Atlanta Regional Freight Mobility Plan: Community & Environmental Impact Scan and Assessment

Technical Memo

Contents

Introduction

The purpose of this report is three-fold: to analyze the impacts of freight movement on communities and the environment based on current conditions and populations; to assess future impacts, and to suggest mitigation practices. The analysis of the report is based upon the five case study areas—Atlanta Road / Marietta Boulevard, Fairburn, Fulton Industrial Boulevard, Gwinnett County, and Henry County—determined by the Atlanta Regional Commission (ARC). The case studies were chosen by the ARC because they are representative of current development patterns and conditions in the truck-based freight movement industry. As such, the analysis conducted in this report, while specific to the case study areas, is representative of the current conditions of communities and the environment located near truck-based freight facilities. In addition, the mitigation strategies for freight-based impacts provided in this report are also designed to be applied where needed throughout the region.

This report is divided into five sections and an appendix:

Introduction:
The introduction sets the stage for this report. It briefly describes the state of the freight industry in the Metropolitan Atlanta Region; some of the challenges faced by the industry; and some of the impacts of the freight industry on the environment and communities. Finally, the introduction discusses some of the key findings from the report.

Section 1: Case Study Analysis
This section of the report is divided into the five case study areas. For each of the areas an analysis of the community, current and future land uses, and the environment is conducted.

- The community analysis determines if environmental justice is an issue within each of the case study areas, and if so, who is affected, and to what extent.
- The current and future land use analysis determines if incompatible land use adjacencies between freight-based facilities and residential development currently exist; if current zoning ordinances allow or discourage such adjacencies; and if the Future Land Use Map continues these trends.
- The environmental analysis examines possible impacts of freight on the environment –air quality, water, and greenspace—within each case study area.

Section 2: Impacts of Freight and Mitigation Best Practices Table
This table summarizes the major impacts of freight—air pollution, road issues, noise and light pollution, community safety, environmental issues, and visual and aesthetic concerns. The table details the health and quality of life impacts of freight on the community and the environment. Finally, it provides tools for preventing and mitigating these impacts along with links to best practices mitigation case studies.

Section 3: Mitigation Best Practices Abstracts
This section examines in greater detail a selection of mitigation best practices case studies listed in the table in Section 2.

Section 4: Acknowledgments and Source List
This section lists the references used in the writing of this report.

Appendix: Land Use Characteristics of the Five Study Areas

This table provides a summation of the findings of the land use assessment conducted by Wilbur Smith Associates for each of the five case study areas that formed the basis for the analysis in this report.

An Overview of the Freight Industry

Freight movement is the transportation of goods from manufacturing, warehousing and distribution locations to consumers by air, rail, truck, water or pipeline. Nationally, freight is the fastest-growing segment of travel with expected increases in growth by 2020 in both truck volumes and truck ton-miles. Growth in freight transportation in Atlanta is among the largest of any city in the country. The Atlanta region is a major hub for distribution of goods across the country because of its extensive interstate, roadway, and rail network and access to a major international airport. Trucks are the primary mode of freight transportation in the region, accounting for approximately 90 percent of all freight movement. The Atlanta Regional Commission predicts that by 2010 approximately, 940 million truck tons of goods will be moved through the region, nearly 9 million truckloads of commodities will be moved annually and 40 percent of all truck trips will be primarily through trips without an origin or destination in the Atlanta region. Although freight distribution by rail makes up less than 10 percent of freight movement in the Atlanta region today, rail is the fastest growing segment nationally.[1]

As freight mobility and volumes increase, the Atlanta region faces substantial challenges and issues associated with freight movement. Major population and employment growth in the region has fueled the demand for goods. A significant amount of freight movement is by trucks that share the existing roadway network with passenger traffic, since there are no dedicated truck facilities in the region. According to the ARC Freight Mobility Needs Assessment, congestion was identified as the primary issue regarding freight mobility, and infrastructure deficiencies were identified as the principal cause of congestion due to lack of alternative routes and interstate interchange bottlenecks causing recurring congestion. Additionally, there are several land use conflicts that were commonly identified as challenges to freight mobility in the region, including residential encroachment on traditionally industrial corridors and operational issues such as the need for improved network management, updated design standards to accommodate new commercial vehicle requirements, and an updated and properly signed regional truck route system.[2]

Community and Health Impacts

Freight movement has increasingly invoked “not in my backyard” reactions from communities concerned about noise, air quality, traffic, safety, and land use issues leading to concerns about the location of freight facilities and the movement of cargo.[3] Trucking, which is the primary mode of freight transportation in the Atlanta region, generates the greatest number of community issues. Issues related to truck movements include inadequate infrastructure, wear and damage to pavement, insufficient loading space at customer facilities, and heavier truck movements adversely affecting automobile speeds on roadways. There are also a number of health impacts on communities given their proximity to freight facilities and pollution. Air pollution issues stemming from diesel emissions, hazardous materials spills, accidents caused by truck movements, noise pollution and vibration, and safety issues can have serious health implications for community residents. Despite community apprehension, there is a mutual understanding that freight transportation plays a vital role in the economic well-being of communities and businesses. National efforts have been made to balance the movement of freight with community goals by making freight transportation operations and facilities “good neighbors”.[4] There is no one-size-fits-all

[1] Atlanta Regional Commission, *Atlanta Region Transportation Planning Fact Book 2006*, pg 15.
[2] Atlanta Regional Commission, *Atlanta Region Freight Mobility Plan Needs Assessment*, pg 77.
[3] Transportation Research Board of the National Academies, *Integrating Freight Facilities and Operations with Community Goals: A Synthesis of Highway Practice,* National Cooperative Highway Research Program Synthesis 320, 2003, pg 3.
[4] Transportation Research Board of the National Academies, *Integrating Freight Facilities and Operations with Community Goals: A Synthesis of Highway Practice,* National Cooperative Highway Research Program Synthesis 320, 2003, pg 3.

approach to making freight a good neighbor for a community, but a wide range of practices to balance or mitigate the presence of freight facilities and operations have been developed and implemented, such as modifying the hours of freight operations to reduce noise impacts, incorporating low emission technologies and practices, and creating buffer zones to transition between freight/industrial uses and residential uses in an effort to address land use conflicts.[5]

Environmental Impacts
Freight transport enables trade and offers a wide range of benefits including accessibility to goods and services in the Atlanta region. However, freight transport is also identified as one of the main consumers of fossil fuels and the resultant emissions cause negative impacts on the environment and human health.[6] Freight vehicles emit a substantial amount of pollutants and the transport sector is a significant contributor to air pollution at the local, regional, and global scales.[7] The main pollutants emitted from freight transport are carbon dioxide, carbon monoxide, nitrogen oxides, particulate matter, volatile organic compounds, and sulfur dioxide. Emissions of these pollutants:

- increase the greenhouse effect and acid rain;
- cause acidification, eutrophication, and formation of ozone and photochemical smog that lead to fish kills, soil damage, and other adverse environmental effects; and
- result in various human health effects including respiratory problems, cancer, hindrance of oxygen transport to the cells through the blood, and damage to reproductive systems.[8]

In addition to air pollution, freight movement induces other environmental problems such as water pollution and stormwater runoff issues, consumption and fragmentation of land, light pollution that can confuse animal navigation, noise pollution, generation of waste, and disruption of the delicate balance of ecosystems, among others.

Key Findings

This report conducts three areas of analysis regarding the impacts of freight: a community impact scan to identify environmental justice issues; a land use scan to detect current and future land use issues, and an environmental scan to pinpoint key environmental impacts. The analysis of each case study can be found in Section 1 of this report. To limit the redundancy within the case studies, the impacts of freight on communities and the environment—air pollution, road issues, noise pollution and vibration, light pollution, safety issues, environmental issues, and aesthetic and visual concerns—are addressed in tabular form in Section 2 of this report. Within the case study analyses, impacts are referenced briefly and then the reader is directed to the Impacts of Freight and Mitigation Best Practices Table for further information about the impact itself and tools and methods for mitigation.

Environmental Justice Analysis:
An environmental justice (EJ) community is defined as a community that has populations that exceed regional averages for certain population groups that are adversely or disproportionately affected by negative impacts in the area. In the case of this report, negative impacts refer to freight-based operations and facilities. As defined by the Atlanta Regional Commission (ARC) EJ communities in the Metropolitan

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Transportation Research Board of the National Academies, *Integrating Freight Facilities and Operations with Community Goals: A Synthesis of Highway Practice,* National Cooperative Highway Research Program Synthesis 320, 2003, pg 41.
[6] Andersson, J.. *Reducing environmental impacts of freight transport sector: The case of the Czech Republic,* January 2005, pg 10.
[7] Andersson, J. *Reducing environmental impacts of freight transport sector: The case of the Czech Republic,* January 2005, pg 10.
[8] Andersson, J. *Reducing environmental impacts of freight transport sector: The case of the Czech Republic,* January 2005, pg 11-12.

Atlanta Area have greater than 9.1% of the population living in poverty, 30.4% African American, 3.6% Asian, or 7% of Hispanic origin.

Based on U.S. Census numbers from 2000, the environmental justice analysis in this report revealed that of the 74 census block groups in the five case study areas 64 meet at least one of the ARC's criteria for an environmental justice community; 37 meet at least two of the criteria; and nine meet three. What this demographic analysis shows is that the well-established freight-based study areas, Atlanta Road/Marietta Boulevard and Fulton Industrial Boulevard, have acute environmental justice concerns. Atlanta Road/Marietta Boulevard meets EJ criteria in 30 out of 34 block groups; Fulton Industrial Boulevard in 16 out of 17. The Fairburn study area has nine of its nine block groups meeting at least one EJ criteria. Gwinnett and Henry Counties have relatively few environmental justice concerns. Thus the well-established freight areas need to deal with the mitigation of EJ issues and the prevention of new EJ communities. While study areas defined by large amounts of natural space need to be cognizant that they do not produce EJ communities by allowing future residential development to encroach upon freight facilities.

Current and Future Land Use Analysis:
The five study areas were chosen by the ARC because each represents a particular development pattern that exists in the Metropolitan Atlanta Area (See Appendix). Atlanta Road/Marietta Boulevard typifies the trend of redeveloping urban areas with mixed-use developments. The Fairburn area exemplifies greenfield development opportunities. Fulton Industrial Boulevard presents opportunities for brownfield redevelopment. Gwinnett County has opportunities for interchange development. Finally, Henry County exemplifies an area experiencing rapid warehouse and distribution facility development. Although the analysis identifies key issues associated with the development patterns of each study area, trends became apparent across the study areas. These include: the upzoning of almost all natural and open space to accommodate industrial uses; a lack of transitional zoning classifications between industrial and residential land uses; a general lack of adequate buffering between incompatible land use types; and encroachment of residential development on industrial land uses.

Environmental Analysis:
The land use analysis identified the key environmental elements present in each case study area (See Appendix). They include: floodplains, steep topography, wetlands, reservoirs, agricultural and forest lands, and streams and rivers. This report describes in general how freight impacts these elements of the environment and what some of the specific issues are in each study area. Overarching trends indicate that: freight, particularly diesel-emitting freight, has a significant impact on air quality; the construction and operation of freight facilities can disrupt the functionality of natural habitats; and freight is a significant contributor to point- and non-point source water pollution.

Section 1: Case Study Analysis

- Atlanta Road / Marietta Boulevard
- Fairburn Area
- Fulton Industrial Boulevard
- Gwinnett County
- Henry County

Atlanta Road/Marietta Boulevard Study Area

Please note that the Marietta Blvd. case study only includes the area inside the City of Atlanta and does not extend into Cobb County. As part of the revisions to the land use components, this study area will be extended past I-285 to include the new developments in Cobb on the other side of I-285.

Demographics and Environmental Justice Analysis

One of the most pressing social concerns when examining large-scale infrastructure impacts in metropolitan Atlanta is that of environmental justice (EJ). Environmental justice refers to the idea that over time, geographic areas with larger-than-average concentrations of minority populations or populations at or below the poverty line suffer disproportionate negative environmental impacts. Since 1994, federal agencies have been required to identify and address potential or actual disproportional adverse environmental effects on minority and low-income populations. Thus it is appropriate to conduct a demographic analysis of the five case study areas, with a special emphasis on locating concentrations of minority and populations in poverty, in order to address environmental justice issues concerning existing and potential future freight traffic impacts.

To identify areas of environmental justice concern, the Atlanta Regional Commission (ARC), using demographic information obtained from the U.S. Census Bureau for the year 2000[9] for the 13-county region, takes regional averages and then uses those averages to highlight those communities which have greater-than-average concentrations of both minority populations and populations living in poverty, as well as where those two groups overlap. Thus the ARC defines any census block group that meets any of the following criteria as an environmental justice-community: greater than 9.1% in poverty, 30.4% African American, 3.6% Asian, or 7% of Hispanic origin.

The ARC does not have specific environmental justice guidelines in terms of the elderly or children. However, this demographic analysis will highlight those census block groups that have high percentages of people over age 65 or under age 11 living in poverty as compared to the regional average. This methodology mirrors the ARC's methodology for environmental justice which also compares block group percentages of specific populations to the regional average of those populations. The following criteria represent the regional average for concentrations of elderly and children in poverty: the elderly, 9.6% and 18.1% for children under age 11. The elderly and children are singled out because these groups are typically at greater risk of suffering negative health impacts from freight traffic, because of pre-existing health conditions or the development of young lungs and immune systems. In addition, living in poverty makes them vulnerable in terms of their mobility and healthcare options.

Having a larger-than-average percentage of an at-risk population within a block group does not necessarily mean that an environmental justice issue is present. Additional analysis must be conducted to determine if a significantly adverse impact is affecting the community and if that adverse impact is unfairly affecting that population as compared to other populations in the area.[10] If it is determined that significant adverse impacts are disproportionately burdening an at-risk population, then that population can be said

[9] Demographic analysis was conducted using 2000 U.S. Census numbers which are now eight years old and are likely not reflective of current populations in the study area. In addition current land use maps utilized in the analysis are also out-of-date as evidenced when compared to more current aerial photography revealing on-the-ground development. In all cases, we utilized the most current data and maps available.
[10] These criteria are set forth by the USDOT.

to have an environmental justice issue. In the case of this report, the additional analysis consisted of reviewing the current land use map of the study area over aerial photography. Block groups that satisfied one or more of the ARC criteria for EJ populations were examined more closely to determine if certain conditions were present that might cause a negative impact on a surrounding community, neighborhood, or housing development. Conditions include: direct adjacencies of freight facilities and housing units, proximity of housing to truck routes, and the presence or absence of transitional land uses or other buffering tools such as adequate vegetation. While EJ communities cannot be definitively identified using this analysis technique, the analysis points out communities that are potentially at risk.

This same kind of analysis can also be conducted to assess the potential adverse impacts of future projects. However, the demographic analysis in this report is confined to the existing environmental and demographic conditions of the five case study areas: Atlanta Road/Marietta Boulevard, Fairburn, Fulton Industrial Boulevard, Gwinnett County, and Henry County. It is recommended that an environmental justice scan be conducted as specific freight-based projects are proposed.

In this report, the demographic profile of each case study area is examined in turn. Each section begins with a brief description of the ARC's environmental justice at-risk populations found in that study area, followed by two maps. The first shows the spatial arrangement of the at-risk populations. Areas highlighted in green indicate that one EJ criteria is present, yellow indicates two, and red indicates three. A table listing all of the block groups for each study area, the total population for each block group, and percentages of minority populations and people living in poverty provide additional information regarding where EJ issues are present and the percentage of those populations affected. The second map spatially locates the elderly and children under 11 living in poverty. If either elderly or children are identified in the block group as being in poverty that block group is indicated with one hatch mark. If both children and the elderly are identified as living in poverty, that block group is indicated with two hatch marks. The table identifies which population is at risk.

Next the EJ maps are compared to the current land use map for the study area which is laid over an aerial image of the study area. This comparison reveals any areas of potential adverse impact from freight operations on a particular at-risk community. If an at-risk community group is identified as potentially suffering disproportionately from an adjacent freight land use, then it can be called an environmental justice community. Such identification allows mitigation measures to be directed to those areas to address the existing environmental impacts in addition to ensuring that the community will not suffer from future impacts.

Environmental justice remains a relatively new concern in planning and policy, and strategies to mitigate disproportionate environmental impacts on low-income or minority populations are still evolving. Mitigation strategies include: ensuring that affected communities have a say in future developments; ensuring significant and ongoing public involvement in decision-making; addressing specific community issues and responding to community preferences; the provision of environmental benefits to the community such as infrastructure upgrades or landscaping and buffering; and providing economic benefits to the community such as the creation of job opportunities, guaranteed participation in construction projects, and grants or loans for small business start-ups. The goal of environmental justice mitigation is to ensure that vulnerable populations that have been receiving an undue share of the burdens of, in the case of this report, the freight industry, no longer are unfairly burdened. In addition these populations should receive a proportionate share of the benefits of a project.

Environmental Justice Analysis

Atlanta Road/Marietta Boulevard in Fulton County is a sensitive area with respect to environmental justice issues, due both to its high concentrations of African-American and low-income populations as well as the significant presence of rail within the study area boundaries. Twenty of the 34 block groups that intersect or are contained by the study area[11] meet both of the ARC's criteria for African-American percentage and percentage in poverty. In 13 block groups, the African-American population is 90% or more of the total population in that block group.

In addition, there are four block groups that exceed ARC specifications for EJ criteria in three separate categories (Figure 1). Block groups 88.001 and 89.011, in the north center of the study area, exceed the criteria for Hispanic populations. Block group 89.011 has 31.7% of its population of Hispanic origin, compared to 5.33% for the study area as a whole (Table 1). Block group 21.001, intersecting the extreme south of the study area, exceeds the ARC criteria for both African-American population (69.5%) and Asian population (7.7%) as well as population in poverty (43.6%). Block group 89.024, intersecting with the study area in the east, exceeds the ARC criteria for population in poverty (16%), Asian population (4.2%), and population of Hispanic origin (12.8%).

Each of these four block groups that exceed the ARC criteria for three EJ categories are located along rail lines which run parallel to one another on the western edge of the study area and to the east of Marietta Boulevard (Figure 3). Block group 88.001 which includes where the CSX and Norfolk Southern rail lines merge into a large rail yard and storage facility has a population total of 1,752 of which almost 60% or 1,037 are African American, 304 are Hispanic, 583 people exceed the regional average for poverty and 140 children under the age of 11 live in poverty (Table 1). Block group 89.011 has similar demographics although the total population is larger, 3,028 with 1,545 African Americans, 959 Hispanics, 604 living in poverty, and 165 children in poverty (Figure 2). Block group 89.024 shifts from a concentration in African-American population to Asian and Hispanic although the degree of magnitude of the problem in this area is less according to the numbers (fewer people affected). Block group 21.001 in the southern tip of the study area exceeds ARC criteria for African Americans, Asians, and people living in poverty along with higher than average poverty rates for children and the elderly.

In addition, all of the block groups that abut the various rail lines all meet at least one EJ criteria, most meet two. Block groups 22.001 and 22.002 at the southern tip of the study area tell a clear EJ story. Block group 22.001 has a total population of 921 of which 100% are African American, 70% or 646 people live in poverty, and 32 elderly and 244 children under the age of 11 live in poverty. Block group 22.002 has a total population of 242 of which 236 are African American, over half live in poverty, and 100%, or 22 of the children under age 11 live in poverty. In contrast the northeastern portion of the study area, block groups 89.016, 97.002, and 97.003, which geographically corresponds to the edge of Buckhead, reveals no EJ issues for the nearly 4,000 people who live there. Additionally, the residential neighborhoods are well-buffered with vegetation, larger lot sizes, and lower densities against impacts from the rail line that runs proximally.

The environmental impacts of the rail line cause the abutting communities to qualify as EJ communities. Although other non-freight environmental issues are also present, it is the purpose of this report to focus on freight-related impacts. Rail freight impacts air quality, contributes to noise and light pollution and vibration, has impacts where rail intersects the road, has implications for community safety, impacts soil and water quality, and can have visual and aesthetic ramifications (see the Freight Impacts and Mitigation Best Practices table for more details). In the case of rail, air and noise pollution are the expected primary

[11] For this study, demographic data were obtained for each study area using Census data from the 2000 census and gathering and analyzing data from the census block groups that intersect or lie completely within the study area boundary.

impacts on a community, with the remainder of the impacts playing roles to a lesser degree.[12] Health impacts associated with air pollution result from exposure to ozone and diesel particulate matter. Negative health impacts include increased risks of certain cancers, respiratory illnesses, increased risk of heart disease, and a compromised immune system, among others. The magnitude of impact has a relationship both to the existing health condition of the individual, their EJ status, and their proximity to the polluter. Neighborhoods in block group 88.001, which are predominantly African American, high poverty, with high percentages of children and elderly living in poverty, directly abut the rail yard where the CSX and Norfolk Southern lines come together.[13] Research in the public health field has shown that these populations are at increased risk of suffering the negative health effects associated with air pollution.

Additionally, there are health consequences associated with other freight impacts. Noise pollution and vibration have both physical and mental health impacts such as annoyance, sleep disturbance, reduced productivity, hearing loss and tinnitus, ischemic heart disease, cardiovascular disease, and effects on the immune system, among others. Light pollution causes such adverse health outcomes as headaches, carcinoma and other cancers, sleep deprivation leading to decreased mental capacity, a compromised immune system, type 2 diabetes, depression, hypertension, and weight gain, among others. Light pollution also has environmental consequences such as disrupting delicate ecosystems by confusing animal navigation or changing predator-prey relationships. In addition, it wastes energy, can encourage criminal activity when it creates shadows, and can infringe upon one's sense of privacy causing anxiety or stress.

Road issues associated with freight movement include traffic congestion at at-grade crossings. Traffic congestion has been linked to negative health effects caused primarily by stress—hypertension, headaches, weakened immune system. Traffic congestion also increases the exposure of the occupants of the car to traffic-related air pollutants. Train crossings can have safety implications particularly when drivers try to out-maneuver traffic delays. Rail lines and rail yards have environmental impacts as well. Spills from maintenance work and fueling of trains, particulate matter that contaminates the air typically from diesel engines and equipment utilized in rail yards, fluids generated from the cleaning of equipment that contaminate ground water, and chemicals used for vegetation management that leach into the soil and water all have health implications for surrounding communities.

It is for these reasons that the populations surrounding the rail lines and rail yard in the Atlanta Road/Marietta Boulevard study area qualify as EJ communities. They are at-risk by virtue of their high concentrations of vulnerable populations and disproportionately suffer the impacts of the rail yard as compared to other populations in the study group, primarily the wealthier, predominately white communities in the northeastern portion of the study area.

[12] It was beyond the scope of this demographic analysis to conduct on the ground research in the case study areas, so all freight impacts discussed in this report are based upon extensive literature reviews of respected researchers in the field including the Federal Highway Administration and the Transportation Research Board.
[13] The land use analysis section discusses this particular incompatible land use situation in greater detail and offers possible mitigation solutions.

Table 1. Atlanta Road/Marietta Boulevard Case Study Area

		Against ARC Criteria				Against Regional Mean	
Block Group	Total Population	African American 30.4%	Asian 3.6%	Hispanic 7.0%	Poverty 9.1%	Elderly (65+) in Poverty 9.6%	Children (under 11) in Poverty 18.1%
5.001	1,722	No (9.9%)	No (2.7%)	No (2.0%)	No (7.9%)	No (0.0%)	No (4.4%)
6.001	2,736	No (10.9%)	Yes (18.9%)	No (4.5%)	Yes (23.2%)	No (0.0%)	No (0.0%)
7.001	3,137	Yes (88.3%)	No (0.2%)	No (1.7%)	No (3.2%)	No (9.1%)	Yes (21.4%)
7.002	449	Yes (48.6%)	No (1.8%)	No (4.5%)	Yes (15.8%)	No (0.0%)	Yes (22.9%)
8.003	943	Yes (95.0%)	No (0.0%)	No (1.4%)	Yes (22.8%)	Yes (21.1%)	Yes (29.0%)
8.005	586	Yes (94.9%)	No (0.0%)	No (1.0%)	Yes (30.4%)	Yes (28.6%)	Yes (55.7%)
10.002	1,448	No (8.6%)	Yes (41.4%)	No (6.4%)	Yes (17.5%)	No (0.0%)	Yes (27.3%)
10.003	1,916	No (6.7%)	Yes (19.1%)	No (4.2%)	No (0.8%)	No (0.0%)	No (0.0%)
10.004	4,425	No (13.0%)	Yes (17.8%)	No (2.8%)	No (3.6%)	No (0.0%)	No (0.0%)
10.005	1,434	No (11.0%)	Yes (13%)	No (2.6%)	No (0.0%)	No (0.0%)	No (0.0%)
19.001	1,361	Yes (61.4%)	No (2.0%)	No (2.0%)	Yes (36.2%)	Yes (55.0%)	Yes (40.5%)
19.002	671	Yes (83.5%)	No (2.4%)	No (3.4%)	Yes (60.2%)	Yes (56.7%)	Yes (56.8%)
21.001	1,604	Yes (69.5%)	Yes (7.7%)	No (2.4%)	Yes (43.6%)	Yes (49.1%)	Yes (37.9%)
22.001	921	Yes (100.0%)	No (0.2%)	No (0.4%)	Yes (70.1%)	Yes (78.1%)	Yes (72.8%)
22.002	242	Yes (97.5%)	No (0.0%)	No (1.2%)	Yes (52.5%)	Yes (72.2%)	Yes (100.0%)
23.001	649	Yes (100.0%)	No (0.2%)	No (1.9%)	Yes (47.6%)	Yes (33.3%)	Yes (75.9%)
23.004	983	Yes (98.7%)	No (0.2%)	No (1.2%)	Yes (35.1%)	Yes (46.0%)	No (15.8%)
23.006	1,095	Yes (97.6%)	No (0.6%)	No (0.4%)	Yes (26.9%)	Yes (53.3%)	Yes (27.4%)
25.001	866	Yes (97.6%)	No (0.2%)	No (0.5%)	Yes (41.0%)	Yes (25.4%)	Yes (85.3%)
25.004	728	Yes (100.0%)	No (0.0%)	No (1.0%)	Yes (38.7%)	Yes (23.1%)	Yes (62.9%)
26.001	1,330	Yes (97.1%)	No (0.0%)	No (1.3%)	Yes (30.8%)	Yes (19.7%)	Yes (38.4%)
85.001	1,827	Yes (92.7%)	No (0.0%)	No (0.6%)	Yes (24.8%)	Yes (34.0%)	Yes (26.8%)
85.003	901	Yes (91.8%)	No (0.3%)	No (0.1%)	Yes (26.4%)	Yes (14.2%)	Yes (37.3%)
87.011	312	Yes (93.3%)	No (0.0%)	No (0.0%)	Yes (25.0%)	Yes (13.0%)	Yes (68.6%)
88.001	1,752	Yes (59.2%)	No (0.3%)	Yes (17.4%)	Yes (33.3%)	Yes (20.1%)	Yes (50.9%)
88.003	1,220	Yes (36.3%)	No (0.3%)	No (6.2%)	Yes (26.5%)	Yes (16.3%)	Yes (53.8%)
89.011	3,028	Yes (51.0%)	No (1.1%)	Yes (31.7%)	Yes (20.0%)	Yes (36.8%)	Yes (25.5%)
89.012	3,066	No (9.8%)	No (2.7%)	No (4.6%)	Yes (10.3%)	No (3.3%)	No (0.0%)
89.016	1,305	No (12.1%)	No (1.3%)	No (6.0%)	No (4.8%)	No (9.1%)	No (0.0%)
89.021	2,321	No (16.2%)	Yes (8.4%)	No (3.6%)	Yes (18.6%)	No (0.0%)	Yes (21.4%)
89.023	755	No (26.8%)	Yes (4.4%)	No (4.2%)	Yes (13.3%)	Yes (16.4%)	No (0.0%)
89.024	1,783	No (13.5%)	Yes (4.2%)	Yes (12.8%)	Yes (16.0%)	Yes (29.9%)	No (4.9%)
97.002	1,089	No (3.9%)	No (1.0%)	No (0.5%)	No (1.2%)	No (4.1%)	No (0.0%)
97.003	1,595	No (0.0%)	No (2.3%)	No (1.7%)	No (2.8%)	Yes (10.5%)	No (0.0%)

Source: U.S. Census, 2000

Figure 1. Atlanta Road/Marietta Boulevard EJ Block Groups

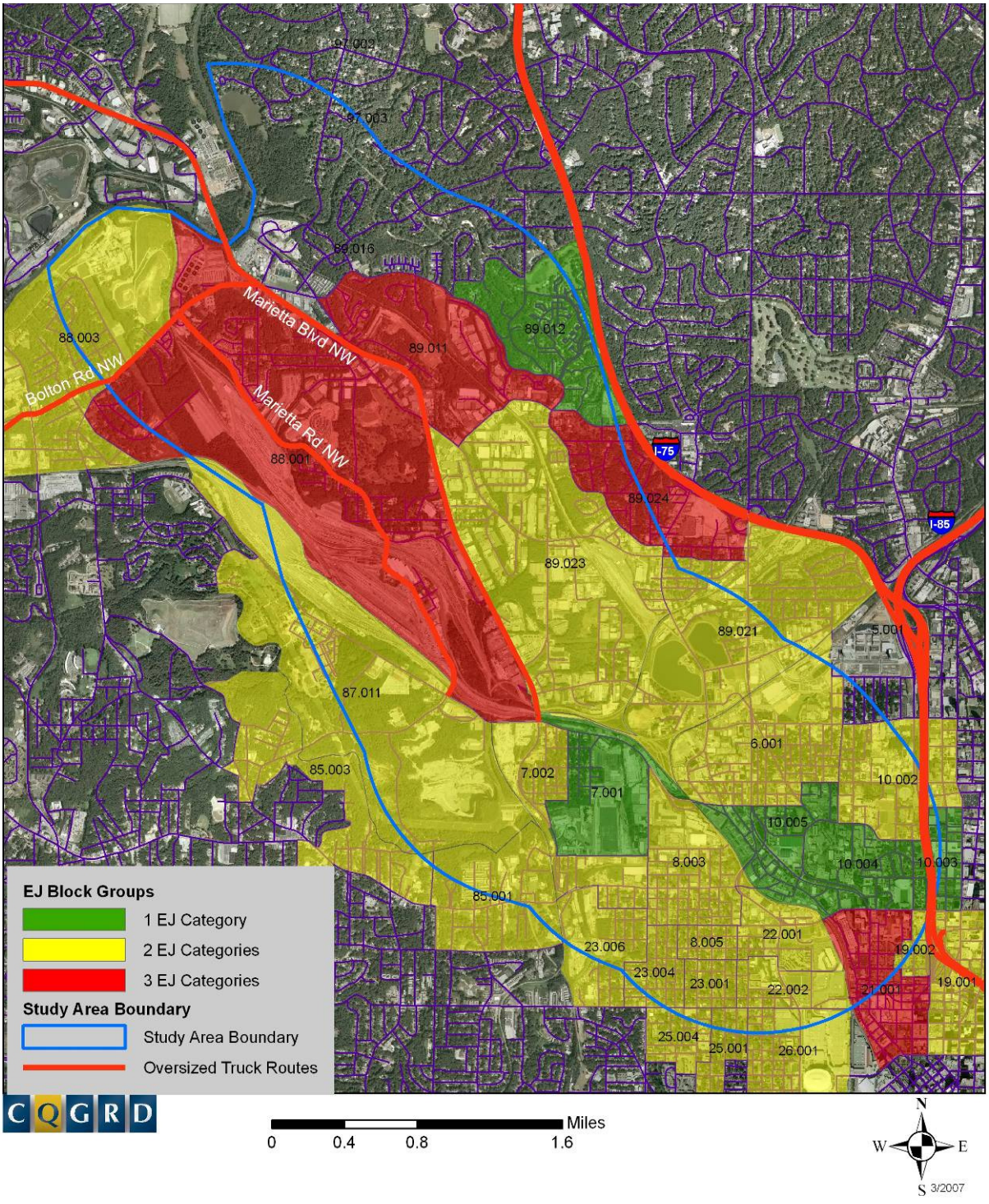


Figure 2. Atlanta Road/Marietta Boulevard EJ Block Groups with Elderly and Children

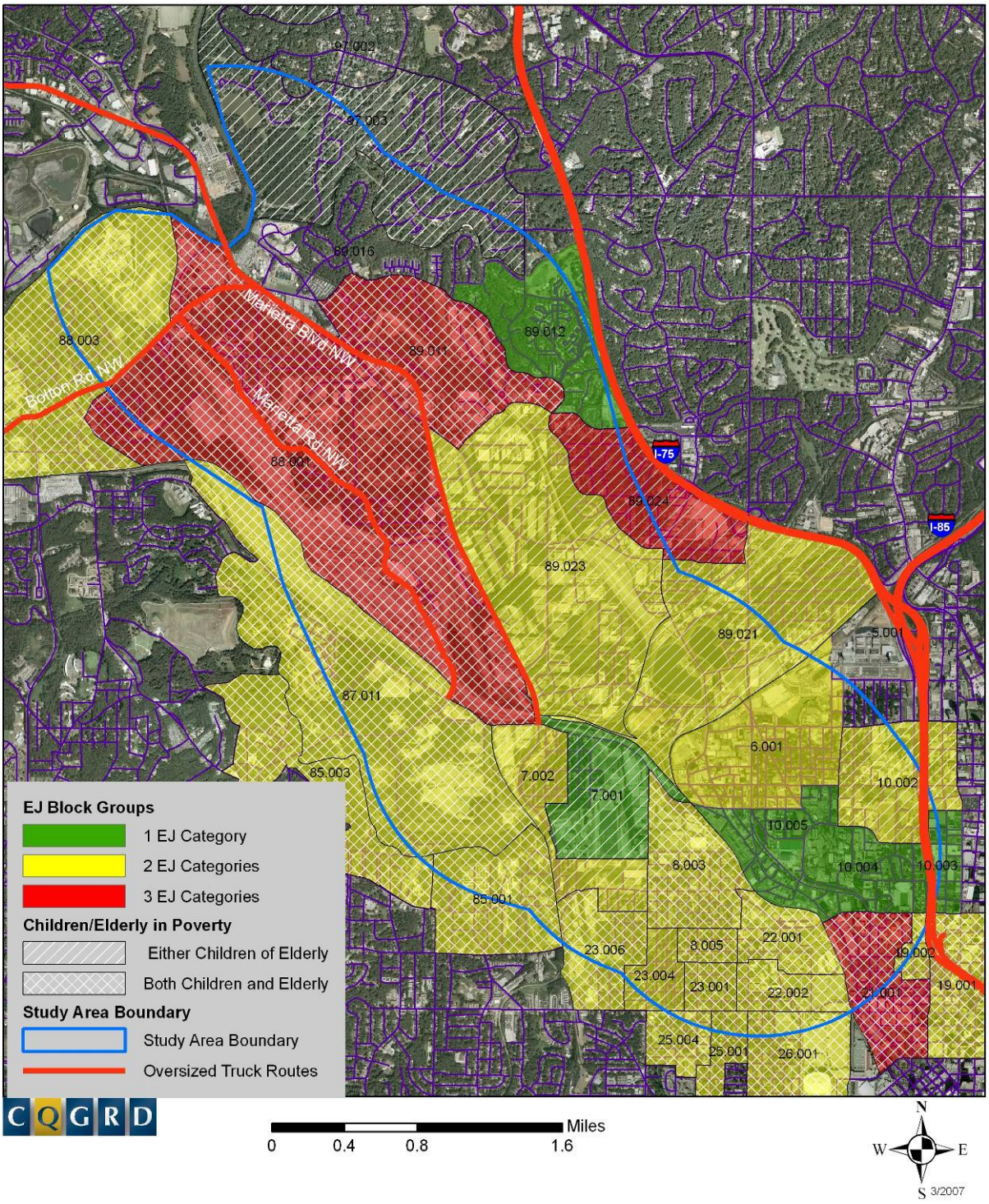
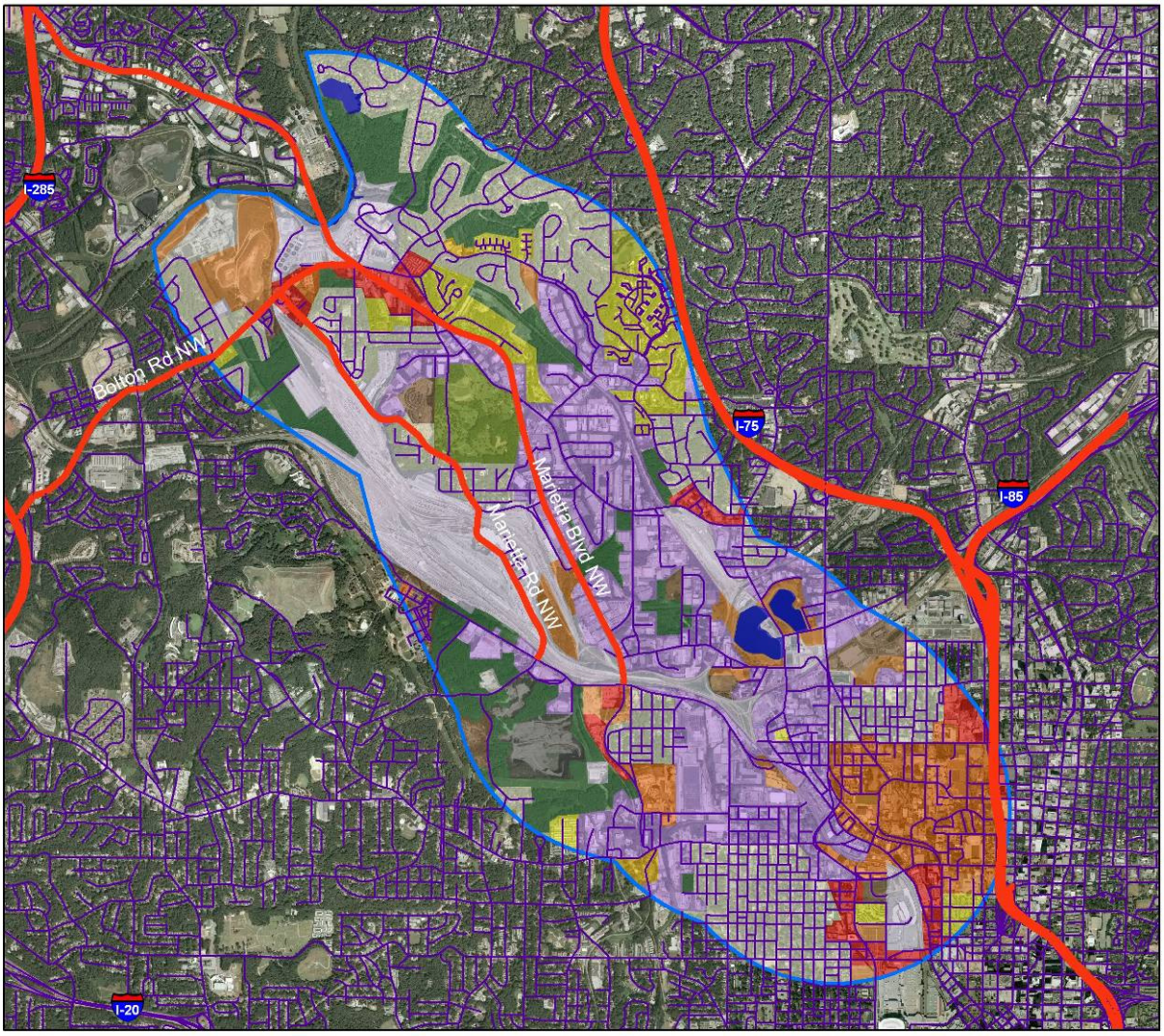


Figure 3. Atlanta Road/Marietta Boulevard Current Land Use Map



Current and Future Land Use Analysis

The Atlanta Road/Marietta Boulevard area historically has been the site of rail yards and freight and logistics facilities with the prevailing land use being industrial. In fact, 27% of the land use in the study area is classified as industrial.[14] However, 23% of current land uses are residential in nature with the area experiencing a renewed interest in residential development. Mixing of industrial and residential land uses, while possible, must be planned and designed carefully so as to mitigate the effects of what are incompatible land use adjacencies. Otherwise the health, well-being, and quality of life of neighboring communities are likely to be compromised. Additionally, the rail and freight entities will probably experience increased objection and push-back from residents as they try to reclaim or create a "neighborhood-feel" for their communities, devoid of freight movement particularly by heavy truck.

A similar study area was the subject of a 2005 report for the City of Atlanta entitled Bolton/Moores Mill Livable Centers Initiative Transportation and Circulation Study.[15] As part of this report, heavy vehicle travel routes and impacts were monitored and issues were identified by neighborhoods as being problematic. These issues included: cut-through traffic, noise, traffic and pedestrian safety, congestion, poor roadway and pavement conditions, and poorly designed intersections. An outcome of this report was proposed new truck routes to alleviate the impacts of freight on residential areas. Clearly, this report indicates that industrial and residential land use adjacencies have compatibility issues within this case study area and freight is considered by the community to be the entity that needs to change in response to encroaching residential development (Figure 4). Was community input sought to draw this conclusion?

The future land use map supports the continued influx of residential development to this largely industrial case study area (Figure 5). Three trends are evident from the future land use map. The first trend is the up-zoning of greenspace to residential zoning classifications. The second is an increase in the presence of mixed-use zoning; the third, an increase in zoning for residential uses primarily in the medium to high density classifications. The first trend, converting greenspace to residential uses, is problematic in that the few remaining opportunities for adequate buffering between industrial and residential land uses are being lost. The potential loss of greenspace is evident after comparing Figures 3 and 5.

The second trend of incorporating a mixed-use category as a buffering land use between industrial and residential uses is good in theory but not necessarily in practice. In Figure 4, the land lots that roughly equate to 17-227 and 17-192, and surrounding lots, show a shift of land use classifications from industrial to mixed-use. However, land lot 17-227 to the south of the CSX/Norfolk Southern rail yard convergence does not buffer the medium density residential classification found in 17-228, formerly greenspace, from the industrial rail yard. Land lot 17-192 was primarily industrial and becomes mixed-use in the future land use map. However, it slices through industrial uses, runs along Marietta Boulevard a designated truck route, and between two major rail yards and rather than acting as a buffer, potentially places future residents (should residential be part of the mixed-use) in increased harms way of suffering from freight-related impacts.

Finally, the third trend of allowing more residential development proximal to freight-related uses whether the rail yards, rail lines, or truck routes not only places more people at increased risk, it increases the likelihood of continued freight-neighborhood schisms. Residential development, such as in Figure 6 that shows single family homes less than 100 feet[16] from the busy intermodal rail yard and buffered only by

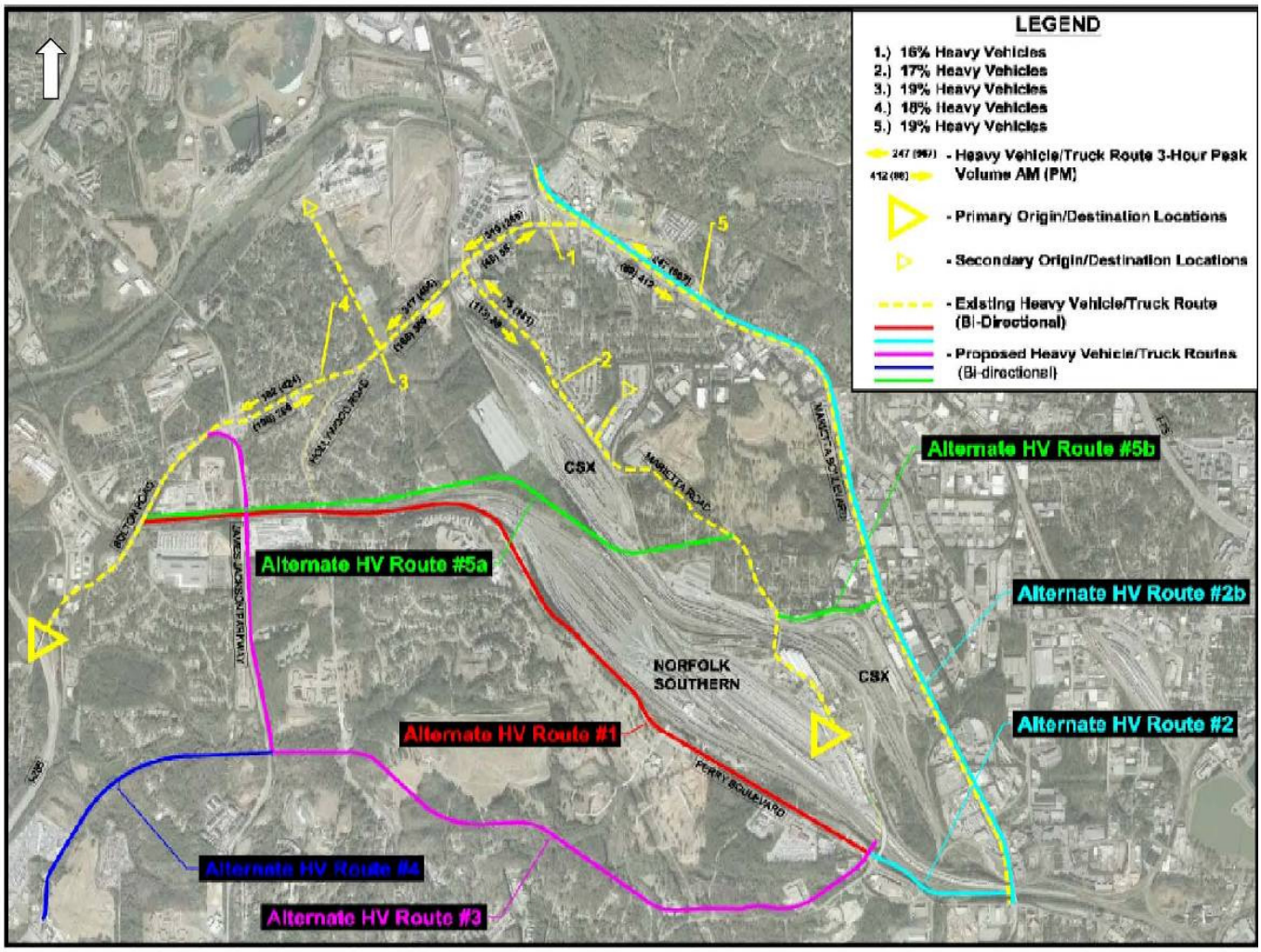
[14] All percentages of land uses are taken from Wilbur Smith Associates Land Use Case Studies.
[15] The report is available on the City of Atlanta website at http://www.atlantaga.gov/client_resources/government/planning/bmt/bmt%20final%20report.pdf. Graphics for the report are available on the City of Atlanta website at http://www.atlantaga.gov/government/planning/boltontransportation.aspx
[16] Exposure to air pollution is exacerbated at distances less than 200 meters to a roadway with 10,000 AADT or greater.

Marietta Road, a designated truck route with approximately 17% heavy truck traffic,[17] is according to the future land use map, an acceptable and desired development pattern. In fact, such development patterns place people in close proximity to heavy polluters, traffic congestion, pedestrian-vehicle safety situations, noise, and other offenders for sensitive land uses. Such adjacencies become of increasing concern when vulnerable populations are affected as is potentially the case in this instance. Figure 2 shows that block group 88.001 has a larger than average percentage of African Americans, Hispanics, and people living in poverty, satisfying three of the ARC's criteria for an environmental justice community. In addition, the block group has a larger than average percentage of elderly and children under the age of 11 living in poverty.

Atlanta Road/Marietta Boulevard exemplifies a highly industrial area (rail and truck) that is experiencing the pressures of encroaching residential and mixed-use development. This case study area is also at increased sensitivity to environmental justice issues with 30 out of 34 block groups satisfying at least one ARC criteria for an at-risk population. Freight-related issues that have been identified by residents in this study area include: noise, air pollution, cut-through traffic, road and pavement conditions, inadequate intersection infrastructure, and traffic congestion. All of which are typical complaints with freight located adjacent to incompatible land uses such as highly sensitive receptors like residential neighborhoods. Prevention and mitigation methods for these freight impacts and others can be found in the Impacts of Freight and Mitigation Best Practices Table in Section 2.

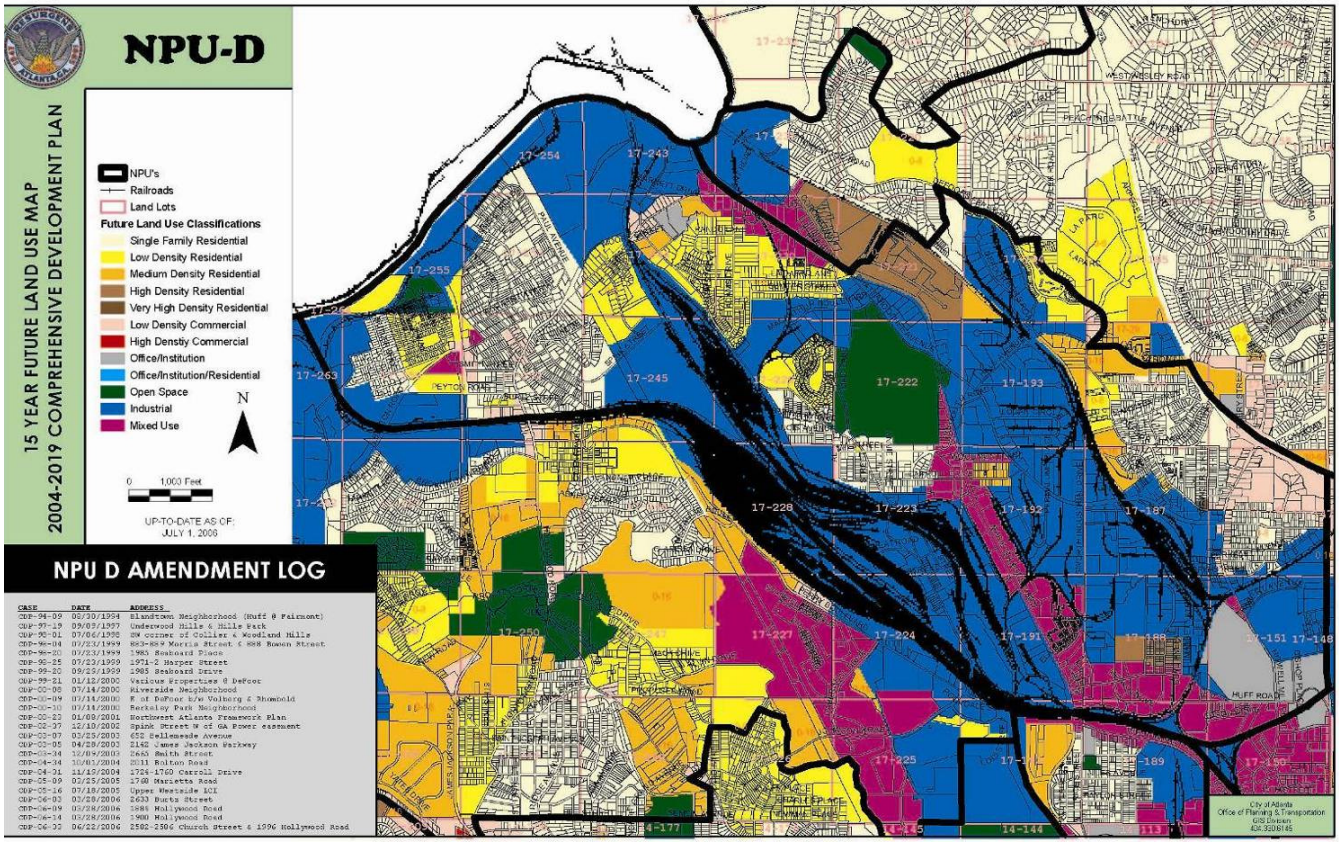
[17] Bolton/Moores Mill Transportation and Circulation Study.

Figure 4. Heavy Truck Routes Existing and Proposed



Source: Bolton/Moores Mill Transportation and Circulation Study. Arcadis G&M, Inc. For the City of Atlanta.

Figure 5. Future Land Use Map for NPU-D



Source: City of Atlanta

Figure 6. EJ Community

Environmental Impacts of Freight Movement and Freight Facilities

Freight movement and freight facilities can affect the surrounding environment in many ways. The buildings and infrastructure of freight facilities and operations can disrupt habitat and can contribute to the loss of green and open space. The movement of freight into, out of, and through facilities and on freight corridors contributes to regional and local air pollution. Fueling, maintenance, cleaning and other routine operational activities can lead to pollutants in surrounding surface and ground waters and soils. Additionally, the land uses associated with freight facilities and movement often consists of large amounts of impervious surfaces which can lead to increased non-point source stormwater runoff into surrounding waterways. These impacts can also affect surrounding communities and populations leading to health concerns and decreased quality of life. While numerous, these impacts can be prevented or mitigated through technological, operational, education, planning and design, and policy and regulation efforts. This section provides a brief overview of the general effects of freight movement and freight facilities on the surrounding environment and also gives a summary of the specific impacts of the study area.

Air Quality

Diesel emissions are a primary contributor to ambient particulate matter and gaseous pollution levels. These emissions contribute to regional and atmospheric changes that exacerbate global warming, acid rain, decreased visibility, and ozone depletion. In addition, due to high volumes of trucks and other diesel vehicles, freight facilities can be air quality hot spots, locales where pollutant concentrations are substantially higher than concentrations indicated by ambient outdoor monitors located in adjacent or surrounding areas. The pollutant concentrations within hot spots can vary over time depending on various factors including emission rates, activity levels of contributing sources, and meteorological conditions. In areas where residential land uses are proximate (closer than 200 meters) to freight facilities or corridors, these hot spots can lead to acute and chronic exposure to elevated pollution levels negatively affecting the populations living nearby.

There are many health effects associated with both ambient and locally concentrated air pollution. These include reduced lung function, asthma and other respiratory illnesses, cancer, irritation of breathing passages and premature death with children and the elderly being at a higher risk than the general population. Furthermore, both short-term (acute) and long-term (chronic) exposure to particulate matter has been associated with increased rates of cardio-respiratory morbidity (illness) and mortality (death) including increased lung cancer risk.

There are several strategies that can mitigate the effects of freight facilities and movement on the surrounding areas.

- Develop and utilize cleaner fuels.
- Develop and require regular monitoring of air quality hot spots.
- Cluster industrial uses and provide adequate buffer zones between industrial and residential uses.
- Develop education programs for facility managers, developers, and officials on pollution prevention.

Water

Land uses associated with freight corridors and facilities contribute to non-point source water pollution through stormwater runoff. Non-point source water pollution comes from many diffuse sources and is caused by water moving over and through the ground picking up and carrying pollutants into waterways and groundwater sources. This is in part due to the large amounts of impervious surfaces associated with the industrial facilities and infrastructure related with freight movement. Non point-source pollution can lead to a deterioration of recreational uses of waterways, can harm water quality, and can potentially

affect the health of nearby residents. Impervious surfaces can also contribute to increased quantities of runoff leading to erosion problems, flooding, and increased sediment loads in nearby streams and rivers.

In addition to environmental impacts, stormwater runoff can also contribute to health effects. Stormwater runoff, especially from industrial land uses, can carry large amounts of contaminants, both microbial and chemical, into storm sewers and streams affecting water quality. Polluted runoff can also contaminate groundwater sources. Polluted stormwater runoff has been associated with outbreaks of waterborne diseases implying a link between polluted runoff and public health. Waterborne illnesses can be caused by drinking contaminated water, recreational contact with contaminated water, or by eating produce irrigated with untreated water. The effects of contact or ingestion of contaminated water are much greater in vulnerable populations such as children, the elderly, and those with compromised immune systems.

Stormwater runoff reduction measures in the construction and redevelopment phases of freight facilities could help mitigate some of the negative effects of stormwater runoff associated with freight movement and freight facilities.

- Capture and treat water used in cleaning processes.
- Minimize use of toxic cleaning solutions.
- Incorporate detention and retention ponds, vegetated swales and filter strips, filtering systems, and porous pavements where appropriate and feasible.
- Develop training programs on pollution prevention and stormwater best management practices.
- Develop a system to monitor water quality in groundwater sources and nearby streams and water bodies.

Greenspace

The land uses associated with freight movement and freight facilities often cause fragmentation in green and open spaces. These spaces are made up of ecologically active lands such as parks, farms, forestlands, and wetlands. These types of spaces provide external benefits such as improved air and water quality, wildlife habitat and biological diversity, and social benefits including preservation of historic/rural character and aesthetic value and positive health benefits. Additionally, vegetative buffers can benefit both people and the environment. They can provide necessary separation between incompatible land uses blocking excess noise and light and can also mitigate negative environmental effects associated with air emissions and stormwater runoff. Green and open spaces can be proactively planned as part of greenfield developments or can be undertaken retroactively as brownfield re-developments.[18]

Green and open spaces provide many benefits to the community and can also be used to mitigate and minimize many of the environmental impacts associated with the movement and processing of freight.

- Utilize greenspace in the form of vegetated swales and constructed wetlands to aid in the control and treatment of stormwater runoff.
- Develop training programs on the use of greenspace and open space to mitigate air and water quality issues.
- Study, and when possible, require the use of green roofs in freight areas. This could help reduce the urban heat-island effect, associated with large amounts of impervious surfaces, which can

[18] The EPA has a publication entitled “Characteristics of Sustainable Brownfield Projects” which covers strategies for effectively returning industrial uses to functional green and open spaces. This can be found at: http://www.epa.gov/brownfields/pdf/sustain.pdf

contribute to increased levels of ground-ozone formation and heat related illnesses and death (EPA, 2007).

- In areas of greenfield development, proactively plan for the strategic conservation and location of green and open space.

Environmental Analysis

The Atlanta Road/Marietta Boulevard study area contains a wide array of environmental concerns that should be taken into account when planning and developing freight movement infrastructure and freight facilities. Issues surrounding water quality and proximity to air quality hot spots are the most prevalent environmental issues in this study area. The study area contains wetlands, floodplains, some areas with steep topography and is close to the Chattahoochee River. Future land use plans and decisions should require that non-point source pollution from warehouse and distribution areas is minimized. This can be accomplished through the use of both structural and non-structural best management practices (BMP). Structural BMPs are those that physically treat runoff at the point of generation or discharge. Filtration, detention, and retention systems are examples of structural BMPs. Non-structural BMPs are less direct methods designed to address the runoff problem through education, design, and open space protection to name a few.

Additionally, there are some locations within the study area where residences are located immediately adjacent to rail yards (see the Environmental Justice Section of this report). There are also transitional land uses adjacent to rail yards and other freight facilities that could possibly become residential areas. These residences and potential future residences could be in air quality hot spots which could be subject to air pollutant levels that are higher than ambient concentrations. These air quality hot spots could put local residents at higher risk for the negative health effects associated with air pollution.

An overview of hot spot monitoring and mitigation practices is covered in *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas* published by the Environmental Protection Agency.[19] Additionally, the Impacts of Freight and Mitigation Best Practices Table, Section 2, contains links to best practices and case studies for managing freight uses with respect to environmental concerns.

[19] http://www.epa.gov/otaq/stateresources/transconf/policy/420b06902.pdf

Fairburn Area Case Study

Demographics and Environmental Justice Analysis

One of the most pressing social concerns when examining large-scale infrastructure impacts in metropolitan Atlanta is that of environmental justice (EJ). Environmental justice refers to the idea that over time, geographic areas with larger-than-average concentrations of minority populations or populations at or below the poverty line suffer disproportionate negative environmental impacts. Since 1994, federal agencies have been required to identify and address potential or actual disproportional adverse environmental effects on minority and low-income populations. Thus it is appropriate to conduct a demographic analysis of the five case study areas, with a special emphasis on locating concentrations of minority and populations in poverty, in order to address environmental justice issues concerning existing and potential future freight traffic impacts.

To identify areas of environmental justice concern, the Atlanta Regional Commission (ARC), using demographic information obtained from the U.S. Census Bureau for the year 2000[20] for the 13-county region, takes regional averages and then uses those averages to highlight those communities which have greater-than-average concentrations of both minority populations and populations living in poverty, as well as where those two groups overlap. Thus the ARC defines any census block group that meets any of the following criteria as an environmental justice-community: greater than 9.1% in poverty, 30.4% African American, 3.6% Asian, or 7% of Hispanic origin.

The ARC does not have specific environmental justice guidelines in terms of the elderly or children. However, this demographic analysis will highlight those census block groups that have high percentages of people over age 65 or under age 11 living in poverty as compared to the regional average. This methodology mirrors the ARC's methodology for environmental justice which also compares block group percentages of specific populations to the regional average of those populations. The following criteria represent the regional average for concentrations of elderly and children in poverty: the elderly, 9.6% and 18.1% for children under age 11. The elderly and children are singled out because these groups are typically at greater risk of suffering negative health impacts from freight traffic, because of pre-existing health conditions or the development of young lungs and immune systems. In addition, living in poverty makes them vulnerable in terms of their mobility and healthcare options.

Having a larger-than-average percentage of an at-risk population within a block group does not necessarily mean that an environmental justice issue is present. Additional analysis must be conducted to determine if a significantly adverse impact is affecting the community and if that adverse impact is unfairly affecting that population as compared to other populations in the area.[21] If it is determined that significant adverse impacts are disproportionately burdening an at-risk population, then that population can be said to have an environmental justice issue. In the case of this report, the additional analysis consisted of reviewing the current land use map of the study area over aerial photography. Block groups that satisfied one or more of the ARC criteria for EJ populations were examined more closely to determine if certain conditions were present that might cause a negative impact on a surrounding community, neighborhood, or housing development. Conditions include: direct adjacencies of freight facilities and housing units, proximity of housing to truck routes, and the presence or absence of transitional land uses or other

[20] Demographic analysis was conducted using 2000 U.S. Census numbers which are now eight years old and are likely not reflective of current populations in the study area. In addition current land use maps utilized in the analysis are also out-of-date as evidenced when compared to more current aerial photography revealing on-the-ground development. In all cases, we utilized the most current data and maps available.
[21] These criteria are set forth by the USDOT.

buffering tools such as adequate vegetation. While EJ communities cannot be definitively identified using this analysis technique, the analysis points out communities that are potentially at risk.

This same kind of analysis can also be conducted to assess the potential adverse impacts of future projects. However, the demographic analysis in this report is confined to the existing environmental and demographic conditions of the five case study areas: Atlanta Road/Marietta Boulevard, Fairburn, Fulton Industrial Boulevard, Gwinnett County, and Henry County. It is recommended that an environmental justice scan be conducted as specific freight-based projects are proposed.

In this report, the demographic profile of each case study area is examined in turn. Each section begins with a brief description of the ARC's environmental justice at-risk populations found in that study area, followed by two maps. The first shows the spatial arrangement of the at-risk populations. Areas highlighted in green indicate that one EJ criteria is present, yellow indicates two, and red indicates three. A table listing all of the block groups for each study area, the total population for each block group, and percentages of minority populations and people living in poverty provide additional information regarding where EJ issues are present and the percentage of those populations affected. The second map spatially locates the elderly and children under 11 living in poverty. If either elderly or children are identified in the block group as being in poverty that block group is indicated with one hatch mark. If both children and the elderly are identified as living in poverty, that block group is indicated with two hatch marks. The table identifies which population is at risk.

Next the EJ maps are compared to the current land use map for the study area which is laid over an aerial image of the study area. This comparison reveals any areas of potential adverse impact from freight operations on a particular at-risk community. If an at-risk community group is identified as potentially suffering disproportionately from an adjacent freight land use, then it can be called an environmental justice community. Such identification allows mitigation measures to be directed to those areas to address the existing environmental impacts in addition to ensuring that the community will not suffer from future impacts.

Environmental justice remains a relatively new concern in planning and policy, and strategies to mitigate disproportionate environmental impacts on low-income or minority populations are still evolving. Mitigation strategies include: ensuring that affected communities have a say in future developments; ensuring significant and ongoing public involvement in decision-making; addressing specific community issues and responding to community preferences; the provision of environmental benefits to the community such as infrastructure upgrades or landscaping and buffering; and providing economic benefits to the community such as the creation of job opportunities, guaranteed participation in construction projects, and grants or loans for small business start-ups. The goal of environmental justice mitigation is to ensure that vulnerable populations that have been receiving an undue share of the burdens of, in the case of this report, the freight industry, no longer are unfairly burdened. In addition these populations should receive a proportionate share of the benefits of a project.

Environmental Justice Analysis

All of the block groups in the Fairburn study area[22] meet at least one of the ARC criteria for environmental justice communities, while four of the nine block groups meet all three criteria (Figure 1). Four of the block groups, all located in the northeastern portion of the study area, have children under 11 and elderly adults living in poverty. Of these only one has both children and elderly (Figure 2) and although the percentages are higher than the regional norm, the actual numbers of people in this block group, around 230, does not indicate an area of great concern (Table 1). Of particular concern are block groups 105.146 and 105.138 each of which meets three criteria for EJ. Block group 105.146 is located north of I-85 in the center of the study area, while block group 105.138 lies directly to its east. Block group 105.146 has a total population of approximately 1,500 people of which over 500 are African American, over 100 are Asian, and almost 300 are Hispanic. Thus almost 60% of the block group's population is composed of minorities. Block group 105.138 has almost 3,000 people of which over half are African American, 11% are Hispanic and 11% live in poverty.

Block group 105.106 which lies south of I-85 directly below 105.146 and 105.138 is of less concern in terms of environmental justice impacts in part because far fewer people live in this block group—368 total. This does not imply that the health and well-being of those 368 people should be valued less than that of others; instead this implies a degree of magnitude. In other words, resources should be focused on communities with the most people in danger of the worst environmental justice impacts. In the case of 105.106, reviewing the land use map and more recent aerial photos shows that residential communities in this block group appear adequately buffered from adverse environmental impacts (Figure 3). In addition, aerial photos confirm that recent residential development is taking place north of I-85 rather than within this block group.

Block groups 105.138 and 105.146 have approximately 4,400 people total between them. These two block groups, each with three EJ issues, have more at-risk groups potentially threatened by environmental impacts. Indeed, an analysis of land uses in the area reveals that block group 105.146 has an apartment complex with potential EJ concerns (Figure 4). The complex is sandwiched between two commercial strips and a warehousing complex and sits next to State Route 74, a designated truck route. Potential negative health outcomes and quality of life issues are associated with truck movement of freight, including exposure to air, noise, and light pollution. Block group 105.138 is of concern because forest land and formerly transitional land uses are rapidly becoming residential development, as evidenced by a visual comparison of the current land use map laid over more recent aerial photography. Some of this residential development is going in next to warehousing facilities and a rail line thus adequate buffering is of concern.

[22] For this study, demographic data were obtained for each study area using Census data from the 2000 census and gathering and analyzing data from the census block groups that intersect or lie completely within the study area boundary.

Table 1. Fairburn Study Area

		Against ARC Criteria				Against Regional Mean	
Block Group	Total Population	African American 30.4%	Asian 3.6%	Hispanic 7.0%	Poverty 9.1%	Elderly (65+) in Poverty 9.6%	Children (under 11) in Poverty 18.1%
104.004	2,086	Yes (40.1%)	No (0%)	Yes (8.1%)	Yes (10.7%)	No (7.4%)	No (10.6%)
105.105	2,951	Yes (87.2%)	No (0.80%)	No (2%)	No (7.9%)	No (0.0%)	No (13.6%)
105.106	1,368	No (22.2%)	No (0.0%)	Yes (7.6%)	Yes (9.1%)	No (9.2%)	No (10.8%)
105.125	1,859	Yes (80.0%)	No (0.0%)	No (2.1%)	Yes (17.2%)	Yes (18.6%)	No (10.9%)
105.126	3,768	Yes (86.4%)	No (1.9%)	No (2.1%)	No (7.7%)	Yes (24.0%)	No (8.2%)
105.137	2,619	Yes (46.0%)	No (0.0%)	Yes (19.0%)	Yes (14.7%)	Yes (17.9%)	Yes (22.4%)
105.138	2,907	Yes (56.8%)	No (0.0%)	Yes (11.1%)	Yes (11.0%)	Yes (30.7%)	No (12.1%)
105.144	3,264	Yes (38.9%)	No (0.0%)	No (4.2%)	No (6.7%)	No (6.3%)	No (11.4%)
105.146	1,496	Yes (33.6%)	Yes (6.9%)	Yes (18.5%)	No (7.4%)	No (3.0%)	No (3.2%)

Source: U.S. Census, 2000

Figure 1. Fairburn EJ Block Groups

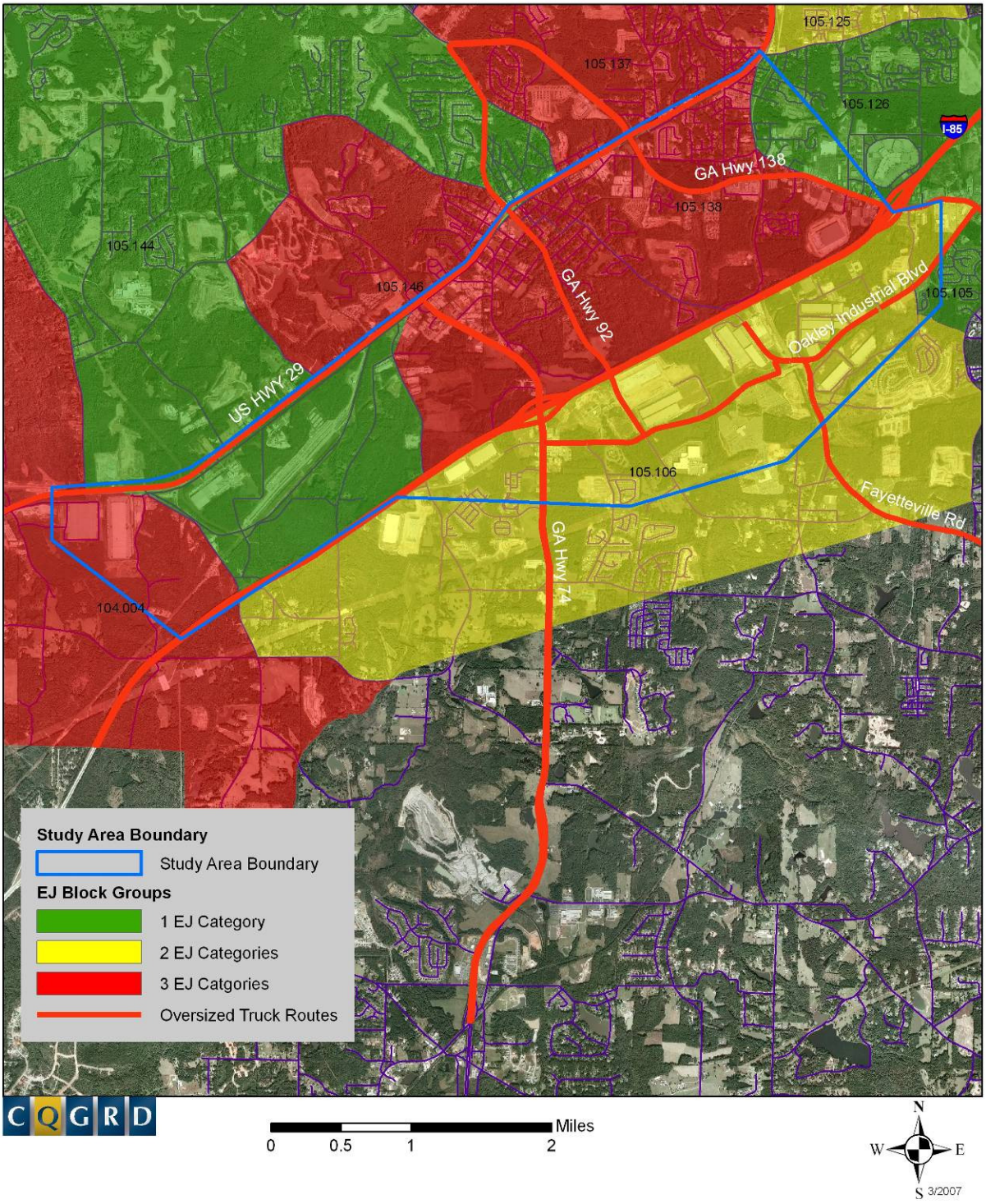


Figure 2. Fairburn EJ Block Groups with Elderly and Children

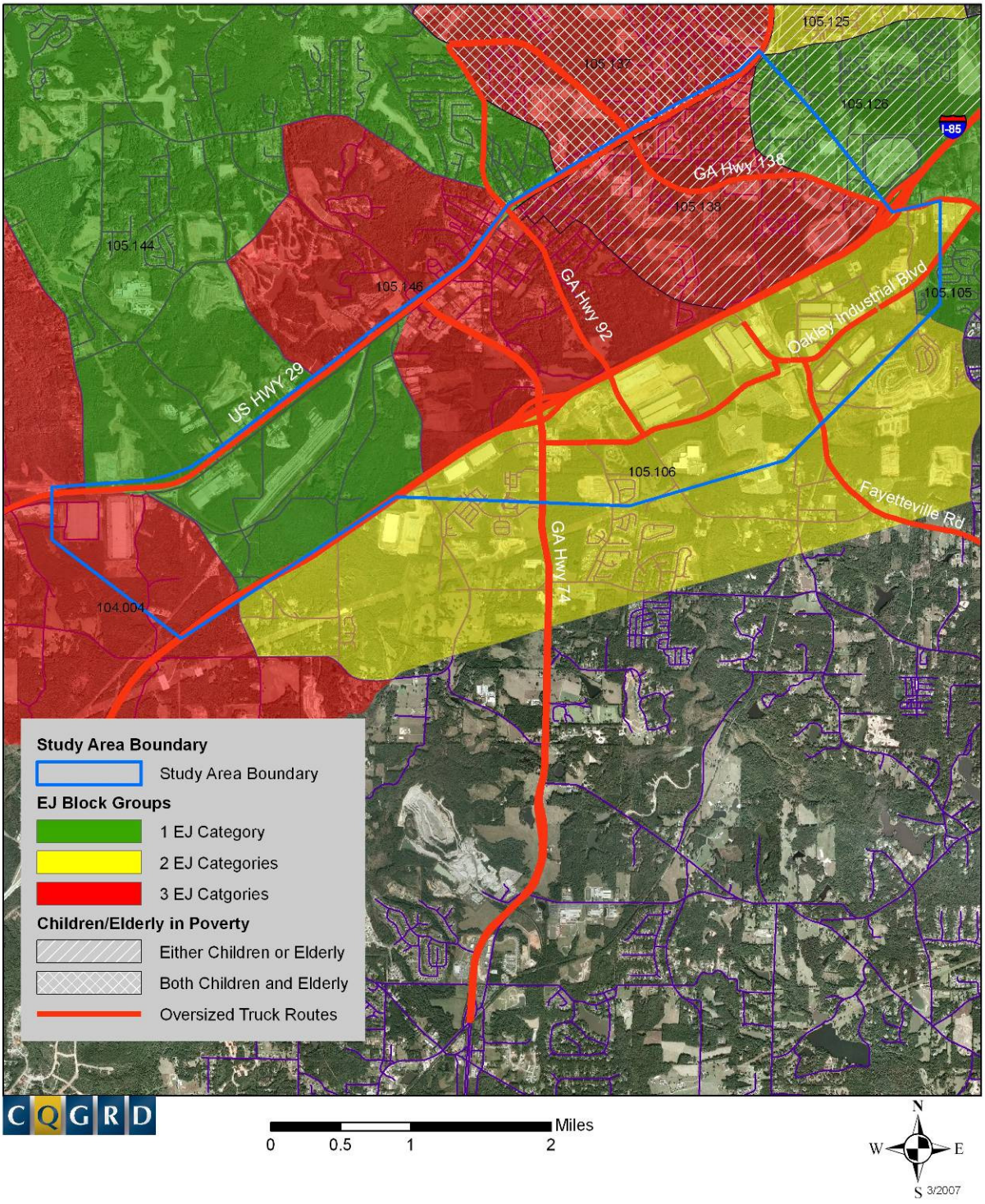


Figure 3. Fairburn Current Land Use Map

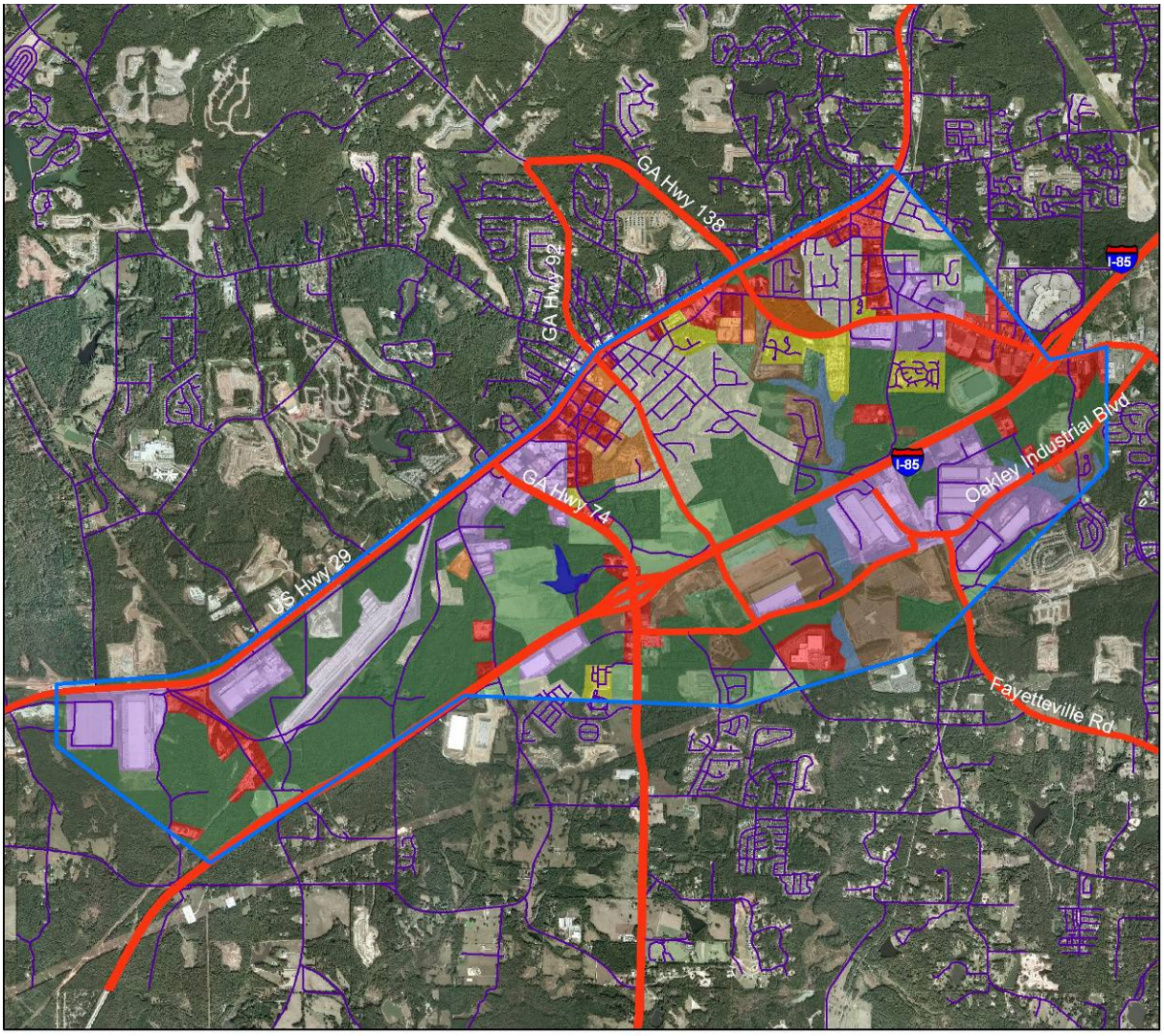
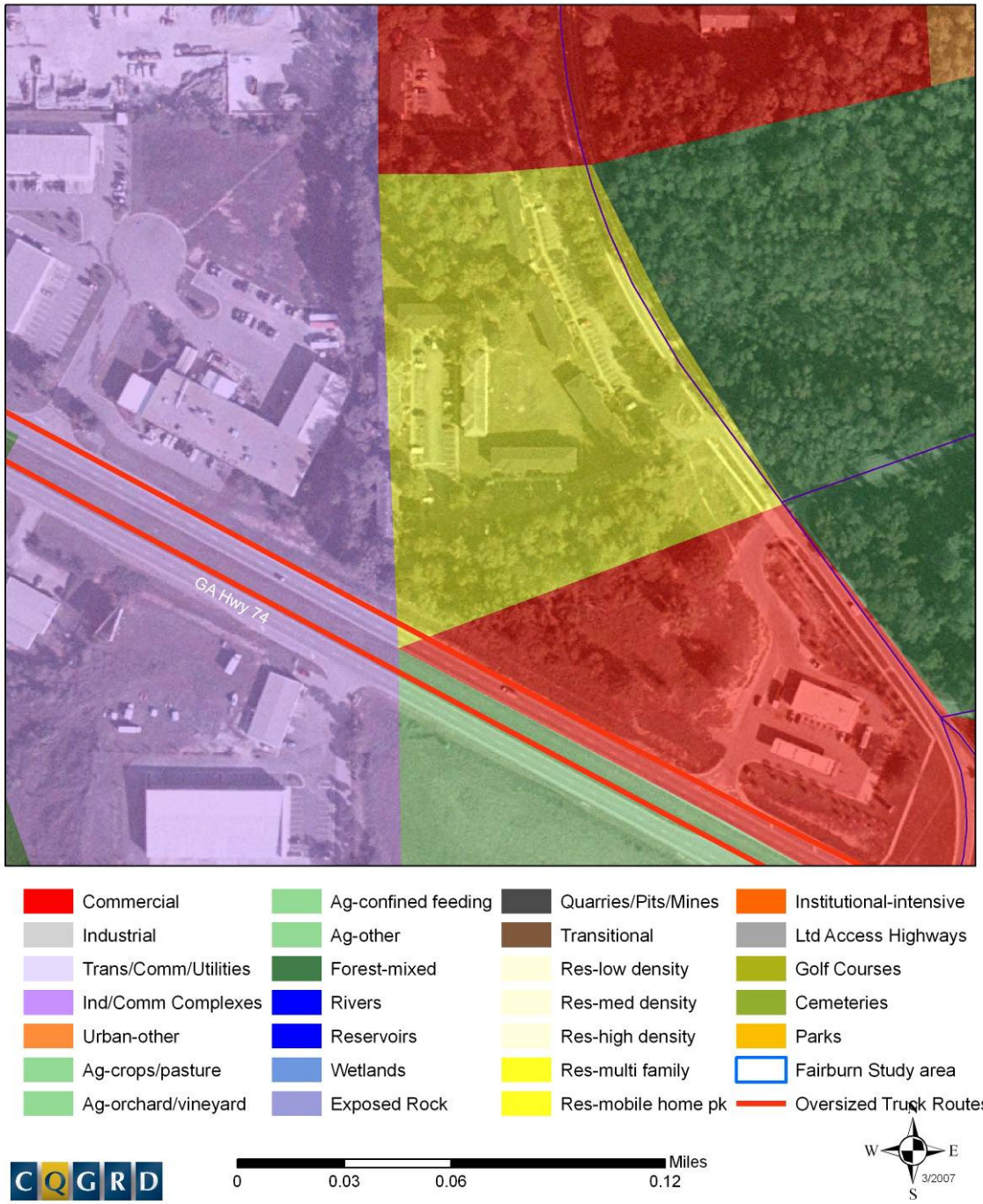


Figure 4. Fairburn Current Land Use Map with EJ Community



Current and Future Land Use Analysis

The Fairburn case study area houses the CSX Fairburn Intermodal Facility, two rail lines, and several concentrated areas of warehouse and distribution (W&D) facilities. However, when combined these areas account for only 3.3% of land uses in the study area.[23] On the other hand, 49.7% of the area is classified as natural or open space, which translates into a significant amount of potentially developable land. Should the Fairburn study area, located within Fulton County and the cities of Fairburn, Palmetto, and Union City, emerge as a significant center for logistics intensive economic activities, there arises the need for an integrated strategy to address both the growth of the freight industry and accompanying residential development.

Because so much of the Fairburn study area is natural space, issues of encroachment of incompatible land uses (industrial and residential) are likely to be of increasing concern. Already there are examples, of incompatible adjacencies; for example, high density residential developments are almost all located next to one or more freight-based facilities. In addition, the large amount of natural space that encircles the intermodal yard has the potential to become a major encroachment concern should the land become developed as residential (Figure 3).

Current development patterns, as ascertained via aerial photography, indicate a concentration of residential growth north of I-85 and east of Sate Highway 74 (Fairburn Industrial Boulevard / Senoia Road). Freight development is concentrating south of I-85 and east of State Highway 74 (Figure 3). Also visible in Figure 3 is a network of truck routes which service the W&D facilities throughout the study area. Residential development is also located along these truck routes which provides access but can also exacerbate the problems that arise from incompatible land use adjacencies: noise and light pollution, air quality issues, traffic congestion, safety concerns, road and pavement conditions, among others. For ways to mitigate such impacts, see the Impacts of Freight and Mitigation Best Practices Table in Section 2.

Adopted in 2005, the Fulton County Future Land Use Map (Figure 5) only shows land use designations for areas that fall within the county. Already it is apparent, when comparing the future land use map to aerial photography that the county is not adhering to its designated land uses. For example, the large area in blue south of I-85 which is designated Business Park has been developed into W&D facilities (Figure 3). In addition, land to the west of the 3-mile un-developable reservoir, was, at the time of the photo, being converted to W&D as well. Such an inconsistency between planned for and actual development is of concern because of the low density residential development that is occurring along the southern and eastern edges of this W&D area, most of which is being built just outside the study area boundary. Also of concern is the loss of greenspace evident when comparing Figures 3 and 5. Note that the intermodal yard falls within the area designated as industrial (light gray) on the future land use map. None of the greenspace that currently surrounds the yard has been maintained in the future land use map, leaving the door open for potential encroachment issues.

The City of Fairburn developed a Character Areas Map as part of its Comprehensive Plan (Figure 6). The primary use of the map is to identify and spatially locate desirable development types providing guidance for future development. Although the Character Areas map is quite general in the level of detail it provides, some potentially undesirable adjacencies are depicted. The industrial character type is the only character area that supports freight movement (dark purple and light purple with white polka dots). These industrial areas clearly border what has been identified as suburban (shades of yellow) low-density residential neighborhoods. Major roadways have been used as boundaries, many of which are designated truck routes. Truck routes, while useful as boundaries, are not sufficient buffers between industrial and residential development. While this Character Area map is only intended to provide a sense

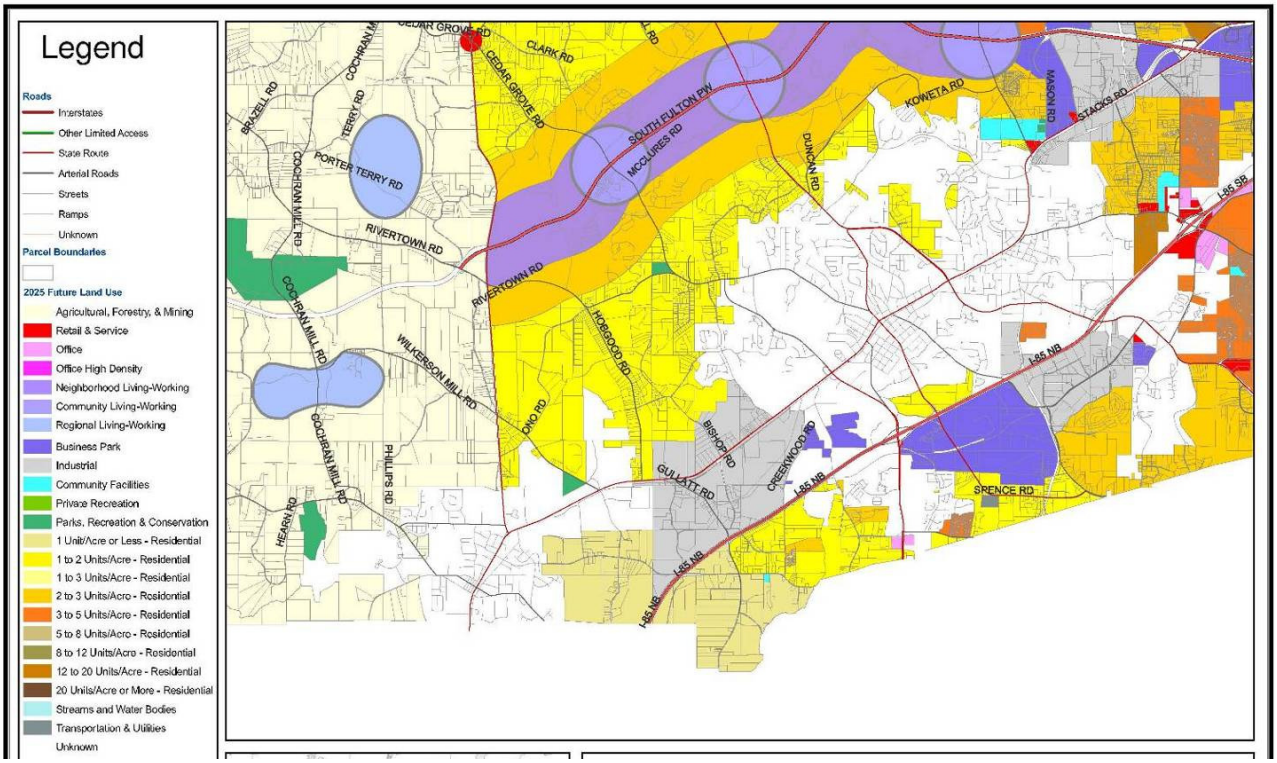
[23] All percentages of land uses are taken from Wilbur Smith Associates Land Use Case Studies

of desired land-use arrangement, it suggests a lack of understanding about the need for buffering land uses. For example a light commercial use would be an acceptable buffer between industrial and residential uses as would a significant greenspace set-aside.

The Fairburn Area is both blessed and cursed with the amount of greenspace it has within the study area. With 49.7% of the study area being natural/open space and a relatively low percentage of land developed as residential, currently 6.8%, the Fairburn study area could opt to cluster freight-based development or even designate areas as freight villages. Such designations would help ensure that freight does not continue to develop in an un-planned fashion. In addition, clustering freight protects the freight industry from encroachment by residential development giving freight priority in that area. In other words, the freight industry can set its hours of operations because noise ordinances would not be applicable. Roadways can be specially designed to accommodate trucks, meaning appropriate turning radii and pavement composition for example. Light pollution would not be as great an issue. Mixing of truck traffic and pedestrian or motor vehicles would be limited creating a safer environment for all. And truck routes would not be subject to change as communities encroach upon existing W&D facilities. Clustering of freight uses is also beneficial to residential development. Minimizing the interaction between the two is an effective tool for preventing the potential impacts of freight that harm the health, quality of life, and well-being of sensitive population groups.

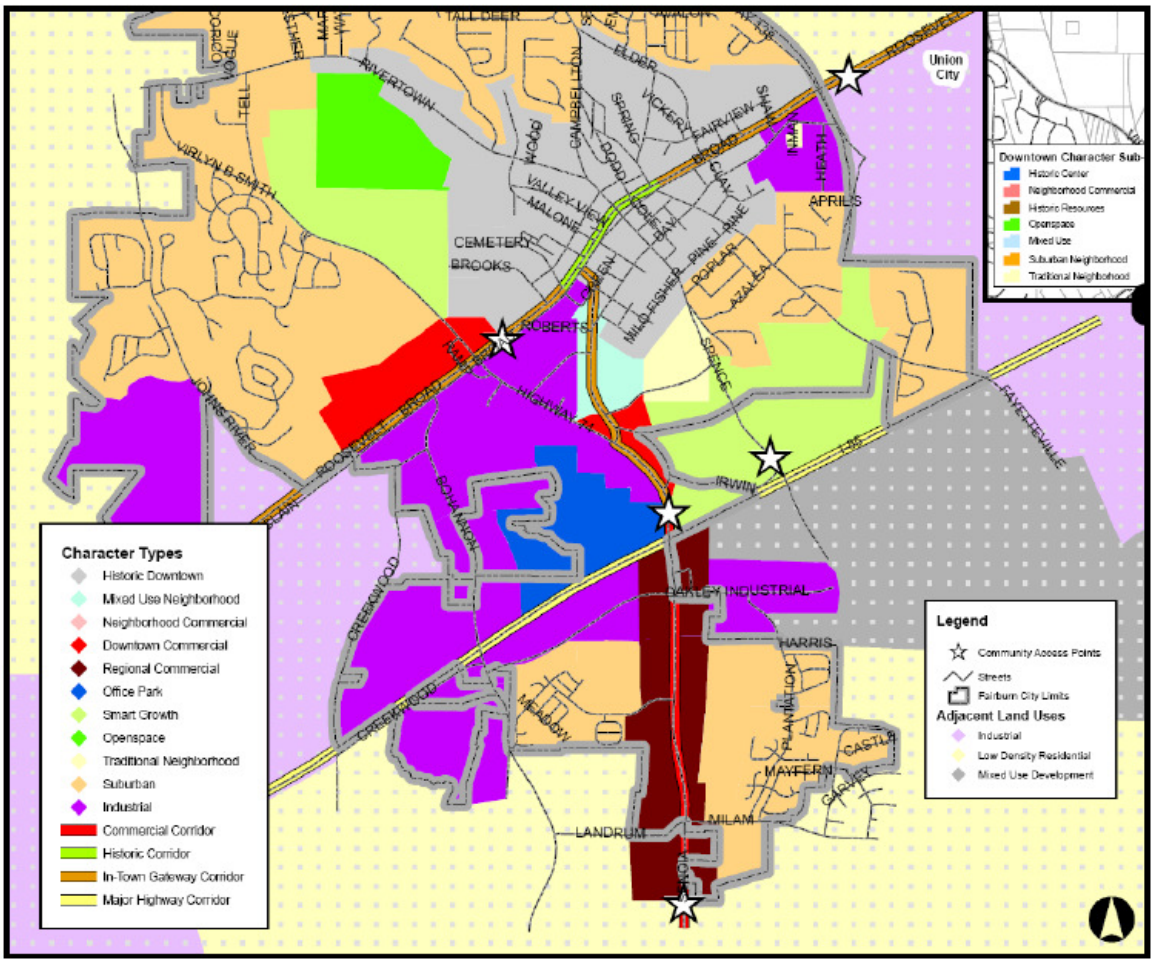
Greenfield development, which is typically discouraged because of its inefficient use of infrastructure and available resources, can be a useful tool for W&D development because it separates incompatible land uses. In addition, it must be acknowledged that not all locations, the Fairburn area included, have brownfield sites to be redeveloped. However, there are ways to responsibly develop a greenfield site to ensure the efficient use of infrastructure and resources and the protection of greenspace. Clustering of freight development or the creation of freight villages are two viable options. The land use analysis provide several greenfield development tools in the Fairburn Area Land Use Case Study.

Figure 5. Fulton County Future Land Use Map



Source: Fulton County

Figure 6. City of Fairburn Character Areas Map



Source: Wilbur Smith Associates

Environmental Impacts of Freight Movement and Freight Facilities

Freight movement and freight facilities can affect the surrounding environment in many ways. The buildings and infrastructure of freight facilities and operations can disrupt habitat and can contribute to the loss of green and open space. The movement of freight into, out of, and through facilities and on freight corridors contributes to regional and local air pollution. Fueling, maintenance, cleaning and other routine operational activities can lead to pollutants in surrounding surface and ground waters and soils. Additionally, the land uses associated with freight facilities and movement often consists of large amounts of impervious surfaces which can lead to increased non-point source stormwater runoff into surrounding waterways. These impacts can also affect surrounding communities and populations leading to health concerns and decreased quality of life. While numerous, these impacts can be prevented or mitigated through technological, operational, education, planning and design, and policy and regulation efforts. This section provides a brief overview of the general effects of freight movement and freight facilities on the surrounding environment and also gives a summary of the specific impacts of the study area.

Air Quality

Diesel emissions are a primary contributor to ambient particulate matter and gaseous pollution levels. These emissions contribute to regional and atmospheric changes that exacerbate global warming, acid rain, decreased visibility, and ozone depletion. In addition, due to high volumes of trucks and other diesel vehicles, freight facilities can be air quality hot spots, locales where pollutant concentrations are substantially higher than concentrations indicated by ambient outdoor monitors located in adjacent or surrounding areas. The pollutant concentrations within hot spots can vary over time depending on various factors including emission rates, activity levels of contributing sources, and meteorological conditions. In areas where residential land uses are proximate (closer than 200 meters) to freight facilities or corridors, these hot spots can lead to acute and chronic exposure to elevated pollution levels negatively affecting the populations living nearby.

There are many health effects associated with both ambient and locally concentrated air pollution. These include reduced lung function, asthma and other respiratory illnesses, cancer, irritation of breathing passages and premature death with children and the elderly being at a higher risk than the general population. Furthermore, both short-term (acute) and long-term (chronic) exposure to particulate matter has been associated with increased rates of cardio-respiratory morbidity (illness) and mortality (death) including increased lung cancer risk.

There are several strategies that can mitigate the effects of freight facilities and movement on the surrounding areas.

- Develop and utilize cleaner fuels.
- Develop and require regular monitoring of air quality hot spots.
- Cluster industrial uses and provide adequate buffer zones between industrial and residential uses.
- Develop education programs for facility managers, developers, and officials on pollution prevention.

Water

Land uses associated with freight corridors and facilities contribute to non-point source water pollution through stormwater runoff. Non-point source water pollution comes from many diffuse sources and is caused by water moving over and through the ground picking up and carrying pollutants into waterways and groundwater sources. This is in part due to the large amounts of impervious surfaces associated with the industrial facilities and infrastructure related with freight movement. Non point-source pollution can lead to a deterioration of recreational uses of waterways, can harm water quality, and can potentially

affect the health of nearby residents. Impervious surfaces can also contribute to increased quantities of runoff leading to erosion problems, flooding, and increased sediment loads in nearby streams and rivers.

In addition to environmental impacts, stormwater runoff can also contribute to health effects. Stormwater runoff, especially from industrial land uses, can carry large amounts of contaminants, both microbial and chemical, into storm sewers and streams affecting water quality. Polluted runoff can also contaminate groundwater sources. Polluted stormwater runoff has been associated with outbreaks of waterborne diseases implying a link between polluted runoff and public health. Waterborne illnesses can be caused by drinking contaminated water, recreational contact with contaminated water, or by eating produce irrigated with untreated water. The effects of contact or ingestion of contaminated water are much greater in vulnerable populations such as children, the elderly, and those with compromised immune systems.

Stormwater runoff reduction measures in the construction and redevelopment phases of freight facilities could help mitigate some of the negative effects of stormwater runoff associated with freight movement and freight facilities.

- Capture and treat water used in cleaning processes.
- Minimize use of toxic cleaning solutions.
- Incorporate detention and retention ponds, vegetated swales and filter strips, filtering systems, and porous pavements where appropriate and feasible.
- Develop training programs on pollution prevention and stormwater best management practices.
- Develop a system to monitor water quality in groundwater sources and nearby streams and water bodies.

Greenspace

The land uses associated with freight movement and freight facilities often cause fragmentation in green and open spaces. These spaces are made up of ecologically active lands such as parks, farms, forestlands, and wetlands. These types of spaces provide external benefits such as improved air and water quality, wildlife habitat and biological diversity, and social benefits including preservation of historic/rural character and aesthetic value and positive health benefits. Additionally, vegetative buffers can benefit both people and the environment. They can provide necessary separation between incompatible land uses blocking excess noise and light and can also mitigate negative environmental effects associated with air emissions and stormwater runoff. Green and open spaces can be proactively planned as part of greenfield developments or can be undertaken retroactively as brownfield re-developments.[24]

Green and open spaces provide many benefits to the community and can also be used to mitigate and minimize many of the environmental impacts associated with the movement and processing of freight.

- Utilize greenspace in the form of vegetated swales and constructed wetlands to aid in the control and treatment of stormwater runoff.
- Develop training programs on the use of greenspace and open space to mitigate air and water quality issues.
- Study, and when possible, require the use of green roofs in freight areas. This could help reduce the urban heat-island effect, associated with large amounts of impervious surfaces, which can

[24] The EPA has a publication entitled “Characteristics of Sustainable Brownfield Projects” which covers strategies for effectively returning industrial uses to functional green and open spaces. This can be found at: http://www.epa.gov/brownfields/pdf/sustain.pdf

contribute to increased levels of ground-ozone formation and heat related illnesses and death (EPA, 2007).

- In areas of greenfield development, proactively plan for the strategic conservation and location of green and open space.

Environmental Analysis

The Fairburn study area contains a wide array of environmental concerns that should be taken into account when planning and developing freight movement infrastructure and freight facilities. Issues surrounding water quality are the most prevalent environmental issues in this study area. The study area contains wetlands, reservoirs and floodplains. Additionally, over 40% of the city of Fairburn lies within a water supply watershed with most of this area contained in the study area boundaries. Future land use plans and decisions should require that non-point source pollution from W&D areas is minimized. This can be accomplished through the use of both structural and non-structural best management practices. Structural BMPs are those that physically treat runoff at the point of generation or discharge. Filtration, detention, and retention systems are examples of structural BMPs. Non-structural BMPs are less direct methods designed to address the runoff problem through education, design, and open space protection to name a few.

The Fairburn study area also contains a large amount of open and natural space. Almost half of the study area has a land use classification of natural space or open space. These spaces can provide valuable buffers between W&D areas and other land uses mitigating the effects of light, noise, air and water pollution. These areas also may provide habitat continuity, recreation opportunities, and aesthetic benefits to the surrounding communities. All of these concerns should be considered as future developments and land use planning efforts are undertaken.

There are many types of stormwater BMPs available, and a successful stormwater management program will include a variety of these that best suit the specific situation. An overview of those practices can be found in *Preliminary Data Summary of Urban Stormwater Best Management Practices* published by the Environmental Protection Agency[25]. Additionally, the Impacts of Freight and Mitigation Best Practices Table, Section 2, contains links to best practices and case studies for managing freight uses with respect to environmental concerns.

[25] http://www.epa.gov/waterscience/guide/stormwater/#nsbd

Fulton Industrial Boulevard Case Study

Demographics and Environmental Justice Analysis

One of the most pressing social concerns when examining large-scale infrastructure impacts in metropolitan Atlanta is that of environmental justice (EJ). Environmental justice refers to the idea that over time, geographic areas with larger-than-average concentrations of minority populations or populations at or below the poverty line suffer disproportionate negative environmental impacts. Since 1994, federal agencies have been required to identify and address potential or actual disproportional adverse environmental effects on minority and low-income populations. Thus it is appropriate to conduct a demographic analysis of the five case study areas, with a special emphasis on locating concentrations of minority and populations in poverty, in order to address environmental justice issues concerning existing and potential future freight traffic impacts.

To identify areas of environmental justice concern, the Atlanta Regional Commission (ARC), using demographic information obtained from the U.S. Census Bureau for the year 2000[26] for the 13-county region, takes regional averages and then uses those averages to highlight those communities which have greater-than-average concentrations of both minority populations and populations living in poverty, as well as where those two groups overlap. Thus the ARC defines any census block group that meets any of the following criteria as an environmental justice-community: greater than 9.1% in poverty, 30.4% African American, 3.6% Asian, or 7% of Hispanic origin.

The ARC does not have specific environmental justice guidelines in terms of the elderly or children. However, this demographic analysis will highlight those census block groups that have high percentages of people over age 65 or under age 11 living in poverty as compared to the regional average. This methodology mirrors the ARC's methodology for environmental justice which also compares block group percentages of specific populations to the regional average of those populations. The following criteria represent the regional average for concentrations of elderly and children in poverty: the elderly, 9.6% and 18.1% for children under age 11. The elderly and children are singled out because these groups are typically at greater risk of suffering negative health impacts from freight traffic, because of pre-existing health conditions or the development of young lungs and immune systems. In addition, living in poverty makes them vulnerable in terms of their mobility and healthcare options.

Having a larger-than-average percentage of an at-risk population within a block group does not necessarily mean that an environmental justice issue is present. Additional analysis must be conducted to determine if a significantly adverse impact is affecting the community and if that adverse impact is unfairly affecting that population as compared to other populations in the area.[27] If it is determined that significant adverse impacts are disproportionately burdening an at-risk population, then that population can be said to have an environmental justice issue. In the case of this report, the additional analysis consisted of reviewing the current land use map of the study area over aerial photography. Block groups that satisfied one or more of the ARC criteria for EJ populations were examined more closely to determine if certain conditions were present that might cause a negative impact on a surrounding community, neighborhood, or housing development. Conditions include: direct adjacencies of freight facilities and housing units, proximity of housing to truck routes, and the presence or absence of transitional land uses or other

[26] Demographic analysis was conducted using 2000 U.S. Census numbers which are now eight years old and are likely not reflective of current populations in the study area. In addition current land use maps utilized in the analysis are also out-of-date as evidenced when compared to more current aerial photography revealing on-the-ground development. In all cases, we utilized the most current data and maps available.
[27] These criteria are set forth by the USDOT.

buffering tools such as adequate vegetation. While EJ communities cannot be definitively identified using this analysis technique, the analysis points out communities that are potentially at risk.

This same kind of analysis can also be conducted to assess the potential adverse impacts of future projects. However, the demographic analysis in this report is confined to the existing environmental and demographic conditions of the five case study areas: Atlanta Road/Marietta Boulevard, Fairburn, Fulton Industrial Boulevard, Gwinnett County, and Henry County. It is recommended that an environmental justice scan be conducted as specific freight-based projects are proposed.

In this report, the demographic profile of each case study area is examined in turn. Each section begins with a brief description of the ARC's environmental justice at-risk populations found in that study area, followed by two maps. The first shows the spatial arrangement of the at-risk populations. Areas highlighted in green indicate that one EJ criteria is present, yellow indicates two, and red indicates three. A table listing all of the block groups for each study area, the total population for each block group, and percentages of minority populations and people living in poverty provide additional information regarding where EJ issues are present and the percentage of those populations affected. The second map spatially locates the elderly and children under 11 living in poverty. If either elderly or children are identified in the block group as being in poverty that block group is indicated with one hatch mark. If both children and the elderly are identified as living in poverty, that block group is indicated with two hatch marks. The table identifies which population is at risk.

Next the EJ maps are compared to the current land use map for the study area which is laid over an aerial image of the study area. This comparison reveals any areas of potential adverse impact from freight operations on a particular at-risk community. If an at-risk community group is identified as potentially suffering disproportionately from an adjacent freight land use, then it can be called an environmental justice community. Such identification allows mitigation measures to be directed to those areas to address the existing environmental impacts in addition to ensuring that the community will not suffer from future impacts.

Environmental justice remains a relatively new concern in planning and policy, and strategies to mitigate disproportionate environmental impacts on low-income or minority populations are still evolving. Mitigation strategies include: ensuring that affected communities have a say in future developments; ensuring significant and ongoing public involvement in decision-making; addressing specific community issues and responding to community preferences; the provision of environmental benefits to the community such as infrastructure upgrades or landscaping and buffering; and providing economic benefits to the community such as the creation of job opportunities, guaranteed participation in construction projects, and grants or loans for small business start-ups. The goal of environmental justice mitigation is to ensure that vulnerable populations that have been receiving an undue share of the burdens of, in the case of this report, the freight industry, no longer are unfairly burdened. In addition these populations should receive a proportionate share of the benefits of a project.

Environmental Justice Analysis

The Fulton Industrial Boulevard study area is sensitive in terms of environmental justice issues. Fourteen of the 17 block groups either contained by or intersecting the study area[28] have African-American population percentages of 90% or greater, two of which are 100%; the African-American population percentage for the study area as a whole is 81%. Only one block group, 103.017, which borders the study area to the southwest, meets none of the ARC's EJ criteria (Figure 1). The study area as a whole has 27.8% of its residents in poverty (Table 1). Thirteen out of 17 block groups have children under age 11 living in poverty greater than the regional average; five out of seventeen have percentages of children in poverty greater than 50%, two block groups are over 80%. These five block groups alone account for approximately 2,700 children out of almost 4,000 children living in poverty in the study area. All of these block groups with greater than 50% of children in poverty are located on the eastern end of the study area from roughly I-20 north. Elderly living in poverty is also of concern although the magnitude of the issue is less than for children in poverty (Figure 2).

Interstate 20 forms an unofficial dividing line between land uses north and east of I-20 and those south and west (Figure 3). The current land use map indicates that block groups 78.051, 78.052, and 103.032, all south and west of I-20, are predominately industrial and commercial (mostly warehousing and distribution) in nature with few residential developments. Block group 78.051 is the only block group to meet three of the ARC's EJ criteria. Of the 2,193 people in the block group, all but 91 are a minority. In addition, 22% of the block group lives in poverty. Ninety-six percent of the population of block groups 78.052 and 103.032 is African American. Over 12% of the population lives in poverty and the relatively high number of children living in poverty is an issue for both as well (Table 1).

While the land use maps indicate some pockets of residential development within these block groups, the predominate land use is industrial/commercial – warehousing and distribution. With such a large minority population and significant poverty numbers, the individuals in these three block groups are already potentially at greater risk of suffering from poor health. In addition, these individuals are living in relatively close proximity to significant warehouse and distribution facilities and other industrial complexes the effects of which could exacerbate or contribute to negative health outcomes. On the current land use map, there exists, in most cases, a significant amount of forest between industrial uses and larger residential developments, however, if the warehousing and distribution facilities continue to expand to the south of Fulton Industrial Boulevard, more residential units will be placed in greater proximity to potential EJ offenders.

The nine block groups to the north and east of I-20 (78.071, 82.011, 82.021, 82.022, 82.023, 82.024, 86.021, 87.021, and 87.023) all meet two EJ criteria – percent in poverty and percent minority. In addition all but 82.022 have percentages of elderly and children in poverty higher than the regional averages (Figure 2). The nine block groups have percentages of African-American populations ranging from 91% of their total population to 100%. Of the more than 17,600 people living in these block groups, 98% are African American. In addition, poverty levels range from a low of 15% of the population to over 75% for a total of more than 7,600 people living in poverty.

What makes these block groups fit the EJ criteria for disproportionate impacts are the proximity of residential developments (mainly high density public housing and apartments) to busy truck routes, including interstates 20 and 285, as well as warehousing and distribution facilities. In addition, the residential developments are not only proximal, they are not buffered. The Fulton Industrial Boulevard case study pointed out the proximity of the Bankhead Court apartments and public housing to a truck route with an average annual daily traffic (AADT) volume of 21,200-21,900 and large industrial facilities (Figure 4). Similar examples of high-density residential uses sited along I-20 and I-285 are also evident in

[28] For this study, demographic data were obtained for each study area using Census data from the 2000 census and gathering and analyzing data from the census block groups that intersect or lie completely within the study area boundary.

the land use map. Interstate 20 has an AADT of 118,800 and I-285 ranges from 134,700-153,100 which exposes nearby residents to high levels of air pollution and noise pollution both of which have significant impacts on the health of these communities (see the Impacts of Freight and Mitigation Best Practices Table, Section 2).

Table 1. Fulton Industrial Boulevard Study Area

		Against ARC Criteria				Against Regional Mean	
Block Group	Total Population	African American 30.4%	Asian 3.6%	Hispanic 7.0%	Poverty 9.1%	Elderly (65+) in Poverty 9.6%	Children (under 11) in Poverty 18.1%
78.051	2,193	Yes (77.5%)	No (0.0%)	Yes (18.4%)	Yes (22.9%)	Yes (19.2%)	Yes (35.6%)
78.052	1,967	Yes (98.1%)	No (0.0%)	No (0.7%)	Yes (13.3%)	No (0.0%)	Yes (26.7%)
78.061	1,605	Yes (91.2%)	No (2.2%)	No (1.6%)	Yes (16.5%)	Yes (21.2%)	Yes (28.1%)
78.062	3,625	Yes (99.7%)	No (0.0%)	No (0.3%)	Yes (13.8%)	Yes (11.1%)	Yes (26.3%)
78.071	2,851	Yes (96.5%)	No (0.0%)	No (5.7%)	Yes (36.8%)	Yes (28.9%)	Yes (53.5%)
82.011	3,798	Yes (98.8%)	No (0.0%)	No (0.4%)	Yes (23.9%)	Yes (12.7%)	Yes (48.4%)
82.021	885	Yes (100.0%)	No (0.0%)	No (0.3%)	Yes (29.3%)	Yes (11.5%)	Yes (34.7%)
82.022	951	Yes (95.0%)	No (0.0%)	No (0.5%)	Yes (15.6%)	No (7.6%)	No (3.2%)
82.023	1,229	Yes (91.2%)	No (0.6%)	No (3.7%)	Yes (32.0%)	Yes (20.0%)	Yes (40.3%)
82.024	1,375	Yes (100.0%)	No (0.0%)	No (1.5%)	Yes (75.5%)	Yes (100.0%)	Yes (84.2%)
86.021	3,625	Yes (98.3%)	No (0.0%)	No (1.3%)	Yes (70.5%)	Yes (32.1%)	Yes (87.7%)
87.021	956	Yes (96.3%)	No (0.0%)	No (1.3%)	Yes (26.8%)	Yes (11.5%)	Yes (57.7%)
87.023	1,971	Yes (99.5%)	No (0.0%)	No (0.7%)	Yes (52.2%)	Yes (9.7%)	Yes (65.8%)
103.016	1,621	Yes (60.8%)	No (1.8%)	No (0.9%)	No (3.2%)	Yes (11.2%)	No (0.0%)
103.017	1,556	No (20.1%)	No (0.5%)	No (1.1%)	No (1.2%)	No (0.0%)	No (0.0%)
103.032	2,819	Yes (94.3%)	No (0.0%)	No (0.6%)	Yes (11.4%)	No (4.2%)	Yes (20.7%)
103.044	1,472	Yes (92.1%)	No (0.3%)	No (0.5%)	No (3.5%)	No (6.5%)	No (0.0%)

Source: U.S. Census, 2000

Figure 1. Fulton Industrial Boulevard EJ Block Groups

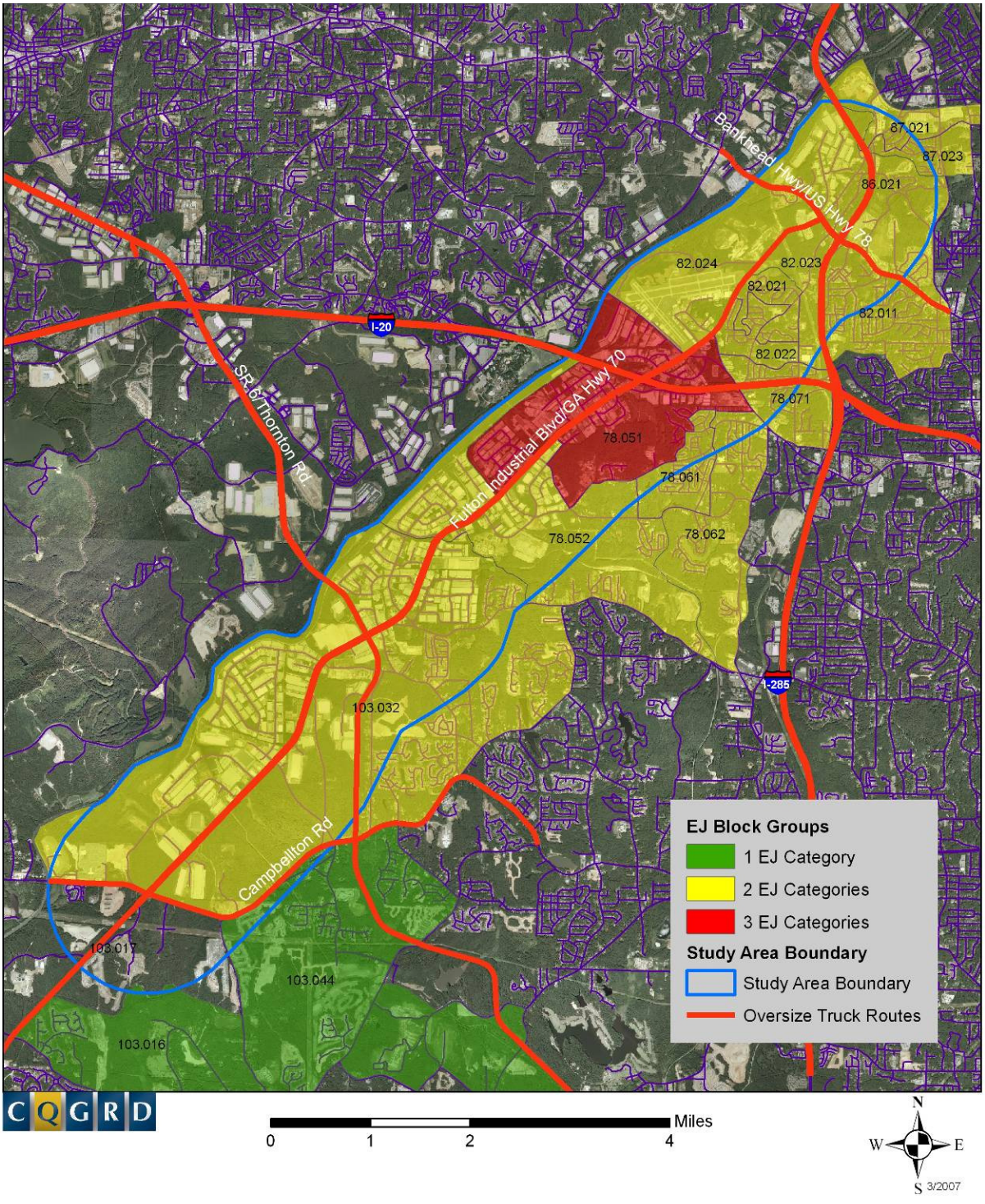


Figure 2. Fulton Industrial Boulevard EJ Block Groups with Elderly and Children

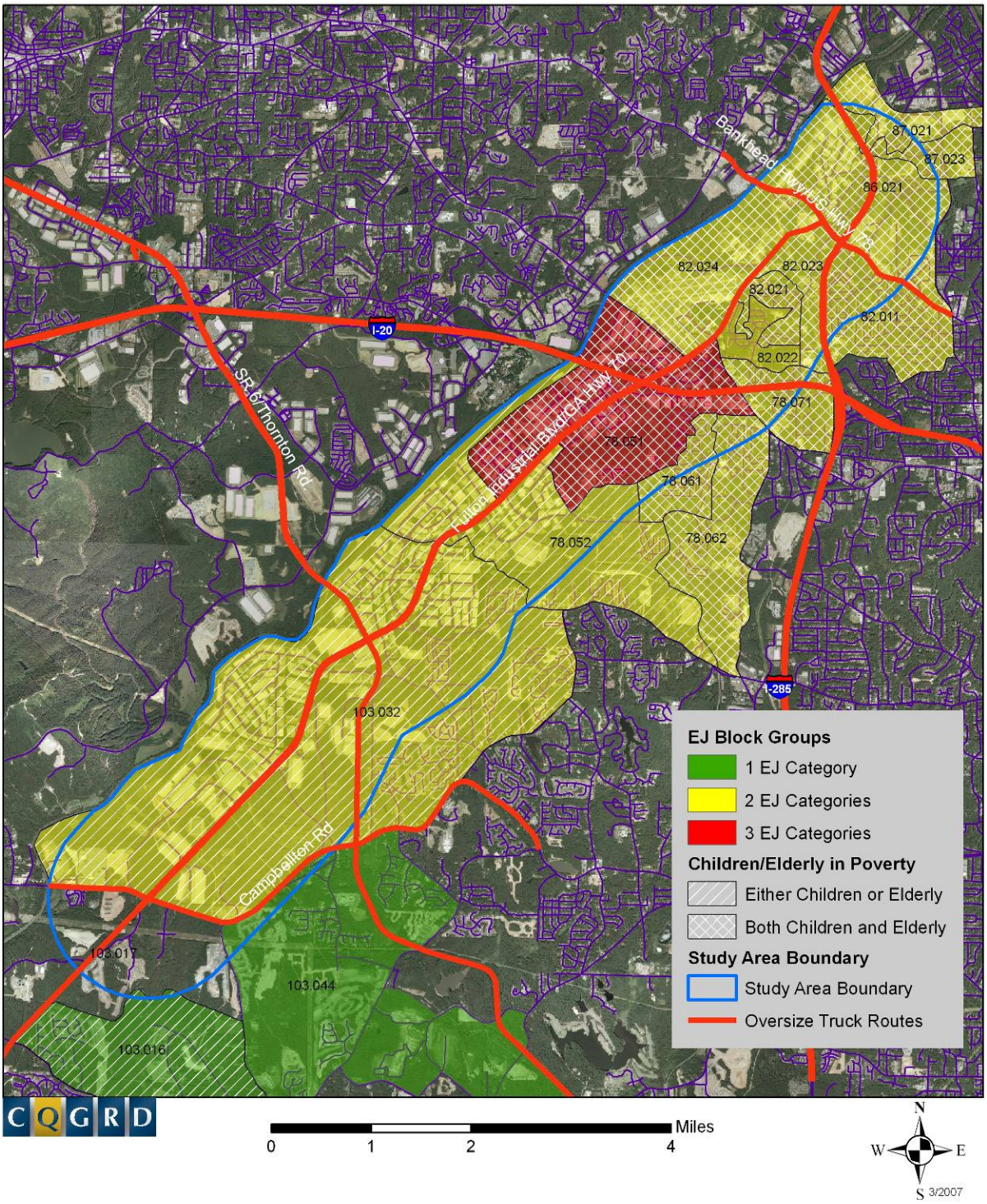


Figure 3. Fulton Industrial Boulevard Current Land Use Map

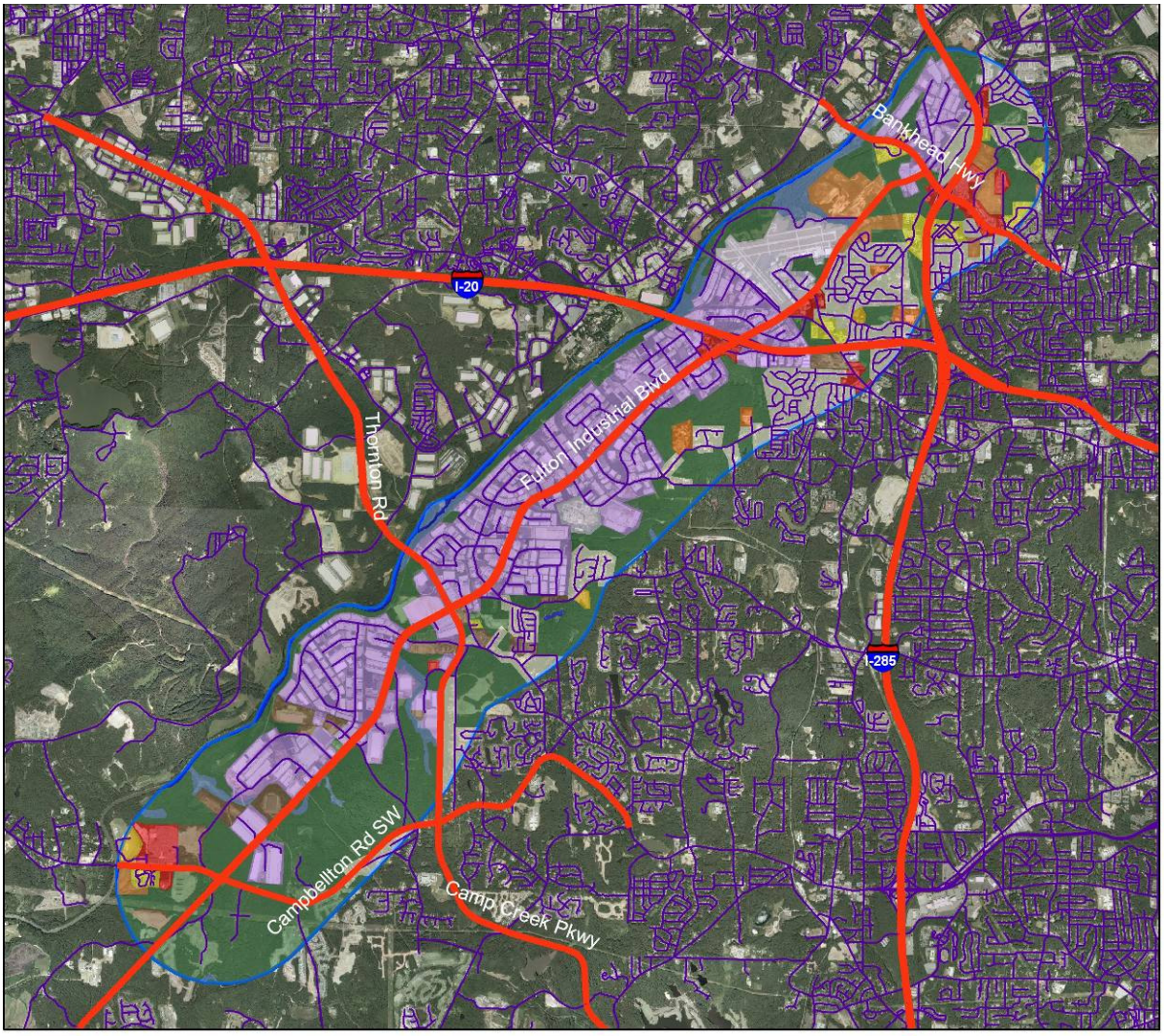
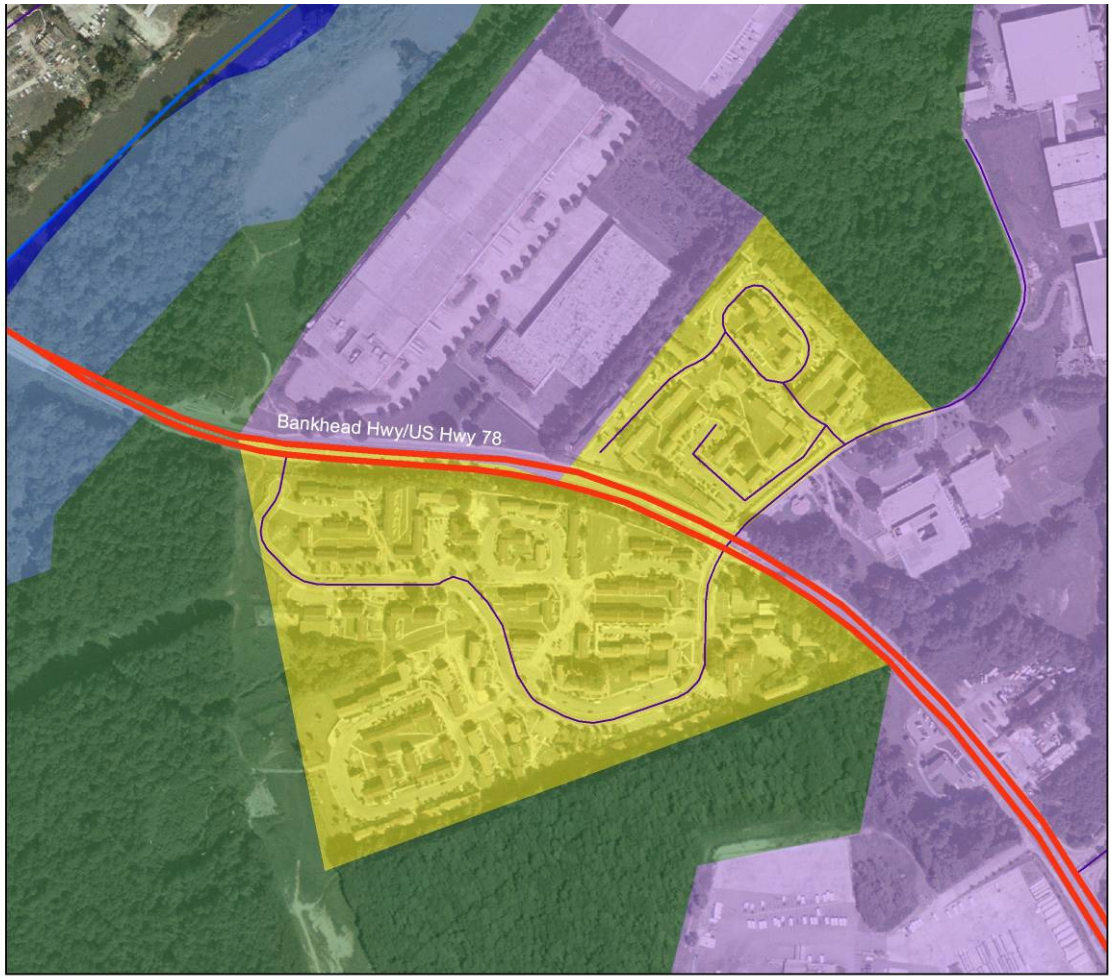


Figure 4. Fulton Industrial Boulevard EJ Community



Current and Future Land Use Analysis

Fulton Industrial Boulevard is Metropolitan Atlanta's main warehousing and Distribution (W&D) center and is called the largest W&D center east of the Mississippi River. Serviced by the CSX and Norfolk Southern rail lines and two interstates, I-20 and I-285, the area became the Fulton Industrial Business District in the 1960s. In more recent years, the area has been experiencing decline due to a shift in the manufacturing base, an excess of older buildings, public safety issues along Fulton Industrial Boulevard, and competition from other industrial complexes. As a result, the area is ripe for brownfield redevelopment and infill opportunities. Redevelopment opportunities combined with several scheduled road improvements that will better service the movement of freight, make the Fulton Industrial area competitive for renewed interest in freight-oriented development. However, older, unused buildings, cheaper land, and a significant amount of open space (42% of the study area), make the area attractive for residential development, which is incompatible with the industrial nature of the area unless adequately mitigated or buffered.

Residential development comprises 16% of the 65.26 square mile study area and is located primarily south of Fulton Industrial Boulevard and east of I-20.[29] Medium and low density development make up the majority of the residential types and are highly incompatible with industrial development. High density residential (HDR) development is compatible with commercial activity and can act as a second-tier of buffer to more intense uses, however, HDR should still be well buffered from W&D and industrial uses.

Because easy access to interstates is often a selling point in residential real estate, almost all of the housing developments (low, medium, and high density) are clustered around I-20 and I-285 or along busy truck routes that access the freeways (Figure 3). Often, as in Figure 4, the developments are not well-buffered from the polluters (air, noise, light). In addition, these developments experience high-rates of truck cut-through traffic and truck parking, poor roadway pavement conditions, safety issues regarding the mixing of vehicles, pedestrian, and heavy trucks, and safety and traffic issues associated with at-grade crossings, among others. Tools for mitigating these impacts of freight and others can be found in the Impacts of Freight and Mitigation Best Practices Table in Section 2. If residential development continues in the area, it will be important to maintain significant portions of the available natural space in the study area to act as buffers between industrial and residential uses.

Figure 5 shows the County's current zoning map for part of the study area. The zoning that is allowed differs from what is actually on the ground (compare Figures 3 and 5). As examples of good practice, Fulton County has clustered the M-1A and M-2 industrial zoning classifications and these clusters are located along truck routes. However, there are a few places in which incompatible zoning classifications abut one another, for example the light blue SUB-A, single family dwelling classification which lies adjacent to M-1A (industrial park) in the lower portion of Figure 5. Also, R-3 development (orange) along the right side of the map abuts M-1A and M-2, heavy industrial. These are very much incompatible land use adjacencies.

When comparing the current zoning map (Figure 5) with the current land use map and aerial photography (Figure 3) it is clear that much of the land that is zoned SUB-A and even much of the M-1A zoning that lies between Fulton Industrial Boulevard (red) and Camp Creek Parkway (green) has not been developed. In fact, this is where a large portion of the study area's natural space is located. The County should consider downzoning some of these two areas to encourage the retention of greenspace to act as buffers between incompatible land uses. It would also be prudent to insert a transitional zoning category between light industrial and low density residential such as community business (light pink).

[29] All percentages of land uses are taken from Wilbur Smith Associates Land Use Case Studies

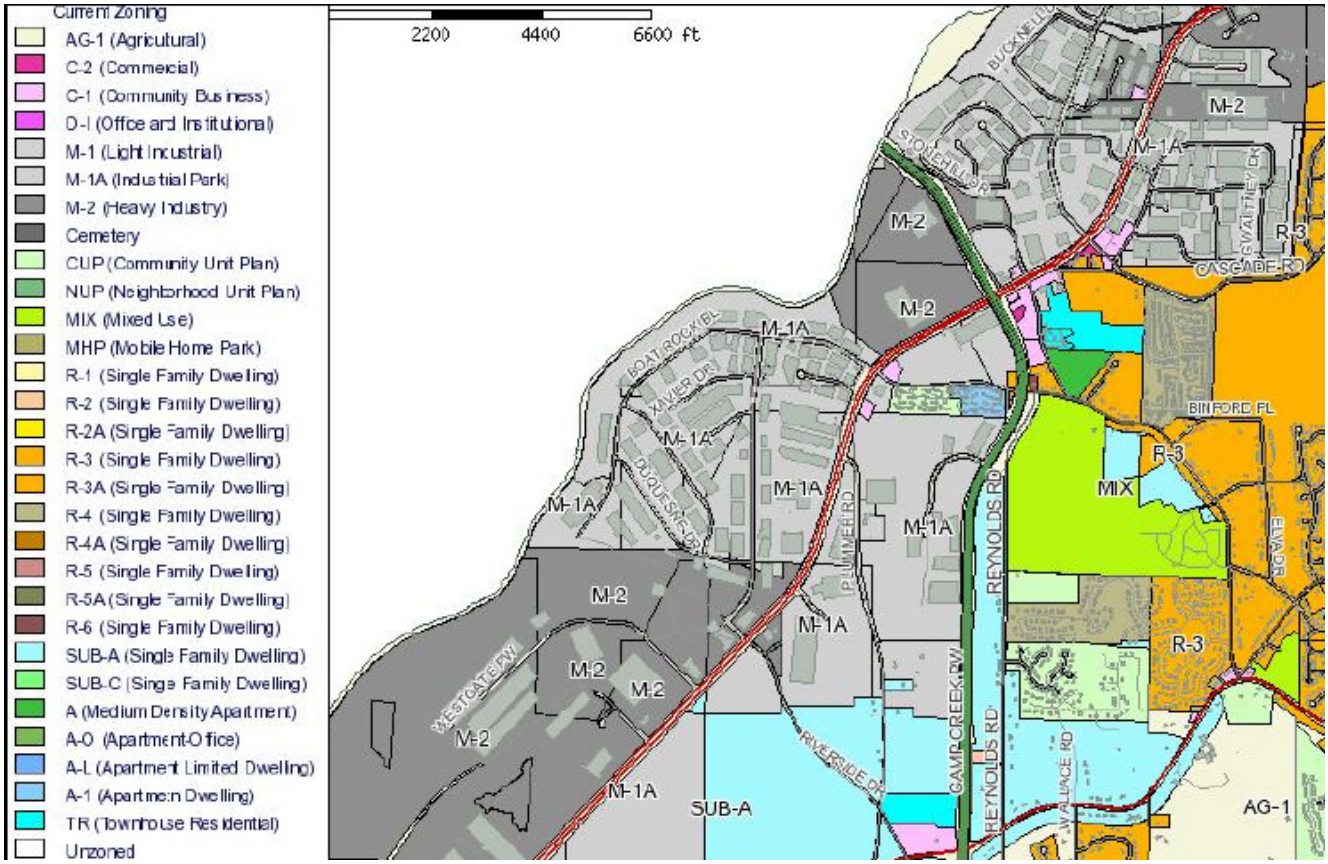
The Future Land Use Map (Figure 6), adopted in 2005, shows a continued interest in clustering industrial uses primarily to the north of Fulton Industrial Boulevard. However, there is also the desire to attract more residential development to the area. The Future Land Use Map demonstrates good transitional land use buffering techniques west of Camp Creek Parkway, and less than ideal buffering to the east of the Parkway. The area to the west of Camp Creek Parkway shows industrial land use bordered by Fulton Industrial Boulevard, then a Business Park designation (dark blue), then medium density residential development (orange), which culminates in low density residential (yellow). However, east of Camp Creek Parkway, low density residential is shown abutting industrial uses. Again, open space is not utilized as a buffering tool. Adequate buffering is necessary to protect the health and well-being of residents living in proximity to noxious land uses. See the Impacts of Freight and Mitigation Best Practices Table for a discussion of the health impacts of freight and tools for mitigation and prevention.

Because the Fulton Industrial Boulevard study area is defined by its W&D facilities which stretch out lengthwise across the study area, adequate truck routes were constructed to access the facilities and the Interstates that bisect the northeastern tip of the study area. As a result the study area has an extensive network of truck routes which are good for freight movement but are less desirable for residential developments. With the increased focus on infill development and brownfield redevelopment within the study area, the truck network is also scheduled to receive improvements which will affect the level and type of impact existing residential developments are likely to experience.[30] Interstate 285, I-20, SR 70 (Fulton Industrial Boulevard), SR 6 (Camp Creek Parkway), and SR 166 (Campbellton Road/Fairburn Road) are expected to receive improvements that will increase capacity; increased capacity may be detrimental for people because it means increased exposure to air pollution along with the potential for more traffic congestion, road wear, noise, safety issues, etc. The effects of such road improvement projects should be considered in light of existing residential development and new residential development should be limited or adequately buffered.

In areas, such as the Fulton Industrial Boulevard study area, that have been freight logistics and W&D facilities for many years, in this case over 40 years, many of the existing facilities have become obsolete and are therefore well-positioned for redevelopment. Such redevelopment potential, coupled with an abundance of open space, provides an opportunity to develop freight facilities responsibly The land use component of the freight mobility plan recommended instituting a W&D zoning classification to cluster freight development into freight villages, thereby making the provision of infrastructure efficient and simultaneously reducing the chances for incompatible land use adjacencies. The recommendations included the use of overly districts as a versatile tool to incorporate and protect features that are deemed important by the community. Brownfield redevelopment can be viewed as an opportunity to learn from past mistakes, rectify existing issues, and prevent future problems.

[30] For a more detailed discussion of road improvements, see the Wilbur Smith Associates Fulton Industrial Case Study

Figure 5. Fulton Industrial Area Current Zoning Map



Source: Wilbur Smith Associates

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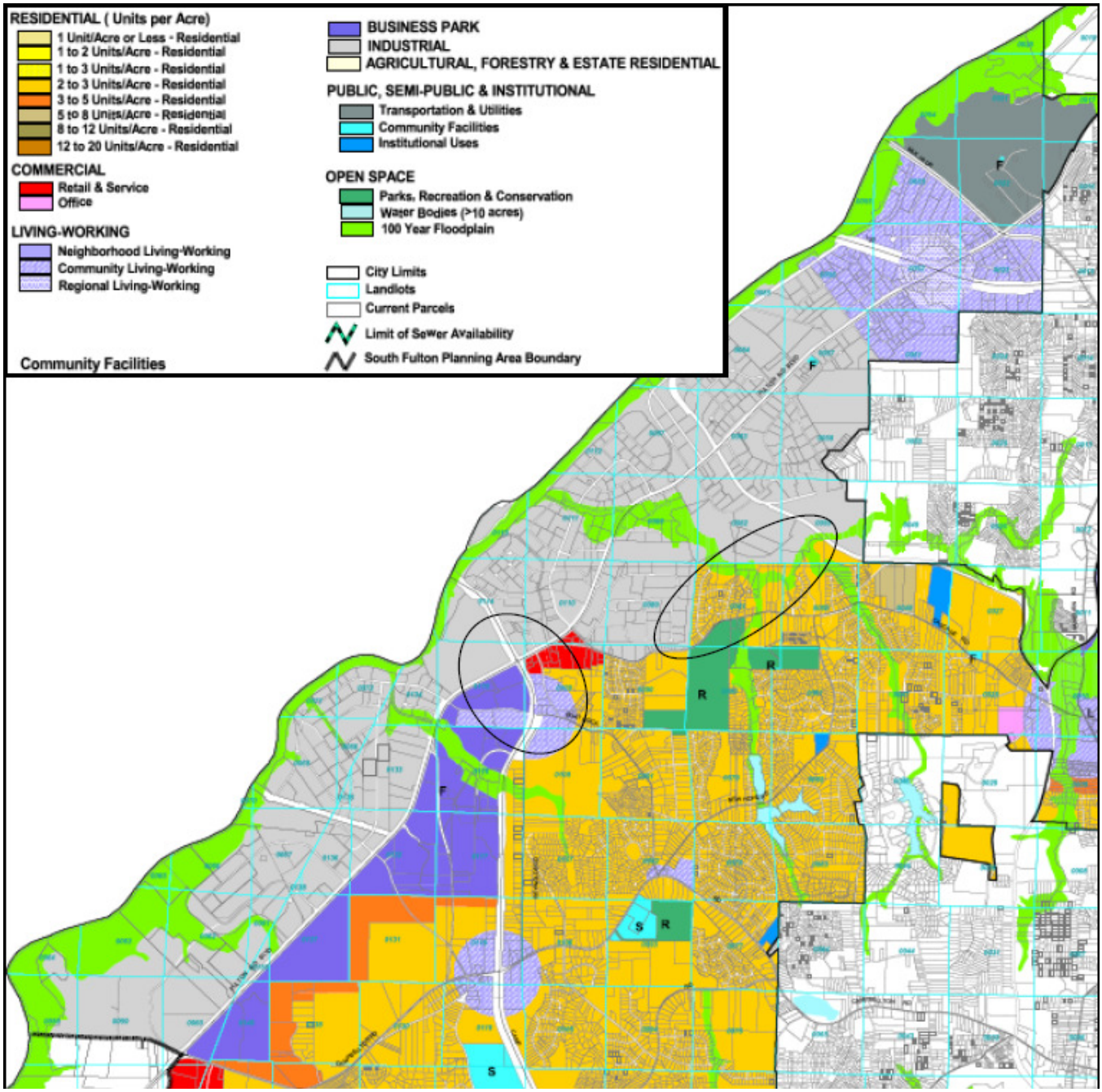

Source: Wilbur Smith Associates

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Air Quality

Diesel emissions are a primary contributor to ambient particulate matter and gaseous pollution levels. These emissions contribute to regional and atmospheric changes that exacerbate global warming, acid rain, decreased visibility, and ozone depletion. In addition, due to high volumes of trucks and other diesel vehicles, freight facilities can be air quality hot spots, locales where pollutant concentrations are substantially higher than concentrations indicated by ambient outdoor monitors located in adjacent or surrounding areas. The pollutant concentrations within hot spots can vary over time depending on various factors including emission rates, activity levels of contributing sources, and meteorological conditions. In areas where residential land uses are proximate (closer than 200 meters) to freight facilities or corridors, these hot spots can lead to acute and chronic exposure to elevated pollution levels negatively affecting the populations living nearby.

There are many health effects associated with both ambient and locally concentrated air pollution. These include reduced lung function, asthma and other respiratory illnesses, cancer, irritation of breathing passages and premature death with children and the elderly being at a higher risk than the general population. Furthermore, both short-term (acute) and long-term (chronic) exposure to particulate matter has been associated with increased rates of cardio-respiratory morbidity (illness) and mortality (death) including increased lung cancer risk.

There are several strategies that can mitigate the effects of freight facilities and movement on the surrounding areas.

- Develop and utilize cleaner fuels.
- Develop and require regular monitoring of air quality hot spots.
- Cluster industrial uses and provide adequate buffer zones between industrial and residential uses.
- Develop education programs for facility managers, developers, and officials on pollution prevention.

Water

Land uses associated with freight corridors and facilities contribute to non-point source water pollution through stormwater runoff. Non-point source water pollution comes from many diffuse sources and is caused by water moving over and through the ground picking up and carrying pollutants into waterways and groundwater sources. This is in part due to the large amounts of impervious surfaces associated with the industrial facilities and infrastructure related with freight movement. Non point-source pollution can lead to a deterioration of recreational uses of waterways, can harm water quality, and can potentially

affect the health of nearby residents. Impervious surfaces can also contribute to increased quantities of runoff leading to erosion problems, flooding, and increased sediment loads in nearby streams and rivers.

In addition to environmental impacts, stormwater runoff can also contribute to health effects. Stormwater runoff, especially from industrial land uses, can carry large amounts of contaminants, both microbial and chemical, into storm sewers and streams affecting water quality. Polluted runoff can also contaminate groundwater sources. Polluted stormwater runoff has been associated with outbreaks of waterborne diseases implying a link between polluted runoff and public health. Waterborne illnesses can be caused by drinking contaminated water, recreational contact with contaminated water, or by eating produce irrigated with untreated water. The effects of contact or ingestion of contaminated water are much greater in vulnerable populations such as children, the elderly, and those with compromised immune systems.

Stormwater runoff reduction measures in the construction and redevelopment phases of freight facilities could help mitigate some of the negative effects of stormwater runoff associated with freight movement and freight facilities.

- Capture and treat water used in cleaning processes.
- Minimize use of toxic cleaning solutions.
- Incorporate detention and retention ponds, vegetated swales and filter strips, filtering systems, and porous pavements where appropriate and feasible.
- Develop training programs on pollution prevention and stormwater best management practices.
- Develop a system to monitor water quality in groundwater sources and nearby streams and water bodies.

Greenspace

The land uses associated with freight movement and freight facilities often cause fragmentation in green and open spaces. These spaces are made up of ecologically active lands such as parks, farms, forestlands, and wetlands. These types of spaces provide external benefits such as improved air and water quality, wildlife habitat and biological diversity, and social benefits including preservation of historic/rural character and aesthetic value and positive health benefits. Additionally, vegetative buffers can benefit both people and the environment. They can provide necessary separation between incompatible land uses blocking excess noise and light and can also mitigate negative environmental effects associated with air emissions and stormwater runoff. Green and open spaces can be proactively planned as part of greenfield developments or can be undertaken retroactively as brownfield re-developments.[31]

Green and open spaces provide many benefits to the community and can also be used to mitigate and minimize many of the environmental impacts associated with the movement and processing of freight.

- Utilize greenspace in the form of vegetated swales and constructed wetlands to aid in the control and treatment of stormwater runoff.
- Develop training programs on the use of greenspace and open space to mitigate air and water quality issues.
- Study, and when possible, require the use of green roofs in freight areas. This could help reduce the urban heat-island effect, associated with large amounts of impervious surfaces, which can

[31] The EPA has a publication entitled "Characteristics of Sustainable Brownfield Projects" which covers strategies for effectively returning industrial uses to functional green and open spaces. This can be found at: http://www.epa.gov/brownfields/pdf/sustain.pdf

contribute to increased levels of ground-ozone formation and heat related illnesses and death (EPA, 2007).

- In areas of greenfield development, proactively plan for the strategic conservation and location of green and open space.

Environmental Analysis

The Fulton Industrial Blvd. study area contains a wide array of environmental concerns that should be taken into account when planning and developing freight movement infrastructure and freight facilities. Issues surrounding water quality are the most prevalent environmental issues in this study area. The study area contains wetlands, floodplains, reservoirs, streams and the western edge of the study area is bounded by the Chattahoochee River. Future land use plans and decisions should require that non-point source pollution from W&D areas is minimized. This can be accomplished through the use of both structural and non-structural best management practices. Structural BMPs are those that physically treat runoff at the point of generation or discharge. Filtration, detention, and retention systems are examples of structural BMPs. Non-structural BMPs are less direct methods designed to address the runoff problem through education, design, and open space protection to name a few.

The Fulton Industrial study area also contains a large amount of open and natural space. Over 40% of the study area has a land use classification of natural or open space. These spaces can provide valuable buffers between W&D areas and other land uses mitigating the effects of light, noise, air and water pollution (this is of special importance for the areas adjacent to the Chattahoochee River and its tributaries). These areas also may provide habitat continuity, recreation opportunities, and aesthetic benefits to the surrounding communities. All of these concerns should be considered as future developments and land use planning efforts are undertaken.

There are many types of stormwater BMPs available, and a successful stormwater management program will include a variety of these that best suit the specific situation. An overview of those practices can be found in *Preliminary Data Summary of Urban Stormwater Best Management Practices* published by the Environmental Protection Agency[32]. Additionally, the Impacts of Freight and Mitigation Best Practices Table, Section 2, contains links to best practices and case studies for managing freight uses with respect to environmental concerns.

[32] http://www.epa.gov/waterscience/guide/stormwater/#nsbd

Gwinnett County Case Study

Demographics and Environmental Justice Analysis

One of the most pressing social concerns when examining large-scale infrastructure impacts in metropolitan Atlanta is that of environmental justice (EJ). Environmental justice refers to the idea that over time, geographic areas with larger-than-average concentrations of minority populations or populations at or below the poverty line suffer disproportionate negative environmental impacts. Since 1994, federal agencies have been required to identify and address potential or actual disproportional adverse environmental effects on minority and low-income populations. Thus it is appropriate to conduct a demographic analysis of the five case study areas, with a special emphasis on locating concentrations of minority and populations in poverty, in order to address environmental justice issues concerning existing and potential future freight traffic impacts.

To identify areas of environmental justice concern, the Atlanta Regional Commission (ARC), using demographic information obtained from the U.S. Census Bureau for the year 2000[33] for the 13-county region, takes regional averages and then uses those averages to highlight those communities which have greater-than-average concentrations of both minority populations and populations living in poverty, as well as where those two groups overlap. Thus the ARC defines any census block group that meets any of the following criteria as an environmental justice-community: greater than 9.1% in poverty, 30.4% African American, 3.6% Asian, or 7% of Hispanic origin.

The ARC does not have specific environmental justice guidelines in terms of the elderly or children. However, this demographic analysis will highlight those census block groups that have high percentages of people over age 65 or under age 11 living in poverty as compared to the regional average. This methodology mirrors the ARC's methodology for environmental justice which also compares block group percentages of specific populations to the regional average of those populations. The following criteria represent the regional average for concentrations of elderly and children in poverty: the elderly, 9.6% and 18.1% for children under age 11. The elderly and children are singled out because these groups are typically at greater risk of suffering negative health impacts from freight traffic, because of pre-existing health conditions or the development of young lungs and immune systems. In addition, living in poverty makes them vulnerable in terms of their mobility and healthcare options.

Having a larger-than-average percentage of an at-risk population within a block group does not necessarily mean that an environmental justice issue is present. Additional analysis must be conducted to determine if a significantly adverse impact is affecting the community and if that adverse impact is unfairly affecting that population as compared to other populations in the area.[34] If it is determined that significant adverse impacts are disproportionately burdening an at-risk population, then that population can be said to have an environmental justice issue. In the case of this report, the additional analysis consisted of reviewing the current land use map of the study area over aerial photography. Block groups that satisfied one or more of the ARC criteria for EJ populations were examined more closely to determine if certain conditions were present that might cause a negative impact on a surrounding community, neighborhood, or housing development. Conditions include: direct adjacencies of freight facilities and housing units, proximity of housing to truck routes, and the presence or absence of transitional land uses or other

[33] Demographic analysis was conducted using 2000 U.S. Census numbers which are now eight years old and are likely not reflective of current populations in the study area. In addition current land use maps utilized in the analysis are also out-of-date as evidenced when compared to more current aerial photography revealing on-the-ground development. In all cases, we utilized the most current data and maps available.
[34] These criteria are set forth by the USDOT.

buffering tools such as adequate vegetation. While EJ communities cannot be definitively identified using this analysis technique, the analysis points out communities that are potentially at risk.

This same kind of analysis can also be conducted to assess the potential adverse impacts of future projects. However, the demographic analysis in this report is confined to the existing environmental and demographic conditions of the five case study areas: Atlanta Road/Marietta Boulevard, Fairburn, Fulton Industrial Boulevard, Gwinnett County, and Henry County. It is recommended that an environmental justice scan be conducted as specific freight-based projects are proposed.

In this report, the demographic profile of each case study area is examined in turn. Each section begins with a brief description of the ARC's environmental justice at-risk populations found in that study area, followed by two maps. The first shows the spatial arrangement of the at-risk populations. Areas highlighted in green indicate that one EJ criteria is present, yellow indicates two, and red indicates three. A table listing all of the block groups for each study area, the total population for each block group, and percentages of minority populations and people living in poverty provide additional information regarding where EJ issues are present and the percentage of those populations affected. The second map spatially locates the elderly and children under 11 living in poverty. If either elderly or children are identified in the block group as being in poverty that block group is indicated with one hatch mark. If both children and the elderly are identified as living in poverty, that block group is indicated with two hatch marks. The table identifies which population is at risk.

Next the EJ maps are compared to the current land use map for the study area which is laid over an aerial image of the study area. This comparison reveals any areas of potential adverse impact from freight operations on a particular at-risk community. If an at-risk community group is identified as potentially suffering disproportionately from an adjacent freight land use, then it can be called an environmental justice community. Such identification allows mitigation measures to be directed to those areas to address the existing environmental impacts in addition to ensuring that the community will not suffer from future impacts.

Environmental justice remains a relatively new concern in planning and policy, and strategies to mitigate disproportionate environmental impacts on low-income or minority populations are still evolving. Mitigation strategies include: ensuring that affected communities have a say in future developments; ensuring significant and ongoing public involvement in decision-making; addressing specific community issues and responding to community preferences; the provision of environmental benefits to the community such as infrastructure upgrades or landscaping and buffering; and providing economic benefits to the community such as the creation of job opportunities, guaranteed participation in construction projects, and grants or loans for small business start-ups. The goal of environmental justice mitigation is to ensure that vulnerable populations that have been receiving an undue share of the burdens of, in the case of this report, the freight industry, no longer are unfairly burdened. In addition these populations should receive a proportionate share of the benefits of a project.

Environmental Justice Analysis

All of the block groups in the Gwinnett County study area[35] exceed the ARC's criterion in terms of concentrations of Asian population: the block groups average 8.1% Asian population, as opposed to the ARC's criterion of 3.6%. Only one block group, 505.101 exceeds ARC EJ criteria in two categories: Asian and Hispanic (Figure 1). While all block groups meet at least one EJ criterion, the map perhaps tells too dramatic a story. In fact, the Asian population makes up only 7.3% of the total population in the area or approximately 3,300 out of 46,000 people (Table 1). Block group 505.101 has a total of 420 Asian and Hispanic minorities out of more than 2,600 people. In addition, poverty is not an issue in this study area, being significantly lower than the regional average. It should be noted that two block groups have elderly in poverty, but this represents only 20 people total (Figure 2).

Because the 2000 U.S. Census numbers do not indicate a large number of minorities in the study area, and because this report cannot identify where the minority populations live, it is difficult to ascertain definitively if environmental justice is an issue within the Gwinnett County study area. However, it is apparent by reviewing the land use maps over aerial photography that, in general, apartment complexes are not well-buffered against the industrial warehousing and distribution complexes and accompanying truck routes that define the study area (Figure 3). Because apartment complexes typically are less expensive forms of housing, one can make the assumption that these complexes could be potential sites of freight-related EJ concern.

Block group 505.101, with two EJ criteria, has apartment complexes tucked between the southern edge of the study area and a large industrial warehousing area. On the land use map (Figure 4), the area is listed as transitional (brown), however, in the intervening years between completion of the land use map and aerial photography, the area has turned high-density residential. In block group 505.131, to the north and east of 505.101 sits high-density residential sandwiched between industrial warehousing on two of its sides and commercial development on the other two sides (Figure 5). Residents of these sites are being exposed to freight-related impacts including air, noise, and light pollution; traffic-related problems; community safety issues; and visual/aesthetic concerns all of which have an affect on the health and quality of life those residents. See the Impacts of Freight and Mitigation Best Practices Table in Section 2 for a discussion of freight-related impacts and mitigation tools.

[35] For this study, demographic data were obtained for each study area using Census data from the 2000 census and gathering and analyzing data from the census block groups that intersect or lie completely within the study area boundary.

Table 1. Gwinnett County Study Area

		Against ARC Criteria				Against Regional Mean	
Block Group	Total Population	African American 30.4%	Asian 3.6%	Hispanic 7.0%	Poverty 9.1%	Elderly (65+) in Poverty 9.6%	Children (under 11) in Poverty 18.1%
502.021	13,403	No (6.8%)	Yes (7.0%)	No (3.7%)	No (1.6%)	No (5.6%)	No (1.7%)
502.022	5,190	No (8.9%)	Yes (9.3%)	No (3.8%)	No (2.3%)	No (0.0%)	No (0.6%)
502.042	5,159	No (6.4%)	Yes (9.7%)	No (3.0%)	No (3.5%)	No (0.0%)	No (4.7%)
505.101	2,614	No (14.0%)	Yes (8.2%)	Yes (7.9%)	No (4.1%)	Yes (20.0%)	No (0.8%)
505.102	2,078	No (11.3%)	Yes (14.5%)	No (5.3)	No (2.8%)	No (0.0%)	No (2.9%)
505.103	3,696	No (8.7%)	Yes (5.4%)	No (2.8%)	No (2.8%)	Yes (9.8%)	No (0.6%)
505.131	5,832	No (6.9%)	Yes (5.7%)	No (5.4%)	No (0.6%)	No (0.0%)	No (0.7%)
505.132	8,250	No (7.6%)	Yes (4.8%)	No (3.9%)	No (1.6%)	No (0.0%)	No (0.0%)

Source: U.S. Census, 2000

Figure 1. Gwinnett County EJ Block Groups

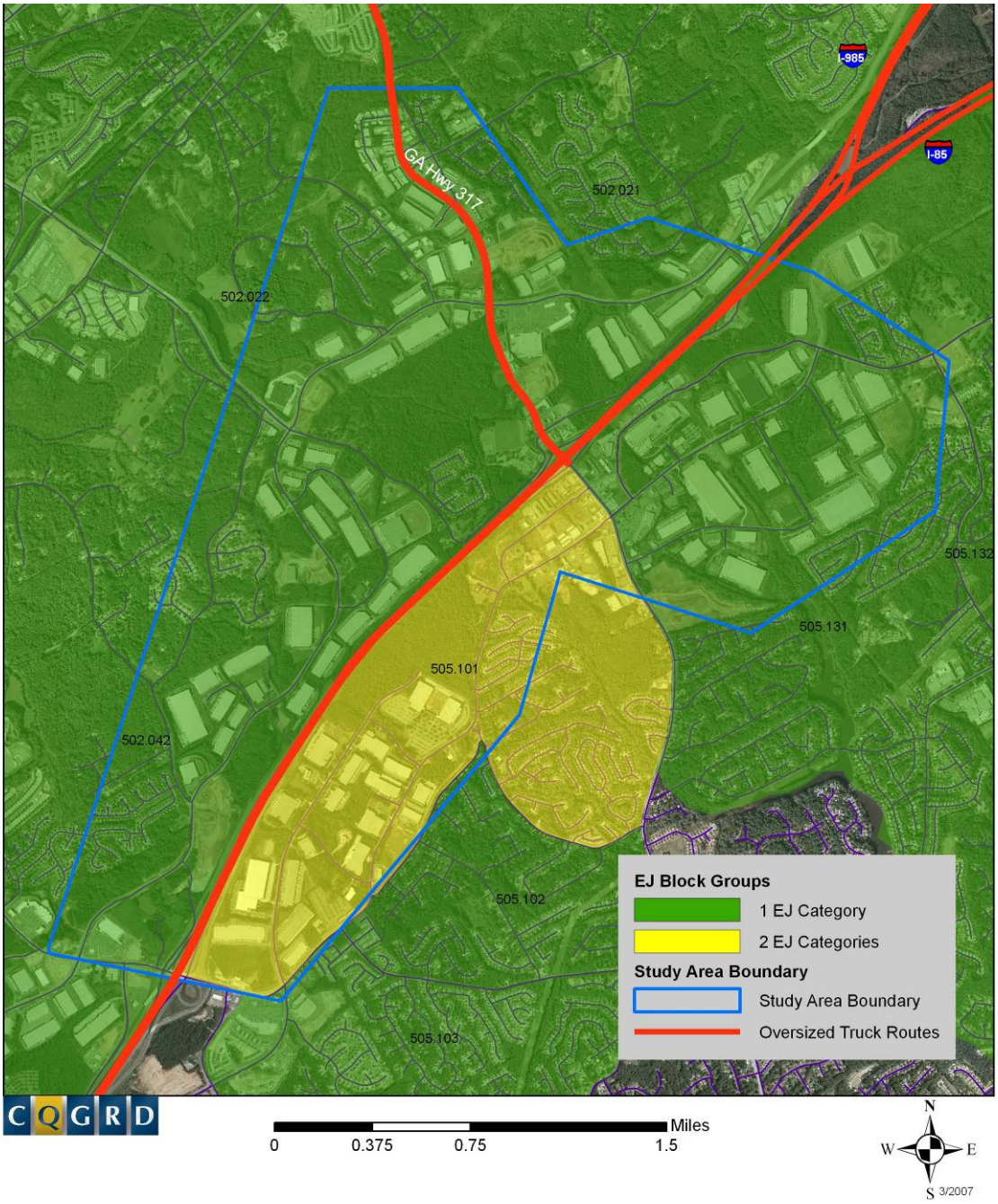


Figure 2. Gwinnett County EJ Block Groups with Elderly and Children

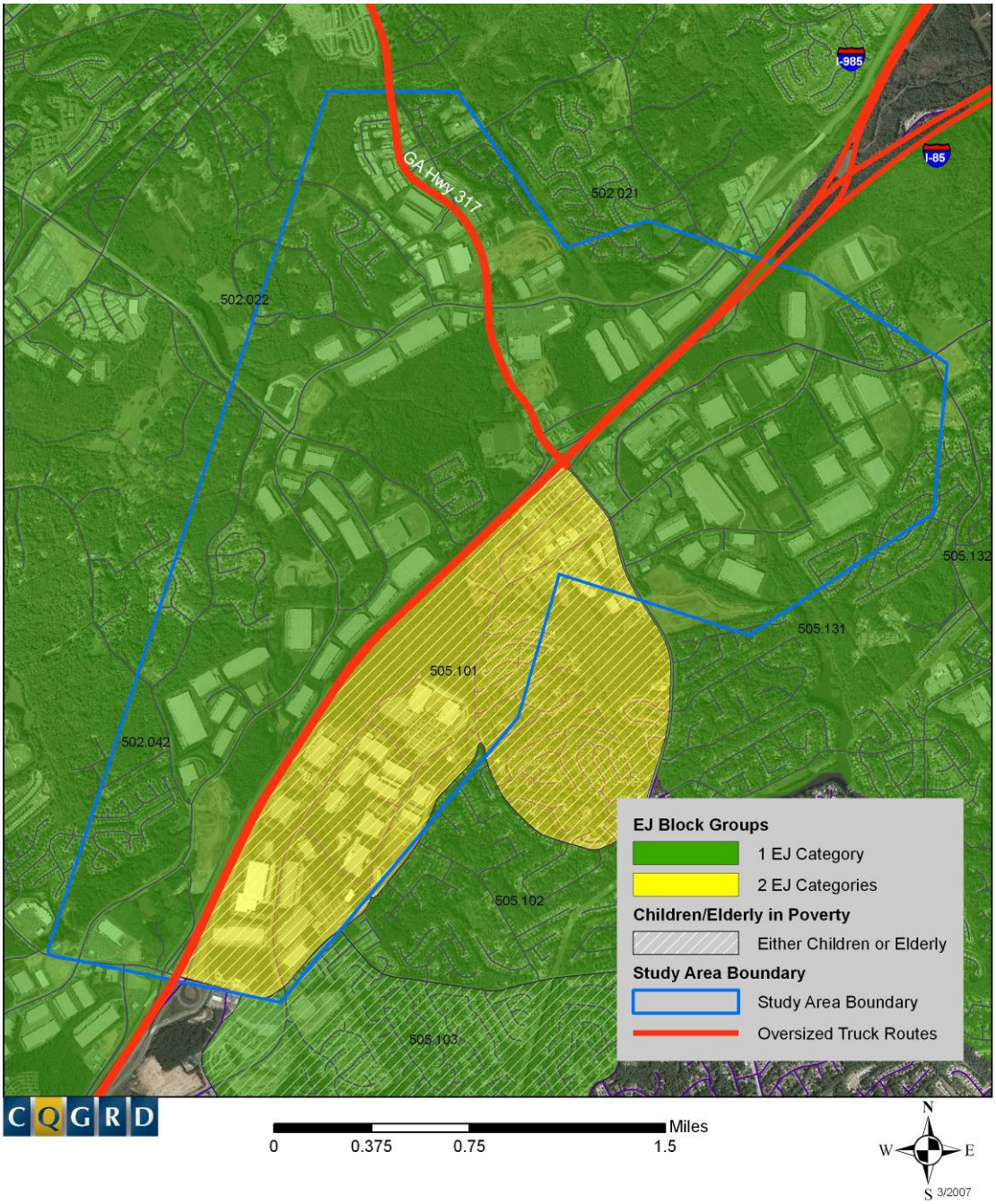


Figure 3. Gwinnett County Current Land Use Map

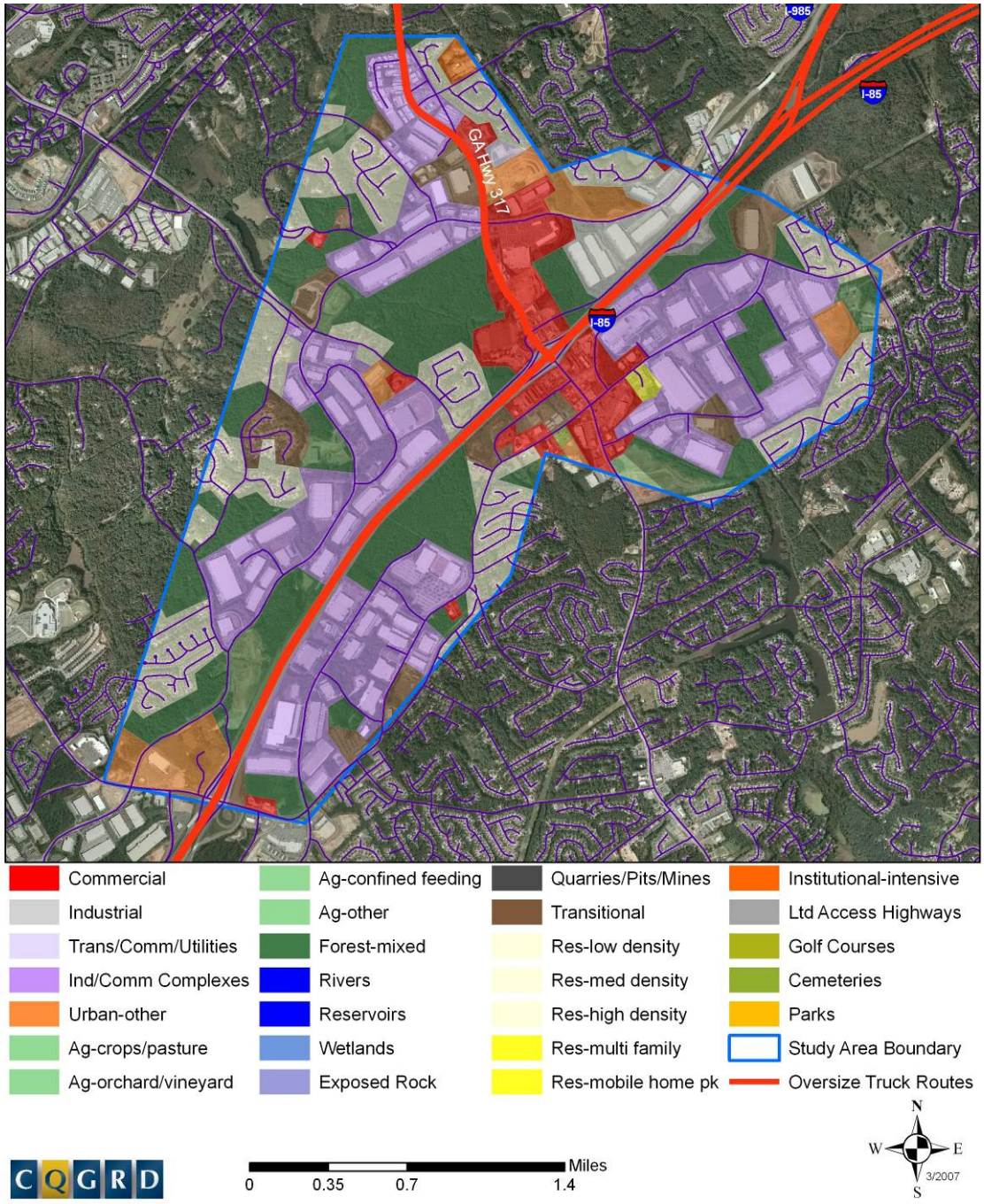


Figure 4. Gwinnett County EJ Community

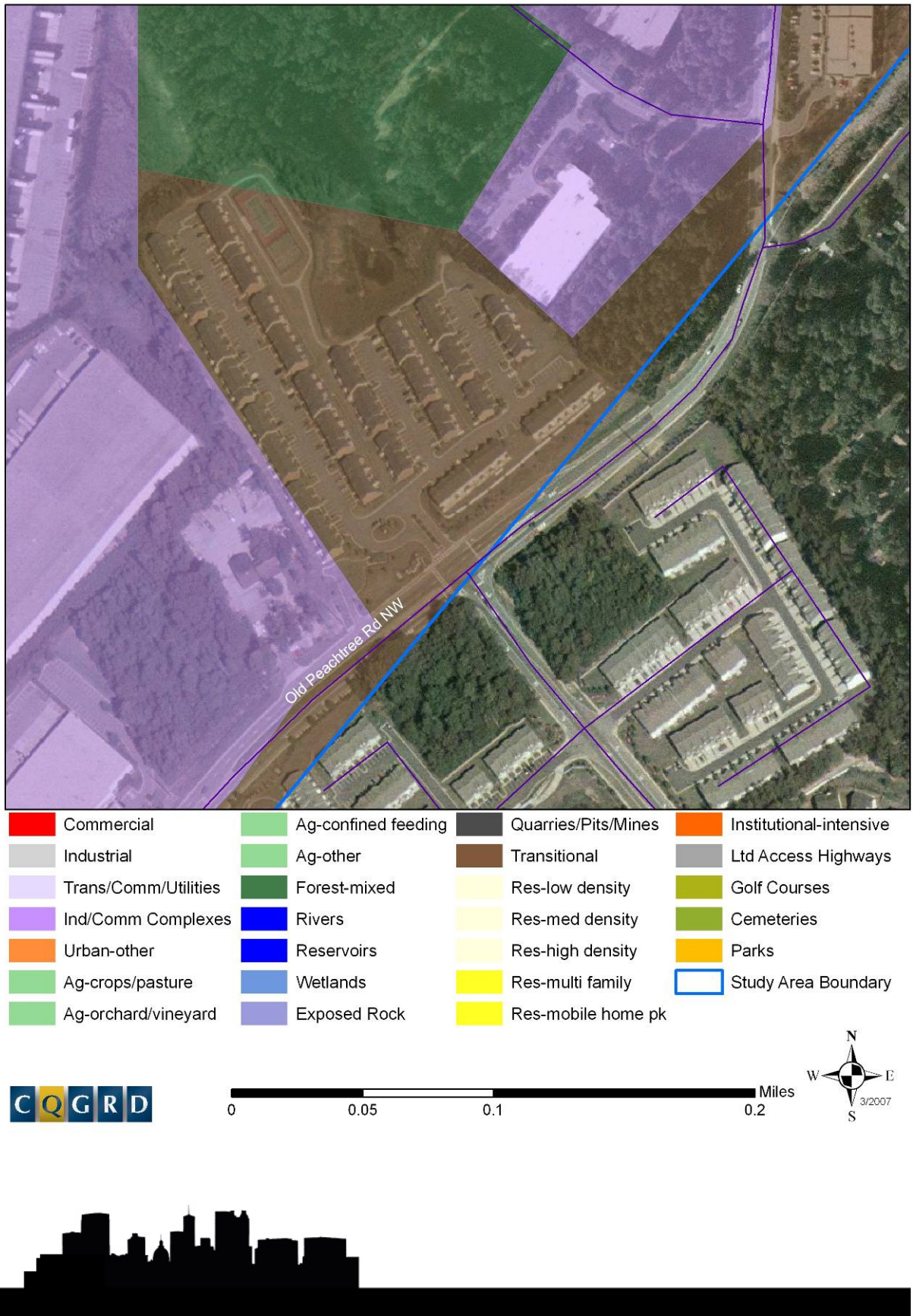
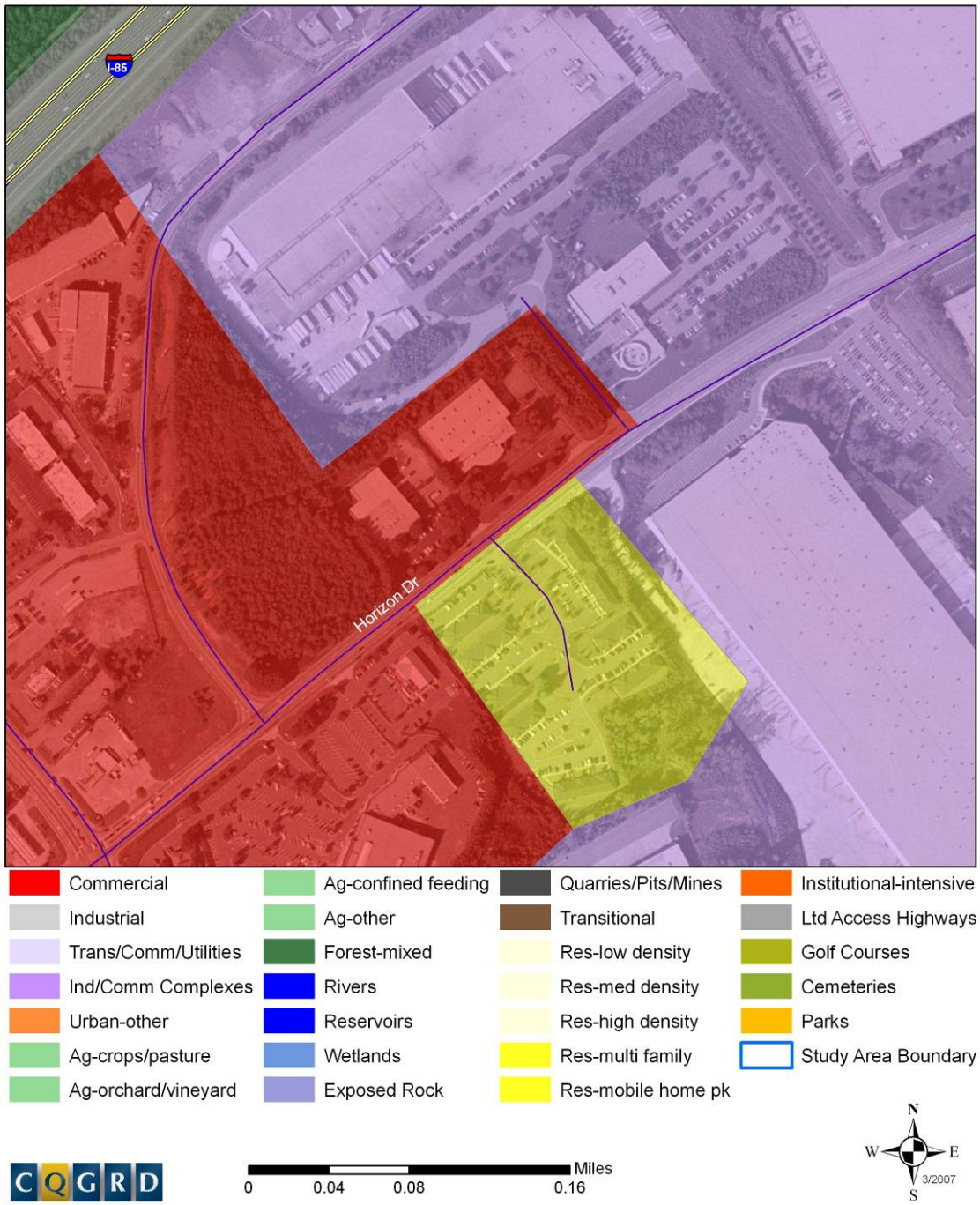


Figure 5. Gwinnett County EJ Community



Current and Future Land Use Analysis

Gwinnett County has been one of the fastest growing counties in the Atlanta region for the past 20 years. It is also the third largest county in the state for freight movement and consequently has a rapidly expanding distribution and logistics industry as well as growing commercial and residential development. This rapid growth in the residential sector is in part driven by proximity to the Atlanta area and the increase in industrial development, by access to I-85. Unfortunately, industrial expansion and residential growth suggest increasing problems with incompatible land use adjacencies. At 5.33 square miles, Gwinnett County is the smallest study area of all the other case study areas analyzed and has the greatest percentage of its land area classified as industrial/industrial commercial at 40% of the study area.[36]

Warehouse and distribution (W&D) facilities are clustered in four distinct nodes within the study area, two north of I-85 and two south (Figure 3). Each freight node is serviced by truck routes and access roads. Residential development mirrors the freight clusters with each node of freight having at least one accompanying residential node. Many of the transitional nodes, in brown in Figure 3, are becoming residential. Figure 4, along the southern edge of the study area, is an example of a transitional area that has shifted to high density residential, sandwiched between two W&D complexes. Residential development often accompanies W&D facilities because of easy access to major roadways such as I-85. However, the ramifications of such proximity are rarely borne by the developers; instead residents and the freight industry often are thrown into opposing positions.

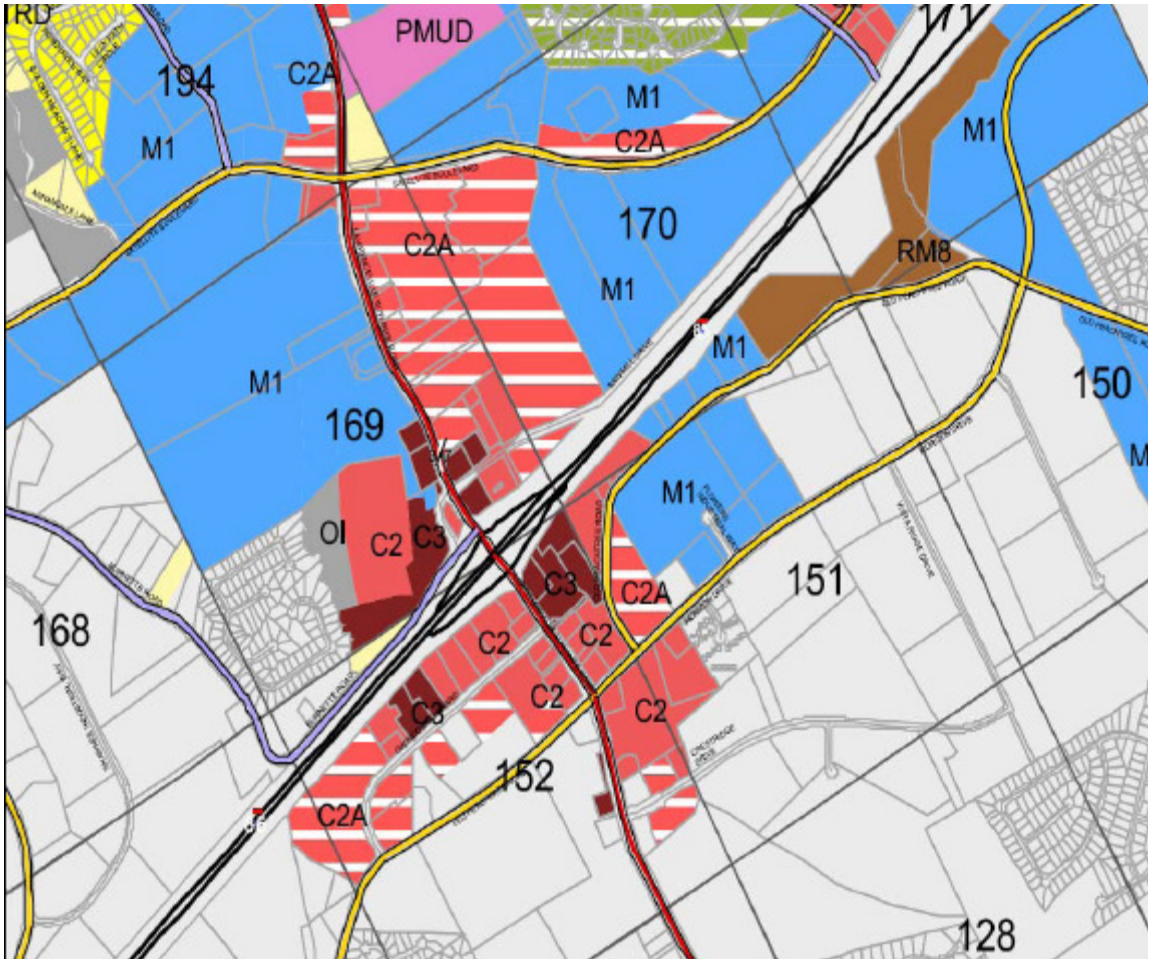
As is evident in the City of Suwanee's zoning ordinance map (Figure 6), the City has been diligent about implementing transitional zoning by planning for commercial and industrial adjacencies. Therefore the RM8 designation, which is currently open space, is curious because it is sandwiched between two industrial zones. It is also not ideal because the county has the land south of it zoned industrial and it is in fact one of the large W&D nodes (Figure 3). Such a discrepancy speaks to the need for city and county governments to communicate and coordinate their zoning and planning initiatives. With the current approach to zoning and land use planning, the city and county are potentially placing people directly into harms way, exposed to industries that have negative effects on their health, well-being, and quality of life.

Gwinnett County's Future Land Use Map tells a similar story of non-coordination causing incompatible land use adjacencies (Figure 7). The municipal boundary for the City of Suwanee is visible in dark blue and just outside the line one finds medium density residential between commercial and industrial uses to the north and slightly west of the I-85 interchange. Also of concern are the medium and low density residential developments at the bottom of the industrial node to the south of I-85 also visible in Figure 3. One entire edge of the residential complexes is exposed to the large W&D complex. Finally, the area south and west of the I-85 interchange does not appear of particular concern if simply looking within the confines of the study area on the current land use map (Figure 3). However, just outside the boundary of the study area, which is the edge of a node of W&D, one finds a sprawling low density residential development, a potential area of concern for incompatible land uses.

The City and County are currently updating their transportation plans and since I-85 bisects the study area, interchange development is a priority. Since heavy trucks, cars, and people share the same access roads, it is important that the new transportation plan address freight-based operations. This means ensuring that roadways are safe for all users, that residential development does not continue to encroach upon industrial development, and that interchange development, which is mainly commercial in nature, is utilized as an appropriate buffer between industrial and residential uses.

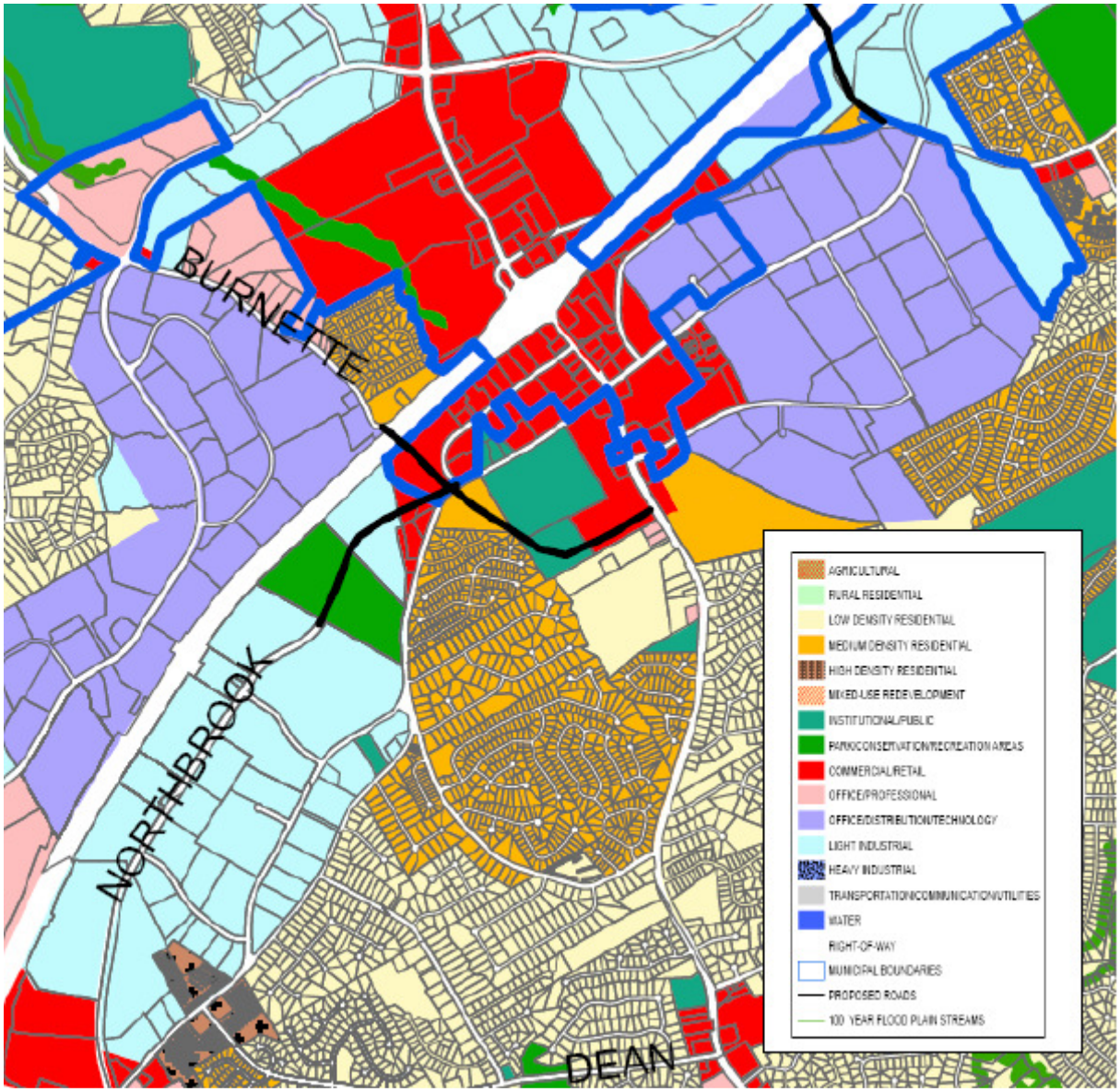
[36] All percentages of land uses are taken from Wilbur Smith Associates Land Use Case Studies

Figure 6. City of Suwanee Zoning Ordinance Map



Source: Wilbur Smith Associates

Figure 7. Gwinnett County Future Land Use Map



Source: Wilbur Smith Associates

Environmental Impacts of Freight Movement and Freight Facilities

Freight movement and freight facilities can affect the surrounding environment in many ways. The buildings and infrastructure of freight facilities and operations can disrupt habitat and can contribute to the loss of green and open space. The movement of freight into, out of, and through facilities and on freight corridors contributes to regional and local air pollution. Fueling, maintenance, cleaning and other routine operational activities can lead to pollutants in surrounding surface and ground waters and soils. Additionally, the land uses associated with freight facilities and movement often consists of large amounts of impervious surfaces which can lead to increased non-point source stormwater runoff into surrounding waterways. These impacts can also affect surrounding communities and populations leading to health concerns and decreased quality of life. While numerous, these impacts can be prevented or mitigated through technological, operational, education, planning and design, and policy and regulation efforts. This section provides a brief overview of the general effects of freight movement and freight facilities on the surrounding environment and also gives a summary of the specific impacts of the study area.

Air Quality

Diesel emissions are a primary contributor to ambient particulate matter and gaseous pollution levels. These emissions contribute to regional and atmospheric changes that exacerbate global warming, acid rain, decreased visibility, and ozone depletion. In addition, due to high volumes of trucks and other diesel vehicles, freight facilities can be air quality hot spots, locales where pollutant concentrations are substantially higher than concentrations indicated by ambient outdoor monitors located in adjacent or surrounding areas. The pollutant concentrations within hot spots can vary over time depending on various factors including emission rates, activity levels of contributing sources, and meteorological conditions. In areas where residential land uses are proximate (closer than 200 meters) to freight facilities or corridors, these hot spots can lead to acute and chronic exposure to elevated pollution levels negatively affecting the populations living nearby.

There are many health effects associated with both ambient and locally concentrated air pollution. These include reduced lung function, asthma and other respiratory illnesses, cancer, irritation of breathing passages and premature death with children and the elderly being at a higher risk than the general population. Furthermore, both short-term (acute) and long-term (chronic) exposure to particulate matter has been associated with increased rates of cardio-respiratory morbidity (illness) and mortality (death) including increased lung cancer risk.

There are several strategies that can mitigate the effects of freight facilities and movement on the surrounding areas.

- Develop and utilize cleaner fuels.
- Develop and require regular monitoring of air quality hot spots.
- Cluster industrial uses and provide adequate buffer zones between industrial and residential uses.
- Develop education programs for facility managers, developers, and officials on pollution prevention.

Water

Land uses associated with freight corridors and facilities contribute to non-point source water pollution through stormwater runoff. Non-point source water pollution comes from many diffuse sources and is caused by water moving over and through the ground picking up and carrying pollutants into waterways and groundwater sources. This is in part due to the large amounts of impervious surfaces associated with the industrial facilities and infrastructure related with freight movement. Non point-source pollution can lead to a deterioration of recreational uses of waterways, can harm water quality, and can potentially

affect the health of nearby residents. Impervious surfaces can also contribute to increased quantities of runoff leading to erosion problems, flooding, and increased sediment loads in nearby streams and rivers.

In addition to environmental impacts, stormwater runoff can also contribute to health effects. Stormwater runoff, especially from industrial land uses, can carry large amounts of contaminants, both microbial and chemical, into storm sewers and streams affecting water quality. Polluted runoff can also contaminate groundwater sources. Polluted stormwater runoff has been associated with outbreaks of waterborne diseases implying a link between polluted runoff and public health. Waterborne illnesses can be caused by drinking contaminated water, recreational contact with contaminated water, or by eating produce irrigated with untreated water. The effects of contact or ingestion of contaminated water are much greater in vulnerable populations such as children, the elderly, and those with compromised immune systems.

Stormwater runoff reduction measures in the construction and redevelopment phases of freight facilities could help mitigate some of the negative effects of stormwater runoff associated with freight movement and freight facilities.

- Capture and treat water used in cleaning processes.
- Minimize use of toxic cleaning solutions.
- Incorporate detention and retention ponds, vegetated swales and filter strips, filtering systems, and porous pavements where appropriate and feasible.
- Develop training programs on pollution prevention and stormwater best management practices.
- Develop a system to monitor water quality in groundwater sources and nearby streams and water bodies.

Greenspace

The land uses associated with freight movement and freight facilities often cause fragmentation in green and open spaces. These spaces are made up of ecologically active lands such as parks, farms, forestlands, and wetlands. These types of spaces provide external benefits such as improved air and water quality, wildlife habitat and biological diversity, and social benefits including preservation of historic/rural character and aesthetic value and positive health benefits. Additionally, vegetative buffers can benefit both people and the environment. They can provide necessary separation between incompatible land uses blocking excess noise and light and can also mitigate negative environmental effects associated with air emissions and stormwater runoff. Green and open spaces can be proactively planned as part of greenfield developments or can be undertaken retroactively as brownfield re-developments.[37]

Green and open spaces provide many benefits to the community and can also be used to mitigate and minimize many of the environmental impacts associated with the movement and processing of freight.

- Utilize greenspace in the form of vegetated swales and constructed wetlands to aid in the control and treatment of stormwater runoff.
- Develop training programs on the use of greenspace and open space to mitigate air and water quality issues.
- Study, and when possible, require the use of green roofs in freight areas. This could help reduce the urban heat-island effect, associated with large amounts of impervious surfaces, which can

[37] The EPA has a publication entitled “Characteristics of Sustainable Brownfield Projects” which covers strategies for effectively returning industrial uses to functional green and open spaces. This can be found at: http://www.epa.gov/brownfields/pdf/sustain.pdf

contribute to increased levels of ground-ozone formation and heat related illnesses and death (EPA, 2007).

- In areas of greenfield development, proactively plan for the strategic conservation and location of green and open space.

Environmental Analysis

There are no specific environmental concerns mentioned in the case study for this area. However, natural and open space accounts for the second largest land use in the study area at approximately 20% of the land. Much of this land is developable and could be turned into residential uses. Care must be taken in future land use and development plans to avoid locating residential land uses in potential air quality hot spots, areas that could be subject to air pollutant levels that are higher than ambient concentrations. Air quality hot spots could put local residents at higher risk for the negative health effects associated with air pollution.

An overview of hot spot monitoring and mitigation practices is covered in *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas* published by the Environmental Protection Agency.[38] Additionally, the Impacts of Freight and Mitigation Best Practices Table, Section 2, contains links to best practices and case studies for managing freight uses with respect to environmental concerns.

[38] http://www.epa.gov/otaq/stateresources/transconf/policy/420b06902.pdf

Henry County Case Study

Demographics and Environmental Justice Analysis

One of the most pressing social concerns when examining large-scale infrastructure impacts in metropolitan Atlanta is that of environmental justice (EJ). Environmental justice refers to the idea that over time, geographic areas with larger-than-average concentrations of minority populations or populations at or below the poverty line suffer disproportionate negative environmental impacts. Since 1994, federal agencies have been required to identify and address potential or actual disproportional adverse environmental effects on minority and low-income populations. Thus it is appropriate to conduct a demographic analysis of the five case study areas, with a special emphasis on locating concentrations of minority and populations in poverty, in order to address environmental justice issues concerning existing and potential future freight traffic impacts.

To identify areas of environmental justice concern, the Atlanta Regional Commission (ARC), using demographic information obtained from the U.S. Census Bureau for the year 2000[39] for the 13-county region, takes regional averages and then uses those averages to highlight those communities which have greater-than-average concentrations of both minority populations and populations living in poverty, as well as where those two groups overlap. Thus the ARC defines any census block group that meets any of the following criteria as an environmental justice-community: greater than 9.1% in poverty, 30.4% African American, 3.6% Asian, or 7% of Hispanic origin.

The ARC does not have specific environmental justice guidelines in terms of the elderly or children. However, this demographic analysis will highlight those census block groups that have high percentages of people over age 65 or under age 11 living in poverty as compared to the regional average. This methodology mirrors the ARC's methodology for environmental justice which also compares block group percentages of specific populations to the regional average of those populations. The following criteria represent the regional average for concentrations of elderly and children in poverty: the elderly, 9.6% and 18.1% for children under age 11. The elderly and children are singled out because these groups are typically at greater risk of suffering negative health impacts from freight traffic, because of pre-existing health conditions or the development of young lungs and immune systems. In addition, living in poverty makes them vulnerable in terms of their mobility and healthcare options.

Having a larger-than-average percentage of an at-risk population within a block group does not necessarily mean that an environmental justice issue is present. Additional analysis must be conducted to determine if a significantly adverse impact is affecting the community and if that adverse impact is unfairly affecting that population as compared to other populations in the area.[40] If it is determined that significant adverse impacts are disproportionately burdening an at-risk population, then that population can be said to have an environmental justice issue. In the case of this report, the additional analysis consisted of reviewing the current land use map of the study area over aerial photography. Block groups that satisfied one or more of the ARC criteria for EJ populations were examined more closely to determine if certain conditions were present that might cause a negative impact on a surrounding community, neighborhood, or housing development. Conditions include: direct adjacencies of freight facilities and housing units, proximity of housing to truck routes, and the presence or absence of transitional land uses or other

[39] Demographic analysis was conducted using 2000 U.S. Census numbers which are now eight years old and are likely not reflective of current populations in the study area. In addition current land use maps utilized in the analysis are also out-of-date as evidenced when compared to more current aerial photography revealing on-the-ground development. In all cases, we utilized the most current data and maps available.
[40] These criteria are set forth by the USDOT.

buffering tools such as adequate vegetation. While EJ communities cannot be definitively identified using this analysis technique, the analysis points out communities that are potentially at risk.

This same kind of analysis can also be conducted to assess the potential adverse impacts of future projects. However, the demographic analysis in this report is confined to the existing environmental and demographic conditions of the five case study areas: Atlanta Road/Marietta Boulevard, Fairburn, Fulton Industrial Boulevard, Gwinnett County, and Henry County. It is recommended that an environmental justice scan be conducted as specific freight-based projects are proposed.

In this report, the demographic profile of each case study area is examined in turn. Each section begins with a brief description of the ARC's environmental justice at-risk populations found in that study area, followed by two maps. The first shows the spatial arrangement of the at-risk populations. Areas highlighted in green indicate that one EJ criteria is present, yellow indicates two, and red indicates three. A table listing all of the block groups for each study area, the total population for each block group, and percentages of minority populations and people living in poverty provide additional information regarding where EJ issues are present and the percentage of those populations affected. The second map spatially locates the elderly and children under 11 living in poverty. If either elderly or children are identified in the block group as being in poverty that block group is indicated with one hatch mark. If both children and the elderly are identified as living in poverty, that block group is indicated with two hatch marks. The table identifies which population is at risk.

Next the EJ maps are compared to the current land use map for the study area which is laid over an aerial image of the study area. This comparison reveals any areas of potential adverse impact from freight operations on a particular at-risk community. If an at-risk community group is identified as potentially suffering disproportionately from an adjacent freight land use, then it can be called an environmental justice community. Such identification allows mitigation measures to be directed to those areas to address the existing environmental impacts in addition to ensuring that the community will not suffer from future impacts.

Environmental justice remains a relatively new concern in planning and policy, and strategies to mitigate disproportionate environmental impacts on low-income or minority populations are still evolving. Mitigation strategies include: ensuring that affected communities have a say in future developments; ensuring significant and ongoing public involvement in decision-making; addressing specific community issues and responding to community preferences; the provision of environmental benefits to the community such as infrastructure upgrades or landscaping and buffering; and providing economic benefits to the community such as the creation of job opportunities, guaranteed participation in construction projects, and grants or loans for small business start-ups. The goal of environmental justice mitigation is to ensure that vulnerable populations that have been receiving an undue share of the burdens of, in the case of this report, the freight industry, no longer are unfairly burdened. In addition these populations should receive a proportionate share of the benefits of a project.

Environmental Justice Analysis

Two of the block groups intersecting the Henry County study area[41] meet at least one of the ARC's environmental-justice criteria: 703.042 and 703.043, both in the northeast portion of the study area (Figure 1). The former, with a 65% African-American population, approximately 1,800 people out of 2,800, and a 24% population in poverty, meets two ARC criteria (Table 1). In addition, block groups 703.042, 703.043, and 703.061 indicate some concern with elderly and children populations living in poverty, however, the actual numbers of people involved are relatively low particularly as compared to the total population of the study area (Figure 2). Although two block groups meet ARC criteria for EJ, environmental justice is not a concern for Henry County at least according to the 2000 U.S. Census, the current land use map, and recent aerial photography. There is no residential development located within the two block groups in the study area, so no group of people is being adversely or disproportionately impacted by the effects of freight (Figure 3).

Table 1. Henry County Study Area

	Against ARC Criteria				Against Regional Mean		
Block Group	Total Population	African American 30.4%	Asian 3.6%	Hispanic 7.0%	Poverty 9.1%	Elderly (65+) in Poverty 9.6%	Children (under 11) in Poverty 18.1%
703.042	2,800	Yes (65.0%)	No (0.4%)	No (0.8%)	Yes (24.0%)	Yes (24.7%)	No (16.0%)
703.043	1,193	No (22.1%)	No (0.0%)	No (1.2%)	Yes (9.6%)	No (0.0%)	Yes (27.4%)
703.061	2,596	No (1.0%)	No (0.0%)	No (1.4%)	No (1.7%)	Yes (13.4%)	No (0.0%)
704.011	1,785	No (4.8%)	No (0.0%)	No (1.7%)	No (1.0%)	No (0.0%)	No (0.0%)
704.012	4,173	No (10.2%)	No (0.0%)	No (2.4%)	No (4.7%)	No (5.4%)	No (5.1%)
705.003	2,924	No (12.4%)	No (0.4%)	No (0.8%)	No (2.3%)	No (9.1%)	No (0.0%)

Source: U.S. Census, 2000

[41] For this study, demographic data were obtained for each study area using Census data from the 2000 census and gathering and analyzing data from the census block groups that intersect or lie completely within the study area boundary.

Figure 1. Henry County EJ Block Groups

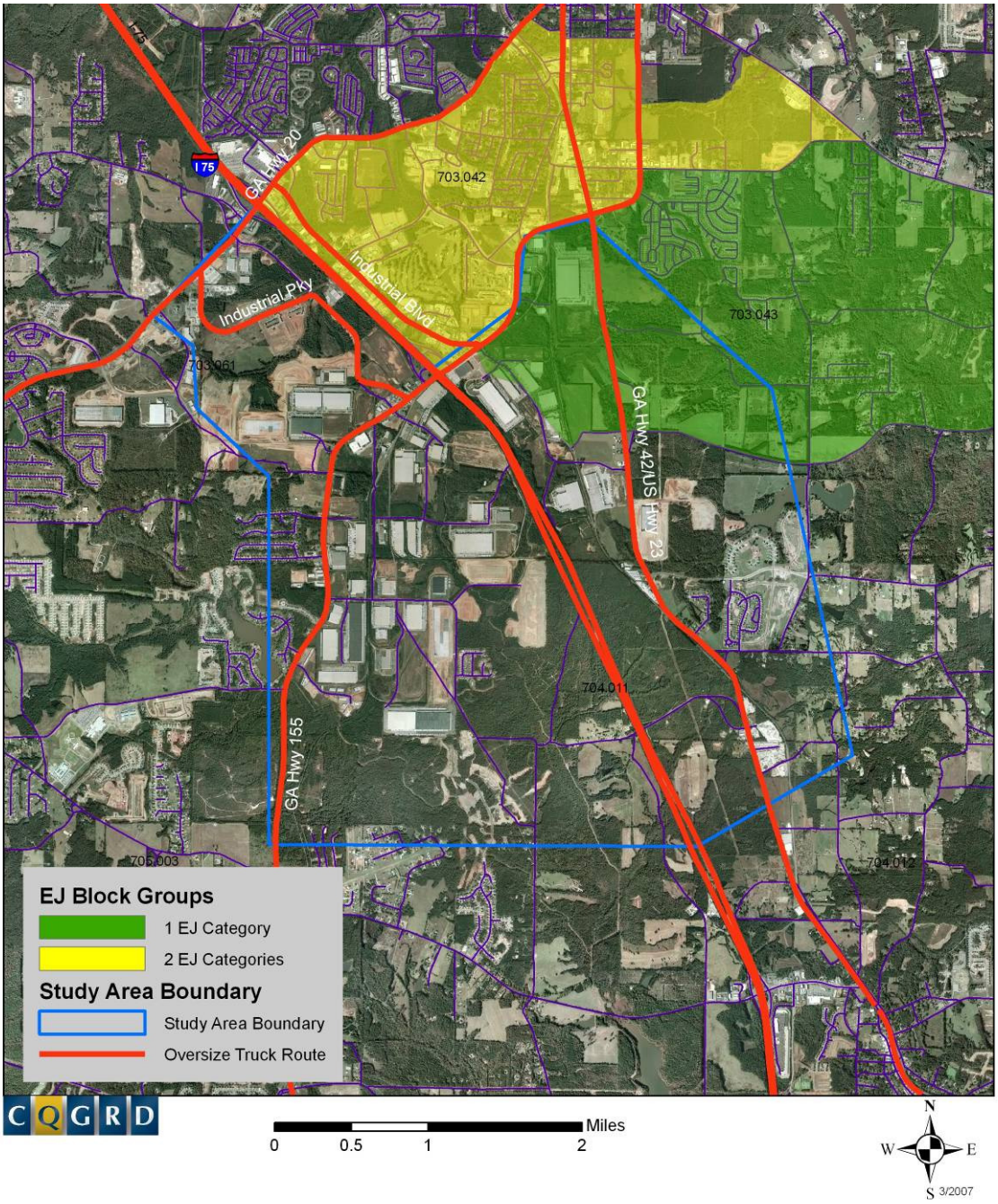


Figure 2. Henry County EJ Block Groups with Elderly and Children

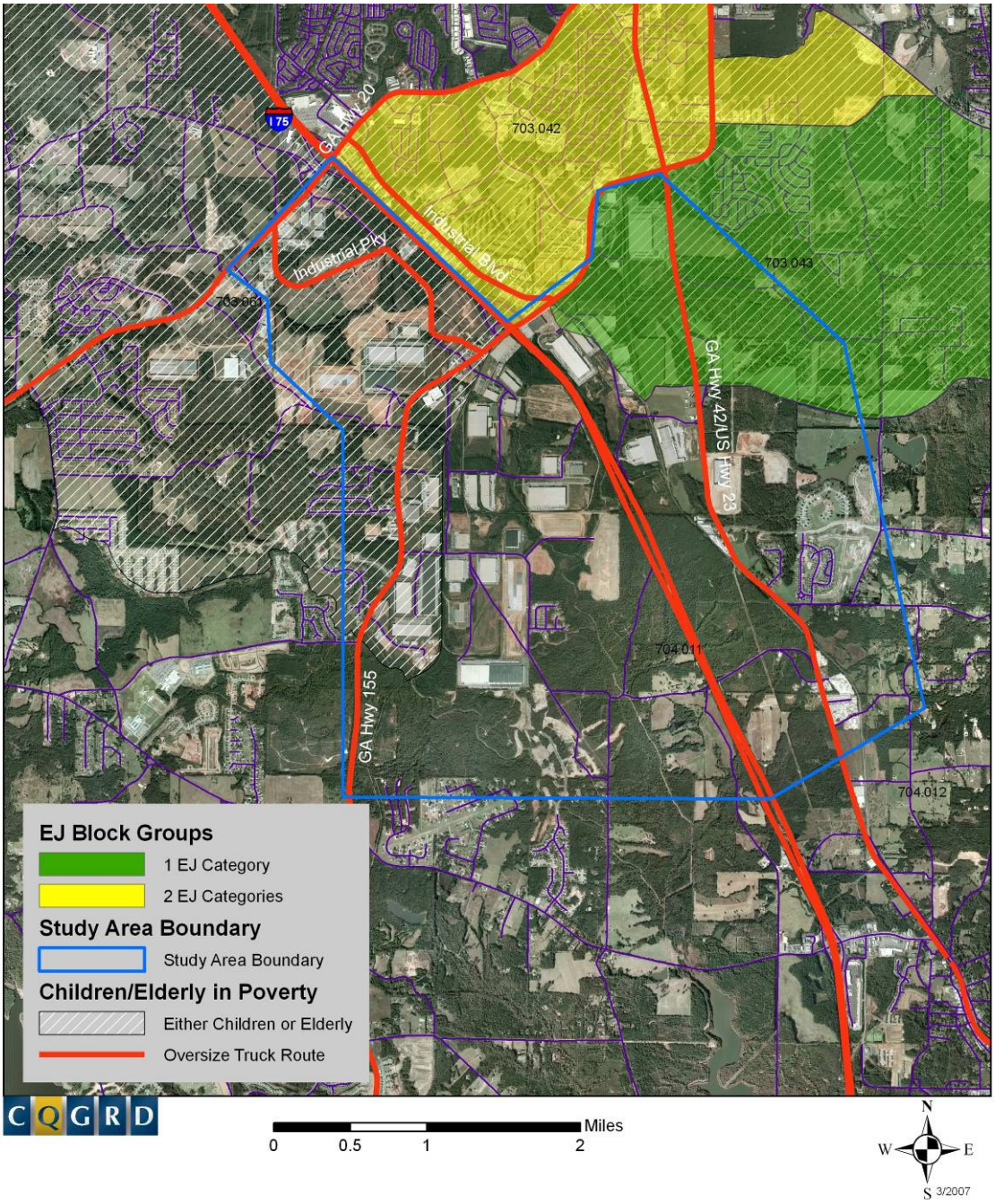
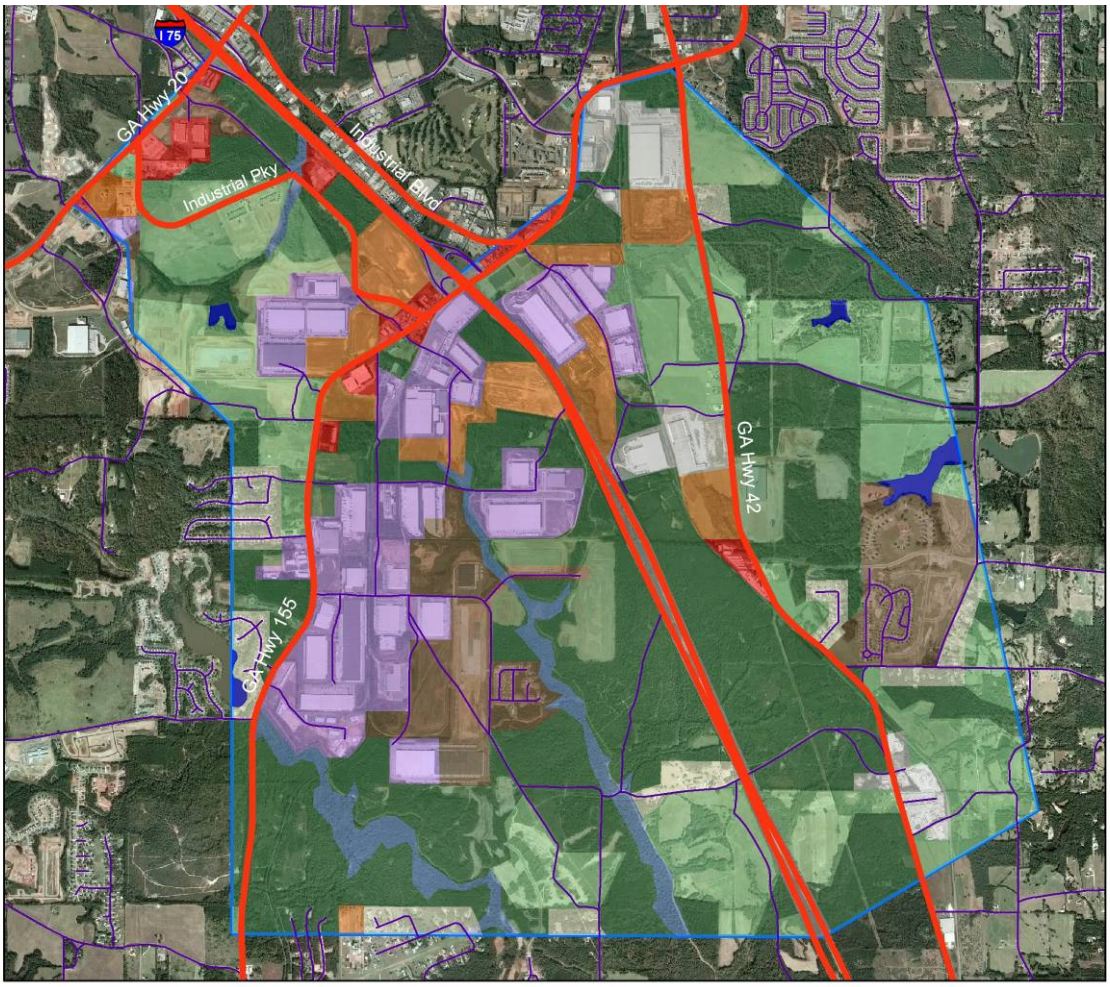


Figure 3. Henry County Current Land Use Map



Current and Future Land Use Assessment

With over 10 million square feet of warehouse and distribution (W&D) space currently being developed within the study area, Henry County is quickly becoming defined by the freight industry. Its proximity to I-75, Norfolk Southern rail line and spur, and an abundance of large undeveloped tracts of relatively inexpensive land have spurred the development boom. Henry County is also experiencing rapid residential and commercial growth which, taken together with industrial development, can signal the increased potential for incompatible land use issues.

The majority of W&D development is occurring along the Norfolk Southern rail spur between Georgia Highway 155 and I-75 in the western portion of the study area although some facilities lie between I-75 and the main rail line (Figure 3). Low and medium density residential developments are scattered within the study area although primarily along the boundary. W&D facilities currently make up approximately 4% of the study area but are expected to continue growing as is residential development, currently only 3.3% of the land uses.[42] It is the large amount of natural space, over 42% of the study area, which raises a red flag. All of the natural space is currently zoned for more intense use with most zoned to accommodate freight. It would benefit the County to set aside areas of greenspace not only to provide substantial buffers between incompatible land uses but also to provide amenities, i.e. parks, for the growing residential population.

As evidenced by the scattering of residential developments seen in Figure 3, a coordinated plan for development does not seem to have been embraced within the study area. With so much green space and the beginnings of concentrated industrial and W&D facilities, Henry County has an opportunity to cluster freight development to the benefit of both the freight industry and current and future residents. The County should not approve requests that result in residential development directly adjacent to industrial in what could be a freight village. Figure 4 shows a single family residential development going in next to W&D facilities. Such placement disrupts the potential for creating a freight village, places people proximal to industries with negative impacts to their health and quality of life, and forces people to share a limited road network with heavy trucks. See the Impacts of Freight and Mitigation Best Practices Table, Section 2, for examples of health-related impacts of freight and tools for mitigation.

Both the zoning ordinances (Figure 5) and the Future Land Use Map (Figure 6) allow construction of the residential development found in Figure 4. As seen in Figure 5, the areas in pink are zoned PD or Planned Development District which allows the mixing of residential, office, commercial, or industrial uses albeit with specifications. The Future Land Use Map (Figure 6) shows the area in light yellow which corresponds to low density residential (LDR) development, which is what was developed. However, it is problematic that the LDR directly abuts industrial (light grey) without any transitional land use or other means of buffering. In the same map is a good example of transitional buffering, to the east of the problematic area, commercial uses are appropriate buffers between industrial and residential developments.

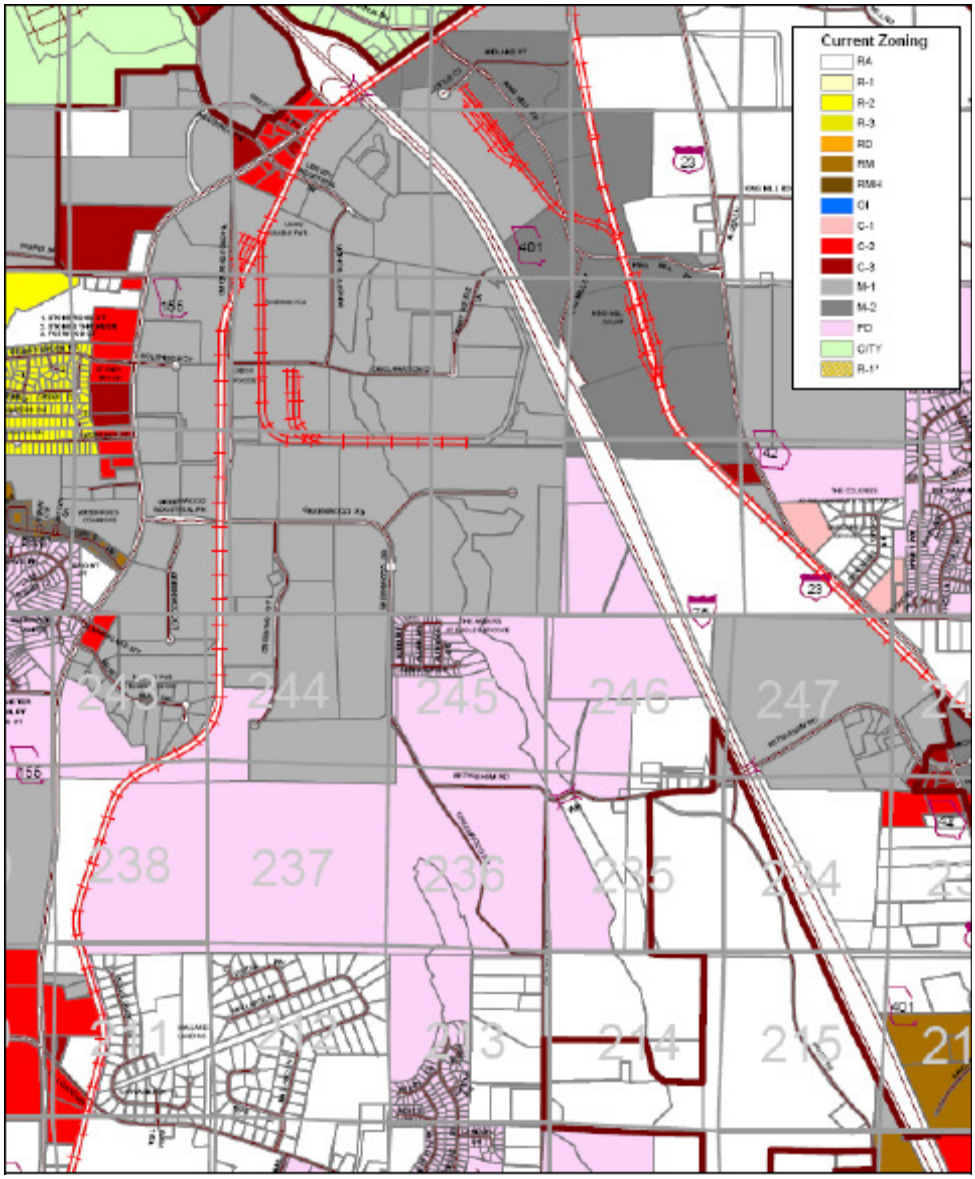
Henry County is an excellent example of an area that, because of its large amount of open space, has an opportunity to cluster freight facilities. This can be accomplished through the designation of a freight village or a special W&D zoning classification among other tools. If the County hopes to continue expanding its freight-based operations it could be strategic and set aside specific areas to be developed as freight-friendly. These areas could then be made conducive to freight movement, with dedicated truck routes with direct access to rail lines and the interstate including better connectivity within the freight village. It could install pavement that would withstand the wear and tear of heavy trucks. Road geometries could be specifically designed to accommodate freight. Residential development would not be allowed to encroach upon industrial areas, which helps protect residents as well as the freight industry. Such a

[42] All percentages of land uses are taken from Wilbur Smith Associates Land Use Case Studies

strategic plan for freight could make Henry County extremely attractive to the freight industry, further accelerating its W&D development rate while establishing and maintaining a high quality of life for its growing residential population.

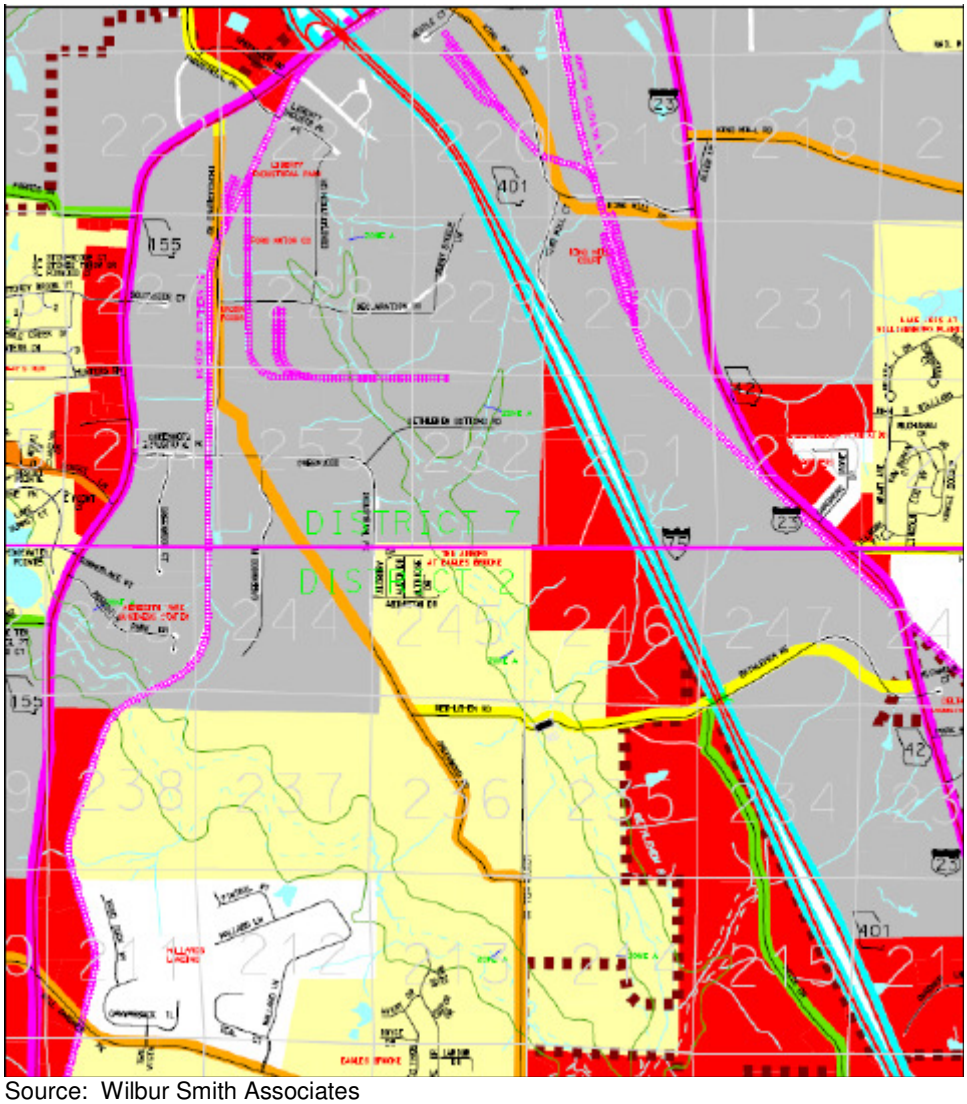
Figure 4. Henry County Study Area Example of Poor Residential Placement

Figure 5. Henry County Zoning Ordinance Map



Source: Wilbur Smith Associates

Figure 6. Henry County Future Land Use Map



Source: Wilbur Smith Associates

Environmental Impacts of Freight Movement and Freight Facilities

Freight movement and freight facilities can affect the surrounding environment in many ways. The buildings and infrastructure of freight facilities and operations can disrupt habitat and can contribute to the loss of green and open space. The movement of freight into, out of, and through facilities and on freight corridors contributes to regional and local air pollution. Fueling, maintenance, cleaning and other routine operational activities can lead to pollutants in surrounding surface and ground waters and soils. Additionally, the land uses associated with freight facilities and movement often consists of large amounts of impervious surfaces which can lead to increased non-point source stormwater runoff into surrounding waterways. These impacts can also affect surrounding communities and populations leading to health concerns and decreased quality of life. While numerous, these impacts can be prevented or mitigated through technological, operational, education, planning and design, and policy and regulation efforts. This section provides a brief overview of the general effects of freight movement and freight facilities on the surrounding environment and also gives a summary of the specific impacts of the study area.

Air Quality

Diesel emissions are a primary contributor to ambient particulate matter and gaseous pollution levels. These emissions contribute to regional and atmospheric changes that exacerbate global warming, acid rain, decreased visibility, and ozone depletion. In addition, due to high volumes of trucks and other diesel vehicles, freight facilities can be air quality hot spots, locales where pollutant concentrations are substantially higher than concentrations indicated by ambient outdoor monitors located in adjacent or surrounding areas. The pollutant concentrations within hot spots can vary over time depending on various factors including emission rates, activity levels of contributing sources, and meteorological conditions. In areas where residential land uses are proximate (closer than 200 meters) to freight facilities or corridors, these hot spots can lead to acute and chronic exposure to elevated pollution levels negatively affecting the populations living nearby.

There are many health effects associated with both ambient and locally concentrated air pollution. These include reduced lung function, asthma and other respiratory illnesses, cancer, irritation of breathing passages and premature death with children and the elderly being at a higher risk than the general population. Furthermore, both short-term (acute) and long-term (chronic) exposure to particulate matter has been associated with increased rates of cardio-respiratory morbidity (illness) and mortality (death) including increased lung cancer risk.

There are several strategies that can mitigate the effects of freight facilities and movement on the surrounding areas.

- Develop and utilize cleaner fuels.
- Develop and require regular monitoring of air quality hot spots.
- Cluster industrial uses and provide adequate buffer zones between industrial and residential uses.
- Develop education programs for facility managers, developers, and officials on pollution prevention.

Water

Land uses associated with freight corridors and facilities contribute to non-point source water pollution through stormwater runoff. Non-point source water pollution comes from many diffuse sources and is caused by water moving over and through the ground picking up and carrying pollutants into waterways and groundwater sources. This is in part due to the large amounts of impervious surfaces associated with the industrial facilities and infrastructure related with freight movement. Non point-source pollution can lead to a deterioration of recreational uses of waterways, can harm water quality, and can potentially affect the health of nearby residents. Impervious surfaces can also contribute to increased quantities of runoff leading to erosion problems, flooding, and increased sediment loads in nearby streams and rivers.

In addition to environmental impacts, stormwater runoff can also contribute to health effects. Stormwater runoff from industrial land uses, can carry large amounts of contaminants, both microbial and

chemical, into storm sewers and streams affecting water quality. Polluted runoff can also contaminate groundwater sources. Polluted stormwater runoff has been associated with outbreaks of waterborne diseases implying a link between polluted runoff and public health. Waterborne illnesses can be caused by drinking contaminated water, recreational contact with contaminated water, or by eating produce irrigated with untreated water. The effects of contact or ingestion of contaminated water are much greater in vulnerable populations such as children, the elderly, and those with compromised immune systems.

Stormwater runoff reduction measures in the construction and redevelopment phases of freight facilities could help mitigate some of the negative effects of stormwater runoff associated with freight movement and freight facilities.

- Capture and treat water used in cleaning processes.
- Minimize use of toxic cleaning solutions.
- Incorporate detention and retention ponds, vegetated swales and filter strips, filtering systems, and porous pavements where appropriate and feasible.
- Develop training programs on pollution prevention and stormwater best management practices.
- Develop a system to monitor water quality in groundwater sources and nearby streams and water bodies.

Greenspace

The land uses associated with freight movement and freight facilities often cause fragmentation in green and open spaces. These spaces are made up of ecologically active lands such as parks, farms, forestlands, and wetlands. These types of spaces provide external benefits such as improved air and water quality, wildlife habitat and biological diversity, and social benefits including preservation of historic/rural character and aesthetic value and positive health benefits. Additionally, vegetative buffers can benefit both people and the environment. They can provide necessary separation between incompatible land uses blocking excess noise and light and can also mitigate negative environmental effects associated with air emissions and stormwater runoff. Green and open spaces can be proactively planned as part of greenfield developments or can be undertaken retroactively as brownfield re-developments.[43]

Green and open spaces provide many benefits to the community and can also be used to mitigate and minimize many of the environmental impacts associated with the movement and processing of freight.

- Utilize greenspace in the form of vegetated swales and constructed wetlands to aid in the control and treatment of stormwater runoff.
- Develop training programs on the use of greenspace and open space to mitigate air and water quality issues.
- Study, and when possible, require the use of green roofs in freight areas. This could help reduce the urban heat-island effect, associated with large amounts of impervious surfaces, which can contribute to increased levels of ground-ozone formation and heat related illnesses and death (EPA, 2007).
- In areas of greenfield development, proactively plan for the strategic conservation and location of green and open space.

[43] The [illegible] s of Sustainable Brownfield Projects" which covers strategies for effectively retur[illegible]n spaces. This can be found at: http://www.epa.gov/brownfields/pdf/sustain.pdf

Environmental Analysis

The primary environmental concerns facing the Henry County study area are related to the large amount of farmland (see Henry County Case Study – Study Area). Over 40% of the land in the study area has a land use classification of natural or open space. These spaces can provide valuable buffers between W&D areas and other land uses mitigating the effects of light, noise, air and water pollution. These areas also may provide habitat continuity, recreation opportunities, and aesthetic benefits to the surrounding communities. All of these concerns should be considered as future developments and land use planning efforts are undertaken.

Much of this open and natural land is zoned for more intensive use and could be developed into residential uses. Care must be taken in future land use and development plans to avoid locating residential land uses in potential air quality hot spots, areas that could be subject to air pollutant levels that are higher than ambient concentrations. Air quality hot spots could put local residents at higher risk for the negative health effects associated with air pollution.

An overview of hot spot monitoring and mitigation practices is covered in *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas* published by the Environmental Protection Agency.[44] Additionally, the Impacts of Freight and Mitigation Best Practices Table, Section 2, contains links to best practices and case studies for managing freight uses with respect to environmental concerns.

[44] http://www.epa.gov/otaq/stateresources/transconf/policy/420b06902.pdf

Section 2: Impacts of Freight and Mitigation Best Practices

The Impacts of Freight and Mitigation Best Practices Table is designed to be a user-friendly resource that looks at freight impacts, factors that exacerbate or contribute to these impacts, how the impacts manifest themselves, prevention and mitigation methods, and examples of best practices case studies with links. The table provides an efficient way to get a fuller understanding of how and to what extent freight impacts communities and the environment as well as some sense of prevention and mitigation methods have been used elsewhere.

Types of Freight

The table includes data on all forms of freight (truck, rail, air, and water) although truck and rail receive the bulk of the attention being the most ubiquitous forms of freight movement for the Metropolitan Atlanta Area and the only two forms of freight found in the five case study areas. Within the table, the elements that contribute to or exacerbate freight impacts as well as methods for prevention and mitigation are separated by freight type. If an element or method is applicable to all forms of freight, it will be listed under the heading “All Freight.”

Impacts of Freight

The table is organized by freight impact. Each impact is discussed in turn and the mitigation methods and best practices directly address that particular impact. The impacts are listed, more or less, in order of severity of the impact and the perception of the severity by the general public. The effects of air pollution on the health and well-being of people and the environment has been well-documented and continues to be at the forefront of research as well as at the forefront of the public’s concern. Road issues address such concerns as traffic flow and congestion, cut-through traffic, road and pavement conditions, and issues of connectivity and access. Noise pollution and vibration address impacts on neighboring noise sensitive communities. Light pollution looks at impacts on people, animals, and ecosystems. Community safety-related impacts include injury, accidents, and crashes, the transport of hazardous materials, and security concerns. Environmental impacts examine the effects of freight on ecosystems, water, soil, air, and historic, cultural, and archaeological resources. Finally, visual and aesthetic concerns look at the effects of this issue on communities.

Who and What is Impacted by Freight

Within the table, the “who” and “what” impacted are identified as the community, the environment, or both. However, within these broad generalizations are locations and populations that are particularly vulnerable or sensitive to the impacts of freight. Sensitive receptor locations include: residential communities, schools, day care centers, playgrounds, parks, youth centers, nursing homes, hospitals, and other public spaces where people are likely to spend time. These sensitive locations are, for the most part, places where the young, the elderly, and people of compromised health spend large portions of their day. Such groups are identified as vulnerable populations and include but are not limited to: children and babies, pregnant women, people with existing illness or compromised immune systems, the elderly, people recovering from illnesses, persons with disabilities, people living in poverty, and minorities. Ecosystems, composed of plants, animals, soil, and water, should also be included in a list of vulnerable populations.

Impacts on the Community and/or Environment

The ramifications of the impacts of freight primarily can be grouped into four categories: health, quality of life, environmental, and economic.

Health impacts range from direct causal links such as exposure to ozone and diesel particulate matter having an effect on respiratory illnesses such as asthma and less directly related effects such as traffic congestion causing stress which then can have consequences related to hypertension and a weakened immu

Some of the impacts are more closely related to issues of quality of life such as diminished enjoyment of the public environment when freight destroys or compromises the beauty of a viewshed. While one could argue that such alterations to one's living environment can produce stress and therefore stress-related health impacts (headaches, increased blood pressure), the research has not specifically linked disruptions to the visual or aesthetic environment with a health impact. Therefore, the impacts are better categorized as quality of life issues.

Environmental impacts are discussed explicitly within the table. They include impacts to air, soil, water, flora, and fauna. Impacts on air quality stem from ozone and diesel particulate matter. Surface and ground water are impacted by point- and nonpoint-source pollution. Stormwater runoff can contain sedimentation from construction sites or contaminants from the operation of freight including oil changes and chemicals related to cleaning, for example. Such contaminants can disrupt the natural habitats of aquatic species and can be detrimental to humans. A list of some of the most common soil contaminants and their related health impacts are included in the table. Finally, freight can disrupt habitats by fragmenting ecosystems altering feeding and migration patterns. Historic, cultural, and archaeological resources are also at risk of impacts from freight particularly when not protected by zoning from incompatible land uses or when disrupted by poor construction or management practices.

Finally, freight movement can have significant economic ramifications, both positive and negative. Businesses are concerned with both the health and well-being of their employees and their own bottom line. Loss of productivity can result from absenteeism and from physical and mental health issues which, while not solely caused by freight, can be exacerbated by the industry. Rising health care costs and the ability to provide quality care are of concern to both state and local governments. While freight can be an economic boon for a city if done well, it can also be disastrous for economic development if done poorly, such as when the character of a place is compromised or there are extensive negative health impacts.

Prevention and Mitigation Methods and Best Practices

Prevention and mitigation methods as listed in the table are divided by freight type and by mitigation method. When prevention and mitigation methods are applicable to all types of freight, they are listed under the heading "All Freight." As a means of further subdividing prevention and mitigation methods, solutions are categorized as: technological, operational, planning & design, regulatory, policy, educational, and enforcement. The best practices and case studies column in the table provides links to reports and projects from all over the United States and covering all freight types. Our research indicates that California, Seattle, and Portland are leading the way in freight management and provide examples of strategies to reduce the negative community and environmental impacts of freight transport.

Impacts of Freight and Mitigation Best Practices Table

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies

Air Pollution	Truck
	Rail
	Air cargo
	Ports
		TRUCK:
		▪ Idling of engines
		▪ Traffic congestion
		▪ Emission rates of equipment
		
		RAIL:
		▪ Car and truck idling at grade crossings
		▪ Idling train engines and handling equipment
		▪ Emission rates of equipment
		  ▪ Moving locomotives produce 50% of emissions
		  ▪ Idling produces 45%
		  ▪ Locomotive testing produces 5%
		
		AIR CARGO:
		▪ Emission rates of equipment
		
		PORTS:
		▪ Idling engines both cargo vessels and handling equipment – "hotelling"
		▪ Emission rates of equipment (cargo handling equipment & diesel engines at dock)
		▪ Fuel used - diesel
		▪ Age of equipment
		▪ Ship engine standards
		▪ Operational practices such as vessel speed
		▪ How auxiliary engines are used at port
		▪ Amount of time spent at or near port
			Community
			Environment
				Exposure to ozone, directly emitted (primary) diesel particulate matter and particulate matter formed in the atmosphere (secondary) from goods movement emissions can cause:
				▪ Premature death
				▪ Cancer - increased risk
				▪ Respiratory illnesses
				  ▪ Asthma
				  ▪ Chronic bronchitis
				  ▪ Reduced lung function and capacity
				▪ Heart disease – increased risk
				▪ Neurotoxicity
				▪ Effects on the immune system
				▪ Can exacerbate the effects of heart disease and diabetes in people who suffer from those illnesses
					ALL FREIGHT:
					
					Technological:
					▪ Integrate Intelligent Transportation System (ITS) Technologies.
					▪ Utilize cleaner fuels and lower emission producing equipment.
					▪ Phase out older equipment and replace with newer, cleaner equipment.
					▪ Retrofit equipment with cleaner technologies.
					▪ Employ filtering technologies where feasible.
					
					Operational:
					▪ Schedule truck appointments to reduce idling.
					▪ Reduce speeds.
					
					Planning & Design:
					▪ Cluster industrial uses.
					▪ Separate non-compatible and sensitive land uses to decrease exposure to air pollutants.
					▪ Create/maintain buffer zones (vegetation, compatible land uses, open space, etc.) of at least 200 meters between diesel polluting freight and sensitive receptors (housing, schools, day cares, playgrounds, hospitals, nursing homes, etc.)
					
					Regulations:
					▪ Develop and maintain truck-only access routes.
					▪ Retain and build-upon existing industrial areas.
					▪ Require that developers use building techniques and materials that mitigate impacts of air pollution in homes being built proximate to freight facilities.
					▪ Limit idling of equipment.
					
					Policy:
					▪ Encourage the use of alternatively fueled vehicles.
					▪ Encourage re-use of brownfields.
					▪ Provide incentives to encourage the acquisition of cleaner technologies
					
					TRUCK:
					
					Technological:
					▪ Utilize Truck-Stop Electrification (TSE) equipment as an alternative to idling. TSE equipment allows refrigeration units to continue operating without the truck idling.
					
					Planning & Design:
					▪ Replace at-grade rail crossings with grade separated crossings to limit idling.
					▪ Develop and integrate an efficient and effective wayfinding signage program that reduces the likelihood of trucks traveling unnecessary distances, off designated truck routes, and through communities.
					▪ Design the site to as to prevent the queuing of trucks and idling
					
					Policy:
					▪ Advocate for mode shift from truck to rail where feasible. Such a mode shift can reduce truck traffic and increase vehicular flow.
					
					Regulations:
					▪ Require staging areas for trucks at buildings. Staging areas are useful as "backing areas," waiting areas, when there is not a sufficient number of loading docks, and when trucks are longer than the design of the building allows.
						Freight Action Strategy for Seattle-Tacoma-Everett Corridor (FAST Corridor) http://www.psrc.org/projects/freight/index.htm
						
						Alameda Corridor – Ports of Long Beach and Los Angeles - http://www.acta.org/
						
						Alameda Corridor (California) - Assessing Rail Freight Solutions to Roadway Congestion: Final Report. Transportation Research Board, NCHRP Project 8-42 http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf
						
						Oakland International Airport – Alternative Fuels Program http://www.oaklandairport.com/noise/environmental.shtml
						
						Port of Oakland Truck Replacement Project - http://www.portofoakland.com/environm/prog_06.asp
						
						U.S. EPA Clean Ports Case Studies - http://www.epa.gov/cleandiesel/ports/casestudies.htm
						
						California Environmental Protection Agency – *Goods Movement Action Plan* http://www.arb.ca.gov/gmp/docs/gmap-1-11-07.pdf
						
						Camden Waterfront South Air Toxics Pilot Project - New Jersey, Department of Environmental Protection http://www.state.nj.us/dep/ej/camden/docs/finalreport.pdf
						
						Pacific Institute, West Oakland California - *Clearing the Air: Reducing Diesel Pollution in West Oakland, California* http://www.pacinst.org/reports/diesel/clearing_the_air_final.pdf

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies

					Educational:
					▪ Develop a driver training program in part to teach drivers about air quality issues and mitigation methods.
					
					RAIL:
					
					Operational:
					▪ Reduce locomotive idling times
					
					Planning & Design:
					▪ Replace at-grade rail crossings with grade separated crossings to limit idling.
					▪ Develop rail spurs or connections to provide direct service to freight facilities removing the need for trucks and reducing truck traffic on roadways.
					
					Policy:
					▪ Advocate for mode shift from truck to rail where feasible. Such a mode shift can reduce truck traffic and increase vehicular flow.
					
					Regulations:
					▪ Implement a Low Sulfur Diesel Fuel Rule.
					
					AIR CARGO:
					
					Technological:
					▪ Install hush kits on aircraft which reduces engine exhaust along with fan noise levels.
					▪ Retire older cargo aircraft which reduces noise and emissions.
					
					PORTS:
					
					Technological:
					▪ Install Green Port technologies including the installation of electric gantry cranes.
					▪ Install exhaust control/emission capturing devices on engines.
					▪ Include shore-side electrical power in dock construction or retrofitting. Allows ships to substitute electric power for diesel power while hotelling.
					
					Operational:
					▪ Faster, more efficient cargo handling strategies can reduce emissions.
					
					Policy:
					▪ Implement EPA Clean Port or Green Port practices that include:
					  ▪ instituting anti-idling policies
					  ▪ switching to ultra-low sulfur diesel fuel (ULSD)
					  ▪ expanding operating hours to allow off-peak operations to reduce congestion
					  ▪ substituting electric power for diesel power (cold ironing)
					  ▪ substituting rail or barge for trucks
					  ▪ educational programming for terminal operators and fleet owners
					▪ Advocate for mode shift from truck to rail where feasible. Such a mode shift can reduce truck traffic and increase vehicular flow.	

Road Issues:
▪ **Traffic flow**
▪ **Congestion**
▪ **Cut-through traffic**
▪ **Road/pavement conditions**
▪ **Connectivity & Access**
	Truck
	Rail
		TRUCK:
		▪ Hours of operation - can affect traffic flow
		▪ Volume – affects available road capacity for other users causing congestion
		▪ Operational characteristics – acceleration and deceleration rates of trucks differ from passenger vehicles adversely affecting automobile speeds
		▪ Road geometries – trucks often require [illegible] widths, turning radii, and turning
			Community	▪ Traffic congestion and delays have stress-related health impacts
				  ▪ Headaches
				  ▪ Hypertension
				  ▪ Depression and anxiety
				  ▪ Weakened immune system
				▪ Sitting in heavy traffic congestion can place drivers and passengers at increased risk of exposure to traffic-related pollutants. Associated health impacts include:
				  ▪ Asthma
				  ▪ Cough
					ALL FREIGHT:
					
					Technological:
					▪ Integrate Intelligent Transportation System (ITS) Technologies.
					
					Operational:
					▪ Schedule truck appointments to reduce idling, parking, and circling while waiting for docks to open.
					
					Planning & Design:
						Freight Action Strategy for Seattle-Tacoma-Everett Corridor (FAST Corridor) http://www.psrc.org/projects/freight/index.htm
						
						Alameda Corridor – Ports of Long Beach and Los Angeles - http://www.acta.org/
						
						Alameda Corridor (California) - Assessing Rail Freight Solutions to Roadway Congestion: Final Report. Transportation Research Board, NCHRP

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies
		lane requirements ▪ Trucks at commercial and retail establishments – can block traffic during loading and unloading or when backing into or pulling out of loading docks. Double-parking of trucks is also an issue ▪ Truck parking on shoulders and ramps – lack of adequate truck parking can slow operations of other vehicles ▪ Damage to road pavement primarily because of truck weight. Can also have damage to curbs and sidewalks, telephone poles and street lights, and signage if turning radii are too tight or loading docks are too small. ▪ Access issues - inadequate truck routes can lead to cut-through traffic **RAIL:** ▪ At grade crossings – freight trains (particularly longer ones) can cause significant traffic delays **AIR CARGO:** ▪ Congestion – truck back-ups can block local roads as well as increase road volumes contributing to congestion **PORTS:** ▪ Congestion – truck back-ups at terminal gates can block local roads as well as increase road volumes contributing to congestion		▪ Reduced lung Function ▪ Cancers ▪ Cardiopulmonary and stroke mortality ▪ Premature births and lower birth weights ▪ Roads heavily traveled by trucks, wide streets, traffic congestion, rail lines, and unsafe road conditions can all disrupt neighborhood or community cohesion resulting in negative health impacts and quality of life. ▪ Sitting in traffic congestion, particularly at grade crossings, can cause drivers to take risky maneuvers to avoid delays. ▪ In creased traffic volume can result in increased risk of accidents. The severing of formerly connected communities because of infrastructure or facility development can isolate people, create un-walkable environments, and limit access. A lack of walkability can reduce the opportunities for physical activity. Inactivity has the following health impacts: ▪ Coronary heart disease ▪ Respiratory disease ▪ Stroke ▪ Stress ▪ Obesity ▪ Diabetes ▪ Cardiovascular disease ▪ Depression Lack of walkability can also result in social exclusion or a loss of social capital. Resulting health impacts can be: ▪ Depression ▪ Anxiety ▪ Reduced life expectancy ▪ Reduced resistance to infections ▪ Increased likelihood for recurrence of cancer Lack of access to people, destinations, and services can have health impacts: ▪ Stress ▪ Depression ▪ Anxiety ▪ Lack of access to a healthy diet	▪ Cluster industrial uses via an industrial area plan or a freight village concept. ▪ Create a W&D zoning designation. **Policy:** ▪ Encourage the re-use of brownfields. **Regulations:** ▪ Develop truck-only access routes where appropriate. ▪ Retain and build-upon existing industrial areas. **TRUCK:** **Operational:** ▪ Switch from truck to rail use where appropriate ▪ Restrict trucks to certain routes. **Planning & Design:** ▪ Develop separate truck access routes where appropriate to increase public safety, re-route traffic from sensitive land uses, and relieve traffic congestion. ▪ Replace at-grade rail crossings with grade separated crossings to ease traffic flow issues. ▪ Develop and designate routes for heavy weight trucks which cause more wear and tear on road pavement and affect traffic flow because of their slower acceleration and deceleration. Such designated routes can ease traffic flow and roads can be especially designed to withstand the impacts of the heavier weight. ▪ Make spot improvements to transportation infrastructure where deemed inadequate for truck usage. Improvements include road geometry issues such as inadequate turning radii, lack of turn lanes, and ramp configurations. ▪ Participate in interjurisdictional corridor analysis to address issues that extend beyond political boundaries. **Regulations:** ▪ Require developers to make necessary highway access improvements as a condition for project approval. ▪ Establish a transportation enhancement district through which property owners and developers contribute to transportation improvements. ▪ Require staging areas for trucks at buildings. Staging areas are useful as "backing areas," waiting areas, when there is not a sufficient number of loading docks, and when trucks are longer than the design of the building allows. ▪ Develop and integrate an efficient and effective wayfinding signage program that reduces the likelihood of trucks traveling unnecessary distances, off designated truck routes, and through communities. **Policy:** ▪ Advocate for mode shift from truck to rail where feasible. Such a mode shift can reduce truck traffic and increase vehicular flow. ▪ Working with local trucking associations, create an incident management program or a truck safety hotline to report and track unsafe trucking activity or conditions. ▪ Encourage freight facilities to schedule truck appointment times. **RAIL:** **Operational:** ▪ Modify hours of operations to minimize traffic-related conflicts particularly with at-grade crossings **Planning & Design:** ▪ Replace at-grade rail crossings with grade separated crossings to ease traffic flow issues.	Project 8-42 http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf Guild's Lake Industrial Sanctuary – Portland, OR http://www.portlandonline.com/shared/cfm/image.cfm?id=58694 Sheffield Flyover, Kansas City, Missouri Assessing Rail Freight Solutions to Roadway Congestion: Final Report. Transportation Research Board, NCHRP Project 8-42 http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf The North Jersey Transportation Planning Authority study – *Brownfields Economic Redevelopment: Preparing Modern Intermodal Freight Infrastructure To Support Brownfields Economic Redevelopment* http://njtpa.org/planning/brownfields/BERfinalreport.html NYCDOT - *NYCDOT Truck Route Management and Community Impact Reduction Study* http://www.nyc.gov/html/dot/html/motorist/trucks.html NYCDOT – Truck Route Management and Community Impact Reduction Study – Technical Memorandum 3: Truck Signage Program http://www.nyc.gov/html/dot/pdf/tm3trucksignprog.pdf NYCDOT – Truck Route Management and Community Impact Reduction Study – Technical Memorandum 1: Traffic Policies and Regulations http://www.nyc.gov/html/dot/pdf/tm1trafpolicies.pdf NYCDOT – Truck Route Management and Community Impact Reduction Study – Technical Memorandum 4: Education Program http://www.nyc.gov/html/dot/pdf/tm4eduprog.pdf Hunts Point Vision Plan - Hunts Point Peninsula, South Bronx, NY http://www.nycedc.com/Web/AboutUs/OurProjects/CurrentProjects/HuntsPointVisionPlan.htm Washington State Department of Transportation – *WSDOT Truck Parking Study: Final Report* http://www.wsdot.wa.gov/freight/Truck%20Study-Final.pdf Volpe National Transportation Systems Center & US Department of Transportation - *District of Columbia Motor Carrier Management and Threat Assessment Study*

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies
					▪ Develop rail spurs or connections to provide direct service to freight facilities removing the need for trucks and reducing truck traffic on roadways. May also have the benefit of relieving at-grade crossings. **Policy:** ▪ Advocate for mode shift from truck to rail where feasible. Such a mode shift can reduce truck traffic and increase vehicular flow. ▪ Encourage freight facilities to schedule truck appointment times. **PORTS:** **Policy:** ▪ Encourage freight facilities to schedule truck appointment times. ▪ Advocate for mode shift from truck to rail where feasible. Such a mode shift can reduce truck traffic and increase vehicular flow.	http://app.ddot.dc.gov/information/studies/Motor_carrier_study/pdf/Preliminary_Draft.pdf Vancouver Gateway Transportation System - Assessing Rail Freight Solutions to Roadway Congestion: Final Report. Transportation Research Board, NCHRP Project 8-42 http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf
Noise Pollution & Vibration	Truck Rail Air cargo Port	**TRUCK:** ▪ Tire/roadway interaction ▪ Engine noise and exhaust; faulty equipment (mufflers) ▪ Steep inclines or other conditions that cause heavy laboring of truck engines ▪ Noise from loading and unloading ▪ Increase in truck volume in terms of numbers **RAIL:** ▪ Speed ▪ Idling ▪ Length of trains ▪ Horns and crossing bells ▪ Equipment: brakes, propulsion system, auxiliary equipment, wheel squeal ▪ Type of facility (i.e. storage or maintenance) ▪ Operational noise: moving & stacking containers, machinery, loading and unloading, coupling/uncoupling **AIR CARGO:** ▪ Number of arrivals and departures ▪ Schedule of operation- day versus night time operations ▪ Operational noise & vibration: Jet and propeller operation; pre-flight engine testing; auxiliary power units; taxiing; loading and unloading **PORTS:** ▪ Operational: ships, container noise, machinery, loading and unloading.	Community Environment	Physical and mental health impacts in order of decreasing causal relationship: Causal links: ▪ Annoyance ▪ performance by school children ▪ sleep disturbance ▪ mood ▪ heat rate ▪ hearing loss and tinnitus ▪ ischemic heart disease Suggested links: ▪ performance in adults ▪ hormones ▪ cardiovascular disease ▪ biochemical effects ▪ effects on the immune system Weak links: ▪ Psychiatric disorders ▪ low birthweight ▪ congenital defects	**ALL FREIGHT:** **Operational:** ▪ Limit idling of equipment. **Planning & Design:** ▪ Cluster industrial uses. ▪ Employ buffering devices (parks, greenspace, open space, distance, compatible land uses) between incompatible land use types. ▪ Build noise barriers (walls & berms) where appropriate. ▪ Utilize acoustical planning techniques which include designing, siting, constructing, and utilizing building materials that minimize noise in a house or a building adjacent to noisy freight facilities. ▪ Utilize noise-compatible land use planning practices. **Regulations:** ▪ Develop truck-only access routes where appropriate. ▪ Retain "buffer zoning" around sensitive land uses that cannot be rezoned for more intense freight uses. **TRUCK:** **Operational:** ▪ Modify hours of freight operation to coincide with normal waking hours of community members ▪ Limit the hours of loading dock operation when near noise sensitive land uses. **Enforcement:** ▪ Enforce EPA regulations on noise limits for new trucks. **Policy:** ▪ Require muffler devices in older vehicles. **Regulations:** ▪ Restrict truck access to certain roads or streets or to certain times of day ▪ Adjust timing of traffic signals (reduces idling) ▪ Reduce speed limits ▪ Incorporate a well-planned and coherent wayfinding signage system **Planning & Design:** ▪ Utilize land use controls to determine road placement based on compatibility of uses ▪ Install quiet pavement ▪ Replace at-grade rail crossings with grade separated crossings to limit idling. ▪ Develop and designate routes for heavy weight trucks.	Alameda Corridor – Ports of Long Beach and Los Angeles - http://www.acta.org/ Oakland International Airport – Noise Management Program http://www.oaklandairport.com/noise/index.shtml Guild's Lake Industrial Sanctuary – Portland, OR http://www.portlandonline.com/shared/cfm/image.cfm?id=58694 NYCDOT - *NYCDOT Truck Route Management and Community Impact Reduction Study* http://www.nyc.gov/html/dot/html/motorist/trucks.html Volpe National Transportation Systems Center & US Department of Transportation - *District of Columbia Motor Carrier Management and Threat Assessment Study* http://app.ddot.dc.gov/information/studies/Motor_carrier_study/pdf/Preliminary_Draft.pdf

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies
					▪ Develop and integrate an efficient and effective wayfinding signage program that reduces the likelihood of trucks traveling unnecessary distances, off designated truck routes, and through communities. **RAIL:** **Technological:** ▪ Install continuous welded rail (CWR) which is more expensive but quieter. **Operational:** ▪ Maintenance of wheels and rails to mitigate noise production caused by age, wear-and-tear, and problems. ▪ Modify hours of freight operation to coincide with normal waking hours of community members **Policy:** ▪ Institute quiet zones for horn blowing by trains at grade crossings **Planning & Design:** ▪ Design/retrofitting of track support systems to incorporate quieter materials. ▪ Grade separation to muffle noise. ▪ Modify train whistles at grade crossings. Mounting horns at the crossing instead of utilizing the train's horns limits the target of the horn to a smaller area. ▪ Replace at-grade rail crossings with grade separated crossings to limit idling. **AIR CARGO:** **Technological:** ▪ Install hush kits on aircraft which reduces engine exhaust along with fan noise levels. ▪ Retire older cargo aircraft to reduce noise and emissions. **Operational:** ▪ Utilize preferred runways ▪ Alter flight corridors as needed **Policy:** ▪ Airport should consider acquiring properties located in high noise areas. **PORTS:** **Operational:** ▪ Modify hours of freight operation to coincide with normal waking hours of community members	
Light Pollution	Truck Rail Air cargo Ports	**ALL FREIGHT:** ▪ Light pollution generated by nighttime operation of facilities ▪ Inappropriate light equipment ▪ Improper installation ▪ Poor lighting design	Community Environment	Light pollution commonly classified as: ▪ Sky glow ▪ Glare ▪ Light trespass ▪ Over illumination ▪ Clutter Community and Environmental Impacts: ▪ Can cause adverse health effects ▪ Visual acuity ▪ Headaches ▪ Carcinoma and other cancers ▪ Sleep deprivation possibly resulting in: decreased mental capacity and concentration, compromised immune system, diabetes type 2, dizziness and fainting, depression, hypertension, impatience and irritability, and weight gain	**All Freight Types:** **Technological:** ▪ Use specialized "dark sky" fixtures to reduce light spillage. ▪ Avoid "over lighting" and use shields, reflectors, and baffles to keep light spill to a minimum and direct light below the horizontal. **Operational:** ▪ Modify hours of operation where feasible. Less work at night means less need for work lighting. ▪ Direct light downwards rather than into the sky. ▪ Use the minimum light level needed rather than the maximum. ▪ Turn lights off when and where not required. Consider installing motion sensor lights, lights on timers, etc.	Southwest Harbor Project – Seattle, WA http://www.holophane.com/hlp_library/case_histories/Seattle.asp Los Angeles World Airports – LAX Master Plan EIS/EIR – Light Emissions Technical Report – Los Angeles, CA http://www.laxmasterplan.org/docs/draft_eir_NE/T09_LR.pdf

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies
				among others. ▪ Can be dangerous for nighttime drivers causing impaired vision or momentary blindness. ▪ Can disrupt delicate ecosystems, confuse animal navigation, change predator-prey relations, and alter animal physiology. ▪ Obscures stars and views of the night sky particularly for urban dwellers ▪ Interferes with astronomical observatories ▪ Wastes energy ▪ Can encourage criminal activity if poor lighting obscures rather than illuminates ▪ Can infringe upon ones sense of privacy particularly in the home. ▪ Can seem more acute in rural communities as opposed to urban environments.	**Planning & Design:** ▪ Employ buffering devices: landscaping, parks, greenspace, openspace, distance, and compatible land uses ▪ Cluster industrial uses.	
Community Safety: ▪ **Injury** ▪ **Accidents** ▪ **Hazardous materials** ▪ **Security concerns**	Truck Rail Air cargo Ports	**TRUCK:** ▪ Mixing of truck and car traffic ▪ Heavy truck volumes ▪ Mixing of truck traffic and pedestrians or bicyclists - 5% of pedestrian fatalities in the U.S. are associated with large trucks ▪ The movement, handling, and storage of hazardous materials ▪ Access issues - inadequate truck routes can lead to cut-through traffic which causes safety issues in terms of other motorists, pedestrians, and bicyclists ▪ Driver exhaustion **RAIL:** ▪ Safety of at-grade rail crossings ▪ Trespassing along rail corridors and in rail yards ▪ Theft or destruction of property/terrorist activities ▪ The movement, handling, and storage of hazardous materials **AIR CARGO:** ▪ Theft or destruction of property/terrorist activities **PORTS:** ▪ The movement, handling, and storage of hazardous materials ▪ Theft or destruction of property/terrorist activities	Community	▪ Death, injury, or amputation from collisions with heavy trucks and trains. Railroad accident injuries are much like other motorized vehicle accident injuries. These can include brain and spinal cord injuries, concussions, sprains, fractures, abrasions, internal and soft tissue injuries, burn injuries, and just about every other injury associated with the operation of other motorized vehicles. ▪ Train crashes and derailments caused by defective equipment; human error, track and signal defects, accidents resulting from individuals walking on or near train tracks or trespassing in train yards, injuries to railroad employees in the course of their employment; vehicle-train accidents at railroad crossings, and terrorist activities. ▪ Unsafe pavement conditions as well as damage to sidewalks and curbs caused by road geometries inadequate for heavy trucks can be dangerous for bicyclists and pedestrians in addition to automobile drivers. ▪ Heavy truck volumes can make walking and biking unsafe.	**ALL FREIGHT:** **Technological:** ▪ Integrate Intelligent Transportation System (ITS) Technologies. **Educational:** ▪ Develop public education programs regarding freight safety. ▪ Develop educational programming regarding the shipment of hazardous materials. **Planning & Design:** ▪ Cluster industrial uses. **Operational:** ▪ Strengthen cargo inspection protocol and practices. ▪ Have a hazardous materials clean-up plan in place. **Regulations:** ▪ Develop truck-only access routes where appropriate. ▪ Retain and build-upon existing industrial areas. ▪ Require developers to enter into a Community Benefits Agreement with community groups as part of their agreement with the city. Such agreements specify the benefits that developers will provide the community as part of the development project in exchange for community support for the project. Benefits can include: mitigation and improvements of environmental concerns (noise, vibration, air quality, lighting, etc.), economic development/job opportunities, infrastructure improvements, buffering and landscaping, improvement/maintenance funds, community involvement. **TRUCK:** **Educational:** ▪ Develop driver training programs in part to teach drivers about automobile and pedestrian safety. ▪ Create a truck-based Highway Watch Program that trains truck drivers to spot and report highway safety incidents. ▪ Develop educational programming regarding the shipment of hazardous materials. **Operational:** ▪ Restrict trucks to certain routes. ▪ Improve maintenance practices. **Planning & Design:** ▪ Replace at-grade crossings with grade separated crossings to limit train/automobile interactions. ▪ Develop and designate routes for heavy weight trucks. ▪ Make spot improvements to transportation infrastructure where deemed inadequate for truck usage. Improvements include road geometry issues such as inadequate turning radii, lack of turn lanes, and ramp configurations.	Freight Action Strategy for Seattle-Tacoma-Everett Corridor (FAST Corridor) http://www.psrc.org/projects/freight/index.htm The Alameda Corridor – Long Beach and Los Angeles, CA http://www.acta.org/projects_completed_alameda.htm **Educational:** The *Share the Road Safely Program* for truck drivers and the *No-Zone Campaign* for car drivers by the Federal Motor Carrier Safety Administration (FMCSA) teach truck safety. ▪ http://www.sharetheroadsafely.org/ ▪ http://www.sharetheroadsafely.org/noZone/noZone.asp *Operation Lifesaver* - rail safety education program - http://www.oli.org/ The Federal Railroad Administration rail safety programs http://www.fra.dot.gov/us/content/1755 **Community Benefits Agreements:** Georgia Department of Community Affairs – Toolkit http://www.dca.state.ga.us/toolkit/ToolDetail.asp?GetTool=150 The Detroit Intermodal Freight Terminal – Detroit, MI – Community Benefits Agreement http://www.southwestdetroit.com/Community/cbawhitepaper.pdf Los Angeles Worlds Airports, LAX Master Plan Program – Los Angeles, CA http://www.environmentaldefense.org/documents/4200_LAX_CBA_attachment.pdf

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies
					▪ Keep abreast of new technologies and install upgraded rail crossing barriers and gates where appropriate. ▪ Identify and correct unsafe roadway and operational characteristics (modify speed limits, thorough signage system to indicate road hazards). **Regulations:** ▪ Require developers to make necessary highway access improvements as a condition for project approval. **RAIL:** **Operational:** ▪ Improve maintenance practices. **Planning & Design:** ▪ Replace at-grade crossings with grade separated crossings to limit train/automobile interactions. ▪ Where trespassing or pedestrian/train interaction is an issue, create barriers and walkways that create a separation. Look for opportunities to improve the pedestrian environment and direct people to safe crossings points. ▪ Keep abreast of new technologies and install upgraded rail crossing barriers and gates where appropriate.	
Environmental Impacts: ▪ **Ecosystems** ▪ **Air** ▪ **Water** ▪ **Soil** ▪ **Wetlands** ▪ **Historic, cultural, and archaeological resources**	Truck Rail Air Cargo Ports	**ALL FREIGHT:** ▪ The movement, handling, and storage of hazardous materials ▪ Contaminants are released both during construction and operation. ▪ Brownfields ▪ Imperious surfaces can cap pollutants in the ground but contribute to runoff of polluted water. ▪ Pollutants generated by the manufacturers that produce freight-related products. ▪ Vehicle and equipment fueling, maintenance and cleaning, and deicing are all sources of pollutants related to freight. ▪ Vegetation management practices particularly along rail lines. **PORTS:** ▪ Release of invasive/exotic aquatic species and diseases from ballast discharges ▪ Dredging and channel deepening and the improper disposal of contaminated sediment all impact environmentally sensitive land, water, and species	Community Environment	Air: ▪ Diesel is the primary contributor to polluted emissions causing adverse health effects in people. Also decreases visibility. ▪ Polluted emissions also contribute to regional and atmospheric changes that contribute to global warming, acid rain, and reduced ultraviolet radiation because of stratospheric ozone depletion. Water: ▪ Water quality degradation from multiple point-source discharges. ▪ Water quality degradation from land uses that result in nonpoint-source pollution within the watershed. ▪ Sediment delivery into streams or estuaries from poor construction techniques or erosion. ▪ Deterioration of recreational uses from nonpoint-source pollutants, competing uses for the body of water, or overcrowding. ▪ Water quality degradation from nonpoint- and multiple-point source pollutants that infiltrate aquifers. ▪ Aquifer depletion and saltwater intrusion from overdrawing. ▪ The stormwater pollutants of most concern are total suspended solids (TSS), oil and grease, nutrients, pesticides, other organics, pathogens, biochemical oxygen demand (BOD), heavy metals, and salts (chlorides). ▪ Sedimentation caused by TSS can destroy the desired habitat for fish and can pollute drinking water. ▪ Oil and grease can be toxic to aquatic life. ▪ Phosphorous and nitrogen act as nutrients and can cause excessive aquatic plant growth. ▪ Growth of bacteria in water can lead to oxygen depletion affecting fish. ▪ Heavy metals in stormwater runoff can affect the reproductive systems of aquatic species and can also cause tumors and lesions in fish. ▪ Runoff can affect the pH of water and when out of balance can be toxic to aquatic species. ▪ Stormwater can contain disease-causing bacteria and viruses that can be unsafe for human consumption. Soil: Contaminants in the soil, particularly around brownfields, can become airborne in	**ALL FREIGHT:** **Technological:** ▪ Develop and utilize cleaner fuels. ▪ Pursue LEED certification for projects. **Operational:** ▪ Develop and require regular systems of monitoring water and air conditions. ▪ Properly dispose of contaminated soil from dredging projects (Ports) ▪ Implement proper ballast discharge techniques (Ports). ▪ Water from the washing of trucks, trains, airplanes, etc. should be troughed and recycled rather than allowed to run into drains. ▪ Promptly contain and clean up solid and liquid pollutant leaks and spills, including oils, solvents, fuels, and dust on any exposed soil, vegetation, or paved area. ▪ Recycle oils, solvents, etc. to the greatest extent possible. ▪ Minimize use of toxic cleaning solutions. **Planning & Design:** ▪ Cluster industrial uses. ▪ Incorporate detention and retention ponds, vegetated swales and filter strips, filtering systems, and porous pavements where appropriate and feasible. **Educational:** ▪ Develop education programs (workshops, training, etc.) on pollution prevention, environmental stewardship best practices, technology innovations, and environmental laws and regulations. ▪ Train employs on pollution identification and clean-up procedures. **Policy:** ▪ Develop a construction site inspection checklist and monitoring procedures to ensure contractor compliance with environmental specifications during the construction period. ▪ Protect open and greenspace to act both as buffers and to perform necessary ecosystem functions such as stormwater run-off management. ▪ Where greenspace (farmland, forestland, undeveloped land) is still plentiful, establish a greenspace plan to protect these spaces in perpetuity. Look for ways to connect	The Port of Oakland – water, wildlife, and environmental management programs http://www.oaklandairport.com/noise/environmental.shtml#Water%20Q The Port of Portland Environmental Programs – Portland, OR http://www.portofportland.com/Env_Home.aspx Federal Highway Administration – *Addressing Freight in the Transportation Planning Process* – has good case studies http://trans.wpcog.org/downloads/freight/Addressing%20Freight.pdf Great Lakes, St. Lawrence Seaway System – Canada & U.S. – Ballast water program – http://www.greatlakes-seaway.com/en/navigation/ballast_water.html Alameda Corridor – Ports of Long Beach and Los Angeles - http://www.acta.org/ The Port of Long Beach - Green Port Policy http://www.polb.com/environment/green_port_policy.asp Port of Oakland, CA – Berths 55-58 – Federal Highway Administration, Review of Environmental Factors Affecting Intermodal Freight Transportation Facility Development and Expansion http://ops.fhwa.dot.gov/freight/freight_analysis/env_factors/env_fact_app_e6.htm

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies

				dust or leach into the water table potentially coming in contact with humans. Chemical leaching can render soils less fertile and productive. Such contaminants and their associated health impacts are as follows:
				▪ Arsenic
				  ▪ Breathing high levels can cause a sore throat and irritated lungs
				  ▪ Ingesting high levels can result in death
				  ▪ Ingesting low levels can cause: nausea and vomiting, abnormal heart rhythm, decreased production of red and white blood cells, damage to blood vessels, and the feeling of "pins and needles" in the hands and feet.
				  ▪ Long-term exposure can cause a darkening of the skin and an increased risk of some cancers
				▪ Lead
				  ▪ Lead is damaging to almost every organ and system in the body
				  ▪ The central nervous system is particularly vulnerable to lead poisoning
				  ▪ It can also damage the kidneys and reproductive system
				▪ Boron
				  ▪ Short-term exposure can cause irritation of the nose, throat, and eyes
				  ▪ Ingesting large amounts over a short period can result in damage to the stomach, intestines, liver, kidneys, and brain
				  ▪ Birth defects can occur in women exposed during pregnancy
				▪ Copper
				  ▪ Copper is stored in the liver, brain, heart, kidneys, and muscles
				  ▪ Copper poisoning is associated with nausea, loss of appetite, vomiting, and an enlarged liver
				  ▪ Long-term exposure in the air can irritate the nose, mouth and eyes, and cause dizziness, headaches, and diarrhea
				▪ Nickel
				  ▪ Ingestion of large amounts of nickel can result in nausea, vomiting, abdominal pain, headache, cough, and shortness of breath
				  ▪ Causes an allergic reaction of the skin
				▪ Zinc
				  ▪ Zinc is an essential element in our diet but must be ingested in moderation.
				  ▪ Ingesting large amounts can cause gastrointestinal upset
				  ▪ Ingesting too much over a long period of time can cause anemia, pancreas damage, and too little lipoprotein cholesterol
				▪ Phenol
				  ▪ Phenol is a manufactured substance and can cause vomiting, difficulty swallowing, salivation, diarrhea, weakness, headache, fainting, distances, and mental disturbances
				▪ Sulphide
				  ▪ Exposure at high levels can result in loss of consciousness and death
				  ▪ Exposure to lower levels can cause eye irritation, sore throat and cough, and shortness of breath
				  ▪ Long-term, low level exposure can result in fatigue, loss of appetite, headaches, irritability, poor memory, and dizziness
				
				Wetlands:
				▪ Habitat fragmentation caused by a variety of factors including the construction or expansion of freight facilities.
				▪ Degradation of fragile ecosystems due to stressors of over-use or misuse.
				▪ Loss of fish and wildlife populations due to barriers to migration (e.g. dams and highways).
				
				Historic, cultural, archaeological resources:
				▪ Fragmentation or destruction of resources because of poor zoning, bad construction practices, and poor monitoring and enforcement of projects.
				▪ Compromised historical structures or settings via proximity to noxious land uses.
					greenspaces to maintain or reestablish networks for wildlife movement/migration.
					▪ Soil and groundwater should be monitored at regularly scheduled intervals. Mitigation should be required when needed.
					
					Regulations:
					▪ Require developers to enter into a Community Benefits Agreement with community groups as part of their agreement with the city. Such agreements specify the benefits that developers will provide the community as part of the development project in exchange for community support for the project. Benefits can include: mitigation and improvements of environmental concerns (noise, vibration, air quality, lighting, etc.), buffering and landscaping, improvement/maintenance funds, community involvement.	

Freight Impact	Associated Freight Type	What Contributes to or Exacerbates the Impacts	Who is Impacted	Impacts on the Community and/or Environment	Prevention and Mitigation Methods	Best Practices and Case Studies

Visual & Aesthetic Concerns	Truck
	Rail
	Air cargo
	Ports
		ALL FREIGHT:
		▪ New freight-based construction projects.
		▪ Retrofitting, expansions, additions to existing freight facilities.
		▪ New freight routes such as rail corridors.
		▪ Corridor improvements can alter the viewshed (e.g. construction of a bridge or interchange).
		▪ Increased traffic and rail-usage.
			Community	▪ Diminished enjoyment of the public environment.
				▪ Compromised character or quality of place. Can result in loss of social capital and community cohesion.
				▪ Impacts on economic development in the community if visual/aesthetic impact is significant.
				
				Stress-related health effects:
				▪ Increased blood pressure
				▪ Headaches
				▪ Increased stomach acids
				▪ Increased metabolism (e.g. heart rate, breathing)
				▪ Suppressed immune system
				▪ Decreased intestinal movement and protein synthesis
				▪ Increased cholesterol and fatty acids in blood for energy production
				▪ Fatigue or insomnia
				▪ Anxiety
				▪ Mood swings
				▪ Depression
					ALL FREIGHT:
					
					Policy:
					▪ Assess the potential impact of a project prior to implementation and invite public input.
					▪ Visually assess the viewsheds, aesthetic quality, and significance of a site prior to construction.
					▪ Involve the community in aesthetic decisions (noise barriers, overpasses, etc.) regarding transportation improvements. Such improvements would benefit both freight and the community.
					
					Planning & Design:
					▪ Utilize siting and design that does not diminish or obstruct the viewshed.
					▪ Implement W&D zoning classification or cluster industrial development.
					▪ Mitigation strategies include:
					  ▪ Screening: natural (vegetation and berms) or artificial (fences and walls). Successful screening must have its own aesthetic qualities.
					  ▪ Relocation
					  ▪ Camouflage/disguise
					  ▪ Low profile – reducing the height of the object in the viewshed
					  ▪ Downsizing – reducing the number, density, or area of the offending object
					  ▪ Alternate technologies
					  ▪ Non-specular materials – use objects that are not shiny reducing glare
					  ▪ Lighting
					  ▪ Decommissioning obsolete structures
					  ▪ Proper maintenance procedures
					
					Regulations:
					▪ Implement a Visual Assessment Policy that requires a visual impact assessment as part of project approval process.
						New Mexico Department of Transportation – I-40/Coors Design-Build Reconstruction Project: Aesthetics Public Involvement Project http://www.nmgrip.com/projects.asp?project=14912
						
						City of Reno, NV - *Reno Railroad Corridor* – Aesthetics, *Final EIS* http://www.cityofreno.com/gov/retrac/library/pdfs_feis/f_3-11.pdf

Section 3: Mitigation Case Studies

Air Quality Case Study 1:	
Title	Camden Waterfront South Air Toxics Pilot Project
Report By/Location	New Jersey, Department of Environmental Protection http://www.state.nj.us/dep/ej/camden/docs/finalreport.pdf
Issues Addressed	Truck Emissions
Abstract	This report identifies exposure to particulate matter as the most critical risk factor in the community. The report recommends efforts to reduce local emissions from trucks by either reducing the number of trucks or making the local trucks emit less pollution. Additional recommendations include diesel engine retrofits and anti-idling efforts along with educational programs for truck drivers and more extensive enforcement procedures. Examples of diesel engine retrofits include tailpipe retrofits and use of ultra low sulfur diesel fuel. The state of New Jersey already has a regulation that restricts the length of time that a vehicle can idle.
Air Quality Case Study 2:	
Title	Clearing the Air: Reducing Diesel Pollution in West Oakland, California
Report By/Location	Pacific Institute http://www.pacinst.org/reports/diesel/clearing_the_air_final.pdf
Issues Addressed	Trucks & Air Quality
Abstract	Key findings of this report are: (i) West Oakland residents face dangerous amounts of diesel soot in the air, (ii)There is far more diesel pollution in West Oakland than in the rest of the State/Region, and (iii) Diesel pollution is every where in West Oakland. The report lists three main goals with recommendations: 1. Reduce impact of trucks on West Oakland community. The recommendations to achieve this goal are: a) increase enforcement/penalties on prohibited routes, b) create a designated truck route, c) pass an ordinance prohibiting overnight truck parking in residential areas, d) install traffic barriers on prohibited streets, e) decrease truck traffic by increasing percentage of containers moved by rail, f) provide truck services at the Port of Oakland. 2. Reduce diesel emissions from trucks. The recommendations to achieve this goal are a) provide financial incentives to replace older trucks, b) regulate idling within port terminals, c) provide electrified parking spaces to reduce unnecessary idling, d) continue to test cleaner fuels and technologies, e) develop a biodiesel consortium. 3. Improve community health. The two recommendations are: to create a Healthy Homes project and support a community fund.

Air Quality Case Study 3:	
Title	NCHRP - *Integrating Freight Facilities and Operations with Community Goals: A Synthesis of Highway Practice*
Report By/Location	Transportation Research Board http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_320.pdf
Issues Addressed	Air Quality, Rail
Abstract	In 1993, 32 trains per day operated to and from the ports of Los Angeles and Long Beach. The average speeds on these lines were in the range of 10 to 20 miles per hour because of a large number of grade crossings and other restrictions. The four mainlines had 198 at-grade street crossings and over 70,000 people living within 500 feet. The ports are expected to experience an increase in rail traffic, with an estimated 97 trains per day moving in and out of the ports by the year 2020. The increased train volumes and deteriorated roadway conditions are expected to result in increasing delays, slower speeds, and less capacity to handle future demands. Without any improvements, locomotive, auto, and truck emissions would increase substantially. The operation of the Alameda Corridor has improved the overall traffic handling capacity. Grade separated crossings over the depressed railroad, left turn pockets, and improved signalization has resulted in significant reductions in train emissions, truck emissions and noise pollution. According to a news release on Alameda Corridor Transit Authority website (http://www.acta.org), during the first three years of its operation, the Alameda Corridor's air quality benefits to the South Coast Air Basin included: • Elimination of 3,863 total tons of pollutants • Reduction of 1,169 tons of Nitrous Oxide (NOX) • Reduction of 49 tons of Particulate Matter (PM10) The Alameda Corridor's air quality benefits are derived primarily from increased rail efficiency and the elimination of vehicle delays at more than 200 road-rail crossings.

Road Issues Case Study 1:	
Title	Sheffield Flyover, Kansas City, Missouri
Report By/Location	Assessing Rail Freight Solutions to Roadway Congestion: Final Report.Transportation Research Board, NCHRP Project 8-42. http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf
Issues Addressed	Road Congestion, Rail
Abstract	Kansas City, MO is the second-largest rail freight hub in the country after Chicago, IL. The rail network contributed to major bottlenecks in and around Kansas City. At-grade crossings of high-density rail routes had not only led to train backups, but also caused extensive delays to highway traffic when trains blocked local streets. The Sheffield Flyover project involved construction of a flyover to improve train traffic flow. The project enlarged capacity and improved operating performance in the busy rail center by reducing interference with urban road traffic. The project was implemented in 2000 and has proved beneficial to both the rail road and to the community. From the public's perspective, the most visible benefit was a reduction in delays at at-grade crossings. It is estimated that 530 vehicle-hours will be saved daily for cars and trucks by the elimination of at-grade crossings, based upon the train volume, the average time that each train blocked a crossing, and the 4,500 daily highway vehicle movements through the area.
Road Issues Case Study 2:	
Title	Vancouver Gateway Transportation System
Report By/Location	Assessing Rail Freight Solutions to Roadway Congestion: Final Report. Transportation Research Board, NCHRP Project 8-42. http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf Greater Vancouver Gateway Council http://www.gvgc.org/home.html
Issues Addressed	Road Congestion, Rail
Abstract	The primary motivation for this initiative was concern about threats to the economic position of the Greater Vancouver Region as an international gateway and conduit for goods movement. The transportation and economic development officials saw major economic threats and opportunities associated with the failure or success of the Vancouver region in addressing surface transportation congestion and capacity for growth of ports and border crossings. The Greater Vancouver Gateway Council noted that the current transportation system, in all its modes, was showing signs of neglect and lack of investment as congestion continued at unprecedented levels. They concluded that investment in the region's transportation network was urgently required to reverse the past trends and to provide a transportation system that supported the nationally important gateways located in the region. The specific needs addressed by proposed road and transit infrastructure projects were to: i) relieve congestion on the major highway and arterial routes within the

	region, either by increasing capacity or by diverting auto drivers to transit; ii) provide a bypass or give priority to commercial vehicles on congested routes; iii) provide more direct connections to either major gateways or commercial activity centers. Some of the proposed projects include: i) additional capacity on Highway 1 (includes adding a second span to the Port Mann Bridge, upgrades to the various interchanges, and extension of the HOV lanes), to address capacity constraints resulting in significant congestion and delays; ii) improvements and additions to existing road corridors between the Mary Hill Bypass and Queensborough to provide needed efficiencies via reduced congestion.
Road Issues Case Study 3:	
Title	Alameda Corridor (California)
Report By/Location	Assessing Rail Freight Solutions to Roadway Congestion: Final Report. Transportation Research Board, NCHRP Project 8-42. http://www.trb.org/NotesDocs/NCHRP08-42_FR_Rev10-06.pdf
Issues Addressed	Road Congestion, Rail
Abstract	The chief objectives of the Alameda Corridor project were: i) raise access capacity and maintain port competitiveness, ii) improve road safety & reduce delays, iii) improve train operations, iv) diminish environmental impacts, and v) promote economic development. Although the provision of congestion relief was not the primary objective, the project does provide it. This point was employed to organize community and financial support. Some of the measures that provide congestion relief are: i) two hundred at-grade crossings were eliminated by rebuilding the right of way and redirecting traffic to a consolidated route. This was estimated to remove 15,000 daily hours of vehicle delay from Los Angeles roads, ii) the street parallel to the rail corridor was widened and improved as part of the right of way reconstruction, leading to better traffic flow. The Alameda Corridor commenced operations in 2002. According to a news release on Alameda Corridor Transit Authority website (http://www.acta.org), during the first three years of its operation, the Alameda Corridor's air quality benefits to the South Coast Air Basin included: • Elimination of 3,863 total tons of pollutants • Reduction of 1,169 tons of Nitrous Oxide (NOX) • Reduction of 49 tons of Particulate Matter (PM10) The Alameda Corridor's air quality benefits are derived primarily from increased rail efficiency and the elimination of vehicle delays at more than 200 road-rail crossings.

Noise Pollution and Vibration Case Study 1:	
Title	NYCDOT Truck Route Management and Community Impact Reduction Study
Report By/Location	New York City DOT http://www.nyc.gov/html/dot/html/motorist/trucks.html
Issues Addressed	Trucks, Noise, Safety
Abstract	To address the safety, noise and air pollution issues that are caused by trucks traveling through residential areas, NYCDOT implemented a series of improvements, including speed reducers, all way stops, and raised medians to calm traffic throughout the residential Hunts Point area. A joint effort involving area residents, local community groups, the Community Board, local elected officials, the trucking companies, Hunts Point Market, NYCEDC, NYPD, NYSDOT, and NYCDOT developed truck route modifications to further separate trucks from entering the residential section of the peninsula, where schools and playgrounds are also located.
Noise Pollution and Vibration Case Study 2:	
Title	District of Columbia Motor Carrier Management and Threat Assessment Study
Report By/Location	Volpe National Transportation Systems Center, US Department of Transportation http://app.ddot.dc.gov/information/studies/Motor_carrier_study/pdf/Preliminary_Draft.pdf
Issues Addressed	Trucks & Noise and Vibration, Cut-through traffic, Education
Abstract	The District of Columbia is the main topic of this study, but this study includes a section on “successful practices in municipal truck management”, which, among others, describes mitigation strategies that the City of Cambridge, MA implemented. Cambridge has long had problems with truck-generated noise and vibration. Located immediately to the northwest of the Port of Boston, Cambridge offers several convenient routes for truck drivers looking to travel from the Massachusetts Turnpike to industrial facilities, located north of Cambridge. Cut-through truck traffic, which accounts for approximately 16% of all truck traffic on Cambridge roads, joins the significant number of trucks serving local businesses and residents, producing a public impression of heavy truck traffic in a predominantly residential city. A Cambridge City ordinance restricts through truck traffic traveling between the hours of 11:00pm and 6:00am to certain designated streets. To develop the approved nighttime routes, Cambridge city staff worked closely with the trucking industry and with neighboring communities to create a series of designated routes that would be acceptable to all. Cambridge coupled the development of the nighttime routes with an extensive education campaign, in which information was provided to truck drivers and trucking companies through pamphlets, websites, and telephone hotlines.
Noise Pollution and Vibration Case Study 3:	
Title	Guild’s Lake Industrial Sanctuary
Report By/Location	Portland Bureau of Planning http://www.portlandonline.com/shared/cfm/image.cfm?id=58694

Issues Addressed	Trucks, Noise
Abstract	The area around Guild's Lake of Portland, OR has been a vibrant manufacturing and industrial location. The location is adjacent to mixed-use and residential areas, which make noise, emissions and truck traffic issues of concern. The Guild's Lake Industrial Sanctuary Plan was developed to preserve existing industrial uses at the location and to balance the need to maintain industrial activity with existence of nearby residential communities. Noise mitigating measures applied included building sound walls and berms and included buffer zones.

Light Pollution Case Study 1:	
Title	Seattle terminal minimizes light trespass, ensures safety and energy efficiency with Holophane High Mast System
Report By/Location	Holophane's Website http://www.holophane.com/hlp_library/case_histories/Seattle.asp
Issues Addressed	Light Pollution, airport
Abstract	[This case study is from a website of a commercial lighting services provider, but this case study was referenced in the NCHRP document: NCHRP SYNTHESIS 320: Integrating Freight Facilities and Operations with Community Goals.] Because of the proximity of private homes, when the terminal expanded its intermodal yard and retrofitted an existing lighting system, light spillover was a major concern. Houses in the adjoining community are located on a hill and overlook the terminal, thus some houses are directly in line of the terminal's light fixtures. Another priority was to boost illumination levels to promote safety. The intermodal yard installed the Holophane's high-mast system that provided the uniform light levels need to ensure safety at the terminal while also ensuring that the light does not intrude into the neighboring community. High-mast system is a lighting system where lights are attached to a tall mast. High-mast system enables large areas to be illuminated without the need for numerous columns. High-mast systems can be particularly suitable for complicated or multi-level road systems, industrial areas, ports and airports.

Water Case Study 1:	
Title	Port of Oakland, CA – Berths 55-58
Report By/Location	Federal Highway Administration, Review of Environmental Factors Affecting Intermodal Freight Transportation Facility Development and Expansion http://ops.fhwa.dot.gov/freight/freight_analysis/env_factors/env_fact_app_e6.htm
Issues Addressed	Water, Ports
Abstract	The Port of Oakland is expanding its facilities through widening and deepening of the existing inner harbor channel, bank excavation, fill land reclamation, and wharf

	construction. The project also involves realignment of Seventh Street and construction of a short access road in order to handle additional traffic anticipated as a result of the project. Additionally, the project includes substantial demolition and reconstruction (containment dike construction and land fill) of a former U.S. Navy facility. Ballast water discharge concerns by National Marine Fisheries Service (NMFS) resulted in a Biological Opinion of possible adverse effects (non-indigenous species invasion) on several fish species from ballast water discharge increases associated with additional maritime traffic. NMFS negotiated with the Port regarding reasonable and prudent measures to mitigate the impact. Although no direct mitigation measures were implemented, the Port is required to contribute $200,000 over four years to aid in the development and implementation of the State's ballast water monitoring and treatment program to minimize the potential impacts of non-indigenous species introduction from ballast water discharge.

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Appendix: Case Study Characteristics[45]

Case Study Area	Study Area location	Study Area Size	Nearby Features	Environmental Analysis	Demographic Analysis	Transportation Infrastructure	Land Use Analysis	Freight-related Conflicts Cited	Conflicting Land Uses Present	Current Zoning (not exhaustive)	Future Land Use Plan	Land Use Recommendations	Current & Future Transportation Policies & Projects	Transportation Recommendations
Atlanta Road / Marietta Boulevard Land use compatibility/ Urban design	City of Atlanta Fulton County	11.4 square miles	Cobb County Line I-75 Simpson St. Chattahoochee River	Floodplain areas (Chattahoochee) Steep topography Wetlands Streams Rivers Hazardous materials	Large concentrations of African-American populations in some parts High percentages of poverty, of African-Americans in poverty, and of children under age 11 in poverty	**Marietta Blvd / Atlanta Blvd** ▪ Urban minor arterial ▪ AADT 14,560 ▪ STAA-Designated Access Route ▪ Truck route **Bolton Rd / Moores Mill Rd / Fulton Industrial Blvd** ▪ Urban minor arterial ▪ AADT 25,010 ▪ Connects to I-75 **Bankhead Ave. (SR 78)** ▪ Urban principal arterial ▪ AADT 9,790 ▪ 18.9% truck traffic **Hills Avenue** ▪ STAA-Designated Access Route ▪ Truck route **CSX & Norfolk Southern** ▪ Merging of multiple rail lines ▪ Storage facility	**Industrial** (27%) **Residential** – all types (23%) ▪ Most is medium density ▪ High density along I-75 & Marietta Blvd. ▪ Very little low density **Other** (20%) **Natural/Open space** (15%) ▪ Forest, cemeteries, golf courses, parks, quarries, and reservoirs ▪ All zoned for more intense uses (freight intensive, commercial, residential) **Institutional** (12%) ▪ GA Tech – W of I-75 off Marietta & N along Bolton Rd. **Commercial** (2%) ▪ Concentrated along I-75 ▪ Some w/n mixed-use dev.	Noise pollution Air pollution Lighting Truck traffic/ mixing of auto and truck on roadways not designed for both Congestion Aesthetics Freight delivery into mixed-use developments	Yes Residential with industrial	**Allows Freight:** **I1** **I2** **PD-BP** **Residential Uses:** LW MU RG2 PDH R4 R4AC R4A RG3 RG3C R5 **Commercial Uses:** C1 C3C	Allows incompatible land use adjacencies	CDP addresses development of vacant industrial areas but needs to include transitional land uses as buffers Create an Industrial Areas Plan Require a site plan for all development proposals Consider an Industrial Area Plan to mitigate visual impacts Amend zoning ordinances Employ LW and MU zoning districts Zoning Ordinance needs to require stricter landscaping/ buffering requirements Create development and site design guidelines for freight movement/delivery within MU developments	**Current Policies:** Designated truck routes **Future Policies & Projects:** ARC Mobility Plan: ▪ Marietta Blvd. (truck route) pedestrian improvements ▪ Howell Mill Rd. improvement upgrades CDP Transportation Programs & projects – intersections: ▪ Bolton Rd. at Marietta ▪ Marietta from Bolton to city limits ▪ Unpaved streets NW ▪ Bolton from Fulton Ind to Marietta ▪ Northside Dr. at 10th, 14th, McDaniel, Fair, Mitchell, Simpson, MLK, North, Bankhead GDOT: None	Pavement for truck routes Intermodal options Industrial Area Improvement Fund Signalization guidelines Signage
Fairburn Greenfield development	Fulton County City of Fairburn City of Palmetto Union City	62.07 square miles		Wetlands Reservoirs Forest Agricultural crops 42% of City of Fairburn falls	Largely African-American, some populations of Hispanic origin Higher than average percentage of populations under age 11 and over	**US Hwy 29 (West Broad/Roosevelt Hwy)** ▪ Principal Arterial ▪ 4 lanes ▪ AADT 9,300-14,200 ▪ Truck route **I-85** ▪ Interstate Arterial	**Natural/Open Space** (49.7%) ▪ Agricultural crops, forests, reservoirs, wetlands (3 sq. miles of reservoir) **Limited**	Noise pollution Air pollution Truck traffic Congestion Unattractive warehouses	Yes	**Allows freight:** **M-1** **M-1A** **M-2** MIX C-2	Allows incompatible land use adjacencies	A Greenspace Plan could address both open space as well as Greenfield development Greenfield development offer opportunities for clustering industrial development	**Current Policies:** Designated truck routes – but each municipalities ordinance differs **Future Policies & Projects:** **TIP Projects:** ▪ Oakley Industrial Blvd. ▪ widening, extending, sidewalks, shoulders	Truck Route Improvements: ▪ Operational improvements ▪ Roadway improvements Design standards (design guidelines for roadway elements, signalization guidelines, signage) Traffic design (intersection,

[45] All of the information provided in this table comes from the land use assessment by Wilbur Smith Associates except for the Demographic Analysis column, which stems from the analysis conducted in this report.

Case Study Area	Study Area location	Study Area Size	Nearby Features	Environmental Analysis	Demographic Analysis	Transportation Infrastructure	Land Use Analysis	Freight-related Conflicts Cited	Conflicting Land Uses Present	Current Zoning (not exhaustive)	Future Land Use Plan	Land Use Recommendations	Current & Future Transportation Policies & Projects	Transportation Recommendations
				within a water supply watershed 100-year flood zone Floodplains	age 65	▪ AADT 88,600-123,100 ▪ Truck route **SR 138 (Beve Ingram Pkwy/ Jonesboro Rd.)** ▪ Minor Arterial ▪ Truck route **SR 74 (Fairburn Industrial Blvd./Senoia Rd.)** ▪ Principal Arterial ▪ Truck route **SR 92 (Campbellton St./Spence Rd)** ▪ Minor Arterial ▪ 2 lanes residential street with sidewalks ▪ AADT 8,700 ▪ Truck route **Fayetteville Rd.** ▪ Minor Arterial ▪ 2 lanes residential street with sidewalks ▪ Truck route (South of I-85) **Oakley Industrial Blvd.** ▪ Truck route **Bohannon Rd.** ▪ Truck route (North of I-85) **CSX Fairburn Intermodal Facility & Rail Lines**	**Access** (I-85 ROW) (33%) **Residential** – Low, medium, & high (6.8%) **Commercial** (3.2%) **Other** (3.1%) **Institutional Intensive Uses** (0.2%) **Extensive Uses** (0.9%)			AG-1 R-4 R-5 TR CUP		Create W&D zoning classification Revise local zoning ordinances	▪ Truck route ▪ SR 74/Senoia Rd. ▪ Corridor study ▪ Truck route ▪ Jonesboro Rd. ▪ Bike lanes ▪ Truck route ▪ I-85 ▪ Interchange upgrades, frontage road, HOV lanes ▪ Truck route	cross-section/geometric design, signalization)
Fulton Industrial Blvd. (SR 70) Brownfield redevelopment	Fulton County City of Atlanta	65.26 square miles	Borders Douglas, Cobb, and Fulton Counties Fulton County Brown Field Airport Adjacent rail network Chattahoochee River Fulton County suburban developments	Chattahoochee River Floodplains Wetlands Reservoirs Park lands Forests Agricultural crops	Almost exclusively African-American Areas of concentrated poverty Very high percentages of African-Americans in poverty and children under age 11 in poverty Highest percentage	**I-20** ▪ AADT 118,800 ▪ Truck route **I-285** ▪ AADT 134,700-153,100 ▪ Truck route **US Hwy 78 (Donald Lee Holloway)** **SR 70 (Fulton Industrial Boulevard)** ▪ AADT 15,600-	**Natural/open space** (42%) ▪ Agricultural crops, forests, park/parklands, reservoirs, wetlands **Limited access** (26%) **Residential** – low, medium, high (16%)	Traffic congestion Incompatible land uses Noise pollution Air pollution Lighting Truck traffic	Yes EJ identified as an issue Redevelopment is causing incompatabilities	**Allows Freight:** **M-1** **M-1A** **M-2** **Residential Uses:** SUB-A R-3 A-1 A R-4 R-5 R-6	Allows incompatible land use adjacencies	Redevelop brownfield sites Buffer through transitional uses Cluster development to create a freight village Utilize overlay districts Create a W&D zoning classification	**Current Policies:** Designated truck routes **Future Policies & Projects:** TIP: ▪ I-285 ▪ advisory initiatives, HOV lanes, interchange upgrades, additional lanes ▪ US HWY 78: ▪ Road widening but not within study area. ▪ Will affect capacity of road. ▪ Not a truck route	Freight-supportive design guidelines Encourage use of rail and intermodal system Improve railroad grade crossings Where designated and restricted truck routes run through residential neighborhoods make sure that roadways are designed to handle the mixed traffic

Case Study Area	Study Area location	Study Area Size	Nearby Features	Environmental Analysis	Demographic Analysis	Transportation Infrastructure	Land Use Analysis	Freight-related Conflicts Cited	Conflicting Land Uses Present	Current Zoning (not exhaustive)	Future Land Use Plan	Land Use Recommendations	Current & Future Transportation Policies & Projects	Transportation Recommendations
			Norfolk Southern Whitaker Intermodal Terminal Austell, GA (in close proximity to study area)		of population over 65 of the five study groups	30,700 ▪ Truck route **SR 139 (MLK Jr. Dr.)** **SR 154/SR 70/SR 166 (Cascade Hills Dr.)** ▪ AADT 30,100 ▪ Truck route **SR 6 (Camp Creek Pkwy)** ▪ AADT 31,700 ▪ Truck route **SR 166 (Campbellton Rd.)** ▪ AADT 30,100 ▪ Truck route **CSX & Norfolk Southern**	**Industrial** (10.6%) **Institutional Intensive uses** (0.2%) **Extensive uses** (3.7%) **Commercial** (1.4%)			MIX AG-1 **Commercial Uses:** C-1 C-2			▪ Public housing nearby ▪ I-20: ▪ HOV lanes, ITS improvements, additional lanes, ramp improvements, a new connection to Thornton Rd. ▪ Mostly industrial, commercial, and natural land uses ▪ SR 70/Fulton Industrial Blvd: ▪ Widening from I-20 to Camp Creek ▪ Truck route ▪ SR 6/Camp Creek Parkway: ▪ Widening ▪ Truck route ▪ SR 166/Campbellton Rd./ Fairburn Rd.: ▪ Widening? ▪ Truck route	
Gwinnett Co. Interchange Development	Gwinnett County City of Suwanee	5.33 square miles	Norfolk Southern rail line (proximal to study area)	No major environmental issues present	Mostly white, but percentage of Asian population higher than in five study areas as a whole Highest percentage of population under age 11 of the five study areas Lowest percentage in poverty of the five study areas	**I-85** ▪ Urban Interstate Principal Arterial ▪ 8 lanes, 4 on each side ▪ AADT 236,700 ▪ Truck route **Old Peachtree Rd. NW** ▪ Urban Collector Street ▪ 2 lanes ▪ AADT 16,000 **Old Peachtree Rd. NE** ▪ Urban Collector Street ▪ 4 lanes ▪ AADT 16,000 **Lawrenceville-Suwanee Rd./ HWY 317** ▪ Urban Minor Arterial ▪ 4 lanes with turn lanes at intersections ▪ AADT 40,450 Satellite Blvd. Northbrook Pkwy. Burnette Road NW	**Industrial/ Commercial** (40%) **Natural/Open space** (19.5%) ▪ Forest (developable) ▪ Could be zoned more intensive for residential or commercial **Residential** – low and medium density (15%) **Other** (15%) **Commercial** (9.3%) **Institutional** (4.9%)	Condition and safety of roads Lighting Air quality Noise Pollution Congestion	Yes	**Allows Freight: M-1** C1 C2 C3 R60 R75 R100 RA200 RM8 RZT OI PMUD	Allows incompatible land use adjacencies although reflects an understanding of the issue.	Buffer through landscaping and transitional uses (City of Suwanee requires substantial buffers year round for M-1 but not required for residential developments) City and County may want to coordinate their buffer requirements. The County may want to revise its zoning ordinance to include the same language as the City to ensure year-round plantings. Suggests considering recreation/open space as buffers Cluster development Utilize transitional land uses Recommends conditional zoning for M-1 zoning district	**Current Policies:** Designated truck routes (existing only not future) Frontage roads are increasingly being shared with residential subdivisions **Future Policies & Projects:** CTP has no projects at this time TIP: **McGinnis Ferry Road Extension** ▪ not a truck route ▪ near industrial facilities **Countywide intersection improvements** ▪ roadway operational upgrades **Countywide safety and alignment improvements** ▪ roadway operational upgrades **Countywide bridge improvements** **No GDOT plans**	City and county should consider a Freight Movement section within their transportation plan Traffic calming guidelines for residential, industrial, and commercial developments Identify truck routes Encourage intermodal freight movement Consider rail line to be part of the “influence area” Consider multi-modal travel to reduce congestion (pedestrian paths/trails) Signage guidelines

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Henry Co. Warehouse & Distribution	Henry County City of McDonnough	46.5 square miles	Near City of Locust Grove	Few environmental issues – couple of wetland and floodplain areas Significant amount of farmland which is prime land for development	Areas with higher African-American population also show higher percentage of population over age 65 and higher percentages of population in poverty Higher than average percentage of population over age 65 Higher than average percentage of children in poverty	**SR 20 / McDonough-Hampton Road** ▪ Urban Minor Arterials ▪ 2 lanes w/turn lanes ▪ Becomes an Urban Principal Arterial at SR81/McDonough-Lovejoy Rd. ▪ 4 lanes w/turn lanes ▪ AADT 18,000 ▪ Truck route **SR 155** ▪ Rural Minor Arterial ▪ 2 lanes w/turn lanes ▪ Become 3 lanes w/turn lanes at I-75 ▪ AADT 18,000 ▪ Truck route **I-75** ▪ Interstate Principal Arterial ▪ 6 lanes, 3 each direction ▪ AADT 90,000 ▪ Truck route **SR 42/US 23** ▪ Rural Minor Arterial ▪ 2 lane w/turn lanes ▪ AADT 8,500 ▪ Truck route Industrial Parkway ▪ Truck route Industrial Blvd. ▪ Truck route Greenwood Industrial Pkwy. Norfolk Southern rail line with spur	**Limited Access** (44.3%) **Natural/Open space** (42.2%) ▪ Farmland/ agricultural crops, forests, reservoirs, wetlands ▪ All zoned for more intensive use. In most cases land is zoned to allow freight intensive development. Also commercial and residential **W&D/Industrial/Industrial-Commercial** (4.3%) **Other** (4.1%) **Residential** – low and medium density (3.3%) **Commercial** (1.6%) **Institutional** (0.00%)	Congestion Safety concerns Noise pollution Air quality issues Lighting Truck traffic Road conditions	Yes, although not terrible yet. However, the future land use plan shows much potential for conflict because of large amount of developable farm land. Henry County is the fastest growing county in GA in terms of population	**Allows Freight:** **M-1** **M-2** **PD** C-2 C-3 R-1 R-2 RA	**Allows heavy freight:** ▪ Industrial and Wholesale ▪ Transportation/Communications/ Utilities Allows incompatible land use adjacencies to an extreme	Create a zoning classification for W&D development Cluster W&D development (freight village)	**Current Policies & Projects:** Designated truck routes Have identified corridors that are deficient **Future Policies & Projects:** RTP Projects: ▪ I-75 S ATMS Communications/ Surveillance ▪ I-75S HOV lanes ▪ SR 20 capacity improvements ▪ McDonough Pkwy capacity improvements ▪ Hampton Locust Grove Rd. operational improvements **GDOT:** SR 155 operational improvements SR 42 intersection improvement	Develop freight-supportive design guidelines Intermodal access Signalization Signage Improved road surface/design