Table F: Auto Ownership by Percentage

Tract	Zero Car Households	1 vehicle	2 vehicles	3 vehicles	4 vehicles	5 or more vehicles
27	21.77%	44.62%	26.48%	4.23%	2.90%	0.00%
28	24.11%	48.60%	19.81%	6.36%	1.12%	0.00%
29	18.01%	52.89%	23.96%	4.58%	0.56%	0.00%
61	14.92%	46.15%	30.58%	6.75%	1.22%	0.38%
64	28.28%	40.06%	21.63%	10.03%	0.00%	0.00%
70	15.58%	43.13%	31.83%	8.46%	1.01%	0.00%
71	18.52%	42.77%	32.05%	5.72%	0.94%	0.00%
72	14.57%	56.36%	23.10%	4.98%	1.00%	0.00%
73	10.14%	45.98%	32.50%	7.31%	2.61%	1.46%
74	27.97%	40.89%	23.85%	4.94%	1.53%	0.82%
77	47.22%	35.84%	15.46%	0.91%	0.56%	0.00%
78	29.22%	43.69%	21.15%	4.77%	0.66%	0.51%
85.02	50.95%	40.34%	5.70%	3.02%	0.00%	0.00%
257	19.32%	46.28%	27.71%	5.56%	1.13%	0.00%
258	15.42%	37.26%	34.41%	8.22%	2.71%	1.98%
Median	23.73%	44.32%	24.68%	5.82%	1.20%	0.34%
City of Cincinnati	23.37%	43.97%	24.39%	6.19%	1.45%	0.62%
Hamilton County	13.50%	36.92%	34.77%	10.82%	2.92%	1.06%
Cincinnati-Hamilton CMSA	9.60%	32.34%	39.22%	13.60%	3.78%	1.46%

Source: US Census (www.census.gov), 2000.

The predominant mode of travel to the workplace is the automobile. Table G displays the commuting patterns within the I-75 Mill Creek Expressway Study Area. Carpooling and transit numbers are slightly higher in the study area Census Tracts and the City of Cincinnati versus the county and CMSA numbers. Mean travel time to work was also included in this table and shows that travel times are approximately equal throughout the study area, City of Cincinnati, Hamilton County and Cincinnati/Hamilton CMSA, regardless of mode.

Table G: Commuting Patterns by Percentage

Tract	Drive Alone	Carpooled	Public Transportation	Other Means	Work at Home	Mean Travel Time to Work (minutes)
27	59.82%	12.70%	7.27%	18.82%	1.39%	20.4
28	53.55%	29.62%	3.79%	12.09%	0.95%	24.9
29	57.26%	13.54%	5.73%	19.35%	4.11%	22.1
61	71.52%	17.62%	4.57%	5.33%	0.95%	21.3
64	72.64%	11.67%	12.21%	1.98%	1.50%	23.0
70	65.97%	10.50%	8.82%	11.48%	3.22%	21.1
71	72.20%	8.14%	6.99%	8.14%	4.52%	19.0
72	72.30%	8.38%	5.33%	12.74%	1.25%	20.7
73	65.80%	15.00%	11.90%	4.44%	2.85%	23.8
74	53.12%	17.79%	16.14%	10.48%	2.47%	24.4
77	55.60%	9.27%	30.32%	3.97%	0.84%	30.2
78	59.14%	14.90%	17.42%	6.36%	2.19%	27.0
85.02	48.08%	16.67%	30.65%	4.60%	0.00%	33.2
257	66.36%	19.13%	3.88%	8.87%	1.76%	21.6
258	81.05%	8.17%	3.89%	5.55%	1.35%	20.2
Median	63.63%	14.21%	11.26%	8.95%	1.96%	23.5
City of Cincinnati	69.53%	11.41%	10.08%	6.30%	2.63%	24.5
Hamilton County	78.87%	9.72%	5.01%	3.54%	2.82%	24.4
Cincinnati-Hamilton CMSA	81.37%	10.02%	2.93%	2.89%	2.73%	25.8

Source: US Census (www.census.gov), 2000.

Conclusions. The information presented above is meant to generally characterize the existing socioeconomic conditions within the I-75 Mill Creek Expressway Study Area. By utilizing U.S. Census Bureau data, comparisons and discrepancies can be established in relation to larger areas. In this case, comparing the study area Census Tracts with the City of Cincinnati, Hamilton County and the Cincinnati/Hamilton CMSA is possible. From those comparisons, conclusions can be drawn that the project area is losing population compared to the region and that will directly affect employment now and into the future. In addition, because of the higher numbers of minority persons, people living below the poverty level and those with disabilities, the Project Team needs to weigh possible alternatives verses the affects they could have on these disadvantaged populations.

4.0 Affected Environment

Existing databases and mapping resources were reviewed for cultural and ecological resources, hazardous materials, noise and air quality and Section 4(f) sites within the I-75 Mill Creek Expressway Study Area.

The majority of the information that follows was obtained from the Cincinnati Area Geographical Information System (CAGIS) mapping and data. Additional studies will be conducted in Step 5 once the alternatives have been identified.

Cultural Resources. The initial Red Flag Summary research at the Ohio Historical Preservation Office identified numerous cultural and historical resources within the study area. The red flag mapping is included in Figures D-1 through D-12. A total of 59 historic properties are present (eligible or listed within the National Register of Historic Places). Of that total, eight have been razed, five are NRHP listed, three are NRHP eligible (one of which has been razed). In addition, there a several historic districts for which NRHP criteria have not been applied.

The I-75 Mill Creek Expressway also includes eleven parks, recreational areas and playgrounds. Four noteworthy cemeteries, St. John's Cemetery, Wesleyan Cemetery, Vine Street Hill Cemetery and Spring Grove Cemetery are partially or totally included in the study area. Also of note is the Western Hills Viaduct, a historic bridge (SFN# 3137082) that spans the Mill Creek Valley and connects the Clifton and South Fairmount neighborhoods of Cincinnati.

Ecological Resources. As a part of the Red Flag Summary, ecological research was initiated using the Cincinnati Area GIS (CAGIS) Mapping, numerous site visits and reference materials from the Mill Creek Conservancy District (www.millcreekwatershed.org), which oversees the predominant ecological resource within the study area.

Upon reviewing the National Wetland Inventory mapping, fifteen areas designated as wetlands occur within the I-75 Mill Creek Expressway study area. Verification and classification will occur in Step 5 of the Project Development Process (PDP). The Mill Creek is the major river within the study area and its channelized and unchannelized sections parallel the I-75 mainline. In addition, five smaller drainages are located within the study area.

Threatened and Endangered Species and/or habitats located within the study area include; Deam's three-seeded mercury, maypop, Kirtland's snake, Indiana bat, bald eagle, sheepnose mussel, running buffalo clover and 19 other threatened or endangered plants within Hamilton County.

Hazardous Materials. As a part of the Red Flag Summary, a hazardous property search was initiated using the Cincinnati Area GIS (CAGIS) Mapping. Within the study area, the CAGIS data indicated at least 34 hazardous sites plus 158 underground storage tanks. An Environmental Site Assessment (ESA) Screening will be completed to determine the presence of additional hazardous sites within the project area. The ESA screening will identify sites and determine those parcels that will be studied in the Phase I ESA. A site visit will be conducted to support the source information.

Noise Quality. The purpose of Part 772 of the Code of Federal Regulations (CFR) is to provide procedures for noise studies and noise abatement measures in order to help protect the public health and welfare, to supply noise abatement criteria and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 of the United States Codes (USC) (23 CFR 772.1). The noise analysis for this project will be conducted in accordance with the Federal Highway Administration (FHWA) Federal Aid Policy Guide, Subchapter H, Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* and the Ohio Department of Transportation (ODOT) guidelines contained in its *Analysis and Abatement of Highway Traffic Noise* document dated October 22, 2001.

Preliminary noise research during the red flag field review and review of existing mapping indicate that there are potential "Activity Category B" noise sensitive land uses present in the study area. Noise sensitive land uses in "Activity Category B" are described as *picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals*. Several of these land uses were identified within the 400-foot boundary used for conducting noise analyses.

Air Quality. Part 81 of the CFR provides procedures on air quality matters, which affect the public health and welfare and environmental quality of the natural and built habitat. The 1990 Clean Air Act is the cornerstone of these procedures and enforced by the U.S. Environmental Protection Agency (USEPA). Ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter and lead are the six pollutant defined as indicators of air quality by the USEPA. Threshold concentrations are established for these pollutants and designated as National Ambient Air Quality Standards (NAAQS).

USEPA air quality designations are categorized by area as: non-attainment, attainment or unclassifiable. When an area does not meet the air quality it is designated as a non-attainment area. The 1-Hour Ozone Standard and the new 8-Hour Ozone Standard require monitoring of pollutant concentration being released into the atmosphere. The USEPA designates Hamilton County as a non-attainment area for the 1-Hour Ozone Standard from 1992 to the present. Hamilton County is also in non-attainment for the new 8-Hour Ozone Standard for 2004.

The OEPA/ODOT agreement states that a quantitative CO analysis is recommended for projects that modify existing facilities that cause an increase in Average Daily Traffic of more than 10,000 vehicles between project completion and ten years hence. Based on preliminary traffic numbers, it appears that the ten-year traffic increase will exceed the 10,000-vehicle maximum. As a result, it is anticipated that a quantitative CO analysis will be required.

Section 4(f). Section 4(f) refers to consideration of property that is publicly owned parks and recreational lands, wildlife and waterfowl reserves and historic properties. From the initial Red Flag review, project area mapping and site visits, Section 4(f) areas were identified. From the CAGIS mapping eleven parks, recreational areas and playgrounds were identified. Should any of these areas be impacted, the Section

4(f) process will be used to ensure that no feasible and prudent alternative to the use of the land exists and that the action includes all possible planning to minimize harm to the property.

Conclusions. The information presented above is meant to generally characterize the existing conditions within the I-75 Mill Creek Expressway Study Area with respect to secondary sources. The resources were identified during preliminary research for completion of the Red Flag Summary Report and should not be considered exhaustive. Field identification and verification studies will be conducted in later steps of the project development process and will provide more exact qualitative and quantitative data necessary for preparation of environmental documents.

5.0 Geotechnical Studies

The I-75 Mill Creek Expressway study area lies within the Outer Bluegrass Region (Physiographic Regions of Ohio, *Ohio Department of Natural Resources, 1998*) that is characterized by the Mill Creek valley. Portions of IR 75 lie within filled areas on floodplains and also within cut/fill benches in and along the eastern Mill Creek valley wall. These benches lie within sedimentary rock, the overlying residual clay soils and also glacial deposits. The geology of the study area is characterized by soils formed from the underlying sedimentary rock (Kope and Point Pleasant Formations) along the hillside slopes and glacial deposits as a result of glacial episodes (Kansas and Illinoan). The residual clay soils formed from the weathered interbedded shale and limestone rock are typically thin and have low shear strength. Soils located within lower elevations along the Mill Creek valley terraces and floodplains consist primarily of glacial deposits (till, silts and lake-bed clays) that were eroded and re-deposited with the most recent glacial episode.

The mapping of the soils (Surficial Glacial Geology of the Ohio Portion of Cincinnati and Falmouth 30 x 60 Quadrangles, *Ohio Department of Natural Resources, 1998*) within and immediately adjacent to the existing IR 75, consists of a Wisconsin-age silt stratum less than 20 feet thick, with localized clay, sand, and gravel layers. In addition, lacustrine (lake-bed) deposits are found in low level slackwater terraces. These glacial soils are underlain by buried glacial valley fills consisting of interlayered medium-fine to fine-grained materials with fine sand predominating along with clay, silt and gravel interbeds on the order of 150 feet thick. To the west of IR 75, within the Mill Creek floodplain, the alluvial deposits range from silt to gravel and cobbles. To the east of IR 75, the surficial soils consist of Illinoan-age clay and glacial till that is capped by loess (silt) layer ranging from 3 to 5 feet in thickness.

The soil overburden is underlain by Ordovician-age sedimentary rock consisting of interbedded shale and limestone (Bedrock Geology of the Cincinnati West and Cincinnati East Quadrangles, *Ohio Department of Natural Resource, 1996*). The rock formations mapped along the project corridor along with their relative

composition of interbedded shale and limestone consist of the following as mapped from south to north of the project limits:

- Point Pleasant Formation (60% limestone, 40% shale)
- Kope Formation (75% shale, 25% limestone)

In general, the rock encountered in this formation is similar and is typically distinguished by some or all of the following features; ratio of shale and limestone within the formation, thickness of shale or limestone beds, the type of bedding observed. The shale is generally described as being gray to bluish gray, weathers to light gray and/or yellowish gray, planar and/or lenticular, bedding that is thin to medium or thin to thick.

The depth of the glacial soils varies with location and can be as deep as 100 to 200 feet below ground surface. Near the northern end of the project at the Norwood Lateral (SR 562) and IR 75 interchange the depth is on the order of 150 feet. Mapping of the bedrock topography (Bedrock Topography of the Cincinnati West and Cincinnati East, *Ohio Department of Natural Resources, 1996*) indicates the elevation of the rock surface ranges from about 425 feet at the southern limit of the project corridor and is relatively level till IR 75 crosses the Mitchell Avenue interchange where the rock surface falls in elevation to about 350 feet at the Norwood Lateral. It should be noted the referenced mapping utilizes 50-foot contours, which are interpolated from topographic surface features, and widely spaced data points where water wells have encountered rock.

According to the Ground Water Resources of Hamilton County (Ohio Department of Natural Resources, 1986), the majority of the project corridor yields ground water from wells in the underlying sand and gravel deposits. The description indicates the volume of water is typically on the order of less than 100 to 500 gallons per minute (gpm).

Original Construction Plan Observations. The following table summarizes the information reviewed by CTL.

Table I: Historical Work within Study Area and related Geotechnical Issues

Roadway	Project	Type of Work	Date	Notes
IR 75 (US 25)	HAM-25-1.63	Structural Foundation Investigation	1977	Soil test borings for Abutment, Bridge No. HAM-25-0252 under US 52
IR 75 (US 25)	HAM-25-2.99	Soil Profile Drawings	1959 (?)	Soil profile for Original Construction of IR 75 (US 25) from north of Harrison Avenue to south of Central Pkwy
IR 75 (US 25)	Millcreek Expressway under Bates Avenue	Structural Foundation Investigation	1959	Soil test borings for Bates Avenue overpass
IR 75 (US 25)	Millcreek Expressway over Marshall Avenue	Structural Foundation Investigation	1959	Soil test borings for Millcreek Expressway over Marshall Avenue
IR 75 (US 25)	Millcreek Expressway under Hopple Street	Structural Foundation Investigation	1959	Soil test borings for Hopple Street over Millcreek Expressway. A buried canal (Miami & Erie) was encountered in the test borings. No problems encountered.

Roadway	Project	Type of Work	Date	Notes
IR 75 (US 25)	HAM-25-2.96	Structural Foundation Investigation	1959	Soil test borings for carrying Ramp "U" over the Millcreek Expressway at Hopple Street Interchange. Soils conditions good however N-values less than 15 were noted for 40 to 70 feet.
IR 75 (US 25)	HAM-25-2.96	Structural Foundation Investigation	1959	Soil test borings for carrying Ramp "W" over the Millcreek Expressway at Hopple Street Interchange. Soils conditions observed in test boring were good.
IR 74	IR 74-1(10)16	Structural Foundation Investigation	1966	Soil test borings for carrying Ramp "N" over the relocated Ramp "N"
IR 75 (US 25)	Bridge No. HA-25-34 over Clifton Avenue	Structural Foundation Investigation	1953	Bridge site plan and pile driving logs
IR 74	HAM-74-1926L HAM-74-1926R	Structural Foundation Investigation	1966	Logs of Borings; Elmore to Millcreek Expressway
IR 74	HAM-74-1902	Structural Foundation Investigation	1966	Logs of Borings; Elmore to Millcreek Expressway
IR 75 (US 25)	Bridge No. HAM-75-0440 over Ramp "G"	Structural Foundation Investigation	1977	Logs of Borings
USR 127	Bridge No. HAM-27-0560L	Structural Foundation Investigation	1970	Logs of Borings US 27 southbound over US 127 (HAM-75-5.47)
USR 127	Bridge No. HAM-127-0521	Structural Foundation Investigation	1970	Logs of Borings
USR 27	Bridge No. HAM-27-0562	Structural Foundation Investigation	1969	Logs of Borings
IR 74	HAM-74-19.00	Structural Foundation Investigation	1968	Logs of Borings
IR 74	HAM-74-19.00	Structural Foundation Investigation	1966	Logs of Borings
IR 74	HAM-74-18.92	Structural Foundation Investigation		Logs of Borings, Ramp "P"
IR 75 (US 25)		Structural Foundation Investigation		Logs of Borings, relocating Spring Grove Ave. Bridge over Millcreek Expressway
IR 75 (US 25)	HAM-75-(5.42) (5.53) (5.97) (9.00)	Landslide Investigation	1976	Summary of slide limits and recommended corrective repairs, cross sections, test boring logs, and soil laboratory test results.
IR 75	Norfolk & Southern RR Third Mainline	Landslide Investigation (FMSM Engineers)	1995	Subsurface Investigation Report and recommended corrective repairs for slide below IR 75 north of Ludlow Avenue Overpass
IR 75	Norfolk & Southern RR Third Mainline	Landslide Investigation (HC Nutting)	1995	Slope movement above retaining wall no. 2 for third mail line and below IR 75 south of FMSM slide area. Conclusion was reactivation of old slide planes induced in 1986 during construction of the toe of slope for improvements and widening of the Mill Creek channel.

Field Reconnaissance Review. The field review consisted of making observations of the I-75 Mill Creek Expressway study area on January 8, 2005 and also on January 10, 2005. The field reconnaissance was limited primarily to the existing IR 75 right-of-way except for observations made along IR 74 and Spring Grove Avenue west of the Mill Creek.

The existing IR 75 mainline structures and corresponding embankments and/or cut slopes were observed for signs of geotechnical concerns. In addition the existing mechanically stabilized earth retaining (MSE) and cantilever walls along with the grass median, where present, were also observed for geotechnical concerns. From the IR 75 roadway, no obvious signs of instability were noted on the slopes above or

below IR 75 or within the retaining walls observed except for isolated signs of continuing seepage from the MSE wall along east side of IR 75.

Summary. The most considerable geologic hazard within project study area is the occurrence of landslides. In general, landslides occur within the soil overburden. Due to the frequency, resulting damage and extensive cost of repairs, the area has bee studied and as a result a landslide susceptibility map was developed for the City of Cincinnati. The types of landslides vary from relatively slow downward movement of soil (creep) to rapidly moving (mudslides). The occurrence of the landslides is attributed to several factors including geology, topography, ground water and most importantly the influence of construction.

Previous studies show that landslides within the study area primarily occur within the cut/fill slopes overlying the glacial deposits. The most notable areas where previous landslides have occurred are at the IR 75-Mitchell Avenue interchange, along eastern hillside slopes above IR 75 between IR 74 interchange at the base of Cincinnati State Community College, and the hillside above the Hopple Street interchange. Repairs have been made in these areas and no obvious signs of continuing instability were observed in the field. The City of Cincinnati Department of Transportation and Engineering has limited instrumentation along the IR 75 corridor that consists of inclinometers and/or piezometers that measure slope movements and ground water levels over time.

Repairs of previous landslides and retaining walls for grade changes have consisted of soldier pile tie-back walls, rock fill buttresses, drilled pier with lagging retaining walls in addition to conventional cantilever retaining walls. The depths to the underlying rock and groundwater levels are typically the most critical design factors. Mapping of the geology (type and depth of materials) along with the identification of previous landslide activity will provide critical information that will affect the alignment alternatives in critical design areas.

6.0 Transportation Network

Study Area Roads

The I-75 Mill Creek Expressway study area is typical of urban highway construction dating from the 1950's and 1960's. Lower speed curves, left-hand exit ramps, poor lane continuity, and undesirable service ramp locations are some of the problematic features within the corridor. A description of the interstate mainlines, along with major access points and the known deficiencies are summarized below:

I-75 Mainline. The existing mainline freeway consists of four lanes each way south of the I-74 interchange, and three lanes each way to the north. A number of deficiencies such as horizontal and vertical curvature and stopping sight distance are present. Other criteria that have proven to be issues on urban freeways of similar age are vertical clearances under overhead structures and shoulder widths, however, further evaluation on clearance will be done in later steps. The median shoulder is narrow (under 10') in most

places. The minimum shoulder width for interstate routes per the *Location and Design Manual* is 15' for three or more lanes each direction.

One existing mainline feature of concern is the tall concrete median barrier that is present over most of the project length. In several horizontal curves, the barrier may reduce stopping sight distance substantially. The speed limit is posted as 55mph throughout the study area.

I-74 Mainline. The existing mainline freeway consists of three lanes each way east of the Montana interchange to the I-75 interchange. I-74 continues northwest outside of the project area and eventually connects with I-275 briefly before continuing into Indiana. The interchanges of I-75, Spring Grove/Elmore/Colerain, Colerain/Beekman and Montana are included within the project area.

The mainline is elevated above the surrounding City of Cincinnati neighborhoods of Northside and South Cumminsville. As it continues west from the Colerain interchange, the mainline is located along the hillside near Mt. Airy Forest and begins an approximately 2 mile section with a high grade at the Montana interchange. The speed limit is posted as 55mph throughout the study area.

Norwood Lateral (SR 562) Mainline. The existing mainline freeway consists of two lanes each direction from east of I-75 to Paddock Road at the edge of the study area. Norwood Lateral provides a connection between I-75 and I-74 and is approximately 3 miles long. The posted speed limit is 55mph along the Norwood Lateral.

Western Hills Viaduct Interchange. The Western Hills Viaduct is located just north of downtown Cincinnati and provides access to Harrison Avenue. It also serves as a major commuter route from Western Cincinnati and the South Fairmount neighborhood. The existing interchange does provide full movements, but is hindered by design deficiencies including inadequate ramp radii, low design speeds, short weave distances, local ramp access and a left exit ramp from I-75 northbound.

The Western Hills Viaduct is a National Register of Historic Places listed historic structure which has a double deck design. The posted speed limit on the Viaduct from Montrose (western end) to Central Parkway (eastern end) is 35mph. Both the upper and lower levels along with a short, third "basement" level to Spring Grove Avenue, have four lanes of travel.

Hopple Street Interchange. The Hopple Street interchange contains a left-hand exit in the I-75 northbound direction. It also has a substandard I-75 eastbound-to-northbound entrance terminal and the westbound-to-northbound entrance ramp originates from Bates Avenue, not Hopple Street, fragmenting the interchange. Northbound traffic from Bates is designed to continue onto I-74 and not permitted to access I-75 north; however, site visits have proven that traffic does not obey the design.