is 120 feet within a town center form district and 45 feet within the transition zone of that form district. The height limitation would not apply to the water tower since it is not considered a building that is subject to development code provisions. The rooftop mechanical and electrical penthouse on the west bar of the proposed VAMC buildings would be the tallest height at 162 feet, which would exceed the maximum height of a town center form district. A lower design height for the buildings would either require larger footprints or require the electrical and mechanical equipment be placed on the ground alongside the buildings. Either approach would result in the design and placement of the buildings and equipment closer (shorter setback distance) to the residential areas to the south and east. The south parking deck would extend approximately 85 feet into the transition zone; at 83 feet high, the parking deck would exceed the height limitation of 45 feet for the transition zone of a town center form district. Any decrease in the design height for the south parking deck would require a larger footprint and placement at the minimum setback distance of 30 feet from the property boundary. Lower heights and shorter setbacks would result in construction and daily operational activities that are closer and likely more disruptive to the adjacent residential areas to the south and east, compared to buildings that would exceed the height limitations but would be placed at the greater setback distances of 100 and 200 feet, respectively. Even with the parking deck set closer to the south property boundary, the transition zone height limit could still be exceeded in order to accommodate the required parking spaces, traffic circulation through the campus, and security requirements for mission critical facilities.

The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations of a town center form district and its transition zone, and would therefore be considered an adverse impact to adjacent land use. The setbacks of the VAMC buildings and parking decks would more than exceed the minimum required distances from the property boundary and would therefore be compatible with the Land Development Code for a town center form district. The placement (setback) of the VAMC buildings and parking decks would not adversely impact adjacent land uses.

The proposed VAMC concept and site layout includes additional design features that are consistent with the policies and guidelines in the Cornerstone 2020 Comprehensive Plan for compatible adjacent land uses, including providing adequate parking while maintaining a greater setback distance, landscape buffer, and perimeter fence.

4.8.3 Alternative B: St. Joseph Site

4.8.3.1 Construction

Impacts from construction at the St. Joseph site would be similar to the construction impacts described for Alternative A.

4.8.3.2 Operation

The zoning of the vacant St. Joseph site as single-family residential anticipates future change to its existing agricultural similar to the surrounding developed land uses. The possibility of a new VAMC would result in a change from vacant, undeveloped land to full development of the St. Joseph Site. Although the impact of altering the character and use of a vacant site to full development use would be major, the impact would be expected with or without the proposed VAMC, and whether or not VA was the entity developing the site.

As described for Alternative A, hospitals, clinics, and other medical facilities are conditional land uses within residential, commercial, and industrial zoning districts. The entrance to the new VAMC campus would be from the north off Factory Lane with the layout of the buildings primarily within the part of the site that is zoned as a neighborhood form district. The laundry, central utility plant, and south parking deck would be within the part of the site zoned as suburban workplace. The buildings would be set back approximately 250 feet from the nearest housing unit within the R-7 multiple-family residential zoning adjacent to the west property boundary. Along the east property boundary, the buildings would be set back approximately 250 to 500 feet from the R-4 single-family residential zoning and approximately 600 feet from the R-6 multiple-family residential zoning (see Figures 3.8-2 and 4.1-8). These distances are compatible with the Land Development Code by exceeding the minimum setback requirements of 50 to 75 feet for non-residential use adjacent to residential zoning within a neighborhood form district, and 30 feet for a conditional use. If industrial uses in a suburban workplace form district include a loading dock within 200 feet of adjacent residential zoning, the Land Development Code calls for a 50-foot landscape buffer and 6-foot high berm along the property boundary. The loading dock and service area adjacent to the laundry would be more than 200 feet from the west property boundary and slightly below grade. The conceptual design for building setbacks would therefore be compatible with the existing neighborhood and suburban workplace form districts zoning of the site.

The transition zone of a suburban workplace form district adjacent to a neighborhood form district covers a linear distance of 200 feet from the property boundary. Because the buildings would be set back more than 200 feet from the property boundary, the proposed layout of the VAMC campus on the St. Joseph site would be compatible with transition zone standards for landscape buffers and perimeter fencing in a suburban workplace form district and for a conditional use adjacent to residential zoning.

Maximum building height is 50 feet within a suburban workplace form district and 45 feet within the transition zone, but 4 feet of additional height is allowed for every additional foot of setback. Maximum non-residential building height within a neighborhood form district is 35 feet. The height limitation would not apply to the water tower since it is not considered a building that is subject to development code provisions. To be compatible with the suburban workplace form district height standards, the west bar of buildings with the rooftop mechanical and electrical penthouse at 162 feet would have to be set back a minimum of 228 feet from the property boundary. The layout of the campus on the site would set back the buildings approximately 250 to 600 feet from the property boundary; therefore, the proposed VAMC would also be compatible with the height limits within the suburban workplace form district design standards.

The buildings would exceed the maximum height for a neighborhood form district and would therefore be incompatible with neighborhood design standards. A lower design height for the buildings would either require larger footprints or require the electrical and mechanical equipment be placed on the ground alongside the buildings. This would result in the design and placement of buildings and equipment within the transition zone and closer (shorter setback distance) to the adjacent residential areas. Lower heights and shorter setbacks would result in construction and daily operational activities that are closer and potentially disruptive to the adjacent residential areas, compared to buildings that exceed the height limitations but would be placed at the greater setback distances of 250 to 600 feet.

The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations of a neighborhood form district, and would therefore be considered an adverse impact to the adjacent residential land use. The setbacks of the VAMC buildings would more than exceed the minimum required distances from the property boundary and would therefore be compatible with the Land Development Code for neighborhood and suburban workplace form districts.

4.8.4 Alternative C: No Action

4.8.4.1 Construction

No construction is planned for the existing VAMC at the Zorn Avenue location; therefore, no construction-related impacts to land use or zoning would occur. If a new VAMC is not constructed at the Brownsboro Site or the St. Joseph Site, future development by others could have similar construction impacts as described for Alternative A or B.

4.8.4.2 Impacts from Operation

Veterans health care services would continue at the existing Robley Rex VAMC; therefore, no operation-related impacts to land use or zoning would occur. The residential zoning and neighborhood form district designation of the site would continue. Future development by others of the Brownsboro Site or St. Joseph Site could have similar operational impacts as described for Alternative A or B.

4.9 Floodplains and Wetlands

4.9.1 Evaluation Criteria

Executive Order 11988, Floodplain Management, requires VA to avoid adverse impacts associated with occupancy and modification of floodplains to the extent possible, and avoid direct and indirect support of floodplain development wherever there is a practicable alternative. According to the VA Site Development Design Manual, development within the 100-year floodplain should be avoided or limited, with structures located in the floodplain only if absolutely necessary. For purposes of this evaluation, an impact to floodplains would be considered adverse if development impedes or redirects flood flows, no practicable alternative exists to development within a 100-year floodplain, or compliance with flood hazard reduction requirements is not technically or economically feasible.

Section 404 of the Clean Water Act requires authorization for activities that fill or disturb waters of the U.S, including wetlands. The U.S. Army Corps of Engineers (USACE) determines if a wetland is within their jurisdictional authority to regulate waters of the U.S. To be a jurisdictional wetland, it must meet the regulatory definition and be adjacent to other waters of the U.S. For purposes of this evaluation, an impact to wetlands would be considered adverse if the loss of a jurisdictional wetland cannot be avoided or if compensatory mitigation is not feasible, and USACE does not authorize the activity that fills or disturbs the wetland.

4.9.2 Alternative A: Brownsboro Site

The Brownsboro Site is not located within the 100-year or 500-year floodplain, and construction activities would not impact floodplains or impede flood flows. There are no wetlands present at the site, and the site is not adjacent to other waters of the U.S. Therefore, no floodplains, flood flows, or jurisdictional wetlands would be impacted by construction activities or site operations.

4.9.3 Alternative B: St. Joseph Site

The St. Joseph Site is not located within the 100-year or 500-year floodplain, and construction activities and site operations would not impact floodplains or impede flood flows.

Small wetland areas are present on the St. Joseph Site, as depicted in Figure 3.9-4 in Section 3.9.2. However, the site is sufficiently large to accommodate design and layout options for the proposed facility such that the wetlands could likely be protected from impacts. In the event that wetlands would be impacted by construction activities, the necessary permit(s) would be obtained from USACE and the Kentucky Department for Environmental Protection in compliance with Sections 401 and 404 of the Clean Water Act. As directed, VA would conduct any mitigation requirements to compensate for the lost function and value of wetlands either by creating or enhancing other wetlands onsite or at an offsite location through an established mitigation bank, or through an in-lieu fee program. Additional impacts to site wetlands from facility operation are not anticipated.

4.9.4 Alternative C: No Action

Under the No Action alternative, no construction or changes to operations are planned for the existing VAMC at the Zorn Avenue location; therefore, no impacts to floodplains or wetlands would occur at that location. If a new VAMC is not constructed at the Brownsboro Site or the St. Joseph Site, future development by others could have similar impacts as described for Alternative A or B.

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4.10 Socioeconomics

4.10.1 Evaluation Criteria

The socioeconomic analysis considers the economic conditions within the Louisville Metropolitan Statistical Area (MSA) in terms of population, educational attainment, housing, income, labor force and employment, property values, and general crime statistics. The evaluation includes a qualitative and quantitative analysis of various sources of data to predict project-related impacts within the Louisville MSA. An impact would be considered adverse if the alternative would result in any of the following conditions:

- Displace populations, residents, or businesses to accommodate construction
- Generate an economic loss or gain without capacity to absorb a decrease or increase
- Place demand on suitable housing that exceeds availability
- Induce growth without adequate supporting infrastructure

4.10.2 Methodology

For the purpose of assessing economic impacts related to construction expenditures, an input-output model (IMPLAN Pro® - version 3) was used. The input-output model was used to predict direct, indirect, induced, and total economic impacts that would occur within the Louisville MSA as a result of replacing the Robley Rex VAMC at the Brownsboro Site or St. Joseph Site, or continuing to operate from the Zorn Avenue location. The Louisville MSA consists of the 13-county Kentucky-Indiana region surrounding Louisville (see Section 3.10.2). The input-output models were developed to estimate economic impacts that would occur as a result of construction phase and operation phase expenditures. Economic impacts related to total output, value-added, employment, and labor income were assessed, and the top 10 most impacted industries were estimated for the Louisville MSA.

Input-output modeling describes commodity flows from producers to intermediate and final consumers. The total industry purchases of commodities, services, employment, compensation, value added, and imports are equal to the value of the commodities produced. Purchases for final use (final demand) drive the input-output model. Industries produce goods and services for final demand and purchase goods and services from producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the region (imports and value added) stop the cycle. Indirect and induced effects (the effects of household spending) can be mathematically derived. The resulting sets of multipliers describe the change in output for each and every regional industry caused by a one-dollar change in final demand for any given industry.

For the purpose of this impact assessment, the following definitions are provided to better understand the types of economic impacts that are discussed in this section (IMPLAN 2015):

- Direct effects: The set of expenditures applied to the predictive model for impact analysis. It is a single or series of production changes or expenditures made by producers/consumers as a result of an activity or policy.
- Economic output effects: Economic output represents the value of industry production.
- Employment effects: Employment effects represent the number of jobs (both part-time and full-time) throughout the economy that are needed, directly and indirectly, to deliver a specific dollar value of final demand for a specific commodity.

- Indirect effects: The impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added.
- Induced Effects: The response by an economy to an initial change (direct effect) that occurs through re-spending income received by a component of value added.
- Input-output analysis: A type of applied economic analysis that tracks the interdependence among various producing and consuming sectors of an economy. More particularly, it measures the relationship between a given set of demands for final goods and services and the inputs required to satisfy those demands.
- Labor income effects: All forms of employment income, including employee compensation (wages and benefits) and proprietor income.
- Value added effects: The difference between an industry's or an establishment's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus.

4.10.3 Alternative A: Brownsboro Site

4.10.3.1 Construction

Construction of the replacement VAMC is expected to occur between October 2017 and 2022 followed by a six- to nine-month “set up” before the hospital becomes fully operational in late 2022 or early 2023. During this time, there would be short-term impacts to employment, housing, and the local economy due to construction expenditures and employment of the construction workforce.

It is estimated that replacing the VAMC would require construction phase expenditures of approximately $925 million (in 2015 dollars). This amount includes planning, design, peer reviews, constructability reviews, value engineering, construction, architecture/engineering construction period services, construction management, construction contingency, testing services, commissioning, market allowances, utility agreements, and municipal contracts.

The estimated number of construction workers that could be employed was derived from an input-output model using the construction phase expenditures ($925 million) as a basis for the model. Adjustments were made to evaluate the portion of this expenditure that can be attributable only to actual construction. It was assumed that 71 percent of construction phase expenditures would be spent on the actual construction. Based on the results on the input-output model, it was estimated that 3,324 full-time construction jobs would be created during the six-year construction period, or approximately 554 full-time construction jobs (on average) for each year of construction. Also, derived from this input-output model, it was predicted that construction phase expenditures would create approximately $211 million in labor income for the construction workforce, with average annual wages for the construction workers at approximately $63,478.

The annual average of 554 construction workers would add a relatively negligible increase to the total number of employed workers within the Louisville MSA as compared to recent workforce data; adding less than 0.1 percent to the 594,609 employed persons in the Louisville MSA in 2014 (see Table 3.10-7). Average annual wages for construction workers ($63,478) would be substantially higher than median household income within the Louisville MSA ($47,798 for 2010) (see Table 3.10-6). It is anticipated that the construction wages would have a beneficial effect on personal income within Louisville MSA. As

these dollars are spent and re-spent locally, there would be beneficial indirect and induced effects within the Louisville MSA.

Given the size of the construction workforce (15,406 employees) within the Louisville Metro area (see Table 3.10-9), it is anticipated an adequate number of construction workers would be available for the project. The construction workforce residing in other nearby counties within the Louisville MSA would add significantly to the available construction workforce in the area.

Most of the construction workforce is expected to live close enough to the Brownsboro Site to easily commute from their current residence. For those who live in areas of the Louisville MSA that are further away than desired for reasonable commuting times, the housing occupancy rate within the Louisville Metro area (see Table 3.10-3) indicates there is available housing should such workers decide to relocate closer to the project site. The short-term impact to housing would be a minor beneficial impact to the local economy.

Using an input-output model with IMPLAN Sector 52-Construction of New Health Care Facilities, beneficial economic impacts within the Louisville MSA over the six-year construction period would be as shown in Table 4.10-1.

Table 4.10-1. Alternative A, Construction Phase Economic Impacts Within Louisville MSA.

Impact	Economic Output	Value Added	Employment	Labor Income
Direct	$661 million	$241 million	3,324 workers	$211 million
Indirect	$236 million	$127 million	1,549 workers	$80 million
Induced	$249 million	$145 million	1,916 workers	$87 million
Total	$1.146 billion	$513 million	6,789 workers	$378 million

Note: All values are expressed in 2020 dollars.

Construction-related expenditures would have the greatest estimated positive economic output and impacts on the following 10 industries (listed by IMPLAN® sector) within the Louisville MSA: (1) construction of new health care structures; (2) wholesale trade; (3) owner-occupied dwellings; (4) real estate; (5) truck transportation; (6) hospitals; (7) insurance carriers; (8) architectural, engineering, and related services; (9) wired telecommunications carriers; and (10) monetary authorities and depository credit intermediation.

Construction-related expenditures would have the greatest estimated positive employment impacts on the following 10 industries (listed by IMPLAN® sector) within the Louisville MSA: (1) construction of new health care structures; (2) wholesale trade; (3) employment services; (4) real estate; (5) full-service restaurants; (6) truck transportation; (7) hospitals; (8) limited service restaurants; (9) architectural, engineering, and related services; and (10) retail, general merchandise stores.

Construction-related expenditures would have short-term beneficial economic impacts within the Louisville MSA by creating jobs, generating income, and having beneficial impacts in terms of economic output, value-added, employment, and labor income over the six-year construction period.

4.10.3.2 Operation

The replacement VAMC would become operational in 2023. This facility would employ essentially the same number of employees as employed by the existing Robley Rex VAMC on Zorn Avenue and the eight community-based outpatient clinics (CBOCs) that are located in the Louisville Metro area. The number of fiscal year (FY) 2015 full-time employee equivalents (FTEEs) was 1,763. The annual payroll for the workforce at the VAMC and CBOCs is approximately $184.2 million, including benefits (VA

2015). The existing VAMC and CBOCs are expected to increase the number of FTEEs to a total of 2,106 by 2022 based upon projected VA service demand, not because of the proposed replacement VAMC.

The FY 2016 operational budget for the existing VAMCs and CBOCs is approximately $338.2 million. The operational budget is expected to increase by $5.5 million per year (above the FY 2016 operational budget) for the foreseeable future regardless of the proposed VAMC replacement project. For analysis purposes, the annual operational budget would be approximately $376.6 million by the opening of the replacement VAMC in 2023 (taking the $5.5 million per year annual increase into account, above the FY 2016 budget). Using an input-output model with IMPLAN Sector 482-Hospitals, the beneficial economic effects that the operation of the consolidated VAMC facility would have within the Louisville MSA operation phase beginning in 2023 would be as shown in Table 4.10-2. However, it is noteworthy that these beneficial operational economic effects that begin in 2023 (although substantial) are not beyond those that would occur with the continued operation of the existing Robley Rex VAMC under Alternative C (No Action).

Table 4.10-2. Alternative A, Operation Phase Economic Impacts Within Louisville MSA.

Impact	Economic Output	Value Added	Employment	Labor Income
Direct	$377 million	$204 million	2,188 workers	$188 million
Indirect	$133 million	$73 million	784 workers	$51 million
Induced	$207 million	$119 million	1,200 workers	$71 million
Total	$717 million	$396 million	4,172 workers	$311 million

Note: All values are expressed in 2023 dollars.

Operation-related expenditures would have the greatest estimated positive economic output and impacts on the following 10 industries (listed by IMPLAN® sector) within the Louisville MSA: (1) hospitals; (2) insurance carriers; (3) owner-occupied dwellings; (4) real estate; (5) wholesale trade; (6) employment services; (7) management and consulting services; (8) offices of physicians; (9) full-service restaurants; and (10) electric power transmission and distribution.

Operation-related expenditures would have the greatest estimated positive employment impacts on the following 10 industries (listed by IMPLAN® sector) within the Louisville MSA: (1) hospitals; (2) employment services; (3) full-service restaurants; (4) real estate; (5) insurance carriers; (6) limited-service restaurants; (7) wholesale trade; (8) management consulting services; (9) dry cleaning and laundry services; and (10) retail, general merchandise stores.

Property values in the surrounding areas are expected to remain essentially unaffected by the operation of the VAMC at the Brownsboro Site. Generally speaking, hospitals are a type of land use that typically either helps maintain existing property values or can often provide a slight boost to surrounding property values because of demand for ancillary services (Alderman 2015) and long-term, stable employment opportunities that create a demand for housing (Dawtrey 2012). The incidence of crime in the area is expected to be unaffected as a result of the operation of the VAMC. Areas with high rates of crime and deviant behavior tend to be densely populated, physically deteriorated places, with a substantial number of transients (National Institute of Justice 2009). The VAMC would not change the demographics or decrease the economic characteristics of the area. The VA would provide 24-hour security for onsite operations, which is expected to have a beneficial effect with regard to discouraging crime onsite and possibly in adjacent areas.

As detailed above, operation phase expenditures would result in long-term beneficial economic impacts within the Louisville MSA beginning in 2023. These beneficial effects include job creation, income generation, and beneficial impacts in terms of economic output, value-added, employment, and labor

income for the life of the project beginning in 2023. Although these beneficial economic effects are substantial, they are not any greater than those effects associated with Alternative C (No Action).

4.10.4 Alternative B: St. Joseph Site

4.10.4.1 Construction

Impacts from construction of a replacement VAMC at the St. Joseph Site would be nearly identical to those described for Alternative A. There could be minor differences for some construction costs such as utilities, but the overall project construction estimate would be the same at $925 million. The construction schedule, construction-phase expenditures, number of construction workers and average annual wages would be the same as Alternative A. Alternative B would have short-term beneficial economic impacts within the Louisville MSA by creating jobs, generating income, and causing beneficial impacts in terms of economic output, value-added, employment, and labor income over the six-year construction period similar as Alternative A.

4.10.4.2 Operation

Impacts from operation of a replacement VAMC at the St. Joseph Site would be nearly identical as described for Alternative A. The replacement facility would employ the same number of workers and annual projected payroll would be the same as Alternative A. The total operational budget during operations (at 2023 opening as well as projected budget) would be the same as Alternative A. The beneficial economic impacts (economic output, value added, employment, and labor income impacts) within the Louisville MSA would be the same as describe for Alternative A and, similarly, are not beyond those that would occur with Alternative C (No Action).

Impacts to surrounding property values and incidences of crime would be similar to the impacts described for Alternative A.

4.10.5 Alternative C: No Action

Under Alternative C, there would be no construction of new facilities or expansion of existing facilities. There would be no short-term expenditures on construction and no creation of construction phase jobs. There would be no short-term construction phase beneficial economic impacts within the Louisville MSA in terms of economic output, value added, employment, or labor income as would be the case with Alternative A or B.

The number of workers employed at the Zorn Avenue VAMC and eight CBOC facilities in the Louisville catchment area for FY 2015 is 1,763 FTEEs. The FY 2016 annual payroll for this workforce is approximately $184.2 million (including benefit costs). The FY 2016 operational budget for the existing VAMCs and CBOCs is estimated at $338.2 million. Under this alternative, continued operation of the existing VAMC and CBOCs would increase the number of FTEEs to a total of 2,106 by 2022 based upon projected VA service demand. The operational budget is expected to increase by $5.5 million per year for the foreseeable future (above 2016 operational budget).

In 2023 (the same operational year for Alternative A or B), the annual operational budget would be approximately $334 million (taking the $1.8 million per year annual increase into account, above the FY 2015 budget). Using an input-output model with IMPLAN Sector 482-Hospitals during the operational phase, the beneficial economic effects of continued operation of the VAMC and eight CBOCs within the Louisville MSA would be the same as the operational impacts described for Alternative A. The No

Action alternative would continue to have long-term beneficial economic impacts within the Louisville MSA by creating jobs, generating income, and continue beneficial impacts in terms of economic output, value-added, employment, and labor income, the same as for Alternative A or B.

There would be no expected change to surrounding property values or incidences of crime due to the continued operation of the VAMC on Zorn Avenue.

4.11 Community Services

4.11.1 Evaluation Criteria

The evaluation of impacts on community services focused on the availability of and demand for health care (hospitals and clinics), emergency response (fire, rescue, medical), law enforcement (public safety), public schools, and consumer amenities (hotels and restaurants). The evaluation involved a qualitative analysis of the operational capacity of providing such services. An adverse effect on community services due to the proposed construction and operation of a new VAMC can be identified by these conditions:

- Change in the number of users of community services that exceed existing capacity
- Change in the demand for emergency response and public safety services that would increase response times based on existing personnel resources and equipment
- Change in the funding needed to sustain services or to increase access to services

The demand for and use of community services is based on the population served; therefore, changes in demand and use depend on changes in that population. The magnitude of impacts on community services can be assessed by changes in employment that would noticeably affect the community. A change in wages (gain or loss) associated with a change in employment could affect local revenue used to support public services that benefit the community.

4.11.2 Alternative A: Brownsboro Site

4.11.2.1 Construction

Construction of a new VAMC campus at the Brownsboro Site could have short-term needs related to emergency response and public safety services. Construction sites can be sources of accidents involving workers, equipment, and materials; attract theft and vandalism; and create safety hazards for persons not authorized to enter the site. Such incidents would have the potential to increase the number of calls for responses by emergency medical providers, fire departments, or police departments. General contractors minimize the occurrence of these types of incidents by properly maintaining construction equipment and implementing “good housekeeping” procedures to prevent fire ignition, educating construction workers in Occupational Safety and Health Administration-required safety standards, and securing and monitoring the construction site. In addition, the general contractor would be required to follow the occupational health and safety, accident prevention, fire safety, and site security policies of the federal agency overseeing construction. With adherence to these procedures to manage onsite risks, any increase in requests for emergency response by medical, fire, or police would not likely exceed the response capacity of these providers.

If Louisville Metro Emergency Medical Service (EMS) or Lyndon Fire is called to the site for a construction-related accident, fire, or rescue, both departments have cost recovery policies whereby their services would be reimbursed. Louisville Metro EMS bills the patient for medical treatment and transport. Lyndon Fire bills the party responsible for service responses to a motor vehicle accident, large structural fire, hazardous materials incident, or special technical rescue. Because of cost recovery policies, construction of the new VAMC would have a negligible effect on the budgetary capacity of these providers.

Construction activities that temporarily close or restrict travel lanes or designate a detour, along with slow-moving construction traffic, could potentially affect emergency vehicle (medical, fire, and police) response times. Access to buildings adjacent to the construction site would be maintained for fire trucks

and emergency vehicles; however, construction vehicles and haul trucks near the site could reduce traffic flows and delay emergency vehicles traveling through the area. Traffic control plans would be prepared and shared with emergency response providers, as required by the Louisville Metro Public Works Engineering Division.

The yearly average of 554 construction workers would likely be from the Louisville Metro area (see Section 4.10.3.1). Research shows that construction workers will commute as much as two hours one way from their residence rather than relocate (EPRI 1982). Therefore, construction of the new VAMC at the Brownsboro Site would not likely cause an increase in student enrollment high enough to affect program capacity in the nearby schools.

The food and drink establishments within walking distance of the site and within convenient driving distance could experience an increase in demand for services from construction workers. This could have a beneficial economic effect on these local consumer amenities.

4.11.2.2 Operation

The operation of a new VAMC at the Brownsboro Site would not directly increase the number of VA employees. VA is expected to increase the number of full-time equivalent employees (FTEEs) from 1,763 (FY 2015) to 2,106 by FY 2022. This increase of 343 FTEEs is based upon projected demand for health care services and not because of the proposed replacement VAMC. This slight increase in VA employees over six to seven years would be immeasurable compared to estimated population growth of the Louisville metropolitan area. There would be no increase in demand for health care, emergency response, or public safety services that would exceed the capacity of the service providers for the area encompassing the Brownsboro Site.

The new VAMC buildings would have state-of-the-art fire prevention and protection equipment, such as detection and sprinkler systems. Routine monitoring and maintenance of equipment by VA staff and supplier contracts would continue to prevent the inadvertent tripping of alarms. It is anticipated that the current rate of two to three fire service responses per year (see Section 3.11.2.3) would not increase and could decrease due to newer facilities and equipment, which would have a minor effect on Lyndon Fire. Response by Lyndon Fire to the new VAMC for a structural fire, hazardous material incident, or technical rescue would be a cost recoverable service according to Lyndon Fire's operational policies, and would not have an adverse effect on their budget capacity to provide these services.

The increase in traffic in the vicinity of the new VAMC could result in an increase in vehicle accidents, to which Lyndon Fire would respond. Response to a vehicle accident would be a cost recoverable service according to Lyndon Fire's operational policies, and would not have an adverse effect on their budget capacity to provide this service.

VA would update the support agreement with the Louisville Metro Police Department to reflect the new location of the VAMC and to address any changes to VA police and security unit operations at the new campus.

Some VA employees, particularly existing renters, could choose to relocate nearer to the Brownsboro Site. Should these VA employees have school-aged children, there could be an increase in enrollment in the nearby schools. Enrollment at the two elementary schools (Dunn and Wilder), middle school (Kammerer), and high school (Ballard) nearest the Brownsboro Site is below program capacity at each school (see Section 3.11.2.1); therefore, any increase in student enrollment due to VA employees could likely be accommodated without any adverse effects.

The economic effect of operating the VAMC at the Brownsboro Site (see Table 4.10-2), which includes employee wages, would be the same as the continued operation at the existing Zorn Avenue location (No Action Alternative). There would be no change in revenue from VA operations at the Brownsboro Site that would adversely affect funding of community services.

The food and drink establishments within walking distance of the site and within convenient driving distance could experience an increase in demand for services from VA employees and volunteers, Veterans, Veterans' families, and visitors. Hotels near the new VAMC could also experience a new clientele from Veterans, Veterans' families, and visitors not local to the area. The operation of a new VAMC could have a beneficial economic effect on these local consumer amenities.

4.11.3 Alternative B: St. Joseph Site

4.11.3.1 Construction

Impacts from construction at the St. Joseph Site would be similar to the impacts described for the Brownsboro Site. Middletown Fire has a cost recovery policy for hazardous material incident response (Riddle 2016). However, if Middletown Fire is called to the site for a construction-related accident, fire, or rescue, the operational budget capacity of the fire department to provide such services could be adversely affected.

4.11.3.2 Operation

Impacts to health care, emergency response, public safety services, and consumer amenities from operation of a new VAMC at the St. Joseph Site would be similar to the impacts described for the Brownsboro Site. Because Middletown Fire does not have cost recovery policies for responding to fire alarms, structural fires, or technical rescues, providing such services for a new VAMC could adversely affect the operational budget capacity of the fire department to provide these services to tax exempt entities, such as the VA. It is anticipated that the current rate of two to three fire service responses per year to the VAMC (see Section 3.11.2.3) would not increase and could decrease due to newer facilities and fire prevention and protection equipment, which would likely have a minor effect on the Middletown Fire Protection District. Middletown Fire has entered into "payment in lieu of taxes" contracts with tax exempt entities to recover the cost of providing them with fire response services (Riddle 2016).

VA employees with school-aged children could choose to relocate nearer to the St. Joseph Site. Enrollment at the elementary (Stopher), middle (Crosby), and high (Eastern) schools nearest the site is below program capacity (see Section 3.11.2.2); therefore, each school could likely accommodate additional students without any adverse effects.

4.11.4 Alternative C: No Action

4.11.4.1 Construction

No construction is planned for the existing VAMC at the Zorn Avenue location; therefore, no construction-related impacts to community services would occur. If the new VAMC is not constructed at either the Brownsboro Site or St. Joseph Site, future development of those sites by others could have similar construction-related impacts to community services as described for Alternatives A and B.

4.11.4.2 Operation

Veterans health care services would continue at the existing Robley Rex VAMC; therefore, no operation-related impacts to community services in the area would occur. The economic effect of continued operations of the existing VAMC (see Table 4.10-2), which includes employee wages, would continue to have the same effect on funding of community services.

Future development of the Brownsboro Site or St. Joseph Site by others could have similar operation-related impacts to community services as described for Alternatives A and B.

4.12 Solid Waste and Hazardous Materials

4.12.1 Evaluation Criteria

The potential effects related to solid waste generation and disposal were evaluated through a comparison of current and projected solid waste generation rates and the permitted capacity and intake rate for the solid waste landfill serving the project area. The evaluation resulted in a determination as to whether existing solid waste disposal facilities could accommodate the projected solid waste generation rates for each alternative.

Hazardous materials that could be transported, used, encountered, or disposed in the construction and operation of each alternative were evaluated to predict the potential effects to human health and the environment. Additionally, the potential for legacy hazardous material contamination at project sites was considered.

An alternative would be considered to result in an adverse impact related to solid waste and hazardous materials if it would:

- result in the exposure of the public or the environment to harmful levels of hazardous materials
- exceed the permitted capacity or intake rate for the solid waste landfill serving the project area
- result in noncompliance with applicable federal and state regulations or VA management practices

4.12.2 Alternative A: Brownsboro Site

4.12.2.1 Construction

A short-term increase in waste generation resulting from construction activities is anticipated. Wastes generated by construction activities would be transferred to the Outer Loop Recycling & Disposal Facility, which has adequate capacity to receive additional solid waste.

The Brownsboro Site is currently an unimproved vacant lot; no recognized environmental conditions have been identified. Should environmental contamination be encountered during construction activities, all waste would be abated and managed in accordance with regulations and disposed in appropriate disposal facilities.

Staging and operation of construction equipment carries an increased potential for incidental releases of vehicle fluids (such as oil, diesel fuel, gasoline, and antifreeze). Proper vehicle maintenance and inspection would reduce this potential, and adverse impacts are not expected.

In the event that a new underground storage tank and/or piping is installed as part of facility construction, Kentucky Department for Environmental Protection must be notified. A permit is also required to install aboveground storage tanks for petroleum products or hazardous substances.

Construction-related adverse impacts from solid waste and hazardous materials are not expected to occur. Short-term increases in solid waste generation are predicted, but would have a negligible effect on remaining landfill capacities. Waste minimization opportunities are described in Chapter 5.

4.12.2.2 Operation

Quantities of solid waste, medical waste, and hazardous waste generated from operation of a new VAMC at the Brownsboro Site would be similar to those generated at the existing Zorn Avenue VAMC, with anticipated increases resulting from projected increases in patients served. The Louisville VAMC is currently an insignificant contributor to the volume handled by waste disposal facilities, and anticipated increases in waste generation would also be insignificant. Attempts to meet VA waste diversion goals could reduce quantities destined for disposal. Adverse impacts to the available capacity of waste disposal facilities are not expected.

Relocating facility operations to the Brownsboro Site would necessitate revisions to the Louisville VAMC RCRA permit or a new site-specific permit.

4.12.3 Alternative B: St. Joseph Site

4.12.3.1 Construction

A short-term increase in waste generation resulting from construction activities is anticipated. Wastes generated by construction activities would be transferred to the Outer Loop Recycling & Disposal Facility, which has adequate capacity to receive additional solid waste.

The St. Joseph Site is currently an unimproved agricultural lot; no recognized environmental conditions have been identified. Should environmental contamination be encountered during construction activities, all waste would be abated and managed in accordance with regulations and disposed in appropriate disposal facilities.

Staging and operation of construction equipment carries an increased potential for incidental releases of vehicle fluids (such as oil, diesel fuel, gasoline, and antifreeze). Proper vehicle maintenance and inspection would reduce this potential, and adverse impacts are not expected.

In the event that a new underground storage tank and/or piping is installed as part of facility construction, Kentucky Department for Environmental Protection must be notified. A permit is also required to install aboveground storage tanks for petroleum products or hazardous substances.

Construction-related adverse impacts from solid waste and hazardous materials are not expected to occur. Short-term increases in solid waste generation are predicted, but would have a negligible effect on remaining landfill capacities. Waste minimization opportunities are described in Chapter 5.

4.12.3.2 Operation

Quantities of solid waste, medical waste, and hazardous waste generated from operation of a new facility at the St. Joseph Site would be similar to those generated at the existing Zorn Avenue facility, with anticipated increases resulting from projected increases in patients served. The Louisville VAMC is currently an insignificant contributor to the volume handled by waste disposal facilities, and anticipated increases in waste generation would also be insignificant. Attempts to meet VA waste diversion goals could reduce quantities destined for disposal. Adverse impacts to the available capacity of waste disposal facilities are not expected.

Relocating facility operations to the St. Joseph Site would necessitate revisions to the Louisville VAMC RCRA permit or a new site-specific permit.

4.12.4 Alternative C: No Action

4.12.4.1 Construction

Under Alternative C, construction activities would not occur; therefore, construction-related adverse impacts from solid waste and hazardous materials would not result.

4.12.4.2 Operation

Quantities of solid waste, medical waste, and hazardous waste generated from continued operation of the existing Zorn Avenue facility would be similar to those presently generated, with potential increases resulting from increases in patients served. The Louisville VAMC is currently an insignificant contributor to the volume handled at waste disposal facilities, and anticipated increases in waste generation would also be insignificant. Attempts to meet VA waste diversion goals could reduce quantities destined for disposal. Adverse impacts to the available capacity of waste disposal facilities are not expected.

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4.13 Transportation and Traffic

4.13.1 Evaluation Approach and Criteria

Each alternative was evaluated based on the impact to the public for vehicles coming to or leaving the site from the interstate highway system. For each path between the facility and the interstate system, the signalized intersections were evaluated based on both level of service (LOS) and the travel time for specific routes to and from the interstate. All evaluations are done for both the AM and PM peak hour periods in the design year of 2025.

The LOS is a qualitative assessment of a road network's operating conditions, generally in terms of traffic speed, travel time or delays, congestion or maneuverability, interruptions, and convenience. An LOS of A through C represents desirable (acceptable) conditions and D represents tolerable conditions. Congestion and delays increase under LOS-E to a level that is considered at capacity, whereas LOS-F ranks as the least functional level of traffic movement and is considered serious congestion. LOS-D is often considered an acceptable level of service for urban roadways like US 42, and LOS-D can also be considered acceptable when the cost to improve operations to LOS-C is prohibitive.

Impacts on transportation and parking infrastructure are evaluated for the potential to disrupt or improve existing levels of service and transportation patterns and circulation. For purposes of this evaluation, an impact would be adverse if degradation of an LOS to unacceptable conditions can be attributed solely to the alternative, or the alternative increases average daily traffic (ADT), measured in vehicles per day, by at least 20 percent on access roads to the project site (38 CFR 26.6(a)(2)).

4.13.2 Alternative A: Brownsboro Site

4.13.2.1 Construction

The daily commute of construction workers and deliveries of construction materials to the site would add vehicle trips to the area. The size of the workforce would vary throughout the construction schedule based on the types of construction activities; up to 1,500 workers could be commuting to the project site on a given day during the most active construction period. Temporary increases in vehicle trips would vary by location based on the travel routes of construction workers and delivery vehicles. It is likely that most construction-related vehicle trips would affect the Watterson Expressway (I-264) ramp split to Old Brownsboro Road and the I-264/US 42 interchange. Based on the anticipated sequence of construction activities and the size of the construction staging areas, parking on the project site would not accommodate all workers' personal vehicles during the most active construction period. Throughout much of construction, site constraints will require the construction contractor and their workforce to utilize carpooling, public transportation, and/or offsite parking and shuttling. Construction bid documents will include the requirement for offerors to submit plans to demonstrate acceptable site use, which would include addressing contractor parking and steps the contractor will take to minimize adverse impact to local traffic. VA anticipates this approved plan may also mitigate traffic impact to the extent that it reduces the number of construction worker vehicles commuting to the site.

The VA Traffic Impact Study (Palmer Engineering 2016; see Appendix B) estimates that approximately 10,000 ADT will be added to the roadways as a result of the VA moving to the Brownsboro Site (referred to as the Midlands site in Appendix B). Construction traffic is anticipated to be much lower with a maximum of 1500 workers making daily trips in and out as well as material deliveries. The use of offsite parking for some of these workers will reduce the daily increase in traffic volumes. Since analysis has been done for impacts from the addition of approximately 10,000 vehicles per day ADT, and since

construction traffic would end before the proposed VAMC becomes operational, the impact on traffic during construction would be less than the impact during operation.

4.13.2.2 Operation

The VA Traffic Impact Study (Appendix B) estimated that approximately 10,000 vehicles per day ADT would be added to area roadways during operations under Alternative A. Entrance to and exit from the site would be at the northeast corner at the existing intersection of Old Brownsboro Road and the ramp split (see Figure 4.13-1). Patients, visitors, staff, buses, and deliveries would use two entrance lanes and two exit lanes. Traffic circulation would be designed to largely eliminate the need for left turns, separate users of the campus facilities, and minimize traffic noise on adjacent residential neighborhoods. An additional right turn lane would split from the main entry drive for staff, maintenance, emergency, and delivery vehicles to access the service road along the west edge of the site, whereas patients, visitors, and buses would continue on the divided boulevard to access the parking structures and VBA and VAMC drop-off locations.

An emergency access road would be located at the southwest corner of the site at Carlimar Lane. This entry/exit would be gated and accessible only to emergency responders (ambulance, fire, and police) should the main entrance on Old Brownsboro Road be inaccessible for some reason, such as an accident.

The roads and traffic circulation on the project site would be designed to accommodate TARC bus routes and stops. VA would coordinate with TARC to encourage realignment of the current bus routes on Old Brownsboro Road to serve the campus, including potentially entering the campus for onsite stop(s).

Pedestrian and bicycle access to the VAMC campus would be located with the vehicle entrance and would be connected to existing sidewalks on Old Brownsboro Road. Pedestrian crossing signals, ramps, and pavement markings would be installed as part of the entrance/exit construction. Pedestrian access would not be provided to Carlimar Lane or Haverhill Road in the adjacent residential neighborhoods. Bicycle parking would be provided in the north parking deck.

Two parking decks would accommodate approximately 3,000 vehicles. The number of parking spaces was based on the number of employees (and overlapping shift changes), volunteers, outpatient visits, inpatient census, vendors, and visitors, and was planned to prevent offsite or street parking. The decks would be connected to the VAMC atrium and the central activity corridor at the ground level. A minimal number of surface parking spaces would be located on the west side of the campus for maintenance and delivery vehicles.

Operation of the proposed campus is anticipated to increase the ADT on Old Brownsboro Road, between the ramp split and US 42, by more than 20 percent. ADT is not expected to increase by more than 20 percent on any other segment of roadway in the corridor.

The 2016 VA Traffic Impact Study evaluated AM and PM traffic conditions for two 2025 design year scenarios including Alternative A: with the existing interchange intact and with the proposed SPUI constructed. Additionally, due to the types of land use surrounding the site and because the few unimproved tracts are already approved for development, it was determined that if the VA selected another site for their location, the Brownsboro Site would be expected to be developed for another use, by the U.S. government or a subsequent property owner. Therefore, in addition to the analysis of traffic conditions with the VAMC, the 2016 VA Traffic Impact Study also evaluated AM and PM traffic

conditions for two 2025 design year scenarios including non-VA use: the existing interchange with mixed-use development traffic and the proposed SPUI with mixed-use development traffic[1].

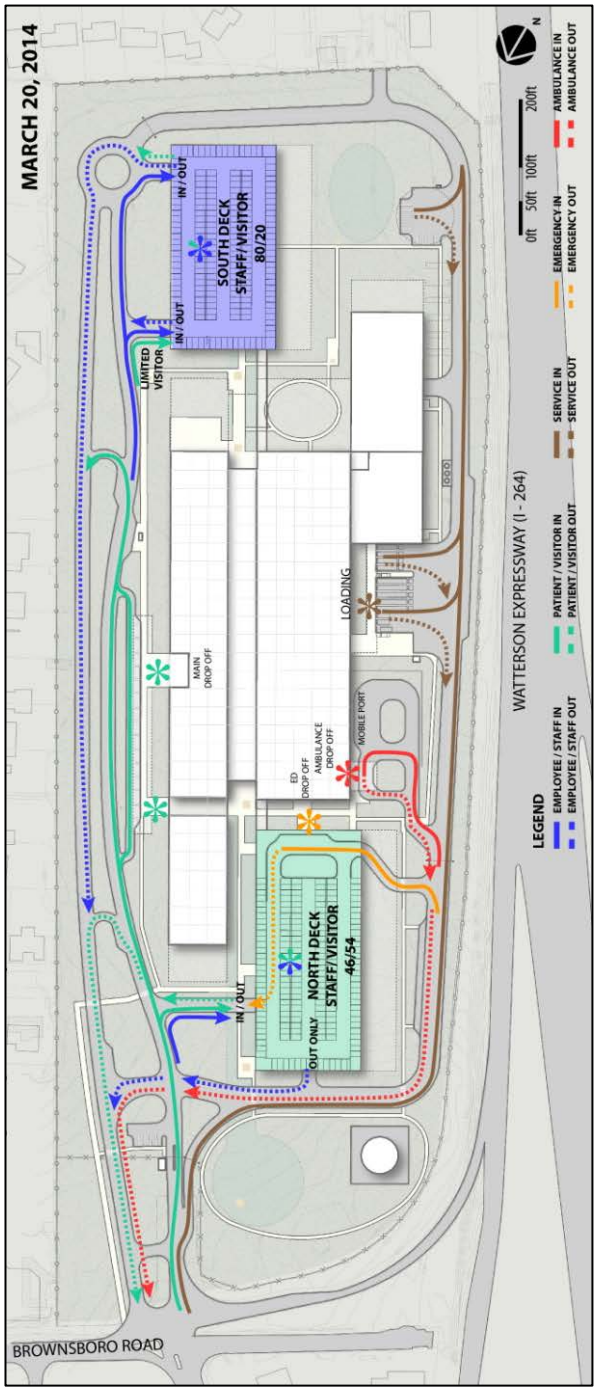

Figure 4.13-1. Traffic Circulation on Proposed VAMC Campus.

[1] Mixed-use development traffic was based on information available in a 2006 Traffic Impact Study for the Midlands, and includes multi-family residential, condos/townhomes, a hotel, office space, high-turnover (sit down) restaurants, and retail space. Internal circulation and pass-by trips were accounted for in anticipated traffic generated by the mixed-use development.

The 2016 VA Traffic Impact Study modeled different measures of effectiveness of the proposed interchange improvement alternatives at Watterson Expressway (I-264) and US 42; two of the measures included LOS and intersection delay. Table 4.13-1 shows the intersection LOS and delay results for the design year of 2025 for the no build (no interchange improvements) conditions with both the VAMC traffic and the mixed-use development traffic and for the proposed SPUI conditions for both the VAMC traffic and the mixed-use development traffic. The LOS is projected to worsen and delays would increase from 2015 baseline conditions (refer to Table 3.13-1) by 2025 under the no build scenario with the operation of either the VAMC campus or a mixed-use development, along with projected population growth and increased rate of development. The LOS and delay with the anticipated SPUI ("build" scenario) would improve the overall ramps intersection in the case of VAMC traffic and mixed-use development traffic. For either the no build or build scenarios, for both the VAMC and mixed-use development, the intersection of US 42 at KY 22 would continue to experience highly congested traffic conditions.

The future adverse conditions under any scenario cannot be attributed solely to the operation of the VAMC campus based on the projected growth of the area at 0.8 to 1.0 percent annually. Although adverse, Alternative A would not significantly contribute to the degradation of the LOS at the intersection of US 42 at KY 22 when compared to design year (2025) conditions for a mixed-use development at the same site.

Table 4.13-1. Future Level of Service and Delay at Signalized Intersections for Design Year 2025 – Brownsboro Site.

Intersection	No Build + VAMC		No Build + Mixed-Use Development		Build + VAMC		Build + Mixed-Use Development	
	AM / PM Peak Hour							
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
US 42 at Rudy Lane	C / D	29/49	C / D	28 / 49	C / D	29/49	C / D	28 / 49
US 42 at I-264 southbound ramp	E / D	61/51	E / D	64 / 54	D / D	40 / 45	D / D	40 / 47
US 42 at I-264 northbound ramp	C / C	34/32	D / C	35 / 32				
US 42 at KY 22 / Northfield Drive	F / F	126/152	F / F	139 / 125	E / F	60 / 133	E / F	70 / 113
KY 22 at ramp split	D / F	43/128	D / F	47 / 92	C / C	23/26	C / C	32 / 23

Note: "Build" and "No Build" indicate whether or not the Watterson Expressway (I-264) and US 42 interchange is improved or not.

The peak hour LOS at an intersection is based in part on the "turning movements" or number of vehicles in the available travel lanes (right turn, left turn, and through lanes) at the intersection. Figure 4.13-2 shows the morning and evening peak hour turning movements for baseline (2015) and future (2025) conditions for the intersections of US 42 at KY 22, and KY 22 at the I-264 ramp split, the two nearest intersections that would serve the Brownsboro Site. The morning and evening peak hour vehicle trips projected to be generated by the proposed VAMC campus, and the directional distribution of these trips, were part of the traffic analysis (Appendix B). The trip distribution is consistent with that used in the KYTC forecast (KYTC 2016). This forecast was adjusted to reflect conditions under Alternative A, using methodology consistent with KYTC's forecast.

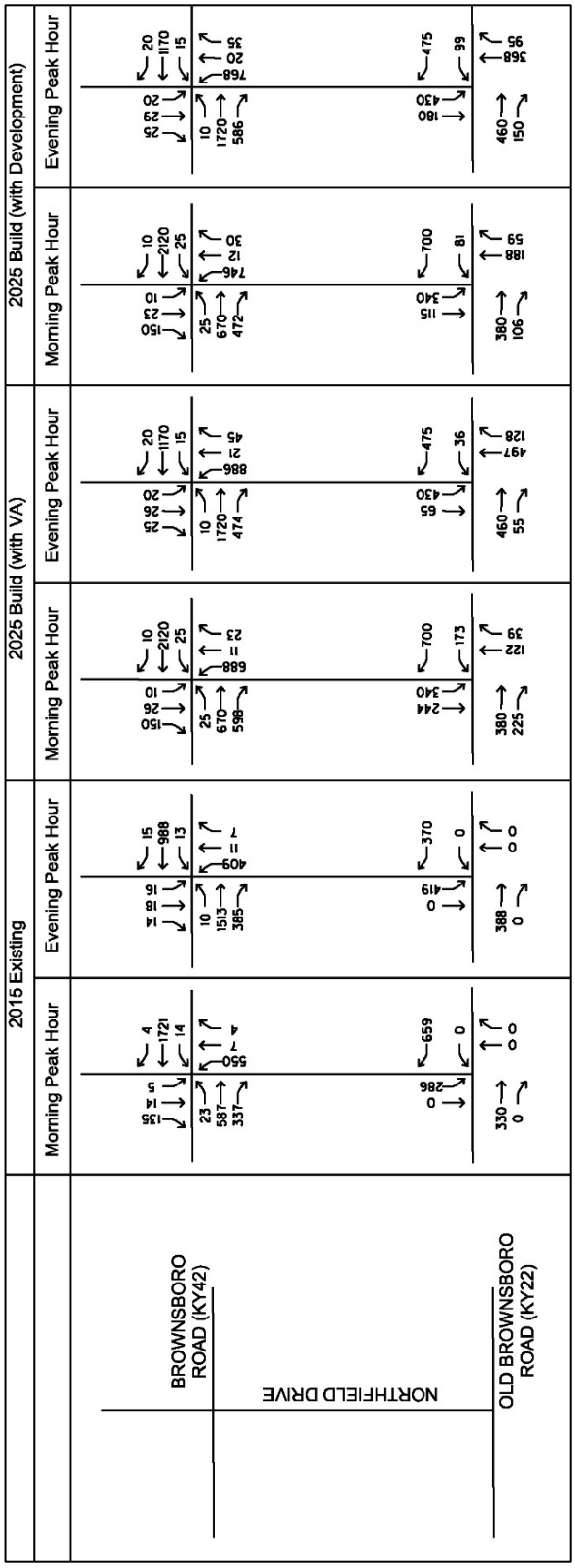

Figure 4.13-2. Brownsboro Site: Future Signalized Intersection Movements for Baseline (2015) and Future (2025) Years

The data in Figure 4.13-2 show the volume of each turning movement entering and exiting the proposed VAMC campus as compared to the overall intersection movements. During the morning peak hour, vehicles entering (244) and exiting (122) the VAMC campus in the direction of the US 42 at KY 22 intersection amount to approximately 9 percent of the total turning movements (4,356) at that intersection. During the evening peak hour, vehicles entering (65) and exiting (497) the VAMC campus in the direction of the US 42 at KY 22 intersection would be approximately 13 percent of the total turning movements (4,432). The Brownsboro Site would therefore contribute some impacts to the increase in delay at that intersection.

The proposed VAMC campus would obviously be the source of a greater number of turning movements and higher percentage of total movements at the KY 22 and I-264 ramp split intersection because this intersection would be the direct entrance and exit to and from the campus. At approximately one-third of the total turning movements at the intersection during the morning (36 percent) and evening (36 percent) peak hours, the Brownsboro Site would have a notable contribution to the intersection delay. However, the KY 22 and I-264 ramp split intersection still has an acceptable LOS of C/C in both the 2015 baseline morning/evening peak hours and would remain C/C for the 2025 build scenario in the morning/evening peak hours. The LOS would drop to D/F in the 2025 No Build scenario in the morning/evening peak hours. The KY 22 and I-264 ramp split intersection is also not anticipated to have a difference in LOS whether the VA is constructed or a different mixed-use development is constructed using that intersection for access.

In addition to measuring LOS and delay, the 2016 VA Traffic Impact Study also measured travel time data for select routes along the corridor. The No Build + VAMC and No Build + Mixed-Use Development scenarios had travel times that were higher than the 2015 baseline conditions for both the morning and evening peaks. The travel times along the corridor (not those directly to and from the Brownsboro Site) are comparable for No Build + VAMC conditions and No Build + Mixed-Use Development conditions.

In general, the no build (existing unimproved interchange) travel times with the VAMC traffic are slightly less to and from the Brownsboro Site than the associated routes for the no build scenario with a mixed-use development. However, with the exception of a few routes, the travel times between the two scenarios are very comparable.

The travel times for the proposed SPUI (both with the VA and with the Mixed Use development) would vary—improve for some routes, worsen at others, or remain comparable to baseline conditions. The travel times along the corridor (not those directly to and from the VA site) are very comparable between the build conditions with the VA and the build conditions with the Mixed Use development.

In general, the AM travel times for the build (SPUI) with the VA traffic and the build with the Mixed Use development traffic are consistent. The PM travel times are about even, with half of the travel times being shorter for the VA build conditions and half of the travel times being shorter for the Mixed Use development conditions. As with the no build conditions (existing interchange), the travel times between the build conditions (with the VA and with the Mixed Use development) are very comparable.

The travel times for the planned SPUI (with the VAMC traffic or with the mixed-use development traffic) are shorter for the AM peak period. Travel times for the SPUI are about even in the PM peak hour, with half of the travel times being shorter than the no build conditions. The travel times that are longer in the PM peak are some of those directly to and from the proposed VAMC.

Overall travel time impacts are negligible between the no build / build conditions with the VAMC traffic, in comparison to those predicted for the mixed-use development traffic.

Table 4.13-2 shows the travel time results for the design year of 2025 for the no build (no interchange improvements) conditions with both the VAMC traffic and the mixed-use development traffic and for the conditions with the planned SPUI for both the VAMC and mixed-use development traffic.

Table 4.13-2. Future (2025) Travel Time Results – Brownsboro Site.

Intersection	Travel Time (minutes)							
	No Build + VAMC		No Build + Mixed-Use Development		Build + VAMC		Build + Mixed-Use Development	
	AM	PM	AM	PM	AM	PM	AM	PM
I-264 eastbound to Lime Kiln Lane	3.4	5.9	3.4	6.4	2.8	3.0	2.7	3.0
I-264 westbound to Lime Kiln Lane	3.6	3.2	3.6	3.3	3.3	2.9	3.2	3.2
US 42 westbound to I-264 westbound	4.3	3.3	4.2	3.3	3.5	3.2	3.5	3.1
KY 22 to I-264 westbound	5.6	4.2	5.9	4.1	3.7	3.3	3.8	3.2
I-264 eastbound to VAMC	1.9	1.9	1.6	1.9	1.6	1.4	1.6	1.5
I-264 westbound to VAMC	2.8	2.5	2.9	2.6	2.6	2.4	2.5	2.6
US 42 eastbound to VAMC	3.2	2.6	3.2	2.8	3.1	3.2	3.1	3.5
US 42 westbound to VAMC	3.1	2.9	3.4	3.6	2.8	3.0	2.4	3.1
KY 22 to VAMC	2.2	-	2.4	-	1.4	1.7	1.4	1.7
VAMC to I-264 westbound	6.6	4.0	8.0	4.0	3.7	4.6	3.7	4.4
VAMC to I-264 eastbound	4.7	2.7	6.2	2.7	2.3	3.6	2.4	3.4
VAMC to US 42 westbound	5.1	2.7	6.7	2.6	2.4	3.7	2.7	3.5
VAMC to US 42 eastbound	5.5	3.0	6.7	3.1	2.7	3.6	2.7	3.3
VAMC to KY 22	1.2	0.8	1.6	0.9	0.6	0.8	0.6	0.7

Note: "Build" and "No Build" indicate whether or not the Watterson Expressway (I-264) and US 42 interchange is improved or not.

4.13.3 Alternative B: St. Joseph Site

4.13.3.1 Construction

The daily commute of construction workers and deliveries of construction materials to the project site would add vehicle trips to the area. The size of the workforce would vary throughout the construction schedule based on the types of construction activities; up to 1,500 workers could be commuting to the project site on a given day during the most active construction period. Temporary increases in vehicle trips would vary by location based on the travel routes of construction workers and delivery vehicles. It is likely that most construction-related vehicle trips would affect the Gene Snyder Freeway (I-265)/Old Henry Road and the Gene Snyder Freeway/LaGrange Road interchanges.

The VA Traffic Impact Study (Palmer Engineering 2016; see Appendix B) estimates that approximately 10,000 ADT will be added to the roadways as a result of the VA moving to the St. Joseph Site. Construction traffic is anticipated to be much lower with a maximum of 1,500 workers making daily trips in and out as well as material deliveries. Since analysis has been done for impacts from the addition of approximately 10,000 vehicles per day ADT, and since construction traffic would end before the proposed VAMC becomes operational, the impact on traffic during construction would be less than the impact during operation. The start of construction under Alternative B would, however, create the possible need for the addition of a signalized intersection where one does not currently exist.

4.13.3.2 Operation

The VA Traffic Impact Study (Appendix B) estimates that approximately 10,000 vehicles per day ADT would be added to the area roadways as a result of the VA moving to the St. Joseph Site. Entrance to and exit from the St. Joseph Site would be along Factory Lane with traffic from I-265 split between the LaGrange and Old Henry Road exits.

VA would have to coordinate with TARC to try to extend existing bus routes to the project site to serve the proposed VAMC campus.

The proposed VAMC is anticipated to increase the ADT on Factory Lane, near both the LaGrange Road and Old Henry intersections, by more than 20 percent.

The 2016 VA Traffic Impact Study evaluated AM and PM traffic conditions for two 2025 design year scenarios: the no VAMC conditions (without VA traffic) and the VAMC conditions (with VA traffic).

The 2016 VA Traffic Impact Study modeled LOS and intersection delay for the study scenarios. Table 4.13-3 shows the intersection LOS and delay results for the design year of 2025 for the no build (without VA traffic) conditions and for the build (with VA traffic) conditions. For either scenario, the intersections of Old Henry Road at Bush Farm Road, LaGrange Road at Factory Lane, and LaGrange Road at I-265 southbound ramp would experience highly congested traffic conditions.

Table 4.13-3. Future Level of Service and Delay at Signalized Intersections for Design Year 2025 – St. Joseph Site.

Intersection	No VAMC				With VAMC			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
Old Henry Road at I-265 northbound ramp	D	49	C	34	D	51	D	39
Old Henry Road at Bush Farm Road	F	127	D	46	F	131	E	59
Old Henry Road at Factory Lane	-	-	-	-	E	69	C	26
Factory Lane at VAMC entrance	-	-	-	-	C	20	C	24
LaGrange Road at Factory Lane	F	265	F	104	F	278	F	178
LaGrange Road at I-265 southbound ramp	F	105	F	81	F	107	F	92

Figure 4.13-3 shows the morning and evening peak hour turning movements for future (2025) conditions for the intersections of LaGrange Road at Factory Lane / Chamberlain Lane and Old Henry Road at Factory Lane, the two nearest intersections that would serve the St. Joseph Site. The morning and evening peak hour vehicle trips projected to be generated by the proposed VAMC campus, and the directional distribution of these trips, were part of the new traffic analysis (Palmer Engineering 2016; see Appendix B). The trip distribution is consistent with that used in the 2012 VA Medical Center, Factory Lane Site, Traffic Impact Study (BTM 2012). The 2012 VA forecast has been updated to reflect the current proposal for the VAMC campus size, but the methodology was consistent with that used in the 2012 forecast.

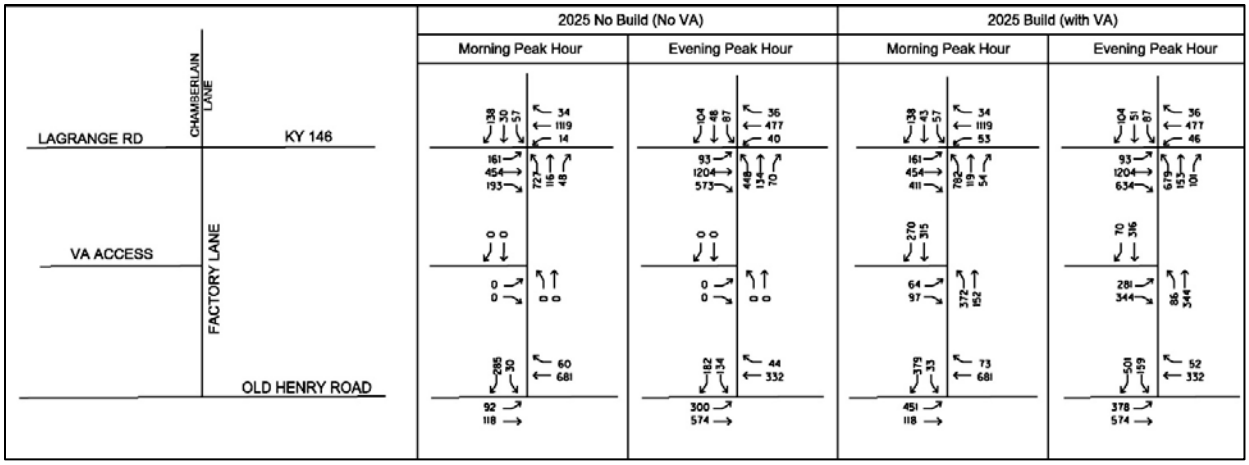

Figure 4.13-3. St. Joseph Site: Future Signalized Intersection Movements for Future (2025) Years.

The data in Figure 4.13-3 show the volume of each turning movement entering and exiting the proposed VAMC campus as compared to the overall intersection movements. During the morning peak hour, vehicles entering (270) and exiting (64) the proposed VAMC campus in the direction of the LaGrange Road at Factory Lane intersection amount to approximately 10 percent of the total turning movements (3,425) at that intersection. During the evening peak hour, vehicles entering (70) and exiting (281) the VAMC campus in the direction of the LaGrange Road at Factory Lane intersection would also be approximately 10 percent of the total turning movements (3,665). Selection of the St Joseph Site would therefore have minor impacts to the degradation of the LOS at that intersection. The LOS at the LaGrange Road and Factory Lane intersection would operate at an F with or without the VAMC, but the additional traffic with the VAMC would increase the intersection delay.

During the morning peak hour, vehicles entering (372) and exiting (97) the proposed VAMC campus in the direction of the Old Henry Road at Factory Lane intersection would amount to approximately 27 percent of the total turning movements (1,735) at that intersection. During the evening peak hour, vehicles entering (86) and exiting (344) the proposed VAMC campus in the direction of the Old Henry Road at Factory Lane intersection would be approximately 22 percent of the total turning movements (1,996). Selection of the St Joseph Site would therefore have moderate impacts to the degradation of the LOS at that intersection. The Old Henry Road at Factory Lane intersection is not signalized now. It is anticipated that a signal will be required with the addition of the VAMC. The signal will operate at LOS E in the AM peak hour and LOS C in the PM peak hour.

The VAMC campus would obviously be the source of a greater number of turning movements and higher percentage of total movements at the Factory Lane intersection with the proposed VAMC entrance (a new intersection) because this intersection would be the direct entrance and exit to and from the campus. At approximately two-thirds of the total turning movements at the intersection during the morning (63 percent) and half of the total turning movements at the intersection during the evening (54 percent) peak hours, the Alternative B would have major impacts to the degradation of the LOS at that intersection. There is currently not a signal at the proposed VAMC entrance location, so it would change from a free-flowing roadway to a signalized intersection with LOS C/C (2025 morning/evening).

In addition to measuring LOS and delay, the 2016 VA Traffic Impact Study also measured travel time data for select routes along the corridor. In the morning peak hour, the travel times with VAMC traffic are significantly higher than the future condition without a VAMC for four of the six routes – the remaining two routes are consistent with the conditions without a VAMC. In the evening peak hour, the Alternative

B travel times are significantly higher than the future condition without the VAMC for five of the six routes, with the remaining route being consistent with the conditions without a VAMC. Table 4.13-6 shows the travel time results for the design year of 2025 without VA traffic and for Alternative B.

There are overall major travel time impacts to the routes under Alternative B compared to future conditions without the VAMC, particularly for VAMC traffic exiting the site and going to the I-265 interchange at LaGrange Road.

Table 4.13-4. Future (2025) Travel Time Results – St. Joseph Site.

Intersection	No VAMC		With VAMC	
	AM (minutes)	PM (minutes)	AM (minutes)	PM (minutes)
Southbound I-265 at LaGrange to VAMC	3.3	3.3	4.0	3.6
Northbound I-265 at LaGrange to VAMC	2.7	3.5	2.8	4.6
VAMC to southbound I-265 at LaGrange	5.6	4.5	6.7	6.5
VAMC to northbound I-265 at LaGrange	4.0	3.4	5.0	5.8
Northbound I-265 at Old Henry to VAMC	4.0	4.2	5.0	4.8
VAMC to northbound I-265 at Old Henry	4.6	4.0	4.5	4.1

4.13.4 Alternative C: No Action

4.13.4.1 Construction

There will be no construction impacts for the No Action alternative.

4.13.4.2 Operation

No changes to current traffic patterns near the existing Zorn Avenue facility are expected under the No Action Alternative. While traffic along Zorn Avenue is anticipated to grow, traffic at the existing VAMC would be expected to remain constant between the baseline 2015 conditions and the future 2025 conditions under Alternative C. While the VA has a need for further capacity to accommodate additional patients, the existing site is already at its maximum capacity, so the 2016 VA Traffic Impact Study (see Appendix B) assumed traffic into and out of the facility would remain constant.

The 2016 VA Traffic Impact Study evaluated AM and PM traffic conditions for the 2025 future year scenario of Alternative C, where the VAMC remains at the Zorn Avenue site.

The 2016 VA Traffic Impact Study modeled LOS and intersection delay for the studied scenario. The Zorn Avenue at I-71 northbound ramp intersection would experience highly congested traffic conditions in the evening peak hour. Table 4.13-5 shows the intersection LOS and delay results for the design year of 2025.

Table 4.13-5. Future Level of Service and Delay at Signalized Intersections for Design Year 2025 – Zorn Avenue (Existing Site)

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)
Zorn Avenue at I-71 northbound ramp	C	34	F	118
Zorn Avenue at Country Club Road	C	30	B	20

Figure 4.13-4 shows the morning and evening peak hour turning movements for future (2025) conditions for the Zorn Avenue intersection with Country Club Road / Riverwood Drive, the intersection that

currently serves the VAMC campus. The morning and evening peak hour vehicle trips generated by the existing VAMC campus, and the directional distribution of these trips, were part of the traffic analysis. The volumes were based on site-specific turning movement counts completed for the Traffic Impact Study.

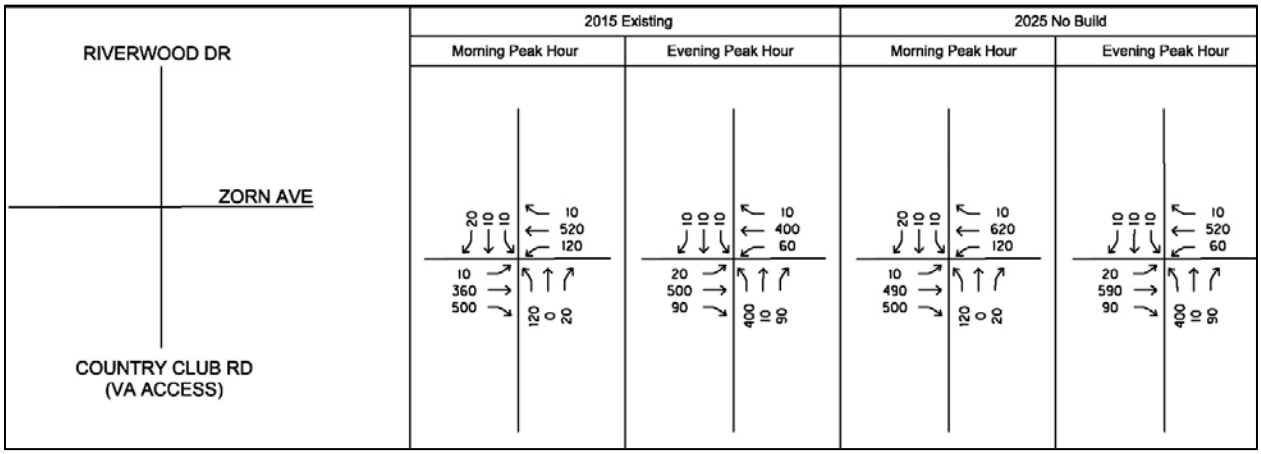

Figure 4.13-4. Zorn Avenue: Future Signalized Intersection Movements for Future (2025) Years.

The data in Figure 4.13-4 show the volume of each turning movement entering and exiting the existing VAMC campus as compared to the overall intersection movements. During the morning peak hour, vehicles entering (630) and exiting (140) the VAMC campus in the direction of the Zorn Avenue intersection with Country Club Road / Riverwood Drive would amount to approximately 40 percent of the total turning movements (1,930) at that intersection. During the evening peak hour, vehicles entering (160) and exiting (500) the VAMC campus in the direction of the Zorn Avenue intersection with Country Club Road / Riverwood Drive would be approximately 36 percent of the total turning movements (1,820). The location of the VAMC has a major impact to the intersection; however, the impact to the LOS is negligible when compared to the existing conditions.

In addition to measuring LOS and delay, the 20156VA Traffic Impact Study also measured travel time data for select routes along the corridor. The 2025 travel times between the VAMC and I-71 are relatively consistent, or slightly higher, than the 2015 existing travel times. Table 4.13-6 shows the travel time results for the future year of 2025 for Alternative C.

The impact to the increase in travel time between 2015 current conditions and 2025 under Alternative C is minor.

Table 4.13-6. Future (2025) Travel Time Results – Existing Zorn Avenue Facility.

Intersection	AM (minutes)	PM (minutes)
Southbound I-71 to VAMC	2.0	2.0
Northbound I-71 to VAMC	1.4	1.3
VAMC to southbound I-71	2.2	2.3
VAMC to northbound I-71	1.5	1.6

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4.14 Utilities

4.14.1 Evaluation Criteria

An alternative would be considered to result in an adverse impact related to utilities if it would:

- require or result in the construction of new water supply or new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause adverse environmental effects
- require or result in the construction of new electricity or natural gas generation or transmission facilities, the construction of which could cause adverse environmental effects
- require or result in the construction of communications lines or expansion of existing facilities, the construction of which could cause adverse environmental effects

4.14.2 Alternative A: Brownsboro Site

4.14.2.1 Construction

Louisville Water Company (LWC) has indicated there is sufficient spare capacity in the existing water supply system along Brownsboro Road to accommodate the domestic and fire protection water requirements of the proposed VAMC campus. A minimum of two points of connection would be made to the LWC system: a main connection to the 12-inch water main in Brownsboro Road, and a secondary connection to the 8-inch water main in the right-of-way of Carlimar Lane. No impacts to the municipal water supply system would be expected.

LG&E stated that natural gas service is available for the proposed development; no impacts related to primary and redundant natural gas service for the replacement Louisville VAMC were identified.

Two separate sources of electrical supply are needed because the proposed VAMC would be a mission critical facility. Although there is no existing nearby electrical source that is capable of serving the site, LG&E has stated their commitment to providing service and is confident that they will be able to provide a single service source to the site at LG&E's cost. The second, separate service feed can also be provided, but would be at the VA's expense. LG&E has identified three possible locations from which primary and secondary services can be extended to the campus. In all three of these options, a circuit would be brought into the site from the north along Brownsboro Road. The electrical utility's capacity and infrastructure could be expanded to accommodate the new VAMC facility, and no adverse impacts are expected.

Louisville and Jefferson County Metropolitan Sewer District (MSD) requires that the first sixteenth of an inch of rain must be stored and treated onsite; MSD also requires the site stormwater discharges to their system for 2-year, 10-year, and 100-year storm events be limited to the predevelopment discharge of the site for each storm. The system would be designed to meet the MSD guidelines to ensure there would be no impacts to the MSD's stormwater handling system.

MSD has indicated that they have capacity to handle the estimated sanitary sewerage flow of 170,500 gallons per day from the facility, as well as a peak flow of 875,000 gallons per day (URS/SmithGroup 2014).

AT&T would provide telecommunications service connections from a point along Brownsboro Road, with redundant service coming in to the VAMC also from Brownsboro Road or from the south at

Carlimar Lane; the final configuration would be coordinated with AT&T. No impacts were identified related to establishing or maintaining telecommunications service to the site.

4.14.2.2 Operation

Operation of the proposed VAMC facility would not be anticipated to require extraordinary utility needs beyond those of similar hospital developments. In addition, operation of the proposed facility would eventually replace the current utilities consumed by the existing Louisville VAMC in terms of the portion of those utilities that support VA-provided healthcare in the Louisville area. As described in Section 4.14.2.1, utility providers are expected to serve the operational needs of the new facility without resulting impacts.

4.14.3 Alternative B: St. Joseph Site

4.14.3.1 Construction

LWC has indicated that it can provide water supply to the St. Joseph Site along the northern boundary (Factory Lane) where there is an existing 12-inch water main (VA 2012). No impacts to the municipal water supply system would be expected.

LG&E stated that natural gas service and electric service is available for the proposed development (VA 2012); no impacts related to primary and redundant natural gas and electric service for the replacement Louisville VAMC were identified.

MSD requires that the first sixteenth of an inch of rain must be stored and treated onsite; MSD also requires the site stormwater discharges to their system for 2-year, 10-year, and 100-year storm events be limited to the predevelopment discharge of the site for each storm. The system would be designed to meet the MSD guidelines to ensure there would be no impacts to MSD's stormwater handling system.

MSD has indicated that they have capacity to handle the estimated sanitary sewerage flow of 170,500 gallons per day from the facility, as well as a peak flow of 875,000 gallons per day (URS/SmithGroup 2014).

AT&T would provide telecommunications service to the St. Joseph Site. No impacts were identified related to establishing or maintaining telecommunications service to the site.

4.14.3.2 Operation

Operation of the proposed VAMC facility would not be anticipated to require extraordinary utility needs beyond those of similar hospital developments. In addition, operation of the proposed facility would eventually replace the current utilities consumed by the existing Louisville VAMC in terms of the portion of those utilities that support VA-provided healthcare in the Louisville area. As described in Section 4.14.3.1, utility providers are expected to serve the operational needs of the new facility without resulting impacts.

4.14.4 Alternative C: No Action

4.14.4.1 Construction

Under Alternative C, no new utility construction or connections would occur, and impacts to utilities would not result.

4.14.4.2 Operation

Under Alternative C, no new or changed utility use would occur, and impacts to utilities would not result.

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4.15 Environmental Justice

4.15.1 Evaluation Criteria

An analysis of environmental justice determines whether a disproportionate share of adverse human health or environmental impacts from implementing a federal action would be borne by minority or low-income populations.

The CEQ (1997) guidance states that, to determine whether impacts to minority or low-income populations are disproportionately high and adverse, agencies should consider the following:

- For human health effects (including bodily impairment, infirmity, illness, or death), whether:
  - Risks or rates of health effects are significant (as the term is used in NEPA analyses) or above generally accepted norms
  - The risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and appreciably exceeds or is likely to exceed the risk or exposure rate for the general population.
  - Health effects occur in a minority or low-income population affected by cumulative or multiple adverse exposures from environmental hazards
- For environmental effects (ecological, cultural, human health, economic, or social impacts), whether:
  - There is or would be an impact on the natural or physical environment that significantly and adversely affects a minority or low-income population when those impacts are interrelated to impacts on the natural or physical environment
  - Environmental effects are significant (as the term is used in NEPA analyses) and are or may be having an adverse impact on minority or low-income populations that appreciably exceeds or is likely to appreciably exceed those on the general population
  - The environmental effects occur or would occur in a minority or low-income population by cumulative or multiple adverse exposures from environmental hazards

As described in Section 3.15, the affected area for the environmental justice analysis is the Louisville VAMC service area, including counties in the states of Indiana and Kentucky. The Kentucky counties of Butler and Carroll are environmental justice communities in the Louisville VAMC service area based on guidance in CEQ (1997), as described in Section 3.15.1.2. There are no environmental justice communities in the VA BHHCS service area in Indiana. Therefore, the environmental justice impact analysis for the replacement VAMC proposal is limited to the two Kentucky counties of Butler and Carroll. Jefferson County, Kentucky, where the physical effects of any alternative would occur, does not have any environmental justice communities.

4.15.2 All Alternatives – Construction

Construction impacts to all resources would be limited to the vicinity of the construction in the selected VAMC location in Jefferson County. This county was not defined as having an environmental justice community; thus, environmental or health impacts from construction would not be disproportionately borne by any environmental justice community.

Construction sites that are in close proximity to areas with higher concentrations of children, such as schools or parks, could attract unauthorized entry by children. Active construction sites are generally monitored or secured by fencing so the potential for unauthorized entry resulting in a safety risk would be minimal. Construction would not have environmental health risks or safety risks that would disproportionately affect children.

4.15.3 All Alternatives – Operation

The operational impacts under any alternative would occur predominantly in the vicinity of the selected VAMC location in Jefferson County. This county was not defined as having an environmental justice population; thus, environmental or health impacts would not be disproportionately borne by any environmental justice community. The proposed replacement VAMC, or continued operation of the existing VAMC, would have no adverse effect in the two counties in the service area that have minority or low-income populations (Butler and Carroll Counties, Kentucky).

As stated in Section 1.2, the proposed project would provide Louisville area Veterans with facilities of sufficient capacity to meet the current and projected future healthcare needs of Veterans in the Louisville service area. This would be a beneficial effect for all Veterans in the service area, including those in minority and low-income populations.

The operations conducted under any alternative for a replacement Louisville VAMC would continue to be provision of health care services to Veterans and their families, and this mission would not have environmental health risks or safety risks that would disproportionately affect children. Adverse effects to land use, traffic, or other environmental resources identified in Sections 4.1 through 4.14 would not disproportionately affect children.

4.16 Cumulative Impacts

The CEQ regulations for implementing NEPA define cumulative effects 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 non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Section 3.16 identified the other past, present, and reasonably foreseeable future actions that may occur within the Louisville area. Cumulative impacts from these actions or other potential future actions together with those of any of the EIS alternatives are expected to be absent, negligible or minor for aesthetics, air quality, cultural resources, geology and soils, hydrology and water quality, wildlife and habitat, noise, floodplains and wetlands, socioeconomics, community services, solid waste and hazardous materials, utilities, and environmental justice. Any impacts to these resources would be similar to current VA health care services operations or to other new private and commercial developments that may occur on or near the alternative sites, and would include mitigation measures to minimize impacts as described in Chapter 5.

Land Use

The area around the Brownsboro Site is mostly developed. Little space remains for infill development other than an approximately 19-acre area of unimproved land located approximately ¼ mile northeast of the site along Herr Lane, which is owned by Providence Point Commercial, LLC. Identified as Providence Point, the proposed development of this area would include 312 residential condominiums and 138,000 square feet for mixed-use retail and offices. Development of the Brownsboro Site by VA would contribute to the complete development of remaining unimproved parcels in the area. There is a greater number of undeveloped parcels near the St. Joseph Site. Eventual development of both the Brownsboro and St. Joseph sites by some entity other than VA would be consistent with the designated zoning at the time of development, and would thus lead to a similar outcome in terms of remaining undeveloped land in each local area as if the site was developed by VA.

Transportation and Traffic

Various improvements have been made to the surrounding transportation network resulting in changes to traffic patterns. Area improvement projects completed by the KYTC included capacity improvements to the I-264 eastbound off-ramp and construction of the ramp split completed in October 2012 that connected to Old Brownsboro Road (KY 22). The I-71 and I-264 interchange was also improved in the fall of 2012 by adding auxiliary lanes on I-264 and lengthening the merge/diverge areas on I-71.

Several roadway projects would impact traffic flow patterns and volumes in the near future, including the construction of two new bridges over the Ohio River and the improvements to I-264 (Watterson Expressway) between the Westport Road and I-71 interchanges, which includes the reconstruction of the US 42 (Brownsboro Road) interchange. The Watterson Expressway (I-264) would be widened to three through lanes in each direction and auxiliary lanes between interchanges. Two-lane ramps would be added from I-264 eastbound to I-71 northbound and at the I-264 westbound off-ramp to Westport Road. A two-lane on-ramp would be provided from US 42 to I-264 westbound. Farther to the east on US 42, there is currently a half interchange with the Gene Snyder Freeway. This interchange will soon become a full interchange and US 42 will be directly connected to the east end of the Ohio River bridge.

The KYTC included these future roadway projects and projected growth and development, including the proposed Brownsboro Site VAMC campus, that are planned for the area in their traffic forecast model in selecting the SPUI design for the US 42 interchange improvement project. The foreseeable actions having a cumulative impact on transportation include KYTC's build and no build scenarios for the US 42

interchange. Therefore, the potential cumulative impacts were accounted for in the analysis of transportation impacts for the operational phase of Alternative A. As discussed in Section 4.13.2, future traffic operations would be considered acceptable at all intersections in the area surrounding the Brownsboro Site, except at Brownsboro Road and Northfield Drive. Alternative A would therefore contribute to adverse cumulative traffic impacts at this intersection along with other roadway projects and increased growth. Based on the percentage of the total turning movements at that intersection to and from the direction of the VAMC campus, the proposed VAMC would not be a significant cumulative contributor to the traffic volumes of degradation of the level of service.

The estimated construction schedules for the US 42 interchange project and the proposed VAMC campus would overlap for approximately two years, having a temporary adverse cumulative impact on the transportation network from construction traffic. The interchange project is scheduled to be completed before the VAMC campus would be completed; thus, construction traffic conditions would be expected to improve while final construction of the proposed VAMC continues.

4.17 Potential for Generating Substantial Controversy

As discussed in Chapter 6, VA has solicited input from the public and various federal, state, and local government agencies regarding the proposed replacement VAMC in Louisville. Several provided input to the programmatic and site-specific environmental assessments (EAs); no federal and state agencies or representatives expressed opposition to the proposed project. The public and agencies will also now have an opportunity to comment on this Draft EIS, with their input incorporated into the Final EIS.

During both EAs, some residents and local government representatives in the vicinity of the Brownsboro Road site expressed opposition to the replacement VAMC at this location. The residents were particularly expressive regarding the potential for further deterioration of the traffic conditions in the area, changes in travel distances for Veterans to be served at the proposed replacement VAMC, and the effects on adjacent properties of stormwater runoff, aesthetic changes, and property values due to construction of the facility on a parcel that is currently undeveloped.

Since the project was first announced, several dozen newspaper articles have been published in local newspapers regarding VA's need for a replacement VAMC in the Louisville area. In addition, articles regarding the Brownsboro Site have been published in local newspapers and stories have been broadcast by local television stations. Public input regarding the project was obtained through the scoping process and public comments on the previous EAs, and scoping for this EIS.

In summary, the proposed replacement VAMC, and particularly Alternative A, is associated with public controversy. The issues of concern to the public that were identified through the scoping process for this EIS have been evaluated in this impact analysis.

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4.18 Unavoidable Adverse Impacts

Unavoidable adverse impacts are those that would occur if an alternative was implemented. In many cases, adverse impacts that were identified and evaluated in this chapter are avoidable through following agency policies, procedures, and directives; complying with federal, state, and local requirements; and applying best management practices and mitigation measures, including those listed in Chapter 5.

The following unavoidable adverse impacts have been identified.

Air Quality: Air emissions, within permit limits, would occur during construction under Alternatives A and B, and during operation under Alternatives A, B, and C. These emissions would be controlled to acceptable levels by compliance with permit limits and regulatory requirements.

Aesthetics: During early stages of construction, the presence of heavy equipment and unfinished stages of site preparation and building construction would temporarily impact visual quality. Over the long term, the VAMC would create a noticeable contrast to the existing landscape, obstruct or detract from what some observers would consider a scenic view, or introduce visual elements that some observers would consider out of scale or character with the surrounding area. The extent of these adverse effects would range from negligible to major, depending on the observer.

Noise: Construction-related noise and vibration impacts would be adverse, short-term, and potentially moderate in magnitude (approaching EPA threshold levels), depending on the receptor type and proximity to the project location. Operation-related noise impacts would be minor.

Land Use: Temporary disturbances to access to adjacent land uses could occur during construction. The design heights of the VAMC buildings and parking decks would not be compatible with the height limitations in existing zoning, and would therefore be an adverse impact to adjacent land use.

Solid Waste and Hazardous Materials, Utilities: Construction would generate solid waste. Solid, medical, and hazardous waste would be generated by operation of the VAMC at the existing or a new location. Energy (electricity and natural gas) and water would be consumed during construction and operation. VA would continue to comply with VA's Waste Prevention and Recycling Program, strategic sustainability performance plan, Sustainability Management Policy, and related agency guidance to minimize waste generation and improve energy and resource efficiency.

Transportation and Traffic: Travel times and intersection delays would be comparable for either Alternative A or a similar mixed use development that would be anticipated to locate at the Brownsboro Site. There are overall major travel time impacts under Alternative B compared to future conditions without the VAMC, particularly for VAMC traffic exiting the site and going to the I-265 interchange at LaGrange Road.

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4.19 Relationship Between Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

CEQ's NEPA regulations (40 CFR 1502.16) require consideration of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This involves considering whether an alternative would sacrifice a resource value that might benefit the environment in the long-term for some short-term value to the government or the public. In this analysis, short-term refers to a time span of approximately five years, including continued uses that would not change and the construction and initial operation of any new facilities. Long-term refers to VA's ongoing operation of existing or new facilities for as long as the location is operated by VA and all time thereafter.

Short-term uses are generally those that determine the present quality of life for the public, including Veterans utilizing VA health care services, VA employees, and the local community. The current use of the existing Zorn Avenue VAMC is that of a facility providing health care services to Veterans. The short-term uses of the environment associated with implementing any of the alternatives would be those typical of operating a medical hospital. Table 4.19-1 summarizes the current use of each existing and potential facility location, and how that use would change under each alternative.

Table 4.19-1. Existing and Future Uses.

Location and Existing Use	Change to Use, by Alternative		
	A	B	C
Brownsboro Site – undeveloped land	Veterans health care	No VA use; expected mixed-use development	No VA use; expected mixed-use development
St. Joseph Site - agriculture	No VA use; expected development	Veterans health care	No VA use; expected development
Existing Zorn Avenue VAMC – Veterans health care	No VA use; re-use to be determined	No VA use; re-use to be determined	Veterans health care

Long-term productivity for a medical facility refers to its capability to support and improve the health of patients seeking care, which is a component of the human environment. Alternatives A and B would improve one or more aspects of the long-term productivity of the Louisville Veterans health care services by providing Veterans with facilities of sufficient capacity to meet their current and projected future healthcare needs in the Louisville service area. The clear goal of VA's proposal for a replacement VAMC is to maintain and enhance the long-term productivity (capacity to provide health care for Veterans) of its facilities.

No measurable difference in the current level of impact to long-term productivity of the human or natural environment is expected, regardless of changes that may be made in the location and levels of activities at a VAMC in Louisville:

- The proposal is for a campus to replace the existing Louisville VAMC within the same metropolitan area. Long-term effects of facility operation would remain generally similar across the alternatives, with the exception of cumulative effects related to traffic compared to the differing current condition baseline traffic scenarios at each location. Because development of the Alternative A and B parcels is expected to occur by others regardless of VA's selected alternative, the long-term traffic and land use conditions would change at both the Brownsboro Site and St. Joseph Site, even if VA did not construct and operate a VAMC there.
- Construction being considered by VA under Alternatives A and B could result in disturbance, use, and long-term decreased productivity of relatively small amounts of previously undisturbed

land. In both cases, these potential locations for constructing and operating a replacement VAMC represent development similar to development that would be expected to occur by others on each parcel in the absence of VA's use. The mitigation measures (see Chapter 5), best management practices, federal and state regulatory compliance, and adherence to VA's policies and guidance for new facilities would consider and seek to minimize any potential for impacts to the environmental values and characteristics of the natural and human environment.

- Ongoing management of sanitary solid waste and medical waste generated by existing or new locations would continue to require the use of energy and space at local or regional disposal facilities. Construction debris would similarly require appropriate disposal. Land used for waste management requires a permanent commitment of terrestrial resources, preventing its long-term environmental productivity. A VA health care facility would not constitute a novel waste source nor generate more than a minor or negligible portion of the volume of the waste handled by a facility; thus, it would have a similarly minor or negligible contribution to the lack of long-term productivity of the land used for disposal. Adequate landfill capacity has already been developed in the area to accommodate any construction waste associated with the alternatives, and thus would also have a minor or negligible contribution to the lack of long-term productivity of the land used for its disposal.

4.20 Irreversible or Irretrievable Commitments of Resources

The CEQ NEPA regulations (40 CFR 1502.16) require an analysis of irreversible and irretrievable commitments of resources, such as the use or consumption of a resource that is neither renewable nor recoverable, or the unavoidable destruction of environmental resources. Irreversible and irretrievable commitments of resources from the replacement Louisville VAMC alternatives include fossil fuel-based energy consumption and use of nonrenewable materials for construction and operation. Construction, operation, and transportation would mainly rely on fossil fuel-based energy to run construction equipment; supply heat, air conditioning, and electricity for operation of the medical facilities; and power private, public, and potentially volunteer transportation of patients to and from the facilities. Energy would be consumed in the form of gas- and oil-generated electricity, fuel oil, natural gas, propane, gasoline, and diesel fuel. Materials from nonrenewable sources used for construction and operation include those produced from mined materials (such as metals) or petroleum-based plastics, polymers, and other materials.

In compliance with Executive Order 13693, VA's strategic sustainability performance plan, in part, identifies approaches for reducing energy use and cost, finding renewable or alternative energy solutions, and using recycled and sustainably produced materials. The provisions of the plan apply agency-wide, including during implementation of the selected alternative from this EIS process, reducing the irreversible and irretrievable commitment of resources.

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5.0 MITIGATION

The Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations [CFR] 1508.20) state that mitigation includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- Compensating for the impact by replacing or providing substitute resources or environments

The measures and best practices identified in this environmental impact statement (EIS) include measures that are incorporated into an alternative; compliance with federal, state, and local regulatory requirements; best management practices incorporated into an alternative; and additional VA-proposed protective measures. The record of decision (ROD) for an EIS binds an agency to implement specific mitigation commitments stated in the ROD. In addition, compliance with regulatory requirements is enforced by the respective regulatory agency. For example, compliance with air quality regulations would be enforced by the Kentucky Department for Environmental Protection – Division for Air Quality. Where relevant for a particular alternative, the following measures can reduce the adverse impacts that were identified in Chapter 4.

5.1 Aesthetics

The Department of Veterans Affairs (VA) would consult with local officials and consider recommendations on setbacks, landscaping, lighting, and exterior facades in accordance with 40 United States Code 619(c) and (d).

Outdoor construction activities would cease at sunset so there would be no impact from the use of construction equipment lights for nighttime lighting. Any security lighting used during construction would be directed downward to minimize light trespass onto adjacent property and land uses.

Exterior lighting of the campus would be controlled to minimize light trespass but would be designed to meet physical security requirements. Light fixtures (or luminaires) would use the cutoff design that directs light downward and minimizes glare. Fixtures for the security fence would be a similar style as adjacent neighborhood fixtures provided that cutoff design requirements are met. The exterior lighting would be generally consistent with the Land Development Code.

5.2 Air

Measures to minimize particulate emissions during construction are specified by Louisville Metro Air Pollution Control District (APCD) Regulation 1.14 on controlling fugitive dust. VA will require the general construction contractor to prepare and submit a dust control plan to be reviewed and approved by the APCD before the start of any site preparation and construction activities. The plan will specify the abatement measures to prevent visible dust emissions beyond the property boundaries, and will include the following measures:

- Provide the approved dust control plan to subcontractors and establish expectations for compliance with the plan.
- Post site rules for dust control.
- Install and maintain trackout control devices at the construction entrance and exit locations.
- Establish type and frequency of application of dust suppression methods, such as water sprays or dust palliatives.
- Apply dust suppression (water or palliative) on all disturbed ground surfaces and material stockpiles.
- Cover loaded haul trucks entering and exiting the project site.
- Limit vehicle speed to 15 miles per hour or less on the project site.
- Clean paved road surfaces adjacent to the project site of dirt and mud from construction traffic and activities.
- Suspend earth-moving activities during high wind conditions.
- Establish a schedule to monitor abatement measures for effectiveness and make adjustments as necessary.

The construction or installation and operation of emission source equipment (boilers, cooling towers, generators, and gasoline dispensing equipment) would comply with Louisville Metro APCD permit requirements.

VA will implement any measures to minimize or monitor emissions as may be required by the Louisville Metro APCD as a condition of issuing the construction or operating permits.

5.3 Cultural Resources

Under Alternatives A and B, VA's plans for disposition of the potentially National Register of Historic Places-eligible existing Zorn Avenue VA Medical Center (VAMC) have not been determined and would be the subject of a future reutilization feasibility study, National Environmental Policy Act analysis, and consultation under Section 106 of the National Historic Preservation Act, as appropriate.

5.4 Geology and Soils

Designing and constructing the facilities of the VAMC campus following the karst-related guidelines of the Louisville Metro Government Land Development Code will ensure that the potential for adverse impacts of development on karst terrain are addressed. VA will ensure the requisite karst survey or geological assessment has been or would be completed by a State of Kentucky licensed engineer, and construction performance standards that address karst features are included in the site design.

During construction, a geotechnical engineer will be present to observe the excavation, rock removal, and geothermal bore drilling to determine whether treatment methods will be required for any exposed sinkholes and to minimize the potential for karstic activity.

Any blasting operations, if needed, will be conducted by a person certified by the Kentucky Department of Natural Resources. In accordance with Kentucky Revised Statute 350.430, if blasting is determined to be needed, VA will provide advance written notice of the blasting schedule to the Louisville-Jefferson

County Metro Government and area residents within one-half mile of the project site, and if requested by a resident or owner of a structure within the notification area, conduct a pre-blast survey of the structure. The notice will include a point of contact for requesting a survey as well as for additional questions related to any blasting activities.

As with any other commercial development, if needed, the building would be constructed to incorporate a radon mitigation system in compliance with all applicable design and construction standards, if such a system is required to ensure that building occupants would not be exposed to radon in excess of 4 picocuries per liter.

Construction- and operation-related geology and soils impacts, including erosion and sedimentation impacts, would be minimized through implementation of the following:

- Design, install, and maintain erosion and sediment controls during the duration of construction activities and any subsequent soil disturbance activities near site drainages. Such controls may include silt fences, runoff control berms, erosion control fabric, and rip-rap.
- Minimize the disturbance of steep slopes.
- Provide an undisturbed natural buffer between the activity area and surface drainages, and direct stormwater runoff to vegetated areas.
- Develop a stormwater pollution prevention plan, consistent with the requirements of the construction general permit.
- Implement spill and leak prevention and response procedures.
- Use appropriate dust control methods during construction activities. Dust control methods include water sprays, chemical soil additives, and wheel washers.
- Suspend construction activities during periods of high winds.

Contractor selection and bore drilling procedures for the geothermal system would follow the requirements and best practices detailed in VA's *Master Construction Specification, Division 23 81 49, Ground-Source Heat Pumps*. This specification requires (1) the contractor is accredited by the International Ground Source Heat Pump Association (IGSHPA) or an equivalent nationally recognized association, (2) loops are constructed in accordance with specific IGSHPA configurations, and (3) specific borehole construction and grouting practices are utilized to protect hydrogeological resources.

Landscape vegetation would be installed and maintained throughout the lifetime of this campus.

5.5 Hydrology and Water Quality

The Stormwater Pollutant Prevention Plan and Erosion Prevention and Sediment Control Plan will outline required measures and best management practices to implement, monitor, and maintain to ensure stormwater runoff during construction is controlled and water quality is not adversely affected. VA (and/or USACE on its behalf) will ensure the construction contractor adheres to both plans, as well as the groundwater protection plan and agency specifications for borehole drilling.

Construction- and operation-related hydrology and water quality impacts, including erosion and sedimentation impacts, would be minimized through implementation of the best management practices listed for Geology and Soils (Section 5.4). Additional impacts would be minimized through implementation of the following:

- Design new facilities to minimize the area of impervious surfaces.
- Route stormwater runoff from impervious surfaces to stormwater retention and drainage areas.
- Implement spill and leak prevention and response procedures, including maintaining a complete spill kit at the project area, to reduce the impacts of incidental releases of vehicle fluids.
- Design onsite construction staging areas to minimize stormwater runoff from these areas directly to drainages.

Before drilling any geothermal bores, a groundwater protection plan (GPP) would be prepared in accordance with Kentucky Administrative Regulation (Title 40, Chapter 5:037). A GPP establishes the minimum acceptable groundwater protection practices for such construction. A state-certified water supply well driller would construct the geothermal bores; the driller would provide project-specific details in the GPP, identifying the construction practices that would be implemented to protect groundwater for this specific project, such as full-depth grouting for each borehole to prevent shallow, often lower-quality groundwater from reaching deeper groundwater. The GPP would be retained in the drill rig(s) or contractor vehicle(s) that would be present onsite during the drilling.

The approved design, operation, and maintenance of the stormwater management infrastructure will ensure stormwater runoff is restored to predevelopment site hydrology (meeting predevelopment discharge rates for the 2-, 10-, 25-, and 100-year storm events) in accordance with the Metropolitan Sewer District (MSD) stormwater discharge regulations.

The discharge of groundwater to surface water from dewatering during construction or a sump during operation would be permitted in accordance with the Kentucky Pollutant Discharge Elimination System and would be monitored to ensure water quality standards are maintained to prevent adverse impacts from occurring.

The geothermal system would be constructed in accordance with VA's Master Construction Specification, Division 23 81 49, Ground-Source Heat Pumps, which specifies strict requirements related to the chemical and physical properties and limits on the toxicity of the heat transfer fluid used in closed loop geothermal systems at VA facilities. The specification also requires installation of an Underwriter Laboratories-listed leak detection system with a sensor probe, control panel, and LED indicators.

5.6 Wildlife and Habitat

Measures that would be employed to minimize wind erosion of soils would also avoid noxious weed infestations, such as minimizing the amount of exposed soils at any given time during construction activities, quickly revegetating disturbed areas following completion of activities, and maintaining landscaping during the campus operation. Monitoring and eradication will also be implemented, as needed, to reduce noxious weeds from invading the project site after ground disturbance occurs and before landscaping is installed.

To protect migratory birds if construction is scheduled to begin between April and July, the project site will be surveyed by a qualified biologist to confirm the absence of nests and nesting activity. If found, active nests (containing eggs or young) will be avoided until they are no longer active or the young birds have fledged. The Kentucky Department of Fish and Wildlife Resources will be contacted for guidance on appropriate avoidance measures for specific species and distances to keep away from active nests.

To avoid impacts to roosting northern long-eared bats at the Brownsboro Site and to the Indiana bat and northern long-eared bat at the St. Joseph Site, VA would ensure that any unavoidable tree removal would only occur between October 1 and March 31, or that tree removal during roosting season was preceded by a mist net survey to confirm the absence of any listed bats from the site. These actions would be coordinated in consultation with the Kentucky Ecological Services field office of the U.S. Fish and Wildlife Service (FWS) to ensure compliance with Section 7 of the Endangered Species Act.

Alteration of habitat at the St. Joseph Site would require an onsite inspection for the presence of running buffalo clover prior to site clearing under Alternative B. VA would coordinate and consult with the Kentucky Ecological Services field office of the FWS on field methods for the survey and specific requirements to fully comply with Section 7 of the Endangered Species Act if this plant species is identified onsite in areas proposed for disturbance.

5.7 Noise

VA will conduct a community outreach effort to local elected officials, businesses, and residents to provide early information and schedules on construction activities and expected noise levels and durations.

Construction activities are allowed between 7:00 a.m. and 9:00 p.m. daily in accordance with the Louisville-Jefferson County Metro Government noise ordinance.

Construction contractors will be required to shut down heavy equipment and stationary construction equipment if not actively being used.

VA will include in the construction bid documents the requirement for offerors to submit details of their plan to manage site use, including limited onsite parking during construction. VA anticipates this approved plan may also mitigate noise impacts to the extent it decreases the number of construction worker vehicles commuting to the site.

Any blasting operations, if needed, will be conducted by a person certified by the Kentucky Department of Natural Resources. In accordance with Kentucky Revised Statute 350.430, if blasting is needed, VA will provide advance written notice of the blasting schedule to the Louisville-Jefferson County Metro Government and area residents within one-half mile of the project site, and if requested by a resident or owner of a structure within the notification area, conduct a pre-blast survey of the structure. The notice will include a point of contact for requesting a survey as well as for additional questions related to any blasting activities.

5.8 Land Use

VA would notify adjacent property owners of construction schedules and activities to minimize disturbance to land uses during construction. Outdoor construction activities would cease at sunset to minimize disruption to access to residential areas. Construction would not block ingress/egress to adjacent businesses during their business hours of operation.

5.9 Floodplains and Wetlands

There are no wetlands present at the Brownsboro Site (Alternative A). At the St. Joseph Site (Alternative B), site design would avoid jurisdictional (regulated) wetlands to the extent practicable. In the event that

wetlands would be impacted by construction activities, VA would consult with, and obtain the necessary permit(s) from USACE and the Kentucky Department for Environmental Protection in compliance with Sections 401 and 404 of the Clean Water Act. As directed, VA would conduct any mitigation requirements to compensate for the lost function and value of wetlands either by creating or enhancing other wetlands onsite or at an offsite location through an established mitigation bank, or through an in-lieu fee program.

5.10 Socioeconomics

No adverse socioeconomic effects were identified.

5.11 Community Services

General contractors would minimize needs related to emergency response and public safety services by properly maintaining construction equipment and implementing "good housekeeping" procedures to prevent fire ignition, educating construction workers in Occupational Safety and Health Administration-required safety standards, and securing and monitoring the construction site. In addition, the general contractor would be required to follow the occupational health and safety, accident prevention, fire safety, and site security policies of the federal agency overseeing construction.

5.12 Solid Waste and Hazardous Materials

Construction- and operation-related solid waste and hazardous materials impacts would be minimized through implementation of the following:

- Conduct proper vehicle maintenance and inspection to reduce the potential for incidental releases of vehicle fluids.
- Should environmental contamination be encountered during construction activities, all waste would be abated and managed in accordance with regulations and disposed in appropriate disposal facilities.
- In the event that a new underground storage tank and/or piping is installed as part of facility construction, Kentucky Department for Environmental Protection must be notified. A permit is also required to install aboveground storage tanks for petroleum products or hazardous substances.
- Maximize reuse and recycling of wastes to minimize quantities destined for disposal.
- Implement construction and operational best management practices to minimize effects and comply with applicable regulations.

5.13 Transportation and Traffic

VA will continue to coordinate with the Kentucky Transportation Cabinet (KYTC) on the planning, design, and construction of the Watterson Expressway (I-264) and US 42 interchange improvement project, which includes construction of the intersection at KY 22 (Old Brownsboro Road) and the entrance/exit to the VAMC campus.

VA will include in the construction bid documents the requirement for offers to submit details for their plan to manage site use, including limited onsite parking during construction. VA anticipates this

approved plan may also mitigate impacts to local traffic to the extent it decreases the number of construction worker vehicles commuting to the site.

The Leadership in Energy and Environmental Design Silver certification design for the VAMC campus requires energy conservation measures that reduce air pollutants associated with combustion sources, which in turn, also reduces vehicle trips. Some of these measures include vehicle-sharing (carpool) programs and parking incentives, public transit programs, and bicycle storage racks.

VA will implement, if practicable and feasible, flextime and variable staff work schedules with the objective of avoiding morning and evening peak hour traffic.

VA will request service and supply deliveries be scheduled, if practicable and feasible, to avoid morning and evening peak hour traffic.

VA will encourage the Transit Authority of River City (TARC) to extend bus routes onto the VAMC campus to serve the VAMC and Veterans Benefit Administration buildings for patients, visitors, and staff to reduce personal vehicle trips.

VA will advocate for potential solutions that KYTC could implement to improve traffic along the Brownsboro Road corridor, including:

- Widen KY 22 to five lanes.
- Widen Herr Lane to three or five lanes to improve the connection between US 42 and Westport Road.
- Convert the US 42 intersection with KY 22 and Northfield Drive to right-in/right-out. This option was recommended in the 2011 Scoping Study for the US 42 interchange, but was not carried forward into Phase 1 Design or included in the Interchange Modification Report. Reductions in traffic from the opening of the Westport Road interchange and the ramp split from the I-264 eastbound off-ramp directly to KY 22 along with heavy public opposition led the KYTC to drop converting the intersection from consideration.
- Relocate the US 42 / KY 22 intersection to Glenview Avenue and construct a connector road. This option was explored as part of the 2011 Scoping Study for the US 42 interchange and as part of the construction of the ramp split from the eastbound I-264 off-ramp directly to KY 22. The connector road would be needed if the US 42 intersection with KY 22 and Northfield Drive was converted to right-in/right-out.
- Consider adding an interchange along I-71 at the US 42 underpass.
- Consider a direct connection between KY 22 and I-264 westbound using a flyover ramp. As part of the Value Engineering Study performed for the US 42 interchange in December 2014, KYTC considered a direct flyover ramp connection from KY 22 traffic directly over the I-264 eastbound off-ramp and I-264 before merging with the I-264 westbound on-ramp. This addition would remove a considerable amount of traffic from the single-point urban interchange (SPUI) intersection and from the US 42 intersection with KY 22 and Northfield Drive. The additional construction cost of $4.4 million and concerns for driver expectancy with this configuration led the KYTC to drop this option. However, the current design of the SPUI will be developed to not preclude the option of adding a direct flyover connection.

5.14 Utilities

Construction- and operation-related utilities impacts would be minimized through implementation of the following:

- Consider use of renewable energy generation and energy/water conservation measures in the design of new and renovated facilities.
- Utilize native vegetation and drought-resistant vegetation for area landscaping to reduce irrigation requirements.
- Comply with Louisville Water Company, MSD, and Louisville Gas & Electric requirements.

5.15 Environmental Justice

No environmental justice impacts were identified.

6.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

The goals of agency coordination and public involvement are to provide thorough information in a convenient and timely manner to allow meaningful input to the National Environmental Policy Act (NEPA) process, and help facilitate decisions to be made by the U.S. Department of Veterans Affairs (VA). Agencies and the public are commonly referred to as "stakeholders". Stakeholders include those who may be affected by or have an interest in VA's proposal for a replacement VA medical center (VAMC) and the NEPA process, including individuals, interest groups, community organizations, elected officials, tribal governments, and federal, state, or local government agencies.

6.1 Agency Coordination

Coordination with federal, state, or local agencies is required by certain laws such as the Endangered Species Act, National Historic Preservation Act, and Clean Water Act; executive orders addressing interagency and intergovernmental coordination; and the Council on Environmental Quality (CEQ) regulations implementing NEPA that emphasize cooperative consultation among agencies. Agencies with jurisdiction by law or with special expertise with respect to any environmental issue are requested to cooperate in the NEPA process (40 Code of Federal Regulations [CFR] 1501.6). VA notified, via direct-mail postcard, the following federal, state, and local agencies and elected officials of VA's intent to prepare this environmental impact statement (EIS):

- U.S. Department of Agriculture – Natural Resources Conservation Service
- U.S. Environmental Protection Agency, Region 4 – NEPA Program Office
- U.S. Fish and Wildlife Service – Southeast Region, Kentucky Ecological Field Services Office
- U.S. Senator Mitch McConnell (KY)
- U.S. Senator Rand Paul (KY)
- U.S. Senator Dan Coats (IN)
- U.S. Senator Joe Donnelly (IN)
- U.S. Representative Ed Whitfield (KY-1st District)
- U.S. Representative Brett Guthrie (KY-2nd District)
- U.S. Representative John Yarmuth (KY-3rd District)
- U.S. Representative Thomas Massie (KY-4th District)
- U.S. Representative Hal Rogers (KY-5th District)
- U.S. Representative Larry Buschon (IN-8th District)
- U.S. Representative Todd Young (IN-9th District)
- Kentucky Department for Environmental Protection
- Kentucky State Historic Preservation Officer (SHPO)
- Kentucky Governor Steve Beshear
- Kentucky State Representative Bob DeWeese (48th District)
- Develop Louisville
- Louisville Metro Air Pollution Control District
- Louisville Metro Department of Public Works
- Louisville Metro Parks Department
- Louisville Mayor Greg Fischer
- Louisville Metro Council

VA requested scoping input for this EIS, while acknowledging that information, comments, and feedback provided for the previous environmental assessments (EAs) did not need to be re-submitted. Input from these agencies and officials was received during this EIS scoping period from Louisville Metro

Councilwoman Angela Leet; her input is included in the scoping summary in Section 6.2.2 and Appendix C.

During development and review of the programmatic and site-specific EAs, VA contacted federal, state, and local agencies with oversight responsibilities related to this project. Table 6-1 lists the agencies and the input received.

Table 6-1. Agency NEPA Coordination and Input to Date for Replacement Louisville VAMC.

Agency	Input*
U.S. Fish and Wildlife Service – Southeast Region	Programmatic EA: Brownsboro Site was previously cleared, is adjacent to a highway, and surrounded by development. Based on these factors, the site does not contain suitable roost trees for Indiana bats and future development would not likely adversely affect the Indiana bat. Indiana bat and running buffalo clover may be present at St. Joseph Site and Zorn Avenue campus. Site-specific EA: Brownsboro Site should be surveyed for newly listed northern long-eared bat.
U.S. Natural Resources Conservation Service – Mount Washington Service Center	Programmatic EA: No response was reported. Site-specific EA: Development of Brownsboro Site does not require further consideration for protection of prime or unique farmland.
Kentucky Department for Environmental Protection	Programmatic EA: Division of Air Quality stated that any future VA development of any site would be required to comply with regulations 401 KAR 63:010 (Fugitive Emissions), and recommended that local government regulations should be considered. Nature Preserves Commission indicated that they did not have any concerns. Division of Water stated that best management practices should be used to reduce runoff from development of any site into adjacent surface waters. Division of Waste Management stated that they do not have any comments and would provide comments after the site selection has been completed. Site-specific EA: No comments received.
Kentucky Department of Fish and Wildlife Resources	Programmatic EA: • Impacts to aquatic resources should be minimized through the implementation of strict erosion control measures prior to any future construction to minimize siltation into streams and stormwater drainage systems located within the project area. Such erosion control measures may include, but are not limited to, silt fences, staked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures would need to be installed prior to any future construction and should be inspected and repaired regularly as needed. • No listed threatened or endangered species were identified for the Brownsboro Site. However, this site falls within known Indiana bat summer maternity habitat and is considered a sensitive area for this species. The Kentucky Department of Fish and Wildlife Resources stated that further coordination with the U.S. Fish and Wildlife Service Kentucky Field Office would be required prior to any future construction. • No listed species were identified at the St. Joseph Site, but impacts to streams and wetlands should be addressed if deemed necessary. • Louisville crayfish may be present, and the campus is also within sensitive habitat for the Indiana bat. Site-specific EA: No comments received.

Agency	Input*
Kentucky Transportation Cabinet (KYTC)	Programmatic EA: • The KYTC has planned improvements to the I-264 and Brownsboro Road interchange (single point urban interchange). The reconfigured interchange would likely be able to accommodate the proposed VAMC without significant, additional modifications to roadways. • At the St. Joseph Site, KYTC indicated that the Old Henry Road/I-265 interchange has ample capacity for the future VAMC. This intersection was designed with the development of the surrounding area for residential, commercial, and medical facilities in mind, including the St. Joseph Site. A connector road from the St. Joseph Site to Old Henry Road would be the best way to access the site. • At the existing Zorn Avenue campus, westbound I-71 frequently backs up to Zorn Avenue. I-71 highway expansion in the works and should go a long way to solve the problems. No changes to I-71/Zorn Avenue interchanged planned or needed. Zorn Avenue also has plenty of capacity. Site-specific EA: No comments received.
Kentucky Heritage Council (SHPO)	Programmatic EA: • The SHPO concurred with findings that the Brownsboro Site does not contain cultural resources listed, or eligible for listing, in the National Register of Historic Places and that no further archaeological investigations are indicated. Additional analyses would be required to evaluate direct and indirect impacts to above ground cultural resources within the area of potential effect (APE). Site-specific EA: A cultural resources survey of the APE was completed, with a recommended finding of no adverse impacts to historic properties. SHPO reviewed and determined that undertaking at Brownsboro Site will have no adverse effect on historic properties.
Jefferson County – Louisville Metro Public Works and Assets	Programmatic EA: • For Brownsboro Site, stated concern regarding the potential future loss of pervious surfaces but did not indicate that this would prevent the future development of a VAMC at the site. The site includes prime and unique farmland soils. Future construction of a VAMC at this site would create traffic and associated air quality issues. The US 42 and I-264 interchange is already congested and any further development in this area could require major improvement to the highway infrastructure, likely involving improvements to the I-264 interchange. With the congestion at this location, further degradation to traffic and air quality would be problematic. Indiana bats have been found in many wooded areas in Jefferson County. Site-specific EA: No comments received.

*The EA input summarized in this table is that which was specific to the Brownsboro Road, St. Joseph, and Zorn Avenue sites and is relevant to their environmental conditions.

VA consults with federally recognized tribal governments in accordance with Section 106 of the National Historic Preservation Act on issues relating to historic properties, including those of traditional religious and cultural importance. VA also consults with tribal governments on a much broader range of potential tribal concerns and issues with respect to proposed VA actions, as prescribed by Executive Order 13175, Consultation and Coordination with Indian Tribal Governments and by VA Directive 8603, Consultation and Communication with Federally-Recognized Indian Tribes.

The programmatic EA reported that VA, via a coordination and consultation letter sent by certified mail, invited federally recognized tribes that have potential ancestral ties to Jefferson County to participate in the NEPA process, and that no response from any of these tribes was received during that EA. VA also sent letters to the Delaware Nation, Miami Tribe of Oklahoma, Peoria Tribe, and Eastern Band of

Cherokee Indians inviting their comment on the draft site-specific EA. The Peoria Tribe replied that they have no objection to the proposed project at the Brownsboro Site, the Delaware Nation found no concerns for construction of the proposed facility, and no reply was received from the other two tribes. The VA letters and the Delaware Nation and Peoria Tribe responses are included in Appendix D.

6.2 Public Involvement

The public involvement process begins with scoping and continues throughout the preparation of the EIS until VA signs the record of decision. This section describes the milestones and timeframes when stakeholders are involved during the NEPA process.

The public involvement process to date for this EIS has consisted of publication of a Notice of Intent to prepare the EIS, a scoping period, and publication of a Notice of Availability of this Draft EIS. The process will continue with a 45-day public comment period on the Draft EIS, including a public meeting to accept comments on the document.

6.2.1 Notice of Intent

The Notice of Intent is the U.S. government's means of notifying the public and interested parties of an agency's intention to prepare an EIS for its proposed action. VA published a "Notice of Intent to Prepare an Environmental Impact Statement for a Replacement Robley Rex Veterans Affairs Medical Center, Louisville, Kentucky" in the Federal Register on October 30, 2015. The Notice of Intent is included in Appendix C.

6.2.2 Scoping

"Scoping" is the term used in the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1501.7) to define the process for determining the scope of issues to address during the environmental analysis of an agency's proposed action. Scoping also helps identify issues that are neither significant nor relevant to a proposal, or alternatives that are not feasible, thereby eliminating these issues or alternatives from detailed analysis.

In addition to the scoping period conducted for this EIS, extensive public input was provided by Veterans, elected officials, residents near the alternative locations, and other interested members of the public throughout the scoping and public draft reviews for the two previous EAs related to this proposal. These comments remain in the project record and have been incorporated as identified scoping issues for this EIS.

This EIS has considered all the scoping comments, whether a comment was made once or multiple times. Questions and issues raised in these scoping comments are addressed throughout this EIS, with analysis focused on a full and fair discussion of significant environmental impacts to inform the VA's comparison of environmental impacts among the alternatives in support of the Agency's decision that will be documented in the Record of Decision at the conclusion of the NEPA process.

6.2.2.1 Scoping Notice, Media Release, VA Website, and Direct Mail Notification

Scoping notices announcing the EIS, inviting scoping comments, and describing options for submitting scoping comments were published in the Louisville *Courier-Journal* on October 30, October 31, and November 1, 2015; and were posted online on the *Courier-Journal*'s website from October 30 to

November 7, 2015. The scoping notices were paid publications in the legal notice section of the newspaper.

VA also prepared a media release announcing the EIS, inviting scoping comments, and describing options for submitting scoping comments. The media release was circulated to 38 representatives of print media, radio, television, and online news sources; forwarded to the Kentucky Department of Veterans Affairs listserv, the Joint Executive Council of Veterans Organizations for the state of Kentucky, the Louisville Metro Council, local and federal elected officials, and the City of Louisville; and posted to the VA Louisville website.

On the VA website for the Louisville Robley Rex VAMC, a page is dedicated to the proposal for a replacement VAMC, at www.louisville.va.gov/newmedicalcenter. When the EIS was announced, VA posted a fact sheet on the EIS, the scoping process, and options for submitting comments.

Postcards were mailed to 301 individuals, organizations, government agencies, and elected officials on October 28, 2015, notifying them of the EIS, the scoping process, and options for submitting scoping comments.

The newspaper notice, media release, fact sheet, and postcard are included in Appendix C.

6.2.2.2 EIS Scoping Summary

The public scoping period was open for 31 days from October 30 through November 30, 2015. The scoping process provided sufficient opportunity for stakeholders to express their comments and provide meaningful input to the NEPA process. There were 63 unique comment letters, email, and website comments received; three of these letters/emails were submitted by email as well as through the mail or website. The majority of the comments focused on the details of or preference for an alternative, and the impacts related to traffic.

The 63 comment submissions raised 159 total issues, many of which were raised more than once in multiple letters, or for which a single letter submitted multiple issues within the same category. The 159 comment issues fall into the following categories:

Category	Number of Comment Issues
Alternatives	42
Aesthetics	6
Air quality	5
Geology and soils	2
Hydrology and water quality	3
Wildlife and habitat	1
Noise	1
Land use	11
Socioeconomics and environmental justice	9
Community services	3
Solid waste and hazardous materials	4
Transportation and traffic	47
Utilities	2
General impact analysis	3
NEPA process	4
Agency coordination	1
Public involvement	4
Out of scope	12

Table 6-2 lists the issues raised in the scoping comments, and includes several explanatory notes responding to scoping comments that are not explicitly addressed elsewhere in this EIS. A summary of the public scoping process and further details from the comments are provided in Appendix C.

Table 6-2. Summary of Scoping Comments.

Summary of Scoping Comments.
Alternatives
Locate the future site - in an area accessible by public transportation - near current medical schools, doctors, and other medical care downtown - near homeless support services The Brownsboro Site is too small for the proposed medical center campus. Surface parking is less expensive than parking garages and provides room for future expansion. The new facility should be environmentally friendly. It is a mistake to close the outpatient facilities in the Louisville VAMC Region. All of the sites identified in the programmatic EA should be included as EIS alternatives. Explain why VA prefers one site over another. Cost-benefit analysis among the alternative sites. Will there be a helipad for helicopters to be used to bring patients to the facility? ***Note:*** *VA has no current plans to have a helipad at the proposed replacement VAMC.* Will the VA pay for any damage caused by the blasting? Concern about when VA will need to use a rear exit from the property and to Carlimar Lane. Veterans do not want the Brownsboro location. Veterans prefer the Zorn Avenue location. Supposedly the Brownsboro site has been bought – why is VA considering the St. Joseph site? The studies have been done. Build on the Brownsboro Site. Veterans for the most part do not live in this area. ***Note:*** *As stated in Section 1.1, the Louisville VAMC serves Veterans from a 35-county area in western Kentucky and southern Indiana. It does not serve any one Louisville area or neighborhood.* If there was a fix for the traffic flow, I would be willing to reconsider my position. Oppose Brownsboro Site alternative. Support St. Joseph Site alternative. Support keeping facility on Zorn Avenue and adding a parking garage. Support a downtown location that would centralize services accessible to all.
Aesthetics
Concerns about appearance of campus and structures. The many story buildings and parking garage is really out of character with this residential area at Brownsboro. Appropriate planting of trees. Light pollution.
Air Quality
The addition of the hospital at the Brownsboro site will increase pollution. The additional traffic should be analyzed regarding air quality changes to the surrounding area.
Geology and Soils
Concern for sinkholes causing structural instability. The 4906 Brownsboro Road site has two different layers of limestone, both of which offgas radon gas.
Hydrology and Water Quality
Parking for 3000 cars will require at least 20 acres of land and the runoff and heat generated would be an environmental hazard. Concern for drainage issues, runoff causing habitat destruction, and effects to adjacent subdivision. Concern for impacts to structural integrity due to shallow groundwater.
Wildlife and Habitat
Wildlife will be displaced.
Noise
Concern for noise affecting the subdivision.

Summary of Scoping Comments.
Land Use
The planned hospital does not blend with the residential neighborhoods it borders. It does not fall into the planned development guidelines. The area is residential and has no multi-story non-residential buildings. The proposed project would profoundly change the longstanding character of the area and Eastern Jefferson county.
Socioeconomics and Environmental Justice
As a neighbor, I would welcome a nicely designed suitably situated VA Hospital on this site if it enhanced property values while keeping traffic flow at a bearable level. Environmental justice and socioeconomics impact analyses have not been adequately evaluated. Concern about effect on property values. Having a hospital facility of this magnitude here is likely to cause a change in the nature of the businesses in the area.
Community Services
Additional risk to other people in the area if the emergency services are being used at the VA and are not available when other people need them. When families and visitors come in from out of town, where will they stay? Adequate funding for the needed level of emergency services.
Solid Waste and Hazardous Materials
Solid and hazardous waste in residential area. Questions about existing site contamination from Agent Orange at the Zorn Avenue campus.
Transportation and Traffic
Existing traffic in the Brownsboro area is too congested and would get worse with the VAMC located there. Conduct detailed traffic studies at each location. Public transportation should be considered. The slip ramp and traffic light have created adverse impacts. Traffic for the VBA and clinic patients must also be considered. Emergency vehicle access to area in heavy traffic. Veterans access. Adequacy of interchange improvements for relieving traffic congestion.
Utilities
Solar panels should be place on the roof of the hospital. Utility infrastructure costs.
General Impact Analysis
VA's ownership of the Brownsboro Rd site should not be a factor in the EIS. ***Note:*** *VA's ownership of the Brownsboro Site is not a factor in identifying and comparing the environmental impacts of the alternatives evaluated in this EIS.* Examine all construction and operation impacts.
NEPA Process
Objectivity of EIS contractor. ***Note:*** *An EIS (or EA) is not an audit. A federal agency contracts with firms when the agency does not have the staff resources or full range of needed expertise to prepare a NEPA document in-house. The agency is the author of record of a NEPA document.* Full EIS needed.
Agency Coordination
Input from local agencies needed. ***Note:*** *City and county agencies were notified of VA's intent to prepare an EIS and the opportunity to submit scoping comments; see Section 6.1. They have also been notified of the availability of the Draft EIS for review and comment, and their input will be considered in preparing the Final EIS.*
Public Involvement
One request for in-person scoping meeting. ***Note:*** *A single request for an in-person meeting was received. VA determined that the published notices and fact sheets adequately updated the issues and status of the EIS, and therefore a meeting was not held.* EA and EIS comments from the public should be reported correctly in the EIS documentation.

Summary of Scoping Comments.
Outside Scope of EIS
Inadequate medical treatment for Veterans. Future use of Zorn Avenue campus. Sell Brownsboro Site. Develop Brownsboro Site into a national cemetery. Veterans should be able to go to any doctor or hospital they wish and carry a "Vet" insurance card that directly bills to the VA. Price paid for Brownsboro Site.

6.2.2.3 Comments on Draft Programmatic EA

On the draft programmatic EA, VA received 28 verbal public comments, 109 written comments from individuals, 144 petition signatures/emails, and input from Greater Louisville, Inc., the City of Indian Hills, and Louisville Metro Council. Many of the responders provided similar comments and many provided multiple comments, which were addressed in Appendix D to the final programmatic EA. These comments raised issues that were categorized as listed below, with details of the comments (as summarized in that EA) provided in Appendix C.

- Traffic/transportation
- Site selection
- Water resources
- Communications
- Socioeconomics/environmental justice
- Aesthetics
- Air quality
- Noise
- Land use
- General

6.2.2.4 Scoping Comments and Comments on Draft Site-Specific EA

Nineteen individuals provided verbal comments at the public scoping meeting and 23 written comment letters were received. The issues raised in these comments fell into the following categories with details of the comments provided in Appendix C.

- Purpose and need
- Proposed action
- Alternatives
- Aesthetics
- Air quality
- Geology and soils
- Hydrology and water quality
- Noise
- Land use
- Socioeconomics
- Community services
- Transportation and parking
- Utilities
- Environmental justice
- Cumulative impacts
- NEPA process
- Outside scope of NEPA or proposed action

VA received 125 comments, including verbal comments at public meetings, on the draft site-specific EA, from 97 commenters (several commenters provided multiple submissions). The issues raised in these comments fell into the following categories with details of the comments provided in Appendix C.

- Purpose and need
- Alternatives
- Aesthetics
- Air quality
- Hydrology and water quality
- Noise
- Land use
- Floodplains and wetlands
- Socioeconomics and environmental justice
- Community services
- Solid waste and hazardous materials
- Transportation and traffic
- Utilities
- General comments on impact analysis
- NEPA process
- Agency coordination
- Public involvement
- Out of scope of NEPA analysis

All in-scope issues listed in Sections 6.2.2 through 6.2.4 are addressed in this EIS to the extent they are relevant to the NEPA analysis and support identification and comparison of the environmental impacts of the alternatives.

6.3 Draft EIS Comment Period

VA published a Notice of Availability (NOA) of the Draft EIS in the Federal Register, inviting public comments on the content of this document. VA offers a 45-day comment period that officially started when the NOA for the Draft EIS was published by the Environmental Protection Agency in the Federal Register. The NOA was also published in the Louisville *Courier-Journal*, posted online (along with other project updates and information) on the VA Robley Rex Replacement VAMC webpage (www.louisville.va.gov/newmedicalcenter), and provided to the media outlets covering the service area. More than 300 stakeholders on the project mailing list were mailed a postcard with the NOA of the Draft EIS.

VA will host two public comment meetings (an identical afternoon and evening meeting on the same day, to accommodate schedules of interested parties) in Louisville during the 45-day comment period. The meetings will provide stakeholders an opportunity to comment on the potential environmental impacts as described in the Draft EIS. The meeting format will consist of a presentation to explain the purpose of and need for the replacement VAMC, describe the alternatives, and summarize the analysis and potential impacts associated with each alternative. The presentation and verbal comments at each meeting will be transcribed by a professional court reporter. The date, times, and location for the meetings are included in the newspaper notice and postcard mailing announcing the availability of the Draft EIS, and published on the VA Robley Rex Replacement VAMC webpage.

Comments may also be submitted by email to LouisvilleReplacementHospitalComments@va.gov, online at www.Louisville-EIS.com, or by U.S. Postal Service mail to Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206.

Responses to comments received during the comment period will be addressed in the Final EIS.

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9.0 GLOSSARY

Aesthetic resources: The components of the environment as perceived through the visual sense only. Aesthetic specifically refers to beauty in both form and appearance.

Affected environment: A portion of the NEPA document that succinctly describes the environment of the area(s) to be affected or created by the alternatives under consideration. Includes the environmental and regulatory setting of the proposed action.

Alternative: A reasonable way to fix the identified problem or satisfy the stated need.

Attainment area: An area that the Environmental Protection Agency has designated as being in compliance with one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants but not for others.

Conformity analysis: The Clean Air Act requires the Environmental Protection Agency to promulgate rules to ensure that federal actions conform to the appropriate state implementation plans (SIP) for air quality. Two sets of rules (one for transportation and one for all other actions) developed by EPA establish the criteria and procedures governing the determination of this conformity. A conformity analysis follows these criteria and procedures to quantitatively assess whether a proposed federal action confirms with the SIP.

Council on Environmental Quality (CEQ): Established by Congress within the Executive Office of the President as part of the National Environmental Policy Act of 1969, CEQ coordinates federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives. The Council's Chair, who is appointed by the President with the advice and c consent of the Senate, serves as the principal environmental policy adviser to the President. The CEQ reports annually to the President on the state of the environment, oversees federal agency implementation of the environmental impact assessment process, and acts as a referee when agencies disagree over the adequacy of such assessments.

Criteria pollutant: An air pollutant that is regulated by National Ambient Air Quality Standards. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, PM_{10} and $PM_{2.5}$ New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available.

Critical habitat: Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the *Endangered Species Act* and its implementing regulations.

Cumulative effect (cumulative impact): The impact on the environment that 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 non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Decibel (dB): A unit for expressing the relative intensity of sounds on a logarithmic scale from zero for the average least perceptible sound to about 130 for the average level at which sound

causes pain to humans. For traffic and industrial noise measurements, the A-weighted decibel (dBA), a frequency-weighted noise unit, is widely used. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with the loudness perceived by people.

Direct effects: Caused by the action and occur at the same time and place.

Effects: Effects and impacts, as used in NEPA, are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

Endangered species: Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations.

Environmental assessment (EA): A concise public document for which a federal agency is responsible that serves to briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact; aid an agency's compliance with NEPA when no environmental impact statement is necessary; or facilitate preparation of an EIS when one is necessary. Includes brief discussions of the need for the proposal, of alternatives, of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted.

Environmental impact statement (EIS): A detailed written statement required by Section 102(2)(C) of NEPA, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources.

Environmental justice: The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Executive Order 12898 directs federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.

Finding of no significant impact (FONSI): A public document issued by a federal agency briefly presenting the reasons why an action for which the agency has prepared an environmental assessment has no potential to have a significant effect on the human environment and, thus, will not require preparation of an environmental impact statement.

Floodplain: The lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Fugitive emissions: Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device. Any air pollutant emitted to the atmosphere other than from a stack. Sources of fugitive emissions include pumps; valves; flanges; seals; area sources such as ponds, lagoons, landfills, and piles of stored material (such as coal); and road construction areas or other areas where earthwork is occurring.

Hazardous material: Any material that poses a threat to human health and/or the environment. Hazardous materials are typically toxic, corrosive, ignitable, explosive, or chemically reactive.

Historic property: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

Impacts: see Effects.

Impervious surface: A hard surface area that either prevents or retards the entry of water into the soil or causes water to run off the surface in greater quantities or at an increased rate of flow. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, driveways, parking lots, storage areas, concrete or asphalt paving, and gravel roads.

Indirect effects: Caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Karst terrain: Regions where the type of rock below the land surface can naturally be dissolved by groundwater circulating through them. Karst terrain is characterized by springs, caves, and sinkholes. About 20 percent of the land surface in the U.S. is classified as karst. Most of the groundwater flow and transport occurs through a network of interconnected fissures, fractures, and conduits in a relatively low-permeability rock matrix (summarized from www.usgs.gov).

Level of service: A standard measurement used by transportation officials that reflects the relative ease of traffic flow on a scale of A to F, with free-flow being rated LOS-A and congested conditions rated as LOS-F.

Mitigation: Includes (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.

National Ambient Air Quality Standards (NAAQS): Standards defining the highest allowable levels of certain pollutants in the ambient air (i.e., the outdoor air to which the public has access). Primary standards are established to protect public health; secondary standards are established to protect public welfare (for example, visibility, crops, animals, buildings).

National Pollutant Discharge Elimination System (NPDES): A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the Environmental Protection Agency, a state, or, where delegated, a tribal government on an Indian reservation.

National Register of Historic Places: The nation's inventory of known historic properties that have been formally listed by the National Park Service (NPS). The National Register of Historic Places is administered by the NPS on the behalf of the Secretary of the Interior. National Register listings include districts, landscapes, sites, buildings, structures, and objects that meet the set of criteria found in 36 CFR 60.4.

No action alternative: The alternative where current conditions and trends are projected into the future without another proposed action.

Non-attainment area: An area that the Environmental Protection Agency has designated as not meeting (that is, not being in attainment of) one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants, but not for others.

Particulate matter (PM), PM_{10}, $PM_{2.5}$: Any finely divided solid or liquid material, other than uncombined (that is, pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM_{10} includes only those particles equal to or less than 10 micrometers (0.0004 inch) in diameter; $PM_{2.5}$ includes only those particles equal to or less than 2.5 micrometers (0.0001 inch) in diameter.

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across ground surface and is eventually returned to streams. Runoff can pick up pollutants from the air or the land and carry them to streams, lakes, and oceans.

Scope: Consists of the range of actions, alternatives, and impacts to be considered in an environmental analysis. The scope of an individual statement may depend on its relationships to other statements (also see tiering).

Scoping: An early and open process for determining the extent and variety of issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR §1501.7). The scoping process helps not only to identify significant environmental issues deserving of study, but also to deemphasize insignificant issues, narrowing the scope of the NEPA process accordingly, and for early identification of what are and what are not the real issues (40CFR §1500.5(d)). The scoping process identifies relevant issues related to a proposed action through the involvement of all potentially interested or affected parties (affected federal, state, and local agencies; recognized Indian tribes; interest groups, and other interested persons) in the environmental analysis and documentation.

Solid waste: Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage

sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers.

Tiering: Refers to the coverage of general matters in broader environmental impact statements (EIS) (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basin-wide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared. Tiering in such cases is appropriate when it helps the lead agency to focus on the issues that are ripe for decision and exclude from consideration issues already decided or not yet ripe.

Wetlands: Those areas that are inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances do, or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas. Jurisdictional wetlands are those wetlands protected by the *Clean Water Act*. They must have a minimum of one positive wetland indicator from each parameter (vegetation, soil, and hydrology). The U.S. Army Corps of Engineers requires a permit to fill or dredge jurisdictional wetlands.

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Appendix A
Permits

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Appendix A: Permits

This appendix lists environmental permits or other agreements that may need to be obtained by the U.S. Department of Veterans Affairs (VA) to implement the actions included in the alternatives in this environmental impact statement. Key federal, state, and local requirements are identified for both construction and operation.

Agency	Project Stage	Environmental Permit, Compliance, or Coordination	Key Requirements
Air Quality			
Louisville Metro Air Pollution Control District (APCD)	Construction	Dust control plan	Prepare and implement plan to control fugitive particulate emissions (APCD Regulation 1.14).
Louisville Metro APCD	Construction/ Operation	Permit(s) to construct and operate	Calculate potential to emit for operating units (such as boilers, generators, others) based on maximum capacity of emission sources to determine type of permit application (Title V or minor source).
Louisville Metro APCD	Operation	Gasoline dispensing facility permit	Submit application for gasoline dispensing equipment.
Louisville Metro APCD	Operation	Permit	Apply for and obtain Title V Air Quality Permit.
Cultural Resources			
Kentucky Heritage Council (State Historic Preservation Office [SHPO])	Planning/ Construction	Consultation in accordance with Section 106 of the National Historic Preservation Act	Archaeological consultation and above-ground surveys completed during EAs, pending SHPO re-confirmation of concurrence with finding of no adverse effect to historic properties.
Geology and Soils			
Natural Resource Conservation Service (U.S. Department of Agriculture)	Construction	Farmland Conversion Impact Rating (Form AD-1006)	If Alternative B is selected – Evaluate prime, unique, statewide, or local important farmland that may be impacted, in accordance with the Farmland Protection Policy Act.
Jefferson County Metro Government	Construction	Blasting notification (if blasting is determined to be needed)	In accordance with Kentucky Revised Statute 350.430, VA will provide advance written notice of the blasting schedule to the Louisville-Jefferson County Metro Government and area residents within one-half mile of the project site.
Hydrology and Water Quality			
Kentucky Department for Environmental Protection (KDEP) Division of Water	Construction	Kentucky Pollutant Discharge Elimination System General Permit for Stormwater Discharges Associated with Construction Activities	File Notice of Intent with Division of Water prior to start of construction activities; prepare and implement a stormwater pollution prevention plan to control stormwater discharges (runoff) from project site during construction.
Louisville-Jefferson County Metropolitan Sewer District	Construction	Site disturbance permit	File permit application with detailed Erosion Prevention and Sediment Control Plan.

Agency	Project Stage	Environmental Permit, Compliance, or Coordination	Key Requirements
Kentucky Energy and Environment Cabinet	Construction	Groundwater protection plan (GPP)	Prepared by borehole driller in accordance with 40 KAR 5:037. Driller would use KDEP's generic GPP and provide project-specific conditions, identifying the groundwater-protective construction practices. Approval of GPP by Energy and Environment Cabinet, available for 30-day public review.
KDEP Division of Water	Operation	Application for Emergency Authorization to Withdraw Water	Submit in the case of an emergency situation requiring a withdrawal rate greater than 10,000 gallons per day.
KDEP Division of Water	Operation	Kentucky Pollutant Discharge Elimination System Permit	File application with Division of Water to discharge groundwater from foundation dewatering system to surface water.
Wildlife and Habitat			
U.S. Fish and Wildlife Service (FWS) – Southeast Region	Planning/ Construction	Consultation with the FWS under Section 7 of the Endangered Species Act	Under Alternative A, consult with FWS regarding northern long-eared bats. Under Alternative B, consult with FWS regarding northern long-eared bats, Indiana bats, and running buffalo clover.
Land Use			
Louisville Metro Planning Commission	Planning/ Construction	Zoning	Consult with local officials and consider recommendations on zoning issues, including landscaping, setbacks, building heights, and exterior facades in accordance with 40 U.S.C. 619(c) and (d).
Federal Aviation Administration	Planning/ Construction	Notice of Proposed Construction or Alteration, FAA Form 7460-1	Provide notice for approval for construction of water tower that exceeds height restrictions within 20,000 feet of an airport.
Kentucky Airport Zoning Commission	Planning/ Construction	Form TC 56-50	File form for final design and location of water tower
Floodplains and Wetlands			
U.S. Army Corps of Engineers and KDEP	Construction	Clean Water Act Section 401/404 permit(s)	Under Alternative B, permits under Sections 401 and 404 of the Clean Water Act may be required before construction activities commence if wetlands are present.
Solid Waste and Hazardous Materials			
KDEP / State Fire Marshal	Construction	Underground storage tank (UST)/Aboveground Storage Tank (AST) Facility Registration Form	All UST systems must be registered with the KDEP UST Branch. Owners and operators of ASTs that contain petroleum and hazardous substances must obtain a permit from the state fire marshal.
Utilities			
Louisville Gas & Electric (LGE)	Planning/ Construction	LGE would obtain right of way permits and approvals from the Kentucky Public Service Commission to provide a primary and backup electrical feed to the site.	VA to coordinate and provide information to LGE as needed.

Appendix B
Traffic Study

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Veterans Affairs Medical Center Traffic Impact Study

Louisville, KY

October 2016

Prepared by
Palmer Engineering

Palmer
ENGINEERING

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Acronyms and Abbreviations

ADT	Average Daily Traffic
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
ITE	Institute of Transportation Engineers
KYTC	Kentucky Transportation Cabinet
LOS	Level of Service
SPUI	Single Point Urban Interchange
VA	Veterans Affairs

1.0 Introduction

This traffic study was undertaken to assess the traffic impact of a proposed replacement medical center campus, also referred to as proposed hospital in this report, by the Department of Veterans Affairs in Jefferson County, KY. The study analyzed and compared three sites:

- Existing Site (Zorn Avenue)
- St Joseph Site(Factory Lane)
- Midlands Site (KY 22)

The intersections within each study area were analyzed for levels of service and delay. The study also measures travel time data for each site. Travel time data are measured between the interstate and the VA Medical Center for the AM and PM peak periods for all three sites. The analyses determine the impacts that the proposed hospital will have on the street network surrounding each of the sites.

The Existing Site (Zorn Avenue) was studied for the AM and PM peak hours in the 2015 Existing and the 2025 No Build conditions. The St Joseph Site (Factory Lane) was studied for the AM and PM peak hours in the 2015 Existing, 2025 No Build, and 2025 Build (with VA Medical Center) conditions. The Midlands Site (KY 22) was studied for the AM and PM peak hours in both the 2015 Existing and the 2025 Build conditions. Two scenarios for the Midlands Site Build conditions were analyzed: 1) with the VA Medical Center, and 2) with a Mixed Use Development in place of the VA Medical Center. Those conditions were also studied both with and without the new Single Point Urban Interchange (SPUI) planned for construction by the Kentucky Transportation Cabinet (KYTC Item No. 5-804.00).

A vicinity map (Figure 1) displays the location of each site while the study area maps (Figures 2, 3, and 4) show the limits of each site. The proposed hospital will have 1,030,500 square feet of gross floor space and is anticipated to be complete by 2022.

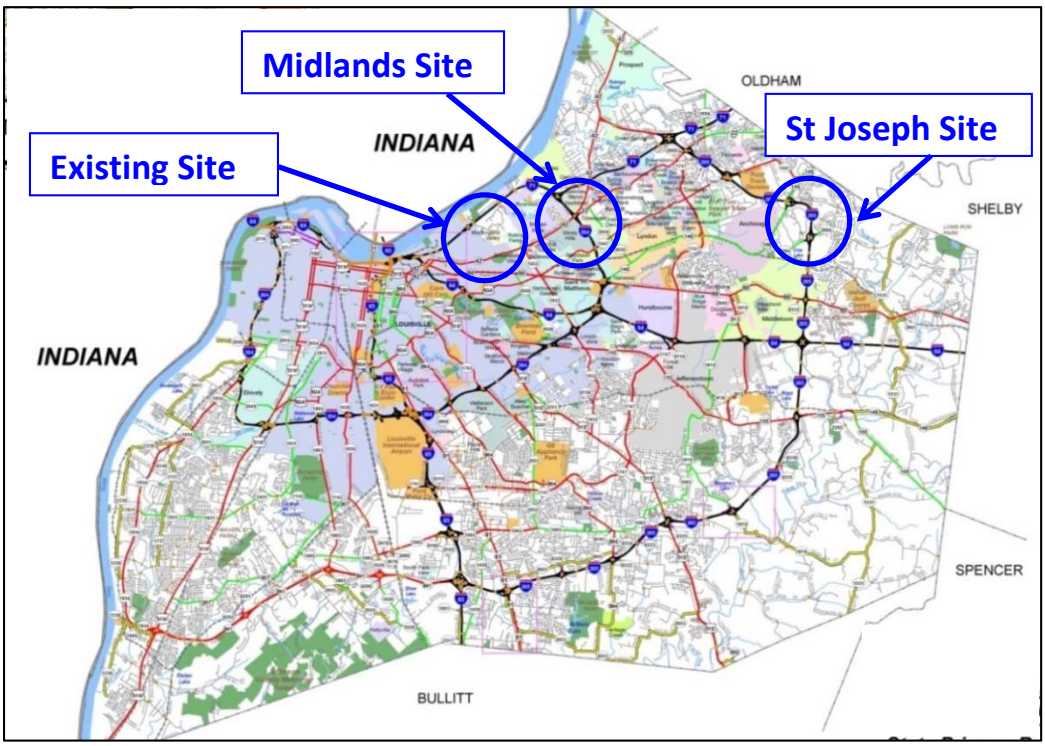


Figure 1: Vicinity Map

Figure 2: Study Area – Existing Site (Zorn Avenue)

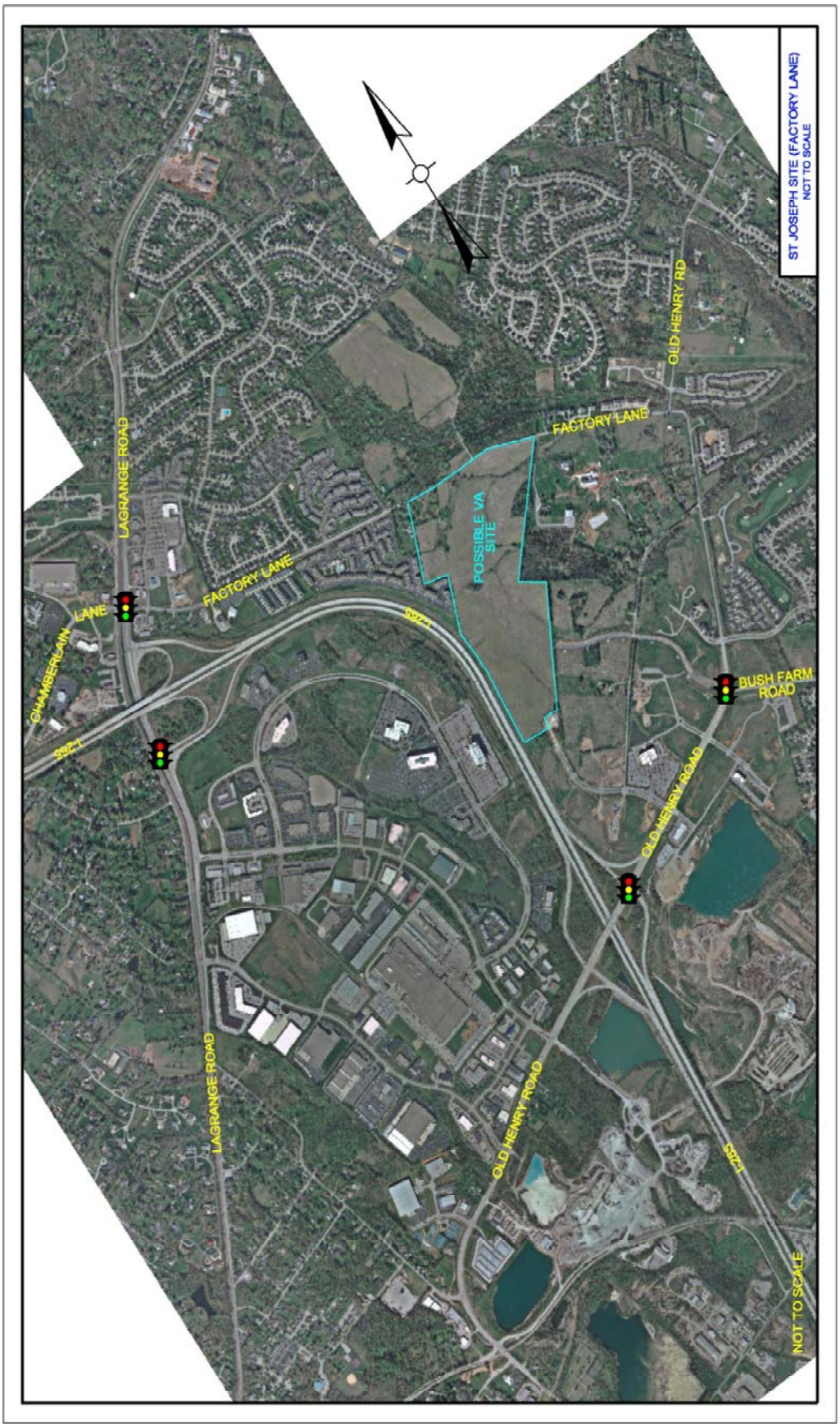


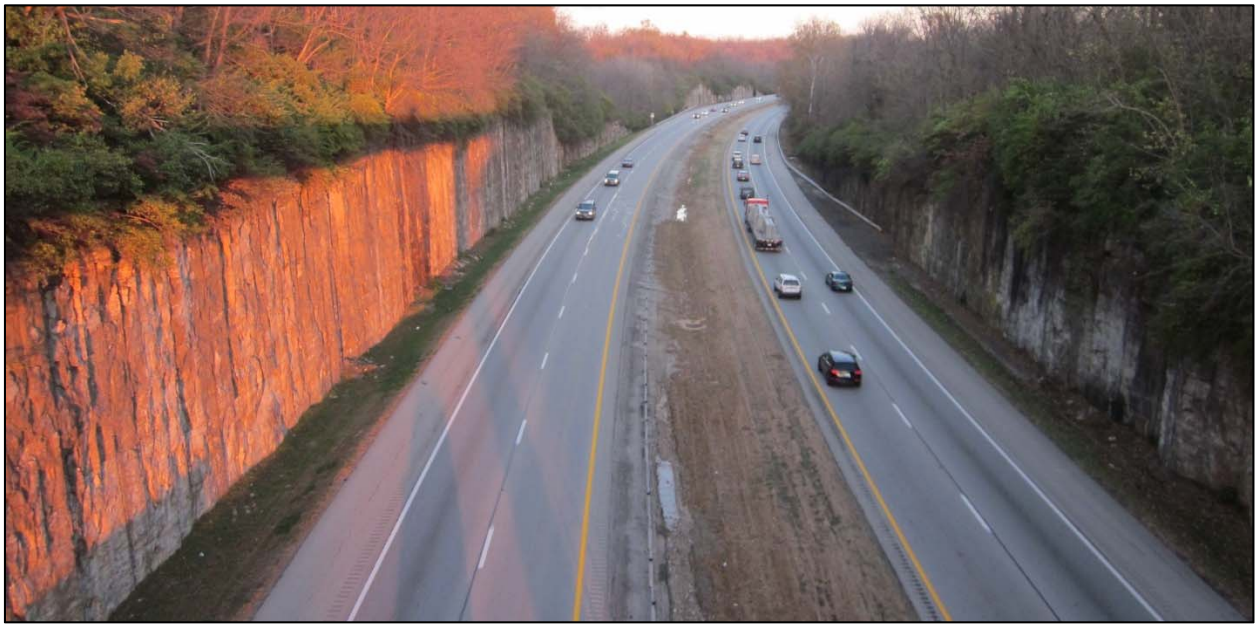
Figure 3: Study Area – St. Joseph Site (Factory Lane)

Figure 4: Study Area – Midlands Site (KY 22)

2.0 Study Area

2.1 Existing Site (Zorn Avenue)

I-71 is an urban expressway that connects Louisville, KY and Cincinnati, OH. I-71 in this area is four lanes and the average daily traffic (ADT) is approximately 64,000 vehicles per day[1].



I-71

Zorn Avenue is classified as an urban minor arterial connecting US 42 and I-71 and is surrounded by residential and commercial land-uses. Zorn Avenue in this area has four lanes with an ADT of 15,000 vehicles per day.

Zorn Avenue

[1] The source for all ADT data in this study comes from the Kentucky Transportation Cabinet's Traffic Count Website. http://maps.kytc.ky.gov/photolog/?config=TrafficCounts

Country Club Drive is an urban local street. It is a two-lane roadway and serves as the entrance to the VA Hospital. It is located approximately 1800 ft south of I-71.

Country Club Drive

Mellwood Avenue is a 1.7 mile long urban local street with an offset intersection at Zorn Avenue. Mellwood Avenue is a two-lane roadway with an ADT of 5,000 vehicles per day located approximately 500 ft south of I-71.

Mellwood Avenue

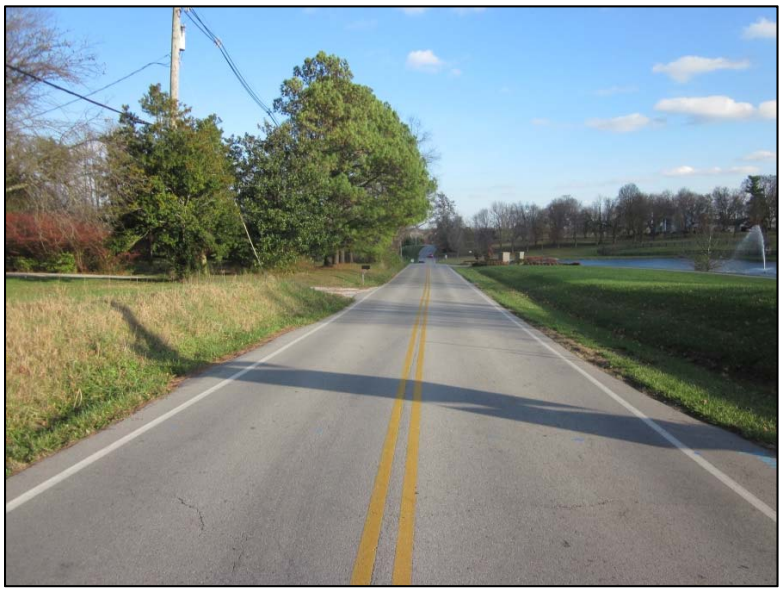
2.2 St Joseph Site (Factory Lane)

LaGrange Road is classified as an urban minor arterial in this section of roadway. LaGrange Road is a five-lane section with an ADT of about 18,000 vehicles per day in the project area. LaGrange Road is a

congested roadway that serves as a major route for commuters into and out of the Louisville Metro Area. The CSX railroad runs parallel along the north side of LaGrange Road and periodically blocks traffic from being able to access Chamberlain Lane.

LaGrange Road

Factory Lane is classified as an urban minor arterial in the project vicinity. This 1.5-mile, two-lane road serves as a connection between LaGrange Road and Old Henry Road. The ADT is approximately 3,800 vehicles per day. Factory Lane serves mostly residential neighborhoods except for the commercial area located near the LaGrange Road intersection.



Factory Lane

Old Henry Road is classified as an urban minor arterial with a five-lane section in the vicinity of the I-265 interchange. Current ADT on Old Henry Road is 15,200 vehicles per day between I-265 and Bush Farm

Road. Old Henry Road reduces to a two-lane urban collector east of Bush Farm Road and the ADT drops to 8,100 vehicles per day between Bush Farm Road and Factory Lane. KYTC is currently designing an interchange congestion improvement project with I-265 (KYTC Item No. 5-474.00) as well as a widening and improvement project along Old Henry Road (KYTC Item No. 5-367.20) to increase capacity out to Ash Avenue. The proposed three lane section will have one lane in each direction and a center turn lane from Bush Farm Road to KY 362 in Oldham County.

Old Henry Road – 2 Lane Section

Old Henry Road – 5 Lane Section

Bush Farm Road is a half-mile two-lane road that connects Old Henry Road and Aiken Road. Several large subdivisions and an elementary school use Bush Farm Road as an access route to and from I-265 via Old Henry Road. The current ADT on Bush Farm Road is 8,300 vehicles per day.

Bush Farm Road

I-265 (Gene Snyder Freeway) is an urban expressway that connects I-65 in southern Jefferson County to I-71 in northeastern Jefferson County. I-265 in this area is four lanes and the ADT ranges from 50,000 to 75,000 vehicles per day.

I-265

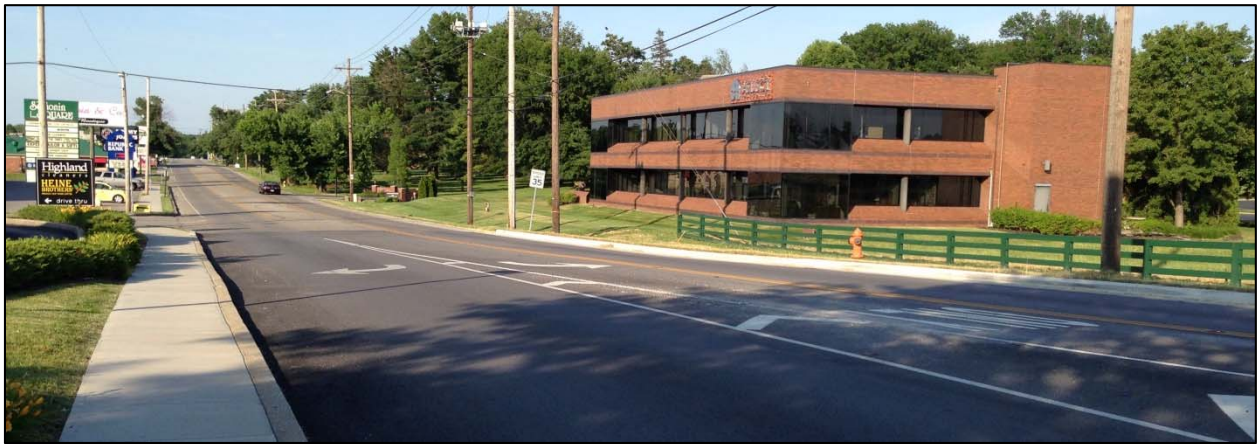
2.3 Midlands Site (KY 22)

US 42 is classified as an urban principal arterial in this section of roadway. It is a five-lane section with an ADT of approximately 56,000 vehicles per day in the project area. US 42 is a congested roadway that serves as a major route for commuters into and out of the Louisville Metro Area. A reconstruction and widening project is planned for the interchange in 2019 which will replace a diamond interchange with a SPUI[2] interchange (KYTC Item No. 5-804.00). An Interchange Modification Report has been submitted and approved pending approval of the Categorical Exclusion document which is currently under review by the Federal Highway Administration.

US 42

[2] The SPUI is a type of interchange where the arterial and ramp entrances/exits are controlled by a single traffic signal. This type of interchange can be more efficient than a standard diamond interchange and takes up less space. (Kentucky Transportation Cabinet)

KY 22 (Old Brownsboro Rd) is classified as an urban minor arterial and is a three-lane section with a current ADT of approximately 22,000 vehicles per day. KY 22 provides a connection to Herr Lane and Seminary Drive and is surrounded by residential and commercial land-uses including Ballard High School.



KY 22

I-264 (Watterson Expressway) is an urban expressway that connects I-64 in eastern Jefferson County to I-71 in northeastern Jefferson County. I-264 in this area is currently four lanes and the ADT ranges from 57,000 to 72,000 vehicles per day. An eastbound auxiliary lane is located between the interchange ramps between Westport Rd and US 42 and between US 42 and Interstate 71 to provide three lanes for weaving in that direction. As part of the US 42 interchange reconstruction project, KYTC plans to widen I-264 to three basic lanes in each direction with auxiliary lanes (KYTC Item No. 5-594.00).

I-264

3.0 Traffic Forecasting

3.1 Existing Site (Zorn Avenue)

Manual traffic counts were taken from 6:00-9:00 AM and 2:00-6:30 PM on Thursday, September 10, 2015 at the following intersections:

- Zorn Avenue at I-71 Southbound Ramps
- Zorn Avenue at I-71 Northbound Ramps
- Zorn Avenue at Mellwood Avenue
- Zorn Avenue at Country Club Road / Riverwood Drive

The counts were used to determine base level traffic conditions along the study corridor. All counts were conducted in 15-minute intervals to obtain peak hour factors. (See Appendix D for raw count data.)

Using the Kentucky Transportation Cabinet's CTS Traffic Count program, historical growth rates for the study area were analyzed. Available count data were identified along Zorn Avenue, between Hillcrest Avenue and River Road (Station 757). These data were analyzed to develop historical growth rate trend lines and to predict future growth. Data indicated a 1.4% growth rate would be applicable for traffic projections. Based on these historical growth trends in the area, the existing (2015) traffic volumes were then increased by 1.4% per year to reach the design year (2025) traffic projections. See Appendix A for 2015 Existing traffic volumes and 2025 No Build traffic volumes.

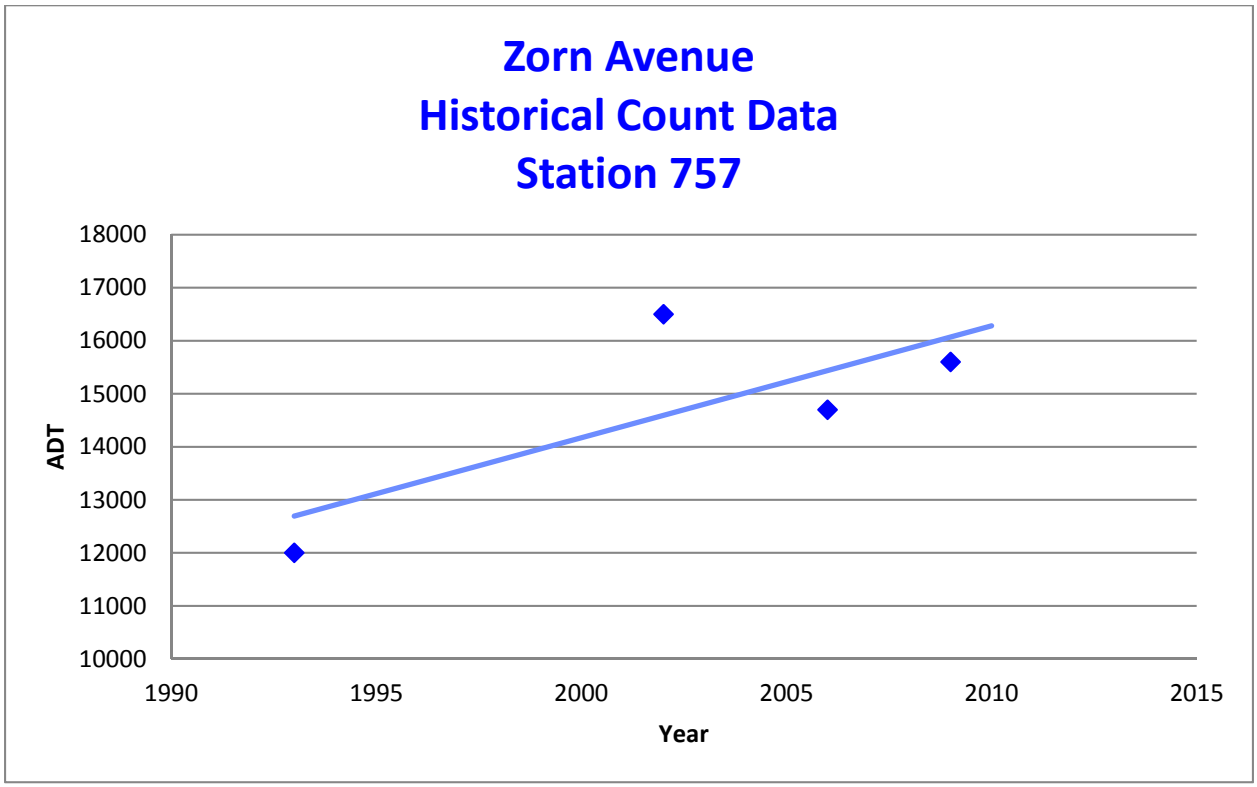


Figure 5: Historical Count Data along Zorn Avenue

Traffic entering and exiting Country Club Road (VA Access) was not grown between 2015 and 2025. Since the VA Hospital is at maximum capacity, it was assumed traffic into and out of the facility would remain constant.

3.2 St. Joseph Site (Factory Lane)

The 2012 *VA Medical Center, Factory Lane Site, Traffic Impact Analysis* completed by BTM Engineering was used for the base forecasts of the Factory Lane Site update.

AM and PM peak hour turning movement counts were provided in the *2012 Traffic Impact Analysis (2012 TIA)* for the following intersections:

- KY 146 (LaGrange Road) at Southbound I-265 Ramps
- KY 146 (LaGrange Road) at Chamberlain Lane / Factory Lane
- Old Henry Road at Factory Lane
- Old Henry Road at Bush Farm Road
- Old Henry Road at Northbound I-265 Ramps

Additionally, manual traffic counts were taken from 7:00-9:00 AM and 4:00-6:00 PM on Tuesday, October 6, 2015 at the KY 146 (LaGrange Road) intersection with the northbound I-265 ramps (See Appendix D for raw count data at the LaGrange Road and northbound I-265 ramps intersection). This intersection was not counted in the 2012 study since it is not signalized. Due to the increase in traffic created by the potential hospital construction, a signal may become warranted, so additional counts were performed.

The *2012 TIA* forecasted 2018 traffic volumes based on the following growth rates:

- LaGrange Road – 1.1% up to 2015, 1.0% after 2015
- Factory Lane – 6.5% up to 2015, 3.0% after 2015
- Old Henry Road – 2.0% up to 2015, 3.6% after 2015
- Bush Farm Road – 3.6% up to 2015, 2.8% after 2015

Per the *2012 TIA,* these growth rates were based on a Data Needs Analysis and Pre-Design Scoping Study for the proposed improvements to Old Henry Road (anticipated construction in 2016). This forecast grows the baseline 2018 traffic data from the *2012 TIA* at the same growth rates used in that study, to obtain 2015 Existing and 2025 No Build traffic data (See Appendix B for 2015 Existing and 2025 No Build traffic data).

3.2.1 Factory Lane Site Trip Generation

The study site for the VA Medical Center, which is to the East of I-265, between Exits 29 and 30, would be located on an undeveloped tract of land and would include a gross floor area of 1,030,500 square feet. The size of the VA Medical Center will be a larger facility than was anticipated in the *2012 TIA* (anticipated to be 800,000 square feet).

To estimate traffic generated by the VA Medical Center, information found in *Trip Generation, 9th Edition,* for a Hospital (ITE Code 610) was used. This manual is a nationally recognized resource of trip generation rates published by the Institute of Transportation Engineers (ITE). The area of the anticipated

VA Medical Center was used in conjuction with the Hospital rates to establish the number of trips generated. AM (80% entering/20% exiting) and PM (20% entering/80% exiting) peak hour distributions were based on the current Louisville VA Medical Center (located along Zorn Avenue), as well as studies at two other VA sites.

This study does recognize that part of the 1,030,500 square feet VA Medical Center (approximately 132,000 square feet) will be the Veterans Benefits Administration building. The analysis however, generates traffic for the entire site as if it were a hospital, as opposed to a mixed hospital and office use facility. Analyzing the site as 100% hospital use provides a higher trip generation rate than would actually be anticipated with the hospital / office use mix, resulting in a more conservative modeling approach that errs on the side of overestimating the traffic impact.

Table 1 summarizes the trip generation data for the Hospital.

Table 1: Trip Generation for VA Medical Center

ITE Code	610				
Land Use	Hospital				
Area (sf)	1,030,500				
Trip Generation per 1000 Sq. Ft. Gross Floor Area					
Weekday					
Daily					
Equation	Volume	% Entering	Volume Entering	% Exiting	Volume Exiting
T=6.91X+2923.63	**10,044**	50%	**5,022**	50%	**5,022**
AM Peak Hour					
Equation	Volume	% Entering	Volume Entering	% Exiting	Volume Exiting
Ln(T)=0.66Ln(X)+2.11	**803**	80%	**642**	20%	**161**
PM Peak Hour					
Equation	Volume	% Entering	Volume Entering	% Exiting	Volume Exiting
Ln(T)=0.64Ln(X)+2.22	**781**	20%	**156**	80%	**625**

The study site for the VA Medical Center has one proposed access point for entering and exiting traffic located along Factory Lane. The distribution of traffic to the existing network is based upon the *2012 TIA*. Appendix B illustrates the entering and exiting trip distributions, as well as the total entering and exiting trips generated by the VA Medical Center.

The trips generated by the VA Medical Center were added to the 2025 No Build volumes, to produce 2025 Build traffic (See Appendix B).

3.3 Midlands Site (KY 22)

The 2016 *I-264/US 42 Brownsboro Interchange Traffic Forecast (2016 Traffic Forecast)* completed by Palmer Engineering / URS was used for the base work of the KY 22 Site update.

The study site for the VA Medical Center, which is to the East of I-264, at Exit 22, would be located on an undeveloped tract of land and would include a gross floor area of 1,030,500 square feet. The size of the VA Medical Center will be a smaller facility than was anticipated in the *2016 Traffic Forecast* (anticipated to be 1,286,731 square feet).

The *2016 Traffic Forecast* provided 2020 and 2040 traffic forecasts (which included traffic associated with the VA Medical Center). Since the size of the VA Medical Center is different than what was analyzed in the *2016 Traffic Forecast*, the trips generated by the VA were revised. This process included:

- Reducing the 2020 and 2040 traffic forecasts for the VA Medical Center traffic included in the original study (based on 1,286,731 square feet size facility)
- Determining the growth rate between 2020 and 2040
- Calculating design year 2025 base traffic volumes
- Adding the revised trips generated by the smaller VA Medical Center (based on 1,030,500 square feet) to the 2025 base traffic volumes

3.3.1 KY 22 Site Trip Generation

As noted above, the study site for the VA Medical Center will be a smaller facility (1,030,500 square feet) than was anticipated in the *2016 Traffic Forecast* (anticipated to be 1,286,731 square feet). The traffic generated by the VA Medical Center, and the associated entering/exiting trip distributions is consistent with Table 1, found in the Factory Lane section. As with the St Joseph Site (Factory Lane), the entire VA Medical Center has been assumed as 100% hospital use, as opposed to a mixed hospital / office use, resulting in a more conservative modeling approach that errs on the side of overestimating the traffic impact.

The study site for the VA Medical Center has one proposed access point for entering and exiting traffic located along KY 22 (Old Brownsboro Road). The distribution of traffic to the existing network is based upon the *2016 Traffic Forecast* (which references a 2013 Traffic Impact Study performed by Olsson Associates for the VA Medical Center). Appendix C illustrates the entering and exiting trip distributions, and the total entering and exiting trips generated by the VA Medical Center.

The trips generated by the VA Medical Center were added to the 2025 No Build volumes, to produce 2025 Build traffic (See Appendix C for 2025 Build traffic).

3.3.2 KY 22 Alternative Scenario

The KY 22 study site is located in a densely developed area of Louisville. It is lined with existing residential and commercial developments. The few unimproved tracts within the study area are

currently approved for development and are in various stages of planning and/or construction. If the VA Medical Center were to choose another site for their location, the tract of land they are currently considering, is still expected to be developed by the U.S. government or a subsequent property owner. Therefore, in addition to the analysis of traffic conditions with the VA Medical Center, this study evaluated the traffic conditions from non-VA use, as described in the following paragraph.

Based on a 2006 Traffic Impact Study for The Midlands, the existing land use, and current zoning, it has been assumed that if the vacant site was developed by others, it would be a mixed use facility. It has been assumed, based on the 2006 Traffic Impact Study, that the site would be composed of:

- Multi-Family Residential (192 Units)
- Condos/Townhomes (117 Units)
- Hotel (150 Units)
- Office (66,400 square feet)
- High-Turnover Restaurant (17,000 square feet)
- Retail (119,550 square feet)

3.3.3 KY 22 Alternative Scenario - Site Trip Generation

To estimate traffic generated by the alternative scenario, the 2006 Traffic Impact Study was updated with information found in *Trip Generation, 9th Edition,* for Apartment (ITE Code 220), Residential Condominium/Townhouse (ITE Code 230), Hotel (ITE Code 310), General Office Building, (ITE Code 710), High-Turnover (Sit Down) Restaurant (ITE Code 932), and Shopping Center (ITE Code 820) were used. Since this is a mixed use development, internal circulation and pass-by trips would be anticipated. The trips generated by the development have been reduced by these anticipated trips. Table 2 summarizes the trip generation data for the alternative scenario.

Table 2: Trip Generation for Mixed Use Development

Code	Land Use	Size	A.M. Peak Hour			P.M. Peak Hour			24-hour total
			Enter	Exit	Total	Enter	Exit	Total	
220	Multi Family Residential	192 units	**20**	**78**	**98**	**80**	**43**	**123**	**1287**
	-Internal Circulation Capture		-2	-8	-10	-8	-4	-12	-129
230	Condos/Townhomes	117 units	**10**	**49**	**59**	**46**	**23**	**68**	**737**
	-Internal Circulation Capture		-1	-5	-6	-5	-2	-7	-74
310	Hotel	150 units	**47**	**33**	**80**	**46**	**44**	**90**	**969**
	-Internal Circulation Capture		-5	-3	-8	-5	-4	-9	-97
710	Office	66,400 s.f.	**121**	**17**	**138**	**26**	**127**	**153**	**962**
	-Internal Circulation Capture		-12	-2	-14	-3	-13	-15	-96
932	High Turnover Restaurant	17,000 s.f.	**101**	**83**	**184**	**100**	**67**	**167**	**2162**
	-Internal Circulation Capture		-10	-8	-18	-10	-7	-17	-216
	High-Turnover less internal capture		**91**	**75**	**166**	**90**	**60**	**150**	**1946**
	-Pass-by (P.M.- 34%)		-31	-26	-56	-31	-20	-51	-662
820	Retail	119,550 s.f.	**108**	**66**	**174**	**324**	**351**	**675**	**7627**
	-Internal Circulation Capture		-11	-7	-17	-32	-35	-68	-763
	Retail less internal capture		**97**	**59**	**157**	**292**	**316**	**607**	**6864**
	-Pass-by (P.M.- 34%)		-33	-20	-53	-99	-107	-206	-2334
	Gross Trips		**407**	**326**	**733**	**622**	**655**	**1276**	**13744**
	-Reductions		-105	-79	-182	-193	-192	-385	-4371
	Net Generated Trips		302	247	**551**	429	463	**891**	**9373**

The distribution of traffic to the existing network is consistent with the VA Medical Center distribution pattern. Appendix C illustrates the total entering and exiting trips generated by the mixed use development.

The trips generated by the mixed use development were added to the 2025 No Build volumes, to produce 2025 Build traffic (See Appendix C).

4.0 Analyses

4.1 Performance Measures

Level of Service (LOS) and delay were used as the measures of effectiveness for each turning movement. According to the Highway Capacity Manual (HCM), the level of service is defined in terms of delay (See Tables 3 and 4). Delay results in driver discomfort, frustration, fuel consumption, and lost travel time and may be caused by a number of factors including traffic signal timing, geometrics, and traffic congestion. Level of service is based on a grade scale from A to F with A being excellent and F being failure. A Level of Service C is desirable, and D is acceptable in an urban setting.

Table 3: Unsignalized Intersections

Level of Service	Delay (Seconds per Vehicle)
A	<=10
B	>10 and <=15
C	>15 and <=25
D	>25 and <=35
E	>35 and <=50
F	>50

Table 4: Signalized Intersections

Level of Service	Delay (Seconds per Vehicle)
A	<=10
B	>10 and <=20
C	>20 and <=35
D	>35 and <=55
E	>55 and <=80
F	>80

Analyses were completed using HCS 2010, a standard analysis tool, which uses the *Highway Capacity Manual* methodologies to evaluate roadway corridors. Level of Service and delay were measures of effectiveness used for this study. (HCS Results can be found in Appendix E.)

VISSIM, a behavior-based, microscopic simulation model software package that provides a graphic and numeric representation of lane geometry, driver behavior, signal timing, and traffic volumes, was used to evaluate no build and build conditions. The VISSIM simulations model the interaction of closely spaced signals and how congestion at one signal impacts the upstream signals. Simulations were run 10 times in order to obtain an average travel time measurement for each selected route. The travel time measurements were extracted from these simulations as a comparison tool between no build and build conditions.

4.2 Existing Site (Zorn Avenue)

The HCS results indicate that much of the Zorn Avenue corridor operates at an acceptable level of service in the AM and PM peak periods of 2015 and 2025. The movements that operate beyond capacity are discussed further below. The HCS results for the Existing Site (Zorn Avenue) can be found in Table 5.

Zorn Avenue @ I-71 Southbound Ramp (Unsignalized)

The I-71 southbound ramp currently operates at a LOS F in the 2015 peak periods. The ramp will continue to operate at a LOS F in the 2025 No Action peak periods, but will have a significant increase in delay to this approach.

Zorn Avenue @ I-71 Northbound Ramp (Signalized)

The Zorn Avenue at I-71 northbound Ramp operates at a LOS F in the 2015 and 2025 PM peak period. This is in large part due to the volume turning left from Zorn Avenue onto the I-71 northbound on ramp.

The northbound Zorn Avenue right turn onto the I-71 northbound ramp operates at a LOS D in the 2015 PM peak. This movement is anticipated to operate at a LOS E in the 2025 No Action PM peak.

The southbound Zorn Avenue left turn onto the I-71 northbound Ramp operates at a LOS F in the 2015 PM peak. This movement will continue to operate at a LOS F in the 2025 No Action peak period, but will have a significant increase in delay to this movement.

Zorn Avenue @Mellwood Avenue (Unsignalized)

The eastbound shared left/thru lane operates at a LOS F in the AM and PM peaks for both 2015 and 2025. A significant increase in delay is anticipated in the 2025 No Action scenario.

Zorn Avenue at Country Club Road / Riverwood Drive- Existing VA Access Signalized Intersection

The northbound Zorn Avenue shared left/thru lane operates at a LOS E in the 2015 AM peak. The movement is anticipated to drop to a LOS F in the 2015 AM peak.

Table 5: Existing Site (Zorn Avenue) HCS Results – LOS and Delay

Existing Site (Zorn Avenue) Level of Service and Delay (sec)						
Year			2015 Existing		2025 No Action	
Peak			AM	PM	AM	PM
Zorn Ave @ I-71 SB Ramp (Unsignalized)	I-71 SB Ramp	WB L	F / 73	F / 56	F / 389	F / 132
		WB R	B / 13	B / 11	B / 13	B / 12
	Zorn Ave	NB L	A / 10	A / 9	B / 11	A / 10
Zorn Ave @ I-71 NB Ramp (Signalized)	I-71 NB Ramp	EB L	C / 30	C / 30	D / 42	C / 32
		EB R	C / 29	C / 28	C / 29	C / 29
	Zorn Ave	NB T	C / 29	C / 30	C / 30	C / 30
		NB R	D / 37	D / 50	D / 42	E / 73
	Zorn Ave	SB L	D / 41	F / 276	D / 41	F / 370
		SB T	B / 13	B / 14	B / 14	B / 14
	Overall		C / 29	F / 91	C / 34	F / 118
Zorn Ave @ Mellwood Ave (Unsignalized)	Mellwood Ave	EB Lt/Th	F / 97	F / 295	F / 239	F / 648
		EB R	B / 14	B / 12	C / 16	B / 12
		WB Lt/Th/Rt	C / 17	C / 19	C / 20	C / 24
	Zorn Ave	NB Lt/Th	B / 11	A / 10	B / 12	B / 10
	Zorn Ave	SB Lt/Th	A / 9	A / 10	A / 9	B /10
Zorn Ave @ Country Club Rd / Riverwood Dr (Signalized)	Country Club Rd	EB Lt/Th	C / 21	D / 38	C / 21	D / 38
		EB R	B / 19	C / 20	B / 19	C / 20
	Riverwood Dr	WB Lt/Th/Rt	B / 20	B / 19	B / 20	B / 19
	Zorn Ave	NB Lt/Th	E / 67	B / 13	F / 96	B / 14
		NB Th/Rt	B / 15	B / 13	B / 17	B / 13
	Zorn Ave	SB Lt/Th	B / 14	B / 13	B / 16	B / 14
		SB Th/Rt	C / 22	B / 13	C / 22	B / 14
	Overall		C / 25	B / 20	C / 30	B / 20

*WB = Westbound; EB = Eastbound; NB = Northbound; SB = Southbound

2015 Existing and 2025 No Action travel time measurements were extracted from VISSIM simulations for the following conditions:

- Southbound I-71 Off Ramp to Country Club Road (VA)
- Northbound I-71 Off Ramp to Country Club Road (VA)

- Country Club Road (VA) to Southbound I-71 On Ramp
- Country Club Road (VA) to Northbound I-71 On Ramp

2025 travel time results for each route either increased from 2015 travel time results, or essentially remained constant between the scenarios. The VISSIM results for the Existing Site (Zorn Avenue) can be found in Table 6.

Table 6: Existing Site (Zorn Avenue) VISSIM Results – Travel Time

Existing Site (Zorn Avenue) Travel Time Measurements (Min)				
Year	2015 Existing		2025 No Action	
Peak	AM	PM	AM	PM
SB I-71 to VA	1.8	1.8	2.0	2.0
NB I-71 to VA	1.3	1.3	1.4	1.3
VA to SB I-71	2.0	2.2	2.2	2.3
VA to NB I-71	1.5	1.5	1.5	1.6

*NB = Northbound; SB = Southbound

4.3 St. Joseph Site (Factory Lane)

The HCS results for the St Joseph Site (Factory Lane) can be found in Table 7. The table compares the AM and PM peak periods for the 2015 Existing scenario, 2025 No Build scenario (no VA Medical Center) and the 2025 Build scenario (with VA Medical Center).

Old Henry Road@I-265 Northbound Ramp (Signalized)

The overall Old Henry Road at I-265 northbound ramp operates at a LOS F in the Existing AM peak period, largely due to the delay of vehicles turning left from the I-265 off ramp. The intersection operates at an acceptable LOS in the Existing PM peak period. With the improvements KYTC is making to the intersection, it will operate at an acceptable LOS in both the AM and PM peak periods for both the No Build and Build conditions.

The left turn movement from Old Henry to the I-265 northbound on ramp falls from a LOS D in the AM peak of the No Build condition to a LOS E in the Build condition.

Old Henry Road @ Bush Farm Road (Signalized)

The Old Henry Road at Bush Farm Road intersection operates at a LOS E in the AM Existing scenario, and falls to a LOS F in the AM No Build and Build scenarios. The PM operates at a LOS C in the Existing conditions, and a LOS D in the No Build conditions. The intersection falls to a LOS E with the Build condition.

The westbound Bush Farm left turns onto Old Henry Road operate at a LOS F in the AM peak for Existing, No Build, and Build scenarios. The movement operates at a LOS C in the Existing PM peak and falls to LOS E in the PM peak for both the No Build and Build scenarios.

For both the No Build and Build conditions, the southbound Old Henry left turns operate at a LOS F in the PM peak. Also, for the Build condition, the northbound Old Henry thru movement operates at a LOS F in the PM peak.

Old Henry Road @ Factory Lane (Existing – Unsignalized; Proposed – Signalized)

Old Henry Road at Factory Lane is currently a three-way stop controlled intersection. The overall intersection (2015 Existing conditions) operates at acceptable levels (LOS C in the AM and LOS D in the PM) under these conditions. The shared thru/right from Old Henry northbound to Old Henry eastbound operates at a LOS E in the PM peak.

With the Old Henry project noted in the background information, Old Henry will be realigned to reduce the tight curve near the Factory Lane intersection. The Old Henry intersection will become a stop controlled intersection on the Factory Lane approach in the 2025 No Build scenario. This results in the Factory Lane left turn operating at a LOS F in the PM peak, while the right turn will operate at a LOS E in the AM peak.

With the addition of the VA Medical Center, a signal will likely be warranted at this location. The Build scenario assumes that a signal will be added to this intersection. The Old Henry left turns onto Factory Lane would operate at a LOS F in the AM peak, while the Factory Lane right turns onto Old Henry would operate at a LOS E in the AM peak. The overall intersection would operate at a LOS E in the AM peak period.

Factory Lane at VA Medical Center Entrance (Signalized)

The VA Medical Center Entrance at Factory Lane was analyzed for the Build scenario. It was assumed the intersection would be signalized and includes left and right turning lanes. This results in a LOS C in the AM and PM peaks for the overall intersection.

LaGrange Road @ Factory Lane (Signalized)

The LaGrange Road at Factory Lane intersection operates at a LOS F in the Existing AM peak conditions. The intersection operates at a LOS E in the Existing PM peak conditions. The intersection operates at LOS F for the AM and PM conditions of the No Build scenario. With the additional traffic generated by the VA Medical Center, the delay is lengthened even further in the AM and PM Build scenarios.

The northbound LaGrange Road thru and right turning movements operate at a LOS D in the AM peak period for the Existing, No Build, and Build scenarios. All other movements exceed capacity.

LaGrange Road @ I-265 Northbound Ramp (Unsignalized)

The LaGrange Road at I-265 northbound ramp is currently an unsignalized intersection that has two right turning movements from the I-265 northbound off ramp to LaGrange Road. HCS 2010 does not have the capabilities to analyze a dual right turn on an unsignalized intersection, so microsimulation models are used to analyze travel time measurements.

LaGrange Road @ I-265 Southbound Ramp (Signalized)

The LaGrange Road at I-265 southbound ramp will operate at a LOS E for the AM and PM peaks of the Existing conditions. The intersection will operate at a LOS F for the AM and PM peaks of the No Build and Build scenarios.

The left turns from I-265 southbound off ramp operates at a LOS F in the AM peak period for all three conditions. The right turning movements operate at LOS F in the PM peak Existing and No Build, and for both the AM and PM peak of the Build condition.

The northbound LaGrange Road thru's operate at a LOS E in the PM Existing and No Build, and falls to a LOS F in the PM Build.

The southbound LaGrange Road left turns operate at a LOS F in the AM and PM peak for all three conditions.

Table 7: St Joseph Site (Factory Lane) HCS Results – LOS and Delay

St Joseph Site (Factory Lane) Level of Service and Delay (sec)								
Year			2015 Existing		2025 No Build		2025 Build	
Peak			AM	PM	AM	PM	AM	PM
Old Henry Rd @ I-265 NB Ramp (Signalized)	I-265 NB Ramp	WB L	F / 287	D / 40	D / 55	D / 37	D / 55	D / 40
		WB R	D / 38	D / 52	C / 33	D / 48	D / 45	D / 55
	Old Henry Road	NB L	C / 28	C / 24	D / 52	D / 36	E / 60	D / 51
		NB T	B / 17	C / 20	C / 26	C / 23	C / 26	C / 22
	Old Henry Rd	SB T	D / 53	D / 39	D / 50	D / 39	D / 53	D / 45
	Overall		F / 141	C / 34	D / 49	C / 34	D / 51	D / 39
Old Henry Rd @ Bush Farm Rd (Signalized)	Bush Farm Road	EB Lt/Th	B / 17	B / 17	C / 22	C / 26	C / 27	C / 26
		EB R	B / 17	B / 17	B / 20	C / 25	C / 24	C / 25
	Bush Farm Road	WB L	F / 109	C / 22	F / 298	E / 68	F / 367	E / 68
		WB Th/Rt	B / 18	B / 17	C / 20	C / 24	C / 25	C / 24
	Old Henry Road	NB L	D / 39	C / 20	C / 35	B / 16	D / 36	B / 17
		NB T	B / 15	C / 27	B / 18	D / 54	C / 23	F / 79
		NB R	B / 15	C / 21	B / 19	C / 27	B / 17	C / 27
	Old Henry Road	SB L	B / 17	D / 39	C / 29	F / 235	D / 38	F / 387
		SB Th/Rt	C / 33	B / 17	D / 50	C / 22	D / 43	C / 24
	Overall		E / 60	C / 23	F / 127	D / 46	F / 131	E / 59
Old Henry Rd @ Factory Ln (Unsignalized - Ex; Signalized - Prop)	Old Henry Road	EB L	N/A	N/A	B / 10	A / 9	F / 117	B / 19
		EB T	N/A	N/A	-	-	A / 5	B / 13
		NB Th/Rt (Ex)	B / 11	E / 41	-	-	-	-
	Old Henry Road	WB T	N/A	N/A	-	-	D / 54	C / 31
		WB R	N/A	N/A	-	-	D / 54	C / 31
		WB Lt/Rt (Ex)	D / 30	C / 16	-	-	-	-
	Factory Lane	SB L	N/A	N/A	D / 26	F / 561	D / 39	C / 35
		SB R	N/A	N/A	E / 40	B / 13	E / 60	D / 46
		SB Lt/Th (Ex)	B / 13	B / 14	-	-	-	-
	Overall		C / 22	D / 30	-	-	E / 69	C / 26
Factory Ln @ VA (Signalized)	VA Site	EB L	-	-	-	-	C / 31	D / 39
		EB R	-	-	-	-	C / 31	D / 42
	Factory Lane	NB L	-	-	-	-	C / 25	B / 11
		NB T	-	-	-	-	A / 9	B / 10
	Factory Lane	SB T	-	-	-	-	B / 17	B / 17
		SB R	-	-	-	-	B / 17	B / 15
	Overall		-	-	-	-	C / 20	C / 24
LaGrange Rd @ Factory Ln (Signalized)	Factory Lane	EB Lt/Th	E / 68	E / 69	E / 69	E / 70	E / 69	E / 70
		EB R	E / 72	E / 68	E / 73	E / 69	E / 73	E / 69
	Factory Lane	WB L	F / 417	F / 138	F / 680	F/ 275	F / 758	F / 593
		WB T	E / 69	E / 68	E / 70	E / 70	E / 71	E / 71
		WB R	E / 66	E / 65	E / 67	E / 66	E / 67	E / 68
	LaGrange Road	NB L	E / 72	E / 67	E / 73	E / 68	E / 73	E / 68
		NB T	D / 46	E / 68	D / 47	F / 87	D / 47	F / 87
		NB R	D / 44	E / 61	D / 45	E / 69	D / 54	F / 85
	LaGrange Road	SB L	F / 83	F / 83	F / 83	F / 83	F / 86	F / 83
		SB T	F / 164	E / 61	F / 212	E / 63	F / 212	E / 63
		SB R	F / 164	E / 61	F / 213	E / 63	F / 213	E / 63
	Overall		F / 174	E / 74	F / 265	F / 104	F / 278	F / 178
LaGrange Rd @ I-265 NB Ramp (Unsignalized)	I-265 NB Ramp	WB L	* Dual Right --> Unable to Analyze	* Dual Right --> Unable to Analyze	* Dual Right --> Unable to Analyze	* Dual Right --> Unable to Analyze	* Dual Right --> Unable to Analyze	* Dual Right --> Unable to Analyze
		WB R						
	LaGrange Road	NB T						
		NB R						
	LaGrange Road	SB L						
		SB T						
	Overall							
LaGrange Rd @ I-265 SB Ramp (Signalized)	I-265 SB Ramp	WB L	F / 84	D / 53	F / 161	D / 54	F / 161	D / 54
		WB R	D / 54	F / 95	D / 54	F / 121	F / 97	F / 178
	LaGrange Road	NB T	D / 37	E / 60	D / 37	E / 79	D / 38	F / 80
	LaGrange Road	SB L	F / 170	F / 85	F / 222	F / 111	F / 224	F / 119
		SB T	B / 10	A / 9	B / 11	A / 9	B / 11	A / 9
	Overall		E / 75	E / 63	F / 105	F / 81	F / 107	F / 92

*WB = Westbound; EB = Eastbound; NB = Northbound; SB = Southbound

2015 Existing, 2025 No Build and 2025 Build travel time measurements were extracted from VISSIM simulations for the following conditions:

- Southbound I-265 Off Ramp at LaGrange Road to VA
- Northbound I-265 Off Ramp at LaGrange Road to VA
- VA to Southbound I-265 On Ramp at LaGrange Road
- VA to Northbound I-265 On Ramp at LaGrange Road
- Northbound I-265 Off Ramp at Old Henry Road to VA
- VA to Northbound I-265 On Ramp at Old Henry Road to VA

2025 Build scenario travel time results for each route either increased (or essentially remained constant for one route) between the scenarios. The VISSIM results for the St Joseph Site (Factory Lane) can be found in Table 8.

Table 8: St Joseph Site (Factory Lane) VISSIM Results – Travel Time

St Joseph Site (Factory Lane) Travel Time Measurements (Min)						
Year	2015 Existing		2025 No Build		2025 Build	
Peak	AM	PM	AM	PM	AM	PM
SB I-265 LaGrange to VA	3.4	3.1	3.4	3.3	4.0	3.6
NB I-265 LaGrange to VA	2.6	2.9	2.7	3.5	2.8	4.6
VA to SB I-265 LaGrange	4.6	4.1	5.6	4.5	6.7	6.5
VA to NB I-265 LaGrange	3.3	3.2	4.0	3.4	5.0	5.8
NB I-265 Old Henry to VA	4.6	5.1	4.0	4.2	5.0	4.8
VA to NB I-265 Old Henry	4.3	4.0	4.6	4.0	4.5	4.1

*NB = Northbound; SB = Southbound

4.4 Midlands Site (KY 22)

The HCS results for the Midlands Site (KY 22) can be found in Table 9. The table compares the AM and PM peak periods for the following scenarios

- 2015 Existing
- 2025 with VA with Existing Interchange
- 2025 with Mixed Use Development with Existing Interchange
- 2025 with VA with Proposed SPUI
- 2025 with Mixed Use Development with Proposed SPUI

US 42 @ Rudy Lane

The US 42 at Rudy Lane intersection performs at an overall acceptable LOS for all scenarios in both the AM and PM peak hours.

The southbound left turn from US 42 operates at a LOS E for all scenarios for the AM and PM peak hours. The northbound left turn from US 42 operates at a LOS E for all AM peak hour scenarios.

The eastbound left turn and the westbound right turn from Rudy Lane operates at a LOS E for all scenarios for the AM and PM peak hours. The westbound left/thru movement operates at a LOS E in the AM peak for all scenarios.

US 42 @ I-264

The US 42 @ I-264 southbound ramps intersection operates at an acceptable LOS in the 2015 AM and PM peak periods. The intersection drops to a LOS E for the 2025 AM peak in the No Build (with VA) and No Build (with Mixed Use Development) scenarios.

The US 42 @ I-264 northbound ramps intersection operate at acceptable LOS for the AM and PM peak periods for all scenarios.

The proposed US 42 @ I-264 SPUI configuration operates at acceptable LOS for the AM and PM peak periods for all scenarios.

US 42 @ KY 22/Northfield Drive

The US 42 intersection with KY 22 / Northfield Drive operates at a LOS E in the 2015 AM peak period. All 2025 AM and PM No Build (with VA and with Development) peak scenarios operate at a LOS F. The 2025 AM Build (with VA and with Development) peak scenarios operate at a LOS E. The 2025 PM Build (with VA and with Development) peak scenarios operate at a LOS F.

KY 22 @ Slip Ramp/VA Entrance

The KY 22 intersection with the Slip Ramp / VA entrance will operate at a LOS D in the 2025 No Build AM peak and a LOS F in the 2025 No Build PM peak. The entrance will operate at a LOS C in the 2025 Build AM and PM peak.

The KY 22 intersection with the Slip Ramp / Mixed Use Development will operate at a LOS D in the 2025 No Build AM peak and a LOS F in the 2025 No Build PM peak. The entrance will operate at a LOS C in the 2025 AM and PM peak.

Table 9: Midlands Site (KY 22) HCS Results – LOS and Delay

Midlands Site (KY 22) Level of Service and Delay (sec)												
Year			2015 Existing		2025 No Build (with VA)		2025 No Build (With Develop)		2025 Build (with VA)		2025 Build (with Develop)	
Peak			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
US 42 @ Rudy Ln (Signalized)	Rudy Lane	EB L	E / 62	E / 57	E / 61	E / 70	E / 61	E / 70	E / 61	E / 70	E / 61	E / 70
		EB T	D / 53	D / 46	D / 51	D / 45	D / 52	D / 45	D / 51	D / 45	D / 52	D / 45
		EB R	D / 55	D / 48	D / 53	D / 47	D / 53	D / 47	D / 53	D / 47	D / 53	D / 47
	Rudy Lane	WB Lt/Th	E / 56	D / 48	E / 56	D / 47	E / 56	D / 47	E / 56	D / 47	E / 56	D / 47
		WB R	E / 62	F / 81	E / 61	E / 64	E / 62	E / 64	E / 61	E / 64	E / 62	E / 64
	US 42	NB L	E / 70	D / 54	E / 68	D / 51	E / 68	D / 52	E / 68	D / 51	E / 68	D / 52
		NB T	B / 14	C / 33	B / 17	D / 39	B / 17	D / 41	B / 17	D / 39	B / 17	D / 41
		NB R	B / 11	C / 26	B / 13	C / 29	B / 13	C / 30	B / 13	C / 29	B / 13	C / 30
	US 42	SB L	E / 65	E / 62	E / 65	E / 60	E / 65	E / 60	E / 65	E / 60	E / 65	E / 60
		SB T	B / 16	C / 34	C / 24	D / 49	C / 24	D / 47	C / 24	D / 49	C / 24	D / 47
		SB R	B / 11	C / 33	B / 13	D / 42	B / 13	D / 42	B / 13	D / 42	B / 13	D / 42
	Overall		C / 24	D / 43	C / 29	D / 49	C / 28	D / 49	C / 29	D / 49	C / 28	D / 49
US 42 @ I-264 SB Ramp (Signalized)	I-264 SB Ramp	EB L	D / 41	E / 58	D / 50	E / 61	D / 47	E / 66	-	-	-	-
		EB R	E / 63	D / 50	F / 192	D / 47	F / 192	D / 45	-	-	-	-
	US 42	NB T	D / 47	C / 28	D / 40	E / 63	D / 39	F / 73	-	-	-	-
		NB R	D / 53	C / 26	D / 48	D / 40	D / 48	D / 40	-	-	-	-
	US 42	SB L	D / 42	D / 52	F / 97	F / 75	F / 105	F / 74	-	-	-	-
		SB T	B / 10	A / 8	A / 9	B / 11	A / 10	B / 12	-	-	-	-
	Overall		D / 35	C / 33	E / 61	D / 51	E / 64	D / 54	-	-	-	-
US 42 @ I-264 NB Ramp (Signalized)	I-264 NB Ramp	WB L	D / 49	D / 39	D / 48	D / 35	D / 48	D / 35	-	-	-	-
		WB R	D / 52	D / 53	E / 70	D / 54	E / 70	D / 54	-	-	-	-
	US 42	NB L	E / 63	E / 63	E / 62	E / 62	E / 62	E / 62	-	-	-	-
		NB T	A / 6	B / 14	A / 8	C / 21	A / 7	C / 24	-	-	-	-
	US 42	SB T	B / 18	B / 20	C / 28	C / 31	C / 29	C / 29	-	-	-	-
		SB R	C / 23	B / 17	D / 40	C / 26	D / 44	C / 25	-	-	-	-
	Overall		C / 25	C / 26	C / 34	C / 32	D / 35	C / 32	-	-	-	-
US 42 @ I-264 SPUI (Signalized)	I-264 SPUI	EB L	-	-	-	-	-	-	E / 55	E / 58	D / 53	E / 65
		EB R	-	-	-	-	-	-	D / 54	D / 46	D / 54	D / 45
	I-264 SPUI	WB L	-	-	-	-	-	-	E / 56	D / 40	E / 57	D / 39
		WB R	-	-	-	-	-	-	C / 26	C / 29	C / 26	C / 30
	US 42	NB L	-	-	-	-	-	-	E / 72	E / 72	E / 72	E / 72
		NB T	-	-	-	-	-	-	D / 39	E / 56	D / 39	E / 55
		NB R	-	-	-	-	-	-	C / 29	C / 27	C / 30	C / 26
	US 42	SB L	-	-	-	-	-	-	D / 50	E / 55	D / 50	E / 57
		SB T	-	-	-	-	-	-	B / 19	C / 25	B / 19	C / 25
		SB R	-	-	-	-	-	-	B / 12	B / 15	B / 11	B / 14
	Overall		-	-	-	-	-	-	D / 40	D / 45	D / 40	D / 47
US 42 @ KY 22 / Northfield Dr (Signalized)	Northfield Drive	EB Lt/Th	E / 62	F / 87	E / 69	F / 92	E / 65	F / 102	E / 69	F / 368	E / 65	F / 403
		EB R	E / 68	E / 67	F / 150	E / 61	F / 150	E / 61	F / 150	E / 75	F / 150	E / 75
	KY 22	WB L	D / 49	E / 71	F / 242	F / 382	F / 294	F / 280	F / 148	F / 280	F / 190	F / 193
		WB Th/Rt	C / 27	D / 38	C / 32	C / 31	C / 32	C / 31	C / 27	C / 31	C / 27	C / 31
	US 42	NB L	F / 82	D / 45	F / 92	F / 138	F / 93	F / 138	D / 45	F / 141	D / 45	F / 141
		NB T	E / 57	D / 48	D / 55	F / 148	D / 55	F / 148	D / 44	F / 148	D / 44	F / 148
		NB R	C / 28	B / 19	C / 25	C / 25	C / 24	C / 27	C / 31	C / 28	C / 29	C / 30
	US 42	SB L	E / 61	E / 66	E / 63	E / 61	E / 63	E / 61	E / 63	E / 75	E / 63	E / 75
		SB T	F / 85	B / 19	F / 126	C / 27	F / 126	C / 27	D / 37	C / 25	D / 37	C / 25
		SB R	F / 85	B / 19	F / 127	C / 27	F / 127	C / 27	D / 43	C / 26	D / 43	C / 26
	Overall		E / 69	D / 40	F / 126	F / 152	F / 139	F / 125	E / 60	F / 133	E / 70	F / 113
Old Brownsboro Rd @ VA (Signalized)	KY 22	EB L	E / 55	E / 69	D / 52	F / 256	D / 53	F / 256	C / 30	C / 31	C / 30	C / 30
		EB T	-	-	D / 45	D / 44	D / 41	D / 49	B / 20	B / 13	B / 18	B / 15
	VA Site	WB T	-	-	E / 62	F / 200	E / 59	F / 83	D / 46	C / 30	F / 145	C / 30
		WB R	-	-	E / 56	D / 39	D / 52	D / 36	C / 30	C / 25	C / 31	C / 24
	Ramp Split	NB T	A / 7	B / 12	C / 34	D / 39	C / 31	D / 43	C / 21	C / 26	B / 17	C / 24
		NB R	-	-	C / 30	C / 25	C / 24	C / 30	B / 19	B / 18	B / 14	B / 19
	Old Brownsboro Road	SB L	-	-	E / 60	C / 25	E / 65	C / 27	C / 32	B / 18	D / 36	B / 17
		SB R	B / 12	B / 12	D / 38	C / 24	D / 51	C / 24	B / 17	B / 20	B / 17	B / 17
	Overall		C / 20	C / 32	D / 43	F / 128	D / 47	F / 92	C / 23	C / 26	C / 32	C / 23

*WB = Westbound; EB = Eastbound; NB = Northbound; SB = Southbound

2015 Existing, 2025 No Build, 2025 Build with VA, and 2025 Build with Mixed Use Development travel time measurements were extracted from VISSIM simulations for the following movements:

- I-264 eastbound at Westport Road to US 42 eastbound at Lime Kiln
- I-264 westbound at I-71 to KY 22 at Lime Kiln
- US 42 westbound at Lime Kiln to I-264 westbound at Westport Road
- KY 22 at Lime Kiln to I-264 westbound at Westport Road
- I-264 eastbound at Westport Road to VA
- I-264 westbound at I-71 to VA
- US 42 eastbound west of Rudy Lane to VA
- US 42 westbound at Lime Kiln to VA
- KY 22 at Lime Kiln to VA
- VA to I-264 westbound at Westport Road
- VA to I-264 eastbound at I-71
- VA to US 42 westbound east of Rudy Lane
- VA to US 42 eastbound at Lime Kiln
- VA to KY 22 at Lime Kiln

The VISSIM results for the Midlands Site (KY 22) can be found in Table 10.

In general, the SPUI configuration (in comparison to the existing interchange) reduces the travel times for most of the 2025 Build scenario with VA routes. However, the PM peak movements from the VA to I-264 and US 42 are longer.

The SPUI configuration (in comparison to the existing interchange) reduces, or maintains, the travel times for all of the 2025 Build scenario AM peak with Mixed Use Development routes. The PM scenario for the Mixed Use Development has a little less than half of the routes (most of the routes from the development) with an increase in travel time.

In comparison to the Mixed Use Development, the travel times for the existing interchange with the VA were shorter, or maintained, in the AM and PM peaks, with the exception of 2 routes.

The travel times for the SPUI configuration with the VA were shorter, or maintained for every route but four in the AM peak, and half of the routes with the PM peak.

Table 10: Midlands Site (KY 22) VISSIM Results – Travel Time

Midlands Site (KY 22) Travel Time Measurements (Min)										
Year	2015 Existing		2025 Build (with VA) Existing Interchange		2025 Build (with Develop) Existing Interchange		2025 Build (with VA) SPUI		2025 Build (with Develop) SPUI	
Peak	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
I-264 EB to Lime Kiln	3.2	4.6	3.4	5.9	3.4	6.4	2.8	3.0	2.7	3.0
I-264 WB to Lime Kiln	3.1	3.0	3.6	3.2	3.6	3.3	3.3	2.9	3.2	3.2
US 42 WB to I-264 WB	3.4	3.1	4.3	3.3	4.2	3.3	3.5	3.2	3.5	3.1
KY 22 to I-264 WB	3.7	3.4	5.6	4.2	5.9	4.1	3.7	3.3	3.8	3.2
I-264 EB to VA	-	-	1.9	1.9	1.6	1.9	1.6	1.4	1.6	1.5
I-264 WB to VA	-	-	2.8	2.5	2.9	2.6	2.6	2.4	2.5	2.6
US 42 EB to VA	-	-	3.2	2.6	3.2	2.8	3.1	3.2	3.1	3.5
US 42 WB to VA	-	-	3.1	2.9	3.4	3.6	2.8	3.0	2.4	3.1
Old Brownsboro to VA	-	-	2.2	-	2.4	-	1.4	1.7	1.4	1.7
VA to I-264 WB	-	-	6.6	4.0	8.0	4.0	3.7	4.6	3.7	4.4
VA to I-264 EB	-	-	4.7	2.7	6.2	2.7	2.3	3.6	2.4	3.4
VA to US 42 WB	-	-	5.1	2.7	6.7	2.6	2.4	3.7	2.7	3.5
VA to US 42 EB	-	-	5.5	3.0	6.7	3.1	2.7	3.6	2.7	3.3
VA to Old Brownsboro	-	-	1.2	0.8	1.6	0.9	0.6	0.8	0.6	0.7

*WB = Westbound; EB = Eastbound

5.0 Conclusions and Recommendations

Three sites were evaluated from a traffic standpoint to determine traffic impacts from the potential construction of a VA Medical Center. Travel times to and from an interstate highway were compared for each. The Existing site (Zorn Avenue) does not show a significant increase in travel time to and from the VA Hospital between the existing 2015 conditions and the 2025 No Action scenario since the hospital is restricted from expanding and no additional traffic is anticipated (see Table 6). The St. Joseph Site (Factory Lane) would be expected to encounter increases in travel time with the construction of a new VA Hospital, particularly in the PM peak periods travelling to the LaGrange Road interchange with I-265 (see Table 8). These increases in travel times in the 2025 Build condition as opposed to the 2025 No Build condition are mainly attributable to the lack of improvements proposed by the KYTC along LaGrange Road.

The Midlands Site (KY 22) is expected to experience reductions in travel time to and from I-264 for the 2025 Build condition with the new SPUI interchange compared to the 2025 Build condition without the new SPUI being constructed. With the new interchange constructed, the 2025 Build travel times are generally the same or slightly lower than existing 2015 conditions due to construction of the new interchange. Since the Midlands site is anticipated to develop prior to 2025 if the VA is not constructed, and since traffic volumes for a mixed use development at the Midlands site are anticipated to be similar to those anticipated with a VA Hospital, very little difference is seen between travel times for the 2025 Build condition with the VA and 2025 Build conditions with a different mixed-use development.

Recommendations for each of the three studied sites are discussed below. Many of the recommendations would involve the inclusion of a new project in Kentucky's 6-year Highway Plan to move forward.

5.1 Existing Site (Zorn Avenue)

The Existing VA Medical Center location at Zorn Avenue is currently constrained by its location, so no growth was assumed to and from the VA site. Several recommendations have been identified for consideration to improve congestion along the Zorn Avenue corridor. These recommendations for improvements to the Zorn Avenue study area include:

- Evaluate signalizing the I-71 southbound ramp at Zorn Avenue
- Evaluate turn lane lengths at I-71 northbound ramp with Zorn Avenue intersection
- Evaluate realignment and intersection improvements of Mellwood Drive at Zorn Avenue intersection, including adequate turning lanes
- Evaluate signalizing the Mellwood Drive intersection with Zorn Avenue
- Improve Country Club Road / Riverwood Drive and Zorn Avenue intersection with adequate turn lanes, and consider using protected/permitted phasing for Zorn Avenue turns

5.2 St Joseph Site (Factory Lane)

The addition of the VA Medical Center to the St Joseph Site will add considerable traffic to the corridor, which further exacerbates the congestion at the LaGrange Road intersection with Factory Lane, as well as causing queue storage concerns at several other locations (northbound I-265 ramps with Old Henry and the southbound I-265 ramps with LaGrange Road). The Factory Lane intersection with Old Henry Road will also be congested during the peak hours. Several recommendations have been identified for consideration to improve congestion along the corridor. These recommendations for improvements to the Factory Lane study area include:

- Widen Old Henry Road (Currently under design by KYTC)
- Evaluate the Old Henry Road with Bush Farm Road intersection for capacity improvements and additional turn lanes, appropriate storage lengths
- Signalize the Old Henry Road intersection with Factory Lane and provide adequate turn lane storage
- Widen Factory Lane to three lanes
- Evaluate capacity improvements at the LaGrange Road intersection with Factory Lane with additional turn lanes
- Evaluate the LaGrange Road intersection with I-265 northbound ramps for signalization
- Evaluate the I-265 southbound ramps at LaGrange Road for additional turning lanes along the exit ramp
- Evaluate the LaGrange Road intersection at I-265 southbound ramps for dual left turns onto the southbound entrance ramp

5.3 Midlands Site (KY 22)

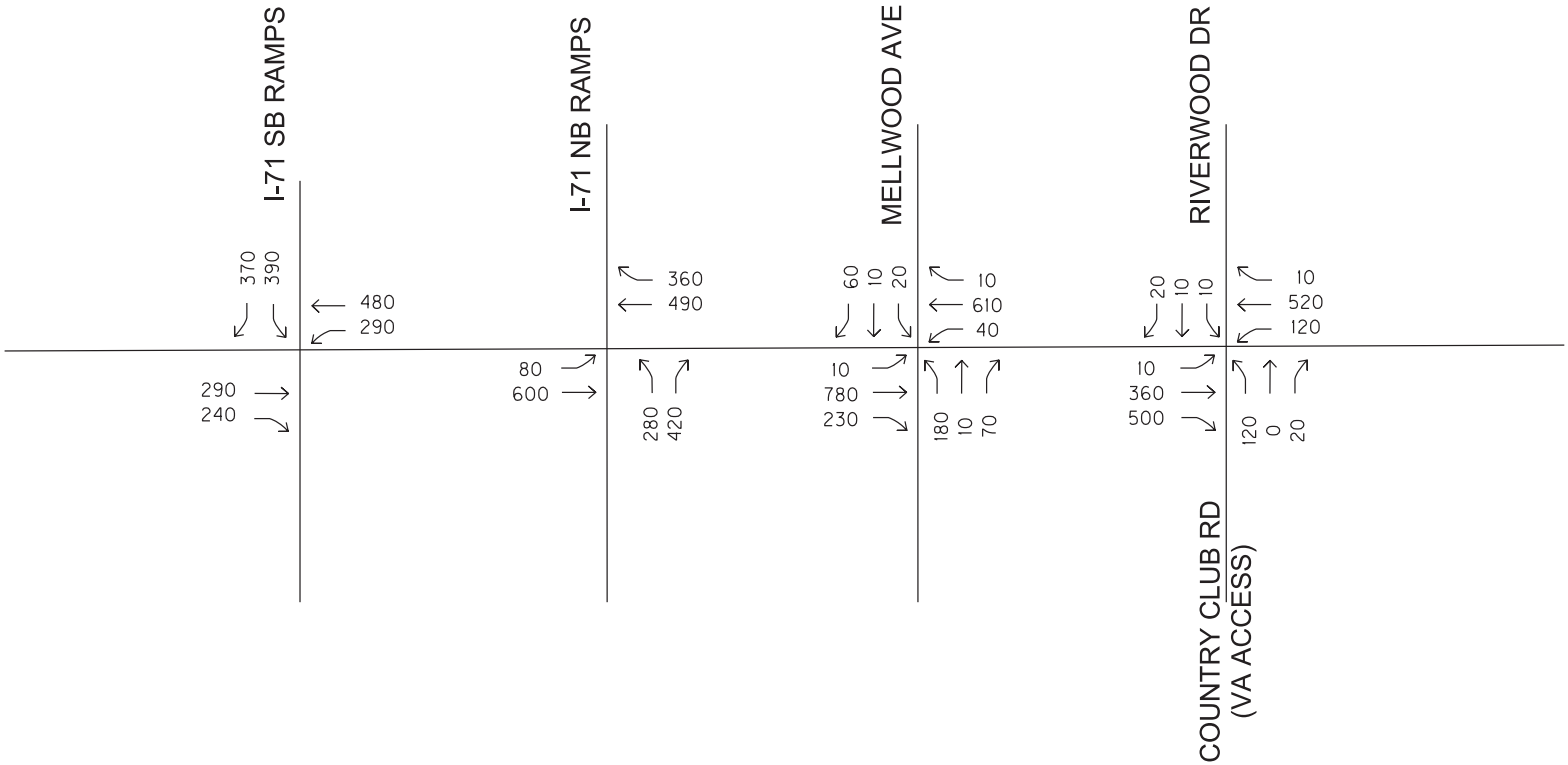
Construction of the proposed SPUI (KYTC Item No. 5-804.00) near the KY 22 corridor will greatly improve congestion in the area. The analyses find that both the VA and a mixed use development will add similar levels of traffic to the corridor, with the mixed use development anticipated to add more traffic to the corridor than the VA in the PM peak while the VA will add more traffic during the AM peak. Several possible solutions have been identified for consideration to further improve congestion along the corridor. These possible solutions for improvement to the KY 22 study area include:

- Widen KY 22 to five lanes
- Widen Herr Lane to three or five lanes to improve the connection between US 42 and Westport Road
- Convert the US 42 intersection with KY 22 and Northfield Drive to right-in/right-out. This option was recommended in the 2011 Scoping Study for the US 42 interchange, but was not carried forward into Phase I Design or included in the Interchange Modification Report recently submitted. Reductions in traffic from the opening of the Westport Road interchange and the ramp split from the I-264 eastbound off-ramp directly to KY 22 along with heavy public opposition led the KYTC to drop converting the intersection from consideration.

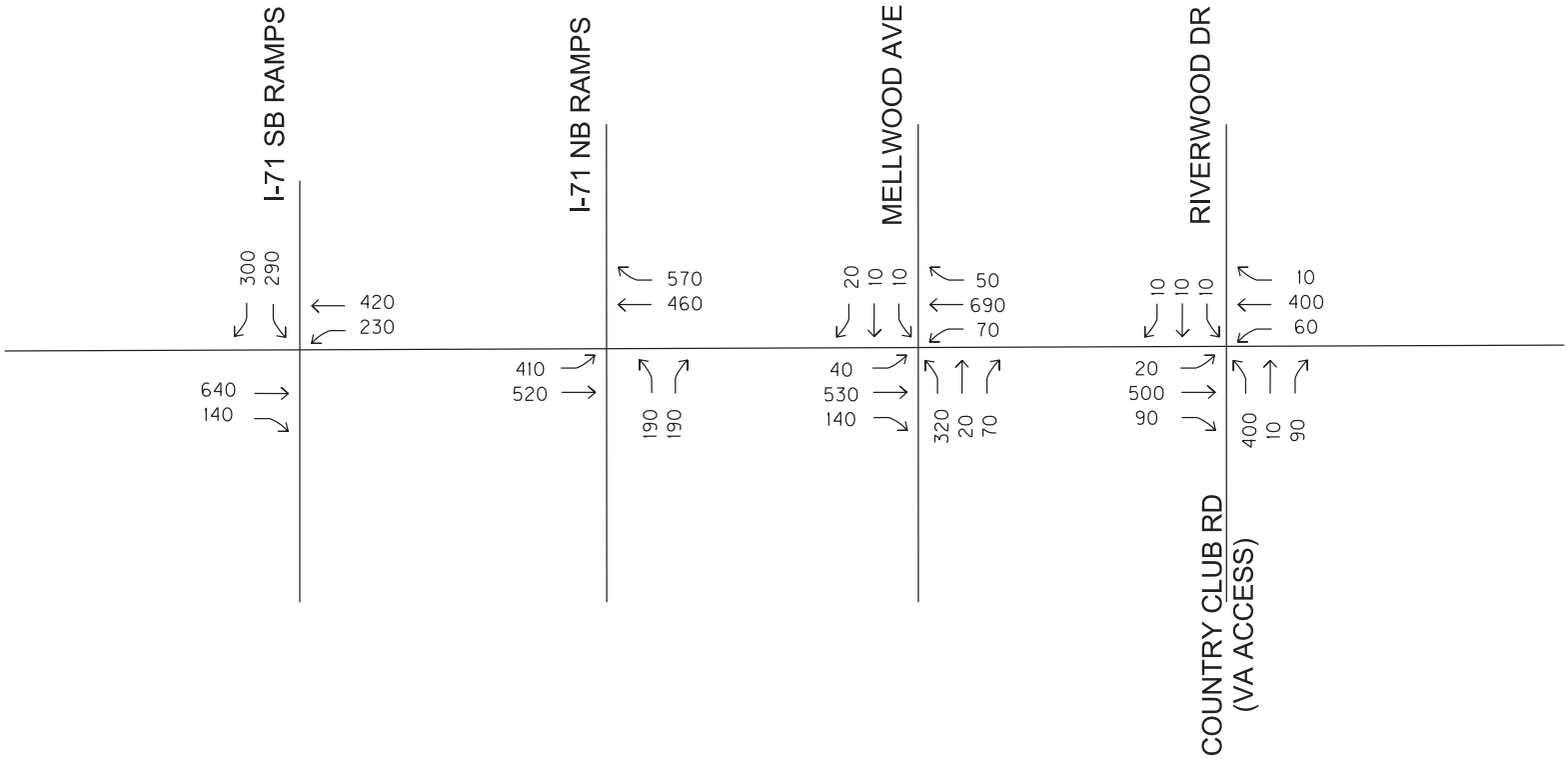
- Relocate the US 42/KY 22 intersection to Glenview Avenue and construct a connector road. This option was explored as part of the 2011 Scoping Study for the US 42 interchange and as part of the construction of the ramp split from the eastbound I-264 off-ramp directly to KY 22. The connector road would be needed if the US 42 intersection with KY 22 and Northfield Drive were converted to right-in/right-out.
- Consider adding an interchange along I-71 at the US 42 underpass
- Consider a direct connection between KY 22 and I-264 westbound using a flyover ramp. As part of the Value Engineering Study performed for the US 42 interchange in December 2014, the KYTC considered a direct flyover ramp connection from KY 22 at the VA entrance to the I-264 westbound on-ramp. This flyover ramp took both VA and KY 22 traffic directly over the I-264 eastbound off-ramp and I-264 before merging with the I-264 westbound on-ramp. This addition would remove a considerable amount of traffic from the SPUI intersection and from the US 42 intersection with KY 22 and Northfield Drive. The additional construction cost of $4.4 million and concerns for driver expectancy with this configuration led the KYTC to drop this option. The current design of the SPUI will be, however, developed to not preclude the option of adding a direct flyover connection.

APPENDIX A

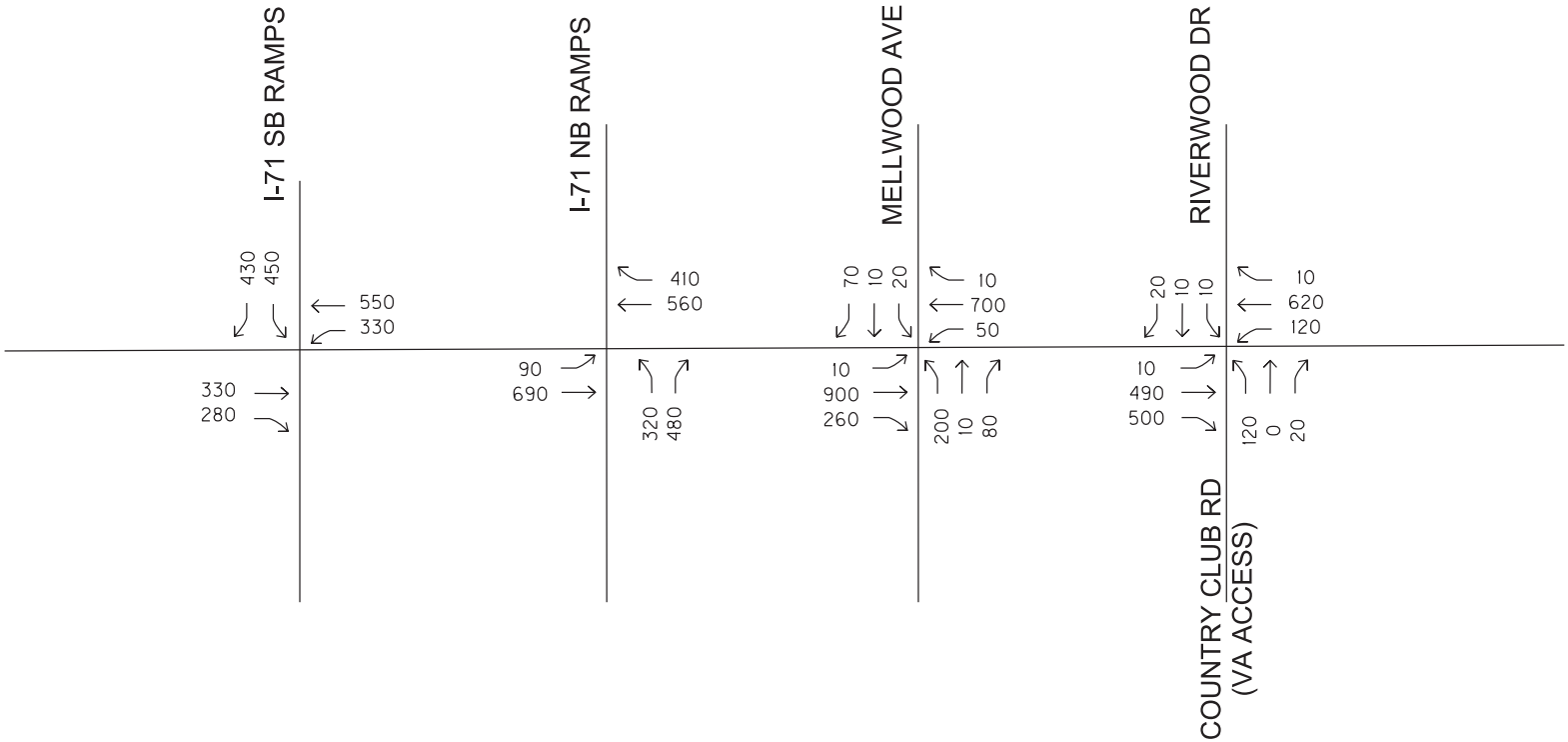
Existing Site (Zorn Avenue)
Traffic Volumes
(Vehicles per Hour)



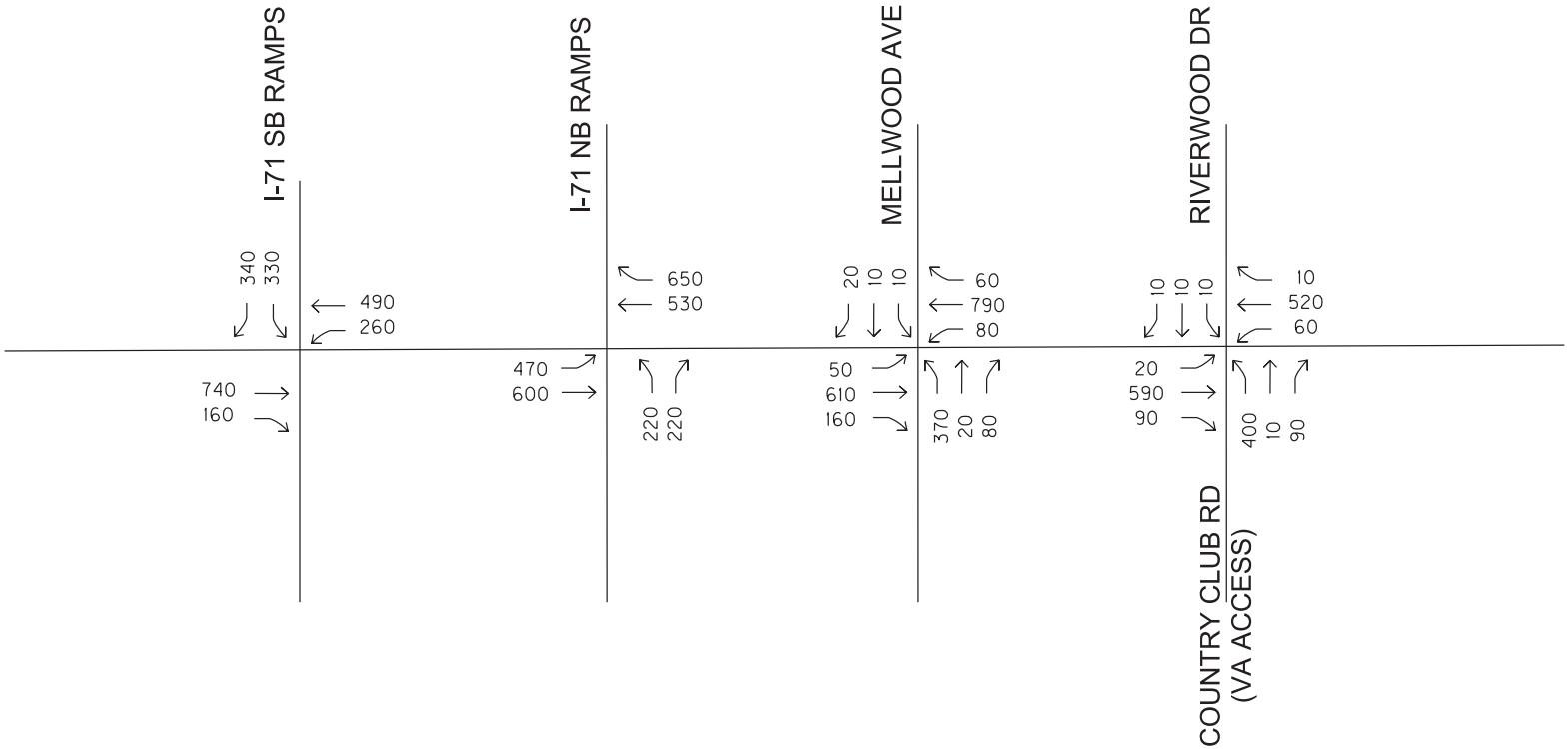
2015 EXISTING
AM PEAK TURNING MOVEMENTS



2015 EXISTING
PM PEAK TURNING MOVEMENTS



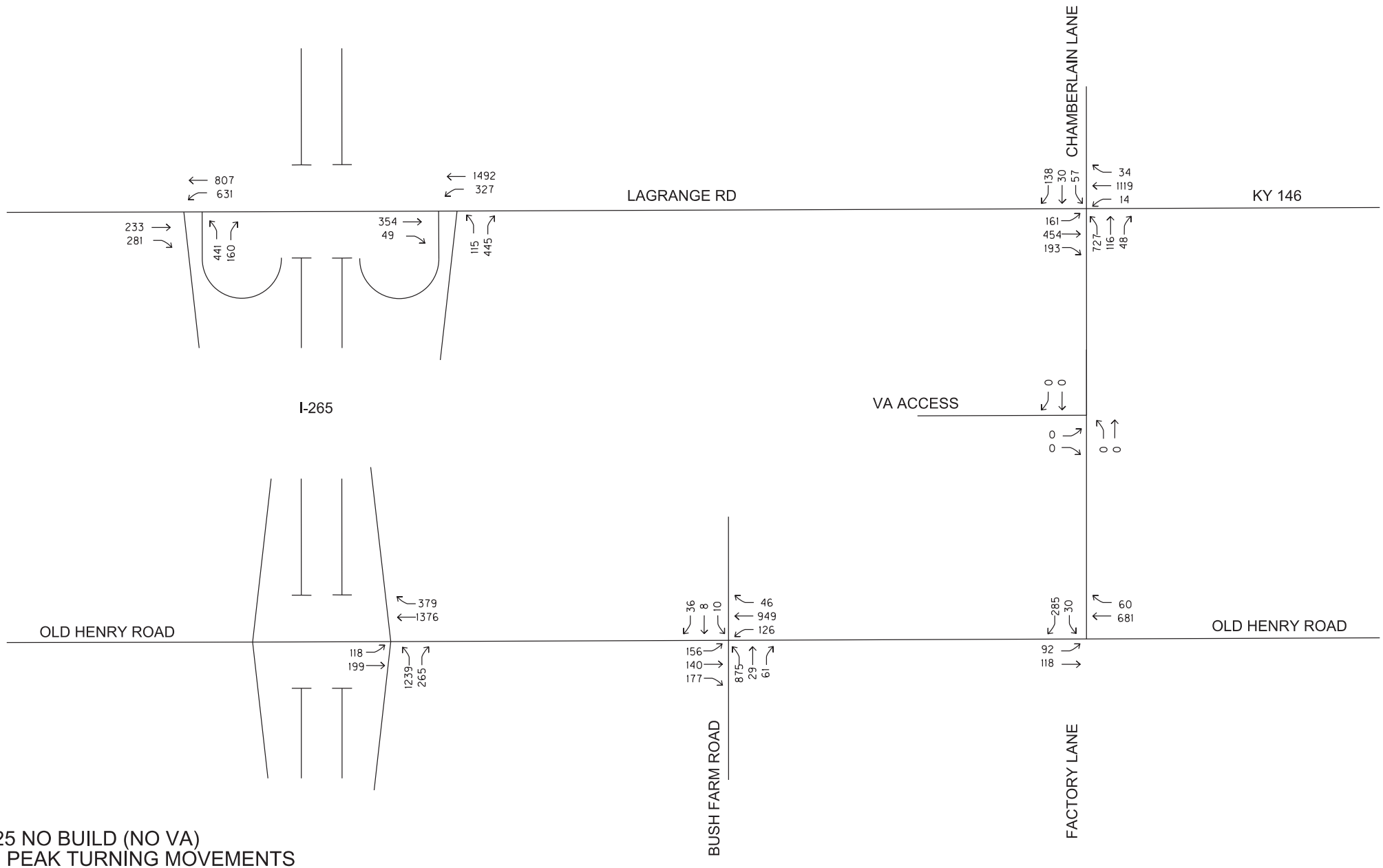
2025 NO ACTION
AM PEAK TURNING MOVEMENTS



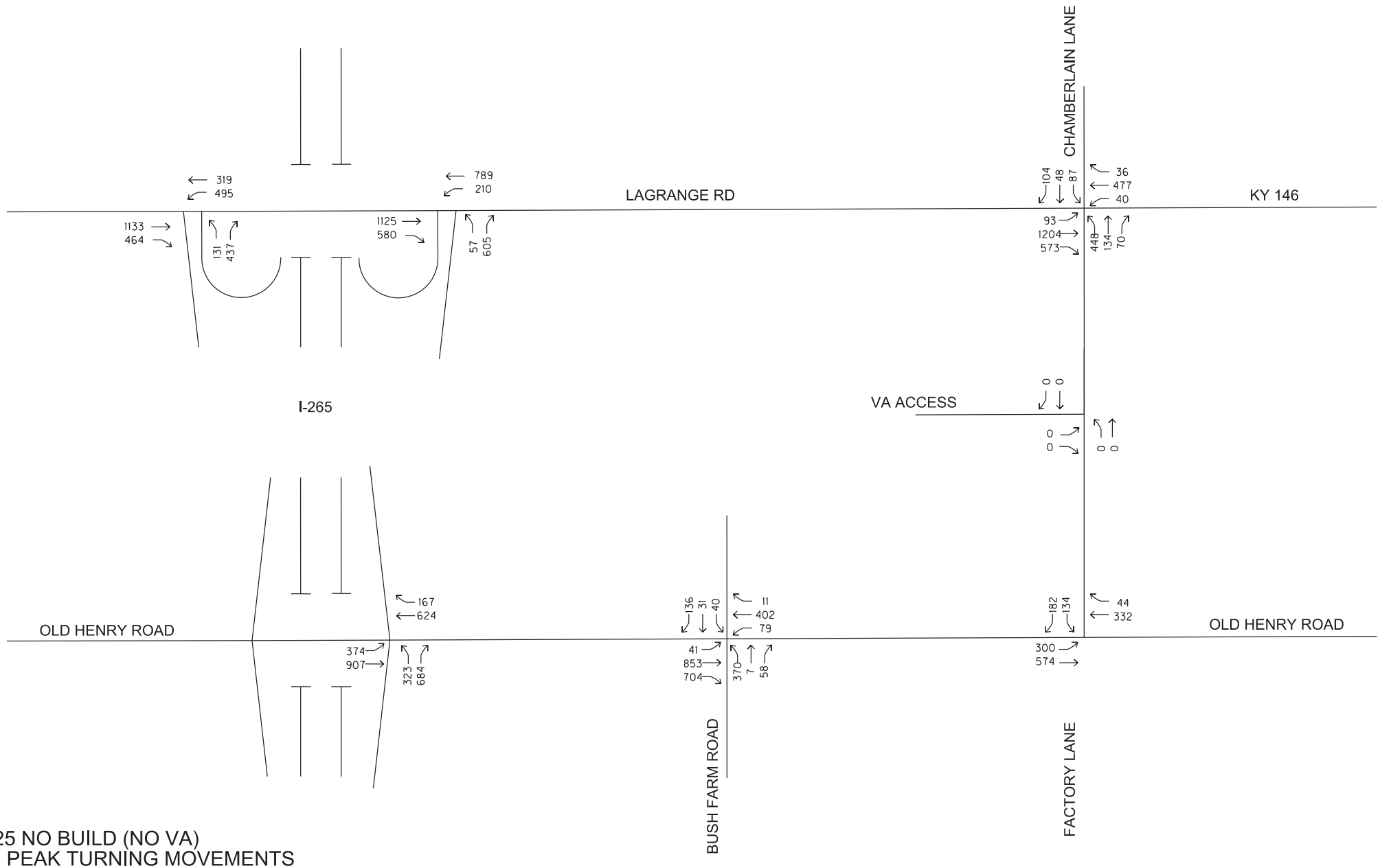
2025 NO ACTION
PM PEAK TURNING MOVEMENTS

APPENDIX B

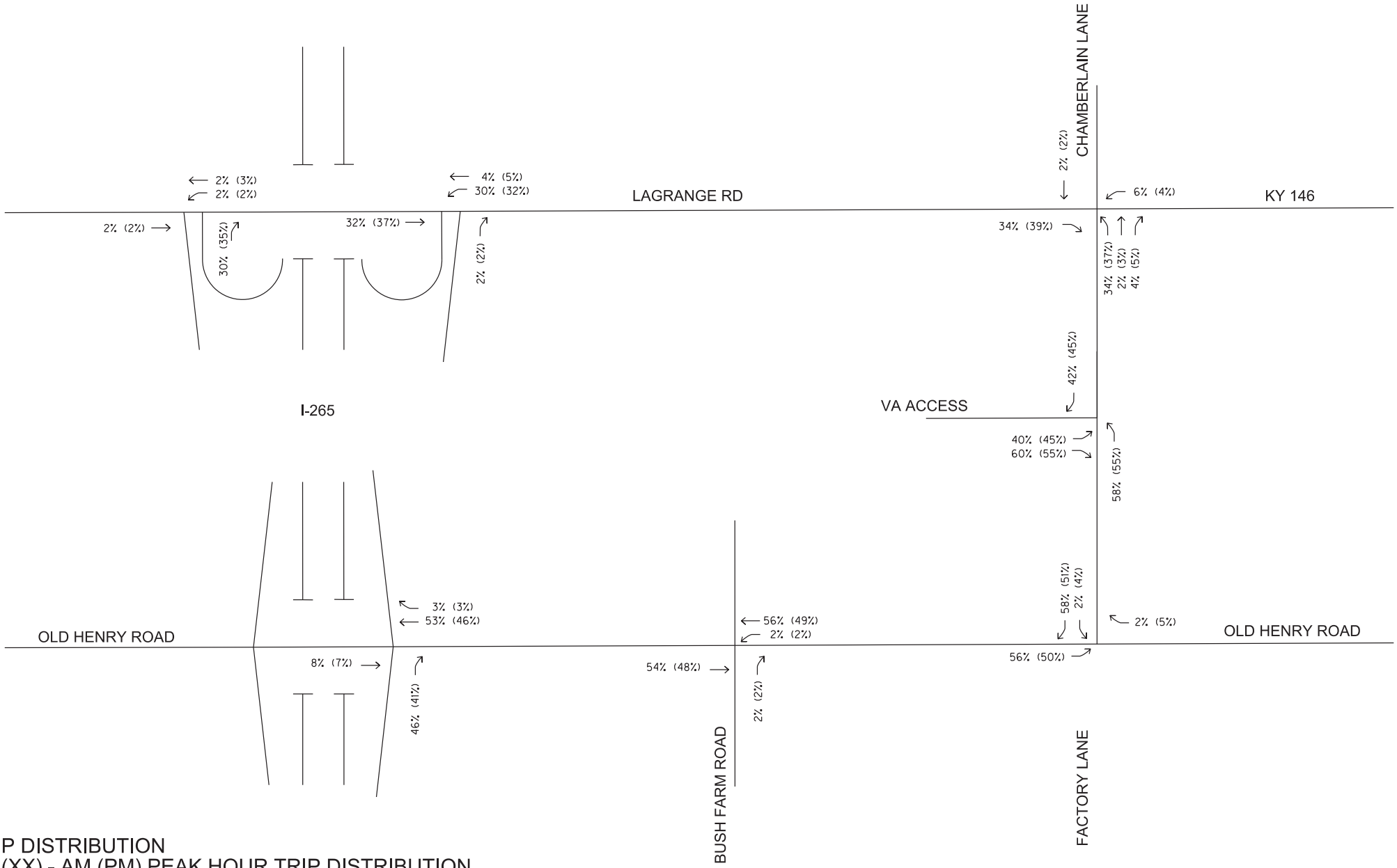
St Joseph Site (Factory Lane)
Traffic Volumes
(Vehicles per Hour)



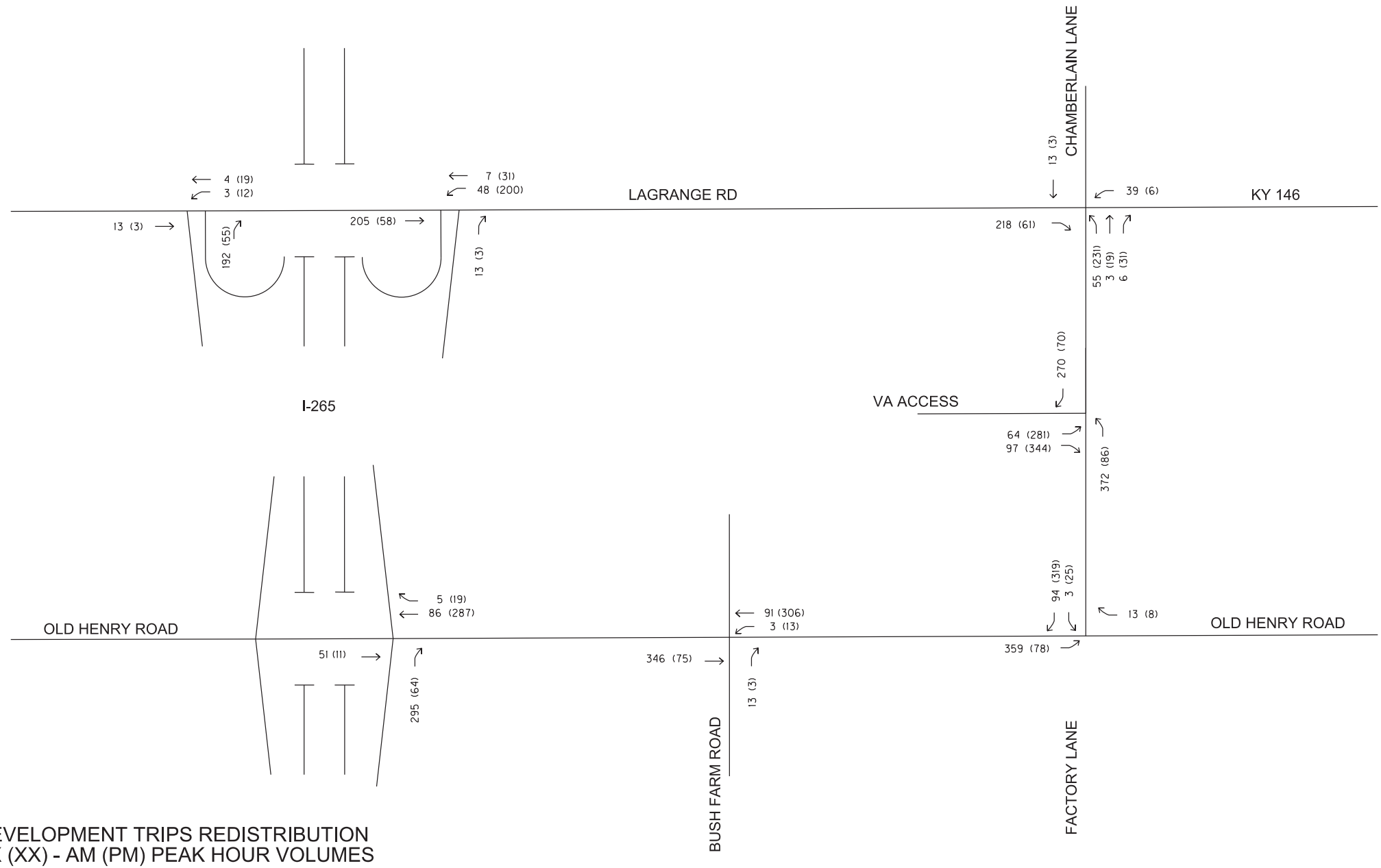
2025 NO BUILD (NO VA)
AM PEAK TURNING MOVEMENTS



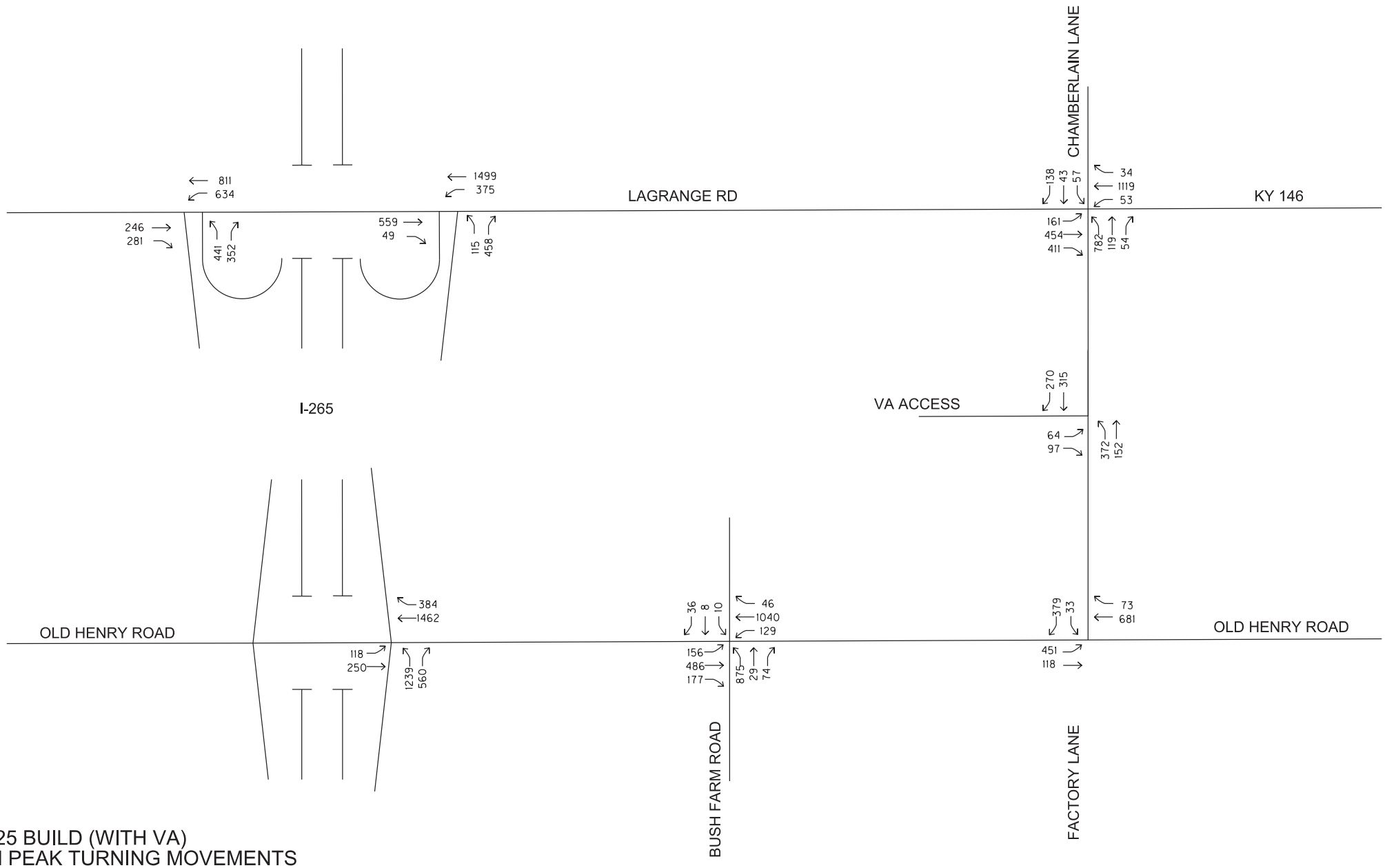
2025 NO BUILD (NO VA)
PM PEAK TURNING MOVEMENTS



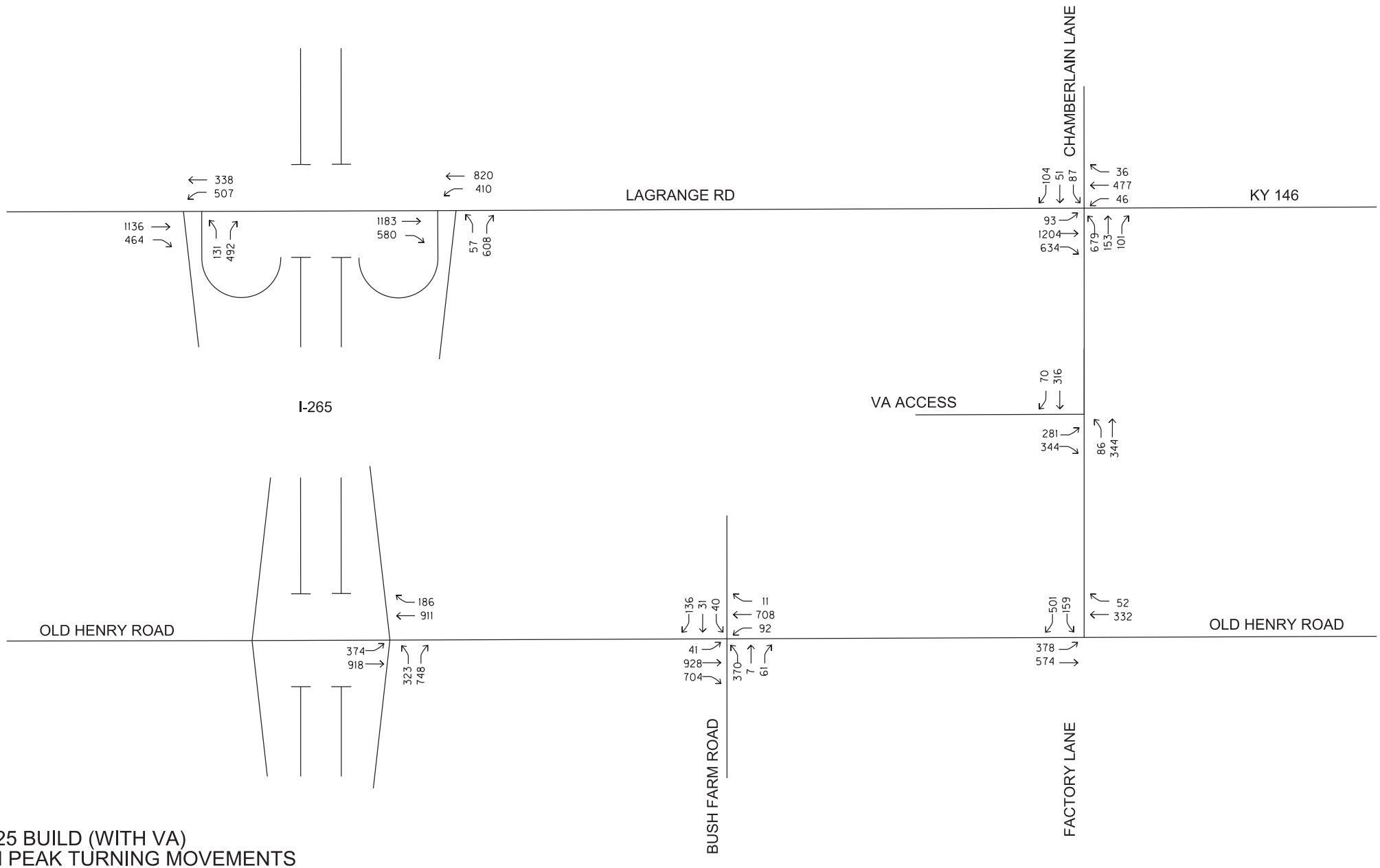
TRIP DISTRIBUTION
XX (XX) - AM (PM) PEAK HOUR TRIP DISTRIBUTION



DEVELOPMENT TRIPS REDISTRIBUTION
XX (XX) - AM (PM) PEAK HOUR VOLUMES



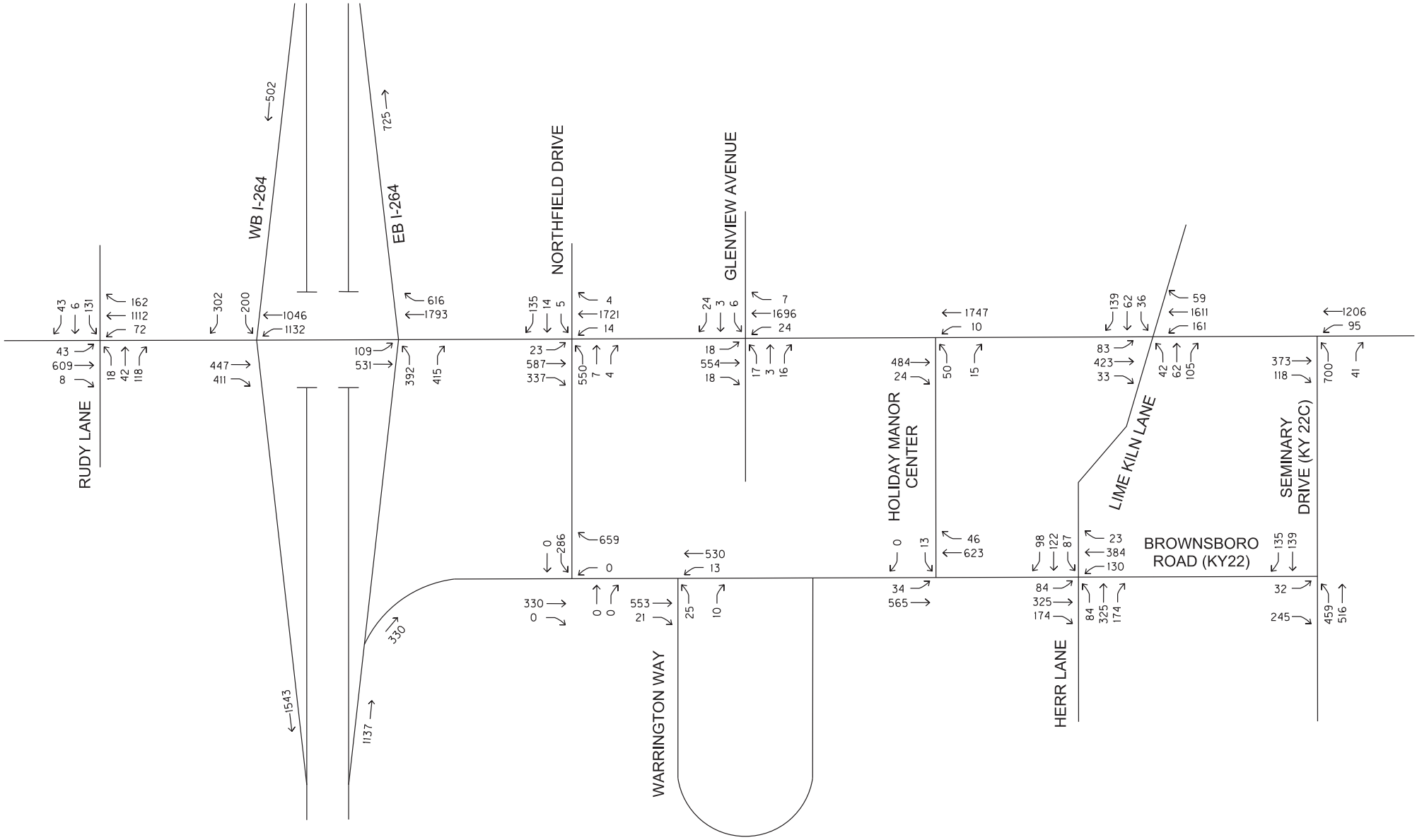
2025 BUILD (WITH VA)
AM PEAK TURNING MOVEMENTS



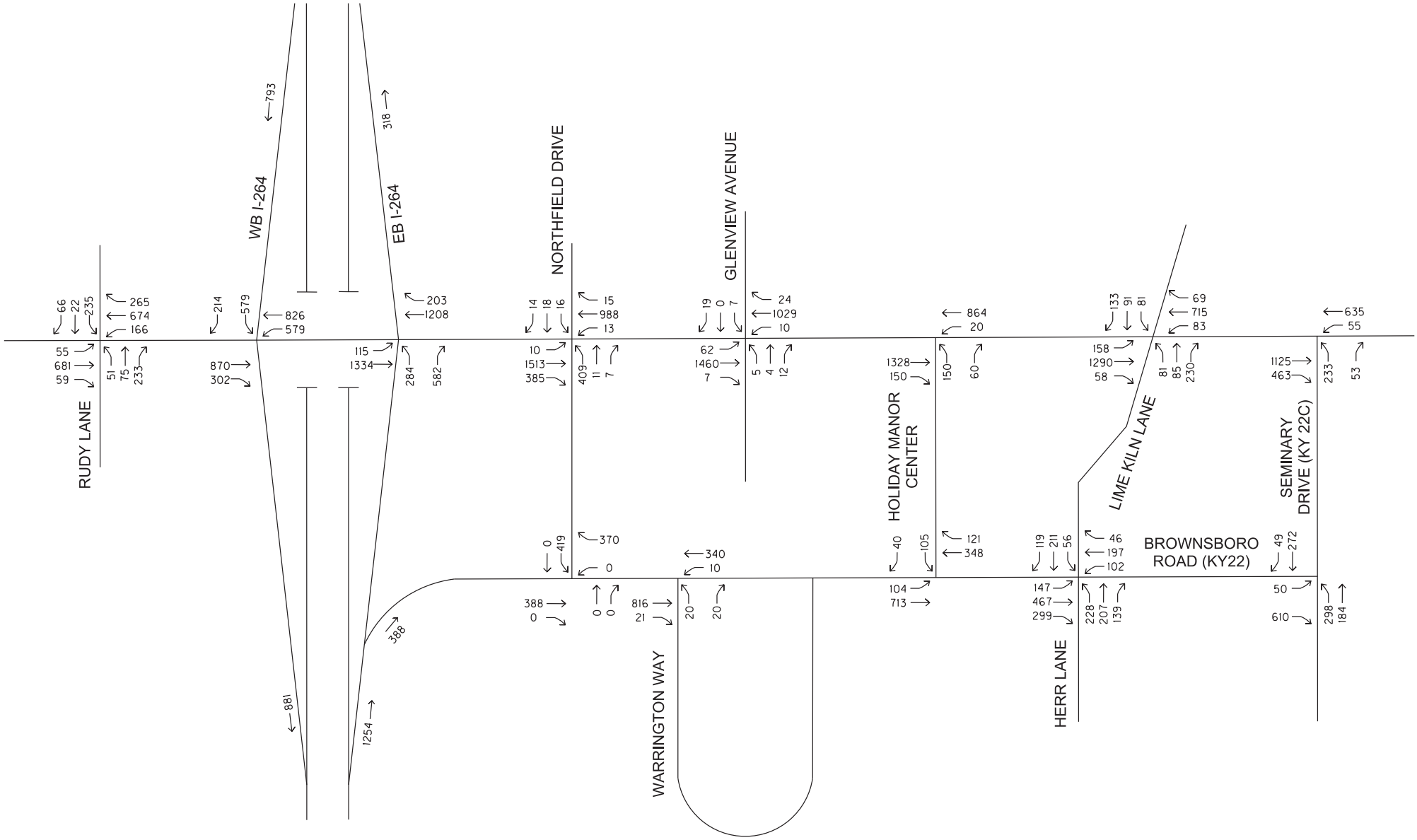
2025 BUILD (WITH VA)
PM PEAK TURNING MOVEMENTS

APPENDIX C

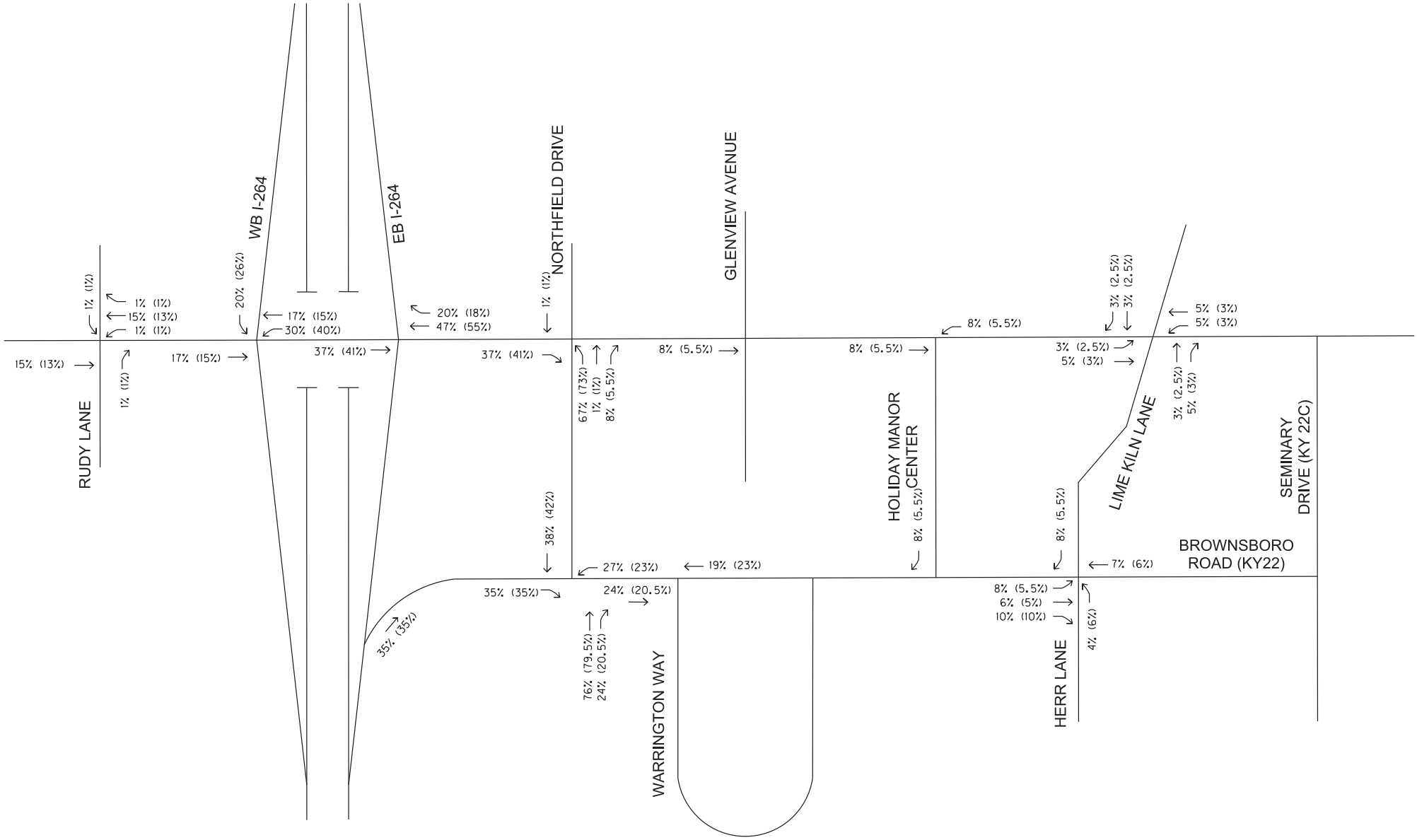
Midlands Site (KY 22)
Traffic Volumes
(Vehicles per Hour)



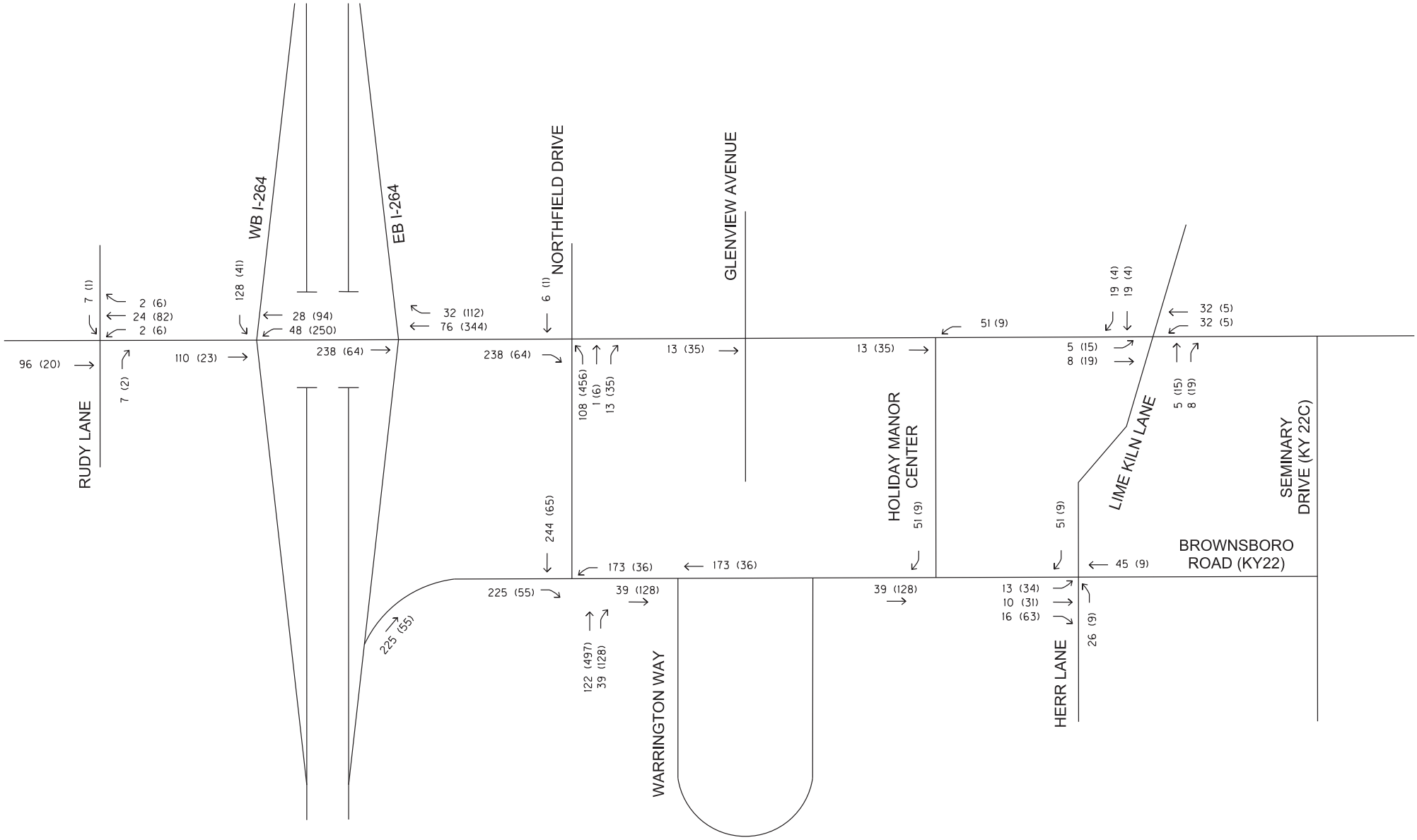
2015 EXISTING
AM PEAK TURNING MOVEMENTS



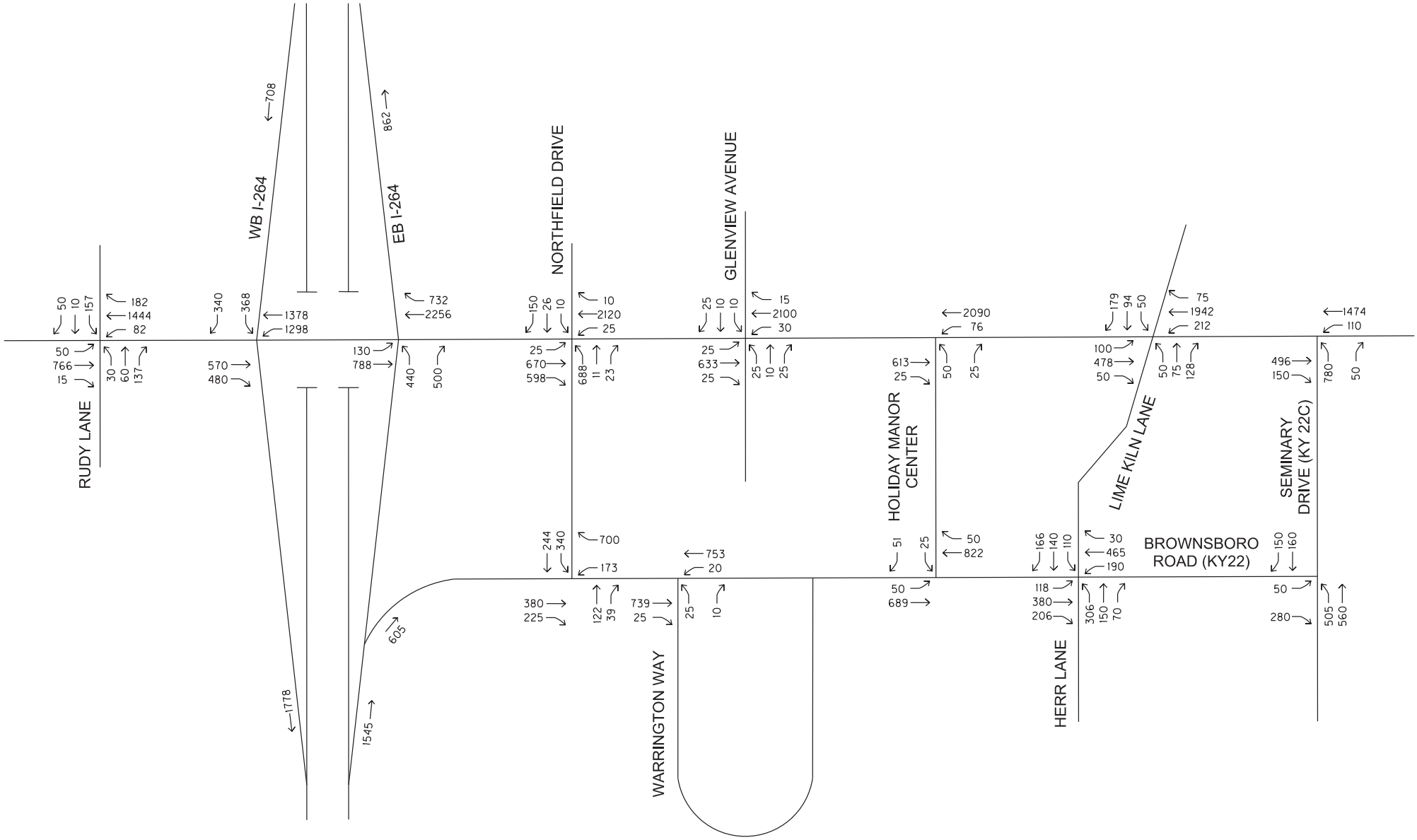
2015 EXISTING
PM PEAK TURNING MOVEMENTS



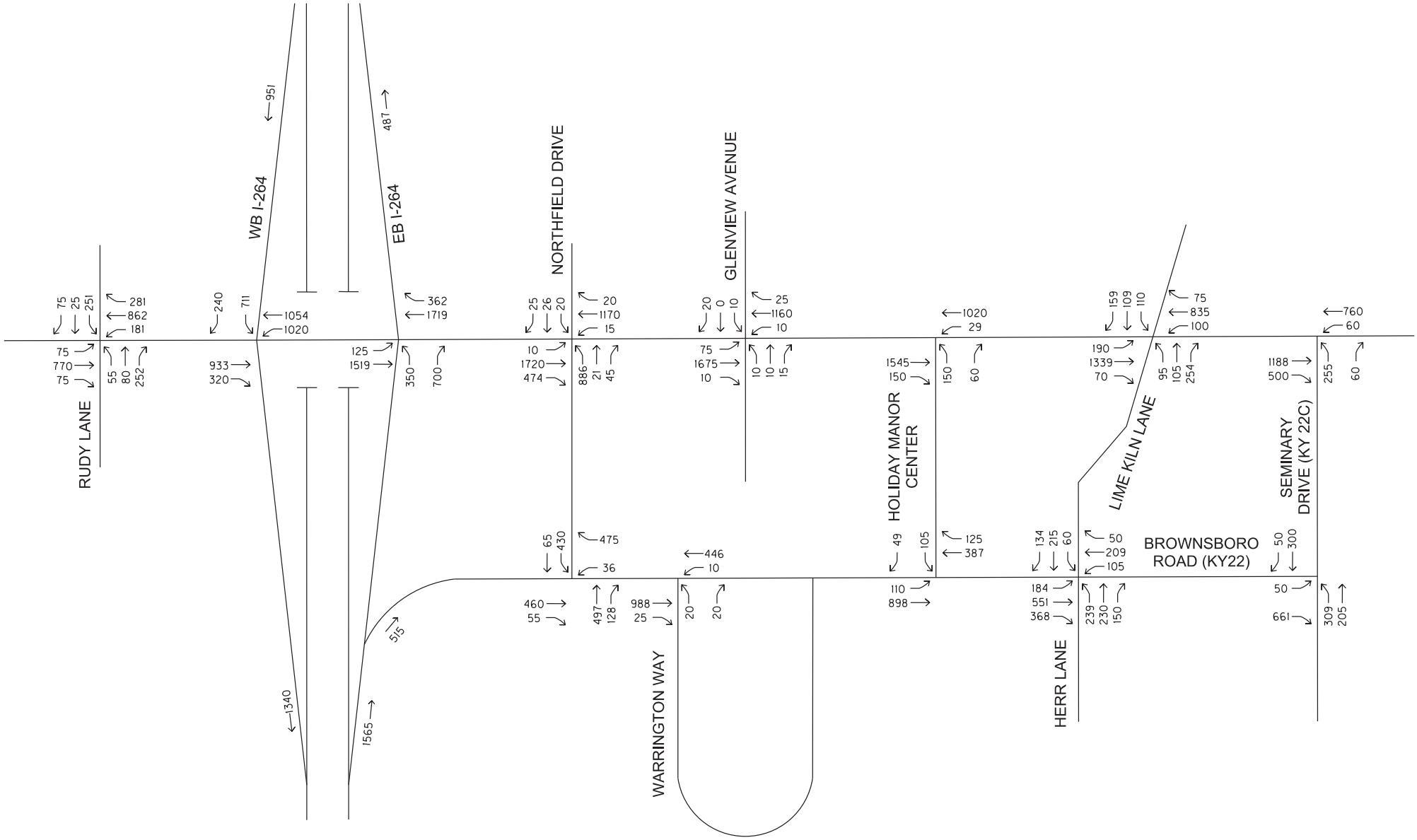
TRIP DISTRIBUTION
XX (XX) - AM (PM) PEAK HOUR TRIP DISTRIBUTION



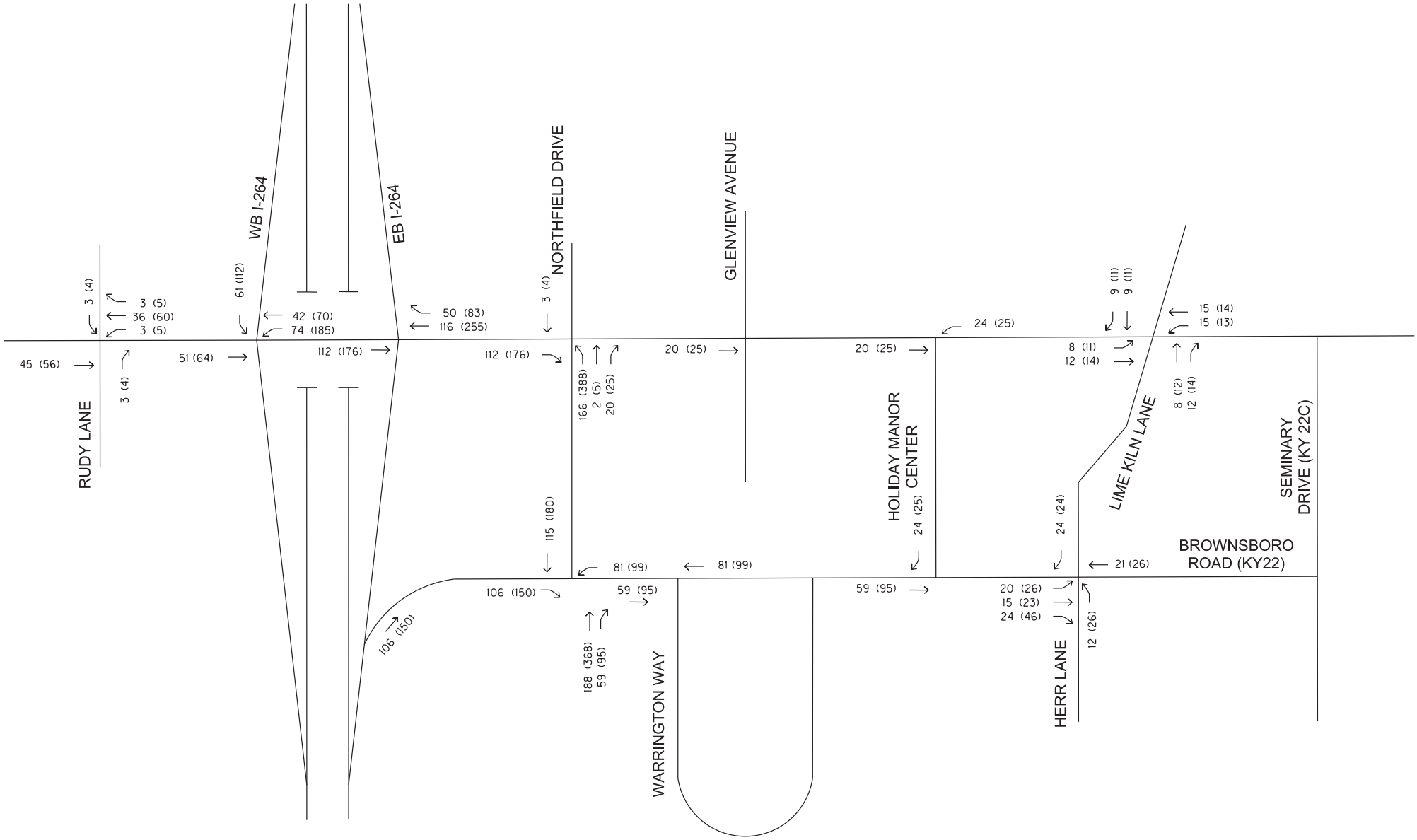
VA TRIPS REDISTRIBUTION
XX (XX) - AM (PM) PEAK HOUR VOLUMES



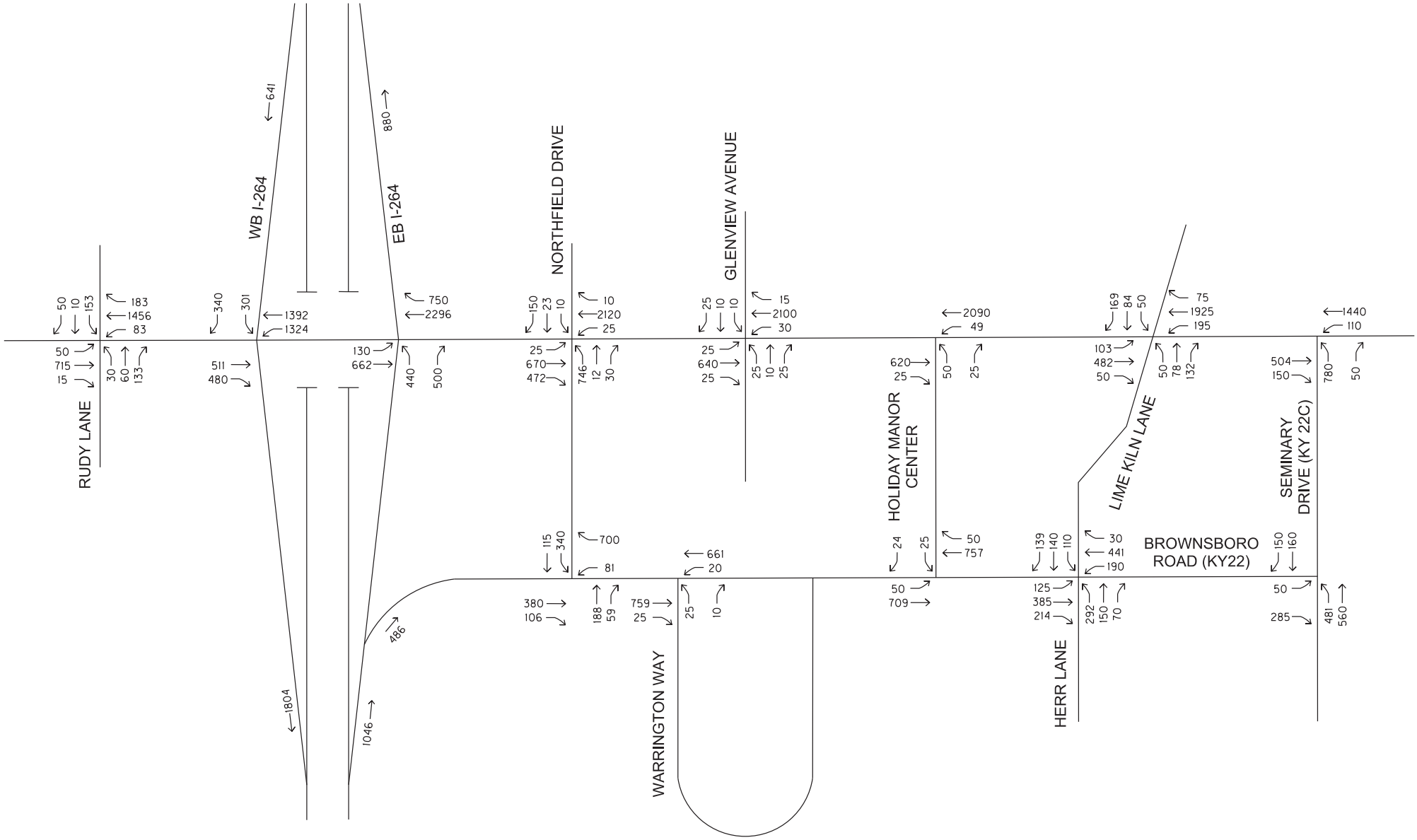
2025 BUILD (WITH VA)
AM PEAK TURNING MOVEMENTS



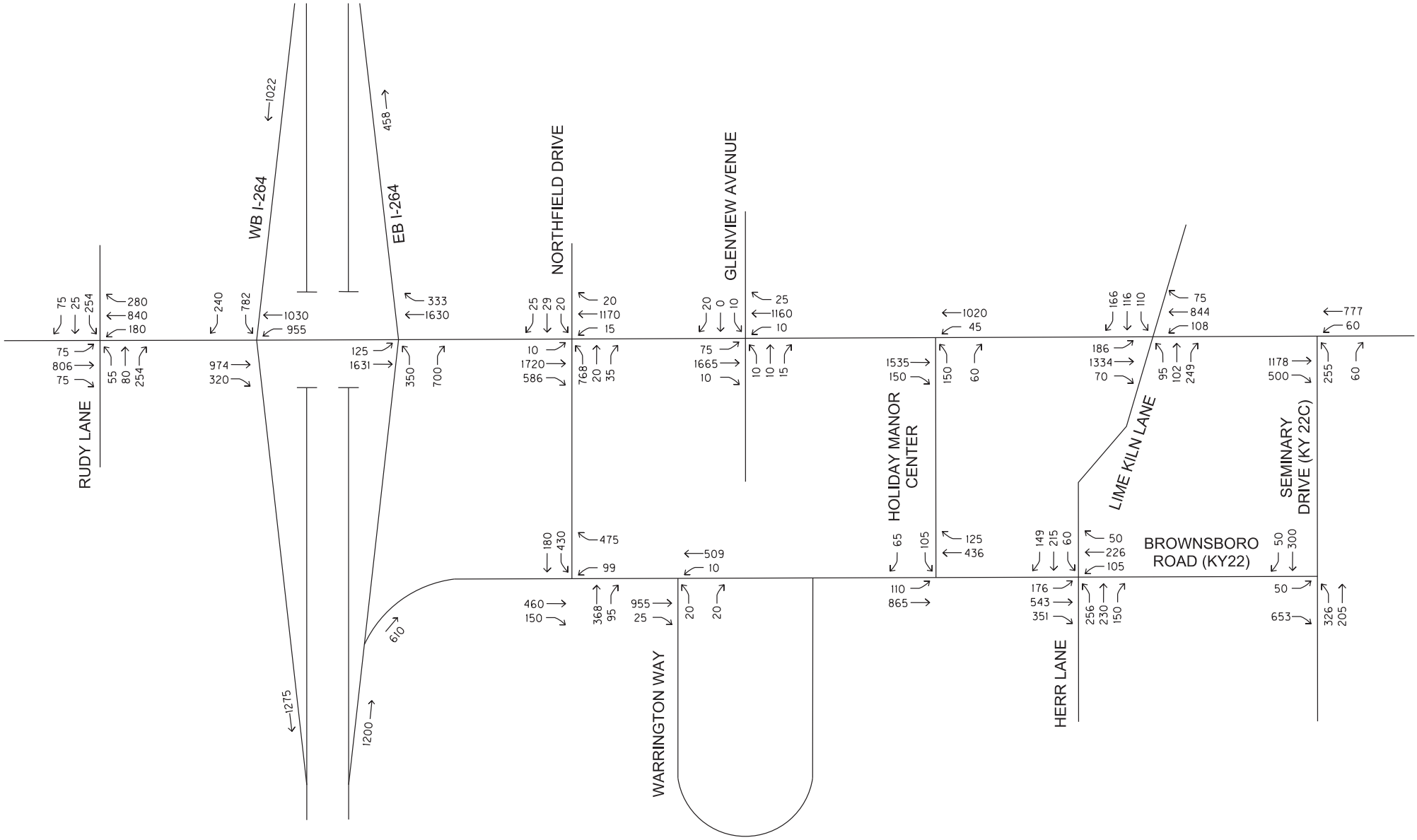
2025 BUILD (WITH VA)
PM PEAK TURNING MOVEMENTS



DEVELOPMENT TRIPS REDISTRIBUTION
XX (XX) - AM (PM) PEAK HOUR VOLUMES



2025 BUILD (WITH DEVELOPMENT)
AM PEAK TURNING MOVEMENTS



2025 BUILD (WITH DEVELOPMENT)
PM PEAK TURNING MOVEMENTS

APPENDIX D

Raw Count Data

Zorn Avenue

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ I-71 SB Ramps

File Name : zorn-71sb
Site Code : 00000000
Start Date : 9/10/2015
Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					71SBR From East					Zorn From South					71SBR From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	16	7	0	1	24	17	0	29	0	46	0	30	24	0	54	0	0	0	0	0	124
06:15 AM	23	16	0	1	40	33	0	36	0	69	0	44	37	0	81	0	0	0	0	0	190
06:30 AM	33	23	0	0	56	31	0	37	0	68	0	40	46	0	86	0	0	0	0	0	210
06:45 AM	39	27	0	0	66	51	0	75	0	126	0	73	59	0	132	0	0	0	0	0	324
Total	111	73	0	2	186	132	0	177	0	309	0	187	166	0	353	0	0	0	0	0	848
07:00 AM	64	42	0	0	106	44	0	96	0	140	0	61	60	0	121	0	0	0	0	0	367
07:15 AM	62	91	0	0	153	99	0	105	0	204	0	110	54	0	164	0	0	0	0	0	521
07:30 AM	69	91	0	0	160	87	0	117	0	204	0	94	83	0	177	0	0	0	0	0	541
07:45 AM	60	59	0	0	119	92	0	96	0	188	0	157	62	0	219	0	0	0	0	0	526
Total	255	283	0	0	538	322	0	414	0	736	0	422	259	0	681	0	0	0	0	0	1955
08:00 AM	45	51	0	0	96	87	0	75	0	162	5	110	89	0	204	0	0	0	0	0	462
08:15 AM	42	52	0	0	94	65	0	53	0	118	0	128	74	0	202	0	0	0	0	0	414
08:30 AM	52	53	0	3	108	56	0	60	0	116	0	95	73	0	168	0	0	0	0	0	392
08:45 AM	60	50	0	0	110	59	0	65	0	124	0	101	79	0	180	0	0	0	0	0	414
Total	199	206	0	3	408	267	0	253	0	520	5	434	315	0	754	0	0	0	0	0	1682
*** BREAK ***																					
02:00 PM	47	76	0	0	123	37	0	53	0	90	0	77	55	0	132	0	0	0	0	0	345
02:15 PM	39	73	0	0	112	36	0	69	0	105	0	72	78	0	150	0	0	0	0	0	367
02:30 PM	53	65	0	0	118	25	0	62	0	87	0	80	100	0	180	0	0	0	0	0	385
02:45 PM	56	82	0	0	138	31	1	58	0	90	0	72	87	0	159	0	0	0	0	0	387
Total	195	296	0	0	491	129	1	242	0	372	0	301	320	0	621	0	0	0	0	0	1484
03:00 PM	46	93	0	0	139	26	1	72	0	99	0	84	83	0	167	0	0	0	0	0	405
03:15 PM	67	90	0	0	157	34	0	57	0	91	0	98	68	0	166	0	0	0	0	0	414
03:30 PM	65	101	0	0	166	30	0	63	0	93	0	83	108	0	191	0	0	0	0	0	450
03:45 PM	44	86	0	0	130	41	1	47	0	89	0	98	70	0	168	0	0	0	0	0	387
Total	222	370	0	0	592	131	2	239	0	372	0	363	329	0	692	0	0	0	0	0	1656
04:00 PM	51	120	0	0	171	41	0	54	0	95	0	78	86	0	164	0	0	0	0	0	430
04:15 PM	40	161	0	0	201	61	0	70	0	131	2	80	79	0	161	0	0	0	0	0	493
04:30 PM	51	153	0	0	204	61	0	64	0	125	0	100	82	0	182	0	0	0	0	0	511
04:45 PM	30	158	0	0	188	89	0	80	0	169	0	96	34	0	130	0	0	0	0	0	487
Total	172	592	0	0	764	252	0	268	0	520	2	354	281	0	637	0	0	0	0	0	1921

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ I-71 SB Ramps

File Name : zorn-71sb
Site Code : 00000000
Start Date : 9/10/2015
Page No : 2

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					71SBR From East					Zorn From South					71SBR From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 PM	16	168	0	0	184	86	0	76	0	162	0	123	32	0	155	0	0	0	0	0	501
05:15 PM	28	146	0	0	174	75	0	58	0	133	0	120	28	0	148	0	0	0	0	0	455
05:30 PM	25	162	0	0	187	98	0	66	0	164	0	90	47	0	137	0	0	0	0	0	488
05:45 PM	24	140	0	0	164	82	0	78	0	160	0	109	34	0	143	0	0	0	0	0	467
Total	93	616	0	0	709	341	0	278	0	619	0	442	141	0	583	0	0	0	0	0	1911
06:00 PM	12	128	0	0	140	84	1	89	0	174	0	91	18	0	109	0	0	0	0	0	423
06:15 PM	15	84	0	0	99	65	0	88	0	153	0	85	57	0	142	0	0	0	0	0	394
Grand Total	1274	2648	0	5	3927	1723	4	2048	0	3775	7	2679	1886	0	4572	0	0	0	0	0	12274
Apprch %	32.4	67.4	0	0.1		45.6	0.1	54.3	0		0.2	58.6	41.3	0		0	0	0	0		
Total %	10.4	21.6	0	0	32	14	0	16.7	0	30.8	0.1	21.8	15.4	0	37.2	0	0	0	0	0	
Unshifted	1140	2518	0	5	3663	1617	4	2006	0	3627	7	2510	1829	0	4346	0	0	0	0	0	11636
% Unshifted	89.5	95.1	0	100	93.3	93.8	100	97.9	0	96.1	100	93.7	97	0	95.1	0	0	0	0	0	94.8
Bank 1	21	65	0	0	86	27	0	13	0	40	0	82	25	0	107	0	0	0	0	0	233
% Bank 1	1.6	2.5	0	0	2.2	1.6	0	0.6	0	1.1	0	3.1	1.3	0	2.3	0	0	0	0	0	1.9
Bank 2	113	65	0	0	178	79	0	29	0	108	0	87	32	0	119	0	0	0	0	0	405
% Bank 2	8.9	2.5	0	0	4.5	4.6	0	1.4	0	2.9	0	3.2	1.7	0	2.6	0	0	0	0	0	3.3

	Zorn From North					71SBR From East					Zorn From South					71SBR From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	62	**91**	0	0	153	**99**	0	105	0	**204**	0	110	54	0	164	0	0	0	0	0	521
07:30 AM	**69**	91	0	0	**160**	87	0	**117**	0	204	0	94	83	0	177	0	0	0	0	0	**541**
07:45 AM	60	59	0	0	119	92	0	96	0	188	0	**157**	62	0	**219**	0	0	0	0	0	526
08:00 AM	45	51	0	0	96	87	0	75	0	162	**5**	110	**89**	0	204	0	0	0	0	0	462
Total Volume	236	292	0	0	528	365	0	393	0	758	5	471	288	0	764	0	0	0	0	0	2050
% App. Total	44.7	55.3	0	0		48.2	0	51.8	0		0.7	61.6	37.7	0		0	0	0	0		
PHF	.855	.802	.000	.000	.825	.922	.000	.840	.000	.929	.250	.750	.809	.000	.872	.000	.000	.000	.000	.000	.947

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ I-71 SB Ramps

File Name : zorn-71sb
Site Code : 00000000
Start Date : 9/10/2015
Page No : 3

	Zorn From North					71SBR From East					Zorn From South					71SBR From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	40	161	0	0	201	61	0	70	0	131	**2**	80	79	0	161	0	0	0	0	0	493
04:30 PM	**51**	153	0	0	**204**	61	0	64	0	125	0	100	**82**	0	**182**	0	0	0	0	0	**511**
04:45 PM	30	158	0	0	188	**89**	0	**80**	0	**169**	0	96	34	0	130	0	0	0	0	0	487
05:00 PM	16	**168**	0	0	184	86	0	76	0	162	0	**123**	32	0	155	0	0	0	0	0	501
Total Volume	137	640	0	0	777	297	0	290	0	587	2	399	227	0	628	0	0	0	0	0	1992
% App. Total	17.6	82.4	0	0		50.6	0	49.4	0		0.3	63.5	36.1	0		0	0	0	0		
PHF	.672	.952	.000	.000	.952	.834	.000	.906	.000	.868	.250	.811	.692	.000	.863	.000	.000	.000	.000	.000	.975

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ I-71NB Ramps

File Name : zorn-71nb
Site Code : 00000000
Start Date : 9/10/2015
Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					NB71 From East					Zorn From South					NB71 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	0	35	3	0	38	0	0	0	0	0	24	32	0	0	56	26	0	24	0	50	144
06:15 AM	0	51	8	0	59	0	0	0	0	0	26	45	0	0	71	42	0	38	0	80	210
06:30 AM	0	49	12	0	61	0	0	0	0	0	34	68	0	0	102	55	0	35	0	90	253
06:45 AM	0	95	12	0	107	0	0	0	0	0	43	86	0	0	129	95	0	51	0	146	382
Total	0	230	35	0	265	0	0	0	0	0	127	231	0	0	358	218	0	148	0	366	989
07:00 AM	0	121	14	0	135	0	0	0	0	0	64	78	0	0	142	98	0	46	0	144	421
07:15 AM	0	167	15	0	182	0	0	0	0	0	75	119	0	0	194	116	0	71	0	187	563
07:30 AM	0	177	17	0	194	0	0	0	0	0	97	117	0	0	214	104	0	74	1	179	587
07:45 AM	0	124	20	0	144	0	0	0	0	0	100	157	0	0	257	101	0	69	0	170	571
Total	0	589	66	0	655	0	0	0	0	0	336	471	0	0	807	419	0	260	1	680	2142
08:00 AM	0	121	20	0	141	0	0	0	0	0	88	112	0	0	200	78	0	67	0	145	486
08:15 AM	0	77	13	0	90	0	0	0	0	0	69	130	0	0	199	79	0	77	0	156	445
08:30 AM	0	99	22	0	121	0	0	0	0	0	73	106	0	0	179	73	0	55	0	128	428
08:45 AM	0	88	20	0	108	0	0	0	0	0	60	109	0	0	169	79	0	64	0	143	420
Total	0	385	75	0	460	0	0	0	0	0	290	457	0	0	747	309	0	263	0	572	1779
*** BREAK ***																					
02:00 PM	0	73	42	0	115	0	0	0	0	0	60	94	0	0	154	61	0	43	0	104	373
02:15 PM	0	83	38	0	121	0	0	0	0	0	65	101	0	0	166	56	0	48	0	104	391
02:30 PM	0	72	38	0	110	0	0	0	0	0	81	117	0	0	198	64	0	55	0	119	427
02:45 PM	0	88	51	0	139	0	0	0	0	0	84	103	0	0	187	62	0	53	0	115	441
Total	0	316	169	0	485	0	0	0	0	0	290	415	0	0	705	243	0	199	0	442	1632
03:00 PM	0	97	53	0	150	0	0	0	0	0	97	122	0	0	219	58	0	39	0	97	466
03:15 PM	0	95	45	0	140	0	0	0	0	0	75	111	0	0	186	58	1	60	0	119	445
03:30 PM	0	114	57	0	171	0	0	0	0	0	115	134	0	0	249	52	0	46	0	98	518
03:45 PM	0	85	55	0	140	0	0	0	0	0	104	119	0	0	223	44	0	56	0	100	463
Total	0	391	210	0	601	0	0	0	0	0	391	486	0	0	877	212	1	201	0	414	1892
04:00 PM	0	96	81	0	177	0	0	0	0	0	137	131	0	0	268	44	1	28	0	73	518
04:15 PM	0	122	106	0	228	0	0	0	0	0	115	127	0	0	242	56	1	46	0	103	573
04:30 PM	0	130	97	0	227	0	0	0	0	0	154	142	0	0	296	47	0	52	0	99	622
04:45 PM	0	143	97	0	240	0	0	0	0	0	139	105	0	0	244	56	0	39	0	95	579
Total	0	491	381	0	872	0	0	0	0	0	545	505	0	0	1050	203	2	165	0	370	2292

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ I-71NB Ramps

File Name : zorn-71nb
Site Code : 00000000
Start Date : 9/10/2015
Page No : 2

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					NB71 From East					Zorn From South					NB71 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 PM	0	139	112	0	251	0	0	0	0	0	166	88	0	0	254	35	0	54	0	89	594
05:15 PM	0	120	104	0	224	0	0	0	0	0	123	99	0	1	223	51	0	53	0	104	551
05:30 PM	0	160	98	0	258	0	0	0	0	0	93	106	0	0	199	48	0	33	0	81	538
05:45 PM	0	142	67	0	209	0	0	0	0	0	98	107	0	0	205	53	0	37	0	90	504
Total	0	561	381	0	942	0	0	0	0	0	480	400	0	1	881	187	0	177	0	364	2187
06:00 PM	0	147	64	0	211	0	0	0	0	0	114	77	0	0	191	46	0	33	0	79	481
06:15 PM	0	123	51	0	174	0	0	0	0	0	66	113	0	0	179	37	0	36	0	73	426
Grand Total	0	3233	1432	0	4665	0	0	0	0	0	2639	3155	0	1	5795	1874	3	1482	1	3360	13820
Apprch %	0	69.3	30.7	0		0	0	0	0		45.5	54.4	0	0		55.8	0.1	44.1	0		
Total %	0	23.4	10.4	0	33.8	0	0	0	0	0	19.1	22.8	0	0	41.9	13.6	0	10.7	0	24.3	
Unshifted	0	3143	1360	0	4503	0	0	0	0	0	2580	3046	0	1	5627	1830	3	1375	1	3209	13339
% Unshifted	0	97.2	95	0	96.5	0	0	0	0	0	97.8	96.5	0	100	97.1	97.7	100	92.8	100	95.5	96.5
Bank 1	0	77	27	0	104	0	0	0	0	0	43	99	0	0	142	38	0	40	0	78	324
% Bank 1	0	2.4	1.9	0	2.2	0	0	0	0	0	1.6	3.1	0	0	2.5	2	0	2.7	0	2.3	2.3
Bank 2	0	13	45	0	58	0	0	0	0	0	16	10	0	0	26	6	0	67	0	73	157
% Bank 2	0	0.4	3.1	0	1.2	0	0	0	0	0	0.6	0.3	0	0	0.4	0.3	0	4.5	0	2.2	1.1

	Zorn From North					NB71 From East					Zorn From South					NB71 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	167	15	0	182	0	0	0	0	0	75	119	0	0	194	**116**	0	71	0	**187**	563
07:30 AM	0	**177**	17	0	**194**	0	0	0	0	0	97	117	0	0	214	104	0	**74**	**1**	179	**587**
07:45 AM	0	124	**20**	0	144	0	0	0	0	0	**100**	**157**	0	0	**257**	101	0	69	0	170	571
08:00 AM	0	121	20	0	141	0	0	0	0	0	88	112	0	0	200	78	0	67	0	145	486
Total Volume	0	589	72	0	661	0	0	0	0	0	360	505	0	0	865	399	0	281	1	681	2207
% App. Total	0	89.1	10.9	0		0	0	0	0		41.6	58.4	0	0		58.6	0	41.3	0.1		
PHF	.000	.832	.900	.000	.852	.000	.000	.000	.000	.000	.900	.804	.000	.000	.841	.860	.000	.949	.250	.910	.940

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ I-71NB Ramps

File Name : zorn-71nb
Site Code : 00000000
Start Date : 9/10/2015
Page No : 3

	Zorn From North					NB71 From East					Zorn From South					NB71 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	122	106	0	228	0	0	0	0	0	115	127	0	0	242	**56**	**1**	46	0	**103**	573
04:30 PM	0	130	97	0	227	0	0	0	0	0	154	**142**	0	0	**296**	47	0	52	0	99	**622**
04:45 PM	0	**143**	97	0	240	0	0	0	0	0	139	105	0	0	244	56	0	39	0	95	579
05:00 PM	0	139	**112**	0	**251**	0	0	0	0	0	**166**	88	0	0	254	35	0	**54**	0	89	594
Total Volume	0	534	412	0	946	0	0	0	0	0	574	462	0	0	1036	194	1	191	0	386	2368
% App. Total	0	56.4	43.6	0		0	0	0	0		55.4	44.6	0	0		50.3	0.3	49.5	0		
PHF	.000	.934	.920	.000	.942	.000	.000	.000	.000	.000	.864	.813	.000	.000	.875	.866	.250	.884	.000	.937	.952

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ Melwood

File Name : Zorn-Melwood
Site Code : 00000000
Start Date : 9/10/2015
Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					MELWOOD From East					Zorn From South					MELWOOD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	17	41	0	0	58	1	1	3	0	5	0	39	2	0	41	6	1	19	0	26	130
06:15 AM	22	69	1	0	92	3	0	0	0	3	0	44	3	0	47	2	0	26	0	28	170
06:30 AM	22	75	2	2	101	3	0	0	0	3	1	69	3	0	73	8	0	27	0	35	212
06:45 AM	41	136	4	0	181	6	0	0	0	6	0	79	4	0	83	9	0	39	0	48	318
Total	102	321	7	2	432	13	1	3	0	17	1	231	12	0	244	25	1	111	0	137	830
07:00 AM	36	186	3	0	225	6	0	2	0	8	1	105	6	0	112	10	0	37	0	47	392
07:15 AM	49	227	5	0	281	11	0	3	0	14	0	134	7	0	141	15	0	38	0	53	489
07:30 AM	56	239	0	0	295	22	4	5	0	31	0	145	9	0	154	18	1	48	0	67	547
07:45 AM	62	166	2	0	230	16	4	5	0	25	6	174	13	0	193	12	1	54	0	67	515
Total	203	818	10	0	1031	55	8	15	0	78	7	558	35	0	600	55	2	177	0	234	1943
08:00 AM	67	118	4	0	189	9	3	1	0	13	5	156	9	0	170	23	1	39	0	63	435
08:15 AM	49	106	6	0	161	11	4	1	0	16	6	139	16	0	161	11	3	48	0	62	400
08:30 AM	57	106	4	0	167	10	1	2	0	13	2	118	21	0	141	19	1	47	0	67	388
*** BREAK ***																					
Total	173	330	14	0	517	30	8	4	0	42	13	413	46	0	472	53	5	134	0	192	1223
*** BREAK ***																					
02:00 PM	26	103	5	0	134	8	1	1	0	10	3	109	12	0	124	16	2	38	0	56	324
02:15 PM	31	108	1	0	140	4	0	0	0	4	1	123	6	0	130	11	3	42	0	56	330
02:30 PM	23	99	7	0	129	5	5	1	0	11	5	143	10	0	158	20	1	42	0	63	361
02:45 PM	30	115	7	0	152	6	0	2	0	8	3	131	7	0	141	7	2	46	0	55	356
Total	110	425	20	0	555	23	6	4	0	33	12	506	35	0	553	54	8	168	0	230	1371
03:00 PM	32	113	6	0	151	4	0	3	0	7	1	151	12	0	164	12	2	52	0	66	388
03:15 PM	30	124	7	0	161	3	3	2	0	8	2	137	17	0	156	19	1	51	0	71	396
03:30 PM	30	128	7	0	165	3	0	0	0	3	2	195	17	0	214	15	1	48	0	64	446
03:45 PM	22	98	4	0	124	3	3	3	0	9	7	160	13	0	180	11	3	55	0	69	382
Total	114	463	24	0	601	13	6	8	0	27	12	643	59	0	714	57	7	206	0	270	1612
04:00 PM	26	105	3	0	134	9	0	1	0	10	2	210	17	0	229	13	3	61	0	77	450
04:15 PM	28	138	10	0	176	1	1	2	0	4	3	158	12	0	173	18	3	72	0	93	446
04:30 PM	38	118	7	0	163	6	0	6	0	12	12	221	15	0	248	9	1	73	0	83	506
04:45 PM	34	140	14	0	188	6	3	3	0	12	21	165	13	0	199	13	2	74	0	89	488
Total	126	501	34	0	661	22	4	12	0	38	38	754	57	0	849	53	9	280	0	342	1890

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ Melwood

File Name : Zorn-Melwood
Site Code : 00000000
Start Date : 9/10/2015
Page No : 2

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					MELWOOD From East					Zorn From South					MELWOOD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 PM	33	123	14	0	170	5	1	4	0	10	9	149	14	0	172	30	4	89	0	123	475
05:15 PM	30	134	6	0	170	2	1	2	0	5	9	145	22	0	176	21	7	87	0	115	466
05:30 PM	55	138	6	0	199	5	0	6	0	11	8	126	28	0	162	12	6	62	0	80	452
05:45 PM	58	121	12	0	191	10	2	10	0	22	10	130	24	0	164	18	4	70	0	92	469
Total	176	516	38	0	730	22	4	22	0	48	36	550	88	0	674	81	21	308	0	410	1862
06:00 PM	44	117	17	0	178	8	1	4	0	13	1	105	29	0	135	18	4	59	0	81	407
06:15 PM	29	119	12	3	163	13	1	5	0	19	6	121	19	0	146	10	3	66	0	79	407
Grand Total	1077	3610	176	5	4868	199	39	77	0	315	126	3881	380	0	4387	406	60	1509	0	1975	11545
Apprch %	22.1	74.2	3.6	0.1		63.2	12.4	24.4	0		2.9	88.5	8.7	0		20.6	3	76.4	0		
Total %	9.3	31.3	1.5	0	42.2	1.7	0.3	0.7	0	2.7	1.1	33.6	3.3	0	38	3.5	0.5	13.1	0	17.1	
Unshifted	1045	3524	174	5	4748	196	39	70	0	305	124	3779	349	0	4252	369	59	1460	0	1888	11193
% Unshifted	97	97.6	98.9	100	97.5	98.5	100	90.9	0	96.8	98.4	97.4	91.8	0	96.9	90.9	98.3	96.8	0	95.6	97
Bank 1	18	80	2	0	100	3	0	6	0	9	1	93	30	0	124	36	1	28	0	65	298
% Bank 1	1.7	2.2	1.1	0	2.1	1.5	0	7.8	0	2.9	0.8	2.4	7.9	0	2.8	8.9	1.7	1.9	0	3.3	2.6
Bank 2	14	6	0	0	20	0	0	1	0	1	1	9	1	0	11	1	0	21	0	22	54
% Bank 2	1.3	0.2	0	0	0.4	0	0	1.3	0	0.3	0.8	0.2	0.3	0	0.3	0.2	0	1.4	0	1.1	0.5

	Zorn From North					MELWOOD From East					Zorn From South					MELWOOD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	49	227	**5**	0	281	11	0	3	0	14	0	134	7	0	141	15	0	38	0	53	489
07:30 AM	56	**239**	0	0	**295**	**22**	**4**	**5**	0	**31**	0	145	9	0	154	18	**1**	48	0	**67**	**547**
07:45 AM	62	166	2	0	230	16	4	5	0	25	**6**	**174**	**13**	0	**193**	12	1	**54**	0	67	515
08:00 AM	**67**	118	4	0	189	9	3	1	0	13	5	156	9	0	170	**23**	1	39	0	63	435
Total Volume	234	750	11	0	995	58	11	14	0	83	11	609	38	0	658	68	3	179	0	250	1986
% App. Total	23.5	75.4	1.1	0		69.9	13.3	16.9	0		1.7	92.6	5.8	0		27.2	1.2	71.6	0		
PHF	.873	.785	.550	.000	.843	.659	.688	.700	.000	.669	.458	.875	.731	.000	.852	.739	.750	.829	.000	.933	.908

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ Melwood

File Name : Zorn-Melwood
Site Code : 00000000
Start Date : 9/10/2015
Page No : 3

	Zorn From North					MELWOOD From East					Zorn From South					MELWOOD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	**38**	118	7	0	163	**6**	0	**6**	0	**12**	12	**221**	15	0	**248**	9	1	73	0	83	**506**
04:45 PM	34	**140**	**14**	0	**188**	6	**3**	3	0	12	**21**	165	13	0	199	13	2	74	0	89	488
05:00 PM	33	123	14	0	170	5	1	4	0	10	9	149	14	0	172	**30**	4	**89**	0	**123**	475
05:15 PM	30	134	6	0	170	2	1	2	0	5	9	145	**22**	0	176	21	**7**	87	0	115	466
Total Volume	135	515	41	0	691	19	5	15	0	39	51	680	64	0	795	73	14	323	0	410	1935
% App. Total	19.5	74.5	5.9	0		48.7	12.8	38.5	0		6.4	85.5	8.1	0		17.8	3.4	78.8	0		
PHF	.888	.920	.732	.000	.919	.792	.417	.625	.000	.813	.607	.769	.727	.000	.801	.608	.500	.907	.000	.833	.956

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ VA

File Name : zorn-VA
Site Code : 00000000
Start Date : 9/10/2015
Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					VA From East					Zorn From South					VA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	40	14	0	0	54	2	0	0	0	2	0	35	5	0	40	1	0	2	0	3	99
06:15 AM	44	19	0	0	63	0	0	0	0	0	0	40	10	0	50	1	0	7	0	8	121
06:30 AM	56	24	0	0	80	2	0	0	0	2	2	55	15	0	72	1	0	12	0	13	167
06:45 AM	95	52	0	0	147	3	0	2	0	5	0	68	22	0	90	1	0	9	0	10	252
Total	235	109	0	0	344	7	0	2	0	9	2	198	52	0	252	4	0	30	0	34	639
07:00 AM	126	78	0	1	205	5	0	2	0	7	0	90	24	0	114	4	0	16	0	20	346
07:15 AM	138	93	4	0	235	6	1	3	0	10	1	105	37	0	143	4	0	25	0	29	417
07:30 AM	128	123	5	0	256	1	2	2	0	5	0	127	43	0	170	5	0	20	0	25	456
07:45 AM	104	72	1	0	177	1	0	0	0	1	0	159	19	0	178	6	0	24	0	30	386
Total	496	366	10	1	873	13	3	7	0	23	1	481	123	0	605	19	0	85	0	104	1605
08:00 AM	53	76	3	1	133	8	0	2	0	10	1	107	22	0	130	11	0	42	0	53	326
08:15 AM	49	51	3	1	104	3	1	0	0	4	0	126	12	0	138	11	0	31	0	42	288
08:30 AM	44	67	3	0	114	6	0	0	0	6	0	105	14	0	119	6	0	25	0	31	270
08:45 AM	50	78	6	1	135	5	0	1	0	6	0	107	4	0	111	4	0	26	0	30	282
Total	196	272	15	3	486	22	1	3	0	26	1	445	52	0	498	32	0	124	0	156	1166
*** BREAK ***																					
02:00 PM	31	91	2	0	124	1	0	1	0	2	0	76	7	0	83	15	0	47	0	62	271
02:15 PM	27	89	5	0	121	3	0	1	0	4	2	74	9	0	85	9	0	46	0	55	265
02:30 PM	22	96	2	0	120	4	0	2	0	6	1	89	8	0	98	15	0	69	0	84	308
02:45 PM	25	90	5	0	120	1	0	2	0	3	2	88	9	0	99	11	0	48	0	59	281
Total	105	366	14	0	485	9	0	6	0	15	5	327	33	0	365	50	0	210	0	260	1125
03:00 PM	41	91	4	0	136	0	1	2	0	3	0	99	5	0	104	15	0	67	0	82	325
03:15 PM	28	120	3	0	151	3	1	2	0	6	4	96	10	0	110	16	0	50	0	66	333
03:30 PM	25	109	2	0	136	3	0	2	0	5	2	101	7	0	110	11	0	106	0	117	368
03:45 PM	25	93	7	0	125	1	2	1	0	4	0	110	9	0	119	21	0	68	0	89	337
Total	119	413	16	0	548	7	4	7	0	18	6	406	31	0	443	63	0	291	0	354	1363
04:00 PM	17	102	0	0	119	1	0	1	0	2	1	88	16	0	105	23	5	135	0	163	389
04:15 PM	26	132	6	1	165	1	1	1	0	3	1	97	14	0	112	19	1	71	0	91	371
04:30 PM	24	112	2	0	138	1	0	1	0	2	2	106	21	0	129	31	0	135	0	166	435
04:45 PM	22	133	6	0	161	2	0	2	0	4	0	113	12	0	125	17	1	61	0	79	369
Total	89	479	14	1	583	5	1	5	0	11	4	404	63	0	471	90	7	402	0	499	1564

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ VA

File Name : zorn-VA
Site Code : 00000000
Start Date : 9/10/2015
Page No : 2

Groups Printed- Unshifted - Bank 1 - Bank 2

	Zorn From North					VA From East					Zorn From South					VA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 PM	18	132	9	0	159	5	0	0	0	5	2	108	21	0	131	17	0	51	0	68	363
05:15 PM	16	150	5	0	171	3	0	1	0	4	1	138	19	0	158	7	0	33	0	40	373
05:30 PM	8	146	3	0	157	6	0	1	0	7	2	126	9	0	137	15	0	35	0	50	351
05:45 PM	5	148	7	0	160	0	0	1	0	1	2	128	14	0	144	6	0	28	0	34	339
Total	47	576	24	0	647	14	0	3	0	17	7	500	63	0	570	45	0	147	0	192	1426
06:00 PM	11	141	4	0	156	1	0	2	0	3	0	100	5	0	105	8	0	36	0	44	308
06:15 PM	10	127	5	0	142	2	0	0	0	2	1	111	8	0	120	5	0	23	0	28	292
Grand Total	1308	2849	102	5	4264	80	9	35	0	124	27	2972	430	0	3429	316	7	1348	0	1671	9488
Apprch %	30.7	66.8	2.4	0.1		64.5	7.3	28.2	0		0.8	86.7	12.5	0		18.9	0.4	80.7	0		
Total %	13.8	30	1.1	0.1	44.9	0.8	0.1	0.4	0	1.3	0.3	31.3	4.5	0	36.1	3.3	0.1	14.2	0	17.6	
Unshifted	1242	2801	101	4	4148	79	9	34	0	122	27	2909	421	0	3357	301	7	1280	0	1588	9215
% Unshifted	95	98.3	99	80	97.3	98.8	100	97.1	0	98.4	100	97.9	97.9	0	97.9	95.3	100	95	0	95	97.1
Bank 1	61	32	1	0	94	1	0	1	0	2	0	42	8	0	50	10	0	61	0	71	217
% Bank 1	4.7	1.1	1	0	2.2	1.2	0	2.9	0	1.6	0	1.4	1.9	0	1.5	3.2	0	4.5	0	4.2	2.3
Bank 2	5	16	0	1	22	0	0	0	0	0	0	21	1	0	22	5	0	7	0	12	56
% Bank 2	0.4	0.6	0	20	0.5	0	0	0	0	0	0	0.7	0.2	0	0.6	1.6	0	0.5	0	0.7	0.6

	Zorn From North					VA From East					Zorn From South					VA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	126	78	0	**1**	205	5	0	2	0	7	0	90	24	0	114	4	0	16	0	20	346
07:15 AM	**138**	93	4	0	235	**6**	1	**3**	0	**10**	**1**	105	37	0	143	4	0	**25**	0	29	417
07:30 AM	128	**123**	**5**	0	**256**	1	**2**	2	0	5	0	127	**43**	0	170	5	0	20	0	25	**456**
07:45 AM	104	72	1	0	177	1	0	0	0	1	0	**159**	19	0	**178**	**6**	0	24	0	**30**	386
Total Volume	496	366	10	1	873	13	3	7	0	23	1	481	123	0	605	19	0	85	0	104	1605
% App. Total	56.8	41.9	1.1	0.1		56.5	13	30.4	0		0.2	79.5	20.3	0		18.3	0	81.7	0		
PHF	.899	.744	.500	.250	.853	.542	.375	.583	.000	.575	.250	.756	.715	.000	.850	.792	.000	.850	.000	.867	.880

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by:
Weather: Sunny
Zorn @ VA

File Name : zorn-VA
Site Code : 00000000
Start Date : 9/10/2015
Page No : 3

	Zorn From North					VA From East					Zorn From South					VA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	17	102	0	0	119	1	0	1	0	2	1	88	16	0	105	23	**5**	**135**	0	163	389
04:15 PM	**26**	132	**6**	**1**	**165**	1	**1**	1	0	3	1	97	14	0	112	19	1	71	0	91	371
04:30 PM	24	112	2	0	138	1	0	1	0	2	**2**	106	**21**	0	**129**	**31**	0	135	0	**166**	**435**
04:45 PM	22	**133**	6	0	161	**2**	0	**2**	0	**4**	0	**113**	12	0	125	17	1	61	0	79	369
Total Volume	89	479	14	1	583	5	1	5	0	11	4	404	63	0	471	90	7	402	0	499	1564
% App. Total	15.3	82.2	2.4	0.2		45.5	9.1	45.5	0		0.8	85.8	13.4	0		18	1.4	80.6	0		
PHF	.856	.900	.583	.250	.883	.625	.250	.625	.000	.688	.500	.894	.750	.000	.913	.726	.350	.744	.000	.752	.899

St Joseph

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by: Jason Ishmael
Weather: Sunny
Other:

File Name : I-265@KY146
Site Code : 00000000
Start Date : 10/6/2015
Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

	I-265 (Gene Snyder) From North					KY 146 (LaGrange Road) From East					I-265 (Gene Snyder) From South					KY 146 (LaGrange Road) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	182	52	0	234	87	0	16	0	103	10	33	0	0	43	380
07:15 AM	0	0	0	0	0	0	0	74	0	74	103	0	20	0	123	7	0	0	0	7	204
07:30 AM	0	0	0	0	0	0	0	79	0	79	108	0	26	0	134	14	0	0	0	14	227
07:45 AM	0	0	0	0	0	0	0	63	0	63	105	0	42	0	147	13	0	0	0	13	223
Total	0	0	0	0	0	0	182	268	0	450	403	0	104	0	507	44	33	0	0	77	1034
08:00 AM	0	0	0	0	0	0	0	72	0	72	114	0	40	0	154	14	0	0	0	14	240
08:15 AM	0	0	0	0	0	0	0	43	0	43	101	0	40	0	141	18	0	0	0	18	202
08:30 AM	0	0	0	0	0	0	0	60	0	60	99	0	35	0	134	18	0	0	0	18	212
08:45 AM	0	0	0	0	0	0	0	45	0	45	101	0	41	0	142	20	0	0	0	20	207
Total	0	0	0	0	0	0	0	220	0	220	415	0	156	0	571	70	0	0	0	70	861
*** BREAK ***																					
04:00 PM	0	0	0	0	0	0	0	32	0	32	117	0	9	0	126	85	0	0	0	85	243
04:15 PM	0	0	0	0	0	0	0	54	0	54	116	0	11	0	127	84	0	0	0	84	265
04:30 PM	0	0	0	0	0	0	0	44	0	44	132	0	13	0	145	161	0	0	0	161	350
04:45 PM	0	0	0	0	0	0	0	56	0	56	151	0	10	0	161	97	0	0	0	97	314
Total	0	0	0	0	0	0	0	186	0	186	516	0	43	0	559	427	0	0	0	427	1172
05:00 PM	0	0	0	0	0	0	0	44	0	44	120	0	15	0	135	133	0	0	0	133	312
05:15 PM	0	0	0	0	0	0	0	46	0	46	145	0	14	0	159	134	0	0	0	134	339
05:30 PM	0	0	0	0	0	0	0	42	0	42	149	0	22	0	171	97	0	0	0	97	310
05:45 PM	0	0	0	0	0	0	0	45	0	45	115	0	6	0	121	67	0	0	0	67	233
Total	0	0	0	0	0	0	0	177	0	177	529	0	57	0	586	431	0	0	0	431	1194
Grand Total	0	0	0	0	0	0	182	851	0	1033	1863	0	360	0	2223	972	33	0	0	1005	4261
Apprch %	0	0	0	0		0	17.6	82.4	0		83.8	0	16.2	0		96.7	3.3	0	0		
Total %	0	0	0	0	0	0	4.3	20	0	24.2	43.7	0	8.4	0	52.2	22.8	0.8	0	0	23.6	
Unshifted	0	0	0	0	0	0	178	828	0	1006	1764	0	353	0	2117	956	31	0	0	987	4110
% Unshifted	0	0	0	0	0	0	97.8	97.3	0	97.4	94.7	0	98.1	0	95.2	98.4	93.9	0	0	98.2	96.5
Bank 1	0	0	0	0	0	0	0	16	0	16	38	0	2	0	40	11	1	0	0	12	68
% Bank 1	0	0	0	0	0	0	0	1.9	0	1.5	2	0	0.6	0	1.8	1.1	3	0	0	1.2	1.6
Bank 2	0	0	0	0	0	0	4	7	0	11	61	0	5	0	66	5	1	0	0	6	83
% Bank 2	0	0	0	0	0	0	2.2	0.8	0	1.1	3.3	0	1.4	0	3	0.5	3	0	0	0.6	1.9

Palmer Engineering Company

400 Shoppers Drive
Winchester, KY 40391
859-744-1218

Counter:
Counted by: Jason Ishmael
Weather: Sunny
Other:

File Name : I-265@KY146
Site Code : 00000000
Start Date : 10/6/2015
Page No : 2

	I-265 (Gene Snyder) From North					KY 146 (LaGrange Road) From East					I-265 (Gene Snyder) From South					KY 146 (LaGrange Road) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	**182**	52	0	**234**	87	0	16	0	103	10	**33**	0	0	**43**	**380**
07:15 AM	0	0	0	0	0	0	0	74	0	74	103	0	20	0	123	7	0	0	0	7	204
07:30 AM	0	0	0	0	0	0	0	**79**	0	79	**108**	0	26	0	134	**14**	0	0	0	14	227
07:45 AM	0	0	0	0	0	0	0	63	0	63	105	0	**42**	0	**147**	13	0	0	0	13	223
Total Volume	0	0	0	0	0	0	182	268	0	450	403	0	104	0	507	44	33	0	0	77	1034
% App. Total	0	0	0	0		0	40.4	59.6	0		79.5	0	20.5	0		57.1	42.9	0	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.848	.000	.481	.933	.000	.619	.000	.862	.786	.250	.000	.000	.448	.680
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	0	0	0	0	44	0	44	132	0	13	0	145	**161**	0	0	0	**161**	**350**
04:45 PM	0	0	0	0	0	0	0	**56**	0	**56**	**151**	0	10	0	**161**	97	0	0	0	97	314
05:00 PM	0	0	0	0	0	0	0	44	0	44	120	0	**15**	0	135	133	0	0	0	133	312
05:15 PM	0	0	0	0	0	0	0	46	0	46	145	0	14	0	159	134	0	0	0	134	339
Total Volume	0	0	0	0	0	0	0	190	0	190	548	0	52	0	600	525	0	0	0	525	1315
% App. Total	0	0	0	0		0	0	100	0		91.3	0	8.7	0		100	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.848	.000	.848	.907	.000	.867	.000	.932	.815	.000	.000	.000	.815	.939

APPENDIX E

HCS Results

Existing Site

(Zorn Avenue)

HCS 2010 Two-Way Stop Control Summary Report

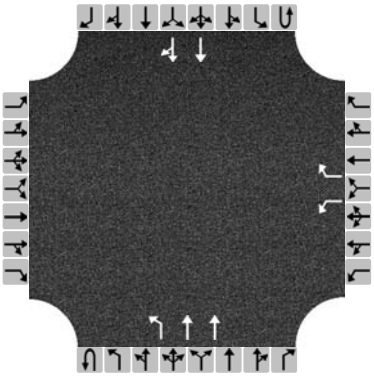
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2015 AM

Site Information

Intersection	Zorn Ave. @ I-71 SB Ramp
Jurisdiction	
East/West Street	I-71 SB Ramp
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	2	0	0	0	2	0
Configuration						L		R		L	T				T	TR
Volume (veh/h)						280		420		290	200				210	240
Percent Heavy Vehicles						5		5		5						
Proportion Time Blocked																
Right Turn Channelized	No				Yes				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						304		457		315						
Capacity						322		916		1050						
v/c Ratio						0.94		0.50		0.30						
95% Queue Length						9.6		2.8		1.3						
Control Delay (s/veh)						73.4		12.8		9.9						
Level of Service (LOS)						F		B		A						
Approach Delay (s/veh)					37.0				5.9							
Approach LOS					E				A							

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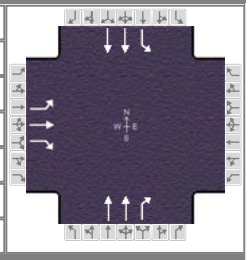
HCS 2010 Signalized Intersection Results Summary

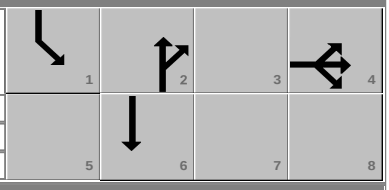
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ I-71 NB Ra…	File Name	2015 AM - Zorn at I-71 NB Ramp.xus		
Project Description	VA Traffic Study - 2015 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	280	0	420					200	360	80	210	

Signal Information			
Cycle, s	113.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	35.0	40.0	0.0	0.0	0.0
Yellow	3.6	3.6	3.6	0.0	0.0	0.0
Red	1.9	2.1	4.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		47.6				40.7	25.5	66.2
Change Period, ($Y+R_c$), s		7.6				5.7	5.5	5.7
Max Allow Headway (*MAH*), s		5.2				2.2	3.6	2.0
Queue Clearance Time (g_s), s		17.8				22.2	7.0	5.8
Green Extension Time (g_e), s		3.2				0.5	0.1	0.2
Phase Call Probability		1.00				1.00	1.00	1.00
Max Out Probability		0.02				0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	304	0	228					217	313	87	228	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723	1900	1533					1723	1533	1723	1723	
Queue Service Time (g_s), s	15.8	0.0	12.9					5.3	20.2	5.0	3.8	
Cycle Queue Clearance Time (g_c), s	15.8	0.0	12.9					5.3	20.2	5.0	3.8	
Green Ratio (*g/C*)	0.35	0.35	0.35					0.31	0.31	0.18	0.53	
Capacity (*c*), veh/h	606	668	539					1060	472	303	1832	
Volume-to-Capacity Ratio (*X*)	0.502	0.000	0.423					0.205	0.664	0.287	0.125	
Available Capacity (c_a), veh/h	606	668	539					1060	472	303	1832	
Back of Queue (*Q*), veh/ln (95 th percentile)	10.8	0.0	8.4					3.9	12.3	3.8	2.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00					0.00	1.07	0.33	0.00	
Uniform Delay (d_1), s/veh	29.1	0.0	28.1					29.1	34.3	40.7	13.4	
Incremental Delay (d_2), s/veh	0.9	0.0	0.8					0.0	2.8	0.4	0.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	30.0	0.0	28.9					29.2	37.1	41.1	13.4	
Level of Service (LOS)	C		C					C	D	D	B	
Approach Delay, s/veh / LOS	29.5	C		0.0			33.8	C		21.0	C	
Intersection Delay, s/veh / LOS	29.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	1.9	A	2.2	B
Bicycle LOS Score / LOS	1.4	A			0.9	A	0.7	A

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HCS 2010 Two-Way Stop Control Summary Report

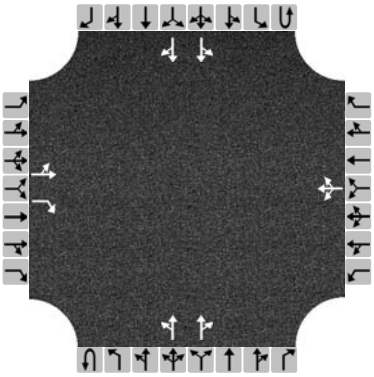
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2015 AM

Site Information

Intersection	Zorn Ave. @ Mellwood Ave.
Jurisdiction	
East/West Street	Mellwood Avenue
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		0	1	0	0	0	2	0	0	0	2	0
Configuration		LT		R			LTR			LT		TR		LT		TR
Volume (veh/h)		180	10	70		20	10	60		40	610	10		10	780	230
Percent Heavy Vehicles		5	5	5		5	5	5		5				5		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left + Thru															
Median Storage	2															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		207		76			98			375				435		
Capacity		216		477			402			626				906		
v/c Ratio		0.96		0.16			0.24			0.60				0.48		
95% Queue Length		8.2		0.6			0.9			0.2				0.0		
Control Delay (s/veh)		97.1		14.0			16.8			11.2				9.0		
Level of Service (LOS)		F		B			C			B				A		
Approach Delay (s/veh)	67.3				16.8				1.2				0.2			
Approach LOS	F				C				A				A			

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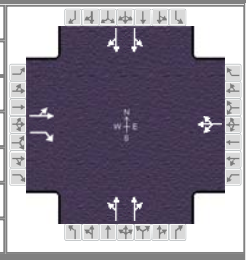
HCS 2010 Signalized Intersection Results Summary

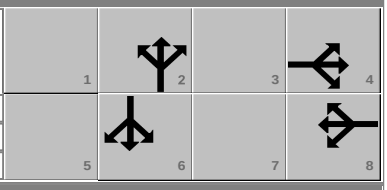
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ VA	File Name	2015 AM - Zorn at VA.xus		
Project Description	VA Traffic Study - 2015 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	120	0	20	10	10	20	120	520	10	10	360	500

Signal Information			
Cycle, s	87.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	45.0	30.0	0.0	0.0	0.0	0.0
Yellow	3.6	3.6	0.0	0.0	0.0	0.0
Red	2.5	2.9	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		7.0		8.0		8.0		8.0
Phase Duration, s		36.5		36.5		51.1		51.1
Change Period, ($Y+R_c$), s		6.5		6.5		6.1		6.1
Max Allow Headway (*MAH*), s		4.6		4.7		5.1		4.7
Queue Clearance Time (g_s), s		8.3		3.5		47.0		29.2
Green Extension Time (g_e), s		0.6		0.1		0.0		4.7
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		1.00		0.19

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		130	22		43		264		442	402		543
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1332	1533		1571		433		1639	1790		1395
Queue Service Time (g_s), s		4.7	0.8		0.0		17.8		15.7	0.0		27.2
Cycle Queue Clearance Time (g_c), s		6.3	0.8		1.5		45.0		15.7	12.2		27.2
Green Ratio (*g/C*)		0.34	0.34		0.34		0.51		0.51	0.51		0.51
Capacity (*c*), veh/h		538	525		589		284		842	962		717
Volume-to-Capacity Ratio (*X*)		0.242	0.041		0.074		0.932		0.525	0.418		0.758
Available Capacity (c_a), veh/h		538	525		589		284		842	962		717
Back of Queue (*Q*), veh/ln (95 th percentile)		3.4	0.5		1.1		13.2		9.3	8.1		13.6
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.11		0.00		0.00		0.00	0.00		0.00
Uniform Delay (d_1), s/veh		21.0	19.2		19.4		30.7		14.2	13.3		17.0
Incremental Delay (d_2), s/veh		0.3	0.0		0.1		35.9		0.7	0.4		4.8
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0		0.0		0.0	0.0		0.0
Control Delay (*d*), s/veh		21.3	19.2		19.5		66.6		14.9	13.7		21.8
Level of Service (LOS)		C	B		B		E		B	B		C
Approach Delay, s/veh / LOS	21.0	C		19.5	B		34.2	C		18.3	B	
Intersection Delay, s/veh / LOS	24.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.7	B	2.7	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	0.7	A	0.6	A	1.1	A	1.3	A

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HCS 2010 Two-Way Stop Control Summary Report

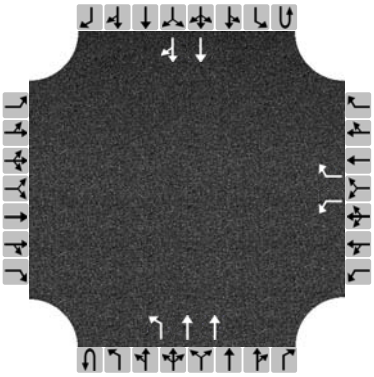
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2015 PM

Site Information

Intersection	Zorn Ave. @ I-71 SB Ramp
Jurisdiction	
East/West Street	I-71 SB Ramp
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	2	0	0	0	2	0
Configuration						L		R		L	T				T	TR
Volume (veh/h)						290		300		230	230				230	140
Percent Heavy Vehicles						5		5		5						
Proportion Time Blocked																
Right Turn Channelized	No				Yes				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						315		326		250						
Capacity						360		893		1132						
v/c Ratio						0.88		0.37		0.22						
95% Queue Length						8.4		1.7		0.8						
Control Delay (s/veh)						55.7		11.3		9.1						
Level of Service (LOS)						F		B		A						
Approach Delay (s/veh)					33.1				4.5							
Approach LOS					D				A							

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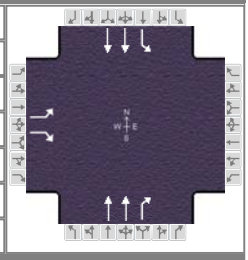
HCS 2010 Signalized Intersection Results Summary

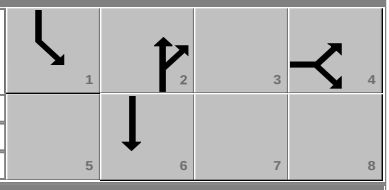
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ I-71 NB Ra…	File Name	2015 PM - Zorn at I-71 NB Ramp.xus		
Project Description	VA Traffic Study - 2015 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	290		300					230	570	410	230	

Signal Information			
Cycle, s	113.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	35.0	40.0	0.0	0.0	0.0
Yellow	3.6	3.6	3.6	0.0	0.0	0.0
Red	1.9	2.1	4.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		47.6				40.7	25.5	66.2
Change Period, ($Y+R_c$), s		7.6				5.7	5.5	5.7
Max Allow Headway (*MAH*), s		5.2				2.2	3.6	2.0
Queue Clearance Time (g_s), s		18.5				30.0	22.0	6.2
Green Extension Time (g_e), s		3.1				0.4	0.0	0.2
Phase Call Probability		1.00				1.00	1.00	1.00
Max Out Probability		0.02				0.09	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	315		212					250	402	446	250	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533					1723	1533	1723	1723	
Queue Service Time (g_s), s	16.5		11.8					6.2	28.0	20.0	4.2	
Cycle Queue Clearance Time (g_c), s	16.5		11.8					6.2	28.0	20.0	4.2	
Green Ratio (*g/C*)	0.35		0.35					0.31	0.31	0.18	0.53	
Capacity (*c*), veh/h	606		539					1060	472	303	1832	
Volume-to-Capacity Ratio (*X*)	0.520		0.393					0.236	0.853	1.471	0.136	
Available Capacity (c_a), veh/h	606		539					1060	472	303	1832	
Back of Queue (*Q*), veh/ln (95 th percentile)	11.2		7.8					4.6	17.7	42.8	2.8	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	1.53	3.71	0.00	
Uniform Delay (d_1), s/veh	29.3		27.8					29.4	37.0	46.9	13.5	
Incremental Delay (d_2), s/veh	1.1		0.7					0.0	13.4	229.3	0.0	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	30.4		28.4					29.5	50.4	276.2	13.5	
Level of Service (LOS)	C		C					C	D	F	B	
Approach Delay, s/veh / LOS	29.6		C	0.0			42.4		D	181.8		F
Intersection Delay, s/veh / LOS	90.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	1.9	A	1.8	A
Bicycle LOS Score / LOS		F			1.0	A	1.1	A

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HCS 2010 Two-Way Stop Control Summary Report

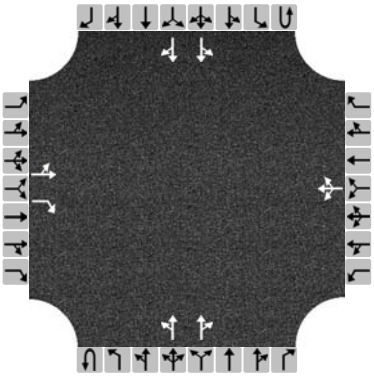
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2015 PM

Site Information

Intersection	Zorn Ave. @ Mellwood Ave.
Jurisdiction	
East/West Street	Mellwood Avenue
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		0	1	0	0	0	2	0	0	0	2	0
Configuration		LT		R			LTR			LT		TR		LT		TR
Volume (veh/h)		320	20	70		10	10	20		70	690	50		40	530	140
Percent Heavy Vehicles		5	5	5		5	5	5		5				5		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left + Thru															
Median Storage	2															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		370		76			44			451				331		
Capacity		242		630			300			865				810		
v/c Ratio		1.53		0.12			0.15			0.52				0.41		
95% Queue Length		22.2		0.4			0.5			0.3				0.2		
Control Delay (s/veh)		294.9		11.5			19.0			9.6				9.7		
Level of Service (LOS)		F		B			C			A				A		
Approach Delay (s/veh)	210.5				19.0				1.4				0.8			
Approach LOS	F				C				A				A			

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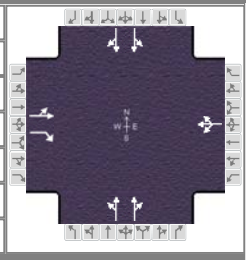
HCS 2010 Signalized Intersection Results Summary

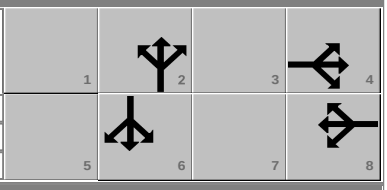
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ VA	File Name	2015 PM - Zorn at VA.xus		
Project Description	VA Traffic Study - 2015 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	400	10	90	10	10	10	60	400	10	20	500	90

Signal Information			
Cycle, s	87.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	45.0	30.0	0.0	0.0	0.0	0.0
Yellow	3.6	3.6	0.0	0.0	0.0	0.0
Red	2.5	2.9	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		7.0		8.0		8.0		8.0
Phase Duration, s		36.5		36.5		51.1		51.1
Change Period, ($Y+R_c$), s		6.5		6.5		6.1		6.1
Max Allow Headway (*MAH*), s		4.6		4.6		4.8		4.6
Queue Clearance Time (g_s), s		30.3		3.1		15.5		12.6
Green Extension Time (g_e), s		0.0		0.1		2.7		3.4
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		0.00		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		446	98		33		239		272	352		311
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1353	1533		1635		1220		1635	1759		1559
Queue Service Time (g_s), s		27.2	3.9		0.0		2.9		8.5	0.0		10.6
Cycle Queue Clearance Time (g_c), s		28.3	3.9		1.1		13.5		8.5	10.3		10.6
Green Ratio (*g/C*)		0.34	0.34		0.34		0.51		0.51	0.51		0.51
Capacity (*c*), veh/h		545	525		615		679		840	947		801
Volume-to-Capacity Ratio (*X*)		0.818	0.186		0.053		0.352		0.324	0.371		0.389
Available Capacity (c_a), veh/h		545	525		615		679		840	947		801
Back of Queue (*Q*), veh/ln (95 th percentile)		15.0	2.5		0.8		4.5		5.2	7.0		6.3
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.52		0.00		0.00		0.00	0.00		0.00
Uniform Delay (d_1), s/veh		28.2	20.2		19.3		12.7		12.4	12.9		12.9
Incremental Delay (d_2), s/veh		9.7	0.2		0.0		0.4		0.3	0.3		0.4
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0		0.0		0.0	0.0		0.0
Control Delay (*d*), s/veh		38.0	20.4		19.3		13.1		12.7	13.1		13.3
Level of Service (LOS)		D	C		B		B		B	B		B
Approach Delay, s/veh / LOS	34.8	C		19.3	B		12.9	B		13.2	B	
Intersection Delay, s/veh / LOS	19.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.7	B	2.7	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	1.4	A	0.5	A	0.9	A	1.0	A

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HCS 2010 Two-Way Stop Control Summary Report

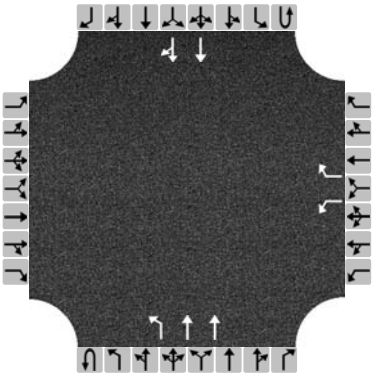
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2025 AM

Site Information

Intersection	Zorn Ave. @ I-71 SB Ramp
Jurisdiction	
East/West Street	I-71 SB Ramp
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	2	0	0	0	2	0
Configuration						L		R		L	T				T	TR
Volume (veh/h)						450		430		330	230				240	280
Percent Heavy Vehicles						5		5		5						
Proportion Time Blocked																
Right Turn Channelized	No				Yes				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						489		467		359						
Capacity						278		893		983						
v/c Ratio						1.76		0.52		0.37						
95% Queue Length						32.1		3.1		1.7						
Control Delay (s/veh)						388.6		13.4		10.8						
Level of Service (LOS)						F		B		B						
Approach Delay (s/veh)					205.3				6.3							
Approach LOS					F				A							

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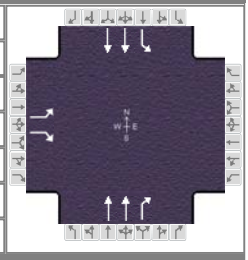
HCS 2010 Signalized Intersection Results Summary

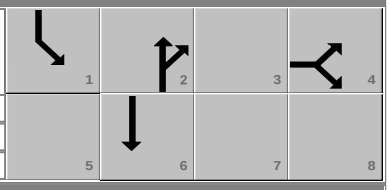
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ I-71 NB Ra…	File Name	2025 AM - Zorn at I-71 NB Ramp.xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	450		430					230	410	90	240	

Signal Information			
Cycle, s	113.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	35.0	40.0	0.0	0.0	0.0
Yellow	3.6	3.6	3.6	0.0	0.0	0.0
Red	1.9	2.1	4.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		47.6				40.7	25.5	66.2
Change Period, ($Y+R_c$), s		7.6				5.7	5.5	5.7
Max Allow Headway (*MAH*), s		5.2				2.2	3.6	2.0
Queue Clearance Time (g_s), s		31.2				25.9	7.6	6.4
Green Extension Time (g_e), s		3.0				0.5	0.1	0.2
Phase Call Probability		1.00				1.00	1.00	1.00
Max Out Probability		0.54				0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	489		234					250	357	98	261	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533					1723	1533	1723	1723	
Queue Service Time (g_s), s	29.2		13.3					6.2	23.9	5.6	4.4	
Cycle Queue Clearance Time (g_c), s	29.2		13.3					6.2	23.9	5.6	4.4	
Green Ratio (*g/C*)	0.35		0.35					0.31	0.31	0.18	0.53	
Capacity (*c*), veh/h	606		539					1060	472	303	1832	
Volume-to-Capacity Ratio (*X*)	0.807		0.434					0.236	0.756	0.323	0.142	
Available Capacity (c_a), veh/h	606		539					1060	472	303	1832	
Back of Queue (*Q*), veh/ln (95 th percentile)	19.3		8.5					4.6	14.6	4.3	3.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	1.26	0.38	0.00	
Uniform Delay (d_1), s/veh	33.4		28.2					29.4	35.5	41.0	13.5	
Incremental Delay (d_2), s/veh	8.3		0.8					0.0	6.2	0.5	0.0	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	41.8		29.0					29.5	41.7	41.4	13.5	
Level of Service (LOS)	D		C					C	D	D	B	
Approach Delay, s/veh / LOS	37.6	D		0.0			36.7	D		21.1	C	
Intersection Delay, s/veh / LOS	33.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	1.9	A	2.0	A
Bicycle LOS Score / LOS		F			1.0	A	0.8	A

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HCS 2010 Two-Way Stop Control Summary Report

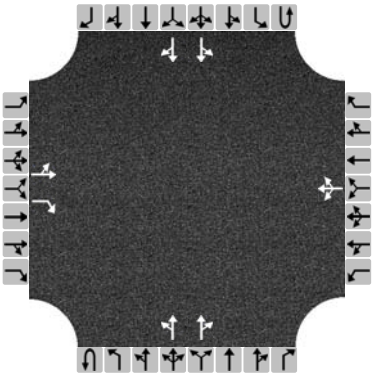
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2025 AM

Site Information

Intersection	Zorn Ave. @ Mellwood Ave.
Jurisdiction	
East/West Street	Mellwood Avenue
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		0	1	0	0	0	2	0	0	0	2	0
Configuration		LT		R			LTR			LT		TR		LT		TR
Volume (veh/h)		200	10	80		20	10	70		50	700	10		10	900	260
Percent Heavy Vehicles		5	5	5		5	5	5		5				5		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left + Thru															
Median Storage	2															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		228		87			109			435				500		
Capacity		170		422			346			542				832		
v/c Ratio		1.34		0.21			0.31			0.80				0.60		
95% Queue Length		13.5		0.8			1.3			0.3				0.0		
Control Delay (s/veh)		239.1		15.7			20.1			12.4				9.4		
Level of Service (LOS)		F		C			C			B				A		
Approach Delay (s/veh)	162.1				20.1				1.7				0.3			
Approach LOS	F				C				A				A			

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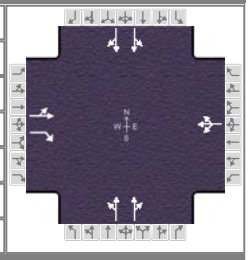
HCS 2010 Signalized Intersection Results Summary

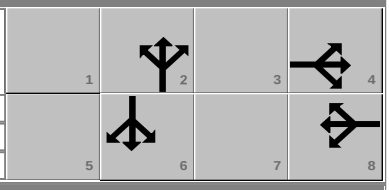
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ VA	File Name	2025 AM - Zorn at VA.xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	120	0	20	10	10	20	120	620	10	10	490	500

Signal Information			
Cycle, s	87.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	45.0	30.6	0.0	0.0	0.0	0.0
Yellow	3.6	3.0	0.0	0.0	0.0	0.0
Red	2.5	2.9	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		7.0		8.0		8.0		8.0
Phase Duration, s		36.5		36.5		51.1		51.1
Change Period, ($Y+R_c$), s		6.5		6.5		6.1		6.1
Max Allow Headway (*MAH*), s		4.6		4.7		5.2		4.7
Queue Clearance Time (g_s), s		8.3		3.5		47.0		29.2
Green Extension Time (g_e), s		0.6		0.1		0.0		5.5
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		1.00		0.26

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		130	22		43		301		514	543		543
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1332	1533		1571		445		1640	1792		1395
Queue Service Time (g_s), s		4.7	0.8		0.0		17.8		19.4	0.0		27.2
Cycle Queue Clearance Time (g_c), s		6.3	0.8		1.5		45.0		19.4	18.3		27.2
Green Ratio (*g/C*)		0.34	0.34		0.34		0.51		0.51	0.51		0.51
Capacity (*c*), veh/h		538	525		589		287		843	963		717
Volume-to-Capacity Ratio (*X*)		0.242	0.041		0.074		1.048		0.610	0.565		0.758
Available Capacity (c_a), veh/h		538	525		589		287		843	963		717
Back of Queue (*Q*), veh/ln (95 th percentile)		3.4	0.5		1.1		17.5		11.2	11.4		13.6
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.11		0.00		0.00		0.00	0.00		0.00
Uniform Delay (d_1), s/veh		21.0	19.2		19.4		30.2		15.1	14.8		17.0
Incremental Delay (d_2), s/veh		0.3	0.0		0.1		66.2		1.4	0.9		4.8
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0		0.0		0.0	0.0		0.0
Control Delay (*d*), s/veh		21.3	19.2		19.5		96.4		16.5	15.7		21.8
Level of Service (LOS)		C	B		B		F		B	B		C
Approach Delay, s/veh / LOS	21.0	C		19.5	B		46.0	D		18.7	B	
Intersection Delay, s/veh / LOS	29.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.7	B	2.7	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	0.7	A	0.6	A	1.2	A	1.4	A

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HCS 2010 Two-Way Stop Control Summary Report

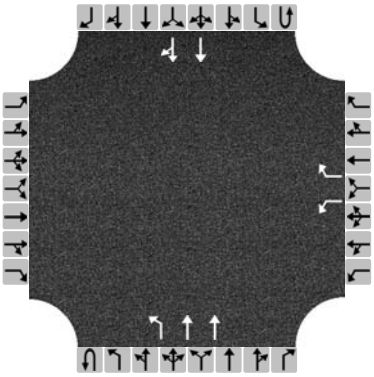
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2025 PM

Site Information

Intersection	Zorn Ave. @ I-71 SB Ramp
Jurisdiction	
East/West Street	I-71 SB Ramp
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	2	0	0	0	2	0
Configuration						L		R		L	T				T	TR
Volume (veh/h)						330		340		260	270				270	160
Percent Heavy Vehicles						5		5		5						
Proportion Time Blocked																
Right Turn Channelized	No				Yes				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						359		370		283						
Capacity						314		865		1070						
v/c Ratio						1.14		0.43		0.26						
95% Queue Length						14.8		2.2		1.1						
Control Delay (s/veh)						132.1		12.2		9.6						
Level of Service (LOS)						F		B		A						
Approach Delay (s/veh)					71.3				4.7							
Approach LOS					F				A							

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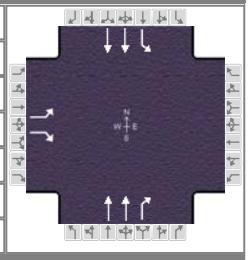
HCS 2010 Signalized Intersection Results Summary

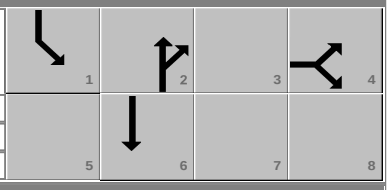
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ I-71 NB Ra…	File Name	2025 PM - Zorn at I-71 NB Ramp.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	330		340					270	650	470	270	

Signal Information			
Cycle, s	113.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	35.0	40.0	0.0	0.0	0.0
Yellow	3.6	3.6	3.6	0.0	0.0	0.0
Red	1.9	2.1	4.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		47.6				40.7	25.5	66.2
Change Period, ($Y+R_c$), s		7.6				5.7	5.5	5.7
Max Allow Headway (*MAH*), s		5.2				2.2	3.6	2.0
Queue Clearance Time (g_s), s		21.4				35.6	22.0	7.0
Green Extension Time (g_e), s		3.5				0.0	0.0	0.3
Phase Call Probability		1.00				1.00	1.00	1.00
Max Out Probability		0.06				1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	359		240					293	459	511	293	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533					1723	1533	1723	1723	
Queue Service Time (g_s), s	19.4		13.7					7.3	33.6	20.0	5.0	
Cycle Queue Clearance Time (g_c), s	19.4		13.7					7.3	33.6	20.0	5.0	
Green Ratio (*g/C*)	0.35		0.35					0.31	0.31	0.18	0.53	
Capacity (*c*), veh/h	606		539					1060	472	303	1832	
Volume-to-Capacity Ratio (*X*)	0.592		0.446					0.277	0.973	1.687	0.160	
Available Capacity (c_a), veh/h	606		539					1060	472	303	1832	
Back of Queue (*Q*), veh/ln (95 th percentile)	12.9		8.8					5.4	23.5	55.5	3.4	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	2.03	4.81	0.00	
Uniform Delay (d_1), s/veh	30.2		28.4					29.8	38.9	46.9	13.6	
Incremental Delay (d_2), s/veh	1.9		0.8					0.1	34.1	323.0	0.0	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	32.1		29.2					29.9	73.1	369.9	13.7	
Level of Service (LOS)	C		C					C	E	F	B	
Approach Delay, s/veh / LOS	30.9	C		0.0			56.2	E		239.9	F	
Intersection Delay, s/veh / LOS	117.7						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	1.9	A	1.8	A
Bicycle LOS Score / LOS		F			1.1	A	1.2	A

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HCS 2010 Two-Way Stop Control Summary Report

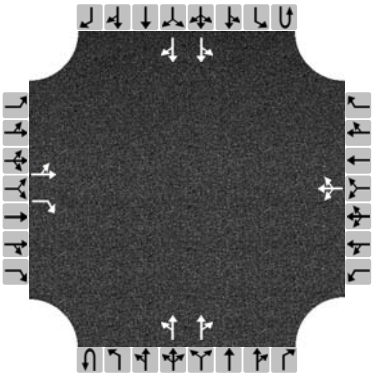
General Information

Analyst	
Agency/Co.	Palmer Engineering
Date Performed	10/12/2015
Analysis Year	2015
Time Analyzed	
Intersection Orientation	North-South
Project Description	VA Traffic Study - 2025 PM

Site Information

Intersection	Zorn Ave. @ Mellwood Ave.
Jurisdiction	
East/West Street	Mellwood Avenue
North/South Street	Zorn Avenue
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		0	1	0	0	0	2	0	0	0	2	0
Configuration		LT		R			LTR			LT		TR		LT		TR
Volume (veh/h)		370	20	80		10	10	20		80	790	60		50	610	160
Percent Heavy Vehicles		5	5	5		5	5	5		5				5		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left + Thru															
Median Storage	2															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		424		87			44			517				386		
Capacity		183		581			233			787				729		
v/c Ratio		2.31		0.15			0.19			0.66				0.53		
95% Queue Length		34.7		0.5			0.7			0.4				0.2		
Control Delay (s/veh)		648.1		12.3			24.0			10.1				10.3		
Level of Service (LOS)		F		B			C			B				B		
Approach Delay (s/veh)	485.7				24.0				1.7				1.1			
Approach LOS	F				C				A				A			

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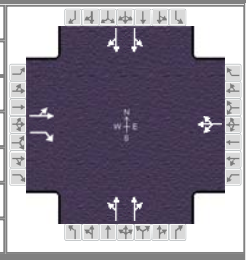
HCS 2010 Signalized Intersection Results Summary

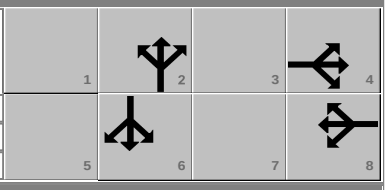
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Zorn Avenue	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Zorn Ave. @ VA	File Name	2025 PM - Zorn at VA.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	400	10	90	10	10	10	60	520	10	20	590	90

Signal Information			
Cycle, s	87.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	45.0	30.0	0.0	0.0	0.0	0.0
Yellow	3.6	3.6	0.0	0.0	0.0	0.0
Red	2.5	2.9	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		7.0		8.0		8.0		8.0
Phase Duration, s		36.5		36.5		51.1		51.1
Change Period, ($Y+R_c$), s		6.5		6.5		6.1		6.1
Max Allow Headway (*MAH*), s		4.6		4.6		4.8		4.6
Queue Clearance Time (g_s), s		30.3		3.1		18.1		14.6
Green Extension Time (g_e), s		0.0		0.1		3.4		4.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		0.00		0.01		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		446	98		33		302		340	402		359
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1353	1533		1635		1258		1637	1756		1570
Queue Service Time (g_s), s		27.2	3.9		0.0		3.4		11.1	0.0		12.6
Cycle Queue Clearance Time (g_c), s		28.3	3.9		1.1		16.1		11.1	12.2		12.6
Green Ratio (*g/C*)		0.34	0.34		0.34		0.51		0.51	0.51		0.51
Capacity (*c*), veh/h		545	525		615		696		841	945		806
Volume-to-Capacity Ratio (*X*)		0.818	0.186		0.053		0.433		0.404	0.425		0.445
Available Capacity (c_a), veh/h		545	525		615		696		841	945		806
Back of Queue (*Q*), veh/ln (95 th percentile)		15.0	2.5		0.8		5.9		6.9	8.1		7.5
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.52		0.00		0.00		0.00	0.00		0.00
Uniform Delay (d_1), s/veh		28.2	20.2		19.3		13.2		13.1	13.3		13.4
Incremental Delay (d_2), s/veh		9.7	0.2		0.0		0.5		0.4	0.4		0.5
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0		0.0		0.0	0.0		0.0
Control Delay (*d*), s/veh		38.0	20.4		19.3		13.7		13.4	13.7		13.9
Level of Service (LOS)		D	C		B		B		B	B		B
Approach Delay, s/veh / LOS	34.8	C		19.3	B		13.6	B		13.8	B	
Intersection Delay, s/veh / LOS	19.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.7	B	2.7	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	1.4	A	0.5	A	1.0	A	1.1	A

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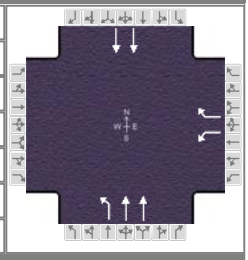
St Joseph Site

(Factory Lane)

Existing

HCS 2010 Signalized Intersection Results Summary

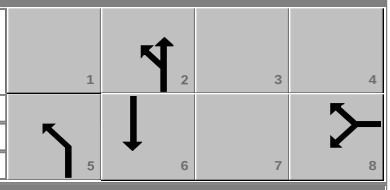
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ I-265…	File Name	2015 AM - Old Henry at I-265 NB Ramp.xus		
Project Description	VA Traffic Study - 2015 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				870		186	83	139			966	

Signal Information			
Cycle, s	164.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	25.0	60.0	60.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.5	0.0	0.0	0.0
Red	2.8	2.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	1.0	4.0		8.3
Phase Duration, s				66.5	31.3	97.9		66.6
Change Period, ($Y+R_c$), s				6.5	6.3	6.6		6.6
Max Allow Headway (*MAH*), s				6.2	4.0	3.5		5.9
Queue Clearance Time (g_s), s				62.0	6.3	5.4		47.8
Green Extension Time (g_e), s				0.0	0.2	0.5		6.8
Phase Call Probability				1.00	1.00	1.00		1.00
Max Out Probability				1.00	0.00	0.00		0.61

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	
Adjusted Flow Rate (*v*), veh/h				946		162	90	151			1050	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533	1723	1723			1723	
Queue Service Time (g_s), s				60.0		12.3	4.3	3.4			45.8	
Cycle Queue Clearance Time (g_c), s				60.0		12.3	4.3	3.4			45.8	
Green Ratio (*g/C*)				0.36		0.36	0.53	0.56			0.36	
Capacity (*c*), veh/h				629		560	351	1913			1257	
Volume-to-Capacity Ratio (*X*)				1.504		0.289	0.257	0.079			0.835	
Back of Queue (*Q*), ft/ln (95 th percentile)				2614.1		217.6	81.6	62.1			716.1	
Back of Queue (*Q*), veh/ln (95 th percentile)				100.5		8.4	3.1	2.4			27.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.73	0.20	0.00			0.00	
Uniform Delay (d_1), s/veh				52.2		37.1	27.6	17.0			47.7	
Incremental Delay (d_2), s/veh				234.8		0.6	0.4	0.0			5.5	
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	
Control Delay (*d*), s/veh				287.0		37.7	28.0	17.0			53.2	
Level of Service (LOS)				F		D	C	B			D	
Approach Delay, s/veh / LOS	0.0			250.6		F	21.1		C	53.2		D
Intersection Delay, s/veh / LOS	141.1						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	1.7	A	1.9	A
Bicycle LOS Score / LOS				F	0.7	A	1.4	A

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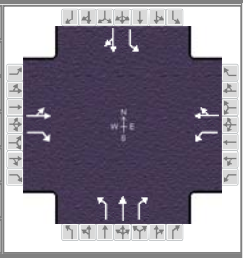
HCS 2010 Signalized Intersection Results Summary

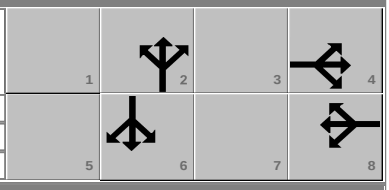
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Bush…	File Name	2015 AM - Old Henry at Bush Farm.xus		
Project Description	VA Traffic Study - 2015 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	1	1	1	664	0	46	1	98	124	88	666	1

Signal Information			
Cycle, s	97.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	45.0	40.0	0.0	0.0	0.0	0.0
Yellow	4.3	3.6	0.0	0.0	0.0	0.0
Red	1.3	3.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		7.0		6.0		5.0		6.0
Phase Duration, s		46.6		46.6		50.6		50.6
Change Period, ($Y+R_c$), s		6.6		6.6		5.6		5.6
Max Allow Headway (*MAH*), s		4.7		4.7		5.1		5.0
Queue Clearance Time (g_s), s		2.1		42.0		37.0		36.9
Green Extension Time (g_e), s		0.0		0.0		0.6		3.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		1.00		0.24		0.62

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		2	1	722	50		1	107	108	96	725	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1535	1533	1370	1533		705	1810	1533	1245	1809	
Queue Service Time (g_s), s		0.0	0.0	39.9	1.9		0.1	3.3	3.9	4.6	34.9	
Cycle Queue Clearance Time (g_c), s		0.1	0.0	40.0	1.9		35.0	3.3	3.9	7.9	34.9	
Green Ratio (*g/C*)		0.41	0.41	0.41	0.41		0.46	0.46	0.46	0.46	0.46	
Capacity (*c*), veh/h		687	631	637	631		147	838	710	609	838	
Volume-to-Capacity Ratio (*X*)		0.003	0.002	1.133	0.079		0.007	0.127	0.152	0.157	0.866	
Back of Queue (*Q*), ft/ln (95 th percentile)		1.3	0.7	1075	31.4		1.1	58.8	60.3	58.8	570.6	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.1	0.0	41.3	1.2		0.0	2.3	2.3	2.3	21.9	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	2.39	0.00		0.00	0.00	0.00	0.47	0.00	
Uniform Delay (d_1), s/veh		16.9	16.8	31.0	17.4		39.1	14.9	15.1	17.1	23.4	
Incremental Delay (d_2), s/veh		0.0	0.0	78.3	0.1		0.0	0.1	0.1	0.2	9.7	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		16.9	16.8	109.3	17.5		39.1	15.0	15.2	17.3	33.1	
Level of Service (LOS)		B	B	F	B		D	B	B	B	C	
Approach Delay, s/veh / LOS	16.9	B		103.3	F		15.2	B		31.3	C	
Intersection Delay, s/veh / LOS	60.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.5	B	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.5	A	1.8	A	0.8	A	1.8	A

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Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: Palmer Engineering
Agency/Co.: Palmer Engineering
Date Performed: 8/31/2016
Analysis Time Period: 2015 AM Peak Existing
Intersection: Old Henry @ Factory Lane
Jurisdiction: District 5
Units: U. S. Customary
Analysis Year: 2015
Project ID: VA Traffic Study - St Joe Site - 2015 Existing Conditions
East/West Street: Old Henry Road
North/South Street: Old Henry / Factory Lane

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	0	0	0	478	0	42	0	65	83	22	212	0
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration			LR		TR		LT	
PHF			0.92		0.92		0.92	
Flow Rate			564		160		253	
% Heavy Veh			5		5		5	
No. Lanes			1		1		1	
Opposing-Lanes			0		1		1	
Conflicting-lanes			1		1		1	
Geometry group			1		1		1	

Duration, T 0.25 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane			564		160		253	
Left-Turn			519		0		23	
Right-Turn			45		90		0	
Prop. Left-Turns			0.9		0.0		0.1	
Prop. Right-Turns			0.1		0.6		0.0	
Prop. Heavy Vehicle			0.0		0.0		0.0	
Geometry Group			1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj			0.2		0.2		0.2	

hRT-adj			-0.6		-0.6		-0.6	
hHV-adj			1.7		1.7		1.7	
hadj, computed			0.2		-0.3		0.1	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate			564		160		253	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial			0.50		0.14		0.22	
hd, final value			5.35		5.79		5.96	
x, final value			0.839		0.257		0.419	
Move-up time, m			2.0		2.0		2.0	
Service Time			3.4		3.8		4.0	

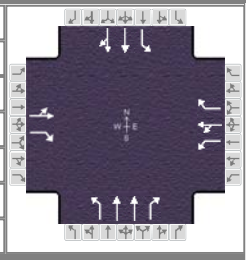
Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate			564		160		253	
Service Time			3.4		3.8		4.0	
Utilization, x			0.839		0.257		0.419	
Dep. headway, hd			5.35		5.79		5.96	
Capacity			671		615		602	
95% Queue Length								
Delay			29.8		10.8		13.2	
LOS			D		B		B	
Approach:								
Delay			29.8		10.8		13.2	
LOS			D		B		B	

Intersection Delay 22.4 Intersection LOS C

HCS 2010 Signalized Intersection Results Summary

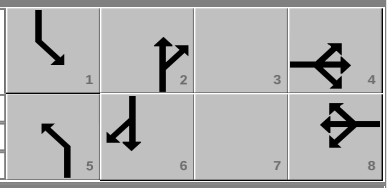
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ Facto…	File Name	2015 AM - La Grange at Factory Lane.xus		
Project Description	VA Traffic Study - 2015 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	51	27	125	541	86	36	146	411	175	13	1013	31

Signal Information			
Cycle, s	201.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	13.5	55.0	40.0	40.0	0.0
Yellow	3.5	3.5	4.3	3.6	3.6	0.0
Red	3.0	3.0	1.6	3.5	3.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		11.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		47.1		47.1	46.5	80.9	26.5	60.9
Change Period, ($Y+R_c$), s		7.1		7.1	6.5	5.9	6.5	5.9
Max Allow Headway (*MAH*), s		4.3		4.6	4.0	3.7	4.0	3.6
Queue Clearance Time (g_s), s		17.7		42.0	18.4	20.9	3.5	57.0
Green Extension Time (g_e), s		0.8		0.0	0.5	2.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		1.00	0.00	0.00	0.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		85	136	588	93	32	159	447	152	14	570	564
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1752	1533	1723	1810	1533	1723	1723	1533	1723	1810	1790
Queue Service Time (g_s), s		8.2	15.7	40.0	8.8	3.4	16.4	18.9	13.9	1.5	55.0	55.0
Cycle Queue Clearance Time (g_c), s		8.2	15.7	40.0	8.8	3.4	16.4	18.9	13.9	1.5	55.0	55.0
Green Ratio (*g/C*)		0.20	0.20	0.20	0.20	0.20	0.20	0.37	0.37	0.10	0.27	0.27
Capacity (*c*), veh/h		348	304	342	359	304	342	1282	570	171	494	488
Volume-to-Capacity Ratio (*X*)		0.244	0.447	1.720	0.260	0.104	0.464	0.349	0.267	0.083	1.155	1.156
Back of Queue (*Q*), ft/ln (95 th percentile)		175.8	271.3	1984.7	194.8	63.6	305.5	333.3	238.7	31.7	1356.1	1344.2
Back of Queue (*Q*), veh/ln (95 th percentile)		6.8	10.4	76.3	7.5	2.4	11.7	12.8	9.2	1.2	52.2	51.7
Queue Storage Ratio (*RQ*) (95 th percentile)		1.76	2.71	9.92	0.97	0.32	0.76	0.83	0.80	0.09	0.00	0.00
Uniform Delay (d_1), s/veh		68.1	71.1	80.8	68.3	66.1	71.3	45.7	44.1	82.5	73.3	73.3
Incremental Delay (d_2), s/veh		0.4	1.0	336.0	0.5	0.2	1.0	0.1	0.2	0.2	90.8	91.1
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		68.4	72.1	416.8	68.8	66.3	72.3	45.8	44.3	82.7	164.1	164.4
Level of Service (LOS)		E	E	F	E	E	E	D	D	F	F	F
Approach Delay, s/veh / LOS	70.7	E		355.7	F		51.1	D		163.2	F	
Intersection Delay, s/veh / LOS	174.4						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.5	B	2.3	B
Bicycle LOS Score / LOS	0.9	A	1.7	A	1.1	A	1.4	A

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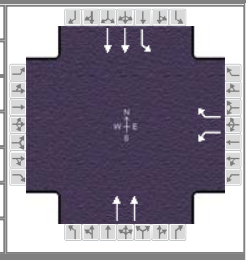
HCS 2010 Signalized Intersection Results Summary

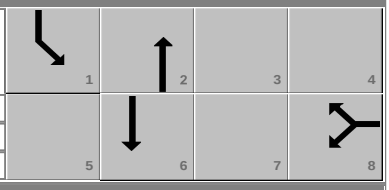
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ I-265…	File Name	2015 AM - La Grange at I-265 SB Ramp.xus		
Project Description	VA Traffic Study - 2015 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				339		145		211		572	731	

Signal Information			
Cycle, s	167.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	50.0	60.0	40.0	0.0	0.0	0.0
Yellow	4.4	5.0	3.7	0.0	0.0	0.0
Red	1.4	1.2	1.8	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		8.3	2.0	4.0
Phase Duration, s				45.5		66.2	55.8	122.0
Change Period, ($Y+R_c$), s				5.5		6.2	5.8	6.2
Max Allow Headway (*MAH*), s				5.2		3.5	6.0	3.5
Queue Clearance Time (g_s), s				36.7		9.7	52.0	17.5
Green Extension Time (g_e), s				0.9		0.7	0.0	2.8
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				1.00		0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2		1	6	
Adjusted Flow Rate (*v*), veh/h				368		126		229		622	795	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533		1723		1723	1723	
Queue Service Time (g_s), s				34.7		11.4		7.7		50.0	15.5	
Cycle Queue Clearance Time (g_c), s				34.7		11.4		7.7		50.0	15.5	
Green Ratio (*g/C*)				0.24		0.24		0.36		0.30	0.69	
Capacity (*c*), veh/h				412		366		1234		514	2382	
Volume-to-Capacity Ratio (*X*)				0.895		0.344		0.186		1.209	0.334	
Back of Queue (*Q*), ft/ln (95 th percentile)				637.6		208.1		151.6		1375.8	246.7	
Back of Queue (*Q*), veh/ln (95 th percentile)				24.5		8.0		5.8		52.9	9.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00		1.38	0.00	
Uniform Delay (d_1), s/veh				61.7		52.9		37.0		58.8	10.4	
Incremental Delay (d_2), s/veh				21.9		0.8		0.1		111.0	0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh				83.6		53.7		37.0		169.8	10.4	
Level of Service (LOS)				F		D		D		F	B	
Approach Delay, s/veh / LOS	0.0			76.0		E	37.0		D	80.4		F
Intersection Delay, s/veh / LOS	74.7						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.9	C	2.3	B	0.7	A
Bicycle LOS Score / LOS				F	0.7	A	1.7	A

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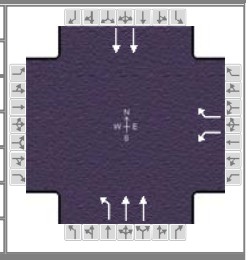
HCS 2010 Signalized Intersection Results Summary

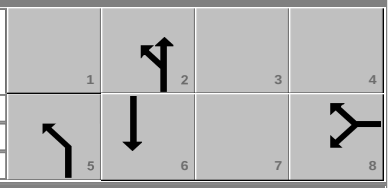
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ I-265…	File Name	2015 PM - Old Henry at I-265 NB Ramp.xus		
Project Description	VA Traffic Study - 2015 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				227		480	263	637			438	

Signal Information			
Cycle, s	164.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	25.0	60.0	60.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.5	0.0	0.0	0.0
Red	2.8	2.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	1.0	4.0		8.3
Phase Duration, s				66.5	31.3	97.9		66.6
Change Period, ($Y+R_c$), s				6.5	6.3	6.6		6.6
Max Allow Headway (*MAH*), s				6.3	4.0	3.5		5.9
Queue Clearance Time (g_s), s				41.0	17.4	20.4		18.7
Green Extension Time (g_e), s				5.6	0.6	2.3		4.6
Phase Call Probability				1.00	1.00	1.00		1.00
Max Out Probability				0.19	0.12	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	
Adjusted Flow Rate (*v*), veh/h				247		417	286	692			476	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533	1723	1723			1723	
Queue Service Time (g_s), s				17.4		39.0	15.4	18.4			16.7	
Cycle Queue Clearance Time (g_c), s				17.4		39.0	15.4	18.4			16.7	
Green Ratio (*g/C*)				0.36		0.36	0.53	0.56			0.36	
Capacity (*c*), veh/h				629		560	540	1913			1257	
Volume-to-Capacity Ratio (*X*)				0.392		0.746	0.530	0.362			0.379	
Back of Queue (*Q*), ft/ln (95 th percentile)				315.1		581.8	270.6	304.2			297.7	
Back of Queue (*Q*), veh/ln (95 th percentile)				12.1		22.4	10.4	11.7			11.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		1.94	0.65	0.00			0.00	
Uniform Delay (d_1), s/veh				38.7		45.5	23.4	20.3			38.5	
Incremental Delay (d_2), s/veh				0.9		6.5	1.0	0.1			0.4	
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	
Control Delay (*d*), s/veh				39.5		52.0	24.4	20.4			38.9	
Level of Service (LOS)				D		D	C	C			D	
Approach Delay, s/veh / LOS	0.0			47.4		D	21.6		C	38.9		D
Intersection Delay, s/veh / LOS	33.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	1.8	A	1.9	A
Bicycle LOS Score / LOS				F	1.3	A	0.9	A

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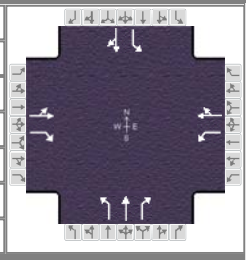
HCS 2010 Signalized Intersection Results Summary

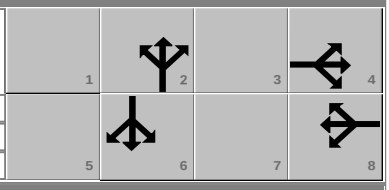
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Bush…	File Name	2015 PM - Old Henry at Bush Farm.xus		
Project Description	VA Traffic Study - 2015 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	1	1	2	281	0	44	2	599	495	56	282	1

Signal Information			
Cycle, s	97.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	45.0	40.0	0.0	0.0	0.0	0.0
Yellow	4.3	3.6	0.0	0.0	0.0	0.0
Red	1.3	3.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		7.0		6.0		5.0		6.0
Phase Duration, s		46.6		46.6		50.6		50.6
Change Period, ($Y+R_c$), s		6.6		6.6		5.6		5.6
Max Allow Headway (*MAH*), s		4.7		4.7		5.1		5.3
Queue Clearance Time (g_s), s		2.1		18.5		31.3		38.5
Green Extension Time (g_e), s		0.0		1.6		5.7		1.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		0.41		0.67

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		2	2	305	48		2	651	430	61	308	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1536	1533	1370	1533		1037	1810	1533	755	1808	
Queue Service Time (g_s), s		0.0	0.1	16.4	1.8		0.1	29.3	20.4	7.1	10.7	
Cycle Queue Clearance Time (g_c), s		0.1	0.1	16.5	1.8		10.8	29.3	20.4	36.5	10.7	
Green Ratio (*g/C*)		0.41	0.41	0.41	0.41		0.46	0.46	0.46	0.46	0.46	
Capacity (*c*), veh/h		688	631	637	631		440	838	710	196	837	
Volume-to-Capacity Ratio (*X*)		0.003	0.003	0.480	0.076		0.005	0.777	0.606	0.311	0.367	
Back of Queue (*Q*), ft/ln (95 th percentile)		1.3	1.3	230.7	30		1.5	467.9	290.6	62.4	193.3	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.1	0.1	8.9	1.2		0.1	18.0	11.2	2.4	7.4	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.51	0.00		0.01	0.00	0.00	0.50	0.00	
Uniform Delay (d_1), s/veh		16.9	16.9	21.7	17.4		20.4	21.9	19.5	37.2	16.9	
Incremental Delay (d_2), s/veh		0.0	0.0	0.7	0.1		0.0	4.9	1.8	1.3	0.4	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		16.9	16.9	22.4	17.4		20.4	26.8	21.2	38.5	17.3	
Level of Service (LOS)		B	B	C	B		C	C	C	D	B	
Approach Delay, s/veh / LOS	16.9	B		21.7	C		24.6	C		20.8	C	
Intersection Delay, s/veh / LOS	23.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	B	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.5	A	1.1	A	2.3	B	1.1	A

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Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: Palmer Engineering
Agency/Co.: Palmer Engineering
Date Performed: 8/31/2016
Analysis Time Period: 2015 PM Peak Existing
Intersection: Old Henry @ Factory Lane
Jurisdiction: District 5
Units: U. S. Customary
Analysis Year: 2015
Project ID: VA Traffic Study - St Joe Site - 2015 Existing Conditions
East/West Street: Old Henry Road
North/South Street: Old Henry / Factory Lane

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	0	0	0	233	0	31	0	210	403	100	135	0
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration			LR		TR		LT	
PHF			0.92		0.92		0.92	
Flow Rate			286		666		254	
% Heavy Veh			5		5		5	
No. Lanes			1		1		1	
Opposing-Lanes			0		1		1	
Conflicting-lanes			1		1		1	
Geometry group			1		1		1	

Duration, T 0.25 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane			286		666		254	
Left-Turn			253		0		108	
Right-Turn			33		438		0	
Prop. Left-Turns			0.9		0.0		0.4	
Prop. Right-Turns			0.1		0.7		0.0	
Prop. Heavy Vehicle			0.0		0.0		0.0	
Geometry Group			1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj			0.2		0.2		0.2	

hRT-adj			-0.6		-0.6		-0.6	
hHV-adj			1.7		1.7		1.7	
hadj, computed			0.2		-0.3		0.2	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate			286		666		254	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial			0.25		0.59		0.23	
hd, final value			6.46		5.04		6.07	
x, final value			0.513		0.933		0.428	
Move-up time, m			2.0		2.0		2.0	
Service Time			4.5		3.0		4.1	

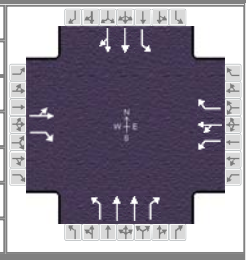
Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate			286		666		254	
Service Time			4.5		3.0		4.1	
Utilization, x			0.513		0.933		0.428	
Dep. headway, hd			6.46		5.04		6.07	
Capacity			561		716		591	
95% Queue Length								
Delay			16.1		41.4		13.5	
LOS			C		E		B	
Approach:								
Delay			16.1		41.4		13.5	
LOS			C		E		B	

Intersection Delay 29.5 Intersection LOS D

HCS 2010 Signalized Intersection Results Summary

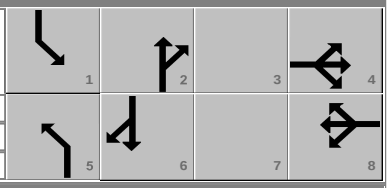
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ Facto…	File Name	2015 PM - La Grange at Factory Lane.xus		
Project Description	VA Traffic Study - 2015 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	79	44	94	333	100	52	84	1090	518	36	432	33

Signal Information			
Cycle, s	198.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	13.5	55.0	40.0	40.0	0.0
Yellow	3.5	3.5	4.3	3.6	3.6	0.0
Red	3.0	3.0	1.6	0.0	3.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		11.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		43.6		47.1	46.5	80.9	26.5	60.9
Change Period, ($Y+R_c$), s		3.6		7.1	6.5	5.9	6.5	5.9
Max Allow Headway (*MAH*), s		4.2		4.6	4.0	3.7	4.0	3.6
Queue Clearance Time (g_s), s		15.1		42.0	10.8	66.5	6.1	25.7
Green Extension Time (g_e), s		0.8		0.0	0.3	0.0	0.1	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		1.00	0.00	1.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		134	102	362	109	46	91	1185	450	39	255	250
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1753	1533	1723	1810	1533	1723	1723	1533	1723	1810	1764
Queue Service Time (g_s), s		13.1	11.3	40.0	10.1	4.9	8.8	64.5	51.1	4.1	23.5	23.7
Cycle Queue Clearance Time (g_c), s		13.1	11.3	40.0	10.1	4.9	8.8	64.5	51.1	4.1	23.5	23.7
Green Ratio (*g/C*)		0.20	0.20	0.20	0.20	0.20	0.20	0.38	0.38	0.10	0.28	0.28
Capacity (*c*), veh/h		354	310	348	365	310	348	1304	581	174	502	490
Volume-to-Capacity Ratio (*X*)		0.378	0.330	1.040	0.297	0.147	0.262	0.908	0.775	0.225	0.508	0.511
Back of Queue (*Q*), ft/ln (95 th percentile)		259.4	208.1	836.3	217.2	90.9	183.8	994.9	727.3	87.4	422.3	416.1
Back of Queue (*Q*), veh/ln (95 th percentile)		10.0	8.0	32.2	8.4	3.5	7.1	38.3	28.0	3.4	16.2	16.0
Queue Storage Ratio (*RQ*) (95 th percentile)		2.59	2.08	4.18	1.09	0.45	0.46	2.49	2.42	0.25	0.00	0.00
Uniform Delay (d_1), s/veh		68.3	67.6	79.1	67.1	65.0	66.6	58.3	54.1	81.9	60.2	60.2
Incremental Delay (d_2), s/veh		0.7	0.6	59.1	0.5	0.3	0.4	9.5	6.4	0.6	0.7	0.8
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		69.0	68.2	138.1	67.7	65.3	67.0	67.8	60.5	82.6	60.9	61.0
Level of Service (LOS)		E	E	F	E	E	E	E	E	F	E	E
Approach Delay, s/veh / LOS	68.6	E		116.8	F		65.8	E		62.5	E	
Intersection Delay, s/veh / LOS	74.2						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	2.9	C	2.5	B	2.3	B
Bicycle LOS Score / LOS	0.9	A	1.3	A	1.9	A	0.9	A

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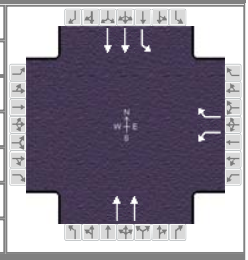
HCS 2010 Signalized Intersection Results Summary

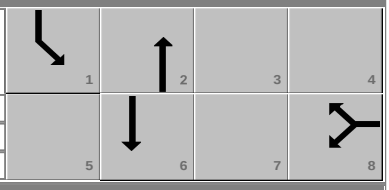
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ I-265…	File Name	2015 PM - La Grange at I-265 SB Ramp.xus		
Project Description	VA Traffic Study - 2015 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				118		396		1026		448	289	

Signal Information			
Cycle, s	167.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	50.0	60.0	40.0	0.0	0.0	0.0
Yellow	4.4	5.0	3.7	0.0	0.0	0.0
Red	1.4	1.2	1.8	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		8.3	2.0	4.0
Phase Duration, s				45.5		66.2	55.8	122.0
Change Period, ($Y+R_c$), s				5.5		6.2	5.8	6.2
Max Allow Headway (*MAH*), s				5.3		3.5	6.0	3.5
Queue Clearance Time (g_s), s				39.0		53.5	48.3	7.2
Green Extension Time (g_e), s				0.3		2.4	0.6	1.0
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				1.00		0.47	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2		1	6	
Adjusted Flow Rate (*v*), veh/h				128		345		1115		487	314	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533		1723		1723	1723	
Queue Service Time (g_s), s				10.3		37.0		51.5		46.3	5.2	
Cycle Queue Clearance Time (g_c), s				10.3		37.0		51.5		46.3	5.2	
Green Ratio (*g/C*)				0.24		0.24		0.36		0.30	0.69	
Capacity (*c*), veh/h				412		366		1234		514	2382	
Volume-to-Capacity Ratio (*X*)				0.312		0.941		0.904		0.947	0.132	
Back of Queue (*Q*), ft/ln (95 th percentile)				209.1		638.1		811.7		822	87.9	
Back of Queue (*Q*), veh/ln (95 th percentile)				8.0		24.5		31.2		31.6	3.4	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00		0.82	0.00	
Uniform Delay (d_1), s/veh				52.4		62.6		51.0		57.4	8.8	
Incremental Delay (d_2), s/veh				0.6		32.4		9.4		27.3	0.0	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh				53.0		95.0		60.4		84.8	8.8	
Level of Service (LOS)				D		F		E		F	A	
Approach Delay, s/veh / LOS	0.0			83.6		F	60.4		E	55.0		D
Intersection Delay, s/veh / LOS	63.2						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.9	C	2.4	B	0.7	A
Bicycle LOS Score / LOS				F	1.4	A	1.1	A

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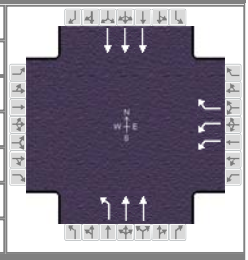
No Build

HCS 2010 Signalized Intersection Results Summary

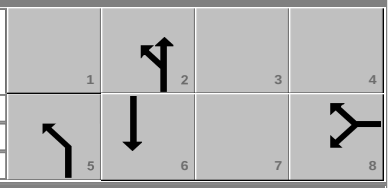
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ I-265…	File Name	2025 AM - Old Henry at I-265 NB Ramp.xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				1239		265	118	199			1376	

Signal Information			
Cycle, s	179.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	10.0	70.0	80.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.5	0.0	0.0	0.0
Red	2.8	2.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	1.0	4.0		8.3
Phase Duration, s				86.5	16.3	92.9		76.6
Change Period, ($Y+R_c$), s				6.5	6.3	6.6		6.6
Max Allow Headway (*MAH*), s				6.2	4.0	3.5		5.9
Queue Clearance Time (g_s), s				68.9	9.8	8.2		49.7
Green Extension Time (g_e), s				8.8	0.0	0.7		13.2
Phase Call Probability				1.00	1.00	1.00		1.00
Max Out Probability				0.86	1.00	0.00		0.55

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	
Adjusted Flow Rate (*v*), veh/h				1347		230	128	216			1496	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1673		1533	1723	1723			1643	
Queue Service Time (g_s), s				66.9		17.6	7.8	6.2			47.7	
Cycle Queue Clearance Time (g_c), s				66.9		17.6	7.8	6.2			47.7	
Green Ratio (*g/C*)				0.45		0.45	0.46	0.48			0.39	
Capacity (*c*), veh/h				1492		684	179	1657			1923	
Volume-to-Capacity Ratio (*X*)				0.902		0.337	0.718	0.131			0.778	
Back of Queue (*Q*), ft/ln (95 th percentile)				993.4		286.5	182.6	120.8			698.8	
Back of Queue (*Q*), veh/ln (95 th percentile)				38.2		11.0	7.0	4.6			26.9	
Queue Storage Ratio (*RQ*) (95 th percentile)				1.20		0.35	0.19	0.00			0.00	
Uniform Delay (d_1), s/veh				46.1		32.4	39.3	25.8			47.9	
Incremental Delay (d_2), s/veh				8.4		0.6	13.0	0.0			2.4	
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	
Control Delay (*d*), s/veh				54.5		33.0	52.4	25.8			50.3	
Level of Service (LOS)				D		C	D	C			D	
Approach Delay, s/veh / LOS	0.0			51.3		D	35.7		D	50.3		D
Intersection Delay, s/veh / LOS	49.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.0	B	1.9	A
Bicycle LOS Score / LOS				F	0.8	A	1.3	A

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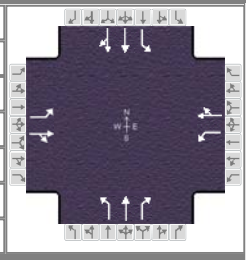
HCS 2010 Signalized Intersection Results Summary

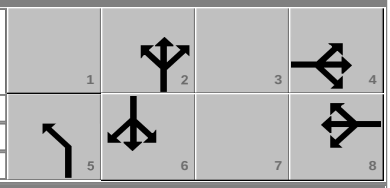
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Bush…	File Name	2025 AM - Old Henry at Bush Farm.xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	8	36	875	29	61	156	140	177	126	949	46

Signal Information			
Cycle, s	116.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	10.0	40.0	50.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.6	0.0	0.0	0.0
Red	1.0	1.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		6.0		6.0	1.0	3.0		6.3
Phase Duration, s		56.6		56.6	14.5	60.1		45.6
Change Period, ($Y+R_c$), s		6.6		6.6	4.5	5.6		5.6
Max Allow Headway (*MAH*), s		4.8		4.7	3.0	5.1		5.0
Queue Clearance Time (g_s), s		6.9		52.0	9.1	9.0		35.1
Green Extension Time (g_e), s		0.2		0.0	0.0	1.8		3.0
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.00		1.00	1.00	0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	11	40		951	98		170	152	154	137	545	536
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1255	1586		1322	1613		1723	1810	1533	1195	1810	1780
Queue Service Time (g_s), s	0.6	1.7		48.3	4.3		7.1	5.7	7.0	9.9	33.1	33.1
Cycle Queue Clearance Time (g_c), s	4.9	1.7		50.0	4.3		7.1	5.7	7.0	9.9	33.1	33.1
Green Ratio (*g/C*)	0.43	0.43		0.43	0.43		0.45	0.47	0.47	0.34	0.34	0.34
Capacity (*c*), veh/h	553	679		609	691		239	845	716	471	620	610
Volume-to-Capacity Ratio (*X*)	0.020	0.059		1.563	0.142		0.709	0.180	0.216	0.291	0.879	0.879
Back of Queue (*Q*), ft/ln (95 th percentile)	8.7	30.2		2503.4	76.2		151.7	108.4	112.3	131.3	594.8	588.1
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	1.2		96.3	2.9		5.8	4.2	4.3	5.1	22.9	22.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00		5.56	0.00		0.61	0.00	0.00	1.05	0.00	0.00
Uniform Delay (d_1), s/veh	21.8	19.6		36.7	20.3		26.8	18.1	18.4	28.5	36.1	36.1
Incremental Delay (d_2), s/veh	0.0	0.0		261.1	0.1		8.0	0.1	0.2	0.5	14.0	14.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	21.8	19.6		297.8	20.4		34.8	18.2	18.6	29.0	50.0	50.3
Level of Service (LOS)	C	B		F	C		C	B	B	C	D	D
Approach Delay, s/veh / LOS	20.1	C		271.9	F		24.3	C		47.8	D	
Intersection Delay, s/veh / LOS	127.4						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.4	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	2.2	B	1.3	A	1.5	A

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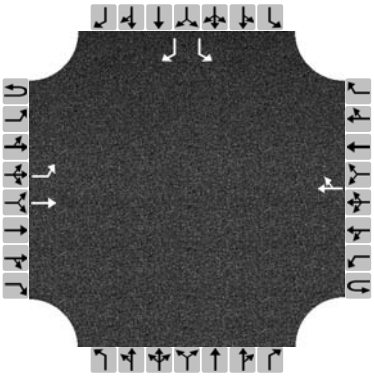
HCS 2010 Two-Way Stop Control Summary Report

General Information

Analyst		Intersection	Factory Lane at Old Henry
Agency/Co.	Palmer Engineering	Jurisdiction	
Date Performed	10/12/2015	East/West Street	Old Henry
Analysis Year	2015	North/South Street	Factory Lane
Time Analyzed		Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	VA Traffic Study - 2025 AM		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume (veh/h)		92	118				681	60						30		285
Percent Heavy Vehicles		5												5		5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		100												33		310
Capacity		808												203		395
v/c Ratio		0.12												0.16		0.78
95% Queue Length		0.4												0.6		6.7
Control Delay (s/veh)		10.1												26.1		40.2
Level of Service (LOS)		B												D		E
Approach Delay (s/veh)	4.4												38.9			
Approach LOS													E			

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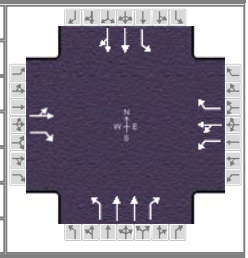
HCS 2010 Signalized Intersection Results Summary

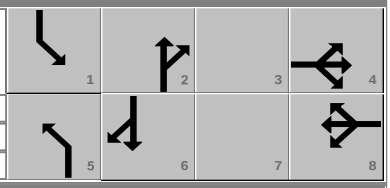
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ Facto…	File Name	2025 AM - La Grange at Factory Lane.xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	57	30	138	727	116	48	161	454	193	14	1119	34

Signal Information			
Cycle, s	201.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	13.5	55.0	40.0	40.0	0.0
Yellow	3.5	3.5	4.3	3.6	3.6	0.0
Red	3.0	3.0	1.6	3.5	3.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		11.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		47.1		47.1	46.5	80.9	26.5	60.9
Change Period, ($Y+R_c$), s		7.1		7.1	6.5	5.9	6.5	5.9
Max Allow Headway (*MAH*), s		4.3		4.6	4.0	3.7	4.0	3.6
Queue Clearance Time (g_s), s		19.5		42.0	20.3	23.2	3.6	57.0
Green Extension Time (g_e), s		0.8		0.0	0.5	2.3	0.0	0.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		1.00	0.00	0.00	0.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		95	150	790	126	41	175	493	167	15	630	624
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1752	1533	1723	1810	1533	1723	1723	1533	1723	1810	1790
Queue Service Time (g_s), s		9.2	17.5	40.0	12.1	4.5	18.3	21.2	15.5	1.6	55.0	55.0
Cycle Queue Clearance Time (g_c), s		9.2	17.5	40.0	12.1	4.5	18.3	21.2	15.5	1.6	55.0	55.0
Green Ratio (*g/C*)		0.20	0.20	0.20	0.20	0.20	0.20	0.37	0.37	0.10	0.27	0.27
Capacity (*c*), veh/h		348	304	342	359	304	342	1282	570	171	494	488
Volume-to-Capacity Ratio (*X*)		0.272	0.493	2.311	0.351	0.136	0.512	0.385	0.293	0.089	1.276	1.277
Back of Queue (*Q*), ft/ln (95 th percentile)		197.1	296.5	3025.1	251.1	83.9	334.4	366.5	259.6	34.2	1649.8	1637.3
Back of Queue (*Q*), veh/ln (95 th percentile)		7.6	11.4	116.4	9.7	3.2	12.9	14.1	10.0	1.3	63.5	63.0
Queue Storage Ratio (*RQ*) (95 th percentile)		1.97	2.97	15.13	1.26	0.42	0.84	0.92	0.87	0.10	0.00	0.00
Uniform Delay (d_1), s/veh		68.5	71.8	80.8	69.6	66.6	72.1	46.4	44.6	82.5	73.3	73.3
Incremental Delay (d_2), s/veh		0.4	1.2	599.1	0.7	0.2	1.3	0.2	0.2	0.2	139.0	139.6
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		68.9	73.0	679.9	70.3	66.8	73.4	46.6	44.9	82.7	212.3	212.9
Level of Service (LOS)		E	E	F	E	E	E	D	D	F	F	F
Approach Delay, s/veh / LOS	71.4	E		573.2	F		51.8	D		211.1	F	
Intersection Delay, s/veh / LOS	265.4						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.5	B	2.3	B
Bicycle LOS Score / LOS	0.9	A	2.1	B	1.2	A	1.5	A

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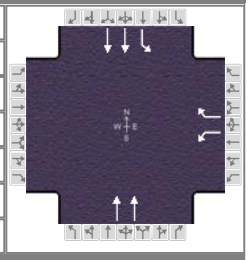
HCS 2010 Signalized Intersection Results Summary

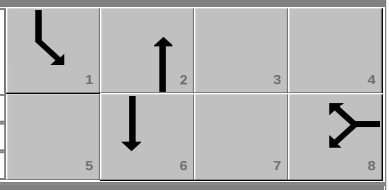
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ I-265…	File Name	2025 AM - La Grange at I-265 SB Ramp.xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				441		160		233		631	807	

Signal Information			
Cycle, s	167.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	50.0	60.0	40.0	0.0	0.0	0.0
Yellow	4.4	5.0	3.7	0.0	0.0	0.0
Red	1.4	1.2	1.8	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		8.3	2.0	4.0
Phase Duration, s				45.5		66.2	55.8	122.0
Change Period, ($Y+R_c$), s				5.5		6.2	5.8	6.2
Max Allow Headway (*MAH*), s				5.2		3.5	6.0	3.5
Queue Clearance Time (g_s), s				42.0		10.5	52.0	19.7
Green Extension Time (g_e), s				0.0		0.8	0.0	3.1
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				1.00		0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2		1	6	
Adjusted Flow Rate (*v*), veh/h				479		139		253		686	877	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533		1723		1723	1723	
Queue Service Time (g_s), s				40.0		12.7		8.5		50.0	17.7	
Cycle Queue Clearance Time (g_c), s				40.0		12.7		8.5		50.0	17.7	
Green Ratio (*g/C*)				0.24		0.24		0.36		0.30	0.69	
Capacity (*c*), veh/h				412		366		1234		514	2382	
Volume-to-Capacity Ratio (*X*)				1.165		0.380		0.205		1.333	0.368	
Back of Queue (*Q*), ft/ln (95 th percentile)				1060.1		226.7		168.8		1699.3	274.2	
Back of Queue (*Q*), veh/ln (95 th percentile)				40.8		8.7		6.5		65.4	10.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00		1.70	0.00	
Uniform Delay (d_1), s/veh				63.8		53.4		37.2		58.8	10.7	
Incremental Delay (d_2), s/veh				97.6		0.9		0.1		162.9	0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh				161.4		54.3		37.3		221.6	10.8	
Level of Service (LOS)				F		D		D		F	B	
Approach Delay, s/veh / LOS	0.0			137.3		F	37.3		D	103.3		F
Intersection Delay, s/veh / LOS	105.1						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.9	C	2.3	B	0.7	A
Bicycle LOS Score / LOS				F	0.7	A	1.8	A

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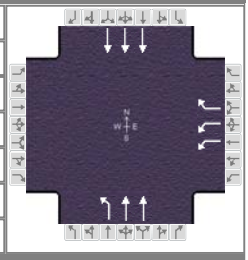
HCS 2010 Signalized Intersection Results Summary

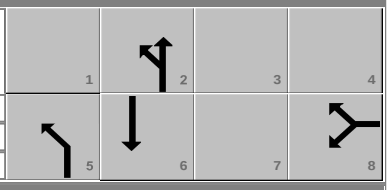
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ I-265…	File Name	2025 PM - Old Henry at I-265 NB Ramp.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				323		684	374	907			624	

Signal Information			
Cycle, s	164.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	25.0	60.0	60.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.5	0.0	0.0	0.0
Red	2.8	2.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	1.0	4.0		8.3
Phase Duration, s				66.5	31.3	97.9		66.6
Change Period, ($Y+R_c$), s				6.5	6.3	6.6		6.6
Max Allow Headway (*MAH*), s				6.3	4.0	3.5		5.9
Queue Clearance Time (g_s), s				35.4	25.9	31.3		18.7
Green Extension Time (g_e), s				6.9	0.0	3.6		7.1
Phase Call Probability				1.00	1.00	1.00		1.00
Max Out Probability				0.10	1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	
Adjusted Flow Rate (*v*), veh/h				351		372	407	986			678	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1673		1533	1723	1723			1643	
Queue Service Time (g_s), s				12.2		33.4	23.9	29.3			16.7	
Cycle Queue Clearance Time (g_c), s				12.2		33.4	23.9	29.3			16.7	
Green Ratio (*g/C*)				0.36		0.36	0.53	0.56			0.36	
Capacity (*c*), veh/h				1221		560	500	1913			1799	
Volume-to-Capacity Ratio (*X*)				0.287		0.664	0.813	0.515			0.377	
Back of Queue (*Q*), ft/ln (95 th percentile)				229.7		501.8	424.7	447.6			285.1	
Back of Queue (*Q*), veh/ln (95 th percentile)				8.8		19.3	16.3	17.2			11.0	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.28		0.61	0.45	0.00			0.00	
Uniform Delay (d_1), s/veh				37.0		43.8	26.2	22.8			38.4	
Incremental Delay (d_2), s/veh				0.3		4.0	9.9	0.2			0.3	
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	
Control Delay (*d*), s/veh				37.3		47.7	36.1	23.0			38.7	
Level of Service (LOS)				D		D	D	C			D	
Approach Delay, s/veh / LOS	0.0			42.7		D	26.8		C	38.7		D
Intersection Delay, s/veh / LOS	33.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.4	B	1.9	A
Bicycle LOS Score / LOS				F	1.6	A	0.9	A

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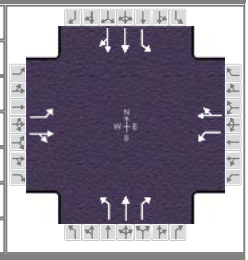
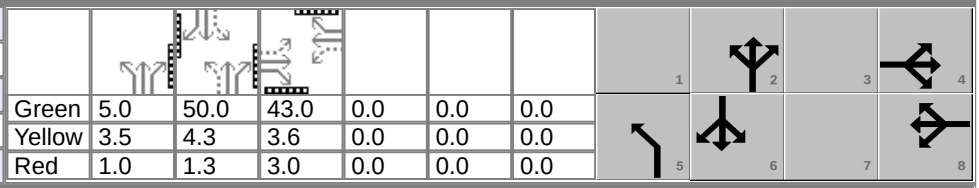
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Bush…	File Name	2025 PM - Old Henry at Bush Farm.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	31	136	370	7	58	41	853	704	79	402	79

Signal Information			
Cycle, s	114.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off



Green	5.0	50.0	43.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.6	0.0	0.0	0.0
Red	1.0	1.3	3.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		6.0		6.0	1.0	3.0		6.3
Phase Duration, s		49.6		49.6	9.5	65.1		55.6
Change Period, ($Y+R_c$), s		6.6		6.6	4.5	5.6		5.6
Max Allow Headway (*MAH*), s		4.8		5.0	3.0	5.0		5.5
Queue Clearance Time (g_s), s		9.6		45.0	3.5	60.0		52.0
Green Extension Time (g_e), s		0.9		0.0	0.0	0.0		0.0
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.00		1.00	1.00	1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	43	152		402	71		45	927	612	86	267	255
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1287	1587		1195	1559		1723	1810	1533	584	1810	1706
Queue Service Time (g_s), s	2.6	7.6		35.4	3.4		1.5	58.0	36.7	1.5	11.2	11.4
Cycle Queue Clearance Time (g_c), s	6.0	7.6		43.0	3.4		1.5	58.0	36.7	50.0	11.2	11.4
Green Ratio (*g/C*)	0.37	0.37		0.37	0.37		0.50	0.52	0.52	0.44	0.44	0.44
Capacity (*c*), veh/h	507	595		431	585		424	939	795	70	789	744
Volume-to-Capacity Ratio (*X*)	0.086	0.256		0.932	0.121		0.105	0.988	0.769	1.220	0.339	0.343
Back of Queue (*Q*), ft/ln (95 th percentile)	38	134.6		547.2	59.1		26.9	992.5	494.4	256	211.2	204.4
Back of Queue (*Q*), veh/ln (95 th percentile)	1.5	5.2		21.0	2.3		1.0	38.2	19.0	9.8	8.1	7.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00		1.22	0.00		0.11	0.00	0.00	2.05	0.00	0.00
Uniform Delay (d_1), s/veh	25.4	24.8		41.1	23.5		15.7	27.2	22.1	57.3	21.4	21.5
Incremental Delay (d_2), s/veh	0.1	0.3		27.2	0.1		0.0	26.3	4.9	178.1	0.4	0.4
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	25.5	25.1		68.4	23.6		15.8	53.6	27.0	235.4	21.8	21.8
Level of Service (LOS)	C	C		E	C		B	D	C	F	C	C
Approach Delay, s/veh / LOS	25.2	C		61.7	E		42.2	D		51.9	D	
Intersection Delay, s/veh / LOS	46.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.4	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.8	A	1.3	A	3.1	C	1.0	A

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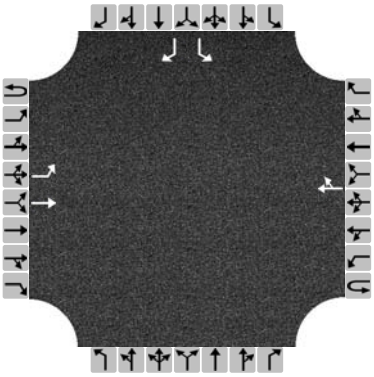
HCS 2010 Two-Way Stop Control Summary Report

General Information

Analyst		Intersection	Factory Lane @ Old Henry
Agency/Co.	Palmer Engineering	Jurisdiction	
Date Performed	11/18/2015	East/West Street	Old Henry
Analysis Year	2015	North/South Street	Factory Lane
Time Analyzed		Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	VA Traffic Study - 2025 PM		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume (veh/h)		300	574				332	44						134		182
Percent Heavy Vehicles		5												5		5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		326												146		198
Capacity		1136												75		657
v/c Ratio		0.29												1.94		0.30
95% Queue Length		1.2												13.1		1.3
Control Delay (s/veh)		9.4												560.6		12.8
Level of Service (LOS)		A												F		B
Approach Delay (s/veh)	3.2								245.3							
Approach LOS									F							

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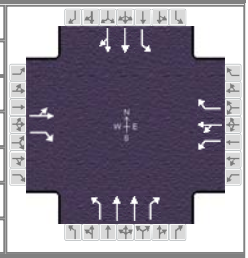
HCS 2010 Signalized Intersection Results Summary

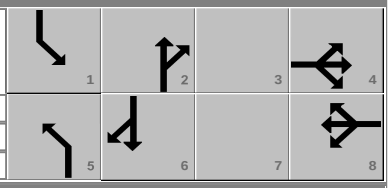
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ Facto…	File Name	2025 PM - La Grange at Factory Lane.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	87	48	104	448	134	70	93	1204	573	40	477	36

Signal Information			
Cycle, s	198.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	13.5	55.0	40.0	40.0	0.0
Yellow	3.5	3.5	4.3	3.6	3.6	0.0
Red	3.0	3.0	1.6	0.0	3.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		11.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		43.6		47.1	46.5	80.9	26.5	60.9
Change Period, ($Y+R_c$), s		3.6		7.1	6.5	5.9	6.5	5.9
Max Allow Headway (*MAH*), s		4.2		4.6	4.0	3.7	4.0	3.6
Queue Clearance Time (g_s), s		16.4		42.0	11.9	77.0	6.6	28.5
Green Extension Time (g_e), s		0.9		0.0	0.3	0.0	0.1	1.6
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		1.00	0.00	1.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		147	113	487	146	61	101	1309	498	43	282	276
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1753	1533	1723	1810	1533	1723	1723	1533	1723	1810	1764
Queue Service Time (g_s), s		14.4	12.6	40.0	13.8	6.5	9.9	75.0	59.2	4.6	26.4	26.5
Cycle Queue Clearance Time (g_c), s		14.4	12.6	40.0	13.8	6.5	9.9	75.0	59.2	4.6	26.4	26.5
Green Ratio (*g/C*)		0.20	0.20	0.20	0.20	0.20	0.20	0.38	0.38	0.10	0.28	0.28
Capacity (*c*), veh/h		354	310	348	365	310	348	1304	581	174	502	490
Volume-to-Capacity Ratio (*X*)		0.415	0.365	1.399	0.399	0.197	0.290	1.003	0.857	0.250	0.561	0.563
Back of Queue (*Q*), ft/ln (95 th percentile)		281.5	226.7	1423.9	279.3	122.5	202.9	1219.6	849.3	97.4	467.6	460.1
Back of Queue (*Q*), veh/ln (95 th percentile)		10.8	8.7	54.8	10.7	4.7	7.8	46.9	32.7	3.7	18.0	17.7
Queue Storage Ratio (*RQ*) (95 th percentile)		2.81	2.27	7.12	1.40	0.61	0.51	3.05	2.83	0.28	0.00	0.00
Uniform Delay (d_1), s/veh		68.9	68.1	79.1	68.6	65.7	67.0	61.6	56.6	82.1	61.2	61.3
Incremental Delay (d_2), s/veh		0.8	0.7	196.3	0.8	0.4	0.5	25.7	12.1	0.7	1.3	1.4
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		69.6	68.8	275.4	69.5	66.1	67.5	87.3	68.7	82.9	62.5	62.6
Level of Service (LOS)		E	E	F	E	E	E	F	E	F	E	E
Approach Delay, s/veh / LOS	69.3	E		213.8	F		81.4	F		64.0	E	
Intersection Delay, s/veh / LOS	104.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.5	B	2.3	B
Bicycle LOS Score / LOS	0.9	A	1.6	A	2.1	B	1.0	A

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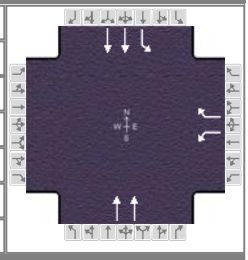
HCS 2010 Signalized Intersection Results Summary

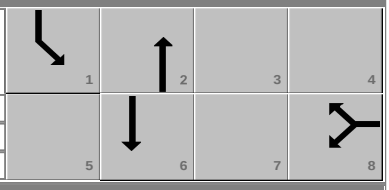
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ I-265…	File Name	2025 PM - La Grange at I-265 SB Ramp.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				131		437		1133		495	319	

Signal Information			
Cycle, s	167.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	50.0	60.0	40.0	0.0	0.0	0.0
Yellow	4.4	5.0	3.7	0.0	0.0	0.0
Red	1.4	1.2	1.8	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		8.3	2.0	4.0
Phase Duration, s				45.5		66.2	55.8	122.0
Change Period, ($Y+R_c$), s				5.5		6.2	5.8	6.2
Max Allow Headway (*MAH*), s				5.3		3.5	6.0	3.5
Queue Clearance Time (g_s), s				42.0		61.8	52.0	7.8
Green Extension Time (g_e), s				0.0		0.0	0.0	1.1
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				1.00		1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2		1	6	
Adjusted Flow Rate (*v*), veh/h				142		380		1232		538	347	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533		1723		1723	1723	
Queue Service Time (g_s), s				11.5		40.0		59.8		50.0	5.8	
Cycle Queue Clearance Time (g_c), s				11.5		40.0		59.8		50.0	5.8	
Green Ratio (*g/C*)				0.24		0.24		0.36		0.30	0.69	
Capacity (*c*), veh/h				412		366		1234		514	2382	
Volume-to-Capacity Ratio (*X*)				0.346		1.039		0.998		1.046	0.146	
Back of Queue (*Q*), ft/ln (95 th percentile)				228.6		770.5		997.9		1006.3	97.9	
Back of Queue (*Q*), veh/ln (95 th percentile)				8.8		29.6		38.4		38.7	3.8	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00		1.01	0.00	
Uniform Delay (d_1), s/veh				52.9		63.8		53.7		58.8	8.9	
Incremental Delay (d_2), s/veh				0.7		57.5		25.1		52.2	0.0	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh				53.6		121.2		78.8		110.9	8.9	
Level of Service (LOS)				D		F		E		F	A	
Approach Delay, s/veh / LOS	0.0			102.8		F	78.8		E	71.0		E
Intersection Delay, s/veh / LOS	80.9						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.9	C	2.4	B	0.7	A
Bicycle LOS Score / LOS				F	1.5	A	1.2	A

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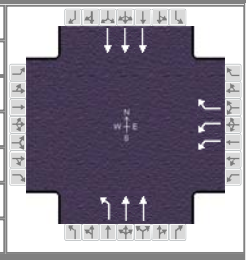
Build

HCS 2010 Signalized Intersection Results Summary

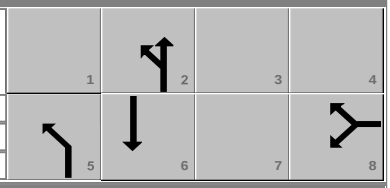
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ I-265…	File Name	2025 AM Build - Old Henry at I-265 NB Ramp.xus		
Project Description	VA Traffic Study - 2025 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				1239		560	118	250			1462	

Signal Information			
Cycle, s	179.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	10.0	70.0	80.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.5	0.0	0.0	0.0
Red	2.8	2.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	1.0	4.0		8.3
Phase Duration, s				86.5	16.3	92.9		76.6
Change Period, ($Y+R_c$), s				6.5	6.3	6.6		6.6
Max Allow Headway (*MAH*), s				6.2	4.0	3.5		5.9
Queue Clearance Time (g_s), s				68.9	9.8	10.0		54.1
Green Extension Time (g_e), s				9.4	0.0	0.8		11.6
Phase Call Probability				1.00	1.00	1.00		1.00
Max Out Probability				0.91	1.00	0.00		0.70

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	
Adjusted Flow Rate (*v*), veh/h				1347		487	128	272			1589	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1673		1533	1723	1723			1643	
Queue Service Time (g_s), s				66.9		46.3	7.8	8.0			52.1	
Cycle Queue Clearance Time (g_c), s				66.9		46.3	7.8	8.0			52.1	
Green Ratio (*g/C*)				0.45		0.45	0.46	0.48			0.39	
Capacity (*c*), veh/h				1492		684	167	1657			1923	
Volume-to-Capacity Ratio (*X*)				0.902		0.712	0.767	0.164			0.826	
Back of Queue (*Q*), ft/ln (95 th percentile)				993.4		658.3	193.7	154.4			759.3	
Back of Queue (*Q*), veh/ln (95 th percentile)				38.2		25.3	7.5	5.9			29.2	
Queue Storage Ratio (*RQ*) (95 th percentile)				1.20		0.80	0.20	0.00			0.00	
Uniform Delay (d_1), s/veh				46.1		40.4	40.8	26.2			49.2	
Incremental Delay (d_2), s/veh				8.4		4.3	19.0	0.0			3.5	
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	
Control Delay (*d*), s/veh				54.5		44.7	59.9	26.3			52.7	
Level of Service (LOS)				D		D	E	C			D	
Approach Delay, s/veh / LOS	0.0			51.9		D	37.0		D	52.7		D
Intersection Delay, s/veh / LOS	50.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	0.8	A	1.4	A

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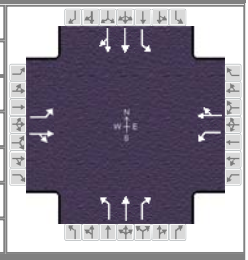
HCS 2010 Signalized Intersection Results Summary

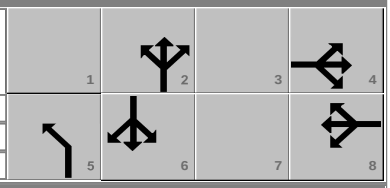
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Bush…	File Name	2025 AM Build - Old Henry at Bush Farm.xus		
Project Description	VA Traffic Study - 2025 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	8	36	875	29	74	156	486	177	129	1040	46

Signal Information			
Cycle, s	126.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	10.0	50.0	50.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.6	0.0	0.0	0.0
Red	1.0	1.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		6.0		6.0	1.0	3.0		6.3
Phase Duration, s		56.6		56.6	14.5	70.1		55.6
Change Period, ($Y+R_c$), s		6.6		6.6	4.5	5.6		5.6
Max Allow Headway (*MAH*), s		4.8		4.8	3.0	5.0		5.1
Queue Clearance Time (g_s), s		8.5		52.0	9.1	27.6		39.6
Green Extension Time (g_e), s		0.2		0.0	0.0	4.1		5.8
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.00		1.00	1.00	0.03		0.68

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	11	40		951	112		170	528	154	140	595	586
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1239	1586		1322	1602		1723	1810	1533	846	1810	1782
Queue Service Time (g_s), s	0.7	2.0		48.0	5.8		7.1	25.6	7.0	17.4	37.5	37.6
Cycle Queue Clearance Time (g_c), s	6.5	2.0		50.0	5.8		7.1	25.6	7.0	28.6	37.5	37.6
Green Ratio (*g/C*)	0.39	0.39		0.39	0.39		0.49	0.51	0.51	0.39	0.39	0.39
Capacity (*c*), veh/h	490	626		558	632		238	921	781	316	714	703
Volume-to-Capacity Ratio (*X*)	0.022	0.064		1.705	0.177		0.713	0.573	0.198	0.443	0.833	0.833
Back of Queue (*Q*), ft/ln (95 th percentile)	10.3	35.6		2792.7	103.9		152.5	411.7	112.1	169.6	631.9	624.9
Back of Queue (*Q*), veh/ln (95 th percentile)	0.4	1.4		107.4	4.0		5.9	15.8	4.3	6.5	24.3	24.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00		6.21	0.00		0.61	0.00	0.00	1.36	0.00	0.00
Uniform Delay (d_1), s/veh	27.1	23.8		41.8	25.0		27.3	21.6	17.0	36.5	34.6	34.6
Incremental Delay (d_2), s/veh	0.0	0.1		324.8	0.2		8.3	1.1	0.2	1.4	8.6	8.8
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	27.1	23.9		366.6	25.1		35.7	22.6	17.2	37.9	43.2	43.4
Level of Service (LOS)	C	C		F	C		D	C	B	D	D	D
Approach Delay, s/veh / LOS	24.6	C		330.6	F		24.2	C		42.7	D	
Intersection Delay, s/veh / LOS	130.8						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.4	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	2.2	B	1.9	A	1.6	A

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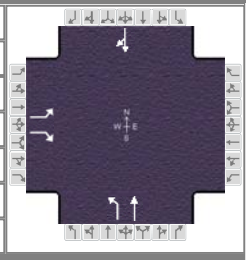
HCS 2010 Signalized Intersection Results Summary

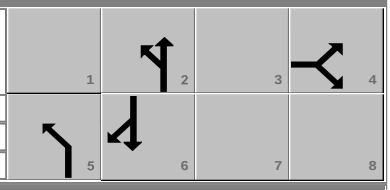
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Factor…	File Name	2025 AM Build - Factory Lane at Old Henry.xus		
Project Description	VA Traffic Study - 2025 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	33		379				451	118			681	73

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	25.0	56.0	24.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		29.0			30.0	91.0		61.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.8			3.5	3.4		3.6
Queue Clearance Time (g_s), s		20.4			27.0	4.6		54.4
Green Extension Time (g_e), s		0.3			0.0	0.3		0.6
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	36		247				490	128			803	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533				1723	1810			1784	
Queue Service Time (g_s), s	2.0		18.4				25.0	2.6			52.4	
Cycle Queue Clearance Time (g_c), s	2.0		18.4				25.0	2.6			52.4	
Green Ratio (*g/C*)	0.20		0.20				0.69	0.72			0.47	
Capacity (*c*), veh/h	345		307				439	1297			833	
Volume-to-Capacity Ratio (*X*)	0.104		0.804				1.118	0.099			0.965	
Back of Queue (*Q*), ft/ln (95 th percentile)	40.8		332.4				824.8	38.6			914.4	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.6		12.8				31.7	1.5			35.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		2.66				3.67	0.00			0.00	
Uniform Delay (d_1), s/veh	39.2		45.8				38.4	5.2			31.0	
Incremental Delay (d_2), s/veh	0.1		14.0				79.0	0.0			22.8	
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	
Control Delay (*d*), s/veh	39.3		59.8				117.4	5.2			53.8	
Level of Service (LOS)	D		E				F	A			D	
Approach Delay, s/veh / LOS	57.2		E	0.0			94.2		F	53.8		D
Intersection Delay, s/veh / LOS	69.0						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.2	B	0.7	A	2.5	B
Bicycle LOS Score / LOS		F			1.4	A	1.8	A

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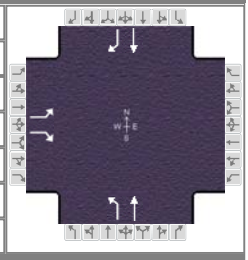
HCS 2010 Signalized Intersection Results Summary

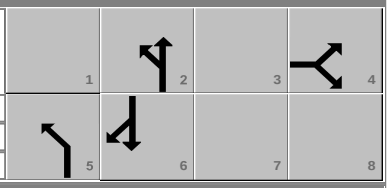
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Factory Lane	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	VA @ Factory Lane	File Name	2025 AM Build - VA at Factory Lane (signalized).xus		
Project Description	VA Traffic Study - 2025 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	64		97				372	152			315	270

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	7.0	55.0	30.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		36.0			13.0	74.0		61.0
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.3			4.1	4.0		4.2
Queue Clearance Time (g_s), s		6.7			9.0	6.2		14.8
Green Extension Time (g_e), s		0.5			0.0	0.6		2.3
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.00			1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	70		85				404	165			342	235
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533				1723	1810			1810	1533
Queue Service Time (g_s), s	3.4		4.7				7.0	4.2			12.8	9.9
Cycle Queue Clearance Time (g_c), s	3.4		4.7				7.0	4.2			12.8	9.9
Green Ratio (*g/C*)	0.27		0.27				0.58	0.62			0.50	0.50
Capacity (*c*), veh/h	470		418				560	1119			905	767
Volume-to-Capacity Ratio (*X*)	0.148		0.203				0.722	0.148			0.378	0.306
Back of Queue (*Q*), ft/ln (95 th percentile)	65.6		81.5				252	73.5			232.5	160
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5		3.1				9.7	2.8			8.9	6.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				1.01	0.00			0.00	0.80
Uniform Delay (d_1), s/veh	30.3		30.8				20.4	8.8			17.0	16.2
Incremental Delay (d_2), s/veh	0.1		0.2				4.5	0.1			0.3	0.2
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	30.5		31.0				24.9	8.9			17.2	16.5
Level of Service (LOS)	C		C				C	A			B	B
Approach Delay, s/veh / LOS	30.8	C		0.0			20.3	C		16.9	B	
Intersection Delay, s/veh / LOS	20.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.4	B	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			1.4	A	1.4	A

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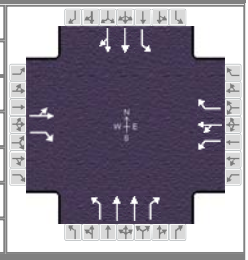
HCS 2010 Signalized Intersection Results Summary

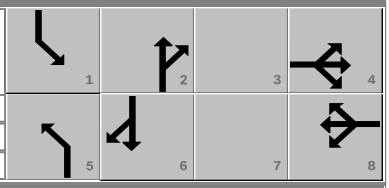
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ Facto…	File Name	2025 AM Build - La Grange at Factory Lane.xus		
Project Description	VA Traffic Study - 2025 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	57	43	138	782	119	54	161	454	411	53	1119	34

Signal Information			
Cycle, s	201.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	13.5	55.0	40.0	40.0	0.0
Yellow	3.5	3.5	4.3	3.6	3.6	0.0
Red	3.0	3.0	1.6	3.5	3.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		11.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		47.1		47.1	46.5	80.9	26.5	60.9
Change Period, ($Y+R_c$), s		7.1		7.1	6.5	5.9	6.5	5.9
Max Allow Headway (*MAH*), s		4.2		4.6	4.0	3.8	4.0	3.6
Queue Clearance Time (g_s), s		19.5		42.0	20.3	40.5	8.3	57.0
Green Extension Time (g_e), s		0.9		0.0	0.5	2.7	0.1	0.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		1.00	0.00	0.04	0.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		109	150	850	129	47	175	493	358	58	630	624
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1759	1533	1723	1810	1533	1723	1723	1533	1723	1810	1790
Queue Service Time (g_s), s		10.6	17.5	40.0	12.4	5.1	18.3	21.2	38.5	6.3	55.0	55.0
Cycle Queue Clearance Time (g_c), s		10.6	17.5	40.0	12.4	5.1	18.3	21.2	38.5	6.3	55.0	55.0
Green Ratio (*g/C*)		0.20	0.20	0.20	0.20	0.20	0.20	0.37	0.37	0.10	0.27	0.27
Capacity (*c*), veh/h		349	304	342	359	304	342	1282	570	171	494	488
Volume-to-Capacity Ratio (*X*)		0.311	0.493	2.486	0.360	0.154	0.512	0.385	0.627	0.337	1.276	1.277
Back of Queue (*Q*), ft/ln (95 th percentile)		221.4	296.5	3325.4	256.6	95.3	334.4	366.5	557.5	133.3	1649.8	1637.3
Back of Queue (*Q*), veh/ln (95 th percentile)		8.5	11.4	127.9	9.9	3.7	12.9	14.1	21.4	5.1	63.5	63.0
Queue Storage Ratio (*RQ*) (95 th percentile)		2.21	2.97	16.63	1.28	0.48	0.84	0.92	1.86	0.38	0.00	0.00
Uniform Delay (d_1), s/veh		69.0	71.8	80.8	69.8	66.8	72.1	46.4	51.8	84.6	73.3	73.3
Incremental Delay (d_2), s/veh		0.5	1.2	677.3	0.7	0.3	1.3	0.2	2.1	1.2	139.0	139.6
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		69.5	73.0	758.1	70.5	67.1	73.4	46.6	53.9	85.8	212.3	212.9
Level of Service (LOS)		E	E	F	E	E	E	D	D	F	F	F
Approach Delay, s/veh / LOS	71.6	E		640.0	F		53.7	D		207.1	F	
Intersection Delay, s/veh / LOS	276.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	2.9	C	2.5	B	2.3	B
Bicycle LOS Score / LOS	0.9	A	2.2	B	1.3	A	1.6	A

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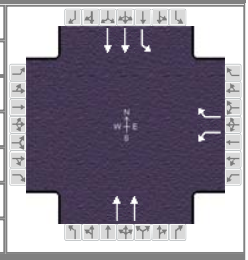
HCS 2010 Signalized Intersection Results Summary

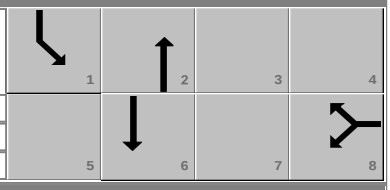
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ I-265…	File Name	2025 AM Build - La Grange at I-265 SB Ramp.xus		
Project Description	VA Traffic Study - 2025 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				441		352		246		634	811	

Signal Information			
Cycle, s	167.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	50.0	60.0	40.0	0.0	0.0	0.0
Yellow	4.4	5.0	3.7	0.0	0.0	0.0
Red	1.4	1.2	1.8	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		8.3	2.0	4.0
Phase Duration, s				45.5		66.2	55.8	122.0
Change Period, ($Y+R_c$), s				5.5		6.2	5.8	6.2
Max Allow Headway (*MAH*), s				5.2		3.5	6.0	3.5
Queue Clearance Time (g_s), s				42.0		11.0	52.0	19.8
Green Extension Time (g_e), s				0.0		0.8	0.0	3.2
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				1.00		0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2		1	6	
Adjusted Flow Rate (*v*), veh/h				479		348		267		689	882	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533		1723		1723	1723	
Queue Service Time (g_s), s				40.0		37.4		9.0		50.0	17.8	
Cycle Queue Clearance Time (g_c), s				40.0		37.4		9.0		50.0	17.8	
Green Ratio (*g/C*)				0.24		0.24		0.36		0.30	0.69	
Capacity (*c*), veh/h				412		366		1234		514	2382	
Volume-to-Capacity Ratio (*X*)				1.165		0.950		0.217		1.340	0.370	
Back of Queue (*Q*), ft/ln (95 th percentile)				1060.1		649.7		178.7		1716.3	275.7	
Back of Queue (*Q*), veh/ln (95 th percentile)				40.8		25.0		6.9		66.0	10.6	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00		1.72	0.00	
Uniform Delay (d_1), s/veh				63.8		62.8		37.4		58.8	10.7	
Incremental Delay (d_2), s/veh				97.6		34.3		0.1		165.6	0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh				161.4		97.1		37.5		224.3	10.8	
Level of Service (LOS)				F		F		D		F	B	
Approach Delay, s/veh / LOS	0.0			134.3		F	37.5		D	104.5		F
Intersection Delay, s/veh / LOS	107.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.9	C	2.3	B	0.7	A
Bicycle LOS Score / LOS				F	0.7	A	1.8	A

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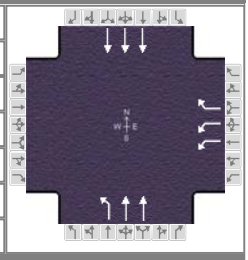
HCS 2010 Signalized Intersection Results Summary

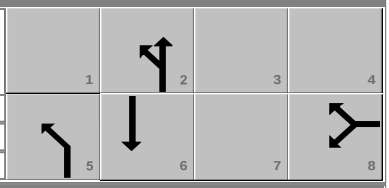
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ I-265…	File Name	2025 PM Build - Old Henry at I-265 NB Ramp.xus		
Project Description	VA Traffic Study - 2025 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				323		748	374	918			911	

Signal Information			
Cycle, s	169.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	30.0	60.0	60.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.5	0.0	0.0	0.0
Red	2.8	2.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	1.0	4.0		8.3
Phase Duration, s				66.5	36.3	102.9		66.6
Change Period, ($Y+R_c$), s				6.5	6.3	6.6		6.6
Max Allow Headway (*MAH*), s				6.3	4.0	3.5		5.9
Queue Clearance Time (g_s), s				41.5	26.0	31.8		29.5
Green Extension Time (g_e), s				6.5	0.6	3.6		10.4
Phase Call Probability				1.00	1.00	1.00		1.00
Max Out Probability				0.24	1.00	0.00		0.10

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	
Adjusted Flow Rate (*v*), veh/h				351		407	407	998			990	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1673		1533	1723	1723			1643	
Queue Service Time (g_s), s				12.8		39.5	24.0	29.8			27.5	
Cycle Queue Clearance Time (g_c), s				12.8		39.5	24.0	29.8			27.5	
Green Ratio (*g/C*)				0.35		0.35	0.54	0.57			0.35	
Capacity (*c*), veh/h				1185		543	453	1959			1746	
Volume-to-Capacity Ratio (*X*)				0.296		0.748	0.897	0.509			0.567	
Back of Queue (*Q*), ft/ln (95 th percentile)				239.4		590	465	454.2			433.6	
Back of Queue (*Q*), veh/ln (95 th percentile)				9.2		22.7	17.9	17.5			16.7	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.80		0.72	0.49	0.00			0.00	
Uniform Delay (d_1), s/veh				39.5		48.1	30.5	22.2			44.2	
Incremental Delay (d_2), s/veh				0.3		6.8	20.2	0.2			0.7	
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	
Control Delay (*d*), s/veh				39.8		54.9	50.7	22.4			44.9	
Level of Service (LOS)				D		D	D	C			D	
Approach Delay, s/veh / LOS	0.0			47.9		D	30.6		C	44.9		D
Intersection Delay, s/veh / LOS	39.2						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.4	B	1.9	A
Bicycle LOS Score / LOS				F	1.6	A	1.0	A

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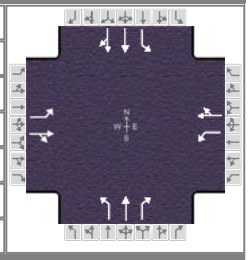
HCS 2010 Signalized Intersection Results Summary

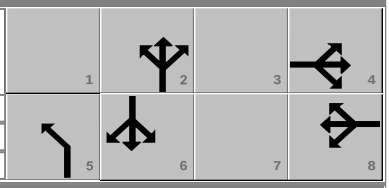
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Bush…	File Name	2025 PM Build - Old Henry at Bush Farm.xus		
Project Description	VA Traffic Study - 2025 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	31	136	370	7	61	41	928	704	92	708	11

Signal Information			
Cycle, s	114.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	5.0	50.0	43.0	0.0	0.0	0.0
Yellow	3.5	4.3	3.6	0.0	0.0	0.0
Red	1.0	1.3	3.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		6.0		6.0	1.0	3.0		6.3
Phase Duration, s		49.6		49.6	9.5	65.1		55.6
Change Period, ($Y+R_c$), s		6.6		6.6	4.5	5.6		5.6
Max Allow Headway (*MAH*), s		4.8		5.0	3.0	5.0		5.4
Queue Clearance Time (g_s), s		9.6		45.0	3.5	61.5		52.0
Green Extension Time (g_e), s		0.9		0.0	0.0	0.0		0.0
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.00		1.00	1.00	1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	43	152		402	74		45	1009	612	100	392	390
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1283	1587		1195	1558		1723	1810	1533	541	1810	1800
Queue Service Time (g_s), s	2.6	7.6		35.4	3.6		1.5	59.5	36.7	0.0	17.9	17.9
Cycle Queue Clearance Time (g_c), s	6.2	7.6		43.0	3.6		1.5	59.5	36.7	50.0	17.9	17.9
Green Ratio (*g/C*)	0.37	0.37		0.37	0.37		0.50	0.52	0.52	0.44	0.44	0.44
Capacity (*c*), veh/h	504	595		431	584		325	939	795	63	789	784
Volume-to-Capacity Ratio (*X*)	0.086	0.256		0.932	0.127		0.137	1.075	0.769	1.593	0.497	0.497
Back of Queue (*Q*), ft/ln (95 th percentile)	38.1	134.6		547.2	62		26.9	1277.1	494.4	351.7	306.9	306
Back of Queue (*Q*), veh/ln (95 th percentile)	1.5	5.2		21.0	2.4		1.0	49.1	19.0	13.5	11.8	11.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00		1.22	0.00		0.11	0.00	0.00	2.81	0.00	0.00
Uniform Delay (d_1), s/veh	25.6	24.8		41.1	23.5		16.7	27.6	22.1	57.3	23.3	23.3
Incremental Delay (d_2), s/veh	0.1	0.3		27.2	0.1		0.1	51.6	4.9	329.2	0.7	0.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	25.7	25.1		68.4	23.6		16.8	79.2	27.0	386.5	24.0	24.0
Level of Service (LOS)	C	C		E	C		B	F	C	F	C	C
Approach Delay, s/veh / LOS	25.2	C		61.4	E		58.3	E		65.1	E	
Intersection Delay, s/veh / LOS	58.6						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.4	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.8	A	1.3	A	3.2	C	1.2	A

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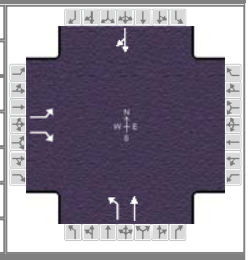
HCS 2010 Signalized Intersection Results Summary

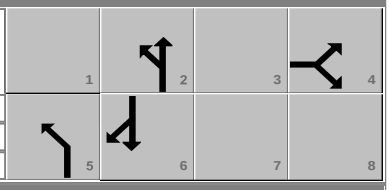
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Old Henry Rd. @ Factor…	File Name	2025 PM Build - Factory Lane at Old Henry.xus		
Project Description	VA Traffic Study - 2025 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	159		501				378	574			332	52

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	25.0	46.0	34.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		39.0			30.0	81.0		51.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.8			3.5	3.4		3.6
Queue Clearance Time (g_s), s		25.3			16.7	25.2		24.0
Green Extension Time (g_e), s		1.1			0.8	1.7		1.1
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.11			0.07	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	173		327				411	624			407	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533				1723	1810			1774	
Queue Service Time (g_s), s	9.6		23.3				14.7	23.2			22.0	
Cycle Queue Clearance Time (g_c), s	9.6		23.3				14.7	23.2			22.0	
Green Ratio (*g/C*)	0.28		0.28				0.61	0.63			0.38	
Capacity (*c*), veh/h	488		434				608	1146			680	
Volume-to-Capacity Ratio (*X*)	0.354		0.753				0.675	0.544			0.598	
Back of Queue (*Q*), ft/ln (95 th percentile)	188.8		377.5				245.3	342.2			376.2	
Back of Queue (*Q*), veh/ln (95 th percentile)	7.3		14.5				9.4	13.2			14.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		3.02				1.09	0.00			0.00	
Uniform Delay (d_1), s/veh	34.3		39.2				16.3	12.3			29.6	
Incremental Delay (d_2), s/veh	0.3		7.0				2.7	0.4			1.3	
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	
Control Delay (*d*), s/veh	34.6		46.1				19.1	12.8			30.9	
Level of Service (LOS)	C		D				B	B			C	
Approach Delay, s/veh / LOS	42.1	D		0.0			15.3	B		30.9	C	
Intersection Delay, s/veh / LOS	25.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.2	B	0.7	A	2.6	B
Bicycle LOS Score / LOS		F			2.1	B	1.2	A

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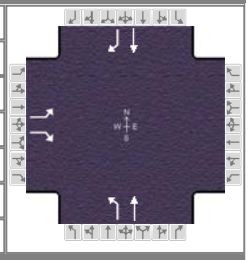
HCS 2010 Signalized Intersection Results Summary

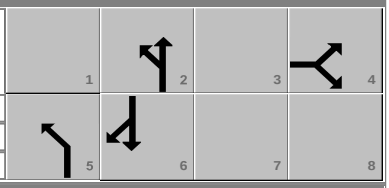
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Factory Lane	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	VA @ Factory Lane	File Name	2025 PM Build - VA at Factory Lane (signalized).xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	281		344				86	344			316	70

Signal Information			
Cycle, s	110.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	7.0	55.0	30.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		36.0			13.0	74.0		61.0
Change Period, ($Y+R_c$), s		6.0			6.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.2			4.1	4.0		4.1
Queue Clearance Time (g_s), s		21.4			4.6	12.9		14.9
Green Extension Time (g_e), s		1.7			0.0	1.4		1.6
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.25			1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	305		299				93	374			343	76
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723		1533				1723	1810			1810	1533
Queue Service Time (g_s), s	17.2		19.4				2.6	10.9			12.9	2.9
Cycle Queue Clearance Time (g_c), s	17.2		19.4				2.6	10.9			12.9	2.9
Green Ratio (*g/C*)	0.27		0.27				0.58	0.62			0.50	0.50
Capacity (*c*), veh/h	470		418				559	1119			905	767
Volume-to-Capacity Ratio (*X*)	0.650		0.715				0.167	0.334			0.380	0.099
Back of Queue (*Q*), ft/ln (95 th percentile)	311.9		320.3				45.4	191.1			233.1	46.1
Back of Queue (*Q*), veh/ln (95 th percentile)	12.0		12.3				1.7	7.4			9.0	1.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.18	0.00			0.00	0.23
Uniform Delay (d_1), s/veh	35.4		36.1				11.3	10.1			17.0	14.5
Incremental Delay (d_2), s/veh	3.1		5.7				0.1	0.2			0.3	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	38.5		41.8				11.4	10.3			17.2	14.5
Level of Service (LOS)	D		D				B	B			B	B
Approach Delay, s/veh / LOS	40.2	D		0.0			10.5	B		16.7	B	
Intersection Delay, s/veh / LOS	24.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.3	B	0.7	A	2.4	B
Bicycle LOS Score / LOS		F			1.3	A	1.2	A

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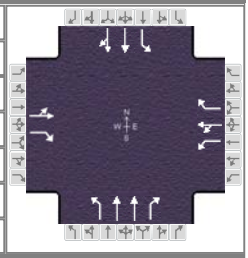
HCS 2010 Signalized Intersection Results Summary

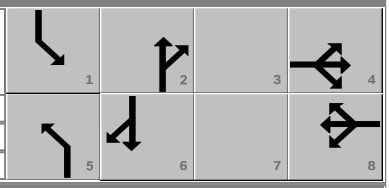
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ Facto…	File Name	2025 PM Build - La Grange at Factory Lane.xus		
Project Description	VA Traffic Study - 2025 PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	87	51	104	679	153	101	93	1204	634	46	477	36

Signal Information			
Cycle, s	198.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	20.0	13.5	55.0	40.0	40.0	0.0
Yellow	3.5	3.5	4.3	3.6	3.6	0.0
Red	3.0	3.0	1.6	0.0	3.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		11.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		43.6		47.1	46.5	80.9	26.5	60.9
Change Period, ($Y+R_c$), s		3.6		7.1	6.5	5.9	6.5	5.9
Max Allow Headway (*MAH*), s		4.2		4.6	4.0	3.7	4.0	3.6
Queue Clearance Time (g_s), s		16.8		42.0	11.9	77.0	7.3	28.5
Green Extension Time (g_e), s		0.9		0.0	0.3	0.0	0.1	1.6
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		1.00	0.00	1.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		150	113	738	166	88	101	1309	551	50	282	276
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1754	1533	1723	1810	1533	1723	1723	1533	1723	1810	1764
Queue Service Time (g_s), s		14.8	12.6	40.0	16.0	9.6	9.9	75.0	69.1	5.3	26.4	26.5
Cycle Queue Clearance Time (g_c), s		14.8	12.6	40.0	16.0	9.6	9.9	75.0	69.1	5.3	26.4	26.5
Green Ratio (*g/C*)		0.20	0.20	0.20	0.20	0.20	0.20	0.38	0.38	0.10	0.28	0.28
Capacity (*c*), veh/h		354	310	348	365	310	348	1304	581	174	502	490
Volume-to-Capacity Ratio (*X*)		0.423	0.365	2.121	0.455	0.284	0.290	1.003	0.949	0.287	0.561	0.563
Back of Queue (*Q*), ft/ln (95 th percentile)		287	226.7	2729.3	314.4	180.7	202.9	1219.6	1026.9	112.7	467.6	460.1
Back of Queue (*Q*), veh/ln (95 th percentile)		11.0	8.7	105.0	12.1	7.0	7.8	46.9	39.5	4.3	18.0	17.7
Queue Storage Ratio (*RQ*) (95 th percentile)		2.87	2.27	13.65	1.57	0.90	0.51	3.05	3.42	0.32	0.00	0.00
Uniform Delay (d_1), s/veh		69.0	68.1	79.1	69.5	66.9	67.0	61.6	59.7	82.5	61.2	61.3
Incremental Delay (d_2), s/veh		0.8	0.7	514.0	1.1	0.6	0.5	25.7	25.3	0.9	1.3	1.4
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		69.8	68.8	593.1	70.5	67.5	67.5	87.3	85.0	83.4	62.5	62.6
Level of Service (LOS)		E	E	F	E	E	E	F	F	F	E	E
Approach Delay, s/veh / LOS	69.4	E		458.9	F		85.6	F		64.3	E	
Intersection Delay, s/veh / LOS	178.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.5	B	2.3	B
Bicycle LOS Score / LOS	0.9	A	2.1	B	2.1	B	1.0	A

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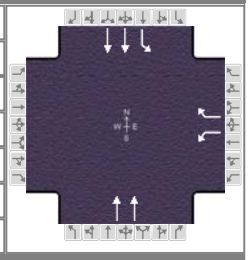
HCS 2010 Signalized Intersection Results Summary

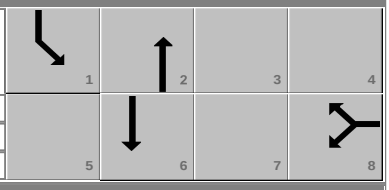
General Information				Intersection Information	
Agency	Palmer Engineering			Duration, h	0.25
Analyst		Analysis Date	Oct 12, 2015	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	La Grange Road	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	La Grange Rd. @ I-265…	File Name	2025 PM Build - La Grange at I-265 SB Ramp.xus		
Project Description	VA Traffic Study - 2025 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				131		492		1136		507	338	

Signal Information			
Cycle, s	167.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	50.0	60.0	40.0	0.0	0.0	0.0
Yellow	4.4	5.0	3.7	0.0	0.0	0.0
Red	1.4	1.2	1.8	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		8.3	2.0	4.0
Phase Duration, s				45.5		66.2	55.8	122.0
Change Period, ($Y+R_c$), s				5.5		6.2	5.8	6.2
Max Allow Headway (*MAH*), s				5.3		3.5	6.0	3.5
Queue Clearance Time (g_s), s				42.0		62.0	52.0	8.2
Green Extension Time (g_e), s				0.0		0.0	0.0	1.2
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				1.00		1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2		1	6	
Adjusted Flow Rate (*v*), veh/h				142		440		1235		551	367	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1723		1533		1723		1723	1723	
Queue Service Time (g_s), s				11.5		40.0		60.0		50.0	6.2	
Cycle Queue Clearance Time (g_c), s				11.5		40.0		60.0		50.0	6.2	
Green Ratio (*g/C*)				0.24		0.24		0.36		0.30	0.69	
Capacity (*c*), veh/h				412		366		1234		514	2382	
Volume-to-Capacity Ratio (*X*)				0.346		1.202		1.001		1.071	0.154	
Back of Queue (*Q*), ft/ln (95 th percentile)				228.6		1027		1004.3		1057.3	104.2	
Back of Queue (*Q*), veh/ln (95 th percentile)				8.8		39.5		38.6		40.7	4.0	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00		1.06	0.00	
Uniform Delay (d_1), s/veh				52.9		63.8		53.8		58.8	8.9	
Incremental Delay (d_2), s/veh				0.7		114.2		25.7		60.1	0.0	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh				53.6		178.0		79.5		118.9	9.0	
Level of Service (LOS)				D		F		F		F	A	
Approach Delay, s/veh / LOS	0.0			147.6		F	79.5		E	74.9		E
Intersection Delay, s/veh / LOS	92.4						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.9	C	2.4	B	0.7	A
Bicycle LOS Score / LOS				F	1.5	A	1.2	A

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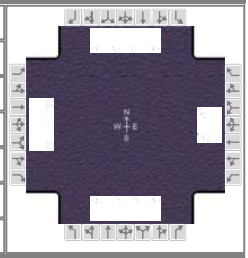
Midlands Site

(KY 22)

Existing

HCS 2010 Signalized Intersection Results Summary

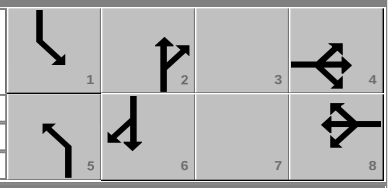
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	RUDY LANE	File Name	2015 AM_EXIST_RUDY.xus		
Project Description	EXIST - AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	131	6	43	18	42	118	43	609	8	72	1112	162

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.6	2.9	77.5	12.9	12.1	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		17.9		17.1	9.6	82.5	12.5	85.4
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.2	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		12.6		11.8	5.5		7.8	
Green Extension Time (g_e), s		0.3		0.3	0.1	0.0	0.1	0.0
Phase Call Probability		1.00		1.00	0.82		0.94	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	146	7	42		67	120	48	677	3	80	1236	169
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1817	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	10.6	0.4	3.3		4.5	9.8	3.5	12.5	0.1	5.8	26.9	6.0
Cycle Queue Clearance Time (g_c), s	10.6	0.4	3.3		4.5	9.8	3.5	12.5	0.1	5.8	26.9	6.0
Green Ratio (*g/C*)	0.10	0.10	0.10		0.09	0.09	0.04	0.60	0.60	0.06	0.62	0.62
Capacity (*c*), veh/h	174	183	155		169	146	62	2094	932	102	2173	967
Volume-to-Capacity Ratio (*X*)	0.837	0.037	0.273		0.394	0.824	0.772	0.323	0.004	0.787	0.569	0.175
Available Capacity (c_a), veh/h	432	454	385		547	471	608	2094	932	581	2173	967
Back of Queue (*Q*), veh/ln (95 th percentile)	8.4	0.4	2.3		3.7	7.1	3.0	8.3	0.1	4.8	15.2	3.7
Queue Storage Ratio (*RQ*) (95 th percentile)	1.65	0.00	0.45		0.00	0.00	0.45	0.00	0.02	0.78	0.00	1.87
Uniform Delay (d_1), s/veh	57.5	53.0	54.2		55.5	57.9	62.2	13.1	10.6	60.5	14.6	10.6
Incremental Delay (d_2), s/veh	4.0	0.0	0.3		0.6	4.4	7.4	0.4	0.0	5.0	1.1	0.4
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	61.6	53.0	54.6		56.0	62.3	69.6	13.5	10.6	65.4	15.7	11.0
Level of Service (LOS)	E	D	D		E	E	E	B	B	E	B	B
Approach Delay, s/veh / LOS	59.8	E		60.1	E		17.2	B		17.8	B	
Intersection Delay, s/veh / LOS	23.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.8	A	0.8	A	1.1	A	1.7	A

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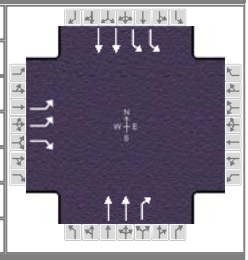
HCS 2010 Signalized Intersection Results Summary

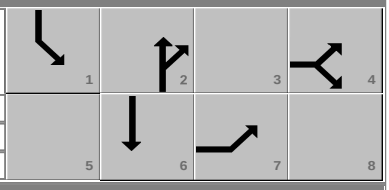
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 SOUTH RAMP	File Name	2015 AM_EXIST_ I-264 SOUTH RAMP.xus		
Project Description	2015 AM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	200		302					447	411	1132	1046	

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	54.0	30.6	30.3	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		35.3				35.6	59.0	94.7
Change Period, ($Y+R_c$), s		5.0				5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2				0.0	6.0	0.0
Queue Clearance Time (g_s), s		29.2					46.4	
Green Extension Time (g_e), s		1.1				0.0	7.7	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.00					0.76	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	222		336					497	234	1258	1162	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1563					1756	1563	1706	1756	
Queue Service Time (g_s), s	6.9		27.2					16.4	17.5	44.4	19.9	
Cycle Queue Clearance Time (g_c), s	6.9		27.2					16.4	17.5	44.4	19.9	
Green Ratio (*g/C*)	0.23		0.23					0.24	0.24	0.42	0.69	
Capacity (*c*), veh/h	796		365					828	368	1418	2422	
Volume-to-Capacity Ratio (*X*)	0.279		0.920					0.600	0.636	0.887	0.480	
Available Capacity (c_a), veh/h	1128		517					828	368	1513	2422	
Back of Queue (*Q*), veh/ln (95 th percentile)	5.2		17.4					11.8	11.9	26.0	11.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	40.9		48.6					44.2	44.7	35.2	9.4	
Incremental Delay (d_2), s/veh	0.1		14.3					3.2	8.1	7.2	0.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	40.9		63.0					47.4	52.8	42.3	10.0	
Level of Service (LOS)	D		E					D	D	D	B	
Approach Delay, s/veh / LOS	54.2		D	0.0			49.2		D	26.8		C
Intersection Delay, s/veh / LOS	35.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.5	B	1.9	A
Bicycle LOS Score / LOS		F			1.1	A	2.5	B

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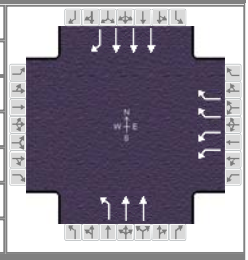
HCS 2010 Signalized Intersection Results Summary

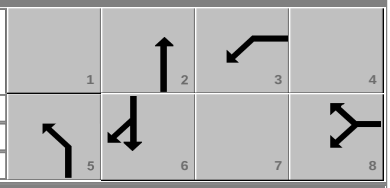
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 NORTH RAMP	File Name	2015 AM_EXIST_I-264 NORTH RAMP.xus		
Project Description	2015 AM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				392		415	109	531			1793	616

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.9	78.9	25.2	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	2.0	4.0		7.3
Phase Duration, s				30.2	15.9	99.8		83.9
Change Period, ($Y+R_c$), s				5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s				3.1	3.0	0.0		0.0
Queue Clearance Time (g_s), s				23.0	10.8			
Green Extension Time (g_e), s				2.3	0.2	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				0.00	0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	16
Adjusted Flow Rate (*v*), veh/h				436		461	121	590			1992	684
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1706		1383	1757	1756			1675	1563
Queue Service Time (g_s), s				15.3		21.0	8.8	7.1			33.6	39.8
Cycle Queue Clearance Time (g_c), s				15.3		21.0	8.8	7.1			33.6	39.8
Green Ratio (*g/C*)				0.19		0.19	0.08	0.73			0.61	0.61
Capacity (*c*), veh/h				662		537	147	2560			3049	949
Volume-to-Capacity Ratio (*X*)				0.658		0.859	0.824	0.230			0.653	0.721
Available Capacity (c_a), veh/h				1260		1022	700	2560			3049	949
Back of Queue (*Q*), veh/ln (95 th percentile)				10.6		11.6	7.2	4.1			17.7	20.4
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh				48.4		50.7	58.6	5.7			16.6	17.9
Incremental Delay (d_2), s/veh				0.4		1.6	4.4	0.2			1.1	4.7
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh				48.8		52.3	63.0	5.9			17.8	22.6
Level of Service (LOS)				D		D	E	A			B	C
Approach Delay, s/veh / LOS	0.0			50.6		D	15.7		B	19.0		B
Intersection Delay, s/veh / LOS	25.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	1.1	A	2.0	A

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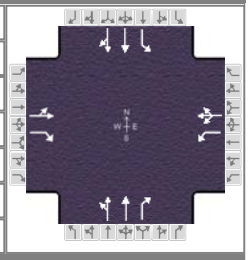
HCS 2010 Signalized Intersection Results Summary

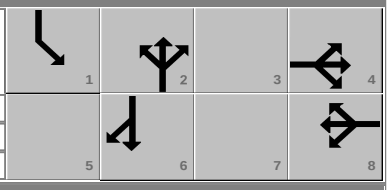
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	NORTHFIELD DRIVE	File Name	2015 AM_EXIST_NORTHFIELD.xus		
Project Description	2015 AM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	14	135	550	7	4	23	587	337	14	1721	4

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	53.0	4.6	47.3	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		9.6		52.3		58.0	10.0	68.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		5.2		46.1			3.1	
Green Extension Time (g_e), s		0.0		1.2		0.0	0.0	0.0
Phase Call Probability		0.89		1.00			1.00	
Max Out Probability		0.00		0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		21	39	611	12		44	634	208	16	958	958
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1821	1563	1757	1731		52	1679	1563	1757	1845	1843
Queue Service Time (g_s), s		1.5	3.2	44.1	0.6		0.0	46.7	11.8	1.1	63.0	63.0
Cycle Queue Clearance Time (g_c), s		1.5	3.2	44.1	0.6		53.0	46.7	11.8	1.1	63.0	63.0
Green Ratio (*g/C*)		0.04	0.04	0.36	0.36		0.41	0.41	0.41	0.04	0.48	0.48
Capacity (*c*), veh/h		65	56	640	630		65	685	638	68	894	894
Volume-to-Capacity Ratio (*X*)		0.325	0.697	0.956	0.019		0.668	0.926	0.326	0.230	1.072	1.072
Available Capacity (c_a), veh/h		210	180	1086	1070		65	685	638	636	894	894
Back of Queue (*Q*), veh/ln (95 th percentile)		1.2	2.4	26.9	0.4		4.0	29.7	8.0	0.9	51.8	51.9
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		61.1	62.0	40.3	26.5		39.4	36.6	26.3	60.6	33.5	33.5
Incremental Delay (d_2), s/veh		1.1	5.7	8.3	0.0		43.0	20.4	1.4	0.6	51.2	51.4
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		62.2	67.7	48.7	26.5		82.4	57.0	27.6	61.3	84.6	84.9
Level of Service (LOS)		E	E	D	C		F	E	C	E	F	F
Approach Delay, s/veh / LOS	65.8	E		48.2	D		51.4	D		84.6	F	
Intersection Delay, s/veh / LOS	69.4						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	2.9	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.6	A	1.5	A	1.2	A	2.1	B

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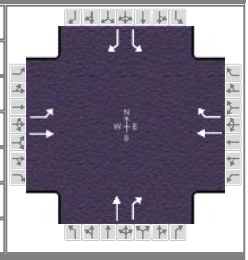
HCS 2010 Signalized Intersection Results Summary

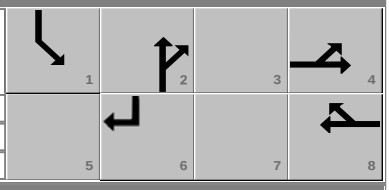
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2015 AM_EXIST_BROWNSBORO.xus		
Project Description	2015 AM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	286	0			0	0		330	0	0		659

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	0.0	94.4	25.6	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		10.0		11.0		7.3	2.0	3.0
Phase Duration, s		30.6		0.0		99.4	0.0	99.4
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		0.0		0.0	0.0	0.0
Queue Clearance Time (g_s), s		25.1						
Green Extension Time (g_e), s		0.6		0.0		0.0	0.0	0.0
Phase Call Probability		1.00						
Max Out Probability		0.00						

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	318	0			0	0		367	0	0		732
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	23.1	0.0			0.0	0.0		8.8	0.0	0.0		31.4
Cycle Queue Clearance Time (g_c), s	23.1	0.0			0.0	0.0		8.8	0.0	0.0		31.4
Green Ratio (*g/C*)	0.20	0.20				0.00		0.73	0.73			0.73
Capacity (*c*), veh/h	346	363			1	1		1339	1135	1		1135
Volume-to-Capacity Ratio (*X*)	0.918	0.000			0.000	0.000		0.274	0.000	0.000		0.645
Available Capacity (c_a), veh/h	919	965			772	654		1339	1135	1127		1135
Back of Queue (*Q*), veh/ln (95 th percentile)	15.5	0.0			0.0	0.0		5.5	0.0	0.0		14.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.00		0.00
Uniform Delay (d_1), s/veh	51.2	0.0			0.0	0.0		6.1	0.0	0.0		9.2
Incremental Delay (d_2), s/veh	4.2	0.0			0.0	0.0		0.5	0.0	0.0		2.8
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	55.4	0.0			0.0	0.0		6.6	0.0	0.0		12.0
Level of Service (LOS)	E							A				B
Approach Delay, s/veh / LOS	55.4	E		0.0			6.6	A		12.0	B	
Intersection Delay, s/veh / LOS	20.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.3	B	2.2	B	2.2	B
Bicycle LOS Score / LOS	1.0	A	0.5	A	1.1	A		F

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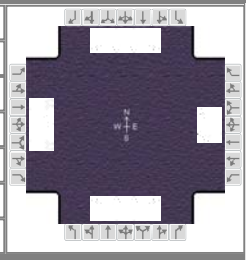
HCS 2010 Signalized Intersection Results Summary

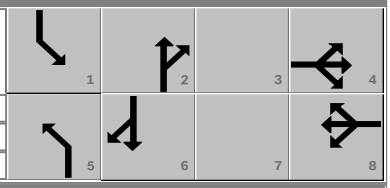
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	RUDY LANE	File Name	2015 PM_EXIST_RUDY.xus		
Project Description	2015 PM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	235	22	66	51	75	233	55	681	59	166	674	265

Signal Information			
Cycle, s	130.0	Reference Phase	6
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.6	0.2	49.4	21.6	23.3	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		26.6		28.3	20.8	54.6	20.6	54.4
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.2	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		20.9		23.3	6.1		15.4	
Green Extension Time (g_e), s		0.6		0.4	0.0	0.0	0.2	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.25	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	261	24	73		140	259	61	757	54	184	749	267
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1808	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	18.9	1.5	5.3		9.0	21.3	4.1	22.0	2.9	13.4	22.0	16.7
Cycle Queue Clearance Time (g_c), s	18.9	1.5	5.3		9.0	21.3	4.1	22.0	2.9	13.4	22.0	16.7
Green Ratio (*g/C*)	0.17	0.17	0.17		0.18	0.18	0.12	0.38	0.38	0.12	0.38	0.38
Capacity (*c*), veh/h	291	306	259		317	274	229	1351	601	211	1315	585
Volume-to-Capacity Ratio (*X*)	0.897	0.080	0.283		0.441	0.943	0.267	0.560	0.091	0.873	0.569	0.455
Available Capacity (c_a), veh/h	595	624	529		396	342	229	1351	601	361	1315	585
Back of Queue (*Q*), veh/ln (95 th percentile)	13.2	1.2	3.7		7.2	15.6	3.5	14.3	2.0	10.2	14.4	10.7
Queue Storage Ratio (*RQ*) (95 th percentile)	2.61	0.00	0.73		0.00	0.00	0.53	0.00	0.68	1.63	0.00	5.49
Uniform Delay (d_1), s/veh	53.1	45.8	47.5		47.9	52.9	50.9	31.4	25.5	56.2	32.3	30.7
Incremental Delay (d_2), s/veh	4.0	0.0	0.2		0.4	28.5	2.8	1.7	0.3	5.4	1.8	2.5
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	57.1	45.9	47.7		48.2	81.4	53.8	33.1	25.8	61.6	34.1	33.2
Level of Service (LOS)	E	D	D		D	F	D	C	C	E	C	C
Approach Delay, s/veh / LOS	54.4	D		69.8	E		34.1	C		38.1	D	
Intersection Delay, s/veh / LOS	43.4						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	1.1	A	1.1	A	1.2	A	1.5	A

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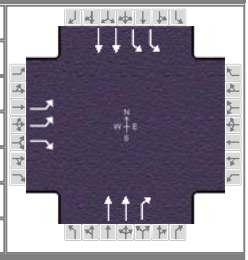
HCS 2010 Signalized Intersection Results Summary

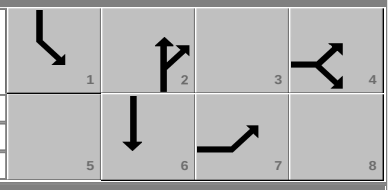
General Information				Intersection Information	
Agency	PALMER			Duration, h	0.25
Analyst	SDS	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	PM	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	I-264 SOUTH RAMP	File Name	2015 PM_EXIST_ I-264 SOUTH RAMP.xus		
Project Description	2015 PM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	579		214					870	302	579	826	

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	27.3	60.2	27.5	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		32.5				65.2	32.3	97.5
Change Period, ($Y+R_c$), s		5.0				5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1				0.0	3.0	0.0
Queue Clearance Time (g_s), s		25.8					25.9	
Green Extension Time (g_e), s		1.6				0.0	1.5	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.07					0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	643		238					967	336	643	918	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1563					1756	1563	1706	1756	
Queue Service Time (g_s), s	23.8		18.4					26.5	19.1	23.9	13.3	
Cycle Queue Clearance Time (g_c), s	23.8		18.4					26.5	19.1	23.9	13.3	
Green Ratio (*g/C*)	0.21		0.21					0.46	0.46	0.21	0.71	
Capacity (*c*), veh/h	721		330					1626	724	718	2500	
Volume-to-Capacity Ratio (*X*)	0.893		0.720					0.594	0.464	0.897	0.367	
Available Capacity (c_a), veh/h	919		421					1626	724	1248	2500	
Back of Queue (*Q*), veh/ln (95 th percentile)	16.0		11.7					16.4	11.6	15.3	7.8	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	49.8		47.7					25.9	23.9	50.0	7.3	
Incremental Delay (d_2), s/veh	8.0		2.7					1.6	2.1	2.3	0.4	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	57.8		50.4					27.5	26.0	52.2	7.7	
Level of Service (LOS)	E		D					C	C	D	A	
Approach Delay, s/veh / LOS	55.8	E		0.0			27.1	C		26.1	C	
Intersection Delay, s/veh / LOS	33.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	3.0	C	2.4	B	1.9	A
Bicycle LOS Score / LOS		F			1.6	A	1.8	A

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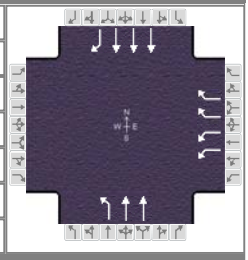
HCS 2010 Signalized Intersection Results Summary

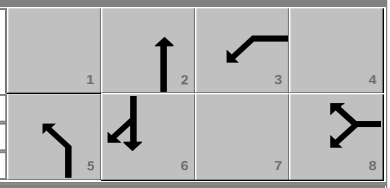
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	I-264 NORTH RAMP	File Name	2015 PM_EXIST_I-264 NORTH RAMP.xus		
Project Description	2015 PM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				284		582	115	1334			1208	203

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	11.4	69.8	33.8	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	2.0	4.0		7.3
Phase Duration, s				38.8	16.4	91.2		74.8
Change Period, ($Y+R_c$), s				5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s				3.2	3.0	0.0		0.0
Queue Clearance Time (g_s), s				31.3	11.3			
Green Extension Time (g_e), s				2.4	0.2	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				0.01	0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	16
Adjusted Flow Rate (*v*), veh/h				316		647	128	1482			1342	226
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1706		1383	1757	1756			1675	1563
Queue Service Time (g_s), s				9.8		29.3	9.3	32.0			21.9	10.1
Cycle Queue Clearance Time (g_c), s				9.8		29.3	9.3	32.0			21.9	10.1
Green Ratio (*g/C*)				0.26		0.26	0.09	0.66			0.54	0.54
Capacity (*c*), veh/h				886		719	154	2330			2699	840
Volume-to-Capacity Ratio (*X*)				0.356		0.900	0.830	0.636			0.497	0.269
Available Capacity (c_a), veh/h				1260		1022	530	2330			2699	840
Back of Queue (*Q*), veh/ln (95 th percentile)				7.3		15.7	7.6	17.0			12.9	6.6
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh				39.2		46.5	58.4	12.8			19.0	16.3
Incremental Delay (d_2), s/veh				0.1		6.4	4.3	1.3			0.7	0.8
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh				39.3		52.9	62.7	14.1			19.7	17.1
Level of Service (LOS)				D		D	E	B			B	B
Approach Delay, s/veh / LOS	0.0			48.4		D	18.0		B	19.3		B
Intersection Delay, s/veh / LOS	25.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	1.8	A	1.3	A

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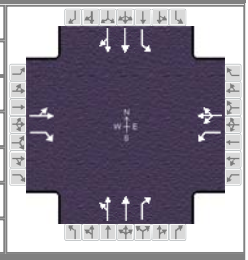
HCS 2010 Signalized Intersection Results Summary

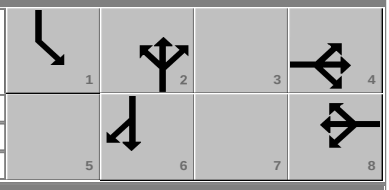
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	NORTHFIELD DRIVE	File Name	2015 PM_EXIST_NORTHFIELD.xus		
Project Description	2015 PM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	16	18	14	409	11	7	10	1513	385	13	988	15

Signal Information			
Cycle, s	140.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	72.8	4.0	38.2	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		9.0		43.2		77.8	10.0	87.8
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		4.9		37.5			3.1	
Green Extension Time (g_e), s		0.0		0.7		0.0	0.0	0.0
Phase Call Probability		0.81		1.00			1.00	
Max Out Probability		1.00		0.02			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		38	4	454	20		886	807	206	14	559	556
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1802	1563	1757	1724		1820	1679	1563	1757	1845	1835
Queue Service Time (g_s), s		2.9	0.4	35.5	1.2		20.5	62.2	10.2	1.1	24.9	24.9
Cycle Queue Clearance Time (g_c), s		2.9	0.4	35.5	1.2		63.4	62.2	10.2	1.1	24.9	24.9
Green Ratio (*g/C*)		0.03	0.03	0.27	0.27		0.52	0.52	0.52	0.04	0.59	0.59
Capacity (*c*), veh/h		52	45	479	471		972	872	812	63	1090	1085
Volume-to-Capacity Ratio (*X*)		0.728	0.099	0.948	0.043		0.911	0.925	0.253	0.230	0.512	0.512
Back of Queue (*Q*), ft/ln (95 th percentile)		73.6	7.2	636.8	23.1		988.4	927.1	172.8	23.3	402.4	400.7
Back of Queue (*Q*), veh/ln (95 th percentile)		2.9	0.3	24.9	0.9		38.6	36.2	6.7	0.9	15.7	15.7
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		67.4	66.2	49.9	37.4		31.2	31.1	18.6	65.6	16.8	16.8
Incremental Delay (d_2), s/veh		19.2	0.4	20.9	0.0		14.1	16.9	0.7	0.7	1.7	1.7
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		86.7	66.6	70.8	37.5		45.2	48.0	19.3	66.3	18.5	18.5
Level of Service (LOS)		F	E	E	D		D	D	B	E	B	B
Approach Delay, s/veh / LOS	84.6	F		69.4	E		43.6	D		19.1	B	
Intersection Delay, s/veh / LOS	39.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	2.9	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	1.3	A	2.1	B	1.4	A

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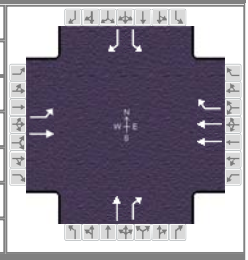
HCS 2010 Signalized Intersection Results Summary

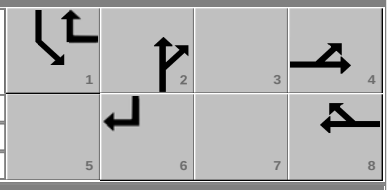
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	BROWNSBORO ROAD	File Name	2015 PM_EXIST_BROWNSBORO.xus		
Project Description	2015 PM EXISTING				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	419	0			0	0		388	0	0		370

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	0.0	83.7	36.3	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		10.0		11.0		7.3	2.0	3.0
Phase Duration, s		41.3		0.0		88.7	0.0	88.7
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		0.0		0.0	0.0	0.0
Queue Clearance Time (g_s), s		35.8						
Green Extension Time (g_e), s		0.6		0.0		0.0	0.0	0.0
Phase Call Probability		1.00						
Max Out Probability		0.13						

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	466	0			0	0		431	0	0		411
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845			1756	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	33.8	0.0			0.0	0.0		14.1	0.0	0.0		16.5
Cycle Queue Clearance Time (g_c), s	33.8	0.0			0.0	0.0		14.1	0.0	0.0		16.5
Green Ratio (*g/C*)	0.28	0.28				0.00		0.64	0.64			0.64
Capacity (*c*), veh/h	491	515			3	-59		1187	1006	1		1006
Volume-to-Capacity Ratio (*X*)	0.948	0.000			0.000	0.000		0.363	0.000	0.000		0.409
Available Capacity (c_a), veh/h	568	596			396	116		1187	1006	806		1006
Back of Queue (*Q*), veh/ln (95 th percentile)	24.2	0.0			0.0	0.0		9.4	0.0	0.0		9.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.00		0.00
Uniform Delay (d_1), s/veh	45.9	0.0			0.0	0.0		10.8	0.0	0.0		11.2
Incremental Delay (d_2), s/veh	22.8	0.0			0.0	0.0		0.9	0.0	0.0		1.2
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	68.7	0.0			0.0	0.0		11.6	0.0	0.0		12.4
Level of Service (LOS)	E							B				B
Approach Delay, s/veh / LOS	68.7	E		0.0			11.6	B		12.4		B
Intersection Delay, s/veh / LOS	32.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.3	B	2.4	B	2.7	B
Bicycle LOS Score / LOS	1.3	A	0.5	A	1.2	A		F

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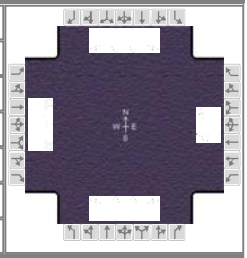
No Build
With VA

HCS 2010 Signalized Intersection Results Summary

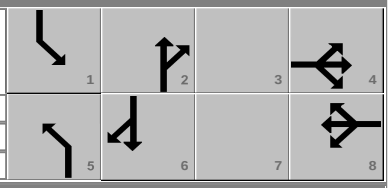
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	RUDY LANE	File Name	2025 AM_SPUI_RUDY.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	157	10	50	30	60	137	50	766	15	82	1444	182

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	3.1	72.6	15.0	13.9	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		20.0		18.9	10.3	77.6	13.5	80.7
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		14.7		13.5	6.1		8.6	
Green Extension Time (g_e), s		0.4		0.4	0.1	0.0	0.1	0.0
Phase Call Probability		1.00		1.00	0.87		0.96	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	174	11	50		100	141	56	851	11	91	1604	191
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1814	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	12.7	0.7	3.8		6.8	11.5	4.1	18.4	0.4	6.6	45.7	7.6
Cycle Queue Clearance Time (g_c), s	12.7	0.7	3.8		6.8	11.5	4.1	18.4	0.4	6.6	45.7	7.6
Green Ratio (*g/C*)	0.12	0.12	0.12		0.11	0.11	0.04	0.56	0.56	0.07	0.58	0.58
Capacity (*c*), veh/h	203	213	181		194	168	72	1961	873	114	2045	910
Volume-to-Capacity Ratio (*X*)	0.859	0.052	0.277		0.514	0.842	0.773	0.434	0.013	0.797	0.784	0.210
Back of Queue (*Q*), ft/ln (95 th percentile)	246.8	14.7	68.2		141.9	209.5	88	295.4	6.7	140.7	635.4	121.6
Back of Queue (*Q*), veh/ln (95 th percentile)	9.6	0.6	2.7		5.5	8.2	3.4	11.5	0.3	5.5	24.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	1.90	0.00	0.52		0.00	0.00	0.52	0.00	0.09	0.67	0.00	0.76
Uniform Delay (d_1), s/veh	56.4	51.1	52.5		54.8	57.0	61.7	16.7	12.8	59.9	20.9	12.9
Incremental Delay (d_2), s/veh	4.1	0.0	0.3		0.8	4.3	6.4	0.7	0.0	4.7	3.1	0.5
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	60.5	51.2	52.8		55.6	61.3	68.2	17.4	12.8	64.7	24.0	13.4
Level of Service (LOS)	E	D	D		E	E	E	B	B	E	C	B
Approach Delay, s/veh / LOS	58.4	E		58.9	E		20.5	C		24.9	C	
Intersection Delay, s/veh / LOS	28.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.9	A	0.9	A	1.2	A	2.0	B

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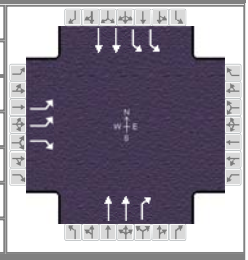
HCS 2010 Signalized Intersection Results Summary

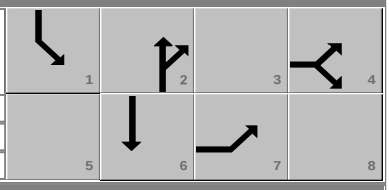
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 SOUTH RAMP	File Name	2025 AM_NO SPUI_ I-264 SOUTH RAMP.xus		
Project Description	2025 AM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	368		340					570	480	1298	1378	

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	50.0	40.0	25.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		30.0				45.0	55.0	100.0
Change Period, ($Y+R_c$), s		5.0				5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1				0.0	6.0	0.0
Queue Clearance Time (g_s), s		27.0					52.0	
Green Extension Time (g_e), s		0.0				0.0	0.0	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		1.00					1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	409		378					633	333	1442	1531	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1563					1756	1563	1706	1756	
Queue Service Time (g_s), s	14.3		25.0					19.8	24.4	50.0	27.0	
Cycle Queue Clearance Time (g_c), s	14.3		25.0					19.8	24.4	50.0	27.0	
Green Ratio (*g/C*)	0.19		0.19					0.31	0.31	0.38	0.73	
Capacity (*c*), veh/h	656		301					1081	481	1312	2567	
Volume-to-Capacity Ratio (*X*)	0.623		1.257					0.586	0.693	1.099	0.597	
Back of Queue (*Q*), ft/ln (95 th percentile)	258.7		821					343.9	393.6	1072.2	346.7	
Back of Queue (*Q*), veh/ln (95 th percentile)	10.1		32.1					13.4	15.4	41.9	13.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	48.2		52.5					38.0	39.6	40.0	8.4	
Incremental Delay (d_2), s/veh	1.4		139.7					2.3	8.0	56.6	1.0	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	49.6		192.2					40.3	47.6	96.6	9.4	
Level of Service (LOS)	D		F					D	D	F	A	
Approach Delay, s/veh / LOS	118.1		F	0.0			42.8		D	51.7		D
Intersection Delay, s/veh / LOS	60.9						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	3.0	C	2.4	B	1.9	A
Bicycle LOS Score / LOS		F			1.3	A	2.9	C

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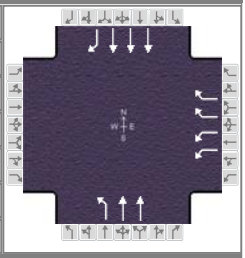
HCS 2010 Signalized Intersection Results Summary

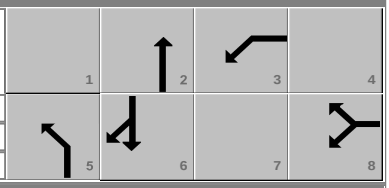
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 NORTH RAMP	File Name	2025 AM_NO SPUI_I-264 NORTH RAMP.xus		
Project Description	NO BUILD - AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				440		500	130	788			2256	732

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.7	74.2	28.1	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	2.0	4.0		7.3
Phase Duration, s				33.1	17.7	96.9		79.2
Change Period, ($Y+R_c$), s				5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s				3.1	3.0	0.0		0.0
Queue Clearance Time (g_s), s				27.6	12.5			
Green Extension Time (g_e), s				0.6	0.2	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				1.00	0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	16
Adjusted Flow Rate (*v*), veh/h				489		556	144	876			2507	813
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1706		1383	1757	1756			1675	1563
Queue Service Time (g_s), s				17.0		25.6	10.5	12.7			55.5	60.5
Cycle Queue Clearance Time (g_c), s				17.0		25.6	10.5	12.7			55.5	60.5
Green Ratio (*g/C*)				0.22		0.22	0.10	0.71			0.57	0.57
Capacity (*c*), veh/h				739		599	171	2482			2868	892
Volume-to-Capacity Ratio (*X*)				0.662		0.927	0.845	0.353			0.874	0.911
Back of Queue (*Q*), ft/ln (95 th percentile)				297.9		396	213.9	194.8			729.1	818.7
Back of Queue (*Q*), veh/ln (95 th percentile)				11.6		15.5	8.4	7.6			28.5	32.0
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh				46.6		49.9	57.7	7.5			23.9	25.0
Incremental Delay (d_2), s/veh				1.6		19.6	4.3	0.4			4.1	15.1
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh				48.2		69.5	62.0	7.8			28.0	40.0
Level of Service (LOS)				D		E	E	A			C	D
Approach Delay, s/veh / LOS	0.0			59.5		E	15.5		B	30.9		C
Intersection Delay, s/veh / LOS	33.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	1.3	A	2.3	B

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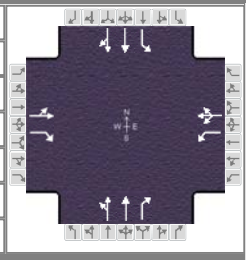
HCS 2010 Signalized Intersection Results Summary

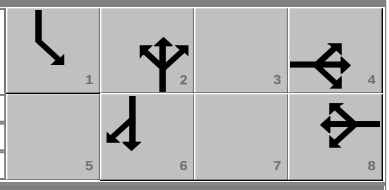
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	NORTHFIELD DRIVE	File Name	2025 AM_NO SPUI_NORTHFIELD.xus		
Project Description	NO BUILD - AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	26	150	688	11	23	25	670	598	25	2120	10

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	60.0	5.0	40.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		10.0		45.0		65.0	10.0	75.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		6.6		42.0			4.0	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.97		1.00			1.00	
Max Out Probability		1.00		1.00			1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		40	56	764	38		40	732	303	28	1183	1183
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1819	1563	1757	1644		29	1679	1563	1757	1845	1842
Queue Service Time (g_s), s		2.8	4.6	40.0	2.1		0.0	54.1	16.9	2.0	70.0	70.0
Cycle Queue Clearance Time (g_c), s		2.8	4.6	40.0	2.1		60.0	54.1	16.9	2.0	70.0	70.0
Green Ratio (*g/C*)		0.04	0.04	0.31	0.31		0.46	0.46	0.46	0.04	0.54	0.54
Capacity (*c*), veh/h		70	60	541	506		60	775	722	68	993	992
Volume-to-Capacity Ratio (*X*)		0.572	0.924	1.414	0.075		0.670	0.945	0.420	0.411	1.191	1.193
Back of Queue (*Q*), ft/ln (95 th percentile)		65	150.2	1778.1	38.4		96	855.8	267.5	41.8	1956.5	1964.2
Back of Queue (*Q*), veh/ln (95 th percentile)		2.5	5.9	69.5	1.5		3.7	33.4	10.5	1.6	76.4	76.7
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		61.4	62.3	45.0	31.9		45.4	33.4	23.4	61.1	30.0	30.0
Incremental Delay (d_2), s/veh		7.0	87.8	197.1	0.0		46.3	21.4	1.8	1.5	96.2	97.0
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		68.5	150.1	242.1	31.9		91.7	54.8	25.2	62.5	126.2	127.0
Level of Service (LOS)		E	F	F	C		F	D	C	E	F	F
Approach Delay, s/veh / LOS	115.9	F		232.2	F		47.8	D		125.9	F	
Intersection Delay, s/veh / LOS	126.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.3	C	2.9	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.6	A	1.8	A	1.4	A	2.5	B

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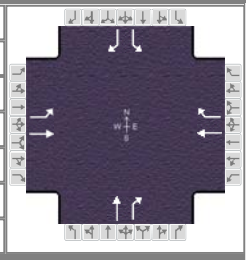
HCS 2010 Signalized Intersection Results Summary

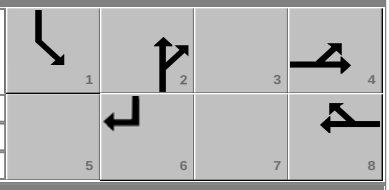
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 AM_NO SPUI_BROWNSBORO.xus		
Project Description	2025 AM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	340	244			122	39		380	225	173		700

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	16.3	51.7	30.4	11.7	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		10.0		11.0		7.3	2.0	3.0
Phase Duration, s		35.4		16.7		56.7	21.3	77.9
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		29.3		11.4			16.0	
Green Extension Time (g_e), s		1.1		0.3		0.0	0.3	0.0
Phase Call Probability		1.00		1.00			1.00	
Max Out Probability		0.00		0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	378	271			136	43		422	250	192		778
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	27.3	17.2			9.4	3.4		23.3	14.9	14.0		56.5
Cycle Queue Clearance Time (g_c), s	27.3	17.2			9.4	3.4		23.3	14.9	14.0		56.5
Green Ratio (*g/C*)	0.23	0.23			0.09	0.09		0.40	0.40	0.13		0.56
Capacity (*c*), veh/h	411	432			165	140		733	621	220		877
Volume-to-Capacity Ratio (*X*)	0.919	0.628			0.819	0.309		0.576	0.402	0.874		0.887
Back of Queue (*Q*), ft/ln (95 th percentile)	452.7	314.2			202.8	61		409.2	247.9	267.1		764.4
Back of Queue (*Q*), veh/ln (95 th percentile)	17.7	12.3			7.9	2.4		16.0	9.7	10.4		29.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.00		0.00
Uniform Delay (d_1), s/veh	48.6	44.7			58.1	55.4		30.6	28.1	55.8		24.9
Incremental Delay (d_2), s/veh	3.6	0.6			3.8	0.5		3.3	1.9	4.2		12.8
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	52.2	45.3			61.9	55.9		33.9	30.0	60.1		37.8
Level of Service (LOS)	D	D			E	E		C	C	E		D
Approach Delay, s/veh / LOS	49.3	D		60.5	E		32.5	C		42.2	D	
Intersection Delay, s/veh / LOS	42.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.6	A	0.8	A	1.6	A		F

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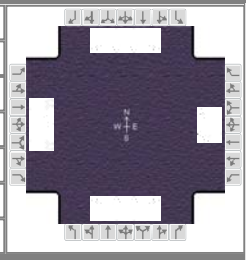
HCS 2010 Signalized Intersection Results Summary

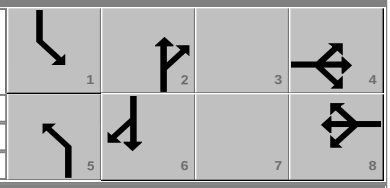
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	RUDY LANE	File Name	2025 PM_SPUI_RUDY.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	251	25	75	55	80	252	75	770	75	181	862	281

Signal Information			
Cycle, s	130.0	Reference Phase	6
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	16.9	3.8	42.0	22.7	24.6	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		27.7		29.6	25.7	50.8	21.9	47.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.2	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		22.2		23.9	7.4		16.6	
Green Extension Time (g_e), s		0.5		0.7	0.1	0.0	0.3	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.03		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	279	28	78		150	269	83	856	78	201	958	301
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1808	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	20.2	1.6	5.6		9.5	21.9	5.4	27.1	4.4	14.6	33.0	21.0
Cycle Queue Clearance Time (g_c), s	20.2	1.6	5.6		9.5	21.9	5.4	27.1	4.4	14.6	33.0	21.0
Green Ratio (*g/C*)	0.17	0.17	0.17		0.19	0.19	0.16	0.35	0.35	0.13	0.32	0.32
Capacity (*c*), veh/h	307	322	273		342	296	279	1237	550	228	1135	505
Volume-to-Capacity Ratio (*X*)	0.908	0.086	0.285		0.438	0.909	0.298	0.692	0.141	0.881	0.844	0.596
Back of Queue (*Q*), ft/ln (95 th percentile)	394.7	34.2	99.6		194.8	368.1	117.9	445.6	78.6	276.9	544.9	340.2
Back of Queue (*Q*), veh/ln (95 th percentile)	15.4	1.3	3.9		7.6	14.4	4.6	17.4	3.1	10.8	21.3	13.3
Queue Storage Ratio (*RQ*) (95 th percentile)	3.04	0.00	0.77		0.00	0.00	0.69	0.00	1.05	1.32	0.00	2.13
Uniform Delay (d_1), s/veh	52.6	44.9	46.6		46.6	51.6	48.3	36.1	28.7	55.6	40.9	36.9
Incremental Delay (d_2), s/veh	17.4	0.0	0.2		0.3	12.3	2.7	3.2	0.5	4.3	7.7	5.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	70.0	45.0	46.8		46.9	63.9	51.0	39.3	29.2	59.9	48.7	42.0
Level of Service (LOS)	E	D	D		D	E	D	D	C	E	D	D
Approach Delay, s/veh / LOS	63.5	E		57.8	E		39.5	D		48.8	D	
Intersection Delay, s/veh / LOS	48.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.5	B
Bicycle LOS Score / LOS	1.1	A	1.2	A	1.3	A	1.7	A

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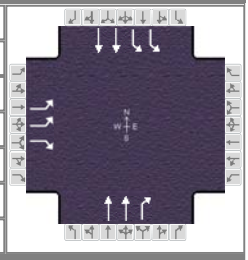
HCS 2010 Signalized Intersection Results Summary

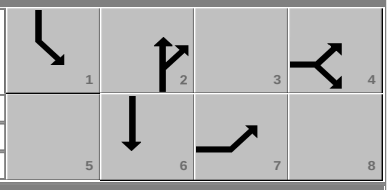
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period		PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 SOUTH RAMP	File Name	2025 PM_NO SPUI_ I-264 SOUTH RAMP.xus		
Project Description	2025 PM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	711		240					933	320	1020	1054	

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	42.5	40.0	32.5	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		37.5				45.0	47.5	92.5
Change Period, ($Y+R_c$), s		5.0				5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1				0.0	3.0	0.0
Queue Clearance Time (g_s), s		31.4					44.5	
Green Extension Time (g_e), s		1.2				0.0	0.0	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.82					1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	790		267					1037	222	1133	1171	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1563					1756	1563	1706	1756	
Queue Service Time (g_s), s	29.4		20.0					37.7	14.9	42.5	21.3	
Cycle Queue Clearance Time (g_c), s	29.4		20.0					37.7	14.9	42.5	21.3	
Green Ratio (*g/C*)	0.25		0.25					0.31	0.31	0.33	0.67	
Capacity (*c*), veh/h	854		391					1081	481	1114	2363	
Volume-to-Capacity Ratio (*X*)	0.925		0.682					0.959	0.462	1.017	0.496	
Back of Queue (*Q*), ft/ln (95 th percentile)	506.5		320.1					658.5	255.3	769	307.5	
Back of Queue (*Q*), veh/ln (95 th percentile)	19.8		12.5					25.7	10.0	30.0	12.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	47.5		44.1					44.2	36.3	43.8	10.4	
Incremental Delay (d_2), s/veh	13.8		3.1					19.2	3.2	31.3	0.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	61.3		47.2					63.4	39.5	75.0	11.2	
Level of Service (LOS)	E		D					E	D	F	B	
Approach Delay, s/veh / LOS	57.7		E	0.0			59.2		E	42.6		D
Intersection Delay, s/veh / LOS	50.6						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.4	B	1.9	A
Bicycle LOS Score / LOS		F			1.5	A	2.4	B

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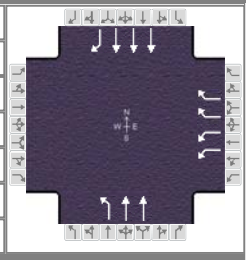
HCS 2010 Signalized Intersection Results Summary

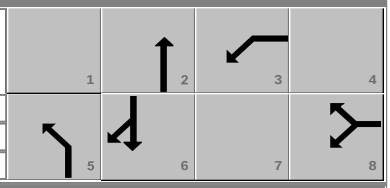
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 NORTH RAMP	File Name	2025 PM_NO SPUI_I-264 NORTH RAMP.xus		
Project Description	2025 PM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				350		700	125	1519			1719	362

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.2	62.9	39.9	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	2.0	4.0		7.3
Phase Duration, s				44.9	17.2	85.1		67.9
Change Period, ($Y+R_c$), s				5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s				3.2	3.0	0.0		0.0
Queue Clearance Time (g_s), s				37.2	12.1			
Green Extension Time (g_e), s				2.7	0.2	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				0.10	0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	16
Adjusted Flow Rate (*v*), veh/h				389		778	139	1688			1910	402
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1706		1383	1757	1756			1675	1563
Queue Service Time (g_s), s				11.6		35.2	10.1	46.2			41.2	23.3
Cycle Queue Clearance Time (g_c), s				11.6		35.2	10.1	46.2			41.2	23.3
Green Ratio (*g/C*)				0.31		0.31	0.09	0.62			0.48	0.48
Capacity (*c*), veh/h				1047		849	165	2164			2431	756
Volume-to-Capacity Ratio (*X*)				0.371		0.916	0.840	0.780			0.786	0.532
Back of Queue (*Q*), ft/ln (95 th percentile)				212.1		478.4	207.7	625.9			580.8	347.8
Back of Queue (*Q*), veh/ln (95 th percentile)				8.3		18.7	8.1	24.4			22.7	13.6
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh				35.2		43.4	57.9	18.4			27.9	23.3
Incremental Delay (d_2), s/veh				0.1		10.2	4.3	2.9			2.6	2.7
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh				35.3		53.7	62.3	21.3			30.6	26.0
Level of Service (LOS)				D		D	E	C			C	C
Approach Delay, s/veh / LOS	0.0			47.6		D	24.4		C	29.8		C
Intersection Delay, s/veh / LOS	31.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	2.0	A	1.8	A

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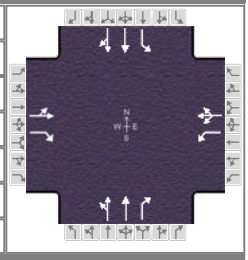
HCS 2010 Signalized Intersection Results Summary

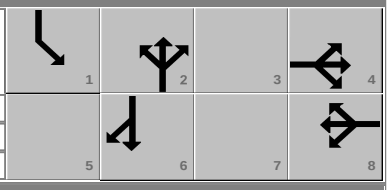
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	NORTHFIELD DRIVE	File Name	2025 PM_NO SPUI_NORTHFIELD.xus		
Project Description	NO BUILD - PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	26	25	886	21	45	10	1720	474	15	1170	20

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	58.0	5.0	42.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		10.0		47.0		63.0	10.0	73.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		5.6		44.0			3.2	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.89		1.00			1.00	
Max Out Probability		1.00		1.00			1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		51	11	984	73		1007	916	249	17	663	659
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1805	1563	1757	1643		1817	1679	1563	1757	1845	1834
Queue Service Time (g_s), s		3.6	0.9	42.0	4.1		23.3	58.0	13.6	1.2	34.8	34.8
Cycle Queue Clearance Time (g_c), s		3.6	0.9	42.0	4.1		58.0	58.0	13.6	1.2	34.8	34.8
Green Ratio (*g/C*)		0.04	0.04	0.32	0.32		0.45	0.45	0.45	0.04	0.52	0.52
Capacity (*c*), veh/h		69	60	568	531		839	749	697	68	965	959
Volume-to-Capacity Ratio (*X*)		0.736	0.185	1.734	0.138		1.200	1.223	0.357	0.247	0.687	0.687
Back of Queue (*Q*), ft/ln (95 th percentile)		101.9	16.5	2813.1	74.1		1769.3	1665.8	227.1	24.7	551.9	550.8
Back of Queue (*Q*), veh/ln (95 th percentile)		4.0	0.6	109.9	2.9		69.1	65.1	8.9	1.0	21.6	21.5
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		61.8	60.5	44.0	31.2		36.7	36.0	23.7	60.7	23.1	23.1
Incremental Delay (d_2), s/veh		29.7	0.5	337.8	0.0		101.5	112.0	1.4	0.7	4.0	4.0
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		91.6	61.1	381.8	31.2		138.2	148.0	25.1	61.4	27.1	27.1
Level of Service (LOS)		F	E	F	C		F	F	C	E	C	C
Approach Delay, s/veh / LOS	86.1	F		357.5	F		129.4	F		27.5	C	
Intersection Delay, s/veh / LOS	151.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	2.2	B	2.3	B	1.6	A

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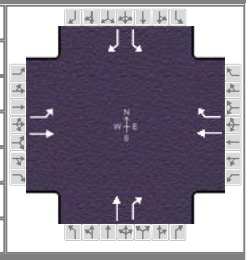
HCS 2010 Signalized Intersection Results Summary

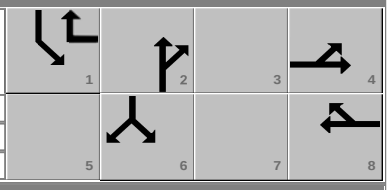
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 PM_NO SPUI_BROWNSBORO.xus		
Project Description	2025 PM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	430	65			497	128		460	55	36		475

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.8	51.2	25.0	30.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		10.0		11.0		7.3	1.0	3.0
Phase Duration, s		30.0		35.0		56.2	8.8	65.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		27.0		32.0			3.7	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		1.00		1.00			0.76	
Max Out Probability		1.00		1.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	478	72			552	142		511	61	40		250
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	25.0	4.3			30.0	9.6		30.2	3.2	1.7		13.3
Cycle Queue Clearance Time (g_c), s	25.0	4.3			30.0	9.6		30.2	3.2	1.7		13.3
Green Ratio (*g/C*)	0.19	0.19			0.23	0.26		0.39	0.39	0.44		0.46
Capacity (*c*), veh/h	338	355			426	407		726	615	248		722
Volume-to-Capacity Ratio (*X*)	1.414	0.204			1.297	0.350		0.704	0.099	0.161		0.346
Back of Queue (*Q*), ft/ln (95 th percentile)	1159.4	89			1180.8	167.9		519.1	56.3	31.8		221.4
Back of Queue (*Q*), veh/ln (95 th percentile)	45.3	3.5			46.1	6.6		20.3	2.2	1.2		8.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.11		0.00
Uniform Delay (d_1), s/veh	52.5	44.1			50.0	39.1		33.1	24.9	25.2		22.4
Incremental Delay (d_2), s/veh	203.1	0.1			150.2	0.2		5.7	0.3	0.1		1.3
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	255.6	44.2			200.2	39.3		38.7	25.2	25.3		23.8
Level of Service (LOS)	F	D			F	D		D	C	C		C
Approach Delay, s/veh / LOS	227.8	F		167.2	F		37.3	D		24.0	C	
Intersection Delay, s/veh / LOS	128.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.7	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.4	A	1.6	A	1.4	A		F

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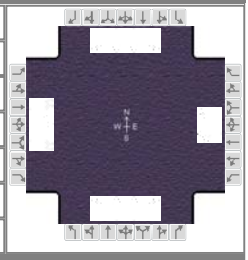
No Build
With Mixed Use

HCS 2010 Signalized Intersection Results Summary

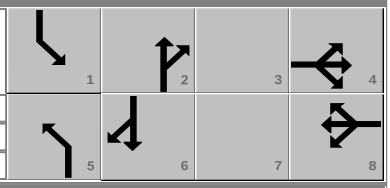
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	RUDY LANE	File Name	2025 AM_SPUI_RUDY.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	153	10	50	30	60	133	50	715	15	83	1456	183

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	3.2	73.2	14.7	13.6	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		19.7		18.6	10.3	78.2	13.5	81.4
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		14.4		13.2	6.1		8.7	
Green Extension Time (g_e), s		0.4		0.4	0.1	0.0	0.1	0.0
Phase Call Probability		1.00		1.00	0.87		0.96	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	170	11	50		100	137	56	794	11	92	1618	192
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1814	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	12.4	0.7	3.8		6.8	11.2	4.1	16.6	0.4	6.7	45.8	7.5
Cycle Queue Clearance Time (g_c), s	12.4	0.7	3.8		6.8	11.2	4.1	16.6	0.4	6.7	45.8	7.5
Green Ratio (*g/C*)	0.11	0.11	0.11		0.10	0.10	0.04	0.56	0.56	0.07	0.59	0.59
Capacity (*c*), veh/h	199	209	177		189	163	72	1977	880	116	2064	919
Volume-to-Capacity Ratio (*X*)	0.855	0.053	0.283		0.528	0.838	0.773	0.402	0.013	0.798	0.784	0.209
Back of Queue (*Q*), ft/ln (95 th percentile)	241.8	14.8	68.4		142.5	204.5	88	271.2	6.6	142.2	634.8	120.5
Back of Queue (*Q*), veh/ln (95 th percentile)	9.4	0.6	2.7		5.6	8.0	3.4	10.6	0.3	5.6	24.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	1.86	0.00	0.53		0.00	0.00	0.52	0.00	0.09	0.68	0.00	0.75
Uniform Delay (d_1), s/veh	56.6	51.4	52.8		55.2	57.1	61.7	16.0	12.5	59.9	20.5	12.6
Incremental Delay (d_2), s/veh	4.0	0.0	0.3		0.9	4.3	6.4	0.6	0.0	4.7	3.1	0.5
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	60.7	51.5	53.1		56.0	61.5	68.2	16.7	12.5	64.6	23.5	13.1
Level of Service (LOS)	E	D	D		E	E	E	B	B	E	C	B
Approach Delay, s/veh / LOS	58.6	E		59.2	E		19.9	B		24.5	C	
Intersection Delay, s/veh / LOS	28.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.9	A	0.9	A	1.2	A	2.1	B

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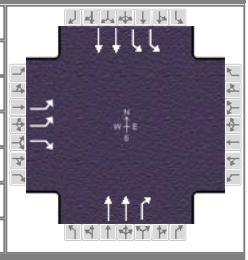
HCS 2010 Signalized Intersection Results Summary

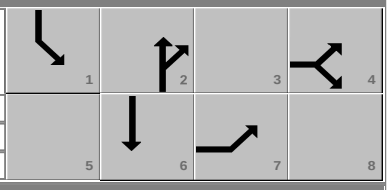
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 SOUTH RAMP	File Name	2025 AM_NO SPUI_ I-264 SOUTH RAMP.xus		
Project Description	2025 AM NO SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	301		340					511	480	1324	1392	

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	50.0	40.0	25.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		30.0				45.0	55.0	100.0
Change Period, ($Y+R_c$), s		5.0				5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2				0.0	6.0	0.0
Queue Clearance Time (g_s), s		27.0					52.0	
Green Extension Time (g_e), s		0.0				0.0	0.0	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		1.00					1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	334		378					568	333	1471	1547	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1563					1756	1563	1706	1756	
Queue Service Time (g_s), s	11.4		25.0					17.4	24.4	50.0	27.5	
Cycle Queue Clearance Time (g_c), s	11.4		25.0					17.4	24.4	50.0	27.5	
Green Ratio (*g/C*)	0.19		0.19					0.31	0.31	0.38	0.73	
Capacity (*c*), veh/h	656		301					1081	481	1312	2567	
Volume-to-Capacity Ratio (*X*)	0.510		1.257					0.525	0.693	1.121	0.603	
Back of Queue (*Q*), ft/ln (95 th percentile)	213.7		821					308	393.6	1135.6	351.9	
Back of Queue (*Q*), veh/ln (95 th percentile)	8.3		32.1					12.0	15.4	44.4	13.7	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	47.0		52.5					37.2	39.6	40.0	8.4	
Incremental Delay (d_2), s/veh	0.3		139.7					1.8	8.0	65.1	1.1	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	47.3		192.2					39.0	47.6	105.1	9.5	
Level of Service (LOS)	D		F					D	D	F	A	
Approach Delay, s/veh / LOS	124.2		F	0.0			42.2		D	56.1		E
Intersection Delay, s/veh / LOS	63.9						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	3.0	C	2.4	B	1.9	A
Bicycle LOS Score / LOS		F			1.2	A	3.0	C

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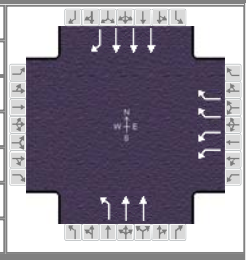
HCS 2010 Signalized Intersection Results Summary

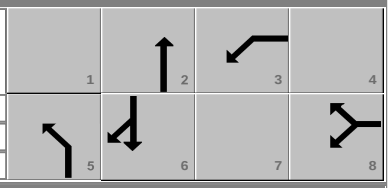
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 NORTH RAMP	File Name	2025 AM_NO SPUI_I-264 NORTH RAMP.xus		
Project Description	2025 AM NO SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				440		500	130	662			2296	750

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.7	74.2	28.1	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	2.0	4.0		7.3
Phase Duration, s				33.1	17.7	96.9		79.2
Change Period, ($Y+R_c$), s				5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s				3.1	3.0	0.0		0.0
Queue Clearance Time (g_s), s				27.6	12.5			
Green Extension Time (g_e), s				0.6	0.2	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				1.00	0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	16
Adjusted Flow Rate (*v*), veh/h				489		556	144	736			2551	833
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1706		1383	1757	1756			1675	1563
Queue Service Time (g_s), s				17.0		25.6	10.5	10.1			57.5	63.7
Cycle Queue Clearance Time (g_c), s				17.0		25.6	10.5	10.1			57.5	63.7
Green Ratio (*g/C*)				0.22		0.22	0.10	0.71			0.57	0.57
Capacity (*c*), veh/h				739		599	171	2482			2868	892
Volume-to-Capacity Ratio (*X*)				0.662		0.927	0.845	0.296			0.889	0.934
Back of Queue (*Q*), ft/ln (95 th percentile)				297.9		396	213.9	156			754.8	871.2
Back of Queue (*Q*), veh/ln (95 th percentile)				11.6		15.5	8.4	6.1			29.5	34.0
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh				46.6		49.9	57.7	7.1			24.3	25.6
Incremental Delay (d_2), s/veh				1.6		19.6	4.3	0.3			4.6	17.8
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh				48.2		69.5	62.0	7.4			28.9	43.5
Level of Service (LOS)				D		E	E	A			C	D
Approach Delay, s/veh / LOS	0.0			59.5		E	16.4		B	32.5		C
Intersection Delay, s/veh / LOS	35.2						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	1.2	A	2.3	B

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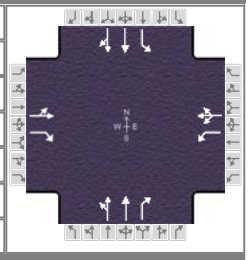
HCS 2010 Signalized Intersection Results Summary

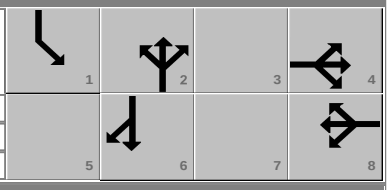
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	NORTHFIELD DRIVE	File Name	2025 AM_NO SPUI_NORTHFIELD_WDEV.xus		
Project Description	NO BUILD - AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	23	150	746	12	30	25	670	472	25	2120	10

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	60.0	5.0	40.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		10.0		45.0		65.0	10.0	75.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		6.6		42.0			4.0	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.96		1.00			1.00	
Max Out Probability		1.00		1.00			1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		37	56	829	47		41	731	247	28	1183	1183
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1817	1563	1757	1635		31	1679	1563	1757	1845	1842
Queue Service Time (g_s), s		2.6	4.6	40.0	2.6		0.0	54.0	13.1	2.0	70.0	70.0
Cycle Queue Clearance Time (g_c), s		2.6	4.6	40.0	2.6		60.0	54.0	13.1	2.0	70.0	70.0
Green Ratio (*g/C*)		0.04	0.04	0.31	0.31		0.46	0.46	0.46	0.04	0.54	0.54
Capacity (*c*), veh/h		70	60	541	503		60	775	722	68	993	992
Volume-to-Capacity Ratio (*X*)		0.525	0.924	1.533	0.093		0.687	0.943	0.342	0.411	1.191	1.193
Back of Queue (*Q*), ft/ln (95 th percentile)		56.8	150.2	2112.2	47.6		99.7	851.9	218.5	41.8	1956.5	1964.2
Back of Queue (*Q*), veh/ln (95 th percentile)		2.2	5.9	82.5	1.9		3.9	33.3	8.5	1.6	76.4	76.7
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		61.3	62.3	45.0	32.1		44.7	33.4	22.4	61.1	30.0	30.0
Incremental Delay (d_2), s/veh		3.5	87.8	249.2	0.0		48.6	21.1	1.3	1.5	96.2	97.0
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		64.8	150.1	294.2	32.1		93.3	54.5	23.7	62.5	126.2	127.0
Level of Service (LOS)		E	F	F	C		F	D	C	E	F	F
Approach Delay, s/veh / LOS	116.2	F		280.3	F		48.6	D		125.9	F	
Intersection Delay, s/veh / LOS	138.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	2.9	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.6	A	1.9	A	1.3	A	2.5	B

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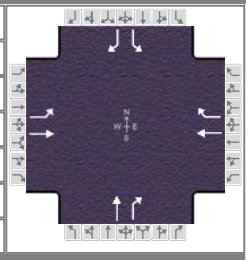
HCS 2010 Signalized Intersection Results Summary

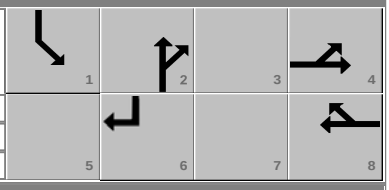
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 AM_NO SPUI_BROWNSBORO.xus		
Project Description	2025 AM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	340	115			188	59		380	106	81		700

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.4	54.5	30.2	16.9	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		10.0		11.0		7.3	2.0	3.0
Phase Duration, s		35.2		21.9		59.5	13.4	72.9
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		29.3		16.4			8.6	
Green Extension Time (g_e), s		0.9		0.5		0.0	0.1	0.0
Phase Call Probability		1.00		1.00			0.96	
Max Out Probability		0.00		0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	378	128			209	66		422	118	90		778
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	27.3	7.4			14.4	5.0		22.4	6.2	6.6		61.5
Cycle Queue Clearance Time (g_c), s	27.3	7.4			14.4	5.0		22.4	6.2	6.6		61.5
Green Ratio (*g/C*)	0.23	0.23			0.13	0.13		0.42	0.42	0.06		0.52
Capacity (*c*), veh/h	408	429			240	203		774	656	113		816
Volume-to-Capacity Ratio (*X*)	0.925	0.298			0.871	0.323		0.546	0.180	0.795		0.953
Back of Queue (*Q*), ft/ln (95 th percentile)	454.6	153.5			284.1	88.7		392.9	107.3	138.9		885.1
Back of Queue (*Q*), veh/ln (95 th percentile)	17.8	6.0			11.1	3.5		15.3	4.2	5.4		34.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.00		0.00
Uniform Delay (d_1), s/veh	48.8	41.1			55.5	51.4		28.4	23.7	60.0		29.5
Incremental Delay (d_2), s/veh	3.9	0.1			3.8	0.3		2.8	0.6	4.7		21.9
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	52.7	41.3			59.3	51.7		31.2	24.3	64.7		51.4
Level of Service (LOS)	D	D			E	D		C	C	E		D
Approach Delay, s/veh / LOS	49.8	D		57.5	E		29.7	C		52.8	D	
Intersection Delay, s/veh / LOS	47.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.3	A	0.9	A	1.4	A		F

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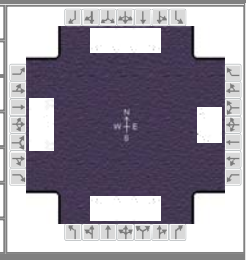
HCS 2010 Signalized Intersection Results Summary

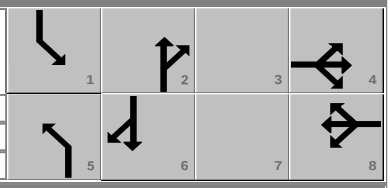
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	RUDY LANE	File Name	2025 PM_SPUI_RUDY.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	254	25	75	55	80	254	75	806	75	180	840	280

Signal Information			
Cycle, s	130.0	Reference Phase	6
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	16.8	3.4	42.0	23.0	24.8	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		28.0		29.8	25.3	50.4	21.8	47.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.2	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		22.5		24.1	7.5		16.5	
Green Extension Time (g_e), s		0.5		0.7	0.1	0.0	0.3	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.04		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	282	28	78		150	271	83	896	78	200	933	300
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1808	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	20.5	1.6	5.6		9.5	22.1	5.5	28.9	4.4	14.5	31.8	20.9
Cycle Queue Clearance Time (g_c), s	20.5	1.6	5.6		9.5	22.1	5.5	28.9	4.4	14.5	31.8	20.9
Green Ratio (*g/C*)	0.18	0.18	0.18		0.19	0.19	0.16	0.35	0.35	0.13	0.32	0.32
Capacity (*c*), veh/h	310	326	276		345	298	274	1228	546	227	1135	505
Volume-to-Capacity Ratio (*X*)	0.910	0.085	0.282		0.435	0.910	0.305	0.729	0.142	0.880	0.822	0.594
Back of Queue (*Q*), ft/ln (95 th percentile)	399.6	34.2	99.4		194.7	372.1	118.6	472.6	78.9	275.3	525.7	338.7
Back of Queue (*Q*), veh/ln (95 th percentile)	15.6	1.3	3.9		7.6	14.5	4.6	18.5	3.1	10.8	20.5	13.2
Queue Storage Ratio (*RQ*) (95 th percentile)	3.07	0.00	0.76		0.00	0.00	0.70	0.00	1.05	1.31	0.00	2.12
Uniform Delay (d_1), s/veh	52.5	44.7	46.4		46.4	51.5	48.6	36.9	28.9	55.6	40.6	36.9
Incremental Delay (d_2), s/veh	17.9	0.0	0.2		0.3	12.9	2.9	3.8	0.5	4.3	6.8	5.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	70.4	44.8	46.6		46.8	64.4	51.5	40.7	29.5	59.9	47.3	41.9
Level of Service (LOS)	E	D	D		D	E	D	D	C	E	D	D
Approach Delay, s/veh / LOS	63.8	E		58.1	E		40.8	D		48.0	D	
Intersection Delay, s/veh / LOS	48.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.5	B
Bicycle LOS Score / LOS	1.1	A	1.2	A	1.4	A	1.7	A

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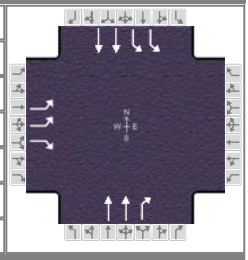
HCS 2010 Signalized Intersection Results Summary

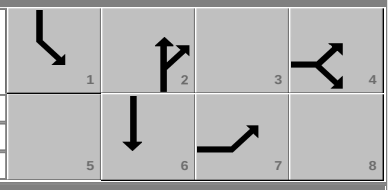
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period		PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 SOUTH RAMP	File Name	2025 PM_NO SPUI_ I-264 SOUTH RAMP.xus		
Project Description	2025 PM NO SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	782		240					974	320	955	1030	

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	40.3	40.0	34.7	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		9.0				7.3	2.0	4.0
Phase Duration, s		39.7				45.0	45.3	90.3
Change Period, ($Y+R_c$), s		5.0				5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1				0.0	3.0	0.0
Queue Clearance Time (g_s), s		34.5					42.3	
Green Extension Time (g_e), s		0.2				0.0	0.0	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		1.00					1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14					2	12	1	6	
Adjusted Flow Rate (*v*), veh/h	869		267					1082	222	1061	1144	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1563					1756	1563	1706	1756	
Queue Service Time (g_s), s	32.5		19.6					40.0	14.9	40.3	21.6	
Cycle Queue Clearance Time (g_c), s	32.5		19.6					40.0	14.9	40.3	21.6	
Green Ratio (*g/C*)	0.27		0.27					0.31	0.31	0.31	0.66	
Capacity (*c*), veh/h	912		418					1081	481	1056	2303	
Volume-to-Capacity Ratio (*X*)	0.953		0.638					1.001	0.462	1.004	0.497	
Back of Queue (*Q*), ft/ln (95 th percentile)	569.8		311.6					727.1	255.3	719.5	315.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	22.3		12.2					28.4	10.0	28.1	12.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00					0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	46.8		42.1					45.0	36.3	44.9	11.4	
Incremental Delay (d_2), s/veh	19.0		2.4					27.7	3.2	28.8	0.8	
Initial Queue Delay (d_3), s/veh	0.0		0.0					0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	65.8		44.5					72.7	39.5	73.7	12.2	
Level of Service (LOS)	E		D					F	D	F	B	
Approach Delay, s/veh / LOS	60.8	E		0.0			67.1	E		41.8	D	
Intersection Delay, s/veh / LOS	53.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.4	B	1.9	A
Bicycle LOS Score / LOS		F			1.6	A	2.3	B

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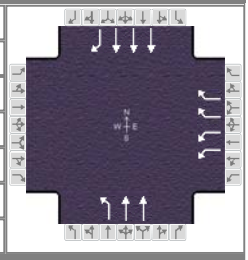
HCS 2010 Signalized Intersection Results Summary

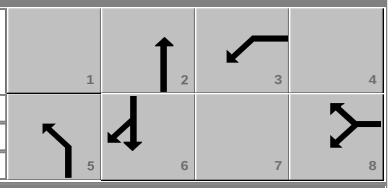
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	I-264 NORTH RAMP	File Name	2025 PM_NO SPUI_I-264 NORTH RAMP.xus		
Project Description	2025 PM NO SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				350		700	125	1631			1630	333

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.2	62.9	39.9	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8	5	2		6
Case Number				9.0	2.0	4.0		7.3
Phase Duration, s				44.9	17.2	85.1		67.9
Change Period, ($Y+R_c$), s				5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s				3.2	3.0	0.0		0.0
Queue Clearance Time (g_s), s				37.2	12.1			
Green Extension Time (g_e), s				2.7	0.2	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				0.10	0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18	5	2			6	16
Adjusted Flow Rate (*v*), veh/h				389		778	139	1812			1811	370
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1706		1383	1757	1756			1675	1563
Queue Service Time (g_s), s				11.6		35.2	10.1	53.2			37.8	20.8
Cycle Queue Clearance Time (g_c), s				11.6		35.2	10.1	53.2			37.8	20.8
Green Ratio (*g/C*)				0.31		0.31	0.09	0.62			0.48	0.48
Capacity (*c*), veh/h				1047		849	165	2164			2431	756
Volume-to-Capacity Ratio (*X*)				0.371		0.916	0.840	0.837			0.745	0.489
Back of Queue (*Q*), ft/ln (95 th percentile)				212.1		478.4	207.7	714.9			538.3	316.7
Back of Queue (*Q*), veh/ln (95 th percentile)				8.3		18.7	8.1	27.9			21.0	12.4
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh				35.2		43.4	57.9	19.8			27.1	22.7
Incremental Delay (d_2), s/veh				0.1		10.2	4.3	4.1			2.1	2.3
Initial Queue Delay (d_3), s/veh				0.0		0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh				35.3		53.7	62.3	23.8			29.2	25.0
Level of Service (LOS)				D		D	E	C			C	C
Approach Delay, s/veh / LOS	0.0			47.6		D	26.6		C	28.5		C
Intersection Delay, s/veh / LOS	32.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.0	C	2.1	B	1.9	A
Bicycle LOS Score / LOS				F	2.1	B	1.7	A

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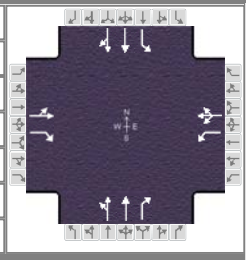
HCS 2010 Signalized Intersection Results Summary

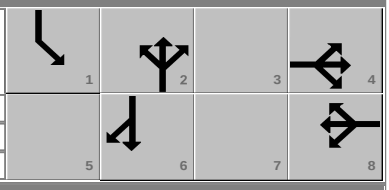
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	NORTHFIELD DRIVE	File Name	2025 PM_NO SPUI_NORTHFIELD_WDEV.xus		
Project Description	NO BUILD - PM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	29	25	768	20	35	10	1720	586	15	1170	20

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	58.0	5.0	42.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		10.0		47.0		63.0	10.0	73.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		5.9		44.0			3.2	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.91		1.00			1.00	
Max Out Probability		1.00		1.00			1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		54	11	853	61		1007	916	301	17	663	659
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1808	1563	1757	1655		1817	1679	1563	1757	1845	1834
Queue Service Time (g_s), s		3.9	0.9	42.0	3.4		23.3	58.0	17.2	1.2	34.8	34.8
Cycle Queue Clearance Time (g_c), s		3.9	0.9	42.0	3.4		58.0	58.0	17.2	1.2	34.8	34.8
Green Ratio (*g/C*)		0.04	0.04	0.32	0.32		0.45	0.45	0.45	0.04	0.52	0.52
Capacity (*c*), veh/h		70	60	568	535		839	749	697	68	965	959
Volume-to-Capacity Ratio (*X*)		0.783	0.185	1.503	0.114		1.200	1.223	0.432	0.247	0.687	0.687
Back of Queue (*Q*), ft/ln (95 th percentile)		116	16.5	2122.2	61.2		1769.3	1665.8	274	24.7	551.9	550.8
Back of Queue (*Q*), veh/ln (95 th percentile)		4.5	0.6	82.9	2.4		69.1	65.1	10.7	1.0	21.6	21.5
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		62.0	60.5	44.0	30.9		36.7	36.0	24.7	60.7	23.1	23.1
Incremental Delay (d_2), s/veh		39.9	0.5	235.7	0.0		101.5	112.0	1.9	0.7	4.0	4.0
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		101.8	61.1	279.7	31.0		138.2	148.0	26.6	61.4	27.1	27.1
Level of Service (LOS)		F	E	F	C		F	F	C	E	C	C
Approach Delay, s/veh / LOS	94.9	F		263.0	F		127.1	F		27.5	C	
Intersection Delay, s/veh / LOS	124.7						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.3	C	2.9	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	2.0	A	2.3	B	1.6	A

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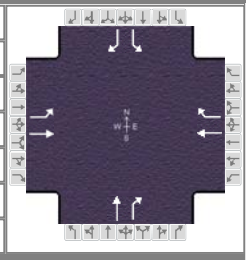
HCS 2010 Signalized Intersection Results Summary

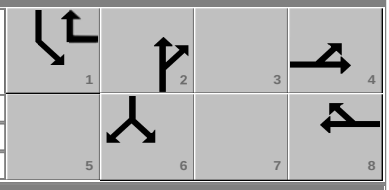
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 PM_NO SPUI_BROWNSBORO.xus		
Project Description	2025 PM NO BUILD				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	430	180			368	95		460	150	99		475

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.9	48.1	25.0	30.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		10.0		11.0		7.3	1.0	3.0
Phase Duration, s		30.0		35.0		53.1	11.9	65.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		27.0		30.5			6.9	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.2	0.0
Phase Call Probability		1.00		1.00			0.98	
Max Out Probability		1.00		1.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	478	200			409	106		511	167	110		250
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	25.0	12.8			28.5	6.7		31.4	9.8	4.9		13.3
Cycle Queue Clearance Time (g_c), s	25.0	12.8			28.5	6.7		31.4	9.8	4.9		13.3
Green Ratio (*g/C*)	0.19	0.19			0.23	0.28		0.37	0.37	0.44		0.46
Capacity (*c*), veh/h	338	355			426	444		682	578	261		722
Volume-to-Capacity Ratio (*X*)	1.414	0.564			0.961	0.238		0.749	0.288	0.421		0.346
Back of Queue (*Q*), ft/ln (95 th percentile)	1159.4	251.8			597.2	116.8		546.2	174.4	91.6		221.4
Back of Queue (*Q*), veh/ln (95 th percentile)	45.3	9.8			23.3	4.6		21.3	6.8	3.6		8.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.31		0.00
Uniform Delay (d_1), s/veh	52.5	47.6			49.4	35.7		35.7	28.9	26.8		22.4
Incremental Delay (d_2), s/veh	203.1	1.3			33.2	0.1		7.4	1.3	0.4		1.3
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	255.6	48.8			82.7	35.8		43.1	30.1	27.2		23.8
Level of Service (LOS)	F	D			F	D		D	C	C		C
Approach Delay, s/veh / LOS	194.6	F		73.0	E		39.9	D		24.8	C	
Intersection Delay, s/veh / LOS	92.1						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.7	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.6	A	1.3	A	1.6	A		F

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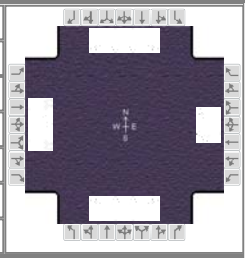
Build with VA

HCS 2010 Signalized Intersection Results Summary

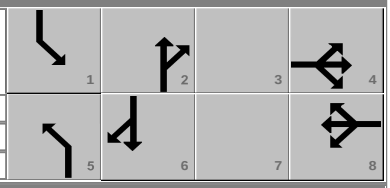
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	RUDY LANE	File Name	2025 AM_SPUI_RUDY.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	157	10	50	30	60	137	50	766	15	82	1444	182

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	3.1	72.6	15.0	13.9	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		20.0		18.9	10.3	77.6	13.5	80.7
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		14.7		13.5	6.1		8.6	
Green Extension Time (g_e), s		0.4		0.4	0.1	0.0	0.1	0.0
Phase Call Probability		1.00		1.00	0.87		0.96	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	174	11	50		100	141	56	851	11	91	1604	191
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1814	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	12.7	0.7	3.8		6.8	11.5	4.1	18.4	0.4	6.6	45.7	7.6
Cycle Queue Clearance Time (g_c), s	12.7	0.7	3.8		6.8	11.5	4.1	18.4	0.4	6.6	45.7	7.6
Green Ratio (*g/C*)	0.12	0.12	0.12		0.11	0.11	0.04	0.56	0.56	0.07	0.58	0.58
Capacity (*c*), veh/h	203	213	181		194	168	72	1961	873	114	2045	910
Volume-to-Capacity Ratio (*X*)	0.859	0.052	0.277		0.514	0.842	0.773	0.434	0.013	0.797	0.784	0.210
Back of Queue (*Q*), ft/ln (95 th percentile)	246.8	14.7	68.2		141.9	209.5	88	295.4	6.7	140.7	635.4	121.6
Back of Queue (*Q*), veh/ln (95 th percentile)	9.6	0.6	2.7		5.5	8.2	3.4	11.5	0.3	5.5	24.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	1.90	0.00	0.52		0.00	0.00	0.52	0.00	0.09	0.67	0.00	0.76
Uniform Delay (d_1), s/veh	56.4	51.1	52.5		54.8	57.0	61.7	16.7	12.8	59.9	20.9	12.9
Incremental Delay (d_2), s/veh	4.1	0.0	0.3		0.8	4.3	6.4	0.7	0.0	4.7	3.1	0.5
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	60.5	51.2	52.8		55.6	61.3	68.2	17.4	12.8	64.7	24.0	13.4
Level of Service (LOS)	E	D	D		E	E	E	B	B	E	C	B
Approach Delay, s/veh / LOS	58.4	E		58.9	E		20.5	C		24.9	C	
Intersection Delay, s/veh / LOS	28.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.9	A	0.9	A	1.2	A	2.0	B

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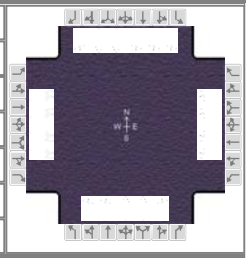
HCS 2010 Signalized Intersection Results Summary

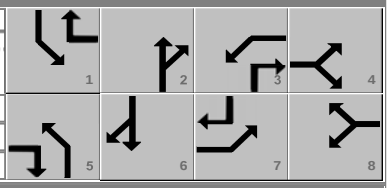
General Information				Intersection Information	
Agency	PALMER			Duration, h	0.25
Analyst	SDS	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2040	Analysis Period	1> 7:00
Intersection	I-264	File Name	2025 AM_SPUI.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	368		340	440		500	130	440	480	1298	958	732

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.5	33.3	50.9	8.0	1.0	23.3
Yellow	4.0	4.0	4.0	4.0	0.0	4.0
Red	1.0	1.0	1.0	1.0	0.0	1.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	13.0	28.3	14.0	29.3	13.5	55.9	51.8	94.1
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.3	3.0	3.3	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	10.0	20.7	11.0	21.8	8.3		42.5	
Green Extension Time (g_e), s	0.0	2.5	0.0	2.5	0.3	0.0	4.3	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	1.00	0.00	1.00	0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14	3		18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	409		378	489		556	144	489	89	1442	1064	247
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1383	1706		1383	1706	1756	1563	1706	1756	1563
Queue Service Time (g_s), s	8.0		18.7	9.0		19.8	6.3	16.0	5.4	40.5	26.5	9.9
Cycle Queue Clearance Time (g_c), s	8.0		18.7	9.0		19.8	6.3	16.0	5.4	40.5	26.5	9.9
Green Ratio (*g/C*)	0.21		0.21	0.22		0.47	0.06	0.34	0.40	0.31	0.59	0.65
Capacity (*c*), veh/h	694		588	736		1312	194	1191	624	1597	2087	1012
Volume-to-Capacity Ratio (*X*)	0.589		0.642	0.665		0.423	0.743	0.410	0.142	0.903	0.510	0.244
Back of Queue (*Q*), ft/ln (95 th percentile)	151.4		271.2	200.3		269.6	126.7	289.7	97	605.9	403.1	157.6
Back of Queue (*Q*), veh/ln (95 th percentile)	5.9		10.6	7.8		10.5	4.9	11.3	3.8	23.7	15.7	6.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.43		0.68	0.57		0.67	0.58	0.00	0.49	1.35	0.00	0.00
Uniform Delay (d_1), s/veh	54.2		53.9	54.5		25.9	69.6	38.1	28.7	49.4	17.7	11.1
Incremental Delay (d_2), s/veh	0.9		0.4	1.8		0.1	2.1	1.0	0.5	0.8	0.9	0.6
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	55.1		54.3	56.3		26.0	71.8	39.1	29.2	50.3	18.6	11.6
Level of Service (LOS)	E		D	E		C	E	D	C	D	B	B
Approach Delay, s/veh / LOS	54.7	D		40.2	D		44.4	D		34.6	C	
Intersection Delay, s/veh / LOS	40.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.7	D	3.9	D	3.3	C	2.9	C
Bicycle LOS Score / LOS		F		F	1.1	A	2.8	C

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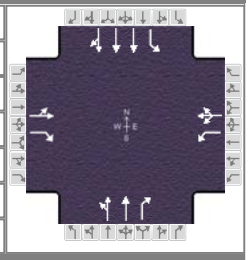
HCS 2010 Signalized Intersection Results Summary

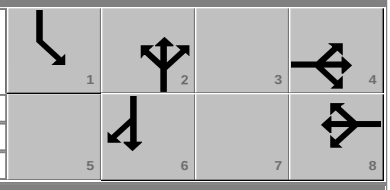
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	NORTHFIELD DRIVE	File Name	2025 AM_SPUI_NORTHFIELD.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	26	150	688	11	23	25	670	598	25	2120	10

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	53.0	5.0	47.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		10.0		52.0		58.0	10.0	68.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		6.6		49.0			4.0	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.97		1.00			1.00	
Max Out Probability		1.00		1.00			1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		40	56	764	38		215	557	303	28	1579	788
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1819	1563	1757	1644		637	1679	1563	1757	1845	1840
Queue Service Time (g_s), s		2.8	4.6	47.0	2.0		11.0	38.3	18.5	2.0	50.1	50.2
Cycle Queue Clearance Time (g_c), s		2.8	4.6	47.0	2.0		51.2	38.3	18.5	2.0	50.1	50.2
Green Ratio (*g/C*)		0.04	0.04	0.36	0.36		0.41	0.41	0.41	0.04	0.48	0.48
Capacity (*c*), veh/h		70	60	635	595		291	684	637	68	1788	892
Volume-to-Capacity Ratio (*X*)		0.572	0.924	1.204	0.064		0.739	0.814	0.476	0.411	0.883	0.884
Back of Queue (*Q*), ft/ln (95 th percentile)		65	150.2	1391.6	34.8		242.3	602.5	295.2	41.8	773.2	814.9
Back of Queue (*Q*), veh/ln (95 th percentile)		2.5	5.9	54.4	1.4		9.5	23.5	11.5	1.6	30.2	31.8
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	1.41	0.13	0.00	0.00
Uniform Delay (d_1), s/veh		61.4	62.3	41.5	27.1		29.8	34.1	28.3	61.1	30.2	30.2
Incremental Delay (d_2), s/veh		7.0	87.8	106.1	0.0		15.5	10.3	2.5	1.5	6.7	12.4
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		68.5	150.1	147.6	27.1		45.3	44.4	30.8	62.5	36.9	42.6
Level of Service (LOS)		E	F	F	C		D	D	C	E	D	D
Approach Delay, s/veh / LOS	115.9	F		141.9	F		40.7	D		39.1	D	
Intersection Delay, s/veh / LOS	60.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.6	D	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.6	A	1.8	A	1.4	A	1.8	A

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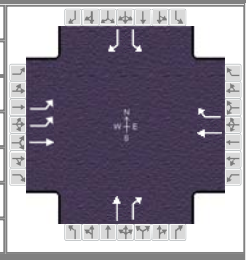
HCS 2010 Signalized Intersection Results Summary

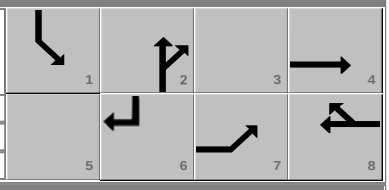
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 AM_SPUI_BROWNSBORO.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	340	244			122	39		380	225	173		700

Signal Information			
Cycle, s	71.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.8	23.6	10.6	7.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8		2	1	6
Case Number	2.0	4.0		7.3		7.3	2.0	3.0
Phase Duration, s	15.6	27.6		12.0		28.6	14.8	43.4
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.0		3.0		3.2	3.0	3.2
Queue Clearance Time (g_s), s	9.6	10.4		7.1		16.2	9.6	34.4
Green Extension Time (g_e), s	0.9	0.7		0.0		3.6	0.3	3.6
Phase Call Probability	1.00	1.00		1.00		1.00	0.98	1.00
Max Out Probability	0.00	0.00		1.00		0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	378	271			136	43		422	250	192		778
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	7.6	8.4			5.1	1.8		14.2	9.1	7.6		32.4
Cycle Queue Clearance Time (g_c), s	7.6	8.4			5.1	1.8		14.2	9.1	7.6		32.4
Green Ratio (*g/C*)	0.15	0.32			0.10	0.10		0.33	0.33	0.14		0.54
Capacity (*c*), veh/h	512	586			180	153		615	521	245		849
Volume-to-Capacity Ratio (*X*)	0.738	0.463			0.752	0.284		0.687	0.480	0.783		0.917
Back of Queue (*Q*), ft/ln (95 th percentile)	132.9	148			130.5	30.2		235.4	134.5	141.4		355.8
Back of Queue (*Q*), veh/ln (95 th percentile)	5.2	5.8			5.1	1.2		9.2	5.3	5.5		13.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.00		0.00
Uniform Delay (d_1), s/veh	29.1	19.5			31.5	30.0		20.6	18.9	29.8		14.9
Incremental Delay (d_2), s/veh	0.8	0.2			14.5	0.4		0.5	0.3	2.1		1.8
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	29.9	19.8			46.0	30.3		21.2	19.2	31.8		16.7
Level of Service (LOS)	C	B			D	C		C	B	C		B
Approach Delay, s/veh / LOS	25.7	C		42.2	D		20.4	C		19.7	B	
Intersection Delay, s/veh / LOS	23.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.7	B	2.3	B	2.4	B
Bicycle LOS Score / LOS	1.6	A	0.8	A	1.6	A		F

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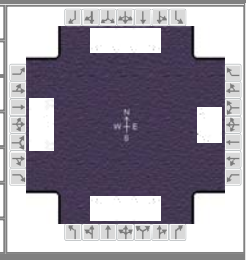
HCS 2010 Signalized Intersection Results Summary

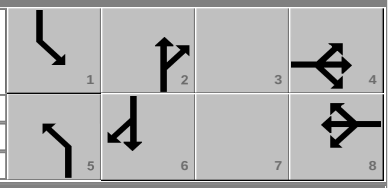
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	RUDY LANE	File Name	2025 PM_SPUI_RUDY.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	251	25	75	55	80	252	75	770	75	181	862	281

Signal Information			
Cycle, s	130.0	Reference Phase	6
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	16.9	3.8	42.0	22.7	24.6	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		27.7		29.6	25.7	50.8	21.9	47.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.2	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		22.2		23.9	7.4		16.6	
Green Extension Time (g_e), s		0.5		0.7	0.1	0.0	0.3	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.03		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	279	28	78		150	269	83	856	78	201	958	301
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1808	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	20.2	1.6	5.6		9.5	21.9	5.4	27.1	4.4	14.6	33.0	21.0
Cycle Queue Clearance Time (g_c), s	20.2	1.6	5.6		9.5	21.9	5.4	27.1	4.4	14.6	33.0	21.0
Green Ratio (*g/C*)	0.17	0.17	0.17		0.19	0.19	0.16	0.35	0.35	0.13	0.32	0.32
Capacity (*c*), veh/h	307	322	273		342	296	279	1237	550	228	1135	505
Volume-to-Capacity Ratio (*X*)	0.908	0.086	0.285		0.438	0.909	0.298	0.692	0.141	0.881	0.844	0.596
Back of Queue (*Q*), ft/ln (95 th percentile)	394.7	34.2	99.6		194.8	368.1	117.9	445.6	78.6	276.9	544.9	340.2
Back of Queue (*Q*), veh/ln (95 th percentile)	15.4	1.3	3.9		7.6	14.4	4.6	17.4	3.1	10.8	21.3	13.3
Queue Storage Ratio (*RQ*) (95 th percentile)	3.04	0.00	0.77		0.00	0.00	0.69	0.00	1.05	1.32	0.00	2.13
Uniform Delay (d_1), s/veh	52.6	44.9	46.6		46.6	51.6	48.3	36.1	28.7	55.6	40.9	36.9
Incremental Delay (d_2), s/veh	17.4	0.0	0.2		0.3	12.3	2.7	3.2	0.5	4.3	7.7	5.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	70.0	45.0	46.8		46.9	63.9	51.0	39.3	29.2	59.9	48.7	42.0
Level of Service (LOS)	E	D	D		D	E	D	D	C	E	D	D
Approach Delay, s/veh / LOS	63.5	E		57.8	E		39.5	D		48.8	D	
Intersection Delay, s/veh / LOS	48.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.5	B
Bicycle LOS Score / LOS	1.1	A	1.2	A	1.3	A	1.7	A

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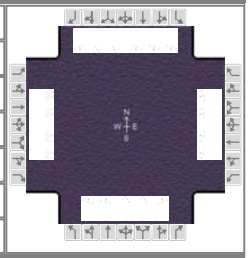
HCS 2010 Signalized Intersection Results Summary

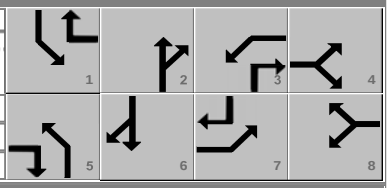
General Information				Intersection Information	
Agency	PALMER			Duration, h	0.25
Analyst	SDS	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	PM	PHF	0.90
Urban Street	US 42	Analysis Year	2040	Analysis Period	1> 7:00
Intersection	I-264	File Name	2025 PM_SPUI.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	711		240	350		700	125	808	320	1020	699	362

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.3	23.9	46.2	12.0	4.0	30.7
Yellow	4.0	4.0	4.0	4.0	0.0	4.0
Red	1.0	1.0	1.0	1.0	0.0	1.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	17.0	35.7	21.0	39.6	13.3	51.2	42.2	80.1
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.3	3.0	3.3	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	14.0	13.8	15.2	32.6	8.0		34.1	
Green Extension Time (g_e), s	0.0	3.0	0.8	2.1	0.3	0.0	3.1	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	1.00	0.00	0.00	0.25	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14	3		18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	790		267	389		778	139	898	59	1133	777	124
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1383	1706		1383	1706	1756	1563	1706	1756	1563
Queue Service Time (g_s), s	12.0		11.8	13.2		30.6	6.0	35.7	3.4	32.1	21.3	5.4
Cycle Queue Clearance Time (g_c), s	12.0		11.8	13.2		30.6	6.0	35.7	3.4	32.1	21.3	5.4
Green Ratio (*g/C*)	0.28		0.26	0.32		0.48	0.06	0.31	0.41	0.25	0.50	0.58
Capacity (*c*), veh/h	940		719	1031		1325	189	1081	647	1269	1758	907
Volume-to-Capacity Ratio (*X*)	0.840		0.371	0.377		0.587	0.736	0.831	0.091	0.893	0.442	0.137
Back of Queue (*Q*), ft/ln (95 th percentile)	363.6		186	238.1		384.7	122	588.4	61	502.1	350	90.3
Back of Queue (*Q*), veh/ln (95 th percentile)	14.2		7.3	9.3		15.0	4.8	23.0	2.4	19.6	13.7	3.5
Queue Storage Ratio (*RQ*) (95 th percentile)	1.04		0.46	0.68		0.96	0.55	0.00	0.31	1.12	0.00	0.00
Uniform Delay (d_1), s/veh	51.4		45.5	39.5		28.3	69.8	48.3	26.7	54.5	24.0	14.3
Incremental Delay (d_2), s/veh	6.5		0.1	0.1		0.3	2.1	7.4	0.3	0.9	0.8	0.3
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	57.9		45.6	39.5		28.6	71.9	55.7	27.0	55.4	24.8	14.7
Level of Service (LOS)	E		D	D		C	E	E	C	E	C	B
Approach Delay, s/veh / LOS	54.8	D		32.3	C		56.2	E		41.2	D	
Intersection Delay, s/veh / LOS	45.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.5	C	3.5	D	3.3	C	2.9	C
Bicycle LOS Score / LOS		F		F	1.4	A	2.2	B

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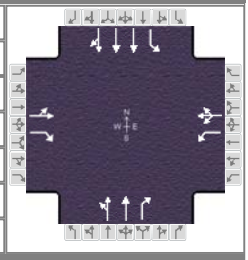
HCS 2010 Signalized Intersection Results Summary

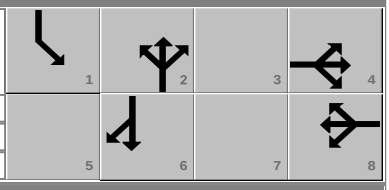
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	NORTHFIELD DRIVE	File Name	2025 PM_SPUI_NORTHFIELD.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	26	25	886	21	45	10	1720	474	15	1170	20

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.4	67.6	3.0	56.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		8.0		61.0		72.6	8.4	81.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		5.0		58.0			3.4	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.93		1.00			1.00	
Max Out Probability		1.00		1.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		51	11	984	73		1007	916	249	17	884	438
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1805	1563	1757	1643		1815	1679	1563	1757	1845	1828
Queue Service Time (g_s), s		3.0	1.1	56.0	4.4		28.9	67.6	15.6	1.4	23.3	23.3
Cycle Queue Clearance Time (g_c), s		3.0	1.1	56.0	4.4		67.6	67.6	15.6	1.4	23.3	23.3
Green Ratio (*g/C*)		0.02	0.02	0.37	0.37		0.45	0.45	0.45	0.02	0.51	0.51
Capacity (*c*), veh/h		36	31	656	613		842	756	704	40	1869	926
Volume-to-Capacity Ratio (*X*)		1.415	0.355	1.501	0.120		1.195	1.211	0.353	0.418	0.473	0.473
Back of Queue (*Q*), ft/ln (95 th percentile)		199.5	20.2	2555.9	79.9		1908.7	1774.7	256.3	30.1	391.9	395.8
Back of Queue (*Q*), veh/ln (95 th percentile)		7.8	0.8	99.8	3.1		74.6	69.3	10.0	1.2	15.3	15.5
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	1.22	0.09	0.00	0.00
Uniform Delay (d_1), s/veh		73.5	72.5	47.0	30.8		41.9	41.2	26.9	72.3	24.0	24.0
Incremental Delay (d_2), s/veh		294.7	2.5	233.4	0.0		99.4	106.9	1.4	2.6	0.9	1.7
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		368.2	75.1	280.4	30.9		141.2	148.1	28.3	74.9	24.9	25.7
Level of Service (LOS)		F	E	F	C		F	F	C	E	C	C
Approach Delay, s/veh / LOS	315.9	F		263.1	F		131.2	F		25.8	C	
Intersection Delay, s/veh / LOS	133.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.5	D	3.0	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	2.2	B	2.3	B	1.2	A

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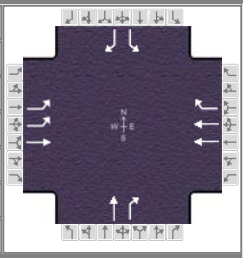
HCS 2010 Signalized Intersection Results Summary

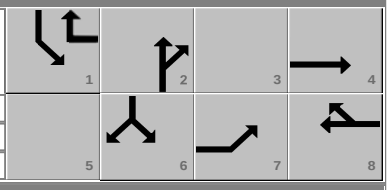
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 PM_SPUI_BROWNSBORO.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	430	65			497	128		460	55	36		475

Signal Information			
Cycle, s	76.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.9	24.7	13.5	15.4	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8		2	1	6
Case Number	2.0	4.0		7.3		7.3	1.0	3.0
Phase Duration, s	18.5	38.8		20.4		29.7	7.9	37.6
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.0		3.0		3.1	3.0	3.1
Queue Clearance Time (g_s), s	12.4	3.8		13.5		22.0	3.1	24.6
Green Extension Time (g_e), s	0.9	1.6		1.6		2.3	0.0	2.3
Phase Call Probability	1.00	1.00		1.00		1.00	0.58	1.00
Max Out Probability	0.00	0.00		0.00		0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	478	72			552	142		511	61	40		528
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706	1845			1756	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	10.4	1.8			11.5	5.9		20.0	2.1	1.1		22.6
Cycle Queue Clearance Time (g_c), s	10.4	1.8			11.5	5.9		20.0	2.1	1.1		22.6
Green Ratio (*g/C*)	0.18	0.44			0.20	0.24		0.32	0.32	0.39		0.43
Capacity (*c*), veh/h	604	818			708	375		598	507	218		668
Volume-to-Capacity Ratio (*X*)	0.792	0.088			0.780	0.379		0.854	0.120	0.184		0.790
Back of Queue (*Q*), ft/ln (95 th percentile)	184.2	29.3			205.2	92.9		322.9	32.4	18.4		293.9
Back of Queue (*Q*), veh/ln (95 th percentile)	7.2	1.1			8.0	3.6		12.6	1.3	0.7		11.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.06		0.00
Uniform Delay (d_1), s/veh	30.4	12.5			29.2	24.6		24.4	18.4	18.1		19.1
Incremental Delay (d_2), s/veh	0.9	0.0			0.7	0.2		1.4	0.0	0.1		0.8
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	31.3	12.5			29.9	24.8		25.8	18.4	18.2		19.9
Level of Service (LOS)	C	B			C	C		C	B	B		B
Approach Delay, s/veh / LOS	28.9	C		28.9	C		25.0	C		19.8	B	
Intersection Delay, s/veh / LOS	25.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.7	B	2.4	B	2.8	C
Bicycle LOS Score / LOS	1.4	A	1.1	A	1.4	A		F

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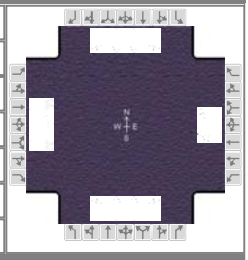
Build with Development

HCS 2010 Signalized Intersection Results Summary

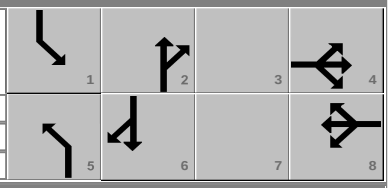
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	RUDY LANE	File Name	2025 AM_SPUI_RUDY.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	153	10	50	30	60	133	50	715	15	83	1456	183

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	3.2	73.2	14.7	13.6	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		19.7		18.6	10.3	78.2	13.5	81.4
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		14.4		13.2	6.1		8.7	
Green Extension Time (g_e), s		0.4		0.4	0.1	0.0	0.1	0.0
Phase Call Probability		1.00		1.00	0.87		0.96	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	170	11	50		100	137	56	794	11	92	1618	192
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1814	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	12.4	0.7	3.8		6.8	11.2	4.1	16.6	0.4	6.7	45.8	7.5
Cycle Queue Clearance Time (g_c), s	12.4	0.7	3.8		6.8	11.2	4.1	16.6	0.4	6.7	45.8	7.5
Green Ratio (*g/C*)	0.11	0.11	0.11		0.10	0.10	0.04	0.56	0.56	0.07	0.59	0.59
Capacity (*c*), veh/h	199	209	177		189	163	72	1977	880	116	2064	919
Volume-to-Capacity Ratio (*X*)	0.855	0.053	0.283		0.528	0.838	0.773	0.402	0.013	0.798	0.784	0.209
Back of Queue (*Q*), ft/ln (95 th percentile)	241.8	14.8	68.4		142.5	204.5	88	271.2	6.6	142.2	634.8	120.5
Back of Queue (*Q*), veh/ln (95 th percentile)	9.4	0.6	2.7		5.6	8.0	3.4	10.6	0.3	5.6	24.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	1.86	0.00	0.53		0.00	0.00	0.52	0.00	0.09	0.68	0.00	0.75
Uniform Delay (d_1), s/veh	56.6	51.4	52.8		55.2	57.1	61.7	16.0	12.5	59.9	20.5	12.6
Incremental Delay (d_2), s/veh	4.0	0.0	0.3		0.9	4.3	6.4	0.6	0.0	4.7	3.1	0.5
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	60.7	51.5	53.1		56.0	61.5	68.2	16.7	12.5	64.6	23.5	13.1
Level of Service (LOS)	E	D	D		E	E	E	B	B	E	C	B
Approach Delay, s/veh / LOS	58.6	E		59.2	E		19.9	B		24.5	C	
Intersection Delay, s/veh / LOS	28.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.9	A	0.9	A	1.2	A	2.1	B

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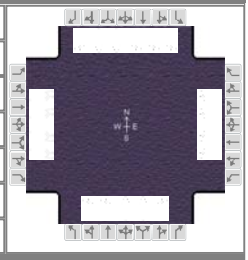
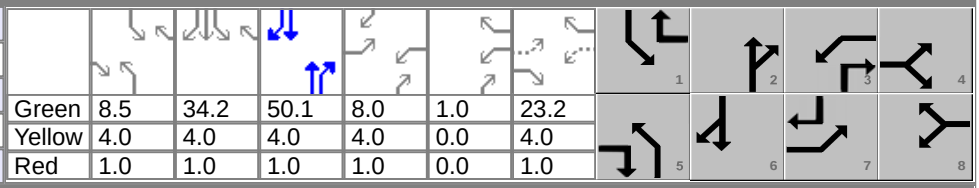
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	PALMER			Duration, h	0.25
Analyst	SDS	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.90
Urban Street	US 42	Analysis Year	2040	Analysis Period	1> 7:00
Intersection	I-264 SPUI	File Name	2025 AM_SPUI.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	301		340	440		500	130	381	480	1324	972	750

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.5	34.2	50.1	8.0	1.0	23.2
Yellow	4.0	4.0	4.0	4.0	0.0	4.0
Red	1.0	1.0	1.0	1.0	0.0	1.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	13.0	28.2	14.0	29.2	13.5	55.1	52.7	94.2
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.3	3.0	3.3	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	10.0	20.7	11.0	21.6	8.3		43.3	
Green Extension Time (g_e), s	0.0	2.5	0.0	2.5	0.3	0.0	4.4	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	1.00	0.00	1.00	0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14	3		18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	334		378	489		556	144	423	89	1471	1080	233
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1383	1706		1383	1706	1756	1563	1706	1756	1563
Queue Service Time (g_s), s	8.0		18.7	9.0		19.6	6.3	13.7	5.5	41.3	27.0	9.3
Cycle Queue Clearance Time (g_c), s	8.0		18.7	9.0		19.6	6.3	13.7	5.5	41.3	27.0	9.3
Green Ratio (*g/C*)	0.21		0.21	0.21		0.48	0.06	0.33	0.39	0.32	0.59	0.65
Capacity (*c*), veh/h	692		586	733		1327	194	1173	616	1628	2090	1013
Volume-to-Capacity Ratio (*X*)	0.483		0.645	0.667		0.419	0.743	0.361	0.144	0.904	0.517	0.230
Back of Queue (*Q*), ft/ln (95 th percentile)	241.5		271.4	200.9		267.2	126.7	255.3	98.1	615.4	410	147.1
Back of Queue (*Q*), veh/ln (95 th percentile)	9.4		10.6	7.8		10.4	4.9	10.0	3.8	24.0	16.0	5.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.69		0.68	0.57		0.67	0.58	0.00	0.49	1.37	0.00	0.00
Uniform Delay (d_1), s/veh	52.7		54.0	54.6		25.4	69.6	37.8	29.2	49.0	17.8	10.9
Incremental Delay (d_2), s/veh	0.2		0.4	1.9		0.1	2.1	0.9	0.5	0.8	0.9	0.5
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	52.9		54.4	56.5		25.5	71.8	38.7	29.7	49.8	18.7	11.4
Level of Service (LOS)	D		D	E		C	E	D	C	D	B	B
Approach Delay, s/veh / LOS	53.7	D		40.0	D		44.8	D		34.5	C	
Intersection Delay, s/veh / LOS	39.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.7	D	4.0	D	3.3	C	2.9	C
Bicycle LOS Score / LOS		F		F	1.0	A	2.8	C

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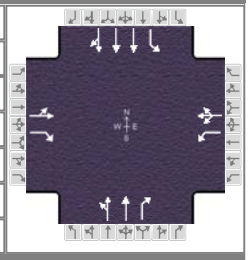
HCS 2010 Signalized Intersection Results Summary

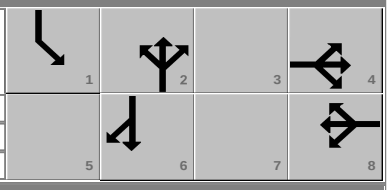
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	NORTHFIELD DRIVE	File Name	2025 AM_SPUI_NORTHFIELD.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	23	150	746	12	30	25	670	472	25	2120	10

Signal Information			
Cycle, s	130.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	53.0	5.0	47.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		10.0		52.0		58.0	10.0	68.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		6.6		49.0			4.0	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.96		1.00			1.00	
Max Out Probability		1.00		1.00			1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		37	56	829	47		214	558	247	28	1579	788
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1817	1563	1757	1635		635	1679	1563	1757	1845	1840
Queue Service Time (g_s), s		2.6	4.6	47.0	2.4		11.0	38.3	14.4	2.0	50.1	50.2
Cycle Queue Clearance Time (g_c), s		2.6	4.6	47.0	2.4		51.2	38.3	14.4	2.0	50.1	50.2
Green Ratio (*g/C*)		0.04	0.04	0.36	0.36		0.41	0.41	0.41	0.04	0.48	0.48
Capacity (*c*), veh/h		70	60	635	591		290	684	637	68	1788	892
Volume-to-Capacity Ratio (*X*)		0.525	0.924	1.305	0.079		0.739	0.815	0.387	0.411	0.883	0.884
Back of Queue (*Q*), ft/ln (95 th percentile)		56.8	150.2	1707.2	43.3		241.8	603.3	240.2	41.8	773.2	814.9
Back of Queue (*Q*), veh/ln (95 th percentile)		2.2	5.9	66.7	1.7		9.4	23.6	9.4	1.6	30.2	31.8
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	1.14	0.13	0.00	0.00
Uniform Delay (d_1), s/veh		61.3	62.3	41.5	27.3		29.8	34.2	27.1	61.1	30.2	30.2
Incremental Delay (d_2), s/veh		3.5	87.8	148.5	0.0		15.5	10.3	1.8	1.5	6.7	12.4
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		64.8	150.1	190.0	27.3		45.3	44.5	28.8	62.5	36.9	42.6
Level of Service (LOS)		E	F	F	C		D	D	C	E	D	D
Approach Delay, s/veh / LOS	116.2	F		181.3	F		40.9	D		39.1	D	
Intersection Delay, s/veh / LOS	69.5						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.5	D	3.0	C	2.3	B	2.4	B
Bicycle LOS Score / LOS	0.6	A	1.9	A	1.3	A	1.8	A

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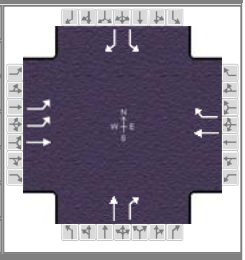
HCS 2010 Signalized Intersection Results Summary

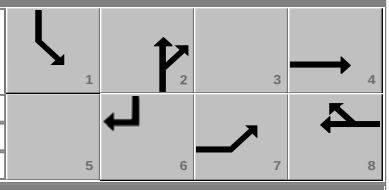
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	am	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 AM_SPUI_BROWNSBORO.xus		
Project Description	2025 AM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	340	115			188	59		380	106	81		700

Signal Information			
Cycle, s	70.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.9	28.1	10.5	7.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8		2	1	6
Case Number	2.0	4.0		7.3		7.3	2.0	3.0
Phase Duration, s	15.5	27.5		12.0		33.1	9.9	43.0
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.0		3.0		3.2	3.0	3.2
Queue Clearance Time (g_s), s	9.5	5.6		9.0		14.7	5.6	34.4
Green Extension Time (g_e), s	0.9	0.7		0.0		3.2	0.1	3.2
Phase Call Probability	1.00	1.00		1.00		1.00	0.83	1.00
Max Out Probability	0.00	0.00		1.00		0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	378	128			209	66		422	118	90		778
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706	1845			1845	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	7.5	3.6			7.0	2.8		12.7	3.5	3.6		32.4
Cycle Queue Clearance Time (g_c), s	7.5	3.6			7.0	2.8		12.7	3.5	3.6		32.4
Green Ratio (*g/C*)	0.15	0.32			0.10	0.10		0.40	0.40	0.07		0.54
Capacity (*c*), veh/h	513	588			182	154		739	626	122		845
Volume-to-Capacity Ratio (*X*)	0.737	0.217			1.151	0.426		0.572	0.188	0.735		0.921
Back of Queue (*Q*), ft/ln (95 th percentile)	131.9	63			360.4	46.3		207.1	49	69.6		355.4
Back of Queue (*Q*), veh/ln (95 th percentile)	5.2	2.5			14.1	1.8		8.1	1.9	2.7		13.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.00		0.00
Uniform Delay (d_1), s/veh	28.9	17.7			32.1	30.2		16.6	13.8	32.4		14.9
Incremental Delay (d_2), s/veh	0.8	0.1			113.1	0.7		0.3	0.1	3.2		1.9
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	29.7	17.8			145.2	30.9		16.8	13.9	35.6		16.8
Level of Service (LOS)	C	B			F	C		B	B	D		B
Approach Delay, s/veh / LOS	26.7	C		117.9	F		16.2	B		18.8	B	
Intersection Delay, s/veh / LOS	32.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.7	B	2.3	B	2.4	B
Bicycle LOS Score / LOS	1.3	A	0.9	A	1.4	A		F

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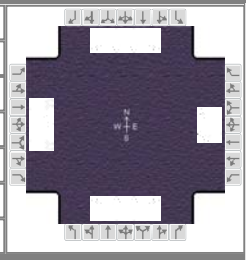
HCS 2010 Signalized Intersection Results Summary

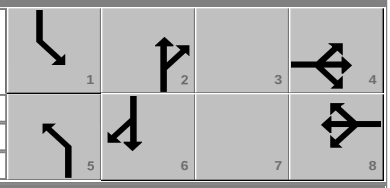
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	7/31/2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	RUDY LANE	File Name	2025 PM_SPUI_RUDY.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	254	25	75	55	80	254	75	806	75	180	840	280

Signal Information			
Cycle, s	130.0	Reference Phase	6
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	16.8	3.4	42.0	23.0	24.8	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.0	0.0	1.0	1.0	1.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		28.0		29.8	25.3	50.4	21.8	47.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.2	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s		22.5		24.1	7.5		16.5	
Green Extension Time (g_e), s		0.5		0.7	0.1	0.0	0.3	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.04		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	282	28	78		150	271	83	896	78	200	933	300
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1845	1563		1808	1563	1757	1756	1563	1757	1756	1563
Queue Service Time (g_s), s	20.5	1.6	5.6		9.5	22.1	5.5	28.9	4.4	14.5	31.8	20.9
Cycle Queue Clearance Time (g_c), s	20.5	1.6	5.6		9.5	22.1	5.5	28.9	4.4	14.5	31.8	20.9
Green Ratio (*g/C*)	0.18	0.18	0.18		0.19	0.19	0.16	0.35	0.35	0.13	0.32	0.32
Capacity (*c*), veh/h	310	326	276		345	298	274	1228	546	227	1135	505
Volume-to-Capacity Ratio (*X*)	0.910	0.085	0.282		0.435	0.910	0.305	0.729	0.142	0.880	0.822	0.594
Back of Queue (*Q*), ft/ln (95 th percentile)	399.6	34.2	99.4		194.7	372.1	118.6	472.6	78.9	275.3	525.7	338.7
Back of Queue (*Q*), veh/ln (95 th percentile)	15.6	1.3	3.9		7.6	14.5	4.6	18.5	3.1	10.8	20.5	13.2
Queue Storage Ratio (*RQ*) (95 th percentile)	3.07	0.00	0.76		0.00	0.00	0.70	0.00	1.05	1.31	0.00	2.12
Uniform Delay (d_1), s/veh	52.5	44.7	46.4		46.4	51.5	48.6	36.9	28.9	55.6	40.6	36.9
Incremental Delay (d_2), s/veh	17.9	0.0	0.2		0.3	12.9	2.9	3.8	0.5	4.3	6.8	5.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	70.4	44.8	46.6		46.8	64.4	51.5	40.7	29.5	59.9	47.3	41.9
Level of Service (LOS)	E	D	D		D	E	D	D	C	E	D	D
Approach Delay, s/veh / LOS	63.8	E		58.1	E		40.8	D		48.0	D	
Intersection Delay, s/veh / LOS	48.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.0	C	2.3	B	2.5	B
Bicycle LOS Score / LOS	1.1	A	1.2	A	1.4	A	1.7	A

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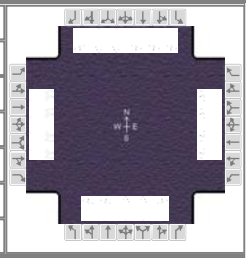
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	PALMER			Duration, h	0.25
Analyst	SDS	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	PM	PHF	0.90
Urban Street	US 42	Analysis Year	2040	Analysis Period	1> 7:00
Intersection	I-264 SPUI	File Name	2025 PM_SPUI.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	782		240	350		700	125	849	320	955	675	333

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.3	21.7	47.8	12.0	3.9	31.3
Yellow	4.0	4.0	4.0	4.0	0.0	4.0
Red	1.0	1.0	1.0	1.0	0.0	1.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	17.0	36.3	20.9	40.2	13.3	52.8	40.0	79.5
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.3	3.0	3.3	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	14.0	13.8	15.1	33.2	8.0		32.1	
Green Extension Time (g_e), s	0.0	3.0	0.8	2.0	0.3	0.0	2.9	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	1.00	0.00	0.00	0.31	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14	3		18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	869		267	389		778	139	943	67	1061	750	87
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706		1383	1706		1383	1706	1756	1563	1706	1756	1563
Queue Service Time (g_s), s	12.0		11.8	13.1		31.2	6.0	37.5	3.8	30.1	20.5	3.7
Cycle Queue Clearance Time (g_c), s	12.0		11.8	13.1		31.2	6.0	37.5	3.8	30.1	20.5	3.7
Green Ratio (*g/C*)	0.29		0.26	0.32		0.47	0.06	0.32	0.43	0.23	0.50	0.58
Capacity (*c*), veh/h	952		730	1041		1294	189	1120	664	1193	1745	902
Volume-to-Capacity Ratio (*X*)	0.913		0.365	0.374		0.601	0.736	0.842	0.100	0.890	0.430	0.096
Back of Queue (*Q*), ft/ln (95 th percentile)	451.6		184.9	237		393.5	122	614.4	67.9	476.9	339.3	61.8
Back of Queue (*Q*), veh/ln (95 th percentile)	17.6		7.2	9.3		15.4	4.8	24.0	2.7	18.6	13.3	2.4
Queue Storage Ratio (*RQ*) (95 th percentile)	1.29		0.46	0.68		0.98	0.55	0.00	0.34	1.06	0.00	0.00
Uniform Delay (d_1), s/veh	52.8		45.0	39.1		29.6	69.8	47.6	25.9	55.6	24.1	14.2
Incremental Delay (d_2), s/veh	12.6		0.1	0.1		0.4	2.1	7.7	0.3	1.0	0.8	0.2
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	65.4		45.1	39.2		30.0	71.9	55.3	26.2	56.6	24.9	14.4
Level of Service (LOS)	E		D	D		C	E	E	C	E	C	B
Approach Delay, s/veh / LOS	60.6	E		33.0	C		55.6	E		42.2	D	
Intersection Delay, s/veh / LOS	47.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.5	C	3.6	D	3.3	C	2.9	C
Bicycle LOS Score / LOS		F		F	1.4	A	2.1	B

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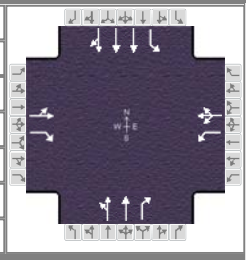
HCS 2010 Signalized Intersection Results Summary

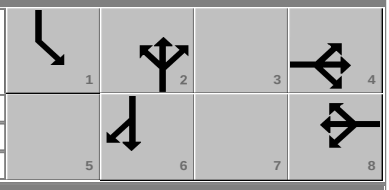
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	US 42	Analysis Year	2013	Analysis Period	1> 16:00
Intersection	NORTHFIELD DRIVE	File Name	2025 PM_SPUI_NORTHFIELD.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	29	25	768	20	35	10	1720	586	15	1170	20

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.4	67.6	3.0	56.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		10.0		7.3	2.0	4.0
Phase Duration, s		8.0		61.0		72.6	8.4	81.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.0		3.0		0.0	3.0	0.0
Queue Clearance Time (g_s), s		5.0		58.0			3.4	
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	0.0
Phase Call Probability		0.93		1.00			1.00	
Max Out Probability		1.00		1.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		54	11	853	61		1007	916	301	17	884	438
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1808	1563	1757	1655		1815	1679	1563	1757	1845	1828
Queue Service Time (g_s), s		3.0	1.1	56.0	3.6		28.9	67.6	19.7	1.4	23.3	23.3
Cycle Queue Clearance Time (g_c), s		3.0	1.1	56.0	3.6		67.6	67.6	19.7	1.4	23.3	23.3
Green Ratio (*g/C*)		0.02	0.02	0.37	0.37		0.45	0.45	0.45	0.02	0.51	0.51
Capacity (*c*), veh/h		36	31	656	618		842	756	704	40	1869	926
Volume-to-Capacity Ratio (*X*)		1.506	0.355	1.301	0.099		1.195	1.211	0.427	0.418	0.473	0.473
Back of Queue (*Q*), ft/ln (95 th percentile)		216	20.2	1868.2	66.1		1908.7	1774.7	309.9	30.1	391.9	395.8
Back of Queue (*Q*), veh/ln (95 th percentile)		8.4	0.8	73.0	2.6		74.6	69.3	12.1	1.2	15.3	15.5
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00	0.00		0.00	0.00	1.48	0.09	0.00	0.00
Uniform Delay (d_1), s/veh		73.5	72.5	47.0	30.6		41.9	41.2	28.0	72.3	24.0	24.0
Incremental Delay (d_2), s/veh		329.9	2.5	146.4	0.0		99.4	106.9	1.9	2.6	0.9	1.7
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		403.4	75.1	193.4	30.6		141.2	148.1	29.9	74.9	24.9	25.7
Level of Service (LOS)		F	E	F	C		F	F	C	E	C	C
Approach Delay, s/veh / LOS	347.7	F		182.6	F		129.0	F		25.8	C	
Intersection Delay, s/veh / LOS	112.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.6	D	3.0	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.6	A	2.0	A	2.3	B	1.2	A

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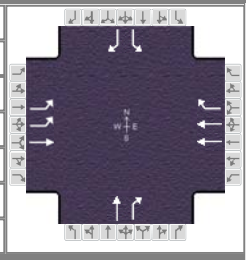
HCS 2010 Signalized Intersection Results Summary

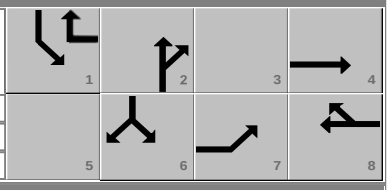
General Information				Intersection Information	
Agency	palmer			Duration, h	0.25
Analyst	sds	Analysis Date	Oct 10, 2013	Area Type	Other
Jurisdiction		Time Period	pm	PHF	0.90
Urban Street	SLIP RAMP	Analysis Year	2013	Analysis Period	1> 7:00
Intersection	BROWNSBORO ROAD	File Name	2025 PM_SPUI_BROWNSBORO.xus		
Project Description	2025 PM SPUI				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	430	180			368	95		460	150	99		475

Signal Information			
Cycle, s	73.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.5	23.9	13.0	11.7	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8		2	1	6
Case Number	2.0	4.0		7.3		7.3	1.0	3.0
Phase Duration, s	18.0	34.7		16.7		28.9	9.5	38.4
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.0	3.0		3.0		3.1	3.0	3.1
Queue Clearance Time (g_s), s	11.9	7.3		10.2		21.0	4.9	22.4
Green Extension Time (g_e), s	0.9	1.4		1.4		2.6	0.1	2.6
Phase Call Probability	1.00	1.00		1.00		1.00	0.90	1.00
Max Out Probability	0.00	0.00		0.00		0.00	0.06	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4			8	18		2	12	1		16
Adjusted Flow Rate (*v*), veh/h	478	200			409	106		511	167	110		528
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1706	1845			1756	1563		1845	1563	1757		1563
Queue Service Time (g_s), s	9.9	5.3			8.2	4.2		19.0	5.9	2.9		20.4
Cycle Queue Clearance Time (g_c), s	9.9	5.3			8.2	4.2		19.0	5.9	2.9		20.4
Green Ratio (*g/C*)	0.18	0.41			0.16	0.22		0.33	0.33	0.42		0.46
Capacity (*c*), veh/h	608	750			565	348		605	513	268		715
Volume-to-Capacity Ratio (*X*)	0.786	0.267			0.724	0.303		0.844	0.325	0.410		0.738
Back of Queue (*Q*), ft/ln (95 th percentile)	173.7	89.5			147.9	65.3		305	88.6	46.5		260.8
Back of Queue (*Q*), veh/ln (95 th percentile)	6.8	3.5			5.8	2.5		11.9	3.5	1.8		10.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00		0.00	0.00	0.15		0.00
Uniform Delay (d_1), s/veh	29.0	14.6			29.4	23.9		23.0	18.6	16.8		16.4
Incremental Delay (d_2), s/veh	0.9	0.1			0.7	0.2		1.3	0.1	0.4		0.6
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0
Control Delay (*d*), s/veh	29.8	14.6			30.1	24.1		24.3	18.8	17.2		17.0
Level of Service (LOS)	C	B			C	C		C	B	B		B
Approach Delay, s/veh / LOS	25.4	C		28.8	C		22.9	C		17.0	B	
Intersection Delay, s/veh / LOS	23.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.7	A	2.7	B	2.4	B	2.8	C
Bicycle LOS Score / LOS	1.6	A	0.9	A	1.6	A		F

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Appendix C
Scoping Summary

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Appendix C – Scoping Summary: Environmental Impact Statement Replacement Robley Rex VA Medical Center Louisville, Kentucky

"Scoping" is the term used in the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1501.7) to define the process for determining the scope of issues to address during the environmental analysis of an agency's proposed action. Scoping also helps identify issues that are neither significant nor relevant to a proposal, or alternatives that are not feasible, thereby eliminating these issues or alternatives from detailed analysis.

This EIS has considered all the scoping comments, whether a comment was made once or multiple times. Questions and issues raised in these scoping comments are addressed throughout this EIS, with analysis focused on a full and fair discussion of significant environmental impacts to inform the VA's comparison of environmental impacts among the alternatives in support of the Agency's decision that will be documented in the Record of Decision at the conclusion of the NEPA process.

The scoping process for this EIS was initiated by VA's publication of a Notice of Intent. The Notice of Intent is the U.S. government's means of notifying the public and interested parties of an agency's intention to prepare an EIS for its proposed action. VA published a "Notice of Intent to Prepare an Environmental Impact Statement for a Replacement Robley Rex Veterans Affairs Medical Center, Louisville, Kentucky" in the Federal Register on October 30, 2015. The Notice of Intent is provided as Exhibit C-1.

C.1 Scoping Notice, Media Release, VA Website, and Direct Mail Notification

Scoping notices announcing the EIS, inviting scoping comments, and describing options for submitting scoping comments were published in the Louisville *Courier-Journal* on October 30, October 31, and November 1, 2015; and were posted online on the *Courier-Journal*'s website from October 30 to November 7, 2015. The scoping notices were paid publications in the legal notice section of the newspaper.

VA also prepared a media release announcing the EIS, inviting scoping comments, and describing options for submitting scoping comments. The media release was circulated to 38 representatives of print media, radio, television, and online news sources; forwarded to the Kentucky Department of Veterans Affairs listserv, the Joint Executive Council of Veterans Organizations for the state of Kentucky, the Louisville Metro Council, local and federal elected officials, and the City of Louisville; and posted to the VA Louisville website.

On the VA website for the Louisville Robley Rex VAMC, a page is dedicated to the proposal for a replacement VAMC, at www.louisville.va.gov/newmedicalcenter. When the EIS was announced, VA posted a fact sheet on the EIS, the scoping process, and options for submitting comments.

Postcards were mailed to 301 individuals, organizations, government agencies, and elected officials on October 28, 2015, notifying them of the EIS, the scoping process, and options for submitting scoping comments.

The newspaper notice, media release, fact sheet, and postcard are provided as Exhibits C-2 through C-5.

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have been considered and are included where relevant within the Draft EIS.

The VA BHHCS Reconfiguration Draft EIS is available for viewing on the VA BHHCS Web site *www.blackhills.va.gov/vablackhillsfuture/* and at the Hot Springs, Rapid City Downtown, Sturgis, Chadron, Alliance, Lied Scottsbluff, and Pierre (Rawlins Municipal) public libraries; as well as in Pine Ridge at the Oglala Lakota College Pine Ridge Center library on the high school campus.

Information related to the EIS process is also available for viewing on the VA BHHCS Web site *www.blackhills.va.gov/vablackhillsfuture/*.

Meetings

Interested parties are invited to participate in any of six public meetings summarizing the results of the Draft EIS. These meetings will be held in Rapid City, SD; Hot Springs, SD; Pine Ridge, SD; Chadron, NE; Alliance, NE; and Scottsbluff, NE. The dates, times, and locations for these meetings will be published online at *www.blackhills.va.gov/vablackhillsfuture/*.

At the public meetings, interested parties will also have the opportunity to comment regarding the National Historic Preservation Act Section 106 process, which has been integrated into this NEPA process.

Signing Authority

The Secretary of Veterans Affairs, or designee, approved this document and authorized the undersigned to sign and submit the document to the Office of the Federal Register for publication electronically as an official document of the Department of Veterans Affairs. Robert L. Nabors II, Chief of Staff, Department of Veterans Affairs, approved this document on October 26, 2015, for publication.

Dated: October 27, 2015.

Michael Shores,

Chief Impact Analyst, Office of Regulation Policy & Management, Office of the General Counsel, Department of Veterans Affairs.

[FR Doc. 2015–27684 Filed 10–29–15; 8:45 am]

BILLING CODE 8320–01–P

DEPARTMENT OF VETERANS AFFAIRS

National Research Advisory Council; Notice of Meeting

The Department of Veterans Affairs (VA) gives notice under the Federal Advisory Committee Act, 5 U.S.C., App. 2, that the National Research Advisory Council will hold a meeting on Wednesday, December 9, 2015, at 810 Vermont Ave. NW., Conference Room 730, Washington, DC 20420. The meeting will convene at 9:00 a.m. and end at 4:00 p.m., and is open to the public. Anyone attending must show a valid photo ID to building security and be escorted to the meeting. Please allow 15 minutes before the meeting begins for this process.

The agenda will include a review of the Million Veteran Program and a joint meeting with the Association of American Medical Colleges.

No time will be allocated at this meeting for receiving oral presentations from the public. Members of the public wanting to attend, or needing further information may contact Pauline Cilladi-Rehrer, Designated Federal Officer, ORD (10P9), Department of Veterans Affairs, 810 Vermont Avenue NW., Washington, DC 20420, at (202) 443–5607, or by email at *pauline.cilladi-rehrer@va.gov*, at least 5 days prior to the meeting date.

Dated: October 27, 2015.

Rebecca Schiller,

Advisory Committee Management Officer.

[FR Doc. 2015–27680 Filed 10–29–15; 8:45 am]

BILLING CODE 8320–01–P

DEPARTMENT OF VETERANS AFFAIRS

Notice of Intent To Prepare an Environmental Impact Statement for a Replacement Robley Rex Veterans Affairs Medical Center, Louisville, Kentucky

AGENCY: Department of Veterans Affairs.

ACTION: Notice of intent.

SUMMARY: Pursuant to the National Environmental Policy Act of 1969 (42 U.S.C. 4321, *et seq.*), VA intends to prepare an Environmental Impact Statement (EIS) for constructing and operating a new campus to replace the existing VA Medical Center, Veterans Benefits Administration office, and three community-based outpatient clinics in Louisville, Kentucky. VA seeks public scoping input on the EIS.

DATES: Interested parties are invited to submit scoping comments for the Replacement Louisville VAMC EIS by Monday, November 30, 2015.

ADDRESSES: Submit scoping comments online through *www.Louisville-EIS.com*, by email to *LouisvilleReplacementHospitalComments@va.gov*, or by regular mail to Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206.

FOR FURTHER INFORMATION CONTACT: Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206 or by email to *LouisvilleReplacementHospitalComments@va.gov*.

SUPPLEMENTARY INFORMATION: VA proposes to construct and operate a new 104-bed hospital, which will include diagnostic and treatment facilities, a Veterans Benefits Administration (VBA) regional office, and required site amenities and improvements on a new campus. This proposed project would replace the existing Robley Rex VA Medical Center (VAMC), three community-based outpatient clinics, and the existing VBA regional office with new facilities of sufficient capacity to meet the current and projected future healthcare needs of Veterans in the Louisville service area. The proposed project is needed because the existing Louisville VAMC facilities on Zorn Avenue have reached the end of their serviceable lives. The building conditions and site configuration at the existing 63-year old VAMC are inadequate to effectively and efficiently meet the expanding needs of VA's health care mission and VBA services in the region. Within the Louisville service area, 60,943 Veterans were enrolled to receive care in Fiscal Year 2014. Enrollment is expected to increase to more than 68,000 by FY 2024. During this same time period, outpatient clinic stops are expected to increase from 763,104 to over 963,000. The existing Louisville VAMC facility is insufficient to meet the current and the increasing future needs of VA's health care mission in the region. Therefore, VA conducted studies beginning in 2009 that recommended new facilities be constructed on a new site that would be better suited to meet future needs.

VA has identified two potential action alternatives to be analyzed in detail in this EIS: Construction and operation of a replacement VAMC campus at the "Brownsboro Site" at 4906 Brownsboro Road, Louisville; and construction and operation of a replacement VAMC campus at the "St. Joseph Site," on a parcel located east of I–265 and south of Factory Lane in Louisville. The Brownsboro and St. Joseph Sites were identified through a site selection process conducted by VA in 2011. The Brownsboro Site was acquired by VA in 2012 as the proposed location for the replacement VAMC. In addition to these two action alternatives, the EIS also will evaluate the impacts associated with No Action or "status quo" as required by the National Environmental Policy Act (NEPA) and its implementing regulations. The three community-based outpatient clinics and the existing VBA

Exhibit C-1. Notice of Intent.

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regional office are currently located in leased spaces, for which the leases would not be renewed under either action alternative. VA has tentatively determined that renovating the existing Robley Rex VAMC is not a reasonably foreseeable alternative and would adversely affect VA's ability to provide needed services to Veterans.

Environmental topics that will be addressed in the EIS include aesthetics, air quality, cultural resources and historic properties, geology and soils, hydrology and water quality, wildlife and habitat, noise, land use, floodplains and wetlands, socioeconomics, community services, solid waste and hazardous materials, transportation and traffic, utilities, and environmental justice. Best management practices and mitigation measures that could alleviate any identified environmental effects will be included where relevant.

Two prior environmental assessments (EAs) addressed aspects of VA's proposal. In June 2012, VA completed a *Programmatic EA of the Proposed Site Selection, Construction, and Operation of a Replacement Louisville VA Medical Center*. This analysis concluded with a Finding of No Significant Impact for selecting and acquiring the Brownsboro Site for the replacement Louisville VAMC, with the provision that mitigation measures would be identified in a subsequent site-specific EA to ensure that impacts would not be significant. In December 2014, VA published a *Draft Site-Specific EA: Proposed Replacement VA Medical Center Campus, Louisville, Kentucky*. However, upon further review before publishing a Final Site-Specific EA, VA concluded that an EIS was the appropriate level of NEPA documentation for evaluating the potential for adverse impacts from constructing and operating a replacement campus at the Brownsboro Site. This Notice of Intent initiates the EIS for the replacement Louisville VAMC campus.

Extensive public input was provided by Veterans, elected officials, residents near the proposed new locations, and other interested members of the public throughout the scoping and public draft reviews for the two EAs. These comments remain in the project record and are being incorporated as identified scoping issues for this EIS.

VA does not intend to hold a public scoping event specific to this EIS, anticipating that any input would largely reiterate issues that have been previously identified. Upon specific request, VA will consider whether an additional in-person scoping event would enhance public involvement in this EIS. The event would be at a Louisville venue at which a project fact sheet would be available in hard copy, posters summarizing the EIS process would be available for viewing, and members of the public could submit written comments using either comment forms or their own written format. There would be no formal presentation by VA or verbal public comment opportunity. The comment form (this form is not a required format for submitting scoping comments), the fact sheet, and the two previous EAs are available online at *www.louisville.va.gov/newmedicalcenter/*, along with other information related to the EIS process.

The Secretary of Veterans Affairs, or designee, approved this document and authorized the undersigned to sign and submit the document to the Office of the Federal Register for publication electronically as an official document of the Department of Veterans Affairs. Robert L. Nabors II, Chief of Staff, Department of Veterans Affairs, approved this document on October 22, 2015, for publication.

Dated: October 27, 2015.

Michael Shores,

Chief Impact Analyst, Office of Regulation Policy & Management, Office of the General Counsel, Department of Veterans Affairs.

[FR Doc. 2015–27658 Filed 10–29–15; 8:45 am]

BILLING CODE 8320–01–P

DEPARTMENT OF VETERANS AFFAIRS

Commission on Care Meeting

In accordance with the Federal Advisory Committee Act, 5 U.S.C., App. 2, the Commission on Care gives notice that it will meet on Monday, November 16, 2015, and Tuesday, November 17, 2015, at the J.W. Marriott, Jr. ASAE Conference Center, 1575 I St. NW., Washington, DC 20005. The meeting will convene at 8:30 a.m. and end at 12:30 p.m. on both days. The meeting is open to the public.

The purpose of the Commission, as described in section 202 of the Veterans Access, Choice, and Accountability Act of 2014, is to examine the access of Veterans to health care from the Department of Veterans Affairs and strategically examine how best to organize the Veterans Health Administration, locate health care resources, and deliver health care to Veterans during the next 20 years.

On the mornings of November 16 and 17, the Commission will hear from experts who will provide insights on work to be done by the Commission. On the afternoons of November 16 and 17, and the morning of November 18, the Committee will convene closed sessions in accordance with The Government in the Sunshine Act, 5 U.S.C. 552b(c)(2) and (c)(9)(B).

No time will be allocated at this meeting for receiving oral presentations from the public. The public may submit written statements for the Commission's review to Sharon Gilles or John Goodrich, Designated Federal Officers, Commission on Care, at *sharon.gilles@va.gov* or *john.goodrich@va.gov*, respectively. Any member of the public wanting to attend may contact Ms. Gilles or Mr. Goodrich.

Dated: October 26, 2015.

Sharon Gilles,

Designated Federal Officer, Commission on Care.

[FR Doc. 2015–27589 Filed 10–29–15; 8:45 am]

BILLING CODE 8320–01–P

Exhibit C-1. Notice of Intent (continued).

Notice of Intent and Public Scoping:
Environmental Impact Statement (EIS) for Replacement Robley Rex VA Medical Center (VAMC)

In accordance with the National Environmental Policy Act (NEI the Department of Veterans Affairs (VA) will prepare an EIS constructing and operating a campus to replace the existing VA Veterans Benefits Administration office, and three commun based outpatient clinics in Louisville, KY. VA has identified two ternative locations for constructing and operating the campus: "Brownsboro Site" and the "St. Joseph Site" and will also evalu the no action alternative. Additional information on the propo project and NEPA process to date is available at **www.louisville.va.gov/newmedicalcenter/.**

VA requests input on potential environmental impacts and sug tions for mitigation. VA does not intend to hold a public scop event, anticipating that it would largely reiterate previously ide fied issues. Upon specific request, VA will consider whether an ditional in-person scoping event would enhance public invo ment. The event would be announced on the VA website ab provide a project fact sheet and form for written comments (b available on the website), and would have no formal presenta by VA or verbal public comment opportunity. The extensive pu input provided for two related environmental assessments rem in the project record and is being incorporated as scoping input this EIS. Additional scoping comments may be submitted on or fore November 30, 2015, through www.Louisville-EIS.com, by e to LouisvilleReplacementHospitalComments@va.gov, or by reg mail to Robley Rex VAMC, Attn: Replacement VAMC Activa Team Office, 800 Zorn Avenue, Louisville, KY 40206.

THE COURIER-JOURNAL – A GANNET

STATE OF KENTUCKY

County of Jefferson

Circulation printed and published at 525 West Broadway, Louisville, Kentucky, do solemnly swear that from my own personal knowledge, and reference to the files of said publication, the advertisement of:

Title:	**Notice of Intent and Public Scoping**	
Run Date(s):	10/30, 10/31, 11/1/2015	NEWSPAPER PRINT
Run Date(s):	10/30/2015 - 11/7/2015	ONLINE

Christine Manning, Inbound Special Services Representative

Signature of person making proof

Subscribed and sworn to before me this 4th day of November 2015

Janice C. Richardson, Notary Public

JANICE C. RICHARDSON
MY COMM. EXPIRES
NOTARY
PUBLIC
JUNE 14, 2018
STATE AT LARGE, KENTUCKY

Exhibit C-2. Newspaper Notice of Scoping.

NOTICE OF INTENT AND PUBLIC SCOPING

Environmental Impact Statement for
Replacement Robley Rex Veterans Affairs Medical Center, Louisville, Kentucky

The U.S. Department of Veterans Affairs (VA) proposes to construct and operate a 104-bed hospital, diagnostic and treatment facilities, Veterans Benefits Administration (VBA) regional office, and required site amenities and improvements on a new campus. This proposed project would replace the existing Robley Rex VAMC, three community-based outpatient clinics, and the existing VBA regional office. In accordance with the *National Environmental Policy Act* (NEPA), VA will prepare an environmental impact statement (EIS) for this project.

The proposed project is needed because the existing Louisville VAMC facilities on Zorn Avenue are inadequate to effectively and efficiently meet the expanding needs of VA's healthcare mission and VBA services in the region. VA has identified two potential action alternatives to be analyzed in detail in this EIS: constructing and operating the replacement VAMC campus at the "Brownsboro Site" at 4906 Brownsboro Road, Louisville; and constructing and operating the replacement VAMC campus at the "St. Joseph Site" on a parcel located east of I-265 and south of Factory Lane in Louisville. The EIS will also evaluate the impacts associated with the No Action alternative.

Two prior environmental assessments (EAs) addressed aspects of VA's proposal. Upon further review, VA concluded that an EIS was the appropriate level of NEPA documentation. Extensive public input was provided throughout the scoping and public draft reviews for the two EAs. These comments remain in the project record and are being incorporated as identified scoping issues for this EIS. Additional scoping input may be provided by submitting comments on or before November 30, 2015, online through **www.Louisville-EIS.com**, by email to **LouisvilleReplacementHospitalComments@va.gov**, or by regular mail to Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206.

VA does not intend to hold a public scoping event specific to this EIS, anticipating that any input would largely reiterate issues that have been previously identified. Upon specific request, VA will consider whether an additional in-person scoping event would enhance public involvement in this EIS. The event would be at a Louisville venue at which a project fact sheet would be available in hard copy, posters summarizing the EIS process would be available for viewing, and members of the public could submit written comments using either comment forms or their own written format. There would be no formal presentation by VA or verbal public comment opportunity. The comment form (this form is not a required format for submitting scoping comments), the fact sheet, and the two previous EAs are available online at www.louisville.va.gov/newmedicalcenter/, along with other information related to the EIS process.

For further information, contact: Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206 or by email to LouisvilleReplacementHospitalComments@va.gov.

Exhibit C-3. Media Release.

FACT SHEET

Environmental Impact Statement for Replacement Robley Rex VA Medical Center Campus

PUBLIC SCOPING

October 30, 2015, to November 30, 2015

National Environmental Policy Act (NEPA)

- Requires a federal agency to consider the environmental impacts of its proposed project in deciding what action to take.
- Prepare an environmental impact statement (EIS) to determine if the proposed action or alternatives have potential to significantly impact the natural and human (social, economic) environment.
- Identify reasonable measures to avoid or minimize environmental harm.

Scoping Process

- Involve the public with identifying the issues and resources to evaluate in the EIS.
- Receive comments on alternatives, impacts, and mitigation options.
- Use comments in preparing EIS.

Purpose of and Need for Replacement VA Medical Center (VAMC) Campus

- ***Purpose:*** Provide full-service replacement VA medical center (VAMC) campus and co-located Veterans Benefit Administration (VBA) office to serve current and projected needs of Veterans.
- ***Need:*** Existing Louisville facilities have reached the end of their serviceable lives. The conditions and configuration at the existing VAMC are inadequate to effectively and efficiently meet the expanding needs of VA's healthcare mission, and upgrading the existing VAMC is not practical given the facility's age and space constraints.

Environmental Impact Statement Content

- Purpose and Need
- Alternatives (tentative)
  - A: Construct and operate replacement VAMC campus at 4906 Brownsboro Road (VA's preferred alternative)
  - B: Construct and operate replacement VAMC campus at St. Joseph site, east of I-265 and south of Factory Lane
  - C: No Action – no replacement VAMC campus, continue services at existing Zorn Avenue location
- Description of Affected Environment – baseline for impact analysis
- Analysis of Impacts – direct, indirect, and cumulative, including updated traffic study
- Summary of Public Involvement and Agency Coordination
- Mitigation Measures

Resources that will be Evaluated for Potential Impacts

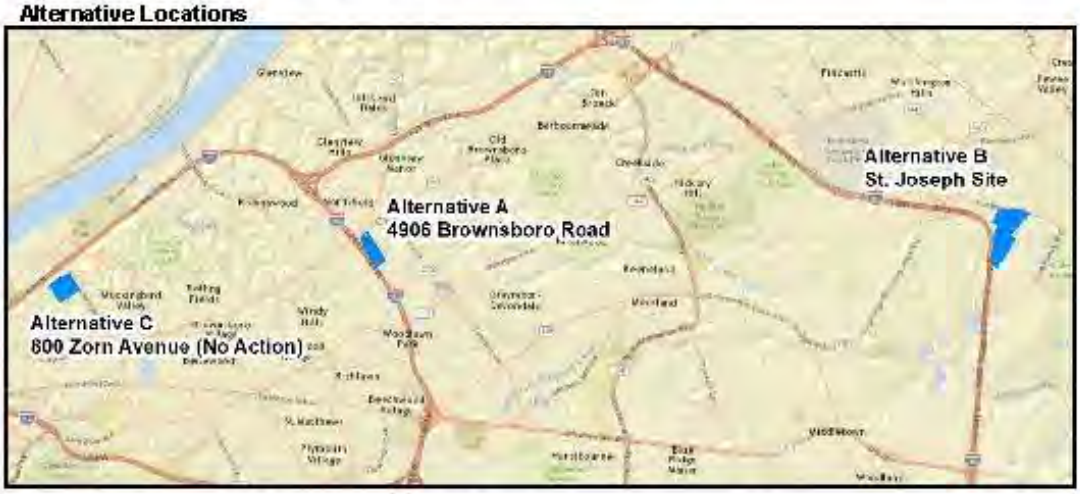
- Aesthetics
- Air quality
- Cultural resources
- Geology / soils
- Wildlife / habitat
- Noise
- Land use
- Socioeconomics
- Utilities
- Community services
- Floodplain / wetlands
- Hydrology / water quality
- Solid waste / hazardous materials
- Traffic / transportation
- Environmental justice

Exhibit C-4. Scoping Fact Sheet.

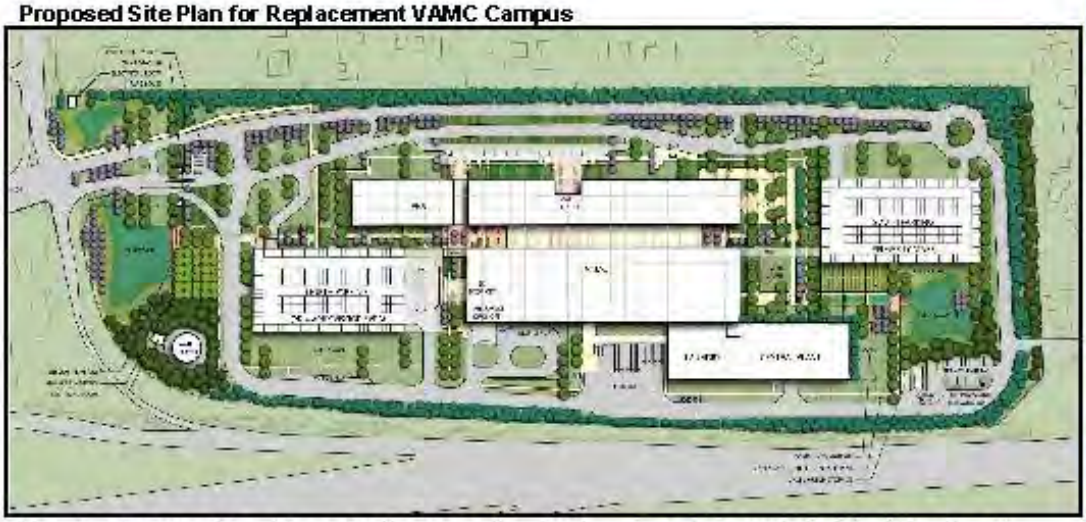
Schedule

- November 30, 2015 – scoping completed
- February 2016 – Draft EIS available
- March 2016 - public meetings on Draft EIS
- July 2016 – Final EIS available
- August 2016 – Record of Decision published
- 2017 (estimated) - construction begins (subject to budgets / appropriations)
- 2022 (estimated) - new VAMC campus opens (subject to budgets / appropriations)

Alternative Locations



Proposed Site Plan for Replacement VAMC Campus



Site plan is shown at the Alternative A location. A similar layout would be evaluated for Alternative B.

Scoping Comments – Submission Options

Please submit scoping comments by **November 30, 2015** using one of the following methods:

- Online through **www.Louisville-EIS.com**
- Email to **LouisvilleReplacementHospitalComments@va.gov**
- Regular mail to Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206

Exhibit C-4. Scoping Fact Sheet (continued).

Notice of Intent and Public Scoping

Environmental Impact Statement
Replacement Robley Rex VA Medical Center, Louisville, KY

In accordance with the National Environmental Policy Act (NEPA), the Department of Veterans Affairs (VA) will prepare an EIS for constructing and operating a campus to replace the existing Robley Rex VAMC, Veterans Benefits Administration office, and three community-based outpatient clinics in Louisville, KY. VA has identified two alternative locations for constructing and operating the campus: the "Brownsboro Site" and the "St. Joseph Site" and will also evaluate the no action alternative. Additional information is available at **www.louisville.va.gov/newmedicalcenter/**.

VA requests input on potential environmental impacts and suggestions for mitigation. VA does not intend to hold a public scoping event. The extensive public input for two related environmental assessments remains in the project record and is being incorporated as EIS scoping input. Upon specific request, VA will consider whether an additional in-person scoping event would enhance public involvement. The event would be announced on the VA website above, provide a fact sheet and comment form (both available on the website), and would have no formal presentation by VA or verbal public comment opportunity. Scoping comments may be submitted on or before November 30, 2015, through **www.Louisville-EIS.com**, by email to **LouisvilleReplacementHospitalComments@va.gov**, or by regular mail to Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206.

U.S. Department of Veterans Affairs
Robley Rex VA Medical Center
800 Zorn Avenue
Louisville, KY 40206
www.louisville.va.gov

Name
Address

Exhibit C-5. Scoping Postcard.

C.2 EIS Scoping (October 30 – November 30, 2015) Summary

The public scoping period was open for 31 days from October 30 through November 30, 2015. The scoping process provided sufficient opportunity for stakeholders to express their comments and provide meaningful input to the NEPA process. There were 63 unique comment letters, email, and website comments received; three of these letters/emails were submitted by email as well as through the mail or website. The majority of the comments focused on the details of or preference for an alternative, and the impacts related to traffic.

The 63 comment submissions raised 159 total issues, many of which were raised more than once in multiple letters, or for which a single letter submitted multiple issues within the same category. The 159 comment issues fall into the following categories:

Category	Number of Comment Issues
Alternatives	42
Aesthetics	6
Air quality	5
Geology and soils	2
Hydrology and water quality	3
Wildlife and habitat	1
Noise	1
Land use	11
Socioeconomics and environmental justice	9
Community services	3
Solid waste and hazardous materials	4
Transportation and traffic	47
Utilities	2
General impact analysis	3
NEPA process	4
Agency coordination	1
Public involvement	4
Out of scope	12

The following subsections list the issues raised in the scoping comments. The majority of the comments that follow are in the words of the commenter. Multiple comments conveying the same input are generally provided only once.

C.2.1. Comments on Alternatives

I encourage the VA to locate the future site in a walkable location that is accessible for those using public transit. Locating the campus in a place only accessible via cars does not serve veterans well, as many may not have access to a car.

I believe that the construction should be made at the alternative B or C. Alternative B because it is directly on the highway which links various counties outside of Louisville in a way that those not wanting to drive into Louisville will feel served. Alternative C provides the current veterans with a place they already know how to get to and feel comfortable in the surroundings. Alternative A requires the veterans from outside our city to negotiate the Watterson Expressway which can been heavily congested.

Most new VA construction in the US is associated and near current medical schools which supply the majority of care for veterans.

Various numbers reported in the Courier-Journal report the project at cost of $600,000,000 with cost overrun of $300,000,000 and last figures as much as 1.5 Billion. A new parking garage at Zorn Ave would cost 1-2 million.

Not included under your alternatives is the best location: in downtown Louisville adjacent to University Hospital and the Medical Center. Of your three "finalists", leaving the location on Zorn avenue and simply improving current facilities and parking is least disruptive to the environment and the community in general, and most convenient for the population the VA serves. Why disrupt the entire community and go against the explicit wishes of the veterans themselves? It's patently obvious that the VA "preferred site" will wreak havoc on the environment and life quality in general, so why do it? It seems that the VA is asking the community to disprove a bureaucrat's determination, not (as it should be doing) proving that the determination is a sound one in the first place. Nothing offered by the bureaucracy to date has met this hurdle, and yet the process streams right along despite indisputable opposition. Stop it while there's still time.

There is no room at the Brownsboro location. Major construction that close to homes and business would cause major damage, trauma, and expense.

The Brownsboro site is really too small for current and potential future needs of the VA hospital. The plot of land acquired by the VA at Brownsboro Road is very small and I cannot see how that small a parcel on land would be able to accomplish anything the VA is trying to do. The site is already land locked and not an overly large parcel of land. We believe it will outlive its usefulness in a very short time.

If there is no room on the property, will our homes be taken by eminent domain so the facilities can be expanded into the area of our neighborhood? I don't want to be forced to move out of my home. If that happens, will property owners be paid the full value of their my property, including money spent on improvements? Will residents be given adequate consideration to find and move to an alternative home?

The 4906 Brownsboro Road site is too small for the size of the medical complex being proposed. An example of the poor long term master planning is the two parking garages that are proposed for 3,000+ vehicles. Typically, on a project of this size between 80 to 100 percent of the parking would be grade (surface) parking. The surface parking has two primary advantages. Initially the surface parking has a lower cost. Parking garages have a construction cost of approximately 10 times the cost of surface parking. The second advantage of surface parking is it then becomes an area for future expansion for buildings/services required of the complex. The parking garages can then be built as needed. This concept was used at two suburban hospitals in the Dupont area that have been in operation for over thirty years, as well as the latest hospitals recently built at the Springhurst and Factory Lane areas. The complex the VA is planning will have a fifty to seventy year life span and will need to be expanded. There will not be an adequate amount of space for this expansion. Please include this as part of the scoping process for the Brownsboro site, the Factory Lane site, and the existing medical complex at Zorn Avenue.

There doesn't seem to be any meaningful attempt to make the new facility environmentally friendly.

Veterans would be much better served with a VA hospital nearer other Medical Care & Doctors (i.e., downtown).

It is a mistake to close the outpatient facilities in the Louisville VAMC Region. Veterans need more outpatient care than inpatient care and the increased driving distance/ congestion will present a significant burden to these patients.

Include all short-listed sites in the EIS. All reasonable alternative sites should be included in the Environmental Impact Statement (EIS), and not just include two sites. That is, all of the sites identified in the PEA should be included as EIS alternatives, such as the Zorn Avenue site, the Downtown site, and any other short-listed sites.

We believe that if the VA is taking a second look at the St. Joseph/Old Henry Road site, then the VA should reconsider all four of the original sites, doing EIS on each of them, and not just two of the original four. How were these two sites chosen and the other two left off the new list? Nothing in this process has been transparent, so we question this latest step in an already convoluted process.

St. Joe site offers proximity to the down town medical centers.

The poor decision to close the three community based outpatient clinics in Louisville. Why do you want to send the Veterans across town?

Compare the alternatives and clearly state and provide substantial analysis verifying the decision why one site is preferred over another and provide detailed analysis to back up that decision. Neither the PEA or the EA provided WHY the Brownsboro location was the chosen site over the alternatives and provide analysis and rationale in support. The PUBLIC deserves this explanation and back-up analysis substantiating the decision!

Louisville, KY is working on a plan to end veteran homelessness called RX: Housing Veterans, finding permanent housing for approximately 360 homeless veterans. The reality of homelessness is such that these men and women

need significant support services, including medical and mental health care, which would be provided by the VA. The other support services would come from agencies such as St. Vincent de Paul, Volunteers of America, the Coalition for the Homeless, St. John's Center, and the Louisville Metro Housing Authority, to name a few. All are located downtown, as are the emergency and transitional shelters the veterans use and much of the public housing available to them. Putting the replacement hospital further away from downtown will only increase the difficulty these men and women will face when it comes to accessing care, and will deter many, if not most, of them from visiting their doctors or mental health specialists.

I have not heard a definite statement about whether there will be a helipad for helicopters to be used to bring patients to the facility but hope this possible impact will be considered as well.

The Veterans Administration officials and the master planners have all indicated there is no plan to have a heliport at the 4906 Brownsboro Road medical complex site. I find this difficult to believe since every new or renovated medical complex in the last thirty years has a heliport or immediate access to one. I think this is also a JACO requirement for emergency departments. The fact that the medical complex will be in operation for fifty to seventy years causes me to believe that sooner or later there will be a heliport installed. The reason to deny there will be a heliport is obvious. The noise, air pollution, and expressway traffic disruption would not be a desirable feature for the surrounding neighborhoods. The 3906 Brownsboro Road site is also an area that general/private aviation fly over frequently due to the fact there are crossing expressways that general/private aviation often use as guides. This area is also used as an approach to Bowman Field, one of the local general aviation airports. For this reason I feel this site should not be the preferred site.

VA note regarding these and similar comments: As the commenter notes, VA has no current plans to have a heliport at the proposed replacement VAMC.

If blasting is used to dig down, that may have an adverse risk of damage to the structure of my house and other buildings in the area which would cause expense and may be a risk to the safety of people using the buildings. Will the VA pay for any damage caused by the blasting?

Another impact to consider is that it is proposed that in case of emergencies when the VA needs another means of ingress and egress that they will use a rear exit from the property and go down Carlimar to Westport Road. Carlimar is a residential street in a subdivision. This will create a lot of risk to residents on that street, including children playing in the neighborhood, in addition to traffic, noise and pollution in that neighborhood.

Lack of access to the physicians working at the facility: Most of these physicians, as has been voiced by the medical staff, are housed in the downtown area where they can move between hospitals without a lot of time lost due to transportation. Moving the physicians out to the new location for a few patients makes this cumbersome and a serious waste use of time. The commute time is 30 minutes at least.

Veterans do not want the Brownsboro location and they were insulted at a meeting when they tried to explain that.

Veterans prefer the Zorn Avenue location, with renovations and a parking garage; that is what they are accustomed to.

I am a Vietnam vet who uses the VA satellite services and occasionally the Zorn location and am very pleased with both.

Supposedly the Brownsboro site has been bought – why is VA considering the St. Joseph site?

I would like to see VA break ground on a new facility during my lifetime – is that going to happen? You have done all of your impact studies on the Brownsboro site. Build on that site and stop messing around.

With the excellent medical personnel working in the downtown Medical Center, I wonder why a remote location was even considered. The veterans deserve good access to the medical professionals, expensive machines for testing and treatment, and a much better public transportation network.

From what I understand, the "Brownsboro" site barely meets the requirements for the new hospital and if this is the case, there will be no opportunity for future growth as the property is surrounded by expressways, main traffic arteries and homes. The only way the Medical Center could grow in the future is for the government to force us out of our homes which would not make a lot of us neighbors happy!

Such a facility will fail to serve well veterans, who for the most part do not live in this area.

If there was a fix for the traffic flow, I would be willing to reconsider my position.

Oppose Brownsboro Site alternative.

Support St. Joseph Site alternative.

Support keeping facility on Zorn Avenue and adding a parking garage.

Support a downtown location that would centralize services accessible to all.

C.2.2 Comments on Aesthetics

It is difficult to discern without seeing further elevations how facing the rear of the facility toward the Watterson could enhance the desirability of the neighborhood. Additionally, placing a typical VA water tower at the corner of US 22 and the Waterson would be a further distraction.

At the Brownsboro site, the many story buildings and parking garage is really out of character with this residential area.

Appropriate planting of trees.

This facility will operate 24 hours a day, 365 days a year. This will result in lights affecting my subdivision.

Buildings of the height and bulk that are being proposed for the site will be constructed right next to an established lovely subdivision of one and two story homes that have been in the area for over 50 years. This will result in blocking sunlight and air flow to our homes.

A hospital built in this location would completely change the NEIGHBORHOOD! YES it is a largely residential area.

C.2.3 Comments on Air Quality

The addition of the hospital at the Brownsboro site will increase pollution.

Air quality issues need to be addressed in the EIS.

Air Quality and Sensitive Receptors in the Area: Additional air monitoring studies are needed as Louisville consistently ranks as one of the worst cities for those suffering from asthma. The VA should measure real-time air quality for pollutants associated with vehicular emissions. This quantitative data should be utilized to create a predicative model of air quality impacts due to the increased traffic as a result of the project. Data should come from monitors in close proximity (<0.25 miles) of the site location. The determination of significance of impact should be done with sensitive receptors as the endpoint. The health and environmental impacts of vehicle emissions must be considered.

The exhaust from cars, buses and trucks at a standstill with motors idling for hours daily is an enormous source of air pollution and frustration, with nary a place for a tree to provide any counteraction.

The additional traffic should be analyzed regarding air quality changes to the surrounding area, delays to traffic, both the intermediate surrounding roadways and how it could affect the regional expressway systems, air quality concentration of two parking garages with a total of 3,000 plus cares and any future expansions.

C.2.4 Comments on Geology and Soils

Structural stability: The 4906 Brownsboro Site has two different limestone formations, the Jeffersonville and the Louisville, in a cross bedding condition with an underground spring according to the specific environmental assessment (SEA). This condition can be the cause of subsurface voids (sinkholes). Over the long term (70 plus years of medical complex operation), the cold possibly cause structural instability. The cross bedding and

underground spring deterioration can possibly be accelerated due to the 150 geothermal wells (400 feet deep according to the SEA) and the four to five feet deep drilled pockets in the bedrock (hundreds) to anchor and support the various building structural systems. This condition should be analyzed and a cost provided for any possible solutions.

The 4906 Brownsboro Road site has two different layers of limestone, the Louisville and Jeffersonville layers, as indicated in the specific environmental analysis. Both of the limestone formations offgas radon gas. The Jeffersonville limestone has a range of 0.50 to 22.30 with a median of 1.80 pCi/L. The Louisville limestone has a range of 0.70 to 25.00 with a median of 5.40 pCi/L. Both of the limestone formations have a capacity of being greater than the radon value of 4.0 pCi/L, the Environmental Protection Agency (EPA) action level for radon. The Louisville limestone is virtually certain to be in excess of the maximum allowed (see attachment Preventive Medicine report). Radon is a colorless, tasteless, odorless radioactive gas derived from the decomposition of uranium in the soil and rock. After smoking, radon is the second leading cause of lung cancer. The analysis of the St. Joseph site and the 4906 Brownsboro Road site and the existing site at Zorn Avenue should be done for radon off gassing. Any possible solutions and the cost associated should be evaluated and published for review.

VA note regarding this comment: As with any other commercial or residential building, should radon testing reveal a potential to exceed a threshold of 4.0 pCi/L, a radon mitigation would be installed to reduce the radon concentration to a level below the EPA threshold.

C.2.5 Comments on Hydrology and Water Quality

Parking for 3000 cars will require at least 20 acres of land. It would be best not to use conventional concrete or asphalt to make this parking lot. Run off from the parking lot and the heat generate by this size lot would be an environmental hazard for the community. Pervious concrete or porous asphalt would be best.

Residents in our subdivision have drainage problems already. Having all of the facilities constructed on the property adjoining our neighborhood may cause additional drainage issues with resulting expense and safety risk.

Water Resources - Surface and Groundwater Hydrology: Changes in surface hydrology alter the flow of water through the landscape. Construction of impervious surfaces such as parking lots, roads, and buildings increase the volume and rate of runoff, resulting in habitat destruction, increased pollutant loads, and flooding. The Final Programmatic Environmental Assessment from March 2012 found shallow groundwater in at least one boring from the Brownsboro Road site. Additional sampling should be conducted to ensure no significant adverse impact exists that would affect structural integrity.

C.2.6 Comments on Wildlife and Habitat

The ducks, geese and other wildlife who fed on the grain from this land and have nested for a hundred years on this site will be displaced.

C.2.7 Comments on Noise

This facility will operate 24 hours a day, 365 days a year. This will result in noise affecting my subdivision. There will be the noise from ambulances. There has been talk of landscaping to help screen but landscaping is not going to adequately reduce these impacts.

C.2.8 Comments on Land Use

The EAs suggests that a nearly 900,000 square foot hospital and 2 8-story parking garages with 3,000 parking spaces along with a water tower, an administration building, and additional clinics are similar to a mixed use development with residential and retail space. THEY ARE NOT SIMILAR. The original proposed hotel in the Midlands development would at maximum have been 100,000 square feet and at least 40 feet lower than the planned hospital. THIS IS NOT SIMILAR. The town center would have been developed with the neighboring communities in mind, keeping the fabric of the area intact. There would have been patio homes, condominiums, retail space and walking paths. None of this is in the planned VAMC. The planned hospital DOES NOT blend with the residential neighborhoods it borders, and I submit that if a commercial hospital were to be proposed for this site, it would be categorically denied based on the fact that it does not fall into the Planned Development guidelines.

It does not create a development that is "livable, diverse, and sustainable." In fact, the proposed hospital is not livable or diverse. As far as sustainable, the hospital is supposed to last only 30-40 years before becoming obsolete.

It does not "promote efficient and economic use of the land." In fact, the VA overpaid for the land at the beginning of the project.

It does not "respect and reinforce existing communities, integrating development with existing development to ensure compatibility." In fact, it is NOTHING like the surrounding community.

It does not "promote development patterns and land uses which reduce transportation needs and which conserve energy and natural resources." In fact, it will create tremendous traffic issues and cause the state to have to reconfigure a major interchange and widen several state roads in order to try to reduce traffic congestion at the cost of millions of taxpayer dollars. It also can only be reached by a vehicle, which does NOT conserve energy or natural resources.

It does not "lower development and building costs by permitting smaller networks of utilities and streets and the use of shared facilities." In fact, the utilities will have to build electrical substations and rebuild water and sewage lines in order to accommodate the proposed hospital.

It does not "protect and enhance natural resources." In fact, it destroys prime farmland.

It does not "promote the development of land that is consistent with the applicable form district." In fact, it is nothing like the form district Town Center, which this land is currently designated. It will not have living space, retail space, or office space open to the public.

It does not "encourage a variety of compatible architectural styles, building forms, and building relationships within a planned development." In fact, there will be nothing at all compatible to the surrounding structures, nor will any of the buildings look anything like the buildings of a Planned Development.

It does not "preserve the historic development patterns of existing neighborhoods." In fact, there are NO buildings or parking garages of this size anywhere near the planned hospital.

The area is residential and has no multi-story non-residential buildings. The proposed project would profoundly change the longstanding character of the area and Eastern Jefferson county.

C.2.9 Comments on Socioeconomics and Environmental Justice

As a neighbor, I would welcome a nicely designed suitably situated VA Hospital on this site if it enhanced property values while keeping traffic flow at a bearable level.

Environmental Justice and Socioeconomics impact analyses have been severely glossed over previously in the PEA and in the Draft Site-Specific EA, resulting in a very misleading "no impacts" conclusion by the VA:

- My previous comments on the PEA and on the Site-Specific EA continue to be inaccurately summarized and grossly minimized in the EA documents.

- In order to understand important Environmental Justice and Socioeconomics issues with this project, there is a long-overdue need to provide demographics showing where Veterans to be served by the new VAMC are living now and where they will be living in the future. The probable answer is in the West End / Downtown area, in the Southwest area, and in the South End area where all the Military Recruiting Stations are located in Jefferson County . . . and not anywhere near Brownsboro Road, where no Military Recruiting Stations are located in the vicinity.
- The previous military draft has provided an existing broad geographic dispersion of Veterans, but the all-voluntary military is primarily being recruited elsewhere in the County, with far less military recruiting in the East End than in other parts of the County. That is, it is not fair for minority and low-income areas of the County to furnish most of our soldiers, and then have all of the Federal investment and development occur in the upper-income part of the County. The unfairness of these demographics has not been addressed to date in the PEA or in the Draft Site-Specific EA.

VA note regarding the two comments above and similar ones that follow: As stated in Section 1.1, the Louisville VAMC serves Veterans from a 35-county area in western Kentucky and southern Indiana. It does not serve any one Louisville area or neighborhood.

- These demographics should have been provided in the PEA and in the Draft EA, but were not provided even after being requested. Federal law (NEPA) requires that Environmental Justice and Socioeconomics be adequately and fairly addressed

The minority and low-income areas of the community are supplying essentially all of the people / investment needed for our military, but are receiving very little if any of the economic benefits and jobs associated with a major new healthcare facility and the other facilities to be located nearby.

Effectively address the socio-economic impact to the locale neighborhood and surrounding community. The EA relied upon conclusions drawn in the PEA concluding "No Significant Impact" without analyzing the project site specific location(s) demographics. Using the City demographics when analyzing socioeconomic impact instead of demographics specific to the direct surrounding (population density, etc.) to analyze the socioeconomic, noise, air quality impact is inadequate and flawed. City demographics is boiler plate and could be used in any construction project providing no relevance. This observation and issue was brought up with the PEA but never addressed.

I am concerned about the impact of the proposed VA development on the value of my home. My husband and I have lived here for over 17 years and had planned to live here for many more years. Before the site was picked, we spent quite a bit of our savings to remodel our home. At that time, the values of property in this neighborhood had been increasing, especially for the ones that had been updated. Values had been coming back and increasing even after the recession. However, I have been watching the sale prices of homes in this neighborhood, and from that and anecdotal information from people about not even looking at homes in this neighborhood because of the potential problems from the hospital, homes seem to be selling for lower prices since the announcement was made to select the Brownsboro Road site for the VA hospital. This is having an adverse impact on property owners in the area. I don't want to move from my home but if this project continues, the conditions may become unbearable. I also don't want to lose money selling my home. I have not seen anything about mitigating this impact or compensating property owners for the adverse impacts on the value of our property and our quality of life.

Having a hospital facility of this magnitude here is likely to cause a change in the nature of the businesses in the area. Right now, we have neighborhood shopping centers, with groceries, drug stores, and other businesses that provide goods and services for the residents in the area. What impact will the proposed VA facilities have on this? Will other medical-related businesses come into this area like has happened around the hospitals in the Breckenridge Lane and Dupont Square area? There is limited space for additional businesses so will these come in and replace existing businesses?

C.2.10 Comments on Community Services

The proposed VA facilities will also have an impact on the emergency services in the area if they are required to provide service to these new facilities. Who will bear that cost? That will create additional risk to other people in the area if the emergency services are being used at the VA and are not available when other people need them.

When families and visitors come in from out of town, where will they stay? There are NO hotels in the Brownsboro Road/Watterson Expressway interchange area. There used to be one that still shows up on hotel search sites sometimes but it closed several years ago and was replaced with a small shopping center. It looks like the closest hotel is located on Zorn Avenue near the existing VA hospital site.

Public Safety: The EIS should include an evaluation of the potential impacts of the project on public safety. The evaluation should include an assessment of the direct, indirect, short-term, long-term, and cumulative effects that the project will have on the Suburban Fire Departments that each site would work with. Unlike Metro Louisville Fire Department, the suburban fire departments of Middletown and Lyndon are not funded as part of the Metro Louisville's annual budget. They receive the bulk of their revenue from property value assessments; that is, for every $100 of property value they receive $0.10. If either of these site locations were developed residentially or commercially the fire departments would receive funding based on the value of the development; however, when the site is developed as a federal project the fire departments will receive no funding. They will be required to provide services that are not within their budgetary means. How will having to provide these new services affect not only the proposed hospital but the community as a whole? The unique nature of this project will necessitate significant training in areas ranging from large-scale evacuation and mass casualty incidents, to terrorist threats and industrial emergencies as well as a full time inspector for the fire prevention office.

C.2.11 Comments on Solid Waste and Hazardous Materials

Hazardous waste in a hospital does not belong in a neighborhood setting.

Even bigger concern is the solid and hazardous waste that would be transported thru these residential areas.

Some officials trying to justify a new site have said the current VA site cannot be used for the replacement hospital because it is contaminated by Agent Orange. Martin Traxler, Director of the Robley Rex VAMC, says that is absolutely not true. So if the current site is just as large as the proposed site, why not rebuild or improve on the existing site?

> ***Note from VA: As acknowledged by the commenter, VA has previously responded to this question. VA has no knowledge of any Agent Orange contamination at the Zorn Avenue campus.***

C.2.12 Comments on Transportation and Traffic

It is hard for me to believe that anyone of sound mind who has driven in this area of town feels that his is the best site for the new hospital. The traffic is difficult to navigate at all times of day even with the new exit coming off 264, traffic backs up onto the highway which is dangerous for us who live in the area not to mention for a vet trying to find his or her way through a congested area. Building this hospital in an area easier for our vets to navigate would be one way to tell them how much they are appreciated for their service to us all.

The statement that traffic will be unaffected due to the improvements at the US42 – Watterson interchange which will render the traffic impact virtually unchanged is incorrect. Currently the traffic during rush hours and discharges from the 4 neighborhood schools cause the traffic on Old Brownsboro to predictably backup to the light at Herr lane and further. This was omitted from the traffic study although it was apparent in the live simulation at the public hearing for the US42 - Watterson Expressway Exchange Improvement public meeting. The queue of backed up vehicles, as I have described, was unchanged by the Improvement Proposal(s). Since the VA hospital must blend into this backed up stream of traffic to get to the US42 Watterson interchange, the Impact Study, in regards to traffic being unaffected, is incomplete and misleading.

A new VA hospital at Brownsboro Road will create a great traffic problem as now there are great traffic problems. With 3000- 5000 cars per day added we will have gridlock and after the building is in place there will be no way to correct it. Again the VA Administration will be blamed for poor planning.

The traffic congestion will make access to the Brownsboro site difficult, as the KY Transportation cabinet in the traffic survey has shown, traffic at peak times going from 3000 cars per peak to 15,000 cars.

As a neighbor, I would welcome a nicely designed suitably situated VA Hospital on this site if it enhanced property values while keeping traffic flow at a bearable level.

Our subdivision exit is direct into the intersection of Highways 22 and 42. Current when traffic is heavy during the hours 11:30am to 1:00pm and 3:30pm to 6:00pm we have trouble exiting because people tend to block the intersection. The early traffic can be as many as 20 school buses. By adding the employees from the VA facility we feel the traffic would become impossible if any of we senior citizens in Northfield should have an emergency.

Increased traffic at the Brownsboro Site will be a nightmare & issue: 3000 to 5000 or more additional cars in & out per day, 2100 of which are employees alone). 22/42/Watterson is, right now, a nightmare for traffic. This facility will only massively compound huge traffic problems at Brownsboro Rd / 22/42/ Watterson & at many neighboring streets. The exhaust fume issues alone from all the long traffic backups and huge number of extra cars can only be problematic. Rush hours and school hours will be much more problematic than they already are.

The huge disruptions to the area during many years of construction will be massively problematic…. plus resulting highway and expressway construction "improvements" which will never really fully cope with the traffic volumes. And all of this will seriously erode what has been for years a primarily residential area.

Due to the proposed Brownsboro site having limited access from only one two lane road, hwy. 22' there will be increased vehicle traffic and resulting pollution. Since the construction of the slip ramp exiting I 264 the traffic in the area has already heavily increased in the last two years. As a resident of Crossgate we see this increase every day trying to enter and exit our subdivision. The resulting exhaust pollution from vehicles stuck in gridlock will be a hazard. This traffic gridlock will and already impacts hwy. 42, hwy. 22, and I 264.

Please perform an in-depth traffic impact study focusing on peak travel times to the facilities for workers, patients, etc., and on the AM and PM peak periods. Specifically look at future build and no build options and the impacts on adjacent transportation facilities including KY 22, US 42, I-264 including the interchange. Measures should include LOS, delay, V/C ratios, etc. Also examine how transit, ride sharing and other transportation demand management practices can become part of the overall operating plans at the chosen site.

Conduct detailed traffic studies at each location.

The Brownsboro Road location is a disaster in traffic. At rush hour it is backed up in every direction.

Traffic around the Brownsboro area is already a concern and continues to grow yearly. The addition of the hospital at this site will cause further congestion and traffic delays, and make it difficult for ambulances to access the hospital in a timely fashion, which could result in loss of life.

We really don't need the extra traffic on Brownsboro Road and 264. The area is already inundated with traffic at all hours. We have many businesses and 3 schools in the immediate area and adding more traffic would bring everything to gridlock. Every year more and more traffic is brought in.

It will take 400 full time 24/7 employees at the at the hospital, not to mention the outpatient staff members, consulting physicians, patients and family members going to the VAMC. Adding to the congestion and resulting in poor air quality in an already congested area.

Traffic will be significantly impacted by this development and will contribute to the overall degradation of the air quality of the surrounding areas. We submit that a new traffic study should be completed as part of the EIS. The last traffic study is now two years old, and traffic has increased significantly since then. The EIS also needs to factor in the traffic that will result from the closing of the CBOCs Section 3.13.3 Environmental Consequences, page 63 indicates a 39% and 31% increase (> 20%) in traffic at KY 22 & I264 VA entrance and a 9% and 13% increase at KY 22 & US 42 during the morning and evening peak hours, respectively. The weighted average morning and evening peak ADT increase is 30% and 24%, respectively (> 20%). FONSI are FLAWED. Comments and questions are as follows:

> (a) Detailed assumptions for current and projected VA ADT (employees, visitors, patients (inpatient & outpatient), deliveries, volunteers, etc.) used in the analysis is not provided.

(b) 753,000 annual outpatient visits are projected annually within 10 years.

(c) No analysis for year 2023 is presented when the hospital starts operation

(d) Traffic from the probable closure of the CBOCs at Newburg, DuPont, and Shively is not included in the traffic count.

(e) The site known as Providence Point is now planning a complex with 519 apartments and thousands of feet of retail space. This traffic is not included in the traffic count.

(f) KY 22 & I264 VA entrance ADT is reflected now at 21,400. The 2,150 VA employees (1,750 Hospital & 400 Administration Building) alone will increase ADT by 4,300 on the first day of operation, a 20% increase (4,300 / 21,400).

(g) Rough Estimate of Total Increased ADT at KY22 & I264 VA entrance (from page 63):

Peak ADT = 918 (918 * 1 hour)

Off Peak ADT = 4,255 (185 * 23 hours)

Total ADT = 10,346 (918 + 4,255) * 2

% Increase in ADT = 46% (10,346/21,400) or 43% (10,346/24,300) > 20%

Page 62 states "the proposed action would significantly contribute to the degradation of the LOS at the KY 22 & I-264 intersection, but mitigates it with anticipated KYTC improvements but provides absolutely NO evidence substantiating this conclusion. An EIS should investigate the increase in average daily vehicle traffic volume of at least 20% on access roads to the site or the major roadway network. It will conclude the additional amount of traffic a new VAMC would add will indeed be a SIGNIFICANT IMPACT.

Please locate the VA hospital in a location on better buslines. the bus number 15 is the only bus out there and there's a half hour between trips on weekdays and longer on Sunday. The West end could use a hospital and bus 23 leaves every 15 minutes which would make the hospital here very accessible.

The addition of so many extra vehicles; occupied by older people going to the VA and students from the schools, would make an already terrible situation impossible.

Public transportation service to that location is spotty. How can people get from Downtown where many of the lower cost housing is or from the southwest part of town on public transportation? They might have to take two transfers and 2 1/2 hours to get there. Access to a hospital is paramount.

Since the VA proposed to build a hospital and other administrative facilities on this site, there have already been adverse impacts. Traffic has gotten worse even before there has been any construction at the site. The "slip ramp" from the Watterson Expressway to Brownsboro Road that was to enable access to and from the Brownsboro Road property has exacerbated an already dangerous situation. It is much harder to get in and out of our subdivision. I know that some people use the slip ramp even though they are going to US 42. They use it as a "shortcut" and this results in traffic on Brownsboro Road that wouldn't have been here. Please note that Brownsboro Road is 3 lanes from its start at US 42 to the intersection at Herr Lane/Lime Kiln Road. There is a large neighborhood shopping center, several small shopping centers, stores, restaurants, a church and a gas station in this section of Brownsboro Road. Most of these have their own access directly onto Brownsboro Road so there are a lot of cars turning in and pulling out of these. At busy times of the day, there are solid lines of traffic and it is hard for me to get in and out of my subdivision to go to work or other destinations. This is before any additional traffic from construction or operation of the proposed hospital. This increases the risk of accidents and injury.

The issue of traffic congestion has been discussed extensively. All of your consultants (OA, Oculus and PJM) and KTC (Palmer) concluded that the traffic congestion can be mitigated with KTC's plans. However the level of service (LOS) can only be improved from obsolete to B in one category and all the rest remain C and D. {see page 99 of June 8, 2012, Final PEA study}. This multi million dollar construction project proposed by KTC is to last 15-20 years. Why are these levels of services acceptable to the VA? Especially in light of the closing of most of the VAMC outpatient facilities and the need for all of the veterans to travel to this new site. I attended the KTC meeting in July, 2014 presented by Palmer. The presenters said that the East End Ohio River Bridge and the increasing population of Oldham Country were not taken into consideration when the I-264, US42, I-71, and KY22 improvements were designed. All the more reason to demand that the LOS be A or B across the board. The

improvements proposed by KTC in 2012 are projected to be complete by 2020. Therefore the roadways will again be obsolete by 2028.

In addition, the traffic light on Brownsboro Road at the end of the slip ramp has already created a traffic hazard between that light and the traffic light at US 42. People trying to get in and out of the restaurants, bank and gas station are crossing lanes of traffic and blocking the other traffic. On the other side of the light, the traffic on Brownsboro Road heading to US 42 is already worse in part because of the traffic island that cuts off one of the lanes that used to turn right at the curve. Now traffic backs up further east on Brownsboro Road because cars have to be in one lane around the curve until there are two lanes. This makes it harder to get in and out of my subdivision.

The studies should consider the adverse impact on traffic on the surrounding roads and existing home and businesses. The proposed facilities will have to be accessed by cars, buses, trucks, ambulances and other emergency vehicles as well as pedestrians. Traffic on surrounding roads is already very heavy. To get to this site, people will be traveling on the Watterson Expressway or I-71, US 42, Brownsboro Road. Other roads that will see increased traffic are US 42 from the west, toward Louisville, or the east, from Prospect. Herr Lane and Lime Kiln Lane will see increased traffic, directly or as people try to find alternatives from the already crowded expressways. In looking at traffic impacts from the proposed VA facilities, it should be considered that a lot of the people coming to and from the facilities do not live in this immediate area so it will be "new" traffic so it will have an impact on all of these roads. There is already a lot of traffic in this area, including traffic to and from five nearby schools. Consideration must also be given to the increased traffic that will occur when the East End Bridge is finished. In addition to people traveling on the Watterson and I-71 from other parts of the area to get to or from the Gene Snyder Expressway to access the bridge, I think there will be increased traffic on US 42 and I-71 with all the people who want to cross the East End Bridge but cannot access it from US 42. There will be no entrance or exit from the bridge from US 42. The only access will be from the Snyder. So many people in areas along US 42 east of the Watterson who want to cross that bridge may come in US 42 to the Watterson to I-71 instead of going further out to the Snyder because they would have to head south on the Snyder and then use the cloverleaf at I-71 to get turned around to head north on the Snyder to go back to the bridge. This should be considered in the study of traffic in relation to the proposed VA facilities.

Traffic for the VBA and clinic patients must also be considered.

What if my house catches on fire and the fire trucks cannot get to my house because they cannot get through traffic? What if I need emergency medical care and the ambulance cannot get to my house or cannot get through the traffic to get me to a hospital quickly? The only way in and out of Crossgate is Brownsboro Road. So increased traffic will make it much harder for me to get in and out of my subdivision and will increase the risk of accidents.

Without a doubt, a hospital build in the Brownsboro corridor will severely constrict the already overburdened and area already-identified as a 'FAIL' in congestion by the Kentucky Transportation Cabinet. The KTC believes that spending a proposed $9 million and rerouting traffic in this area will only result in a "D - " rating in traffic flow.

My main concern is the added congestion of traffic that will be added to an already overly congested area. Congestion in the area: the area has major traffic problems at this point at several times of the day. It may take 20-30 minutes to come up US 42 to get to the facility at several times of the day. Also coming from I-264 from either direction is significant delays.

Access by Veterans: There are very few veterans who will be accessing the facility that live within a 10 mile radius of the facility. Also public transportation is much less in the area making it difficult to reach for many veterans.

I am deeply concerned that an almost impossible traffic congestion area in the Brownsboro Road/Waterson Freeway interchange will get dramatically worse with a hospital in this location.

Since 1988 I have lived near the intersection of Brownsboro Road and I-264, both off Rudy Lane and off Brownsboro Road. Every year the traffic gets worse. It is so bad now that going home traffic results in "parked" cars congested in the right lane of the freeway. I fear being hit by a car coming way too fast with the driver unaware of the snarled traffic ahead. Veterans and their families will be appalled at that dangerous intersection. How will ambulances negotiate with that congestion? The slip ramp off I-264 is a good idea, but it does not solve the problem of too many cars on a two lane freeway. The proposed entrance to the VA Hospital is planned for a very small intersection which will make driving less safe and more irritating for the personnel, and patients of the hospital, not to mention the neighborhood residents.

I wonder how veterans without personal cars will get to the proposed hospital. Public transportation in the Brownsboro area is not optimum, with long waits for buses. A downtown VA hospital would be more centrally located in metro Louisville and would be served by more buses routes.

The biggest concern is the current traffic in this area is about maxed. The congestion in the HWY 42/HWY22 intersection often causes back ups both ways on HWY 42 - for a couple miles in rush hour and in school dismissal hours. I cannot imagine how the road system - both 264 and HWY 22/42 can handle the masses that would be traveling to the hospital. I pity the patients, their families and the employees who would be faced by this obstacle.

Traffic in our area is already impossible at certain times of the day. It can take me 15 or more minutes to get to the gym (which is only a mile or 2 from my home). There are times when we have to sit through three cycles of a single stop light due to traffic. DO NOT ADD TO THIS PROBLEM by putting the VA hospital at the Brownsboro road location.

The building of the new VA hospital at the intersection of KY 22 and the Watterson Expressway will only create more traffic and subsequent congestion in the area. The new East end bridge will eliminate an exit from the Snyder Freeway to US 42 and thus put additional traffic on KY 22 headed West to the new VA facility. There is no way this two lane road can handle this load.

Data from the KY Dept. of Transportation indicates much greater traffic congestion in the area which they currently rate D.

I have suggested to KYTC as part of the traffic study portion of the EIS that the current traffic lights be re-timed in such a way as to mimic the traffic configuration as if the hospital was in operation to give the VA and KYTC a real understanding of the traffic issues for this site. This is such a low cost and low tech way to see the traffic problems in real time. There will be no need for formulas or guesstimates as to how the traffic patterns will look.

The supposed new interchange at the Watterson Expressway and US 42 should be made the catch all solution to the traffic problems. The interchange will not be completed anytime soon. The interchange that will be selected will be the one that is not necessarily the correct one but the most inexpensive one. It will not be the total solution for he ensuring traffic brought on by the hospital.

The traffic that is to be generated by the medical complex will be approximately 11,000 vehicle trips per day. The 4906 Brownsboro Site has approximately 21,000 vehicles that go through the entry intersection to the medical complex site on a daily basis, according to the recent specific environmental assessment. The St. Joseph Site traffic so far has not been determined and/or released to the public. The additional traffic (vehicular trips per day) should be evaluated at the current Robley Rex site, the St. Joseph site, and the 4906 Brownsboro Road site. The additional traffic should be analyzed regarding air quality changes to the surrounding area, delays to traffic, both the intermediate surrounding roadways and how it could affect the regional expressway systems, air quality concentration of two parking garages with a total of 3,000 plus cares and any future expansions.

C.2.13 Comments on Utilities

Solar panels should be place on the roof of the hospital. This is environmentally responsible as well as cutting the expense of operating the hospital. Use the money you save heating and cooling the hospital to provide of veteran services.

Utilities: To date there have been no obvious cost-benefit analyses to indicate site performance from one location to another. It is reasonable to expect that utility infrastructure costs related to the project be considered in order to assure an informed decision. If this is prepared it has not been made readily available to the public. I have no doubt that there are engineering solutions to ensure all utilities are available, but at what cost?

C.2.14 Comments on General Impact Analysis

What you owe me and everybody in the full EIS undertaking is a FRESH evaluation that disregards previous VA actions in the Robley Rex VAMC replacement process. VA's ownership of the Brownsboro Rd site SHOULD NOT be a factor.

> ***Note from VA: VA's ownership of the Brownsboro Site is not a factor in identifying and comparing the environmental impacts of the alternatives evaluated in this EIS.***

I hope the new environmental study is honest and above board which I don't feel has been the case previously.

PLEASE examine carefully ALL the impacts in your environmental study … impacts during the construction period, at the time of full utilization, and multiple years afterward.

C.2.15 Comments on NEPA Process

Traffic congestion needs to be addressed in the EIS.

We are very concerned that Labat Environmental, Inc. is conducting the EIS after previously stating prior to the draft EA that they believed the EA would return with a Finding of No Significant Impact. We do not have faith that Labat Environmental, Inc. will have any kind of objective findings regarding this location.

> ***Note from VA: After reviewing the overall NEPA record and the public comments on the draft site-specific EA, Labat and VA agreed that the appropriate level of NEPA documentation for this proposal is this EIS.***

We are VERY concerned that the traffic study and/or EIS will be conducted by the same contractor that executed the previous PEA, EA and/or traffic study. There is a valid perception of government-to contractor collusion and contractor favoritism, if not fraud on behalf of the VA to receive results that the VA would deem favorable to continue the build on this congressionally cited-overpaid property.

> ***Note from VA: An EIS (or EA) is not an audit. A federal agency contracts with firms such as TTL and Labat when the agency does not have the staff resources or full range of needed expertise to prepare a NEPA document in-house. The agency is the author of record of a NEPA document.***

A full EIS has not been done as required by the National Environment Policy Act. A full EIS will bring to light new facts that have not previously been considered.

C.2.16 Comments on Agency Coordination

There is no input from the following agencies: Louisville Metro Air Pollution Control District, Louisville Economic Development Department, Louisville Inspections, Permits, and Licensing Department, Jefferson County Soil and Water Conservation District, and Louisville Planning and Design Services. Although the report says that comments will be added in the final site-specific EA, we feel that these agencies need to have their comments submitted BEFORE the final EIS so that the community can consider their input on this site. It is a huge disservice to all involved for their comments to not be available for the public.

> ***Note from VA: City and county agencies were notified of VA's intent to prepare an EIS and the opportunity to submit scoping comments; see Section 6.1. They have also been notified of the availability of the Draft EIS for review and comment, and their input will be considered in preparing the Final EIS.***

C.2.17 Comments on Public Involvement

I would like to view the information online concerning the 2 proposed VA replacement sites (and the no build scenario), but the link provided on the postcard my agency received doesn't work. Can you please provide me with a way to view these materials?

Note from VA: In response to this comment, VA verified that the published link works.

An in-person public Scoping Meeting should be held to ensure that the active citizens, government officials, and Veterans are up-to-date on the current issues and status of the EIS, and to help identify key overall issues for the EIS.

Note from VA: A single request for an in-person meeting was received. VA determined that the published notices and fact sheets adequately updated the issues and status of the EIS, and therefore a meeting was not held.

EA and EIS comments from the public should be reported correctly in the EIS documentation, rather than the substantially abbreviated and totally incorrect summaries shown in the May 2014 Scoping Report, and in the December 2014 Executive Summary table for Socioeconomics and Environmental Justice.

I have attended all of the meetings the VA has sponsored regarding the "Brownsboro" site except the last one and must say they were a waste of time. At the first couple meetings, questions were taken and promises of answers were made by the officials in attendance. To my knowledge no answers were ever received and the meetings which followed were to present the design, etc. It appears the meetings were nothing more than opportunities for the VA to "check the box" that they had fulfilled the communication requirements to the affected public and nothing more.

C.2.18 Comments Outside the Scope of the EIS

I am so very ashamed of how vets have been treated medically and this location will only add to their problems. The VA needs to take a hard look at how money has been spent in many cases and this is just one more example of the attitude that this agency seems to have concerning those who have served our country with few rewards.

I would like to encourage the preparers of the EIS to include careful consideration of the future of the existing VA facility on Zorn Ave. in the event it is replaced by a new hospital near the Watterson. The existing VA facility on Zorn is surrounded by residential neighborhoods on several sides. It would be very important that the facility not be simply abandoned but put to some good use compatible with its residential location and protective of the safety of the surrounding population. Will it be reported excess to GSA and repurposed by another agency? Will it be declared surplus and sold to the public? Etc.

VA should sell the 22 & Watterson site and construct this facility on a larger site. Or it should consider using the property in some other way, such as an annex to the Zachary Taylor National Cemetery.

Vets should be able to go to any doctor or hospital they wish and carry a "Vet" insurance card that directly bills to the VA.

It appears that there must have been something underhanded that transpired as the price paid is very significantly great then the value. Please don't compound the problem of cost by continuing to stay there. The land should be sold or used as a cemetery.

I also object to the highly inflated purchase price of the land at I-264 and Brownsboro for the hospital. Due diligence and better negotiation should have indicated "This is not the site." Someone should work on recovering the money paid far beyond a reasonable cost.

The VA paid well over $3 million more than property market value casting a shadow of corruption over the development.

C.3 Input Received During Previous EAs

Throughout the scoping and public draft reviews for the two previous EAs related to this proposal, extensive public input was provided by Veterans, elected officials, residents near the alternative locations, and other interested members of the public. These comments remain in the project record and have been incorporated as identified scoping issues for this EIS.

C.3.1 Comments on Draft Programmatic EA

On the draft programmatic EA, VA received 28 verbal public comments, 109 written comments from individuals, 144 petition signatures/emails, and input from Greater Louisville, Inc., the City of Indian Hills, and Louisville Metro Council. Many of the responders provided similar comments and many provided multiple comments, which were addressed in Appendix D to the final programmatic EA. The issues raised in these comments are listed in Table 6-3, as summarized in that EA.

C.3.1.1 Comments on Traffic and Transportation

Traffic around Brownsboro Site is already bad and will be made worse by the proposed VAMC.
Will Carlimar Lane (south of Brownsboro Site) be affected/used as an access point for the proposed VAMC? Concern about children in the neighborhood, parked cars along road; don't want people to use it as a cut through to Westport Road.
The Draft PEA indicates that the I-264/Westport Road intersection was opened in April 2011 and that the traffic study was conducted using data obtained from February 2011, prior to the opening of the intersection. This is incorrect; the I-264/Westport Road intersection was opened in April 2010. Was traffic study done correctly?
Why did VA ignore traffic study findings that suggest major traffic issues?
The traffic impact analysis does not appear to include related support services vehicles such as delivery trucks, in-patient visitors, ambulances, etc.
Did the traffic study account for KTC's planned Right In/Right Out changes to the US 42/Old Brownsboro Road intersection?
There is a conflict of interest – both the site owner and the VA have used the same company for the traffic study.
Does the traffic impact analysis adequately address egress from the proposed VAMC at the Brownsboro Site? It appears that the study focuses on ingress only.
Traffic study does not expand far enough from the Brownsboro Site. It should include the effects on Brownsboro Road west of the Watterson Expressway. It should also be expanded to assess the impacts to the Crossgate community.
VA stated the need for 2,400 parking spaces to be shared by 3,700 cars. With these projections it appears that street parking may occur in the adjacent subdivisions at the Brownsboro Site.
How much will it cost to implement the necessary roadway improvements and who will pay for them?
The PEA notes that the proposed VAMC at the Brownsboro Site could have a significant adverse effect on traffic and that these impacts would be mitigated to less-than-significant levels, but does not adequately analyze the traffic issues and does not adequately discuss how the traffic impacts would be mitigated. The PEA states that these analyses would be addressed in the SEA. Why would the VA spend millions of dollars of taxpayer's money to purchase the Brownsboro Site without knowing beforehand that significant impacts can be mitigated? VA should conduct additional studies, including an EIS, before taking further action on the Brownsboro Site.
There is no good public transportation to the Brownsboro Site. Have there been studies on the impact to Veterans who rely on public transportation? Suggestion to consult with TARC to arrange for better public transportation.
Access to the Brownsboro Site would be too limited for a VAMC. The only access would be from the north.
The Brownsboro Site area has an inadequate sidewalk system for the proposed VAMC.

C.3.1.2 Comments on Site Selection

All new VA hospitals are being built in downtown locations. Why not build the VAMC downtown – close to doctors, University facilities?

The Draft PEA omits that former mayor, lieutenant governor, University of Louisville, and Courier-Journal recommend that the VAMC be constructed downtown.

Why did VA ignore Veterans desire to keep the VAMC at Zorn Avenue? Other expressions in favor of keeping the VAMC at Zorn Avenue.

Discuss and compare costs of property acquisition, transportation improvements, etc. for the various options, including staying at Zorn Avenue. Costs associated with the Brownsboro Site are greater than other options. The St. Joseph Site provides 3 times the space for ½ the price of the Brownsboro Site.

Why is VA planning to build the VAMC on a site (Brownsboro Site) that is too small/inadequate for future growth? Will the Brownsboro Site provide adequate space for future Veterans needs 20-50 years from now? What additional expansion would be included in the future? Would the VAMC be expanded onto the surrounding properties in the future through eminent domain?

The Brownsboro Site does not possess adequate hotel, retail, and food outlets.

Was consideration given to buying the Jewish Hospital (near St. Joseph Site)?

Could the former River Road Country Club property (owned by the City of Louisville) be used in addition to the renovated Zorn Avenue facility to meet VA's needs?

Could a new parking garage at the Zorn Avenue facility solve the problem?

In past 15 years, how many VAMCs were constructed in similar densely populated neighborhoods? Where are they located?

Veterans and VA staff would be better served if VA would select a site where the VAMC is welcomed, not opposed.

VA should consider land already owned by the Federal government.

Why didn't VA look for large vacant tracts of lands and then contact the site owners to see if they were available?

C.3.1.3 Comments on Water Resources

Underground water in Graymoor. Sump pumps run for weeks after a lot of rain. Concerned that hospital at Brownsboro Site will make this worse.

Has drainage been addressed?

C.3.1.4 Comments on Communications

It has not been made clear why the Brownsboro Site is preferable. Drawbacks seem numerous. It does not seem that the process has been conducted with transparency or true concern for the needs of Veterans.

Please provide the pros and cons for each considered site.

Share all comments on the Draft PEA with the public. Include comments from previous meetings which have not been shared. Where and when will public have access to public comments?

Will Veterans' input be shared with the public?

Why did VA not have better contact, communication, and feedback with local neighbors?

Who is the VA informational contact for those who live in the area?

Once a site is selected, what efforts will be made to involve those living in the area to give input regarding binding elements of construction?

Will public have opportunities to meet with VA again to gain info regarding timelines, design, and landscaping plans?

Public meeting concerns – audio problems, format/presentation.

C.3.1.5 Comments on Socioeconomics and Environmental Justice

Veteran users are not geographically dispersed. Recruiting in Jefferson County is in the Southwest, West, and Central, where minority and low income populations are located, not in high-income Northeast Jefferson

County where proposed the VAMC would be located. Investments and benefits of the new VAMC should be targeted to existing recruiting centers, closer to low-income and minority populations.

Why doesn't the PEA include an analysis of the local neighborhood and community? Federal Financial Institutions Examination Council data is available that indicates that the residential population around the

Brownsboro Site is much denser than that near the St. Joseph Site. The Brownsboro Road Site is surrounded by 5 Metropolitan Statistical Area (MSA) tracts with a total population estimated from 25,000 to 32,000 and 1-4 family units of 9,000-11,000. The St. Joseph Site includes only 1 MSA tract which includes a population of 7,476 and 1-4 single family units of 2,536. No other large hospital in Louisville backs up into a single-family residential community like what is being proposed. Why would VA choose to construct a massive facility in such a densely populated area which directly borders single family homes while the St. Joseph Site is in a much less populated are with no single family homes bordering the site? The PEA does not adequately address potential significant adverse impacts to the surrounding residential area.

C.3.1.6 Comments on Aesthetics

Build a brick wall, flanked by trees, between the VAMC and the Crossgate community.

Concerned about lighting impacts at the Brownsboro Site.

Concerned about aesthetics impacts at the Brownsboro Site.

Concerned about the loss of green space at the Brownsboro Site.

How can VA accommodate maintaining Old Brownsboro Road as a Scenic Corridor as designated by the City of Louisville?

The Draft PEA states that the Brownsboro Site was rezoned as Planned Development in anticipation of a mixed use development, including a six story hotel and that, as such, a similar sized VAMC likely would not be considered a significant adverse aesthetic impact to the area landowners. This statement is false. The proposed mixed use development included high end residences and was designed to complement the surrounding community. It incorporated greenspace, trees, walking paths, and was to include high end retail shops and restaurants. Although the development included a hotel, which many opposed, it was located on the back and north side of the property along I-264, not in the middle of the site such as the proposed VAMC.

C.3.1.7 Comments on Air Quality

Concerned about pollution and dust from the Brownsboro Site.

C.3.1.8 Comments on Noise

Concerned about noise impacts.

Proposed start time for construction is 7 am, recommend a later start time due to adjacent residents at the Brownsboro Site.

C.3.1.9 Comments on Land Use

There are more schools close to the Brownsboro Site than listed in the PEA. Concerns about impacts to schools.
PEA does not account for the dense residential population and retail within 2 miles of the Brownsboro Site.
The Brownsboro Site area is mostly residential. The VAMC would be inconsistent (and incompatible) with the surrounding land use.
The VAMC would negatively impact property values in the Brownsboro Site area and may increase crime rates.

C.3.1.10 General Comments

Why are adverse effects on neighbors not being considered?
Opposed to the Brownsboro Site for the VAMC.
The Brownsboro Site is the best choice for the VAMC.
The St. Joseph Site is the best choice for the VAMC.
The St. Joseph Site is too isolated for the VAMC.
Opposed to the St. Joseph Site for the VAMC.
The PEA does not provide backup to support the conclusion that the Brownsboro Site and the St. Joseph Site are the only reasonable alternatives; the Fegenbush Site is also reasonable.
The Draft PEA should be amended and an EIS prepared to address the omission of the higher taxpayer cost associated with the Brownsboro Site and the error in the conclusion that the Brownsboro and St. Joseph Sites are the only reasonable sites.
Based on the public meeting, VA seems more concerned about Indiana Bats and Running Buffalo Clover at the St. Joseph Site (than traffic/other issues at the Brownsboro Site).
March 3, 2011 Louisville Downtown Development Corporation letter of support for Downtown Site.
Security issues were not addressed in the PEA. The Brownsboro Site is very accessible from the Watterson Expressway. Does this present a security issue for the proposed VAMC?
Has VA already purchased the Brownsboro Site?
Many doctors donate free time to Veterans at the existing VAMC on Zorn Avenue. Has anyone surveyed them to see if they are willing to travel to the Brownsboro Site?
What will happen to the Zorn Avenue facility if a new VAMC is constructed elsewhere?
If VA is still in the planning stage, how will it be held accountable to promises and assurances it makes?
The process for selecting a site for the VAMC has taken too long. VA needs to make a decision and build the VAMC soon.
The proposed VAMC has been presented as a minimum 800,000 square foot, 110-bed facility. However, it has also been said to be a 1,200,000 square foot facility with up to 250 beds. What is the maximum size? The PEA impact analysis by VA has been minimized using the smaller-sized facility. The actual impacts will be greater.

C.3.2 Scoping Comments and Comments on Draft Site-Specific EA

C.3.2.1 Scoping Comments on Site-Specific EA

Nineteen individuals provided verbal comments at the public scoping meeting and 23 written comment letters were received, and are summarized below.

Purpose and Need
Quality of health care for Veterans should be the major consideration.
Explain how the project site was selected.

Proposed Action
Compare size (square footage) of proposed new facilities to existing facilities.
Provide estimated number of patients, visitors, and staff and number of deliveries entering the new VAMC campus.
Provide estimated cost to construct and operate a new VAMC.
Size of the project site is too small for the planned buildings.
Size of the project site limits future expansion.
Explain how the project site was selected.
Purpose for and use of emergency gate at Carlimar Lane.
Alternatives
Use project site as a cemetery.
Aesthetics
Obstruction of views from adjacent neighborhoods.
Visual appearance of buildings.
Security lights and illumination of VAMC campus at night.
Air Quality
Effects to local air quality from additional traffic.
Dust and pollutants from construction equipment and activities.
Geology and Soils
Potential damage to houses from blasting activities.
Hydrology and Water Quality
Surface drainage from adjacent properties.
Stormwater management ponds increasing amount of groundwater infiltration.
Stormwater management ponds as a source of mosquito breeding habitat.
Noise
Increased noise levels from additional traffic.
Noise from construction and blasting activities.
Reduce noise to adjacent properties by installing a concrete security wall (fence).
Land Use
Compatibility with adjacent land uses.
Socioeconomics
Lower property values from changed land use and visual appearance.
Maintain property values and security to adjacent properties with concrete security wall (fence).
Potential damage to houses from blasting activities.
Community Services
Hinder movement of emergency vehicles through the area with additional traffic.
Security of adjacent neighborhoods.
Capacity and availability of emergency response services (fire, police).

Transportation and Parking
Existing and future traffic congestion in vicinity of Watterson Expressway (I-264) and US 42/KY- 22 (Brownsboro Road).
Access to the project site and adjacent businesses and neighborhoods.
Availability of public transportation.
Adequate parking.
Synchronize traffic signals to improve traffic flow.
Farther distance for most Veterans to travel.
Farther distance for most VAMC staff to travel.
Capacity of KYTC-proposed improvements at Watterson Expressway (I-264) and US 42/KY 22 (Brownsboro Road) to adequately handle additional traffic.
Utilities
Availability and capacity of water, sewer, gas, and electric services.
Environmental Justice
Travel distance for minority Veterans.
Cumulative Impacts
Future development (restaurants, hotels, housing) in the area to support out-patients, visitors, and staff.
NEPA Process
Finding of No Significant Impact is inappropriate because of estimated traffic volume increases.
Prepare an environmental impact statement because traffic is projected to increase by more than 20 percent.
Consideration of comments that had been submitted in response to the Programmatic EA.
Outside Scope of NEPA or Proposed Action
Select a different location for the new VAMC.
The new VAMC should be in close proximity to University of Louisville Medical Center and other regional hospitals to provide specific medical services.
Remodel existing VAMC at Zorn Avenue location.
Prepare an environmental impact statement because the project site acquisition was more than 10 acres.
Hire 4,000 motorists to simulate the traffic conditions anticipated at full operational status of the new VAMC.
Acquisition cost of project site.
Availability of funding for KYTC to complete interchange improvements.

C.3.2.2 Comments on Draft Site-Specific EA

VA received 125 comment submissions, including verbal comments at public meetings, on the draft site-specific EA, from 97 commenters (several commenters provided multiple submissions). The issues raised in these comments are listed below.

Purpose and Need
What is justification in detail and by numbers for moving Zorn VA hospital? Why can't it be renovated? The Zorn site could support this hospital with a major parking garage. Four RFPs were issued for a parking garage at Zorn, including one with a signed contract that was canceled two days later. A decent parking garage and considerable improvements at the Zorn Avenue facility could be completed a lot sooner and with considerable less money than what is proposed for Brownsboro Road.
This hospital will have 104 beds, and the current hospital has 110. This property vs. Zorn gains 12 acres, that's all.
Is this going to enhance the experience for the veterans: seen on a more timely basis, with more access to top medical services?

Alternatives
What will be the normal working hours for construction of this VA Hospital Medical Complex?
If there is blasting during the VA Hospital build, what is the plan to protect the City of Crossgate from home/foundation damage? Will the VA pay for damage to the homes and swimming pools? Will VA survey all buildings that may be impacted in advance of the blasting, so there is baseline of conditions of those buildings?
How many parking garages will be built? Above ground or below ground? Location and size of all parking garages and surface lots?
How will VA keep patrons from parking in the Crossgate neighborhood, as they do at the Robley Rex campus?
How will VA protect the campus from malicious, heinous and terroristic activities and threats? What is VA plan for providing security personnel for its facilities?
Can the City of Crossgate expect security protection? How will VA ensure that the residents of Crossgate will be safe from the potential increase in criminal activity, and from construction workers, patients and visitors of the VAMC? Who is accountable for the VA personnel? Will the VA install security cameras for surveillance of key locations involving the Crossgate neighborhood? If a crime is committed in the Crossgate neighborhood and the perpetrator egresses onto the VA campus, who has jurisdiction to apprehend the perpetrator?
Where will the 2 required egress routes and 2 required ingresses for the VA campus be located, exactly? Will the Graymoor-Devondale streets be used for emergencies? Where will all vehicle and pedestrian access points in and out of VA property be located? Will the back gate be locked? A proposed emergency exit at the south end of the site connects to roads that cannot support the type of volume of vehicles that might be involved and would meet heavy resistance from existing residents.
How big will the power plant be and how will it be fenced off to prevent the children from Crossgate and adjacent neighborhoods from being injured by it?
How many TARC and Greyhound bus routes will be added to this area and where will bus shelters be located?
How many buildings, with how many floors, will the new VA campus have? What are the proposed dimensions of all proposed buildings/structures?
What is the expansion plan of the VA medical complex and does it require additional acreage?
Can the hospital, water tower, power station, parking garages, garbage storage containers, and delivery docks be located farther from the Crossgate neighborhood or, for the latter three, not facing the neighborhood?
What is the VA's plan for expanding pedestrian sidewalks?
What is the proposed location, size, color, lighting, etc. for all proposed signage on buildings and on VA site?
What is VA's plan to maintain their purchased property prior to construction? How often will it be mowed?
If and when this new hospital is built, all of the area's community based outpatient clinics will close, and the veterans who use them will be forced to travel to the Midlands site or incur more medical cost for those unable to access the Brownsboro location.
Clinics should be built in multiple locations instead of expanding a hospital. The idea of one-stop shopping is wrongheaded. Using a nearby clinic is easier.
Support proposed action
Oppose proposed action at Brownsboro Site. This site should not be selected because the veterans prefer Zorn Avenue and have better transportation access there, it is not near veterans' residences and should be near other medical services, it is not near homeless veterans, the veterans don't want it here, providers will be even less willing to travel there than to Zorn Avenue or may not even be released to travel there in which case the veterans who need to see them would have to travel downtown, there are traffic impacts, it is too small for the proposed development, and due to the demographics of where veterans to be served will be living in the future.
Support proposed action at Brownsboro Site.
Support No Action alternative to stay at Zorn Avenue.
Support remaining at Zorn Avenue with more parking.
Support for locating replacement VAMC downtown.
Aesthetics
What is the VA's plan on mitigating light noise for this area? Our house directly facing the proposed VA facility will be subject to 24-hour lighting.

At least an 8 to 10 foot BRICK wall on the property adjacent to the Crossgate neighborhood is requested, set back from property line in accordance with agreed plan, and the entire site should be fenced/walled to discourage vehicular and foot traffic through the Crossgate neighborhood. What is the VA's plan for landscape buffering, year-round trees, setbacks, a brick wall set back from property line in accordance with agreed plan with VA commitment to maintain plantings and landscaping on the City's side of the BRICK WALL? Size, height of the structures are out of character for this residential area. The proposed parking structures (two) with a six or eight story design would be a negative impact on the nearby community. It will be an eyesore and not fit in with any current properties. The sunsets I have grown to love will disappear from my perspective. We were told the design would be within the neighborhood aesthetics feeling. The design shown in the EA is far from being residential. There's not a brick to be seen. It's very contemporary. Our homes are very traditional.
Air Quality
What is the VA's plan for mitigating dust and debris from lofting into the Crossgate neighborhood? Traffic will contribute to a degradation of air quality in the surrounding areas. Placing a parking garage next to a residential neighborhood would increase pollution; many senior residents have health issues and intolerance to air pollution. The air quality analysis needs to address air quality in and due to the parking garages.
Hydrology and Water Quality
Where is the surface water from the VA Hospital Medical Complex going to drain? Will the VA develop its property to help the City of Crossgate mitigate its current water drainage issues? Sinkholes in properties adjacent to the proposed VA site are an existing problem associated with the porous subsurface conditions in the area. Cracks in basement floors and sidewalls are common and associated with hydrostatic pressure from high groundwater levels following prolonged heavy rainfalls and saturated soil conditions that result in groundwater infiltration and basement flooding. The potential results of adding a large building complex with extensive foundation requirements, during the building construction phase that will require anticipated blasting, plus operating conditions once the facility is operational, is unknown but a real concern to area residents. This would apply to drainage issues (both surface runoff and groundwater movement) and impact on existing subsurface structures, where the majority of residential homes have full basements.
Geology and Soils
It destroys prime farmland. I can plainly see the sink holes in our entire area. So you blast through the Louisville strata, and the second rock strata, and you're going to have sinking homes. And the VA will just turn their head and say "Oh, well."
Noise
Our house directly facing the proposed VA facility will be subject to noise during construction, noise/vibration from operation of utility units and service vehicles, as well as added noise from emergency vehicles and aircraft if helicopter access is proposed, with minimal buffer zone to minimize impact. What is VA's plan for mitigating noise from operations and onsite passenger, commercial, and emergency vehicle traffic? Noise from traffic during operations will not end and there is no mitigation for that. Placing a parking garage next to a residential neighborhood would increase noise.
Land Use
Will the VA be bound by the same binding elements previously placed on the Midlands property? Why does the EA conclude the new facility will "GENERALLY" be consistent with the comprehensive plan and existing zoning when it is clearly in contradiction with the PD zoning intent? Mitigations pertaining to zoning lack supporting backup data and analysis to conclude a FONSI. VA building heights are not in compliance with zoning It is in contradiction to intent of the Planned Development (PD) District zoning. It does not promote development of land consistent with the applicable form district, but is nothing like the form district Town Center, which this land is currently designated. Per PD guidelines, there will be nothing compatible to the surrounding structures, none of the buildings will look like a PD, there are no buildings of this size anywhere near the site. The proposed hospital is not livable or diverse and is not sustainable since it is supposed to last only 30-40 years before becoming obsolete. The facility will definitely NOT complement the character of the community or offer a community feel. It does not "promote development patterns and land uses which reduce transportation needs and

which conserve energy and natural resources" but it will create tremendous traffic issues and cause the state to have to reconfigure a major interchange and widen several state roads in order to try to reduce traffic congestion at the cost of millions of taxpayer dollars. It also can only be reached by a vehicle, which does NOT conserve energy or natural resources. t does not "lower development and building costs by permitting smaller networks of utilities and streets and the use of shared facilities," but the utilities will have to build electrical substations and rebuild water and sewage lines in order to accommodate the proposed hospital.

A 900,000 square foot hospital and two eight-story parking garages with a water tower, administration building, and additional clinics are not similar to a mixed-use development with residential and retail space.

You said the prior development was a hotel but the prior development was mixed use and complemented the character of the surrounding community.

The ratio of people to land is 164 people/1 acre of land. The ratio in our neighborhood is 23 people/ 1 acre of land. Yes, this is a GROSS OVERDEVELOPMENT.

Floodplains and Wetlands

I don't need a study to see the wetlands visible to the naked eye.

Socioeconomics and Environmental Justice

Traditionally, how has a VA hospital affected property taxes or home values? How could the hospital add to property values when the aggregate impact will add undesirable elements to the region? Do you have any studies or proof that property values will go up after the hospital is built?

The PEA concluded there would be no environmental justice impacts, but this is a false assumption. The site is not appropriate because military personnel are recruited from minority and low-income areas, not near Brownsboro Road, and therefore should have the federal investment and development occur there and not in the upper-income areas of the county.

Do you plan to make payment to those nearby who will be economically harmed? "Socioeconomics. Short-term and long-term beneficial effects to economy. Possible short-term adverse effects to property values." How are we supposed to recoup?

This conclusion that there are no significant socioeconomic impacts is based on the PEA, but the PEA does not have one piece of demographic information about the surrounding area. It's only on the state, county, and Louisville level.

We have concern for how to eliminate increased pedestrian traffic through our neighborhood or protect homeowners from added exposure to crime or trespassing that likely will result from influx of traffic to the VA facility.

The whole Brownsboro corridor should be included in the analysis because the impacts will be that widespread; increase in trade at food outlets will not compensate for the damage done.

Mitigations pertaining to socioeconomic and property values lack supporting backup data and analysis to conclude a FONSI.

Community Services

City staffing cuts will impact the fire department's capability – does VA have a specific fire contingency and how will this plan impact or prioritize fire services of the surrounding neighborhoods?

There is no motel near the Brownsboro Road location, but there is one near Zorn Ave. There are no restaurants, offsite medical office facilities, or other nearby existing full service hospitals to supplement VA capabilities.

Solid Waste and Hazardous Materials

According to the Congressmen Yarmuth -- we met with him, it was about two months ago, maybe three, and he disclosed that the existing site has a $25 million cleanup of Agent Orange on it. And we were surprised about that. Well, why didn't they take part of the $75 million that they've used for buying the site and doing all these plans and clean up the Agent Orange? I mean, isn't that a problem for our veterans up there? Isn't that a problem for the neighbors? So I'm not encouraged by this VA hospital being my new neighbor.

Transportation and Traffic

If this project involves closing the Northfield Drive exit to US 42, then I will oppose it as strongly as I can.

None of the stated road improvements are to be seen. Where are your flyovers or ramps to ease all this traffic? What's the environmental impact of those ramps and bridges that are not needed without your hospital?

How will construction workers access the site? Who is going to monitor to prevent them from cutting through Graymoor Devondale from Westport Road right into that back site? Where is the offsite construction contractor parking? I do not believe they will comply but will instead park in the neighborhoods.

What is the VA's shift change plan to not contribute to traffic issues in the area? Impacts to traffic are unacceptable. Further analysis of traffic impacts is needed. Mitigations pertaining to traffic lack supporting backup data and analysis to conclude a FONSI. The entire plan is retro, it is automobile-centric, it doesn't speak to any other kinds of access. There is no TARC or pedestrian access, not even a bike rack. To assume that for 30 years it will all be 3,000 automobiles is bad planning. The traffic study doesn't appear to address the issue of access by veterans and employees who rely upon public transportation. How will the homeless veterans get to the hospital?
Utilities
Will the power plant be a burden to the current power grid of Crossgate? Will all onsite utilities be underground? How will they impact the City? Existing sanitary sewers most likely are undersized to accept input from the proposed VA facility. Getting hospital-grade utilities installed will be a big mess. The residents on Carlimar Lane will not have a road for their use while the trunk line of the sewers is being installed. Getting hospital-grade utilities installed will be a big pricey. Who will pay for it?
General Comments on Impact Analysis
The EA uses the word "temporary or short-term" for construction impacts, but assuming the project is on time and on budget, it will take 6.5 years to complete. This is a long-term impact, not short-term. Six years of noise, dust, vibration is not temporary. The EA uses a "No Action" alternative for impact analysis which is an improper baseline and does not conform to NEPA guidelines. Has closing the clinics been taken into account in the impact analysis? I didn't hear anything related to compliance of vibration, noise, water runoff, the groundwater plan.
NEPA Process
An EIS is needed in accordance with VA's own NEPA regulations. Conduct more complete environmental impact studies, considering all relevant facts and impacts, before construction is started. An EIS will address all the items that the VA is dismissing. The website for the proposed VA hospital indicates that the next design phase begins on Jan. 20th. Yet, questions can be submitted on the Draft EA until Feb. 1. This seems to imply that the final decision has already been made. Who are the decisionmakers, where do they get their information, and to whom do they answer? Who answers the questions on the EA? You talked about no action. If I understand you correctly, you said the two choices are build here or no action. I don't understand that there were other sites available and other sites could be chosen.
Agency Coordination
What is the compliance plan for ensuring the work is done according to the specified details? We should be entitled to know the compliance plan or the lack thereof on a daily, weekly basis. So that we don't get to the end of this construction project only to find out, "Oh, that guy used the wrong kind of concrete, and he put the drain in the wrong place, and we have residents flooded." Local agencies' comments were not provided in this EA, but these agencies need to have their comments available sooner so the public can consider them before the Final EA. We are also are very concerned that our politicians locally, Representative Yarmuth, Mayor Fischer, Senator McConnell, Senator Rand Paul have not been at least outwardly involved in – in analyzing this for the veterans. If this project goes forward, I hope you will have the courtesy to work with local officials in our area.
Public Involvement
Questions sent to VA previously have not been answered. I don't think the VA or the consultants are listening to our legitimate concerns. Request that VA be more open, more transparent, and more detailed in their responses. Questions were not answered at the public meeting.

My previous comments on the PEA and on the Site-Specific EA continue to be inaccurately summarized and grossly minimized in the EA documents. It is unreasonable to say that we citizens must provide you with data. We are not engineers and cannot conduct our own studies. But our own concerns as citizens are significant and must be considered. Where can we see the EA with all the details for the analysis summarized in this handout? Has this been published anywhere? Why are you having a meeting that affects people outside the Watterson at the Clifton Center? Can the public have access to everything that was said here?
Out of Scope of NEPA Analysis
What will you do with the land if you don't move forward? Consider other non-hospital VA use of Brownsboro Site property such as a national cemetery. The cost of $900M is too high. I have not seen anything to justify this expense presented to the general public. Per PD guidelines, it does not promote efficient and economic use of the land because VA overpaid for the land at the beginning of the project. With so much news of other VA hospitals going over budget, do you know if the $900M budget for this one is correct? What would happen here if construction is halted like at Denver? The news on WAVE 3 they said this plan was approved 10 years ago. Where are the open records on that and why are we wasting money doing studies and looking at sites? How will you guarantee that work goes to the local skilled workforce that plays by the books, including for their subcontractors? What action can we take to stop this? Has the money been appropriated to build this VAMC? How will VA keep the public informed on construction progress and cost? What is the communication plan with local residents once this project starts? Would VA be interested in purchasing equipment from a particular company? What information was given to the physicians who said Brownsboro would be an acceptable location? Did they see the traffic in rush hour? How many physicians were surveyed? When? Who were they? There is no provision for giving homeless veterans a place to live.

All in-scope issues listed in this scoping summary are addressed in this EIS.

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Appendix D
Agency and Tribal Correspondence

- Farmland Conversion Impact Rating for Brownsboro Site, Parts IV and V completed by the Natural Resource Conservation Service, U.S. Department of Agriculture
- Kentucky Department of Fish and Wildlife Resources letter of April 19, 2011: listed species within one mile of the five sites evaluated in the programmatic EA
- U.S. Fish and Wildlife Service letter of May 31, 2011: listed species at five sites evaluated in programmatic EA
- U.S. Fish and Wildlife Service email of June 15, 2011: listed species at Brownsboro Site
- U.S. Fish and Wildlife Service email of December 3, 2015: comments on draft site-specific EA
- Kentucky Energy and Environment Cabinet letter of June 9, 2011: state agency scoping input for programmatic EA
- Louisville Metro Council letter of May 26, 2015: resolution calling for EIS
- Kentucky State Historic Preservation Office letter of April 8, 2015: determination that undertaking at Brownsboro Site will have no adverse effect on historic properties
- VA letters of February 23, 2015, to Delaware Nation, Miami Tribe of Oklahoma, Peoria Tribe, and Eastern Band of Cherokee Indians inviting comments on draft site-specific EA
- Peoria Tribe letter of March 11, 2015: no objection to proposed project at Brownsboro Site
- Delaware Nation email of May 18, 2015: no concerns for construction at Brownsboro Site

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U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request August 5, 2014
Name of Project New Robley Rex VAMC Campus	Federal Agency Involved Dept of Veterans Affairs
Proposed Land Use Institutional	County and State Jefferson County, Kentucky
PART II *(To be completed by NRCS)*	Date Request Received By NRCS Aug 8, 2014 / Person Completing Form: David Gehring

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐		Average Farm Size 60
Corn, Soybeans	Farmable Land In Govt. Jurisdiction Acres: 66794 % 27.3	Amount of Farmland As Defined in FPPA Acres: 53420 % 21.8	
		Date Land Evaluation Returned by NRCS Aug. 13, 2014	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	34.9			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	34.9			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	34.9			
B. Total Acres Statewide Important or Local Important Farmland	0			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.07%			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	13.6%			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	88			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	0			
2. Perimeter In Non-urban Use	(10)	0			
3. Percent Of Site Being Farmed	(20)	0			
4. Protection Provided By State and Local Government	(20)	0			
5. Distance From Urban Built-up Area	(15)	0			
6. Distance To Urban Support Services	(15)	0			
7. Size Of Present Farm Unit Compared To Average	(10)	2			
8. Creation Of Non-farmable Farmland	(10)	10			
9. Availability Of Farm Support Services	(5)	0			
10. On-Farm Investments	(20)	0			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	0			
TOTAL SITE ASSESSMENT POINTS	160	12	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	88	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	12	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	100	0	0	0

Site Selected: A	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☑

Reason For Selection:

Location for the VAMC campus meets the siting criteria for size, current zoning, accessible transportation, available utilities, proximity to local hospitals, and environmental constraints.

Name of Federal agency representative completing this form: Mary B. Peters	Date: 08/05/2014

(See Instructions on reverse side) **Form AD-1006 (03-02)**

KENTUCKY DEPARTMENT OF FISH & WILDLIFE RESOURCES
TOURISM, ARTS, AND HERITAGE CABINET

Steven L. Beshear
Governor

#1 Sportsman's Lane
Frankfort, Kentucky 40601
Phone (502) 564-3400
1-800-858-1549
Fax (502) 564-0506
fw.ky.gov

Marcheta Sparrow
Secretary

Dr. Jonathan W. Gassett
Commissioner

19 April 2011

TTL Associates, Inc.
44265 Plymouth Oak Boulevard
Plymouth, Michigan 48170
ATTN: Paul J. Jackson, Environmental Scientist

RE: Intergovernmental and Interagency Coordination of Environmental Planning for the:
Department of Veterans Affairs (VA)
Proposed VA Medical Center
25 or More Acres on One of Five Potential Sites
Louisville – Jefferson County, Kentucky

Dear Mr. Jackson:

The Kentucky Department of Fish and Wildlife Resources (KDFWR) has received your request for information regarding the subject project. The Kentucky Fish and Wildlife Information System indicates that the following federally and state-listed species are known to occur within one mile, as specified in the request letter, of the project sites:

Brownsboro Site: No listed species, however this site falls within known Indiana bat *(Myotis sodalis)* summer maternity habitat and is considered a sensitive area for this species. These sensitive areas require coordination with the US Fish and Wildlife Service Kentucky Field Office (502-695-0468) prior to construction. This species uses trees (dead, dying, or alive) as summer roosting habitat, with larger trees containing sloughing bark being the most suitable.

Fegenbush Site: State-endangered Louisville Crayfish *(Orconectes jeffersoni)* and Bousfield's Amphipod *(Gammarus bousfieldi)*. The Fern Creek flows within the boundaries of the project area, and any impacts to this stream must be addressed and permits obtained through the Kentucky Division of Water and the U.S. Army Corps of Engineers.

St. Joseph Site: No listed species, but impacts to streams and wetlands should be addressed if deemed necessary.

Downtown Site: Federally-protected Peregrine Falcon *(Falco peregrinus),* the state-endangered Great Egret *(Ardea alba),* and the state-threatened Kirtland's Snake *(Clonophis kirtlandii)* and Black-crowned Night Heron *(Nycticorax nycticorax)*

Existing (Robley Rex) VAMC Site: Louisville Crayfish, also within sensitive habitat for the Indiana bat.

Please be aware that our database system is a dynamic one that only represents our current knowledge of various species distributions. To minimize indirect impacts to aquatic resources, strict erosion control measures should be developed and implemented prior to construction to minimize siltation into streams and storm water drainage systems located within the project area. Such erosion control measures may include, but are not limited to silt fences, staked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures will need to be installed prior to construction and should be inspected and repaired regularly as needed.

I hope this information is helpful to you, and if you have questions or require additional information, please call me at (502) 564-7109 extension 4453.

Sincerely,

Dan Stoelb
Wildlife Biologist

Cc: Environmental Section File

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

May 31, 2011

Mr. Paul Jackson
Environmental Scientist
44265 Plymouth Oaks Boulevard
Plymouth, Michigan 48170

Re: FWS 2011-B-0610; TTL Associates, Inc., Proposed Department of Veterans Affairs (VA) Medical Center to be located within One of Five Potential Sites in Jefferson County, Kentucky

Dear Mr. Jackson:

The U.S. Fish and Wildlife Service (Service) has reviewed your correspondence of April 15, 2011 regarding the above-referenced project. The Service offers the following comments in accordance with the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). This is not a concurrence letter. Please read carefully, as further consultation with the Service may be required.

We understand that the VA is in the process of evaluating five potential sites for the construction and operation of a VA Medical Center (VAMC). All of the five sites that are under consideration are located within Jefferson County, Kentucky. The five sites are identified as the Brownsboro Site, Fegenbush Site, St. Joseph Site, Downtown Site, and the Exising (Robley Rex) VAMC Site.

In order to assist you in determining if the proposed project has the potential to impact protected species we have searched our records for occurrences of listed species within the vicinity of the proposed project. Based upon the information provided to us and according to our databases, we believe that the following federally listed species have the potential to occur within the project vicinity.

Common Name	Scientific Name	Federal Status
Indiana bat	*Myotis sodalis*	endangered
running buffalo clover	*Trifolium stoloniferum*	endangered
Kentucky glade cress	*Leavenworthia exigua var. lacinata*	candidate

We must advise you that collection records available to the Service may not be all-inclusive. Our database is a compilation of collection records made available by various individuals and resource agencies. This information is seldom based on comprehensive surveys of all potential habitats and thus does not necessarily provide conclusive evidence that protected species are present or absent at a specific locality.

Downtown Site

Aerial imagery of the Downtown Site indicates that this site does not contain habitat that coincides with the habitat that is required for any of the aforementioned species. Therefore, we believe that if the Downtown Site is the selected location for the proposed VAMC, the proposed project would not likely adversely affect federally listed species.

Indiana bat

Brownsboro Site and Existing Robley Rex Site

The Brownsboro Site and the Existing Robley Rex Site are situated within the home range of a known Indiana bat maternity colony. "Maternity habitat" refers to suitable summer habitat used by juveniles, and reproductive (pregnant, lactating, or post-lactating) females, and is an essential component of the Indiana bat's lifecycle. Female Indiana bats become pregnant in spring soon after they emerge from their hibernacula, which are usually caves, rockshelters, and mines. The pregnant females migrate to their maternity habitat, forming colonies of up to 100 or more individuals, and roost on "suitable roost trees". A "suitable roost tree" is any tree (live or dead) with a diameter- at- breast- height (DBH) of 5-inches or greater that exhibits any of the following characteristics: exfoliating bark, crevices or cracks. Trees with a DBH of 5-inches or greater and are not "suitable roost trees", as previously defined, still serve as foraging habitat for the Indiana bat. Each female in the colony gives birth to one pup per year. The young bats are nursed by the mother, who leaves the roost tree only to forage for food. The young stay with the maternity colony throughout their first summer.

Typically for a project of this nature, the Service would recommend seasonal tree clearing or the completion of a mist net survey before construction activities take place. Mist net surveys provide presence/absence information; however, we already know that the Indiana bats are present and that the project area falls within a maternity colony and a swarming range of a known hibernacula. We do not believe a survey is necessary for the proposed project. Also, seasonal tree clearing could result in indirect and/or cumulative effects to the bats utilizing this maternity colony and overlapping swarming range through changes to the landscape and the removal of potential foraging and roosting habitat while the bats are hibernating, so even seasonal removal of habitat is likely to result in significant or non-discountable effects to the Indiana bat. Due to these concerns, we cannot concur with a determination of not likely to adversely affect for the Indiana bat at this time.

In order to address these concerns and be in compliance with the ESA, we recommend one of the following options:

1) The project proponent can further modify the proposed project to eliminate impacts to Indiana bat habitat and thus avoid impacts;

2) The project proponent can request formal section 7 consultation through the lead Federal Action Agency associated with the proposed project; or

3) The project proponent may choose to enter into a Conservation Memorandum of Agreement (MOA) with the Service to account for the incidental take of Indiana bats. By entering into a Conservation MOA with the Service, Cooperators gain flexibility in project timing with regard to the removal of suitable Indiana bat habitat. In exchange for this flexibility, the Cooperator provides recovery-focused conservation benefits to the Indiana bat through the implementation of minimization and mitigation measures that are described in the Indiana Bat Mitigation Guidance for the Commonwealth of Kentucky. For additional information about this option, please notify our office.

Fegenbush Site and St. Joseph Site

The Fegenbush and St. Joseph Sites are situated within potential Indiana bat habitat. The aforementioned recommendations, regarding the Indiana bat, apply to these areas, except that the project proponent could remove trees in these areas in between the dates of October 15th through March 31st without additional mitigation.

Running Buffalo Clover

Existing Robley Rex Site, Fegenbush Site, and St. Joseph Site

Running buffalo clover may occur within the Existing Robley Rex Site, Fegenbush Site, and St. Joseph Sites. This plant species requires periodic, moderate disturbances to reduce competition and maintain open or semi-open habitat conditions. Disturbed areas such as old pastures, moderately grazed fields, road rights-of-way, and power line rights-of-way that are mechanically maintained are known to provide suitable habitat for these species. Additionally, running buffalo clover is known to occur in habitats ranging from stream banks and low mesic (moderately moist) forests to lawns and cemeteries. If the proposed project(s) require alteration of habitat that coincides with the habitat required for this species, an on-site inspection or survey of the area must be conducted to determine if the listed species is present or occurs seasonally. Prior to construction activities including tree clearing, a survey should be done by qualified personnel and be conducted during the appropriate time of day and/or year to ensure confidence in survey results. Please notify this office with the results of any surveys and an analysis of the "effects of the action," as defined by 50 CFR 402.02 on any listed species including consideration of direct, indirect, and cumulative effects.

A survey for running buffalo clover would not be necessary if sufficient site-specific information was available that showed that: (1) there is no potentially suitable habitat within the project area or its vicinity or (2) the species would not be present within the project area or its vicinity due to site-specific factors.

Kentucky glade cress

Fegenbush Site

Kentucky glade cress may occur within the Fegenbush Site. Kentucky glade cress is federally listed as a candidate species. This rare plant species in only known to occur in Bullitt County and Jefferson County, Kentucky. It grows in small depressions of exposed bedrock that are in

full sun on flat bedded outcrops of limestone in shallow soils of glades, rock outcrops, pastures and lawns. This habitat is sometimes present along ROWs. The Service requests that the VA voluntarily commit to ensuring that the proposed project does not impact potential or identified Kentucky glade cress habitat. The Service believes this measure would significantly contribute to the conservation and restoration of Kentucky glade cress; and, may prevent the species from becoming listed as endangered or threatened.

Kentucky glade cress is a federal candidate species, which means the Service has sufficient information on its biological status and threats to propose Kentucky glade cress as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species receive no statutory protection under the ESA. The Service encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA.

Addressing the needs of Kentucky glade cress before the regulatory requirements associated with a listed threatened or endangered species come into play, would allow the VA, landowners, and other entities greater management flexibility to stabilize or restore the species and its habitat for future projects. In addition, as such threats are reduced and populations are increased or stabilized, priority for listing can be shifted to those species in greatest need of the ESA's protective measures. Ideally, sufficient threats can be removed to eliminate the need for listing.

Thank you again for your request. Your concern for the protection of endangered and threatened species is greatly appreciated. If you have any questions regarding the information that we have provided, please contact James Gruhala at (502) 695-0468 extension 116.

Sincerely,

Virgil Lee Andrews

Virgil Lee Andrews, Jr.
Field Supervisor

Stacey Creighton

From: James_Gruhala@fws.gov
Sent: Wednesday, June 15, 2011 6:22 PM
To: Stacey Creighton
Subject: Re: FWS 2011-B-0660; Blue Equity, LLC., Property at 4906 Browsboro Road, Louisville, Kentucky

Ms. Stacey Creighton
Assistant to the Chairman
Blue Equity, LLC
333 East main Street, Suite 200
Louisville, Kentucky 40201

Dear Ms. Creighton:

Please accept this correspondence and maintain for your records as the U.S. Fish and Wildlife Service's (Service) official response to your June 15, 2011 correspondence, regarding the above-referenced property that is located at 4906 Brownsboro Road, Louisville, Kentucky. It is our understanding that Blue Equity, LLC is currently considering selling or leasing the property for development. The Service offers the following comments in accordance with the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

In order to assist you in determining if a proposed project that would occur at the subject property has the potential to impact federally protected species we have searched our records for occurrences of listed species within the vicinity of the proposed project. Based upon the information provided to us and according to our databases, we believe that the federally endangered Indiana bat (*Myotis sodalis*) is the only federally listed species that has the potential to occur within the vicinity of the subject property.

Indiana bat

The subject property is within the home range of a known Indiana bat maternity colony. "Maternity habitat" refers to suitable summer habitat used by juveniles, and reproductive (pregnant, lactating, or post-lacting) females, and is an essential component of the Indiana bat's lifecycle. Female Indiana bats become pregnant in spring soon after they emerge from their hibernacula, which is usually caves, rockshelters, and mines. The pregnant females migrate to their maternity habitat, forming colonies of up to 100 or more individuals, and roost on "suitable roost trees". A "suitable roost tree" is any tree (live or dead) with a diameter- at- breast-height (DBH) of 5-inches or greater that exhibits any of the following characteristics: exfoliating bark, crevices or cracks. Trees with a DBH of 5-inches or greater and are not "suitable roost trees", as previously defined, still serve as foraging habitat for the Indiana bat. Each female in the colony gives birth to one pup per year. The young bats are nursed by the mother, who leaves the roost tree only to forage for food. The young stay with the maternity colony throughout their first summer.

Aerial imagery indicates that the subject property is a perviously cleared field that does not contain "suitable roost trees", as defined above for Indiana bats.. Additionally, the property is adjacent to a highway and surrounded by development. Based on the lack of "suitable roost trees" and due to the property's proximity to urban development, we believe that future development at this property would not likely adversely affect the Indiana bat.

Please contact me if you have need any further assistance. Refer to project number FWS 2011-B-0660.

Sincerely,

James Gruhala
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
KY Ecological Services Field Office
330 West Broadway, Room 265
Frankfort, KY 40601

(502) 695 0468 ext. 116

From: Allison, Carrie [mailto:carrie_allison@fws.gov]
Sent: Thursday, December 03, 2015 06:10 AM
To: Louisville Replacement Hospital Comments
Subject: [EXTERNAL] FWS 2016-B-0059; Comments on the DRAFT EA

To Whom It May Concern:

The U.S. Fish and Wildlife Service Kentucky Field Office (KFO) has reviewed the draft Environmental Assessment for the Robley Rex Veterans Affairs Medical Center in Louisville, Kentucky. Potential impacts to federally listed species were addressed during technical assistance and informal consultation with our office in 2011 and it was determined that no suitable habitat for threatened or endangered species was present within the project area.

However, since 2011, the Northern long-eared bat (NLEB) has been listed as a federally threatened species. Based on site-specific information,it appears there is no potential winter habitat within the project area. However, the draft EA does mention that there are a few remaining trees within the project area. These trees could be suitable as NLEB maternity roost trees. NLEB roost trees typically contain peeling bark and/or cavities, similar to roost trees used by the Indiana bat, but can be as small as 3" diameter at breast height.

Therefore, before finalizing the EA, we recommend that the potential for NLEB to be using the site be addressed. We have no additional comments or concerns regarding federally listed species and believe that the draft EA adequately addresses the Indiana bat, running buffalo clover, and Kentucky glade cress.

If you have any questions, please contact me at your earliest convenience.

Carrie L. Allison
U.S. Fish and Wildlife Service
330 W. Broadway, Rm. 265
Frankfort, KY 40601
502-695-0468 ext. 103
"Though for emotional or aesthetic reasons we may lament the loss of large charismatic species, such as tigers, rhinos, and pandas, we now know that loss of animals, from the largest elephant to the smallest beetle, will also fundamentally alter the form and function of the ecosystems upon which we all depend." ~ Rodolfo Dirzo

ENERGY AND ENVIRONMENT CABINET

Steven L. Beshear
Governor

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
300 FAIR OAKS LANE
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-2150
FAX (502) 564-4245
www.dep.ky.gov

Leonard K. Peters
Secretary

R. Bruce Scott
Commissioner

June 9, 2011

TTL Associates, Inc.
44265 Plymouth Oaks Boulevard
Plymouth, MI 48170
ATTN: Paul J. Jackson, Environmental Scientist

Re: Intergovernmental and Interagency Coordination of Environmental Planning for Proposed VA Medical Center Louisville-Jefferson County, KY. (SERO 2011-16)

Dear Mr. Jackson,

The Energy and Environment Cabinet serves as the state clearinghouse for review of environmental documents generated pursuant to the National Environmental Policy Act (NEPA). Within the Cabinet, the Commissioner's Office in the Department for Environmental Protection coordinates the review for Kentucky state agencies.

We received your April 15, 2011 letter requesting our input in the NEPA process as you begin the Environmental Assessment development for the new Proposed VA Medical Center. The document was sent to the Division of Water, Division of Waste Management, Division for Air Quality, and State Nature Preserves Commission. The attached comments were provided by the Division for Air Quality, the Division of Waste Management, and Division of Water. The Nature Preserves Commission had no comment.

If you have any questions, please contact me at (502) 564-2150, ext. 112.

Sincerely,

Larry Taylor

Larry C. Taylor
State Environmental Review Officer

ATTACHMENT

KentuckyUnbridledSpirit.com
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Division of Water Comments

Intergovernmental and Interagency Coordination of Environmental Planning for Proposed VA Medical Center Louisville-Jefferson County, KY

Endorsement:

A request for review of the Jefferson County; Intergovernmental and Interagency Coordination of Environmental Planning for Proposed VA Medical Center Louisville-Jefferson County, KY was received on May 5, 2011. The Division of Water (DOW) completed this review and has provided the following comments.

Compliance & Technical Assistance Branch: No comments

Water Quality Branch: Proposal #4 would be the preferred location for the new hospital because all of the project area is already developed. Proposal #5 would be the second preference. As with any other project, best management practices shall be used to reduce runoff from the project into adjacent surface waters.

Watershed Management: Any construction taking place in the floodplain will require a "Stream Construction Permit" issued by the Division of Water.

Any wells located on any of the properties will need to be properly abandoned by a Kentucky Certified Well Driller. Contractors will need to have a Groundwater Protection Plan if they their activities are included in the covered activities from the Groundwater Protection Plan regulation. If an emergency back-up water supply well is to be drilled, a Kentucky Certified Water Well Driller must be used to perform the work.

Enforcement Branch: The Division of Enforcement does not object to the project proposed by the applicant.

Division of Waste Management Comments

Project Number: SERO 2011-6

Comments will be made when the site is selected.

Division for Air Quality Comments

DAQ Comments: Construction of VA Medical Center in Louisville – Jefferson County (SERO 2011-16)

Kentucky Division for Air Quality Regulation **401 KAR 63:010** Fugitive Emissions states that no person shall cause, suffer, or allow any material to be handled, processed, transported, or stored without taking reasonable precaution to prevent particulate matter from becoming airborne. Additional requirements include the covering of open bodied trucks, operating outside the work area transporting materials likely to become airborne, and that no one shall allow earth or other material being transported by truck or earth moving equipment to be deposited onto a paved street or roadway. Please note the Fugitive Emissions Fact Sheet located at http://air.ky.gov/Pages/OpenBurning.aspx

Kentucky Division for Air Quality Regulation **401 KAR 63:005** states that open burning is prohibited. Open Burning is defined as the burning of any matter in such a manner that the products of combustion resulting from the burning are emitted directly into the outdoor atmosphere without passing through a stack or chimney. However, open burning may be utilized for the expressed purposes listed on the Open Burning Brochure located at http://air.ky.gov/Pages/OpenBurning.aspx

Also, for any proposal that involves the renovation or demolition of an existing structure,

Kentucky Division for Air Quality Regulation **401 KAR 58:025**, Asbestos Standards, apply to this project, and the project must be inspected by a Kentucky Accredited Asbestos Inspector. Asbestos that will be affected by this activity must be removed by a Kentucky accredited contractor before renovation or demolition begins. Written notification must be given on form DEP 7036 to the Louisville Metro Air Pollution Control District at least 10 weekdays prior the start of demolitions, whether or not asbestos has been identified to be present. Please note form DEP 7036 and the Asbestos Fact Sheet located at http://air.ky.gov/Pages/OpenBurning.aspx

The Division also suggests an investigation into compliance with applicable local government regulations.

LOUISVILLE METRO COUNCIL
CLERK'S OFFICE

May 26, 2015

Robley Rex VAMC
Attn: Laura Schafsnitz
800 Zorn Avenue
Louisville, KY 40206

Dear Ms. Schafsnitz:

On behalf of the Louisville Metro Council I am forwarding to your attention a copy of Resolution No. 039, Series 2015, which was adopted at a meeting of the Council held on March 26, 2015.

The title of the Resolution reads as follows:

A RESOLUTION SUPPORTING AN ENVIRONMENTAL IMPACT STATEMENT FOR THE NEW LOUISVILLE VETERANS AFFAIRS MEDICAL CENTER

Section I of the Resolution reads:

"The Louisville Metro Council, by this Resolution, is requesting a complete and thorough Environmental Impact Statement which shall include current and projected traffic data by the U.S. Department of Veterans Affairs."

Your attention to this matter is greatly appreciated.

Sincerely,

H. Stephen Ott, CKMC
Clerk of the Louisville Metro Council
601 West Jefferson Street
Louisville, KY 40202

Enclosure: Resolution 039, Series 2015

Cc: Council Members Leet, Johnson, Owen, Blackwell, Aubrey Welch, Peden, Downard, Kramer, Parker, Benson, Denton, Fowler, Engel, Magre, James, Hollander, Green, Shanklin, Woolridge, Bryant Hamilton, Butler, Stuckel, Flood, Yates, Ackerson and President Tandy

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601 WEST JEFFERSON STREET • 502.574.3902 • LOUISVILLE, KENTUCKY 40202

RESOLUTION NO. 039, SERIES 2015

A RESOLUTION SUPPORTING AN ENVIRONMENTAL IMPACT STATEMENT FOR THE NEW LOUISVILLE VETERANS AFFAIRS MEDICAL CENTER (AMENDED BY SUBSTITUTION)

Sponsored by: Council Members Leet, Johnson, Owen, Blackwell, Aubrey Welch, Peden, Downard, Kramer, Parker, Benson, Denton, Fowler, Engel, Magre, James, Hollander, Green, Shanklin, Woolridge, Bryant Hamilton, Butler, Stuckel, Flood, Yates, Ackerson and President Tandy

WHEREAS there are approximately 57,000 veterans living in Jefferson County and a total of 366,000 veterans living in the Commonwealth of Kentucky that are served by the regional Robley Rex Veterans Affairs Medical Center, which is currently located on Zorn Avenue; and

WHEREAS, veterans of the United State Armed Forces deserve a world class hospital because many have returned after suffering service-related injuries or with mental health issues; and

WHEREAS, the Louisville Metro Council requests the U.S. Department of Veterans Affairs conduct a full Environmental Impact Statement as required by federal law; and

WHEREAS, the Environmental Impact Statement is a necessity and should include a detailed analysis of current and accurate traffic data to properly estimate the impact of the new Veterans Affairs Medical Center on the surrounding environment; and

WHEREAS, the traffic analysis should be done in a detailed and transparent process using experts with demonstrated expertise in traffic analysis in the Louisville area.

NOW THEREFORE, BE IT RESOLVED BY THE LEGISLATIVE COUNCIL OF THE LOUISVILLE/JEFFERSON COUNTY METRO GOVERNMENT (THE COUNCIL) AS FOLLOWS:

SECTION I: The Louisville Metro Council, by this Resolution, is requesting a complete and thorough Environmental Impact Statement which shall include current and projected traffic data by the U.S. Department of Veterans Affairs.

SECTION II: This Resolution shall take effect upon its passage and approval.

H. Stephen Ott
Metro Council Clerk

David W. Tandy
President of the Council

Greg Fischer
Mayor

4/13/15
Approval Date

APPROVED AS TO FORM AND LEGALITY

Michael J. O'Connell
Jefferson County Attorney

BY: _____

LOUISVILLE METRO COUNCIL
ADOPTED
March 26, 2015

R-065-15 COMM AMEND SUB SUPPORT VA HOSPITAL DOWNTOWN 040215

STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

BOB STEWART
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

CRAIG A. POTTS
EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

April, 8, 2015

Christine M. Modovsky
Labat Environmental, Inc.
1406 Fort Crook Road South, Suite 101
Bellevue, NE 68005

Re: A Cultural Historic Resource Survey for the Proposed Brownsboro Road Veterans Affairs Medical Center in Louisville, Jefferson County, Kentucky

Dear Ms. Modovsky:

The Kentucky Heritage Council, State Historic Preservation Office, has received for review and comment the above referenced cultural historic resource survey for the proposed Brownsboro Road Veterans Affairs Medical Center completed by Cultural Resource Analysts, Inc.

The report authors identified two previously surveyed sites (JF 487 and 394), eight previously undocumented sites (JF 2761-2768), and five previously undocumented neighborhoods (JF 028-032) within the APE. In addition, four NRHP/NHL properties within the larger vicinity of the project were identified at the request of the Louisville Metro Historic Preservation Officer (JF 395, 527, 528, and 593).

We are in agreement with each of the report authors recommendations save one. With additional research, Site 3 (JF 487) may be found to have National Register eligibility. Based on the location of Site 3 in relation to the proposed project however, there will be no potential for effect. It is therefore the determination of this office that the undertaking will have No Adverse Effect on Historic Properties.

Thank you for coordinating with this office. Should you have any questions please feel free to contact me at 502-564-7005.

Sincerely,

Craig A. Potts
Executive Director and
State Historic Preservation Officer

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction and Facilities Management
Washington DC 20420

February 23, 2015

Kerry Holton, President
Delaware Nation, Oklahoma
P.O. Box 825
Anadarko, OK 73005

Dear Mr. Holton:

The United States Department of Veterans Affairs (VA) is providing the enclosed *Draft Site-Specific Environmental Assessment: Proposed Replacement VA Medical Center Campus, Louisville, Kentucky* for the Delaware Nation's review and comment.

This site-specific environmental assessment (EA) identifies, analyzes, and documents the potential physical, environmental, cultural, and socioeconomic effects associated with constructing and operating the proposed new Robley Rex VA Medical Center (VAMC) campus, which would include a regional Veterans Benefits Administration office. The new campus would be located at 4906 Brownsboro Road in Louisville, Jefferson County, Kentucky, southeast of the intersection of the Watterson Expressway (I-264) and Brownsboro Road. A programmatic EA completed in June 2012 concluded there would be no significant impacts from selecting the Brownsboro Road site for the location of this Proposed Action.

Two alternatives are analyzed in this site-specific EA: VA's Proposed Action to construct and operate the replacement campus at 4906 Brownsboro Road, and the No Action Alternative of not constructing and operating a replacement VAMC at the Brownsboro Road site, but continuing operations at the existing Louisville VAMC. VA intends to issue a "Finding of No Significant Impact" following the public review period, providing there are no substantive comments that warrant further evaluation.

Comments may be submitted to LouisvilleReplacementHospitalComments@va.gov or Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206. The favor of providing any reply within 30 days is requested.

If you have any questions, please contact me at (224) 610-3817 or George.Odorizzi@va.gov.

Sincerely,

George Odorizzi, PE, CCM
Project Manager

Enclosure: CD with Draft Site-Specific EA

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction and Facilities Management
Washington DC 20420

February 23, 2015

Thomas E. Gamble, Chairperson
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355-1326

Dear Mr. Gamble:

The United States Department of Veterans Affairs (VA) is providing the enclosed *Draft Site-Specific Environmental Assessment: Proposed Replacement VA Medical Center Campus, Louisville, Kentucky* for the Miami Tribe of Oklahoma's review and comment.

This site-specific environmental assessment (EA) identifies, analyzes, and documents the potential physical, environmental, cultural, and socioeconomic effects associated with constructing and operating the proposed new Robley Rex VA Medical Center (VAMC) campus, which would include a regional Veterans Benefits Administration office. The new campus would be located at 4906 Brownsboro Road in Louisville, Jefferson County, Kentucky, southeast of the intersection of the Watterson Expressway (I-264) and Brownsboro Road. A programmatic EA completed in June 2012 concluded there would be no significant impacts from selecting the Brownsboro Road site for the location of this Proposed Action.

Two alternatives are analyzed in this site-specific EA: VA's Proposed Action to construct and operate the replacement campus at 4906 Brownsboro Road, and the No Action Alternative of not constructing and operating a replacement VAMC at the Brownsboro Road site, but continuing operations at the existing Louisville VAMC. VA intends to issue a "Finding of No Significant Impact" following the public review period, providing there are no substantive comments that warrant further evaluation.

Comments may be submitted to LouisvilleReplacementHospitalComments@va.gov or Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206. The favor of providing any reply within 30 days is requested.

If you have any questions, please contact me at (224) 610-3817 or George.Odorizzi@va.gov.

Sincerely,

George Odorizzi, PE, CCM
Project Manager

Enclosure: CD with Draft Site-Specific EA

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction and Facilities Management
Washington DC 20420

February 23, 2015

John P. Froman , Chief
Peoria Tribe of Indians of Oklahoma
P.O. Box 1527
Miami, OK 74355-1527

Dear Mr. Froman:

The United States Department of Veterans Affairs (VA) is providing the enclosed *Draft Site-Specific Environmental Assessment: Proposed Replacement VA Medical Center Campus, Louisville, Kentucky* for the Peoria Tribe of Indians of Oklahoma's review and comment.

This site-specific environmental assessment (EA) identifies, analyzes, and documents the potential physical, environmental, cultural, and socioeconomic effects associated with constructing and operating the proposed new Robley Rex VA Medical Center (VAMC) campus, which would include a regional Veterans Benefits Administration office. The new campus would be located at 4906 Brownsboro Road in Louisville, Jefferson County, Kentucky, southeast of the intersection of the Watterson Expressway (I-264) and Brownsboro Road. A programmatic EA completed in June 2012 concluded there would be no significant impacts from selecting the Brownsboro Road site for the location of this Proposed Action.

Two alternatives are analyzed in this site-specific EA: VA's Proposed Action to construct and operate the replacement campus at 4906 Brownsboro Road, and the No Action Alternative of not constructing and operating a replacement VAMC at the Brownsboro Road site, but continuing operations at the existing Louisville VAMC. VA intends to issue a "Finding of No Significant Impact" following the public review period, providing there are no substantive comments that warrant further evaluation.

Comments may be submitted to LouisvilleReplacementHospitalComments@va.gov or Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206. The favor of providing any reply within 30 days is requested.

If you have any questions, please contact me at (224) 610-3817 or George.Odorizzi@va.gov.

Sincerely,

George Odorizzi, PE, CCM
Project Manager

Enclosure: CD with Draft Site-Specific EA

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction and Facilities Management
Washington DC 20420

February 23, 2015

Michell Hicks, Principal Chief
Eastern Band of Cherokee Indians
Qualla Boundary, P.O. Box 455
Cherokee, NC 28719

Dear Mr. Hicks:

The United States Department of Veterans Affairs (VA) is providing the enclosed *Draft Site-Specific Environmental Assessment: Proposed Replacement VA Medical Center Campus, Louisville, Kentucky* for the Eastern Band of Cherokee Indian's review and comment.

This site-specific environmental assessment (EA) identifies, analyzes, and documents the potential physical, environmental, cultural, and socioeconomic effects associated with constructing and operating the proposed new Robley Rex VA Medical Center (VAMC) campus, which would include a regional Veterans Benefits Administration office. The new campus would be located at 4906 Brownsboro Road in Louisville, Jefferson County, Kentucky, southeast of the intersection of the Watterson Expressway (I-264) and Brownsboro Road. A programmatic EA completed in June 2012 concluded there would be no significant impacts from selecting the Brownsboro Road site for the location of this Proposed Action.

Two alternatives are analyzed in this site-specific EA: VA's Proposed Action to construct and operate the replacement campus at 4906 Brownsboro Road, and the No Action Alternative of not constructing and operating a replacement VAMC at the Brownsboro Road site, but continuing operations at the existing Louisville VAMC. VA intends to issue a "Finding of No Significant Impact" following the public review period, providing there are no substantive comments that warrant further evaluation.

Comments may be submitted to LouisvilleReplacementHospitalComments@va.gov or Robley Rex VAMC, Attn: Replacement VAMC Activation Team Office, 800 Zorn Avenue, Louisville, KY 40206. The favor of providing any reply within 30 days is requested.

If you have any questions, please contact me at (224) 610-3817 or George.Odorizzi@va.gov.

Sincerely,

George Odorizzi, PE, CCM
Project Manager

Enclosure: CD with Draft Site-Specific EA

PEORIA TRIBE OF INDIANS OF OKLAHOMA
118 S. Eight Tribes Trail (918) 540-2535 FAX (918) 540-2538
P.O. Box 1527
MIAMI, OKLAHOMA 74355

CHIEF
John P. Froman

SECOND CHIEF
Jason Dollarhide

March 11, 2015

George Odorizzi, PE, CCM
Project Manager
Department of Veterans Affairs
Office of Construction and Facilities Management
Washington, DC 20420

Re: Proposed Replacement VA Medical Center Campus, Louisville, Jefferson County, Kentucky

Thank you for providing notice of the referenced project. The Peoria Tribe of Indians of Oklahoma is unaware of any documentation directly linking Indian Religious Sites to the proposed project location. There appear to be no objects of cultural significance or artifacts linked to our tribe located in or near the project location.

The Peoria Tribe of Indians of Oklahoma is unaware of items covered under NAGPRA (Native American Graves Protection and Repatriation Act) to be associated with the proposed project site. These items include: funerary or sacred objects; objects of cultural patrimony; or ancestral human remains.

The Peoria Tribe has no objection at this time to the proposed project. If, however, at any time items are discovered which fall under the protection of NAGPRA, the Peoria Tribe requests immediate notification and consultation. In addition state, local and tribal authorities should be advised as to the findings and construction halted until consultation with all concerned parties has occurred.

Thank you,

Cynthia Stacy
Special Projects Manager/NAGPRA

TREASURER
Aaron Wayne Blalock

SECRETARY
Tonya Mathews

FIRST COUNCILMAN
Carolyn Ritchey

SECOND COUNCILMAN
Craig Harper

THIRD COUNCILMAN
Alan Goforth

From: Nekole Alligood [mailto:NAlligood@delawarenation.com]
Sent: Monday, May 18, 2015 2:24 PM
To: Odorizzi, George (CFM)
Cc: Corey Smith
Subject: [EXTERNAL] EA for proposed replacement of VA Medical Center Campus, Louisville, KY

Good afternoon, Mr. Odorizzi, I would like to apologize for getting in touch with you beyond the 30 day review period; I have fallen behind in my reviews.

A formal letter will be sent, but in the meantime I have reviewed the CD included with your letter and find no concerns for the construction of the proposed new VA facility. Considering its proximity to an already developed area, it seems potential for prehistoric or historic findings are minimal although should it occur, construction must be immediately stopped and the proper state entities notified as well as the tribes with historic oversight for the area.

Best regards,
Nekole Alligood

Nekole Alligood
Director of Cultural Preservation
Delaware Nation
31064 HWY 281
PO Box 281
Anadarko, OK 73005
Phone: 405-247-2448
Fax: 405-247-8905