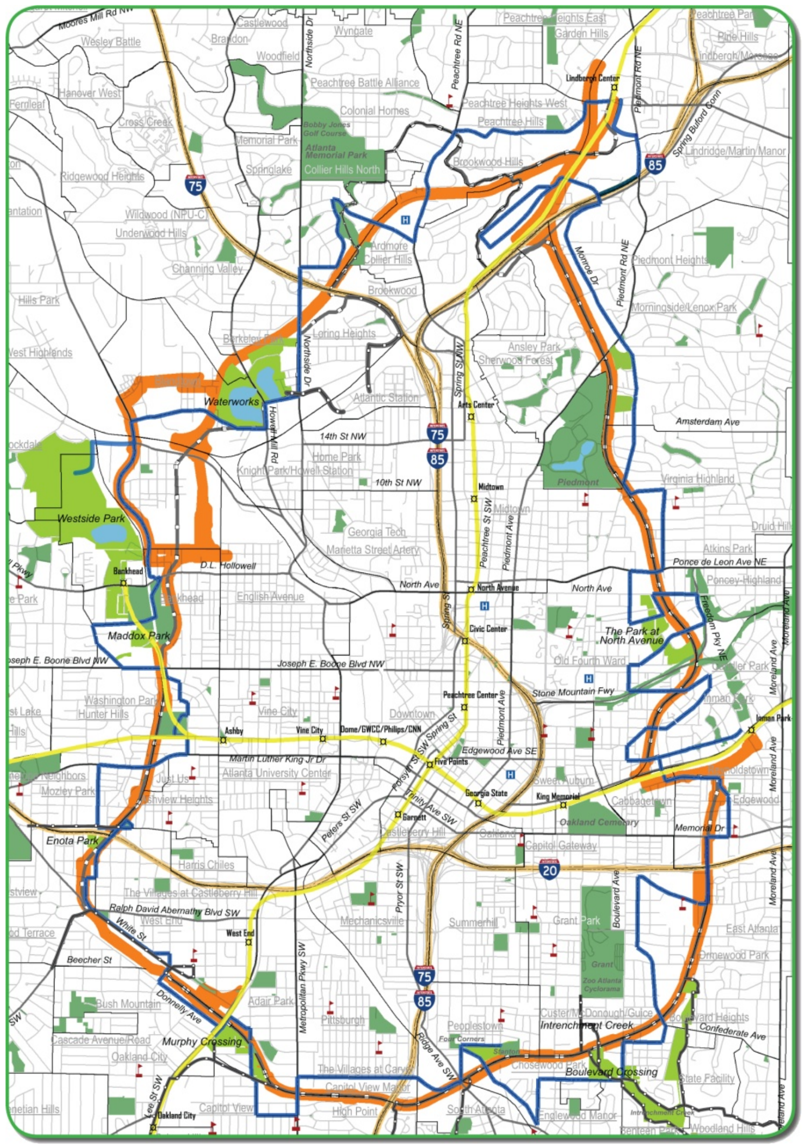
BeltLine
Atlanta Connected

# Development and Implementation of a Decision Support Tool for the Atlanta BeltLine: Final Report

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# 1 Decision Support Tool Overview

The Beltline Tax Allocation Advisory Committee (TADAC) together with the Atlanta Beltline Inc. (ABI) contracted with the Georgia Tech Center for Quality Growth and Regional Development and its partners from Georgia Tech and Cambridge Systematics to develop a tool in support of systematic decision-making for the Beltline. The decision support tool (DST) is designed to help guide TADAC, Atlanta BeltLine Inc., and stakeholders in process and program decisions, clarify and enumerate the goals, objectives, and vision for the BeltLine, and allow scenarios to be compared on their ability to effectively and equitably realize that vision. It provides a means of measuring both baseline conditions throughout the BeltLine and potential impacts of new development on those baseline conditions.

The BeltLine is Atlanta's most ambitious redevelopment project, directly impacting approximately seven percent of the land in the city and encompassing thousands of new homes, businesses, and public facilities, new parks and trails, transit service, and new or redesigned streets and sidewalks. The enabling legislation for the BeltLine requires these changes to be evaluated through a DST. The DST will integrate physical, environmental, and socioeconomic information to establish priorities, evaluate scenarios, establish accountability, and estimate likely impacts of the BeltLine implementation. The DST is designed to provide an objective and consistent way to test decisions against the BeltLine vision and goals, and to evaluate decisions on their alignment with the interests of all stakeholders, as expressed in this vision and goals.

This document presents the Final Report for Phase I of the DST development project. This report describes the background for the project, outlines the framework and development of the DST model, explains the working of the model, and provides details as to its upkeep and management. It documents and provides guidance as to the use and maintenance of the model.

This report is submitted in conjunction with the DST user interface and databases. The model provides baseline metrics for comparison of future scenarios and creates an objective method of evaluating major decisions as specified in the legislation. The model was tested using two case studies and revised to meet objectives of TADAC and ABI. Together with the data used to create the model, the final report and the model constitutes the work contracted in Phase I of the project.

Phase II, (if funded), will provide ongoing review and technical support for the developed DST framework and provide analysis using the DST framework as needed.

# 2 The DST Design Process

The DST is a process, rather than a tool box, in which each actor communicates to determine the best solution or scenario. The process of the DST can be divided into four stages. In the first stage, the vision and goals of the BeltLine were identified, and a strategy set to achieve the identified vision and goals. Baseline goals for the BeltLine and the Subareas were largely identified within the context of planning for the 2005 Atlanta BeltLine Redevelopment Plan, the ten Subarea Plans, and their various revisions. In the second stage, the guiding principles, applications, and overall framework for the DST were developed through a consensual process with TADAC, ABI, and other stakeholders. This was accomplished during spring and summer of 2011. Third, using this strategy and framework, a way to measure and analyze possible decisions was created using demographic, economic, fiscal, transportation, and health and environmental impact metrics. Finally, the model was developed and tested between fall 2011 and spring 2012. ABI staff was trained on the use of the DST in June.

## 2.1 Decision Support Tools: Background

Decision support tools (DST), also known as decision support systems, are interactive computerized systems which compile quantitative data to aid in the decision-making process (Power and Sharda 2009). The intention of these systems is to apply information technology to the decision-making process to increase its efficiency while also improving the quality of the decision (Shim et al. 2002). Research in information technology and organizational decision-making at MIT and Carnegie Mellon in the 1950s and 1960s led to the development of early DSTs in the 1970s (Shim et al. 2002). These early systems were designed for use in addressing problems that may have had some components that could be neatly addressed by a computer, but also had components which were poorly structured, novel, or otherwise difficult to solve. These components required the evaluative capabilities of the human decision-maker, making the DST interactive between human and computer, rather than passive (Shim et al. 2002).

The earliest applications of DSTs were primarily in business, where they were designed for use in making operations and marketing decisions (Power and Sharda 2009). Today, DSTs remain common in business and financial services, but have spread to a variety of other industries. Decision support can be used in many aspects of urban planning and policy. In planning, the development of geographic information systems (GIS) has allowed spatial data to be incorporated into DSTs, which is generally a critical component of DSTs for spatial planning.

Power and Sharda (2009) identify three key characteristics and five main categories of DSTs. A DST must be "designed specifically to facilitate decision processes," aids in but does not automate these processes, and is flexible enough to easily accommodate changes in the user's needs. Power and Sharda categorize DSTs based on the type of assistance being provided as communication-driven, data-driven, document-driven, knowledge-driven or model-driven. Communication-driven DSTs facilitate group decision-making processes through software that aids "communication, scheduling, document sharing, and other group productivity" activities (Power and Sharda 2009). Data-driven DSTs manage, analyze, and manipulate large quantities of data, particularly across time. Document-driven DSTs are used to sort and retrieve unstructured data such as images. The final two categories of DSTs specified by Power and Sharda, knowledge-driven and model-driven, present a problem-solving functionality. These DSTs contain "knowledge about a particular domain, understanding of problems within that domain, and skill at solving some of these problems" (Power and Sharda 2009). Model-driven DSTs are distinguished by the inclusion of quantitative models for data analysis.

A Decision Support Tool (DST) is a consistent and reproducible process for guiding and evaluating decisions by providing a detailed picture of impacts related to the implementation of a plan or policy. While the scope of the DST is broad depending on where it is applied, the roles of the DST can be summarized as organizing relevant information, spatially resolving actions of the plan, predicting impacts, and generating performance measures.

In recent years, many jurisdictions around the US have begun to use comprehensive DST to help guide their decision making as they redevelop urban areas, make transportation investments, or pursue economic development. These efforts have shown the capabilities of properly designed DST to guide decision making in a way that promotes community visions and goals, adheres to principles of smart growth and sustainability and is fiscally and operationally sound. The City of Atlanta recognized this by designating use of a "decision-making support tool" in evaluating decisions relating to the Atlanta BeltLine.

DST is particularly useful in a situation where there are several plan scenarios and conflicting criteria because it provides a tool to investigate potential benefits of alternative scenarios, compare between scenarios and with the baseline data, identify trade-offs, and most importantly have projects/policies move to meet the stated goals.

## 2.2 BeltLine DST Development Process

The Beltline DST builds upon and coordinates with existing or ongoing work regarding environmental impacts, community benefits, planning activities conducted through BeltLine planning units and study groups, and other components of the community engagement and planning process. The tool organizes relevant information, spatially resolves actions of the plan, predicts impacts, and generates performance measures.

The Beltline DST was developed through a series of steps, including:

1. Review and revise the DST development process based on best practices, the beltline planning framework, and engagement with TADAC, ABI, and other stakeholders;

2. Assess BeltLine goals and determine metrics consistent with the BeltLine legislation, the Atlanta BeltLine Redevelopment and Subarea Plans, and the ongoing vision for the BeltLine;

3. Design the DST framework and structure and develop baseline metrics to identify key issues associated with beltline development, and for comparison with future scenarios;

4. Test the DST using two scenarios for future development projects; and

5. Revise the DST in response to feedback from TADAC and ABI.

**Provision for Decision Support Tool in Atlanta Ordinance 05-O-1733 Creating the Beltline Tax Allocation District**

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"The (TAD) Advisory Committee shall be responsible for developing and implementing a "decision making support tool" designed to measure the impact of the BeltLine project and ensure accountability for effective and equitable implementation of the project. By way of description only, the "decision making support tool" should address such factors as balanced development, poverty reduction, income, educational achievement, land use, historic preservation, density, growth, park usage, trail usage, water quality, traffic, sewer capacity, community involvement/civic engagement, retail growth, health measures, cultural considerations, and environmental impacts."

### *2.2.1 Review and revise the DST development process based on best practices, the BeltLine planning framework, and engagement with TADAC, ABI, and other stakeholders.*

The BeltLine legislation identified 18 variables of concern to achieve the vision and goals of the BeltLine. The initial vision was described in the Atlanta BeltLine Redevelopment Plan, prepared by the Atlanta Development Authority in 2005. However, the economic, financial, and social environments have rapidly changed since the Atlanta BeltLine Redevelopment Plan was initially proposed. To revisit the visions and goals of the BeltLine to reflect these changes and consider their impact on future environments, the project team reviewed the current body of plans, activities, decisions and dialogue related to the BeltLine to determine how the DST strategy and approach need to be refined. The results of this activity were summarized and reported to TADAC at the TADAC DST Subcommittee Meeting of March 29th, 2011 and at the April 26th TADAC Meeting.

The DST is structured to include analysis at three levels. The first level focuses on contribution and consistency with the overall vision and goals of the Atlanta BeltLine. At this time, these system-wide goals are primarily identified within the 2005 Atlanta BeltLine Redevelopment Plan. These include:

- Promote a more economically vibrant city through mixed-use development along the BeltLine corridor, including economic development (30,000 jobs), neighborhood revitalization, and workforce housing (5,600 new units);
- Create strategic Activity Centers (nodes of intense development);
- Increase access and connectivity in the redevelopment area and surrounding neighborhoods through pedestrian-friendly transit, complete streets, and trails, linking this system to the larger regional network (MARTA; Peachtree-Auburn Streetcar);
- Create a connected system of greenspace, with over 1,200 acres of new or expanded parks;
- Create sustainable neighborhoods through environmental remediation, preservation of single-family neighborhoods and historic buildings, and appropriate transitions to higher density uses; and
- Promote the tax base.

The second level of assessment evaluate the degree to which proposals contribute to and are consistent with Subarea visions and goals. For purposes of planning and redevelopment, the BeltLine is divided into ten subarea planning districts. Each of these planning districts includes a segment of the BeltLine, the TAD associated with the segment, and that part of the neighborhood not included in the TAD extending out approximately one-half mile on either side of the BeltLine. These areas are shown in Figure 1 and include the following neighborhoods:

1. Abernathy-Cascade
2. The Heritage Communities of South Atlanta (Pittsburg/Peoplestown)
3. Boulevard Crossing
4. Memorial-Glenwood
5. Freedom Parkway

6. Monroe-Piedmont
7. Northside-Peachtree-Piedmont
8. Upper Westside-Northside
9. Upper Marietta-Westside Park
10. Boone-Hollowell

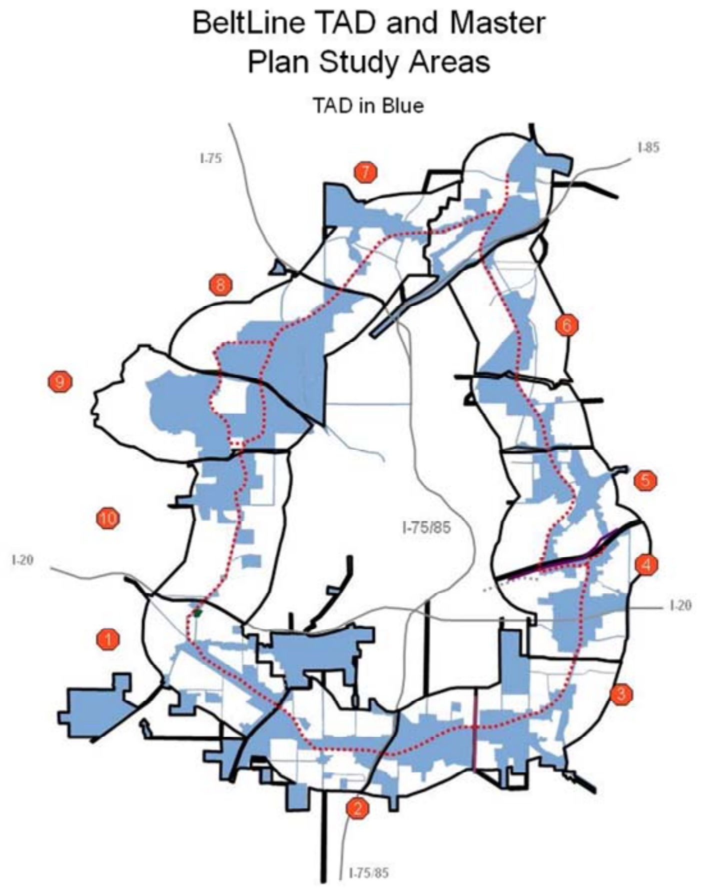


**Figure 1**

Over the past few years, planning for each of the subareas has proceeded, based on the overall goals of the BeltLine, conditions unique to each subarea, and community concerns, opportunities, and challenges. By 2012, all ten of the subarea plans had been approved. These plans provide more detail as to redevelopment goals and objectives for specific areas of the BeltLine, and therefore will provide significant guidance to development projects and other investments.

The third level of assessment focuses on particular aspects of the BeltLine vision that operationalize the sectoral (e.g., housing, greenspace) and functional (e.g., accessibility, healthy living) goals of the BeltLine, both for the system as a whole and for the subareas. It is at this level of assessment that goals are operationalized through the identification of particular variables and indicators, and the construction of a database and presentation tool that helps identify patterns around and focus users attention onto issues of concern.

### *2.2.2 Assess BeltLine goals and determine metrics consistent with the BeltLine legislation, the Atlanta BeltLine Redevelopment and Subarea Plans, and the ongoing vision for the BeltLine.*

The scope and format of the DST was developed in collaboration with TADAC, ABI and other stakeholders. Specific problems and needs for the BeltLine areas and each project to achieve the goals and visions of the BeltLine were identified. Potential variables to address problems and impacts of projects were then determined, starting with the 18 factors identified in the legislation. A list of over a hundred potential variables were generated by the consultant team (from the Georgia Tech Center for Quality Growth and Regional Development and Schools of City and Regional Planning, Public Policy, Economics, and Civil and Environmental Engineering, and Cambridge Systematics) associated with the project. These variables were grouped and discussed with TADAC and ABI staff and interested stakeholders during the June 11, 2011 DST Visioning Meeting. Available revenues and approximate costs for obtaining the data and calculating the variables associated with the DST were estimated to provide a practical DST that could be managed within the project budget. Proposed variables were examined in terms of their usefulness in assessing BeltLine goals.


**Figure 2: DST Goals Matched to Data Needs**

The structure of the DST was also examined during the Visioning meeting. The DST's structure required consideration about the purpose, decision process, and data needs of the DST. It was determined that the DST would:

- Support decisions about the strategic, system-wide level and the single project, comparative level.
- Provide for the needs of the lay members of TADAC and stakeholder users by supporting the DST with technically competent staff
- Provide outputs that highlighted differences and facilitate comparison of metrics
- Focus on variables and indicators of greatest import to TADAC and ABI decision making, thereby reducing the number of indicators to a manageable quantity.
- Maximize use of public databases rather than proprietary databases.
- Employ standard metrics to promote comparability between projects and to identify base conditions.
- Employ metrics that facilitate understanding of the impacts of projects.

### 2.2.3 Design the DST framework and structure and develop baseline metrics to identify key issues associated with BeltLine development, and for comparison with future scenarios.

BeltLine goals were operationalized through seven criteria, each of which focused on a particular condition that the BeltLine sought to create. These are as follows:

1. Accessibility
2. Healthy, Active Living
3. Economic Vibrancy
4. Greenspace & Environment
5. Sustainable Housing & Community Design
6. Diverse Built Environment & Vibrant Tax Base
7. Social & Environmental Equity

Each of these desired conditions was in turn linked to a set of four indicators. These were as follows:

**Table 1: Criteria and Indicators Used in the DST**

| Criteria (Desired Condition) | Indicators |
|---|---|
| **Accessibility** | Street connectivity |
| | Prevalence of sidewalk network |
| | Uncongested roads (LOS = C or better) |
| | Travel speed via transit |
| **Healthy, Active Living** | Walkability |
| | Physical activity |

| | |
|---|---|
| | Safety (few crimes) |
| | Proximity to healthy food |
| **Economic Vibrancy** | Income |
| | Employment |
| | Retail & industrial activities |
| | Educational achievement |
| **Greenspace & Environment** | Access to greenspace & trails |
| | % canopy cover |
| | Environmental sustainable design |
| | Water quality |
| **Sustainable Housing & Community Design** | Housing choice |
| | Health of housing market |
| | Affordability |
| | Density |
| **Diverse Built Environment & Vibrant Tax Base** | Tax base |
| | Art & historic preservation |
| | Land use mix (entropy scores) |
| | Compatibility with subarea plans |
| **Social & Environmental Equity** | Minority & special needs populations |
| | Historic expenditures by ABI |
| | Environmental quality |
| | Civic engagement |

The Decision Support Tool (DST) is designed to support visual comparisons that allow the user to identify pattern and areas of particular opportunity or concern, as well as to conduct Multi-Criteria Decision Analysis that can be used to identify the strength and weaknesses of each project and help determine the priorities for implementation.

The DST is built from three different tools: a database that stores raw data used to calculate variables, a Geographic Information System (GIS) that converts raw data into spatially useful data and outputs this spatially clipped data into a second database, and the user interface and prioritization tool that is used to present the data in formats that reveal patterns and make possible the Multi-Criteria Decision Analysis. Both the sources of these data and their implementation are discussed in future chapters.

The DST requires diverse variables. Most variables may be clearly measured with numeric values, but some variables may not. For example, quantitative measures of historic preservation, community involvement/civic engagement, and cultural considerations would not capture the properties of most value to decision making and should be approached by qualitative analysis. Qualitative analysis requires research into specific conditions because such data does not currently exist. In addition, such data requires professional assessment to interpret results.

The design, conduct and interpretation of such research is more subject to researcher bias and error than is qualitative research, but it also offers rich detail and context that is needed for valid conclusions and action. Qualitative analysis can complement quantitative analysis by representing lived experiences and needs of the residents.

### 2.2.4 Test the DST using two scenarios for future development projects.

The project team's Beta version of the DST was tested using two projects mutually selected by TADAC and ABI. The first hypothetical test project focused on the potential construction of three segments of the BeltLine identified by ABI as likely next additions to the trail system. The second project focused on one of the potential higher intensity activity centers identified by the plan, namely the redevelopment of Ansley Mall. The process and results of these test cases are presented in a future chapter.

### 2.2.5 Revise the DST in response to feedback from TADAC and ABI.

The tool was evaluated and improved based on Beta test results and feedback from TADAC and ABI staff. The review meeting was conducted on April 26, 2012. The review covered the overall structure of the DST, the variables included and their presentation within the DST, and the results of the test cases. Based on this meeting, the DST was revised and finalized. Training of ABI staff in the operational management of the DST was conducted on June 26, 2012.

## 2.3 PHASE II: Ongoing Implementation and Support

As noted above, the DST is a process, rather than a tool box, in which each actor communicates to determine the best solution or scenario. Unlike a plan or document, the DST is a living tool, meant to be used and adapted over time based on experience and needs. As such, it needs ongoing upkeep, management, and development.

The original RFQ issued by TADAC and ABI for development of the DST envisioned this ongoing management and development. Ongoing implementation and support will be provided either directly by ABI staff, an external research team, or some combination of the two, as discussed in the concluding chapter of this report.

# 3 Data Sources, Management, and Analysis

In this chapter we present the way in which the Decision Support Tool is configured. This will include an examination of the data sources, their incorporation into a unified database, the analytic techniques used to generate DST variables, and the organization of the interface used by TADAC, ABI, and other participants in the decision making process. More details concerning the calculations of specific variables will be discussed later in this report.

## 3.1 Data Sources

Data for the variables used in the DST were derived from a wide array of sources. These include:

1. 2010 census data: core demographic data (e.g., population, minority status, age) were derived from the 2010 decennial US Census. This data is derived from actual counts of individuals rather than sampling techniques. However, the data is obtained only once every ten year. The Census therefore provides highly accurate information for this initial version of the DST, but will prove progressively less useful over the next 10 years.
2. American Community Survey (ACS): the ACS is an ongoing statistical survey by the U.S. Census Bureau, providing data on variables such as income and housing. The ACS is sent to approximately 250,000 addresses monthly or roughly 2.5% of all residential addresses each year. As such, it provides a relatively small but systematic sample. Variables derived from the ACS for the DST are based on data collected over the past five years of ACS in order to smooth out perturbations caused by the small sample size. The measures thereby constructed are more stable than what could be constructed from annual data, but also are less responsive to recent changes in income and housing.
3. Claritas Data: Claritas, a service of The Nielsen Company, collects and tabulates marketing information. Claritas databases are used to determine the location of commercial and industrial businesses, number of employees, value of business and similar data.
4. CQGRD GIS base maps: Originally obtained from the Georgia Tech Center for Geographic Information Systems, these databases provide base physical data locating the street and railroad networks, jurisdictional lines, and similar information.
5. City of Atlanta GIS Data: The City of Atlanta created and maintains a wide array of GIS databases, several of which were used in the construction of the DST.

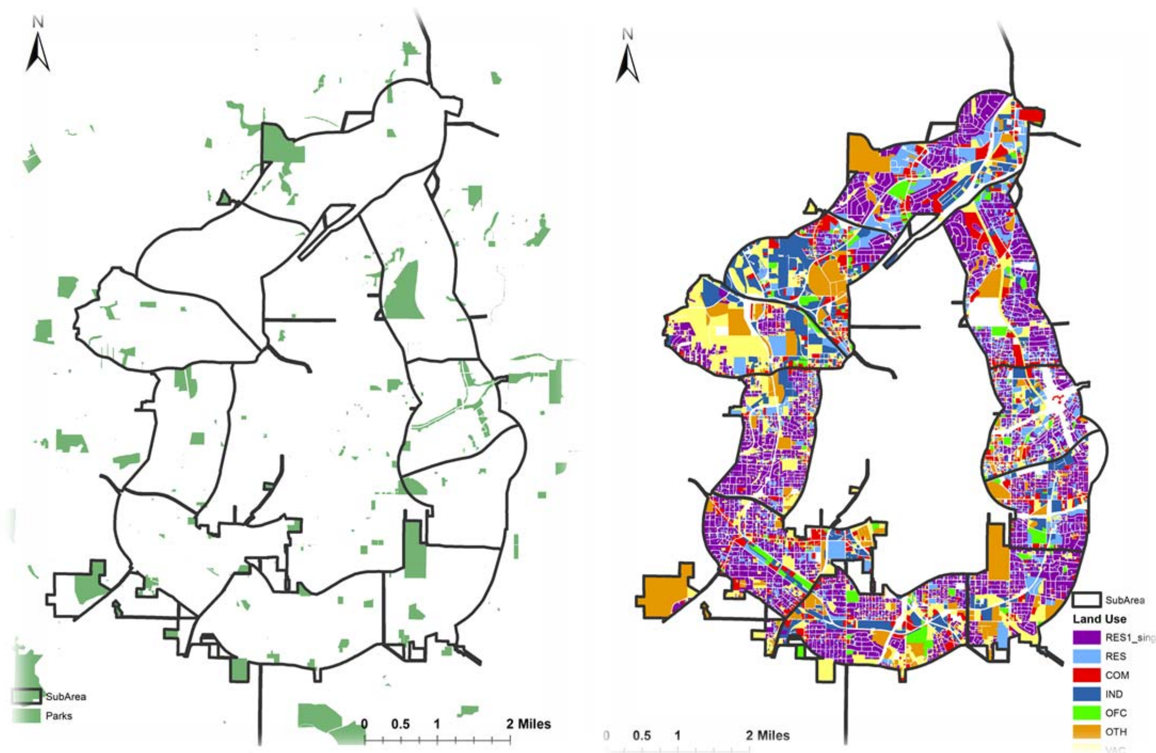


**Figure 3: Parks and land use as examples of polygons that corresponds directly to their location**

These include databases showing location of all building permits, brown fields, flood risk zones, impervious surfaces, park and trails, and tax parcels.

6. Atlanta BeltLine Inc. TAD and Subarea Plan boundaries: provides boundaries to the TAD and planning areas used by ABI, and the DST, to organize its research and decision making processes.
7. Atlanta Police Department: Crime data identifying the location of property and violent crimes.
8. Fulton County Tax Assessments: The County of Fulton created and maintains a database of all property assessments throughout the county. When linked to parcel locations, these provide the basis for analyzing property values.
9. The University of Georgia's Natural Resources Spatial Analysis Laboratory Georgia Land Use Trends Canopy Cover Data: Tree cover for the city of Atlanta was obtained for the year 2008.
10. The Georgia Department of Transportation and the Atlanta Regional Commission road capacity databases: Provide information concerning the capacity of roads and actual traffic volumes for different times of the day and week.

11. Google Map: Google Map provides a function for estimating the length of time to travel from any point in the city to any other point in the city using transit. Google Map was used to estimate transit travel times, as noted below.

## 3.2 Data Types

Each of these databases uses its own distinct system for organizing the data provided. These data take three general forms: polygon, line, and point. Polygon data provide attributes associated with areas defined by vectors. Examples include block, block group, and tract data for the census and ACS and land use data provided by the City of Atlanta. To be useful, the information provided within these databases must be remapped to the geography of interest to users of the DST. For baseline data, this primarily means remapping data to match the boundaries of the BeltLine subarea planning boundaries.

Polygon data that delineate boundaries based on the actual conditions found in those locations, such as land use data, can be easily linked to boundaries used in the DST. On the other hand, attributes associated with polygons represent averaged data across fixed geographies, such as census block groups, are more difficult to translate into the subarea boundaries. To manage this, block groups that cross subarea boundaries were divided into smaller units to match the subarea boundaries.

Figure 4: Block Groups Matched to Subarea Boundaries shows the resulting subarea and reconfigured block groups. Unique identifiers were created to link block group data to the subarea-constrained block groups. Data attributes associated with the block groups were then distributed to the segment of the block group that was contained within the subarea. Attributes based on simple percentages were carried over to the subarea-constrained segments. Attributes based on numbers were allocated

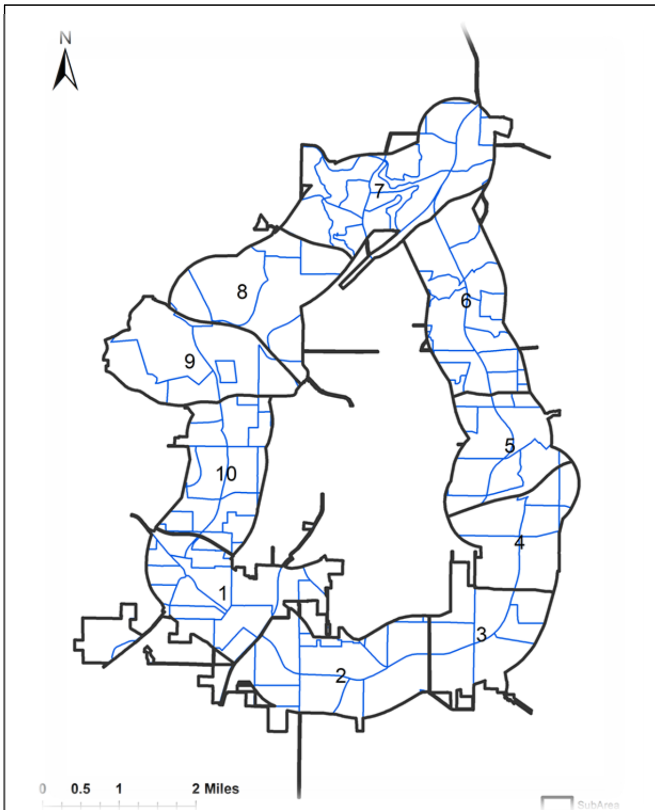


**Figure 4: Block Groups Matched to Subarea Boundaries**

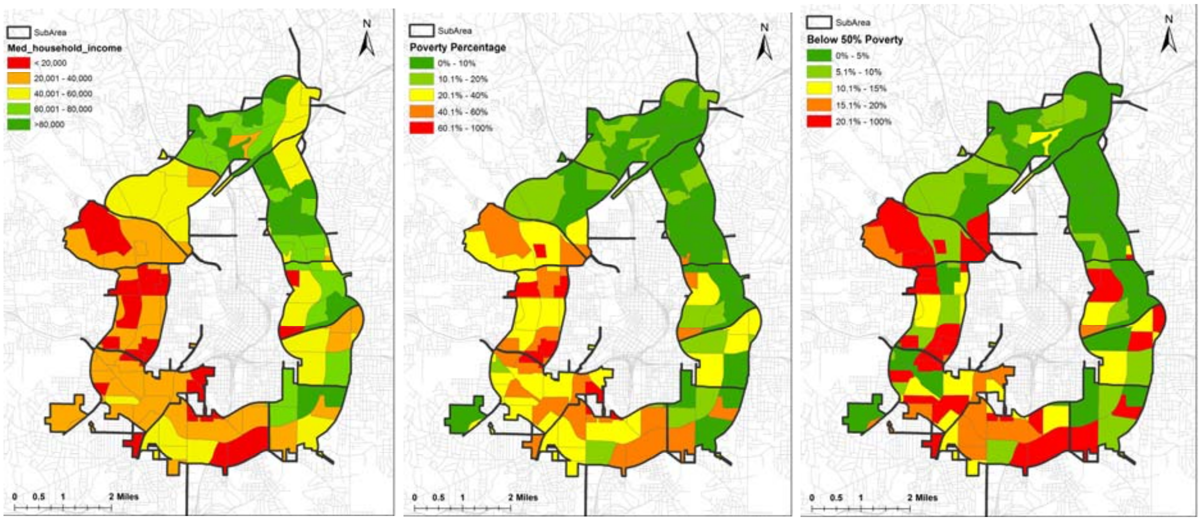


**Figure 5: Three examples of polygon data, showing median household income, percent below poverty, and percent below 50% of poverty.**

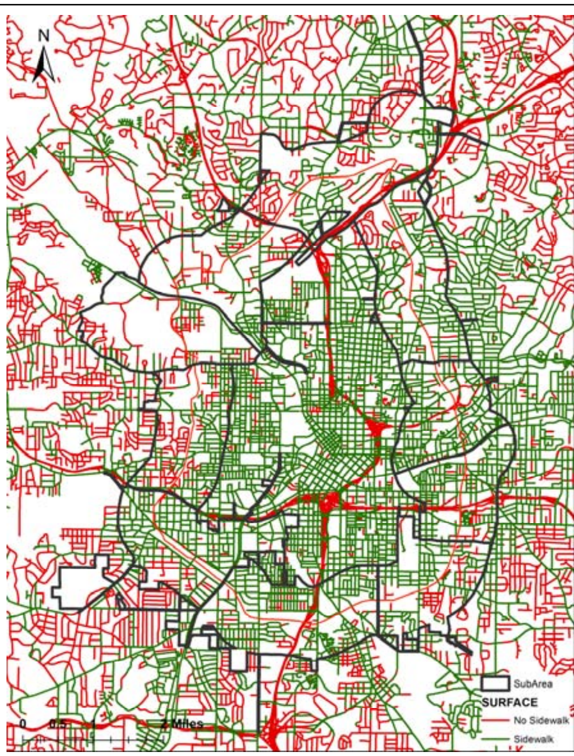


**Figure 6: Sidewalk data presented as line data.**

based on its proportion of the total block group population (calculated based on the census block data, which provides population by block).

Rasterized data, such as is used to indicate tree canopy cover, can be easily converted into polygon data, simply by averaging the values of all rasterized pixels located within the boundaries of the polygon, accounting for the percent of a rasterized pixel that falls within the polygon for those pixels split by a boundary.

Secondly, data can be provided as attributes of lines. Examples of line data include street and sidewalk segments. Such data must be converted into attritues that can be linked to the subarea polygons in order to be comparable to the polygon data. As long as line segments are short relative to the size of the polygons into which they fit, extensions beyond the boundaries of the polygon will be of little consequence. In the case of both road and sidewalk data, the segments largely correspond to blocks. The data was therefore converted to polygons in the same manner as was rasterized data.

Thirdly, data can be provided as points. Point data that provides specific locations for particular attributes, such as data that identifies the location of each crime, poses little difficulty. Crimes were mapped, designated to a particular subarea or project area, and used to calculate the total number of crimes for that area.

Other point data, however, poses more difficulties. Consider, for example, calculations that must be made to estimate the average length of time needed to travel by transit from a subarea to other places in the city. For each subarea, an infinite number of potential starting places, and potentially an equally infinite number of destinations, exist. This is also true for walkability scores, distance to parks or healthy food, and street connectivity measures (metric reach). To calculate such measures, the research team imposed a sampling protocol onto each subarea, and used the sampling points as places to calculate all variables. In each subarea, points were selected one quarter of a mile in from the subarea boundary, with a point selected one quarter of a mile out from the BeltLine on each side. Each subarea thus starts with four sample points located near the BeltLine ingress and egress boundaries of the subarea. Additional sample points are rendered on both sides of the BeltLine at one half mile intervals moving toward the center of the subarea until such time as additional points cannot be added without locating them within one half mile of each other.

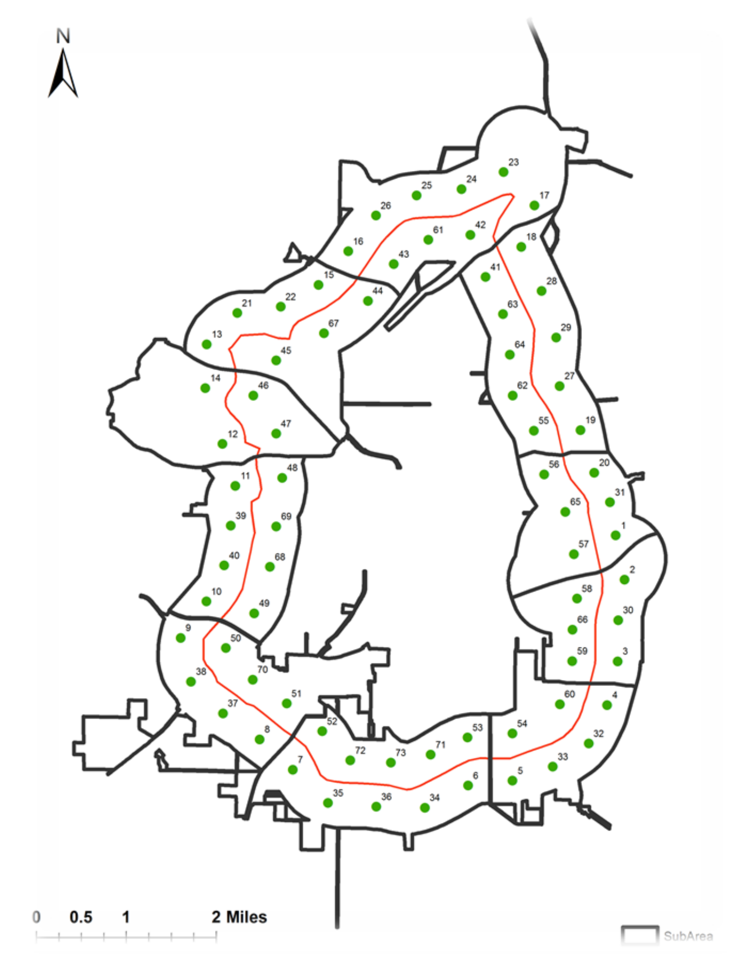


**Figure 7: Sampling points located within each subarea.**

This protocol establishes sampling points that are generally one-half mile from each other (an easy walking distance from one to the next) with a clear pattern established around the BeltLine but extending out past the edge of most subareas. This, of course, has implications for the data that needs to be available for analysis of the variables estimated through these points. While data stored in the database for polygon and line data can be clipped to the boundaries of the subareas, data that will be used for point estimates must extend beyond subarea boundaries.

## 3.3 Data Management and Analysis

Data is organized for two types of analysis: baseline and project-specific. Baseline data is intended to be used by decision makers to understand overall patterns within the BeltLine planning areas, and is amalgamated to the scale of Subareas. Project-specific data is calculated at a finer grain for those variables where a more localized perspective is important. (e.g., road congestion and walkability) and where the base data is provided at the appropriate level of detail.

To enable analysis at the subarea and project levels, all data is incorporated into a GIS database. As discussed in the previous section, this requires strategies for allocating data when a boundary of the polygons or lines to which the source data is attributed extends beyond the boundary of the subarea or project area.

Because GIS is used to align data provided at different scales and of different types, maps of the resulting variables can be produced for most variables incorporated into the DST. These maps (shape files) are not considered to be an integral component of the DST, but will often prove useful in deliberations and in participatory settings.

For purposes of the DST, the GIS is primarily used to calculate values for each variable at either the Subarea or project level. These data are exported into an Access database in tabular format. Calculations needed to create the variables are then conducted either within the Access database itself for simple variables (e.g., acres of park per capita) or modeled in stand-alone Access or Excel spreadsheets for more complicated variables (e.g., walkability). The method for calculating each variable is described in the next chapter. The variables that are produced by these external models are exported back to the Access database, which serves as a central repository for variables.

Finally, after calculations are completed for base variables, these are exported into an Excel spreadsheet which serves as the user interface. The user interface is discussed in Section 4.

## 3.4 Indicators and Data Variables

As noted in Chapter 2, BeltLine goals were operationalized as seven criteria, each focused on a particular condition that the BeltLine seeks to create. These are as follows:

1. Accessibility
2. Healthy, Active Living
3. Economic Vibrancy
4. Greenspace & Environment
5. Sustainable Housing & Community Design
6. Diverse Built Environment & Vibrant Tax Base
7. Social & Environmental Equity

The DST supports analysis of these seven criteria with four indicators each, for a total of 28 indicators. In this section we examine the basis for these indicators. A more detailed description of how each variable is calculated will be presented later.

### *3.4.1 Accessibility*

ABI and TADAC seek to improve accessibility as a core objective of the BeltLine. In particular, the BeltLine plan seeks to enhance accessibility through improvements to transit, pedestrian and bike pathways, and street connectivity.

#### *1) Street connectivity*

Street connectivity is measured based on Metric Reach. Metric Reach is defined as the total length of streets that can be reached from a single point up to 0.5 mile in all directions based on the street network. Metric Reach measures network density and the extent to which streets are connected: the greater the density and connectivity, the higher the value.

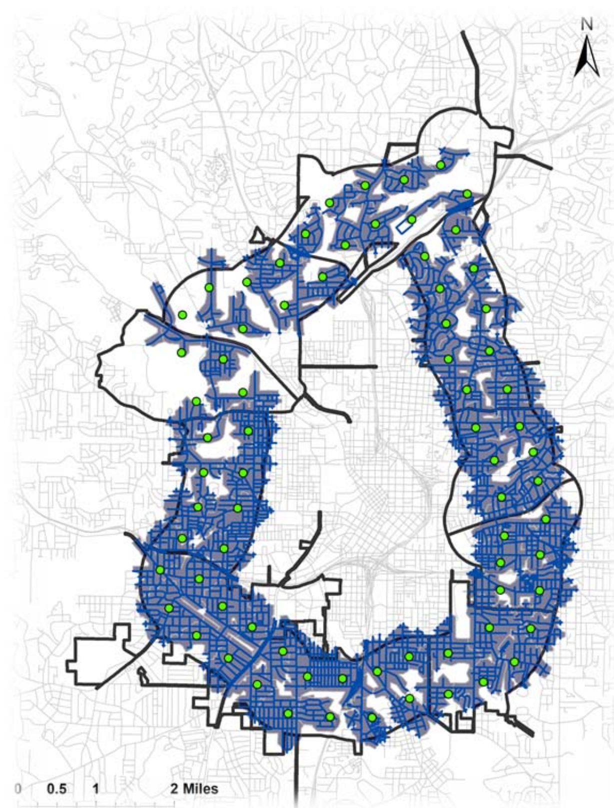


**Figure 8: Street connectivity as measured by metric reach**

The optimum walking block size is approximately 330' along each side, which produces a 1/16 mile by 1/16 mile grid street system. A district composed of blocks this size will generate a metric reach score of 16.

In the DST, the street connectivity indicator is calculated as 100*MetricLength/16. The formula will yield a value of 100 when block size and street connectivity is optimized for walking. Values above 100 (smaller block sizes with greater intersection density) generally continue to improve street connectivity, but few modern cities have block sizes this small. Atlanta has no district with block sizes consistently this small, although parts of Midtown have at least some blocks in this range.

The variable is calculated based on the street network dataset from City of Atlanta.

### 2) *Prevalence of sidewalk network*

The sidewalk network is measured as percent of streets with sidewalks. The variable is calculated by matching the sidewalk database with the street network. A value of 100 indicates that 100% of the streets have sidewalks. The variable does not indicate the quality of sidewalks, since such data is not widely available, nor does it indicate whether sidewalks are located on one or both sides of the road.

### 3) *Uncongested roads (LOS = C or better)*

Uncongested roads are defined as those roads in which the volume of traffic at peak periods does not exceed 75% of the capacity of the road, as determined by the Georgia Department of Transportation. GDOT capacity measures consider only the size of the road and do not take into consideration specific characteristics of intersections, such as the functioning and timing of traffic lights. Uncongested roads are measured as the percent of lane miles in which V/C is less than or equal to .75, producing a level of service of C or better.

### 4) *Travel speed via transit*

Transit travel speed is measured based on the average speed of a person taking transit (including walking but not waiting time) to travel from a point of estimation to the Five Points MARTA station in downtown Atlanta. Five Points was used as the point of destination because it is centrally located relative to the BeltLine and it serves as the most significant connecting hub in the MARTA system. Points of origination are the sampling points located within each subarea, as described above. Travel time was calculated in Google Map's 'Get Directions by public transit'. The data is acquired using a weekday afternoon schedule. The standard (value = 100) is set in comparison with driving time to Five Points. This time is averaged for the BeltLine at 16 minutes (based on 12 min. average driving time between the points of origination and Five Points, plus four minutes to park and walk to the station). Transit travel time is calculated as equal to 100/(ActualTravelTime/16). Thus, a score of 100 means that transit is as fast as driving.

### 3.4.2 Healthy, Active Living

Through improvements in urban design and significant enhancements in trails, connectivity, and greenspace, the BeltLine seeks to promote a more active, healthy life style amongst residents, workers, and visitors.

#### 1) Walkability

Walkability is measured as the distance from an estimation point to amenities that research indicates activates walking. Amenities (groceries, restaurants, shops, coffee shops, banks, parks, schools, book stores, and entertainment) are weighted by their significance as inducers of walking and multiplied by a decay function based on distance, up to 1.36 miles in distance. All amenities within 1.36 miles of any estimation point are identified and the distance from each amenity to each estimation point is calculated based on network distance. The resulting matrix is then sorted in Excel for each estimation point, and amenity weights and distance decay applied for each relevant amenity. Resulting measures are added to yield the total score. The maximum potential score using this methodology is 15. All raw scores are divided by 15 and multiplied by 100. A score of 100 therefore indicates

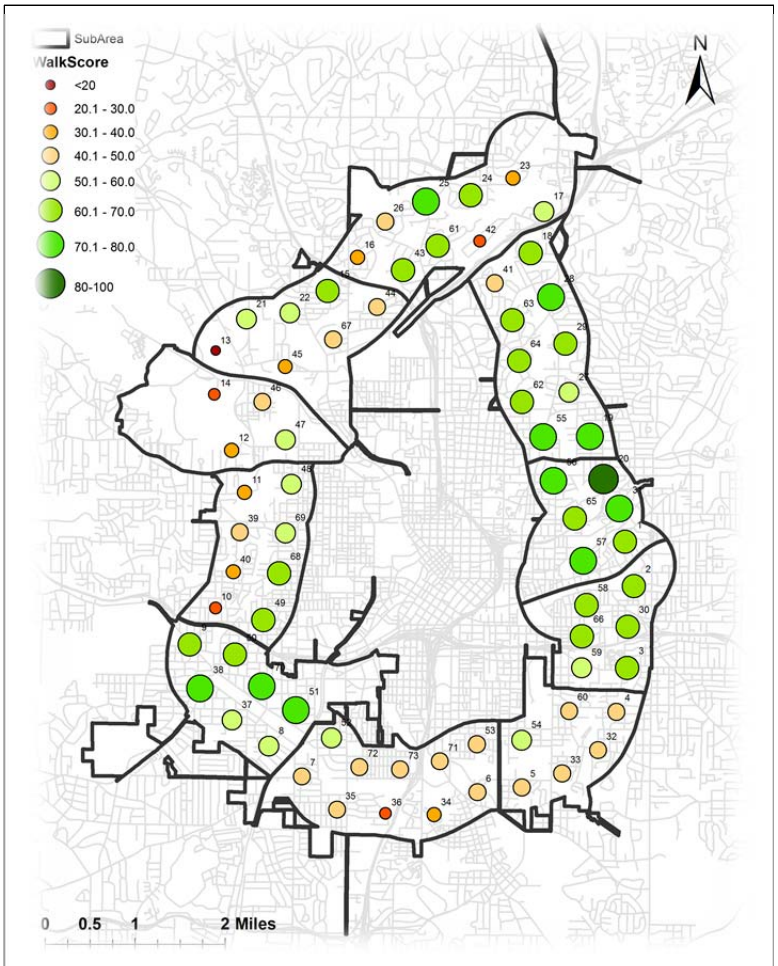


**Figure 9: Walkability Index**

a neighborhood with an extensive array of amenities to which people walk.

Note that the walkability measure closely replicates the system used by walkscore.com. While it is possible to use the walkscore.com site to estimate walk scores equivalent to the ones we estimate, the walkscore.com site does not enable you to alter the street network or the amenities, and hence cannot be used to estimate changes in walk scores as a result of new projects. In order to allow for consistency in comparison between existing and new measures, both the baseline and changes introduced by new projects are calculated from raw data in an equivalent manner.

Also note, the walkability measure does not actually measure the quality of the paths and sidewalks along which people walk or the topography of the terrain. While these can affect walkability, little research has been conducted to indicate their impact. Moreover, walkable amenities tend to congregate in walkable terrain.

### 2) Physical activity

Direct measures of physical activity do not exist. As a surrogate, the DST measures physical activity based on access to major parks and trails that are designed to support such activity. This excludes smaller neighborhood parks, which provide access to more passive forms of recreation. The physical activity measure is therefore measured as the aerial distance between the subarea sampling points to parks and trails larger than 100,000 sq. ft. The shorter the average distance, the better, with 100 set at 110% of the best subarea on the BeltLine.

### 3) Safety (few crimes)

Safety is measured as the absence of crimes. The number of crimes, both violent and property, are counted, and the rate of crime per 1,000 residents is calculated. Violent crimes are measured separately from property crimes and double weighted in the indicator. The scale is based on national average crime rates per capita. A value of 100 is achieved if a subarea's rate equals that of the national average; a value of zero is assigned if the subarea has rates that are ten times the national average. The national average for violent crimes is 4.0/1,000, while the property crime average is 29.4/1,000.

### 4) Proximity to healthy food

Access to healthy foods is considered an important component of healthy living. Unfortunately, several sections of the BeltLine are currently in food deserts, areas with little or no close proximity to sources of healthy food. Distances to healthy food are estimated from the subarea sampling points using Claritas dataset to identify Supermarkets and Grocery (except Convenience) Stores); Meat Markets; Fish and

Seafood Markets; and Fruit and Vegetable Markets. Estimates are made based on network distance to the nearest market, with 100 set to an average of .25 miles or less and 0 set to an average of 1 mile or greater.

### 3.4.3 Economic Vibrancy

The BeltLine redevelopment project seeks to promote improvements in the economic vitality of the BeltLine neighborhoods and the city as a whole. This includes improvements in income, employment, access to jobs, and educational achievement.

#### 1) Income

Income is measured as a weighted average of median household income, percent below poverty line, and percent below 50% of the poverty line. All data is derived from the ACS. Each of the three variables is measured as the percent compared to greatest value found on the Beltline. The metric is weighted to emphasize extreme levels of poverty. Hence, percent below 50% of poverty line constitutes 60% of the metric, while household income and percent below the poverty line are each weighted by 20%. A value of 100 would indicate that a district was the most prosperous on all three measures.

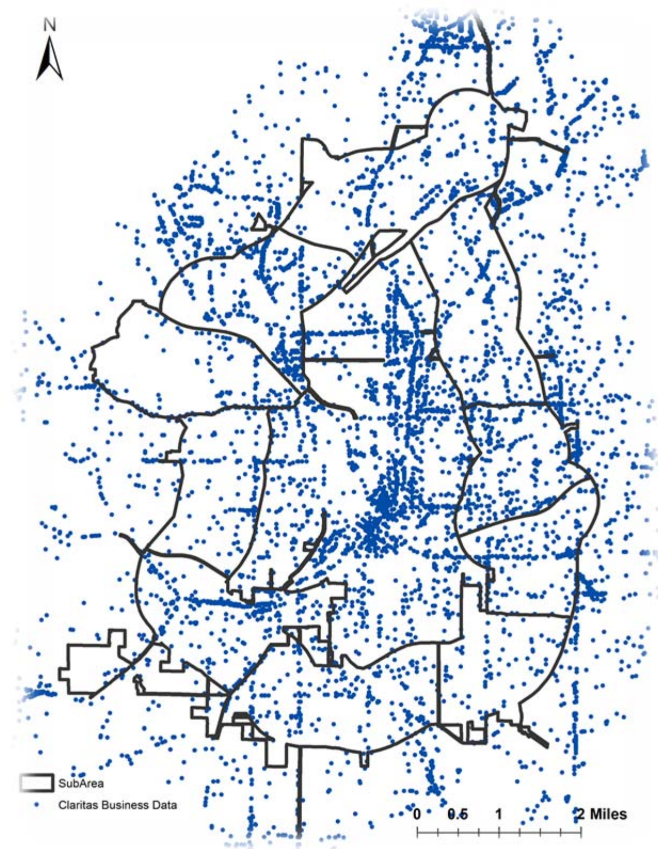


**Figure 10: Location of Businesses, Extracted from Claritas Database**

#### 2) Employment

The total number of jobs for each subarea is calculated based on Claritas data. Employment is normalized both as jobs density (jobs per acre) and jobs per capita. Each is then further normalized relative to the greatest value of that variable found on the Beltline. The indicator is weighted 50/50 for jobs per acre and jobs per capita. A score of 100 would occur in a district if it was the highest on both measures.

#### 3) Retail & industrial activities

Retail and industrial activity is measured as the average of three variables: non-family permits per acre, number of retail establishments per 1,000 residents, and number of office and industrial establishments per 1,000 residents. The first is a leading indicator of new activity and is derived from permit data obtained from the city. The second two are measures of existing levels of activity and are derived from Claritas data. Once again, the variables are measured as the percent of the greatest value found in the Beltline. The three variables are equally weighted. A value of 100 would occur in a district if it had the highest value of all three measures.

#### 4) Educational achievement

Educational achievement is measured as the percent of residents who graduated from high school and the percent who graduated with a bachelor's degree. A value of 100 is set for the top quartile of the state high school graduation rate and double the national average bachelor's degree graduation rate. The indicator is double weighted for the high school graduation rate.

### 3.4.4 Greenspace & Environment

The BeltLine is designed to significantly enhance the quantity and quality of greenspace and the environment of its neighborhoods and for the city. While ABI's efforts to expand access to greenspace and trails has attracted the most attention, the BeltLine also seeks to enhance the overall environment by promoting tree canopy, improving the environmental standards of development, and improving water quality. Each of these efforts also features significantly into the City of Atlanta's efforts to promote neighborhood livability and environmental stewardship.

#### 1) Access to greenspace and trails

Access to greenspace and trails is measured based on the percent of population that lives within ¼ of a mile of a park, and the number of park acres per 1,000 residents. A maximum of 16.2 /1,000 acres (the national average) was counted in order to prevent the scale from being distorted by subareas with very large, regional parks. The indicator is weighted equally for both measures. A value of 100 would occur in a district that contained at least 16.2 /1,000 acres of parkland and had the greatest percentage of residents living within a ¼ mile of a park.

### 2) Canopy cover

Tree canopy cover is measured based on percent of land area covered with tree canopy. Tree canopy cover is derived from the Georgia Land Use Trends Canopy Cover of Georgia 2008, using Natural Resources Spatial Analysis Laboratory data. A value of 100 indicates a canopy cover of 50%.

### 3) Environmental sustainable design

The BeltLine seeks to promote environmentally sustainable design amongst all new development. TADAC and ABI have, however, not linked this goal to any specific measure of sustainability, such as LEED Certification. Moreover, no measures of the quality of existing development exist. As such, this indicator is not measured as a baseline variable, and until a standard of excellence is set, evaluation of proposed projects will be conducted using expert judgment.

### 4) Water quality

Water quality throughout the City of Atlanta faces significant challenges. Water quality can be measured both by impervious surface (greater impervious surface leads to poorer quality stormwater runoff) and by existing conditions found in the watersheds located in each subarea. Water quality is calculated as the percent pervious surface in the area of concern, the percent of water samples taken from the watershed of concern where total coliform MPN/100 mL < 100,000 (measurements should be close to 0); and the suspended sediment concentration (mg/L) in the watershed relative to the worst watershed on the Beltline (worst = 0). Each variable is weighted equally.

## 3.4.5 Sustainable Housing & Community Design

The BeltLine's plan calls for significant increases in affordable and market rate housing, with an emphasis on new development that contributes to the overall quality of life within BeltLine neighborhoods.

### 1) Housing choice

The BeltLine seeks to increase both the availability of affordable housing and the range of housing choice. Both goals imply an increase in the diversity of the housing stock. Housing diversity can best be calculated using entropy measures with three classes: percent low density (SF detached), percent mid density (SF attached & small apartments), and percent high density (large apartments). The entropy measure is calculated based on the sum of each class's percent share, times the natural log of the percent, divided by the natural log of 3, and multiplied by 100. The resulting value ranges from 1 if 100% of housing is in one class to 100 if each of the three classes has an equal share of 33.3% each.

#### 2) Health of housing market

The health of the housing market is best determined by indicators that are highly responsive to changes in the rental and ownership residential markets. This measure is based on occupancy rates and residential home permits per acre. Vacancy rates are estimated so that vacancies greater than 10% (the lowest level of any subarea) are double-counted. Both the occupancy and permits variables are weighted equally.

#### 3) Housing Affordability

Affordability is estimated based on the percent of median income not allocated to either home ownership or rental (the inverse of median income dedicated to housing). Rental and home ownership values were equally weighted. A value of 100 would indicate that no income is dedicated to housing.

#### 4) Density

Community concerns with density are primarily focused on the density of the built environment. As such, the ideal measure would be one that measures Floor Area Ratios on developed parcels. Unfortunately, this information is not available for the city as a whole. As an alternative, density is measured as population density per acre. A value of 100 equates to 110% of most dense subarea.

### 3.4.6 Diverse Built Environment & Vibrant Tax Base

#### 1) Tax base

A vibrant tax base is both necessary for success of the BeltLine and a natural consequence of successful implementation of BeltLine plans. Tax base is measured directly as the total property value (both residential and nonresidential) for all assessed acreage within the district, divided by the number of acres. A value of 100 is set at 105% of most valued district.

#### 2) Art and historic preservation

The enhancement of cultural resources, especially as they relate to art and historic preservation, is an explicit goal of the BeltLine. At the same time, neither is easily measured. Traditional measures of historic preservation, such as listings on the National Register of Historic Places or lists of historic buildings identified by the

Atlanta Urban Design Commission will not adequately serve to identify historic buildings of importance to the BeltLine. Neither list provides much attention to the historic industrial buildings and assets found along the BeltLine. Therefore, no baseline data are available. Projects will need to examine the issue of art and historic preservation specific to each proposal. Qualitative assessments will likely be needed, as quantitative measures are unlikely to capture the essence of what is valued.

#### 3) Land use mix

The BeltLine seeks to promote redevelopment that provides for mixed uses and densities. To measure this diversity, an entropy score was constructed based on five land use classes: single family, multifamily, retail/entertainment, office/institutional/ education, and industry. The measure is calculated as follows:

Land Use Mix = (-1)*[(b1/a)*ln(b1/a) + (b2/a)*ln(b2/a) +(b3/a)*ln(b3/a) +(b4/a)*ln(b4/a) +(b5/a)*ln(b5/a)]/ln(5)

where
- a = total square feet of all land uses
- b = total square feet of specific land use, and
  - b1 = single family residential
  - b2 = multi-family residential
  - b3 = retail, entertainment
  - b4 = office, institutional, education
  - b5 = industrial

This measure is then multiplied by 100, with resulting values ranging from 1 (all land use is in one of the land use categories only) to 100 (each of the five land use categories contains 20% of the total land available).

#### 4) Compatibility with subarea plans

All subarea plans have been approved and should therefore guide future development. Judgments about the degree to which a proposal conforms to subarea plans can be assessed through professional and community judgments. As such, this measure will largely be based on qualitative assessments, and can be assessed only in the context of actual proposals.

### 3.4.7 Social & Environmental Equity

Most American metropolitan areas, including metro Atlanta, suffer from geographic disparities of race, income, housing affordability, employment opportunities, and environmental safety. As required by the Georgia Redevelopment Powers Law, §§ O.C.G.A. 36-44-1 et seq., the Atlanta BeltLine seeks to promote equitable economic and social developments in distressed areas. Equitable development emphasizes an equal distribution of affordable housing, equitable allocation of public investment, and reduction of health disparities between areas to ensure that all community members can benefit from the improved economic and social conditions. Equitable public investments may generate community benefits including the improvement of transportation access, affordable housing, employment opportunities, and environmental justice. At the same time, environmental justice addresses equitable distribution of environmental burdens, such as air pollution, contamination from industrial facilities, and crime, as well as environmental goods, such as clean air and water, access to parks and trails and transportation, and health care.

### 1) Minority & vulnerable populations

To effectively plan for the needs of minority and vulnerable populations, the residential location of these populations must be identified. The US Census provides information on both minority status and age of residents, and therefore allows for identification of these groups. Other vulnerable populations are not so identified. Thus, while it would be useful to locate all vulnerable populations, especially the disabled and people with special needs, only those identified in publicly accessible data bases can currently be incorporated. The needs of other groups will need to be incorporated based on project-specific data where possible.

Minority and vulnerable populations are measured as the percent of the population within any district that is minority, under 15 or over 60. Each of these populations is measured separately, and the DST is structured to allow the relative weight of each variable in this indicator to be adjusted by user input. Thus it is possible to examine all three populations simultaneously, or to place greater focus on one or more of them.

### 2) Historic expenditures by ABI

Any assessment of TAD expenditures associated with project proposals will benefit from analysis of previous expenditures made by ABI in the various subareas and for alternative purposes. This analysis is complicated by the desire to compare equivalent expenditures. At the very least, expenditures for land purchase should be separated from both capital investments and operating funds. In addition, funding for projects provided by other agencies, foundations, or private entities should be separated from expenditures by ABI. No clear formula can be used to structure these comparisons, but the overall objective of this analysis should be to provide transparency and open discussion of current proposals in light of historic expenditures.

### 3) Environmental quality

The BeltLine seeks to improve environmental quality. A number of indicators discussed above promote positive environmental qualities, such as parks, greenspace, tree canopy and sustainable buildings. Water quality is also discussed above. Yet a number of environmental disamenities pose significant problems for neighborhoods along the BeltLine. These include the presence of brownfields, air pollution hot spots, and flooding. The environmental indicator therefore provides for measurement of each of these concerns. Brownfields are measured as the number of brownfields within a subarea divided by the total length of beltline that falls within that subarea. Air pollution hot spots are measured by adjacency to major sources of pollution (highways, rail yards, major streets. Research has shown that air pollution remains elevated alongside these land uses, and that these elevated levels decrease as a function of distance from them. This variable therefore measures the percentage of land located within distances of concern from these land uses. Distances used depend on land use (e.g., roads with greater traffic generate broader hot spots than roads with less traffic). Flooding is measured as the percent of land that would be inundated by a 500 year flood. Each variable is standardized with 100 equivalent to the best district identified. The three variables are then weighted equally.

### 4) Civic engagement

Community involvement and civic engagement are mandated by the legislation to reflect neighborhoods and communities' opinions and warrant the transparency of the planning process. The existing Community Engagement Framework (CEF), including TADAC, BeltLine Affordable Housing Advisory Board, Atlanta BeltLine Study Groups, Community Representation on the ABI Board of Directors, and Citizen Participation Advocate, play a key role in keeping this process going. Assessments of civic engagement associated with particular projects will need to primarily rely on qualitative assessments of those efforts.

## 3.5 Summary of Variables and Their Data Sources

A summary of the variables incorporated into the DST, their description, and their sources is provided in the following table.

**Table 2: Variables: Descriptions and Sources of Data**

| Variable Name | Description | Source of Base Data |
|---|---|---|
| **Pop_total** | total population | census 2010 |
| **PopDense_SqMile** | population density: persons/sq mile | census 2010 |
| **Metric_Length_mile** | The total length of streets reached from a single point up to 0.5 mile in all directions based on street network is defined as metric reach | Atlanta street network from CQGRD database |
| **Sidewalk_ratio_SBA** | Streets with sidewalks, % | Impervious Surface-sidewalk, City of Atlanta GIS data |
| **Congestion_V_CR** | The percent of lane miles wherein volume over capacity exceeds Level of Service D (LOS D or F, in which V/C >0.75 and 1.00 respectively) | Atlanta street network from CQGRD database; Volume and Capacity data from Georgia DOT and Atlanta Regional Commission |
| **Travel_5point_mins** | Time to Five Points MARTA | Google Map |
| **WalkScore** | Walkability score | Claritas Data |
| **Park_distance** | Distance from major park and trail | City of Atlanta GIS data |
| **VioCrime** | Violent crimes, rate per 1,000 residents | City crime data |
| **ProptyCrime** | Property crimes, rate per 1,000 residents | City crime data |
| **supermarket_distance** | Distance to nearest major supermarket or farmers market | Claritas Data |
| **Med_hs_income** | Median household earnings in the spatial unit | ACS |
| **Pov_Total_PCT** | % of Population below poverty line | ACS |
| **POV_bel50_PCT** | % of Population below 50% poverty line | ACS |
| **total_JOBs** | total number of jobs | Claritas Data |
| **Jobs_Acre** | jobs / acre | Claritas Data |

| | | |
|---|---|---|
| **SumOfRetailNo** | # of retailing establishments | Claritas Data |
| **IndustryEstabNO** | # of Industry establishments | Claritas Data |
| **OfficeEstabNO** | # of office establishments | Claritas Data |
| **NonFamPermit_Acre** | Non-housing permit / acre | Building Permit, City of Atlanta GIS data |
| **POP_HIGHgrad_PCT** | High school grads, % | ACS |
| **POP_BACHOR_PCT** | College grads, % | ACS |
| **Park_25mile** | Residents w/in .25 miles of greenspace | Park and trails, City of Atlanta GIS data |
| **Park_Pop_000** | Park acres/1000 population | Park and trails, City of Atlanta GIS data |
| **Tree_ratio** | tree coverage ratio | Georgia Land Use Trends Canopy Cover of Georgia 2008,Natural Resources Spatial Analysis Laboratory |
| **Impervious_raio** | Impervious surface ratio | Impervious Surface, City of Atlanta GIS data |
| **HSING_1uATT_PCT** | Single-family attached housing units, % | ACS |
| **HSING_24u_PCT** | Multi-family 2-4 units, % | ACs |
| **HSING_5PLUS_PCT** | Multi-family 5+ units, % | ACS |
| **HSING_occpy_PCT** | housing Occupancy rate | ACS |
| **FamPermit_Acre** | housing Building permits/ acre | Building Permit, City of Atlanta GIS data |
| **Med_own_mcost** | Median home owner monthly cost (percentage) | ACS |
| **MedRent** | median rent | ACS |
| **Pop_Dense_Acre** | population density: persons/acre | census 2010 |
| **MultiFamily** | multi-family percentage | ACS |
| **TotalPropertyValue** | total property value | TAX Parcels, City of Atlanta |
| **LandUse_Mix** | Land use mix indicator | TAX Parcels, City of Atlanta |
| **Pop_Minor_PCT** | Minorities, % | census 2010 |
| **Pop_HISP_PCT** | Hispanic, % | census 2010 |
| **Pop_15_PCT** | <15 years, % | census 2010 |
| **Pop_over60_PCT** | >59 years, % | census 2010 |
| **Brownfiled_mile** | # of Brownfields per mile along beltline | Brown field, City of Atlanta |

| | | |
|---|---|---|
| **Pct_H_Spot** | air pollution hot spot zone % | % area within 100 Meters of road w/10K vehicles per day to 200m of 50K road; 200m of freight yards |
| **Flood_ratio_SBA** | Environmental hazards-floods % | Flood risk zone, City of Atlanta |

# 4 DST User Interface

The user interface for the Decision Support Tool is structured within an Excel spreadsheet. Excel, rather than Access, was used because of users' widespread familiarity with its basic functions and operations.

The user interface consists of six modules:

1. Subarea baseline data input: data concerning Subarea baseline conditions are transferred from the Access database into the spreadsheet on this page. Calculations necessary to convert input data into metrics standardized to a 100 point scale for each indicator are conducted, with results displayed numerically.
2. Project data input: data concerning proposed projects are transferred from the Access database into the spreadsheet on this page. Calculations necessary to convert input data into metrics standardized to a 100 point scale for each indicator are conducted, with results displayed numerically.
3. Weights: users can adjust weights assigned to the seven sets of indicators as well as the four indicators within each set, to emphasize specific indicators in the overall multi-criteria decision analysis.
4. Display input metrics: Presents the 28 indictors calculated in the baseline and project input spreadsheets. Calculates the seven weighted criteria (indicator sets) and the overall project score based on the weights assigned.
5. Display all metrics: Displays all 28 indicators (baseline and project) visually using a key to highlight relative differences and changes from baseline to project conditions.
6. Display summary metrics: Displays the seven criteria (indicator sets) and total project weighted scores visually using a key to highlight relative differences and changes from baseline to project conditions.

## 4.1 Module 1: Subarea Baseline Data Input Sheet

The subarea baseline data input sheet calculates the 28 indicators for subarea baseline conditions. As indicated above, each indicator is scaled from 0 to 100. For almost all variables, higher values indicate positive outcomes, with criteria more fully met. For example, the measure of road congestion is set so that a zero value indicates completely congested roads, while a value of 100 indicates that all roads are at level of service of C or better (uncongested). Similarly, a value of 100 in the street connectivity index indicates that the subarea consists entirely of ideal block sizes.

For a few variables, such as the percentages of young, old, and minority populations, the 0 to 100 scale indicates the percentages of residents who are in one or more of these populations.

Module 1 consists of two sets of tables. The top table presents the 28 indicators by subarea. Each cell contains the formulas that convert the raw variables imported from Access into the scaled indicator. This is shown for eight indicators associated with two of the seven criteria (accessibility and healthy, active living) in the table below. For indicators that are calculated from multiple variables, such as Safety in the example below, the user may be given an option to change the weights used to aggregate the variables into one indicator. As shown below, two variables are used to calculate the Safety indicator: violent crimes per capita and property crimes per capita. By default, the DST weights violent crimes twice as heavily as property crimes, but the user can change these weights if desired.

**Table 3: Module 1, Indicator Values**

| | Accessibility | | | | Healthy, Active Living | | | |
|---|---|---|---|---|---|---|---|---|
| Beltline Subarea | Street connectivity | Prevalence of sidewalk network | Uncongested roads (LOS = C or better) | Travel speed via transit | Walkability | Physical activity | Safety (few crimes) | Proximity to healthy food |
| 1 | 46.3 | 96.2 | 85.8 | 70.00 | 67.33 | 69.93 | 27.81 | 83.32 |
| 2 | 41.1 | 95.3 | 79.0 | 70.18 | 42.20 | 80.91 | 33.98 | 58.82 |
| 3 | 36.1 | 95.8 | 94.4 | 61.15 | 46.17 | 73.87 | 72.81 | 69.52 |
| 4 | 49.2 | 96.3 | 81.5 | 82.76 | 62.72 | 74.23 | 62.71 | 75.11 |
| 5 | 42.1 | 97.8 | 82.0 | 85.71 | 71.83 | 89.30 | 60.04 | 81.97 |
| 6 | 32.8 | 96.4 | 56.2 | 54.42 | 63.42 | 73.94 | 79.77 | 70.48 |
| 7 | 18.4 | 86.7 | 70.8 | 44.17 | 53.06 | 71.34 | 83.40 | 32.25 |
| 8 | 21.6 | 91.3 | 58.7 | 48.07 | 44.36 | 46.34 | 73.33 | 45.59 |
| 9 | 21.6 | 89.4 | 73.4 | 62.14 | 39.97 | 82.41 | 81.96 | 69.74 |
| 10 | 40.0 | 94.2 | 60.3 | 80.50 | 48.58 | 79.11 | 13.77 | 76.59 |
| | | | | | | | | |
| | | | | | | Weights for crime | | |
| | | | | | | Violent: | 0.67 | |
| | | | | | | Property | 0.33 | |

Variables used to calculate the indicators are obtained from the Access database and inserted into the spreadsheet below the indicator table shown above. As noted above, many of the indicators are built using multiple variables. These can be seen for the Economic Vibrancy and Greenspace & Environment criteria in the table below. For example, the Retail and Industrial Activity indicator consists of three variables (non-family permits per acre, number of retail establishments per 1,000 residents, and number of office and industrial establishments per 1,000 residents). The data for each of these variables are shown with violet headers, while calculations necessary to convert these input data into the standardized 100-point scale have pink headers. Variables are stacked so that all data and calculations for a given indicator are located in one column.

Also of note in this table, the Environmental Sustainable Design indicator is blank, because it does not have a baseline measure applicable at the scale of subareas.

# Table 4: Module 1, Data Used to Calculate Indicators

| Economic Vibrancy | | | | Greenspace & Environment | | | |
|---|---|---|---|---|---|---|---|
| Income | Employment | Retail & industrial activities | Educational achievement | Access to greenspace & trails | % canopy cover | Environmental sustainable design | Water quality |
| Triple weighted for % below 1/2 of the poverty line | wighted 50/50 for jobs per acre and jobs per capita | weighted equally for non-family permits per acre, number of retail establishments per 1,000 residents, and number of office and industrial establishments per 1,000 residents | double weighted for high school graduation rate; measured against top quartile of state average HS grad rate and double the national average for bachelors | weighted half for percent of pop within 1/4 mile and half for acres of park/trail per 1,000, with 16.2 acres/1000 (nat'l ave) being the max counted | standard based on 50% canopy = 100) | | |
| Med_hs_income | total_JOBs | SumOfRetailNo | POP_HIGHgrad_PCT | Park_25mile | Tree_ratio | | Impervious_raio |
| 27,902.14 | 6,192.00 | 129.00 | 0.49 | 0.82 | 0.32 | | 0.38 |
| 30,334.80 | 4,368.00 | 40.00 | 0.45 | 0.76 | 0.25 | | 0.41 |
| 61,583.96 | 4,002.00 | 13.00 | 0.63 | 0.75 | 0.40 | | 0.31 |
| 49,672.11 | 3,304.00 | 55.00 | 0.65 | 0.57 | 0.19 | | 0.50 |
| 60,798.41 | 9,631.00 | 56.00 | 0.69 | 0.95 | 0.18 | | 0.49 |
| 92,288.57 | 6,935.00 | 94.00 | 0.76 | 0.82 | 0.37 | | 0.37 |
| 90,246.08 | 16,704.00 | 201.00 | 0.72 | 0.53 | 0.34 | | 0.39 |
| 49,464.35 | 9,966.00 | 131.00 | 0.47 | 0.14 | 0.13 | | 0.47 |
| 26,624.21 | 2,835.00 | 26.00 | 0.44 | 0.66 | 0.31 | | 0.30 |
| 20,766.86 | 1,662.00 | 30.00 | 0.47 | 0.78 | 0.32 | | 0.34 |
| | | | 0.79 | | | | |
| Pov_Total_PCT | Jobs_Acre | IndustryEstabNO | POP_BACHOR_PCT | Park_Pop_000 | | | Total coliform, % acceptable |
| 0.36 | 3.34 | 24.00 | 0.11 | 16.79 | | | - |
| 0.38 | 2.50 | 8.00 | 0.13 | 11.32 | | | - |
| 0.22 | 3.45 | 7.00 | 0.38 | 25.92 | | | 0.20 |
| 0.21 | 3.13 | 8.00 | 0.37 | 5.78 | | | 0.20 |
| 0.21 | 8.70 | 22.00 | 0.49 | 9.52 | | | 0.20 |
| 0.08 | 4.25 | 6.00 | 0.58 | 15.39 | | | 0.33 |
| 0.08 | 8.13 | 41.00 | 0.56 | 12.14 | | | 0.33 |
| 0.17 | 6.77 | 54.00 | 0.35 | 1.75 | | | 0.33 |
| 0.60 | 1.98 | 11.00 | 0.07 | 8.63 | | | 0.40 |
| 0.45 | 1.29 | 6.00 | 0.09 | 10.16 | | | 0.40 |
| | 8.70 | | 0.61 | | | | |
| POV_bel50_PCT | Jobs per capita | OfficeEstabNO | | Acres/1000 (max 16.2) | | | Suspended sediment concentration, mg/L |
| 0.17 | 0.55 | 125.00 | | 16.20 | | | 563.00 |
| 0.19 | 0.42 | 25.00 | | 11.32 | | | 563.00 |
| 0.13 | 0.63 | 27.00 | | 16.20 | | | 100.80 |
| 0.13 | 0.44 | 52.00 | | 5.78 | | | 100.80 |
| 0.12 | 0.81 | 161.00 | | 9.52 | | | 100.80 |
| 0.04 | 0.54 | 177.00 | | 15.39 | | | 82.50 |
| 0.05 | 1.10 | 258.00 | | 12.14 | | | 108.70 |
| 0.11 | 2.00 | 212.00 | | 1.75 | | | 108.70 |
| 0.37 | 0.50 | 58.00 | | 8.63 | | | 384.30 |
| 0.20 | 0.20 | 30.00 | | 10.16 | | | 384.30 |
| | 2.00 | | | | | | 563.00 |
| | | NonFamPermit_Acre | | | | | |
| | | 0.27 | | | | | |
| | | 0.21 | | | | | |
| | | 0.16 | | | | | |
| | | 0.42 | | | | | |
| | | 0.64 | | | | | |
| | | 0.46 | | | | | |
| | | 0.41 | | | | | |
| | | 0.50 | | | | | |
| | | 0.16 | | | | | |
| | | 0.21 | | | | | |
| | | 0.64 | | | | | |
| | | Retail Establlishments per 1,000 residents | | | | | |
| | | 11.47 | | | | | |
| | | 3.88 | | | | | |
| | | 2.05 | | | | | |
| | | 7.40 | | | | | |
| | | 4.73 | | | | | |
| | | 7.37 | | | | | |
| | | 13.20 | | | | | |
| | | 26.24 | | | | | |
| | | 4.60 | | | | | |
| | | 3.69 | | | | | |
| | | 26.24 | | | | | |
| | | Industrial & Office Establishments per 1,000 residents | | | | | |
| | | 13.25 | | | | | |
| | | 3.20 | | | | | |
| | | 5.37 | | | | | |
| | | 8.07 | | | | | |
| | | 15.44 | | | | | |
| | | 14.35 | | | | | |
| | | 19.64 | | | | | |
| | | 53.29 | | | | | |
| | | 12.20 | | | | | |
| | | 4.42 | | | | | |
| | | 53.29 | | | | | |



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## 4.2 Module 2: Project Data Input Sheet

The project data input module replicates the structure of Module 1 with project rather than baseline condition data and indicators. As with module 1, the project data input module is built on data transferred from the Access database. Calculations necessary to convert input data into metrics standardized to a 100 point scale for each indicator are conducted, with results displayed numerically.

At the same time, the project input module differs in one significant way from the baseline module. Unlike the baseline, project data is measured not only in the current, pre-project condition, but also estimated as to its future, post-project condition. Therefore, as shown in the table below, the module is set up to show both pre- and post-project variables.

**Table 5: Module 2, Indicators for both Pre- and Post-Project Conditions**

| | Accessibility | | | | Healthy, Active Living | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Name** | Street connectivity | Prevalence of sidewalk network | Uncongested roads (LOS = C or better) | Travel speed via transit | Walkability | Physical activity | Safety (few crimes) | Proximity to healthy food |
| **Existing Pre-Project Condition** | | | | | | | | |
| Ansley | 28.3 | 92.3 | 40.4 | 56.14 | 70.11 | 78.52 | 85.88 | 69.70 |
| EST_S | 52.2 | 96.3 | 83.5 | 84.21 | 64.58 | 80.46 | 70.05 | 92.03 |
| WET_N | 42.2 | 92.9 | 69.8 | 85.71 | 49.11 | 76.46 | 11.66 | 74.93 |
| WET_S | 44.6 | 95.4 | 84.4 | 73.56 | 58.16 | 76.79 | -7.09 | 90.27 |
| **Projected Post-Project Condition** | | | | | | | | |
| Ansley | 36.3 | 100.0 | 39.1 | 56.14 | 75.27 | 88.21 | 85.88 | 77.07 |
| Est_S | 54.6 | 100.0 | 83.5 | 84.21 | 67.78 | 82.34 | 70.05 | 92.03 |
| Wet_N | 43.3 | 100.0 | 69.8 | 85.71 | 49.58 | 79.93 | 11.66 | 74.93 |
| Wet_S | 46.2 | 100.0 | 84.4 | 73.56 | 59.47 | 80.89 | -7.09 | 90.27 |

As will be discussed further in the chapter on the case studies, both pre- and post-project data are estimated based on a project impact area that is defined as one-half mile out from the project borders in all directions.

## 4.3 Module 3: Weights

In the Weights module, users can adjust weights assigned to the seven criteria as well as the four indicators associated with each criterion. The weights are used in multi-criteria analysis to emphasize specific indicators in the overall decision analysis. Weights allow the user to incorporate their own values into the analysis, by giving more weight to those variables and indicators of importance to the user relative to those variables of less importance. When variables are aggregated into indicators, indicators into criteria, and criteria into project totals, the weights are integrated into the analysis, with preferences on consequences thereby incorporated into comparison of the impact of various alternatives. The value of any particular alternative will depend not only on actual conditions measured by the 28 indicators, but also the value of each indicator to the user, weighted and summed over all indicators.

The Weights module is organized to enable the user to first weight the criteria and then to weight the indicators within each criteria. This hierarchical structure keeps choices to a cognitively reasonable number. Note that the weights do not need to add to 100 because the module is designed to automatically standardize whatever weights the user inputs onto a 100 point scale.

**Table 6: Module 3, Designed for Weighting the Criteria and Indicators**

| Criteria | Criteria Weights | Indicators | Indicator Weights |
|---|---|---|---|
| **Accessibility** | **10** | Street connectivity | 25 |
| | | Prevalence of sidewalk network | 25 |
| | | Uncongested roads (LOS = C or better) | 25 |
| | | Travel speed via transit | 25 |
| **Healthy, Active Living** | **10** | Walkability | 25 |
| | | Physical activity | 25 |
| | | Safety (few crimes) | 25 |
| | | Proximity to healthy food | 25 |
| **Economic Vibrancy** | **10** | Income | 25 |
| | | Employment | 25 |
| | | Retail & industrial activities | 25 |
| | | Educational achievement | 25 |
| **Greenspace & Environment** | **10** | Access to greenspace & trails | 25 |
| | | % canopy cover | 25 |
| | | Environmental sustainable design | 25 |
| | | Water quality | 25 |
| **Housing & Community Design** | **10** | Housing choice | 25 |
| | | Health of housing market | 25 |
| | | Affordability | 25 |
| | | Density | 25 |
| **Built Environment & Tax Base** | **10** | Tax base | 25 |
| | | Art & historic preservation | 25 |
| | | Land use mix (entropy scores) | 25 |
| | | Compatibility with subarea plans | 25 |
| **Social & Environmental Equity** | **10** | Minority & special needs populations | 25 |
| | | Historic expenditures by ABI | 25 |
| | | Environmental quality | 25 |
| | | Civic engagement | 25 |

## 4.4 Module 4: Display Input Metrics

Once the data are input into the User Interface via Modules 1 and 2 and the weights assigned, the remaining modules are programmed to require no user input. The 28 indicators calculated in the baseline and project input spreadsheets are carried forward to Module 4, displaying all data for each indicator in a single column. At the top of the column, baseline conditions are displayed. Below this, five conditions are shown for each alternative:

1. the value of the indicator for the subarea in which the project is located,
2. the value of the indicator for the project area background,
3. the value of the indicator as estimated for the project area after the project is built,
4. the difference between the post-project indicator and the subarea baseline, and
5. the difference between the post-project indicator and the pre-project project area existing condition.

**Table 7: Module 4, Display of Indicators for Subareas and Projects**

| | | | Weight: | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Accessibility | | | | Healthy, Active Living | | | |
| Project Name | Alt. # | Beltline Subarea | Condition | Street connectivity | Prevalence of sidewalk network | Uncongested roads (LOS = C or better) | Travel speed via transit | Walkability | Physical activity | Safety (few crimes) | Proximity to healthy food |
| | | 1 | 1-Subarea Background | 46.3 | 96.2 | 85.8 | 70.0 | 67.3 | 69.9 | 27.8 | 83.3 |
| | | 2 | 1-Subarea Background | 41.1 | 95.3 | 79.0 | 70.2 | 42.2 | 80.9 | 34.0 | 58.8 |
| | | 3 | 1-Subarea Background | 36.1 | 95.8 | 94.4 | 61.1 | 46.2 | 73.9 | 72.8 | 69.5 |
| | | 4 | 1-Subarea Background | 49.2 | 96.3 | 81.5 | 82.8 | 62.7 | 74.2 | 62.7 | 75.1 |
| | | 5 | 1-Subarea Background | 42.1 | 97.8 | 82.0 | 85.7 | 71.8 | 89.3 | 60.0 | 82.0 |
| | | 6 | 1-Subarea Background | 32.8 | 96.4 | 56.2 | 54.4 | 63.4 | 73.9 | 79.8 | 70.5 |
| | | 7 | 1-Subarea Background | 18.4 | 86.7 | 70.8 | 44.2 | 53.1 | 71.3 | 83.4 | 32.2 |
| | | 8 | 1-Subarea Background | 21.6 | 91.3 | 58.7 | 48.1 | 44.4 | 46.3 | 73.3 | 45.6 |
| | | 9 | 1-Subarea Background | 21.6 | 89.4 | 73.4 | 62.1 | 40.0 | 82.4 | 82.0 | 69.7 |
| | | 10 | 1-Subarea Background | 40.0 | 94.2 | 60.3 | 80.5 | 48.6 | 79.1 | 13.8 | 76.6 |
| East Side Trail, South | 1 | 4 | 1-Subarea Background | 49.2 | 96.3 | 81.5 | 82.8 | 62.7 | 74.2 | 62.7 | 75.1 |
| | | | 2-Project Area Background | 52.2 | 96.3 | 83.5 | 84.2 | 64.6 | 80.5 | 70.1 | 92.0 |
| | | | 3-Built Project | 54.6 | 100.0 | 83.5 | 84.2 | 67.8 | 82.3 | 70.1 | 92.0 |
| | | | 4-Difference from Subarea Background | 5.4 | 3.7 | 2.0 | 1.5 | 5.1 | 8.1 | 7.3 | 16.9 |
| | | | 5-Change from Project Area Background | 2.4 | 3.7 | 0.0 | 0.0 | 3.2 | 1.9 | 0.0 | 0.0 |
| West End Trail, North | 2 | 10 | 1-Subarea Background | 40.0 | 94.2 | 60.3 | 80.5 | 48.6 | 79.1 | 13.8 | 76.6 |
| | | | 2-Project Area Background | 42.2 | 92.9 | 69.8 | 85.7 | 49.1 | 76.5 | 11.7 | 74.9 |
| | | | 3-Built Project | 43.3 | 100.0 | 69.8 | 85.7 | 49.6 | 79.9 | 11.7 | 74.9 |
| | | | 4-Difference from Subarea Background | 3.3 | 5.8 | 9.5 | 5.2 | 1.0 | 0.8 | -2.1 | -1.7 |
| | | | 5-Change from Project Area Background | 1.1 | 7.1 | 0.0 | 0.0 | 0.5 | 3.5 | 0.0 | 0.0 |
| West End Trail, South | 3 | 1 | 1-Subarea Background | 46.3 | 96.2 | 85.8 | 70.0 | 67.3 | 69.9 | 27.8 | 83.3 |
| | | 2 | 1-Subarea Background | 41.1 | 95.3 | 79.0 | 70.2 | 42.2 | 80.9 | 34.0 | 58.8 |
| | | | 1-Subarea Background | 43.7 | 95.8 | 82.4 | 70.1 | 54.8 | 75.4 | 30.9 | 71.1 |
| | | | 2-Project Area Background | 44.6 | 95.4 | 84.4 | 73.6 | 58.2 | 76.8 | -7.1 | 90.3 |
| | | | 3-Built Project | 46.2 | 100.0 | 84.4 | 73.6 | 59.5 | 80.9 | -7.1 | 90.3 |
| | | | 4-Difference from Subarea Background | 2.5 | 4.2 | 2.0 | 3.5 | 4.7 | 5.5 | -38.0 | 19.2 |
| | | | 5-Change from Project Area Background | 1.6 | 4.6 | 0.0 | 0.0 | 1.3 | 4.1 | 0.0 | 0.0 |
| Ansley Mall | 1 | 6 | 1-Subarea Background | 32.8 | 96.4 | 56.2 | 54.4 | 63.4 | 73.9 | 79.8 | 70.5 |
| | | | 2-Project Area Background | 28.3 | 92.3 | 40.4 | 56.1 | 70.1 | 78.5 | 85.9 | 69.7 |
| | | | 3-Built Project | 36.3 | 100.0 | 39.1 | 56.1 | 75.3 | 88.2 | 85.9 | 77.1 |
| | | | 4-Difference from Subarea Background | 3.4 | 3.6 | -17.1 | 1.7 | 11.8 | 14.3 | 6.1 | 6.6 |
| | | | 5-Change from Project Area Background | 8.0 | 7.7 | -1.3 | 0.0 | 5.2 | 9.7 | 0.0 | 7.4 |
| New Project | | | 1-Subarea Background | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| | | | 2-Project Area Background | | | | | | | | |
| | | | 3-Built Project | | | | | | | | |
| | | | 4-Difference from Subarea Background | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| | | | 5-Change from Project Area Background | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The module is structured so that it can contain information from a wide range of potential projects. As shown on the table above, space for new projects are already incorporated into the module.

In addition, the module also calculates the seven weighted criteria and the overall project score based on the weights assigned. This is shown in the table below.

**Table 8: Module 4, Display of Weighted Indicators for Criteria Sets and for Overall Conditions**

| Project Name | Alt. # | Beltline Subarea | Accessibility | Healthy, Active Living | Economic Vibrancy | Greenspace & Environment | Housing & Community Design | Built Environment & Tax Base | Social & Environmental Equity | Overall |
|---|---|---|---|---|---|---|---|---|---|---|
| Subarea Existing Conditions | | 1 | 74.6 | 62.1 | 41.0 | 58.3 | 67.8 | 51.8 | 60.5 | 59.4 |
| Subarea Existing Conditions | | 2 | 71.4 | 54.0 | 33.5 | 47.4 | 68.2 | 51.2 | 52.8 | 54.1 |
| Subarea Existing Conditions | | 3 | 71.9 | 65.6 | 47.6 | 74.9 | 71.9 | 45.3 | 63.1 | 62.9 |
| Subarea Existing Conditions | | 4 | 77.4 | 68.7 | 50.8 | 44.7 | 80.2 | 36.0 | 23.6 | 54.5 |
| Subarea Existing Conditions | | 5 | 76.9 | 75.8 | 68.1 | 54.3 | 85.9 | 63.3 | 42.7 | 66.7 |
| Subarea Existing Conditions | | 6 | 60.0 | 71.9 | 66.9 | 74.6 | 83.4 | 74.4 | 35.1 | 66.6 |
| Subarea Existing Conditions | | 7 | 55.0 | 60.0 | 76.4 | 63.6 | 72.6 | 68.0 | 33.7 | 61.3 |
| Subarea Existing Conditions | | 8 | 54.9 | 52.4 | 76.6 | 31.6 | 67.5 | 67.5 | 41.4 | 56.0 |
| Subarea Existing Conditions | | 9 | 61.6 | 68.5 | 26.3 | 56.5 | 58.1 | 43.1 | 48.1 | 51.7 |
| Subarea Existing Conditions | | 10 | 68.7 | 54.5 | 28.7 | 60.5 | 68.3 | 38.6 | 60.0 | 54.2 |
| East Side Trail, South | 1 | 4 | 77.4 | 68.7 | 50.8 | 44.7 | 80.2 | 36.0 | 23.6 | 54.5 |
| | | | 79.1 | 76.8 | 54.4 | 50.3 | 84.7 | 45.8 | 28.5 | 59.9 |
| | | | 80.6 | 78.1 | 54.4 | 67.4 | 85.3 | 59.1 | 38.5 | 66.2 |
| | | | 3.1 | 9.4 | 3.6 | 33.9 | 5.1 | 41.1 | 26.8 | 17.6 |
| | | | 1.5 | 1.3 | 0.0 | 17.1 | 0.7 | 13.3 | 10.0 | 6.3 |
| West End Trail, North | 2 | 10 | 68.7 | 54.5 | 28.7 | 60.5 | 68.3 | 38.6 | 60.0 | 54.2 |
| | | | 72.6 | 53.0 | 27.6 | 57.6 | 68.7 | 42.7 | 43.1 | 52.2 |
| | | | 74.7 | 54.0 | 27.6 | 68.8 | 69.4 | 55.4 | 53.1 | 57.6 |
| | | | 6.0 | -0.5 | -1.0 | 23.4 | 1.1 | 36.1 | 23.1 | 12.6 |
| | | | 2.1 | 1.0 | 0.0 | 11.2 | 0.6 | 12.8 | 10.0 | 5.4 |
| West End Trail, South | 3 | 1 | 74.6 | 62.1 | 41.0 | 58.3 | 67.8 | 51.8 | 60.5 | 59.4 |
| | | 2 | 71.4 | 54.0 | 33.5 | 47.4 | 68.2 | 51.2 | 52.8 | 54.1 |
| | | | 73.0 | 58.0 | 37.2 | 39.6 | 68.0 | 25.8 | 28.3 | 47.1 |
| | | | 74.5 | 54.5 | 43.3 | 52.0 | 67.3 | 50.2 | 39.3 | 54.5 |
| | | | 76.0 | 55.9 | 43.3 | 67.6 | 67.9 | 63.0 | 49.3 | 60.4 |
| | | | 3.0 | -2.2 | 6.1 | 28.0 | -0.1 | 37.3 | 21.0 | 13.3 |
| | | | 1.5 | 1.4 | 0.0 | 15.7 | 0.6 | 12.8 | 10.0 | 6.0 |

## 4.5 Module 5: Display All Metrics

The fifth module displays all 28 indicators (for both baseline and project data) visually using a color key to highlight relative differences and changes from baseline to project conditions. The module draws directly from Module 4 and contains no new information.

The module enables the user to rapidly compare across subareas and projects to identify areas of concern and opportunity. It uses a color coded system to highlight those indicators that are higher/lower relative to other indicators or relative to the same indicator for another subarea or project alternative. When examining the table below, which shows Module 5 for two of the seven criteria, we can note that the street network of all of the subareas are poorly connected, that sidewalks are widespread throughout the BeltLine, and that safety varies widely by subarea.

## Table 9: Module 5, Visual Display of Indicators for Subareas and Projects

| | | | | Accessibility | | | | Healthy, Active Living | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Project Name | Alt. # | Beltline Subarea | Condition | Street connectivity | Prevalence of sidewalk network | Uncongested roads (LOS = C or better) | Travel speed via transit | Walkability | Physical activity | Safety (few crimes) | Proximity to healthy food |
| | | 1 | 1-Subarea Background | 46 | 96 | 86 | 70 | 67 | 70 | 28 | 83 |
| | | 2 | 1-Subarea Background | 41 | 95 | 79 | 70 | 42 | 81 | 34 | 59 |
| | | 3 | 1-Subarea Background | 36 | 96 | 94 | 61 | 46 | 74 | 73 | 70 |
| | | 4 | 1-Subarea Background | 49 | 96 | 81 | 83 | 63 | 74 | 63 | 75 |
| | | 5 | 1-Subarea Background | 42 | 98 | 82 | 86 | 72 | 89 | 60 | 82 |
| | | 6 | 1-Subarea Background | 33 | 96 | 56 | 54 | 63 | 74 | 80 | 70 |
| | | 7 | 1-Subarea Background | 18 | 87 | 71 | 44 | 53 | 71 | 83 | 32 |
| | | 8 | 1-Subarea Background | 22 | 91 | 59 | 48 | 44 | 46 | 73 | 46 |
| | | 9 | 1-Subarea Background | 22 | 89 | 73 | 62 | 40 | 82 | 82 | 70 |
| | | 10 | 1-Subarea Background | 40 | 94 | 60 | 81 | 49 | 79 | 14 | 77 |
| | | | | | | | | | | | |
| East Side Trail, South | 1 | 4 | 1-Subarea Background | 49 | 96 | 81 | 83 | 63 | 74 | 63 | 75 |
| | | | 2-Project Area Background | 52 | 96 | 83 | 84 | 65 | 80 | 70 | 92 |
| | | | 3-Built Project | 55 | 100 | 83 | 84 | 68 | 82 | 70 | 92 |
| | | | 4-Difference from Subarea Background | 5.4 | 3.7 | 2.0 | 1.5 | 5.1 | 8.1 | 7.3 | 16.9 |
| | | | 5-Change from Project Area Background | 2.4 | 3.7 | 0.0 | 0.0 | 3.2 | 1.9 | 0.0 | 0.0 |
| | | | | | | | | | | | |
| West End Trail, North | 2 | 10 | 1-Subarea Background | 40 | 94 | 60 | 81 | 49 | 79 | 14 | 77 |
| | | | 2-Project Area Background | 42 | 93 | 70 | 86 | 49 | 76 | 12 | 75 |
| | | | 3-Built Project | 43 | 100 | 70 | 86 | 50 | 80 | 12 | 75 |
| | | | 4-Difference from Subarea Background | 3.3 | 5.8 | 9.5 | 5.2 | 1.0 | 0.8 | -2.1 | -1.7 |
| | | | 5-Change from Project Area Background | 1.1 | 7.1 | 0.0 | 0.0 | 0.5 | 3.5 | 0.0 | 0.0 |
| | | | | | | | | | | | |
| West End Trail, South | 3 | 1 | 1-Subarea Background | 46 | 96 | 86 | 70 | 67 | 70 | 28 | 83 |
| | | | 2-Project Area Background | 45 | 95 | 84 | 74 | 58 | 77 | -7 | 90 |
| | | | 3-Built Project | 46 | 100 | 84 | 74 | 59 | 81 | -7 | 90 |
| | | | 4-Difference from Subarea Background | 2.5 | 4.2 | 2.0 | 3.5 | 4.7 | 5.5 | -38.0 | 19.2 |
| | | | 5-Change from Project Area Background | 1.6 | 4.6 | 0.0 | 0.0 | 1.3 | 4.1 | 0.0 | 0.0 |
| | | | | | | | | | | | |
| Ansley Mall | 1 | 6 | 1-Subarea Background | 33 | 96 | 56 | 54 | 63 | 74 | 80 | 70 |
| | | | 2-Project Area Background | 28 | 92 | 40 | 56 | 70 | 79 | 86 | 70 |
| | | | 3-Built Project | 36 | 100 | 39 | 56 | 75 | 88 | 86 | 77 |
| | | | 4-Difference from Subarea Background | 3.4 | 3.6 | -17.1 | 1.7 | 11.8 | 14.3 | 6.1 | 6.6 |
| | | | 5-Change from Project Area Background | 8.0 | 7.7 | -1.3 | 0.0 | 5.2 | 9.7 | 0.0 | 7.4 |

We can also examine the project alternatives. Comparing the three trail alternatives, we note a striking difference across the three alternatives as to levels of safety. For two of the projects, safety is low throughout the subarea in which the alternative is located and it is even lower in the project area. In this example, the post-project condition is shown as identical to the pre-project condition. While this is unlikely, predictions about how safety (or its inverse, rates of crime) will change as a result of a trail being constructed are difficult. The greater accessibility, eyes-on-the-streets, and police patrols are likely to lower crime. On the other hand, an increase in use may also increase opportunities for crime, which may lead to an increase of crime. While the future condition is hard to predict, the need for a strategy to promote public safety is very clear.

We can also note that indicators for each project alternative are shown in absolute terms (first three lines) and relative terms (last two lines). The relative data compares the post-project condition to the existing subarea and project area conditions. The existing conditions are set to zero. Positive differences from these zero points are shown in green while red indicates project impacts that worsen existing conditions. In the safety data, we note that for both low-safety alternatives, the project areas have worse crime problems than the subarea as a whole. Since we could not estimate probable changes in crime, the post-project condition does not change relative to the pre-project condition in the project areas.

## 4.6 Module 6: Display Summary Metrics

The final module displays the seven criteria (indicator sets) and total project weighted scores visually using a key to highlight relative differences and changes from baseline to project conditions. It is equivalent to Module 5, except that while Module 5 presents the 28 unweighted indicators, Module 6 it presents the weighted scores. As such, it can be used to look at higher order trends and for examining overall project impacts. Since it incorporates the weights assigned by users, it will also reflect the subjective values held by the user.

**Table 10: Module 6, Visual Display of Weighted Indicators for Criteria Sets and for Overall Conditions**

| Project Name | Alt. # | Beltline Subarea | Condition | Accessibility | Healthy, Active Living | Economic Vibrancy | Greenspace & Environment | Housing & Community Design | Built Environment & Tax Base | Social & Environmental Equity | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| East Side Trail, South | 1 | 4 | 1-Subarea Background | 77 | 69 | 51 | 45 | 80 | 36 | 24 | 54 |
| | | | 2-Project Area Background | 79 | 77 | 54 | 48 | 85 | 46 | 29 | 60 |
| | | | 3-Built Project | 81 | 78 | 54 | 67 | 85 | 59 | 39 | 66 |
| | | | 4-Difference from Subarea Background | 3.1 | 9.4 | 3.6 | 33.9 | 5.1 | 41.1 | 26.8 | 17.6 |
| | | | 5-Change from Project Area Background | 1.5 | 1.3 | 0.0 | 19.0 | 0.7 | 13.3 | 10.0 | 6.5 |
| | | | | | | | | | | | |
| West End Trail, North | 2 | 10 | 1-Subarea Background | 69 | 55 | 29 | 60 | 68 | 39 | 60 | 54 |
| | | | 2-Project Area Background | 73 | 53 | 28 | 59 | 69 | 43 | 43 | 52 |
| | | | 3-Built Project | 75 | 54 | 28 | 71 | 69 | 55 | 53 | 58 |
| | | | 4-Difference from Subarea Background | 6.0 | -0.5 | -1.0 | 26.1 | 1.1 | 36.1 | 23.1 | 13.0 |
| | | | 5-Change from Project Area Background | 2.1 | 1.0 | 0.0 | 12.7 | 0.6 | 12.8 | 10.0 | 5.6 |
| | | | | | | | | | | | |
| West End Trail, South | 3 | 1 | 1-Subarea Background | 75 | 62 | 41 | 58 | 68 | 52 | 61 | 59 |
| | | | 2-Project Area Background | 74 | 55 | 43 | 51 | 67 | 50 | 39 | 54 |
| | | | 3-Built Project | 76 | 56 | 43 | 68 | 68 | 63 | 49 | 60 |
| | | | 4-Difference from Subarea Background | 3.0 | -2.2 | 6.1 | 28.0 | -0.1 | 37.3 | 21.0 | 13.3 |
| | | | 5-Change from Project Area Background | 1.5 | 1.4 | 0.0 | 17.0 | 0.6 | 12.8 | 10.0 | 6.2 |
| | | | | | | | | | | | |
| Ansley Mall | 1 | 6 | 1-Subarea Background | 60 | 72 | 67 | 75 | 83 | 74 | 35 | 67 |
| | | | 2-Project Area Background | 54 | 76 | 91 | 45 | 57 | 57 | 27 | 58 |
| | | | 3-Built Project | 58 | 82 | 168 | 76 | 83 | 112 | 38 | 88 |
| | | | 4-Difference from Subarea Background | -2.1 | 9.7 | 101.0 | 20.4 | -0.5 | 75.2 | 20.3 | 32.0 |
| | | | 5-Change from Project Area Background | 3.6 | 5.6 | 77.1 | 31.3 | 26.1 | 55.6 | 11.1 | 30.1 |

# 5 Case Studies

In order to test the Decision Support Tool, two hypothetical projects were examined. The projects included a set of three alternative plans for extension of the BeltLine trail system, and a proposal for redevelopment of one of the ten nodes identified by BeltLine planners as a probable site for higher intensity development. Both sets of proposals were drawn from actively promoted proposals. The three trail segments were each identified by the Atlanta Development Authority (for the Atlanta BeltLine Inc.) in proposals submitted to the Georgia Department of Transportation for Transportation Enhancement funds in December 2010. The Ansley Mall redevelopment proposal is drawn from general concept plans presented in the BeltLine Subarea 6 plan[1].

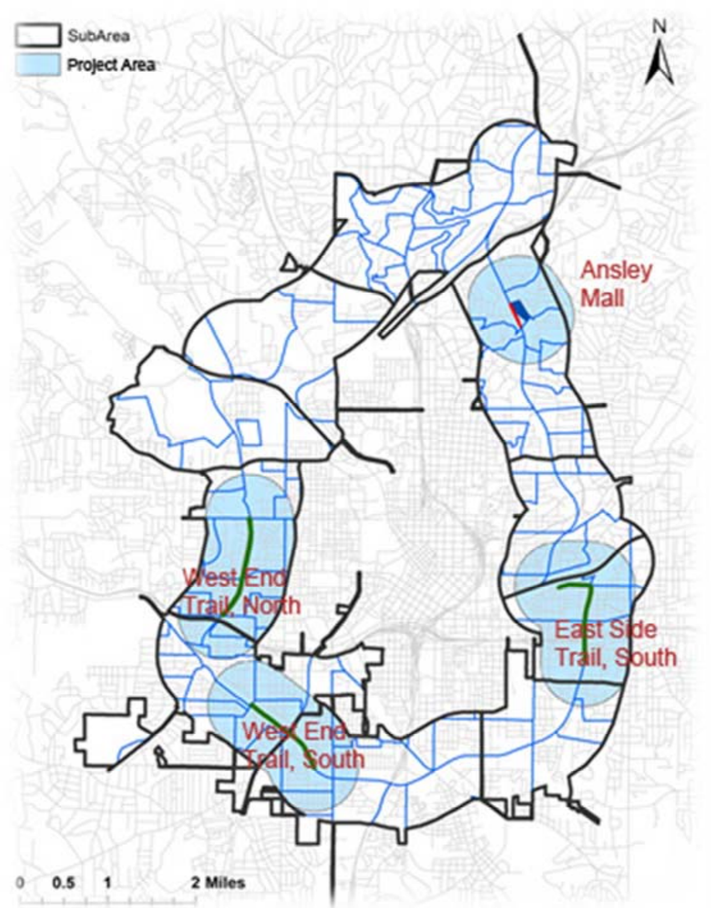


**Figure 11: Location of Hypothetical Projects Used to Test the DST**

The location of the trail and Ansley Mall projects are shown on the adjoining map.

## 5.1 Trails

The Atlanta Development Authority (ADA) and Atlanta BeltLine, Inc. (ABI) proposed to construct three trail segments, ranging from 1.5 miles for the East Side Trial, South to 1.9 miles for the West End Trail, North. The trails were design to be concrete 14 foot

[1] Atlanta BeltLine, Inc. (2011). *Atlanta BeltLine Master Plan: Subarea 6 Piedmont/Monroe Plan Recommendations Report* (Draft September 15, 2011).


**Figure 12: Map Showing Location of Trail Projects**

wide multi-use trail extensions as part of the Atlanta BeltLine 33-mile trail system. The trails were intended to provide improved connectivity and access to transit and existing multi-use trails for three neighborhoods in southeast and southwest Atlanta. All three alternatives would extend existing or planned trails, as well as connect parks, schools, neighborhoods, and retail centers. The attached map shows the location of the three trail projects.

The three alternatives share much in common, and this is reflected in the similarity of many of the indicators associated with the project. All projects are designed to the same standards, add the same tree canopy, alter impervious surface similarly, etc. Differences primarily stem from the neighborhoods and local conditions in which the trails would be built. A few differences stand out.

First, the community that surrounds the East Side Trail, South is more economically vibrant than those that would host the two extensions of the West End Trail. Incomes are substantially higher, as is educational achievement and tax base. The area also serves as home to fewer minorities and vulnerable populations. At the same time, the East Side project area faces more environmental threats, has substantially less tree canopy, and hosts less diverse land uses. The project impact on these variables would therefore be greater. Finally, as discussed above, the East Side Trail, South project area is considerably safer (fewer crimes) than are the West End neighborhoods.

The two West End Trail neighborhoods are much more similar, but a few differences are worth noting. Compared to the West End Trail South location, the neighborhood surrounding the North location is less walkable, less proximate to healthy foods, poorer, and hosts less commercial and industrial activity.

## Table 11: Impacts of Trails Projects

| Project Name | Alt. # | BeltLine Subarea | Condition | Accessibility: Street connectivity | Accessibility: Prevalence of sidewalk network | Accessibility: Uncongested roads (LOS = C or better) | Accessibility: Travel speed via transit | Healthy, Active Living: Walkability | Healthy, Active Living: Physical activity | Healthy, Active Living: Safety (few crimes) | Healthy, Active Living: Proximity to healthy food | Economic Vibrancy: Income | Economic Vibrancy: Employment | Economic Vibrancy: Retail & Industrial activities | Economic Vibrancy: Educational achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Side Trail, South | 1 | 4 | 1-Subarea Background | 49 | 96 | 81 | 83 | 63 | 74 | 63 | 75 | 63 | 29 | 36 | 75 |
| | | | 2-Project Area Background | 52 | 96 | 83 | 84 | 65 | 80 | 70 | 92 | 69 | 30 | 37 | 81 |
| | | | 3-Built Project | 55 | 100 | 83 | 84 | 68 | 82 | 70 | 92 | 69 | 30 | 37 | 81 |
| | | | 4-Difference from Subarea Background | 3.4 | 3.7 | 2.0 | 1.5 | 5.1 | 8.1 | 7.9 | 16.9 | 4.2 | 1.1 | 1.1 | 1.8 |
| | | | 5-Change from Project Area Background | 2.4 | 3.7 | 0.0 | 0.0 | 3.2 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | | | | | | | | |
| West End Trail, North | 2 | 10 | 1-Subarea Background | 40 | 94 | 60 | 81 | 49 | 79 | 14 | 77 | 39 | 13 | 18 | 45 |
| | | | 2-Project Area Background | 42 | 93 | 70 | 86 | 49 | 76 | 12 | 75 | 37 | 10 | 17 | 46 |
| | | | 3-Built Project | 43 | 100 | 70 | 86 | 50 | 80 | 12 | 75 | 37 | 10 | 17 | 46 |
| | | | 4-Difference from Subarea Background | 3.3 | 5.8 | 9.3 | 5.2 | 1.0 | 0.8 | -2.1 | -1.7 | -1.3 | -2.4 | -0.9 | 0.5 |
| | | | 5-Change from Project Area Background | 1.1 | 7.1 | 0.0 | 0.0 | 0.5 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | | | | | | | | |
| West End Trail, South | 3 | 1 | 1-Subarea Background | 46 | 96 | 86 | 70 | 67 | 70 | 28 | 83 | 47 | 33 | 37 | 47 |
| | | | 2-Project Area Background | 45 | 95 | 84 | 74 | 58 | 77 | -7 | 90 | 50 | 35 | 40 | 50 |
| | | | 3-Built Project | 46 | 100 | 84 | 74 | 59 | 81 | -7 | 90 | 50 | 35 | 40 | 50 |
| | | | 4-Difference from Subarea Background | 2.3 | 4.2 | 2.0 | 3.5 | 4.7 | 3.5 | -38.0 | 19.2 | 3.5 | 5.6 | 12.3 | 3.1 |
| | | | 5-Change from Project Area Background | 1.6 | 4.6 | 0.0 | 0.0 | 1.3 | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| Greenspace & Environment: Access to greenspace & trails | Greenspace & Environment: % canopy cover | Greenspace & Environment: Environmental sustainable design | Greenspace & Environment: Water quality | Housing & Community Design: Housing choice | Housing & Community Design: Health of housing market | Housing & Community Design: Affordability | Housing & Community Design: Density | Built Environment & Tax Base: Tax base | Built Environment & Tax Base: Art & historic preservation | Built Environment & Tax Base: Land use mix (entropy scores) | Built Environment & Tax Base: Compatibility with subarea plans | Social & Environmental Equity: Minority & special needs populations | Social & Environmental Equity: Historic expenditures by ABI | Social & Environmental Equity: Environmental quality | Social & Environmental Equity: Civic engagement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 37 | | 51 | 93 | 91 | 76 | 61 | 40 | | 32 | | 27 | | 20 | |
| 44 | 44 | 50 | 56 | 94 | 96 | 77 | 71 | 48 | 50 | 36 | 50 | 25 | | 39 | 50 |
| 47 | 72 | 90 | 61 | 94 | 99 | 77 | 71 | 51 | 50 | 36 | 100 | 25 | | 39 | 90 |
| 0.8 | 34.7 | 90.0 | 10.1 | 1.1 | 7.9 | 1.4 | 10.1 | 10.8 | 50.0 | 3.8 | 100.0 | -1.6 | 0.0 | 18.6 | 90.0 |
| 2.8 | 28.4 | 40.0 | 5.0 | 0.0 | 2.7 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 50.0 | 0.0 | 0.0 | 0.0 | 40.0 |
| | | | | | | | | | | | | | | | |
| 71 | 65 | | 46 | 91 | 64 | 64 | 54 | 15 | | 62 | | 58 | | 62 | |
| 70 | 69 | 50 | 46 | 87 | 67 | 64 | 57 | 15 | 50 | 55 | 50 | 59 | | 64 | 50 |
| 76 | 72 | 90 | 48 | 87 | 69 | 64 | 57 | 16 | 50 | 55 | 100 | 59 | | 64 | 90 |
| 5.3 | 7.2 | 90.0 | 1.9 | -3.6 | 5.3 | 0.0 | 2.7 | 0.9 | 50.0 | -6.5 | 100.0 | 0.5 | 0.0 | 1.9 | 90.0 |
| 5.5 | 3.4 | 40.0 | 2.0 | 0.0 | 2.5 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 50.0 | 0.0 | 0.0 | 0.0 | 40.0 |
| | | | | | | | | | | | | | | | |
| 91 | 63 | | 21 | 90 | 60 | 69 | 53 | 21 | | 82 | | 59 | | 62 | |
| 48 | 57 | 50 | 47 | 76 | 75 | 69 | 50 | 19 | 50 | 82 | 50 | 57 | | 51 | 50 |
| 57 | 72 | 90 | 51 | 76 | 77 | 69 | 50 | 20 | 50 | 82 | 100 | 57 | | 51 | 90 |
| -24.9 | 15.7 | 90.0 | 31.2 | -8.3 | 7.8 | -0.4 | 0.5 | 0.6 | 50.0 | -1.6 | 100.0 | -1.0 | 0.0 | -5.0 | 90.0 |
| 9.1 | 14.6 | 40.0 | 4.5 | 0.0 | 2.3 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 50.0 | 0.0 | 0.0 | 0.0 | 40.0 |



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We should note that none of these differences indicates in a clear and unambiguous manner which project should be designated for highest priority funding. If all criteria and indicators are equally weighted, the East Side South location would be the most highly rated. However, if for instance TADAC and ABI were particularly interested in promoting environmental justice, one of the two West End projects would likely be more highly rated. Concerns about crime might also be of particular concern in the choice.

While the DST would not unambiguously indicate which project is preferred, it does highlight the commonalities and differences that exist between the project areas, and allows for a discussion as to the import of these differences.

**Figure 13: Trail under Development and Upon Completion**

# 5.2 Ansley Mall Redevelopment

## 5.2.1 Background

Ansley Mall, located on the northwest corner of Piedmont Avenue and Monroe Drive, was the fourth shopping mall built in Atlanta when it opened in 1964. Developed by the Adams-Cates Company, the mall was designed as a 175,300 square foot, open-air complex, anchored by Woolworths and a Colonial supermarket. Over time, the mall has hosted a wide range of tenants, including a cinema and LA Fitness, but other than the addition of approximately 30,000 square feet of additional space, the mall's overall design has remained relatively stable over the past 50 years. The entire shopping complex was renovated in 1984 and again in the mid-2000s.


**Figure 14: Ansley Mall**

Today, the site is 668,948 square feet (15.36 acres), containing 206,754 square feet of developed commercial space. The site contains 101,854 square feet of pervious surface, mostly on the southwest edge along the stream. The mall complex is owned by Atlanta-based Selig Enterprises.

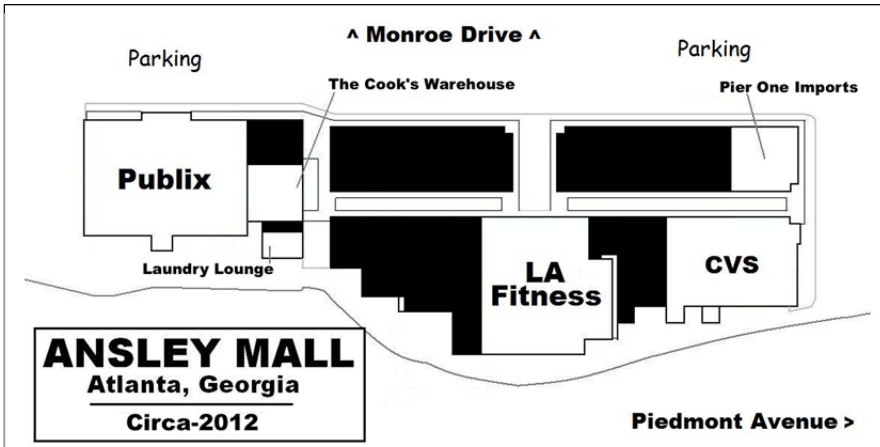



**Figure 15: Ansley Mall Map, With Major Tenants**

In addition to the mall, the site hosts a gas station on the corner of Piedmont and Monroe. The station sits on 22,828 square feet of land, of which 5,472 is covered by the building and 2,465 is pervious. Since any substantial redevelopment of Ansley Mall would almost certainly include the gas station in the redevelopment plans, the hypothetical redevelopment project discussed here also includes that property. In total, for the two parcels, the total parcel size is 691,776 sq. ft., with 212,226 sq. ft. of buildings and a Floor Area Ratio of 0.31.

**Figure 16: Ansley Mall Location Map**

An examination of the Ansley Mall location map shows the mall to be part of a much larger super-block transected by Clear Creek. Moreover, blocks surrounding the mall are also quite large.

### *5.2.2 New Development*

The hypothetical project considered for this test of the DST consists of one 10-story mid-rise (420,000 sq. feet), two 6-story mid-rises (252,000 sq. feet each), and three 4-story buildings (61,000 sq. feet each), for a total of 1,168,000 sq. ft. The buildings would cover 171,000 sq. ft.

**Figure 17: Hypothetical Design for Ansley Mall Redevelopment**

The resulting Floor Area Ratio is 1.69: a substantial increase in density over the current mall.

As noted above, this design was drawn directly from the Atlanta BeltLine Subarea 6 Plan. The subarea plan covered a substantially larger area of redevelopment than examined in this exercise, as shown in the attached figure. The Ansley Mall redevelopment was selected as the focus of this review because it is likely to be central to any redevelopment effort, given its size and location adjacent to the BeltLine.

The redevelopment envisioned would create a mixed-use community, with 355 residential units coupled with 130,000 sq. ft. of entertainment and retail, and 189,000 sq. ft. of office. Such a redevelopment could well serve as a seed for redevelopment of adjoining properties. The program for the buildings is shown in Table 12: Hypothetical Program for an Ansley Mall Redevelopment Project.

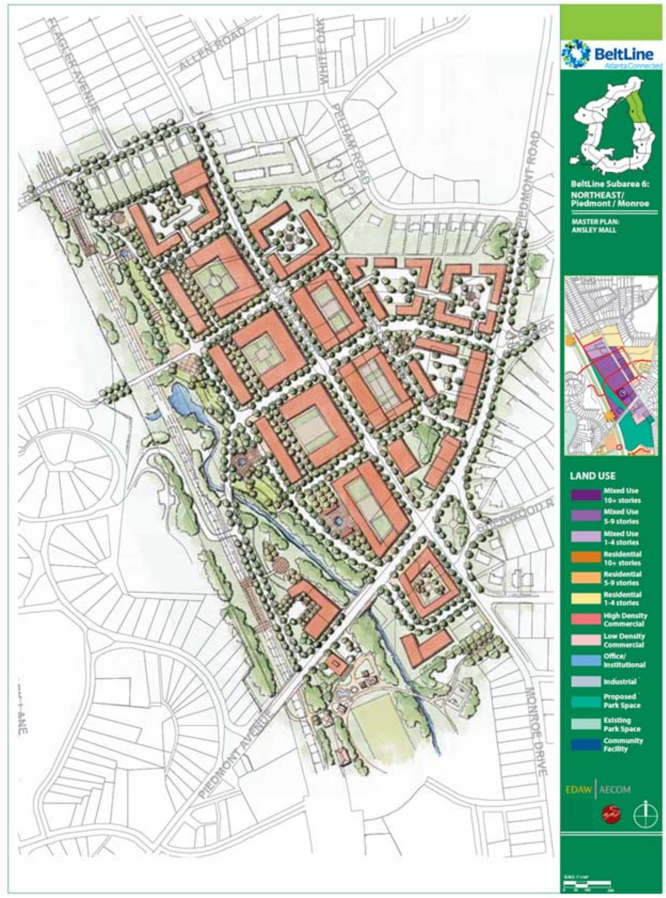



**Figure 18: Subarea 6 Plan, Vision for Ansley Mall Area**

The redevelopment also considers those parts of the BeltLine immediately adjoining Ansley Mall. In particular, the Subarea Plan proposes to increase connectivity through a series of new roads, including ones that cross Clear Creek. Roads that were proposed on or adjacent to the Ansley property were included in this hypothetical redevelopment proposal because they would be integral to any redevelopment that sought to fulfill the plans developed for Subarea 6.

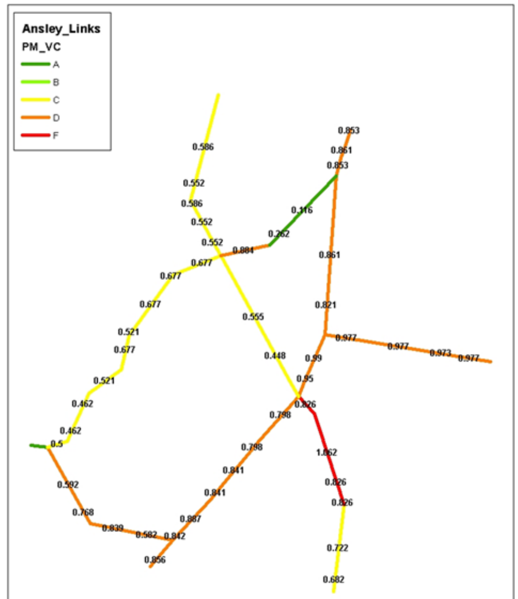
**Table 12: Hypothetical Program for an Ansley Mall Redevelopment Project**

| Use | # of units | Sq. feet per unit | Rentable Sq. Ft. | Gross Sq. Ft. | Parking Spaces Needed | | Total Parking Spaces Needed | Gross Sq. Ft. of Parking (350 $ft^2$ per space) |
|---|---|---|---|---|---|---|---|---|
| 1 BR Apt. | 220 | 700 | 154,000 | 200,200 | 1.25 | per unit | 275 | 96,250 |
| 2 BR Apt. | 110 | 1,050 | 115,500 | 150,150 | 1.50 | per unit | 165 | 57,750 |
| 3 BR Apt. | 25 | 1,300 | 32,500 | 43,250 | 1.75 | per unit | 43.75 | 15,313 |
| retail/ entertain | | | | 130,000 | 1 | per 325 $ft^2$ gross | 400.0 | 140,000 |
| office | | | | 189,000 | 1 | per 450 $ft^2$ gross | 420.0 | 147,000 |
| | | | **Sub-Totals** | **711,600** | | | **1303.8** | **456,313** |
| **Total Sq. Footage for Project: 1,167,913** | | | | | | | | |

**Figure 19: Proposed Redevelopment Plan**

### *5.2.3 Impacts of the Hypothetical Project*

Based on criteria included in the DST, the hypothetical Ansley Mall redevelopment would significantly enhance the BeltLine and surrounding neighborhood. All indicators except two would either be improved or remain unchanged. The two exceptions are in the Uncongested Roads and Affordable Housing indicators.



Traffic links on major roads within a half mile buffer of Ansley Mall. Congestion is concurrently shown for both travel directions.

**Figure 20: Analysis of Congestion**

The proposed project would generate greater levels of congestion than is currently experienced in the area. While no new road segments would move to Level of Service less than C, existing road segments with LOS of D and F would become even more congested. This increase in congestion on already congested roads is only partially captured by the indicator, and this analysis suggests that an alternative indicator that captures these differentials might be needed.

Housing affordability is expected to decrease in the absence of specific efforts to promote such housing in the redevelopment plan. The units, if built to market standards, are likely to be more expensive than housing in the vicinity. However, this impact would be relatively easy to ameliorate.

Many of the other variables are significantly improved by the project. The project has a particularly substantial impact on improving employment and tax base, with improvements in housing choice, canopy cover, compatibility with subarea plans, retail & industrial activities, and environmental sustainable design also being quite strong. Other indicators with solid improvements over existing conditions include access to greenspace and trails, water quality, physical activity, density, street connectivity, prevalence of sidewalk network, proximity to healthy food, and walkability. Overall environmental quality, health of housing market, and income also show minor improvements. Travel speed via transit does not change because the streetcar system was not presumed to be completed before the redevelopment project. However, travel speed via transit would substantially improve once the streetcar is operational.

## Table 13: Results of Hypothetical Ansley Mall Redevelopment Analysis

| | Accessibility | | | | Healthy, Active Living | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | Street connectivity | Prevalence of sidewalk network | Uncongested roads (LOS = C or better) | Travel speed via transit | Walkability | Physical activity | Safety (few crimes) | Proximity to healthy food |
| 1-Subarea Background | 33 | 96 | 56 | 54 | 63 | 74 | 80 | 70 |
| 2-Project Area Background | 28 | 92 | 40 | 56 | 70 | 79 | 86 | 70 |
| 3-Built Project | 36 | 100 | 39 | 56 | 75 | 88 | 86 | 77 |
| 4-Difference from Subarea Background | 3.4 | 3.6 | -17.1 | 1.7 | 11.8 | 14.3 | 6.1 | 6.6 |
| 5-Change from Project Area Background | 8.0 | 7.7 | -1.3 | 0.0 | 5.2 | 9.7 | 0.0 | 7.4 |

| | Economic Vibrancy | | | | Greenspace & Environment | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | Income | Employment | Retail & industrial activities | Educational achievement | Access to greenspace & trails | % canopy cover | Environmental sustainable design | Water quality |
| 4-Difference from Subarea Background | 91 | 38 | 42 | 96 | 89 | 75 | | 60 |
| 5-Change from Project Area Background | 95 | 147 | 28 | 94 | 79 | 6 | 50 | 44 |
| 1-Subarea Background | 97 | 412 | 68 | 94 | 91 | 70 | 90 | 54 |
| 2-Project Area Background | 6.1 | 374.4 | 25.9 | -2.4 | 2.2 | -4.6 | 90.0 | -6.0 |
| 3-Built Project | 2.1 | 265.8 | 40.6 | 0.0 | 11.4 | 64.0 | 40.0 | 10.0 |

| | Housing & Community Design | | | | Built Environment & Tax Base | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | Housing choice | Health of housing market | Affordability | Density | Tax base | Art & historic preservation | Land use mix (entropy scores) | Compatibility with subarea plans |
| 2-Project Area Background | 93 | 92 | 82 | 67 | 90 | | 59 | |
| 3-Built Project | | 93 | 82 | 52 | 69 | 50 | 58 | 50 |
| 4-Difference from Subarea Background | 94 | 97 | 81 | 60 | 241 | 50 | 58 | 100 |
| 5-Change from Project Area Background | 0.6 | 4.9 | -0.4 | -7.2 | 151.6 | 50.0 | -1.0 | 100.0 |
| 1-Subarea Background | 93.8 | 3.3 | -0.9 | 8.1 | 172.5 | 0.0 | 0.0 | 50.0 |

| | Social & Environmental Equity | | | |
|---|---|---|---|---|
| **Condition** | Minority & special needs populations | Historic expenditures by ABI | Environmental quality | Civic engagement |
| 5-Change from Project Area Background | **17** | | **53** | |
| 1-Subarea Background | **17** | | **40** | **50** |
| 2-Project Area Background | **17** | | **44** | **90** |
| 3-Built Project | 0.4 | 0.0 | -9.2 | 90.0 |
| 4-Difference from Subarea Background | 0.4 | 0.0 | 3.9 | 40.0 |

At the same time, despite the fact that this project strongly enhances the criteria developed for the BeltLine, the project would in all likelihood face considerable community concern. Given the history of neighborhood concern about density and traffic, as well as potential concerns about increases in road network connectivity, the project proposal review process would need to be linked to a substantial community engagement process, one that proactively worked with community residents to identify and ameliorate concerns.

# 6 Conclusions and Next Steps

The Beltline Tax Allocation Advisory Committee (TADAC) together with the Atlanta Beltline Inc. (ABI) contracted with the Georgia Tech Center for Quality Growth and Regional Development and its partners from Georgia Tech and Cambridge Systematics to develop a tool in support of systematic decision-making for the Beltline. The decision support tool (DST) was designed to support TADAC, Atlanta BeltLine Inc., and stakeholders in process and program decisions, helping to clarify and enumerate the goals, objectives, and vision for the BeltLine, and allowing scenarios to be compared on their ability to effectively and equitably realize that vision.

As noted above, the DST is a process, rather than a tool box, in which each actor communicates to determine the best solution or scenario. The process of the DST has to date been divided into four stages. In the first stage, the vision and goals of the BeltLine were identified, and a strategy set to achieve the identified vision and goals. Baseline goals for the BeltLine and the Subareas were largely identified within the context of planning for the 2005 Atlanta BeltLine Redevelopment Plan, the ten Subarea Plans, and their various revisions. In the second stage, the guiding principles, applications, and overall framework for the DST were developed through a consensual process with TADAC, ABI, and other stakeholders. This was accomplished during spring and summer of 2011. Third, using this strategy and framework, a way to measure and analyze possible decisions was created using demographic, economic, fiscal, transportation, and health and environmental impact metrics. Finally, the model was developed and tested between fall 2011 and spring 2012. ABI staff was trained on the use of the DST in June.

This document constitutes the Final Report for Phase I of the DST development project. This report described the background for the project, outlined the framework and structure of the DST model, and explained the working of the model. The model was tested using two case studies and revised to meet objectives of TADAC and ABI. Together with the data used to create the model and the model itself, the final report constitutes the work contracted in Phase I of the project.

Phase II, (if funded), will provide ongoing review, continual improvement, and technical support for the Decision Support Tool, and provide analysis of baseline and project proposals using the DST framework as needed. Continuing into the future, five essential functions must be met.

First, the databases used to create the variables and indicators must be updated on a regular schedule.

1. 2010 census data: core demographic data (e.g., population, minority status, age) were derived from the 2010 decennial US Census. This data is derived from actual counts of individuals rather than sampling techniques. However, the data is obtained only once every ten year. The Census therefore provides highly accurate information for this initial version of the DST, but will prove progressively less useful over the next 10 years. Estimates of these variables will need to be obtained from other sources, such as the Atlanta Regional Commission, and updated every two to three years, as available.
2. American Community Survey (ACS): the ACS is an ongoing statistical survey by the U.S. Census Bureau, providing data on variables such as income and housing. Variables derived from the ACS for the DST are based on data collected over the past five years of ACS in order to smooth out perturbations caused by its small sample size. The measures thereby constructed are more stable than what could be constructed from annual data, but also are less responsive to recent changes in income and housing. This data will need to be updated annually, dropping data from the oldest year and replacing it with data from the most recent year.
3. Claritas Data: Claritas, a service of The Nielsen Company, collects and tabulates marketing information. Claritas databases are used to determine the location of commercial and industrial businesses, number of employees, value of business and similar data. Claritas data is updated on a continuous basis. Given the rapid rate of change in businesses adjoining the BeltLine, this data should be updated every two years.
4. CQGRD GIS base maps: These databases provide base physical data locating the street and railroad networks, jurisdictional lines, and similar information. These data change slowly for most of the city, and can be updated on an ongoing basis for changes made within the BeltLine planning areas.
5. City of Atlanta GIS Data: The City of Atlanta created and maintains a wide array of GIS databases, several of which were used in the construction of the DST. These include databases showing location of all building permits, brown fields, flood risk zones, impervious surfaces, park and trails, and tax parcels. The rate of update needed for the DST depends on the speed of change in the variable. Permits and brownfields should be updated annually; the remaining variables can be updated to account for significant changes, such as the creation of a new park.
6. Atlanta BeltLine Inc. TAD and Subarea Plan boundaries: provides boundaries to the TAD and planning areas used by ABI, and the DST, to organize its research and decision making processes. These boundaries will need to be changed only if the boundaries themselves are altered.

7. Atlanta Police Department: Crime data identifying the location of property and violent crimes. This should be updated annually.
8. Fulton County Tax Assessments: The County of Fulton created and maintains a database of all property assessments throughout the county. When linked to parcel locations, these provide the basis for analyzing property values. This should be updated annually.
9. The University of Georgia's Natural Resources Spatial Analysis Laboratory Georgia Land Use Trends Canopy Cover Data: Tree cover for the city of Atlanta was obtained for the year 2008. This should be updated whenever UGA updates its data, which historically has been once every five to seven years.
10. The Georgia Department of Transportation and the Atlanta Regional Commission road capacity databases: Provide information concerning the capacity of roads and actual traffic volumes for different times of the day and week. The road network capacity is reasonably stable and does not require frequent update except in as much as major changes are made to the network. Traffic volume, however, is more variable and should be updated at least every other year.
11. Google Map: Google Map provides a function for estimating the length of time to travel from any point in the city to any other point in the city using transit. Google Map was used to estimate transit travel times, as noted below. This should be updated whenever major changes are made to the transit system and at least every other year to reflect changes in transit speed.

Secondly, data for project proposals must be collected, incorporated into the model, and analyzed. This must be done for each proposal, and for each alternative being considered to that proposal. Both the number of proposals being considered by TADAC and ABI and the complexity of their alternatives will vary considerably year by year.

Thirdly, baseline conditions must be updated on an annual basis to incorporate new data. This will provide a current perspective as to conditions facing each subarea, providing a record for assessing trends over time and allowing TADAC, ABI, and stakeholders to better understand current trends.

Fourth, the DST itself should be evaluated and improved over time. This includes its framework, variable list, data protocols, indicators, and analytic techniques. Changes should be made in response to experience in using the DST and user needs and feedback.

Finally, the ongoing use and management of the DST will require technical support. The DST consists of a complex array of background databases and GIS capabilities. The User Interface, while intended for stakeholder use, will require an operator with detailed familiarity with its functions and operations.

These functions can either be performed internally by ABI technical staff or externally by the Center for Quality Growth and Regional Development or other consultant. There are advantages to either model. Internal management allows for better consistency of staffing and potentially better integration into ABI and TADAC decision making processes. External management allows for better access to technical and research skills and provides for a more neutral forum for managing the DST and analyzing data analysis. The ultimate approach will need to be worked out by TADAC and ABI, but the Center for Quality Growth and Regional Development stands ready to help as needed.

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# 8 Appendix A: Detailed Descriptions of Variable Calculations

This section provides a detailed documentation of the description, calculation and technical steps involved in constructing the variables utilized in the DST.

Note: The GIS layers of sub-area boundary and block groups are unioned to provide the base for GIS calculations. A new spatial unit is created as the basic unit for this study. Block groups are cut by study area sub-area boundaries. NewID is created as the identifier for each unit: the first part is the Subarea ID, and the second part is the blockgroup ID.

<table>
<tr><td>short name</td><td>full name</td><td>Sources</td></tr>
<tr><td>SubArea_ID</td><td>subarea ID</td><td>Census 2010 (blocks); City of Atlanta (subareas)</td></tr>
<tr><td>Pop_total</td><td>total population</td><td>census 2010</td></tr>
<tr><td colspan="3"><ul><li>The total population is aggregated from the block level. If a block crosses subarea boundary, the new population is calculated by (area that falls into subarea)/(total area)*(original block population).</li><li>The population for the subarea is a sum of the component blocks' population.</li></ul></td></tr>
<tr><td>PopDense_SqMile</td><td>population density: persons/sq mile</td><td>census 2010</td></tr>
<tr><td colspan="3">Population density is calculated by population divided by area (sq. mile). The geometry of any polygon (such of block group) is found via "Calculate Geometry" within the polygon attribute table in ArcGIS.</td></tr>
<tr><td>Metric_Length_mile</td><td>metric reach</td><td>City of Atlanta, GIS division, Chuck Shultz, cshultz@atlantaga.gov, (Atlanta Streets)</td></tr>
<tr><td colspan="3">The total length of streets reached from a single point up to 0.5 mile in all directions based on street network is defined as metric reach. It gives a measure of network density and to what extent streets are connected. The ideal scenario is a 1/16 mile by 1/16mile grid street system, which will generate metric reach scores of 16.<br>The variable is calculated based on the street network dataset from City of Atlanta.<br><br>GIS:<ul><li>The first step is to create a transportation network in GIS. Create a personal geodatabase, call it Beltline_1012.mdb. create feature dataset, call it transportNET. Import the street layer into this feature dataset (this can be done in ArcCatalog or ArcToolbox). Right click the feature dataset, create network, set the street layer as the</li></ul></td></tr>
</table>

basis. A transport network based on the Atlanta street network is created, is the basis for other network analysis.

- Then run 'make service area layer', select option ' generating true lines'.
- 'New service area', go to layer properties, set impedance to 2640 feet.
- 'Load locations' to add the sampling points as starting points, set 'generate lines' and 'overlapping lines'.
- 'solve' to get the network lines. This will generate the service area dataset. Open the attribute table for lines. Facility ID is sampling points' identification. Create new filed Length_metric, and calculate geometry to get the length of each service road
- Run 'summarize' in GIS by facility ID to get the total length of streets reached from each point.

| | | |
|---|---|---|
| Sidewalk_ratio_SBA | Streets with sidewalks, % | Impervious Surface-sidewalk, Atlanta Streets, City of Atlanta GIS data, GIS division, Chuck Shultz, cshultz@atlantaga.gov |

- The variable calculated what percentage of streets have sidewalks.
- It is based two GIS datasets: street layer and impervious surface – sidewalk layer.

GIS:

- street layer is polyline and sidewalk layer is polygon.
- Generate a 60 feet buffer layer for the sidewalk layer.
- Union this buffer layer with the street layer, get street_sidewalk_Buff.shp. Streets are identified as with sidewalks and without sidewalks.
- Street segments with the field "BUFF_DIST" equal to 60 are streets with sidewalks.
- Inter sect street_sidewalk_Buff.shp with the subarea boundary layer.
- Calculated total length of streets with sidewalks, and then divided by total length of streets to get the ratio of streets with sidewalks for each subarea.

| | | |
|---|---|---|
| Congestion_V_CR | %V/Crs > 0.75 (LOS = D or F) | ARC, Plan 2040 Loaded Networks for 2010, Guy Rousseau, Surveys & Transportation Model Development Manager, grousseau@atlantaregional.com |

- Definition: %V/Crs > 0.75 (LOS = D or F).
- The percent of lane miles which V/C over LOS D is found. (LaneMilesOverLOSD)/(TotalLaneMiles).
- Measures congestion using segments in the network, excluding TAZ connectors, freeways and on-ramps.
- Each segment gives two volumes, one for each direction of travel (unless one way). Each direction is considered separately.
- The data is presented as a ratio, not a percentage. (i.e. 100% = 1)
  1.

**Baseline Calculation Steps**

- In ArcMap, intersect total10_fin_links.shp with Union_BLG_SBA_diss.shp to create total10_links_blg_sbd_intrsct.shp
- In Access, find the maximum hourly volume to capacity ratio (MAX_VC) among the 4

time periods for each OBJECTID
  - The time periods are AM (6 AM to 10 AM), Midday (10 AM to 3 PM), PM (3 PM to 7 PM) and Nighttime (7 PM to 6 AM). The capacities for each period must be divided by the amount of hours during that period to find the hourly volume for the period.
  - Volumes are in fields V_AM ,V_MD, V_PM, and V_NT
  - Capacities are in fields AMCAPACITY, MDCAPACITY, PMCAPACITY, and NT CAPACITY
  - The time period with the MAX_VC is identified in the MAX_HOUR field
- In Access, calculate the number of lane miles (LANE_MILES) in each OBJECTID by multiplying the LANES field by the DISTANCE field
- In Access, calculate the number of lane miles for links above LOS D by multiplying the LANES field by the DISTANCE field for all OBJECTID's with MAX_VC greater than or equal to .75.
- In Access calculate the total LANE_MILES in each NEW_ID by summing LANE_MILES and grouping by NEW_ID
  - Eliminate highway segments by only selecting OBJECTID's with FACTYPE of 2 Or 12 Or 13 Or 14 Or 15 Or 17 Or 18
- In Access calculate the total LANE_MILES above LOS D in each NEW_ID by summing LANE_MILES and grouping by NEW_ID for all OBJECTID's with MAX_VC greater than or equal to .75.
  - Eliminate highway segments by only selecting OBJECTID's with FACTYPE of 2 Or 12 Or 13 Or 14 Or 15 Or 17 Or 18
- Calculate Congestion_V_CR for the Blockgroup (New_ID) level by dividing LOS D Lane Miles by Total Lane Miles for each NEW_ID from Union_BLG_SBA_diss.shp.
  - See BLG_Pct_St_D_F_Query for query design
  - See BLG_Pct_St_D_F for results table
- Calculate Congestion_V_CR for the Subarea level by dividing LOS D Lane Miles by Total Lane Miles and grouping by Subarea and selecting for NewID's in the 10 subareas.
  - See SBA_Pct_St_D_F_Query for query design
- See SBA_Pct_St_D_F for results table

## Project Area Calculation Steps

- Generate new traffic volumes for new land uses using ITE Trip Generation handbook
  - For all links, use PM traffic volumes
  - Ansley Mall Scenario 1: Z:\Research\CQGRD\PROJECTS\Beltline DST Project 2011\GIS\Maps\Copy of Space requirements for development (version 2).xlsx
  - Ansley Mall Scenario 2: Z:\Research\CQGRD\PROJECTS\Beltline DST Project 2011\GIS\Maps\Space requirements for alternative development (version 2).xlsx
- In ArcMap, allocate new traffic to each link

   - Create segments for Ansley Mall project by clipping total10_links_blg_sbd_intrsct.shp to Ansley Mall project area half mile buffer (Ansley_ha_mi.shp) to create Ansley_Links.shp
- In ArcMap, create new fields to manually enter new traffic to each link.

In Access, follow steps for Baseline Calculation to compute Congestion_V_CR for both the current and proposed land uses.

| | | |
|---|---|---|
| Travel_5point_mins | Time to Five Points MARTA | Google Map |

The travel time between sampling points and Five Points is calculated in Google Map's 'Get Directions by public transit'. The data is acquired using a weekday afternoon schedule.

| | | |
|---|---|---|
| WalkScore | Walkability score | Claritas Data, street network |

- The facilities are classified into the following categories by NAICS code, the following operations will be done separately for each category:

1. Grocery: 445110
2. Restaurant: 722
3. Coffee shop: 722213
4. Bank: 522110
5. Park: 712190 & 712130
6. School: 6111-6113
7. Bookstore: 4512
8. Entertainment: 71

In the walkscore_claritas.shp. the field Walkscore contains identification information about these nine categories.

- Network distance between sampling points and amenity facilities is calculated by 'New OD matrix' based on street network.
- The OD matrix table will be input into Access database. Run Crosstab query, to retrieve the network distances to the closest facilities for each category.

The walkability score in this study tries to replicate the Walk Score methodology.
The following categories, counts and weights are used:

```
amenity_weights = {
"grocery": [3],
"restaurants": [.75, .45, .25, .25, .225, .225, .225, .225, .2, .2],
"shopping": [.5, .45, .4, .35, .3],
"coffee": [1.25, .75],
"banks": [1],
"parks": [1],
"schools": [1],
"books": [1],
"entertainment": [1],
}
```

The distance decay function determines what percentage of a full score an amenity facility will receive based on network distance to its origin. Facilities within 0.25 mile will receive 100%

<table>
<tr><td colspan="3">of full score. Beyond 0.25 miles, the distance decay function is defined as y=1.225-0.9*distance. Under this function, 1.36 mile is the upper bound for calculating walkability score. Facilities beyond 1.36 mile will have a percentage of 0.<br>Multiply the amenity_weights with distance decay percentage, and add these results up for each sampling points. The maximum walkability scores that can be generated using this methodology is 15.</td></tr>
<tr><td>Park_distance</td><td>Distance from major park and trail</td><td>City of Atlanta GIS data, GIS division, Chuck Shultz, cshultz@atlantaga.gov</td></tr>
<tr><td colspan="3">• Parks and trails larger than 100,000 sq. ft are selected as major parks and trails.<br>• Spatial join between the sampling points and the park layer is done to get the aerial distance to the closest park from each sampling point (Euclidian distance to the edge of the trails/parks)</td></tr>
<tr><td>VioCrime</td><td>Violent crimes, rate per 1,000 residents</td><td>Atlanta Police Department, 2012 Crime Data, http://www.atlantapd.org/pdf/crime-data-downloads/69DC94A1-E74B-4640-9FEE-4626A8DB081B.zip<br>Population: American Community Survey, Block Group Population, 2006-2010 five year estimates</td></tr>
<tr><td colspan="3">• (Violent Crimes Committed between 2006 and 2010)/5)/(2006-2010 average population)<br>• Data from Atlanta PD provided as a .txt<br>• Data converted to GIS usable format using provided X,Y coordinates<br>• Violent crimes include Aggravated Assault, Homicide, Rape and Robbery<br>• The Atlanta dataset available online only includes crimes reports since 2009<br>• Data from 2006 came from Arthi Rao, PhD research assistant at CQGRD</td></tr>
<tr><td>ProptyCrime</td><td>Property crimes, rate per 1,000 residents</td><td>Atlanta Police Department, 2012 Crime Data, http://www.atlantapd.org/pdf/crime-data-downloads/69DC94A1-E74B-4640-9FEE-4626A8DB081B.zip<br>Population: American Community Survey, Block Group Population, 2006-2010 five year estimates</td></tr>
<tr><td colspan="3">• (Property Crimes Committed between 2006 and 2010)/5)/(2006-2010 average population)<br>• Data from Atlanta PD provided as a .txt<br>• Data converted to GIS usable format using provided X,Y coordinates<br>• Property crimes include Auto Theft, Burglary, Larceny<br>• The Atlanta dataset available online only includes crimes reports since 2009<br>• Data from 2006 came from Arthi Rao, PhD research assistant at CQGRD<br>4.</td></tr>
<tr><td>supermarket_distanc</td><td>Distance to nearest</td><td>Claritas Data, 2006</td></tr>
</table>

<table>
<tr><td>e</td><td>major supermarket or farmers market</td><td></td></tr>
<tr><td colspan="3">
<ul>
<li>Major supermarket and farmers markets are selected from the Claritas dataset using NAICS code, 44511 Supermarkets and Other Grocery (except Convenience) Stores); 44521 (Meat Markets); 44522 (Fish and Seafood Markets); and 44523(Fruit and Vegetable Markets).</li>
<li>Create a new field, call it “heathmarket”, assign 1 to these selected records.</li>
<li>Run ‘network analyst’-> ‘New OD cost matrix’, add sampling points as origins, and selected super markets layer as destinations. Summarize by sampling point ID, and get the minimum distance for each sampling point.</li>
</ul>
</td></tr>
<tr><td>Med_hs_income</td><td>Median earnings</td><td>ACS 2006-2010</td></tr>
<tr><td colspan="3">Median household income is obtained from American community survey 2006-2010. The subarea level median household income is calculated as the weighted average of the component blockgroups. The equation is<br>$\sum \frac{area\ of\ block\ group}{area\ of\ subarea} * median\ household\ income\ of\ blockgroup$</td></tr>
<tr><td>Pov_Total_PCT</td><td>% of Population below poverty line</td><td>ACS</td></tr>
<tr><td colspan="3">The percentage of population below poverty line is obtained from American Community Survey 2006-2010. The subarea level variable is calculated as the weighted average of the component blockgroups. The equation is $\sum \frac{area\ of\ block\ group}{area\ of\ subarea} * \%\ of\ poverty\ of\ blockgroup$</td></tr>
<tr><td>POV_bel50_PCT</td><td>% of Population below 50% poverty line</td><td>ACS</td></tr>
<tr><td colspan="3">The percentage of population below 50% of poverty line is obtained from American Community Survey 2006-2010 . The subarea level variable is calculated as the weighted average of the component blockgroups. The equation is<br>$\sum \frac{area\ of\ block\ group}{area\ of\ subarea} * \%\ below\ 50\%\ \ poverty\ of\ blockgroup$</td></tr>
<tr><td>total_JOBs</td><td>total number of jobs</td><td>Claritas Data</td></tr>
<tr><td colspan="3">The total number of jobs for each subarea is calculated based the Claritas dataset. Spatial join between subarea boundary and Claritas business is done to calculate the total number of jobs. Each subarea will be given the sum of the attribute information (number of jobs) of the Claritas establishment point that fall into it.</td></tr>
<tr><td>Jobs_Acre</td><td>jobs / acre</td><td>Claritas Data</td></tr>
<tr><td colspan="3">Jobs is calculated by the above total number of jobs divided by acres.</td></tr>
<tr><td>SumOfRetailNo</td><td># of retailing establishments</td><td>Claritas Data</td></tr>
<tr><td colspan="3">Establishment of retailing is selected by NAIICS code 44-45. Spatial join between subarea boundary and Claritas business is done to calculate the total number of establishments. Each subarea will be given the summary (count) of the Claritas establishment points that fall into it.</td></tr>
<tr><td>IndustryEstabNO</td><td># of Industry establishments</td><td>Claritas Data</td></tr>
<tr><td colspan="3">Establishment of industry is selected by NAIICS code 31-33. Spatial join between subarea</td></tr>
</table>

<table>
<tr><td colspan="3">boundary and Claritas business is done to calculate the total number of establishments. Each subarea will be given the summary (count) of the Claritas establishment points that fall into it.</td></tr>
<tr><td>OfficeEstabNO</td><td># of office establishments</td><td>Claritas Data</td></tr>
<tr><td colspan="3">Establishment of industry is selected by NAIICS code 51-55. Spatial join between subarea boundary and Claritas business is done to calculate the total number of establishments. Each subarea will be given the summary (count) of the Claritas establishment points that fall into it.</td></tr>
<tr><td>NonFamPermit_Acre</td><td>Non-housing permit / acre</td><td>Building Permit, City of Atlanta GIS data, Chuck Shultz, cshultz@atlantaga.gov</td></tr>
<tr><td colspan="3">• The permit are classified into housing-related and non-housing permit using the field “SCOPE-DESC”. The field “SCOPE-DESC” provides information for the characteristics of permit. If it contains the word ‘ residential’, ‘residence’ or ‘ family’ , it is classified as housing-related permit. Create a new field, call it FamPermit, assign 1 to these selected. Otherwise it is non-housing permit.<br>• Properties->definition query, select these with FamPermit as 0.<br>• Spatial join from subarea boundary to building permit layer is done to calculate the count of building permits within each subarea.</td></tr>
<tr><td>POP_HIGHgrad_PCT</td><td>High school grads, %</td><td>ACS</td></tr>
<tr><td colspan="3">Population education data is obtained from American Community Survey 2006-2010. Population of the blockgroup level data is aggregated to the subarea level.</td></tr>
<tr><td>POP_BACHOR_PCT</td><td>College grads, %</td><td>ACS</td></tr>
<tr><td colspan="3">Population education data is obtained from American Community Survey 2006-2010. Population of the blockgroup level data is aggregated to the subarea level.</td></tr>
<tr><td>Park_25mile</td><td>Residents w/in .25 miles of green space</td><td>Park and trails, City of Atlanta GIS data, Chuck Shultz, cshultz@atlantaga.gov</td></tr>
<tr><td colspan="3">• 0.25 mile buffer zones are generated for all the parks.<br>• ‘Union’ the buffer zones with the subarea boundary. The subareas are separated into covered by park buffers and not covered by park buffers.<br>• Get the total area for the space covered by park buffers, and calculate the ratios.</td></tr>
<tr><td>Park_Pop_000</td><td>Park acres/1000 population</td><td>Park and trails, City of Atlanta GIS data, Chuck Shultz, cshultz@atlantaga.gov</td></tr>
<tr><td colspan="3">• Intersect Park layer with subarea boundary layer.<br>• Summarize by subarea ID to get the total acres of parks within each subarea.<br>• Calculation: park acres / (1000 population)</td></tr>
<tr><td>Tree_ratio</td><td>tree coverage ratio</td><td>Georgia Land Use Trends Canopy Cover of Georgia 2008,Natural Resources Spatial Analysis Laboratory</td></tr>
<tr><td colspan="3">• ‘Polygon to Raster’: convert subarea boundary shapefile into a raster file.<br>• Spatial analyst tool->zonal->zonal statistics as table: set subarea raster file as input raster feature zone data, subarea field as zone field, tree canopy file as input value raster. Get the table.<br>• The value field contains value for percentage of canopy coverage.</td></tr>
</table>



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5. The value is defined in the metadata file as follows:
6. 0 : 0 Percent Canopy
7. 1 : 1-5 Percent Canopy
8. 2: 6-10 Percent Canopy
9. 3: 11-15 Percent Canopy
10. 4: 16-20 Percent Canopy
11. 5: 21-25 Percent Canopy
12. 6: 26-30 Percent Canopy
13. 7: 31-35 Percent Canopy
14. 8: 36-40 Percent Canopy
15. 9: 41-45 Percent Canopy
16. 10: 46-50 Percent Canopy
17. 11: 51-55 Percent Canopy
18. 12: 56-60 Percent Canopy
19. 13: 61-65 Percent Canopy
20. 14: 66-70 Percent Canopy
21. 15: 71-75 Percent Canopy
22. 16: 76-80 Percent Canopy
23. 17: 81-85 Percent Canopy
24. 18: 86-90 Percent Canopy
25. 19: 91-95 Percent Canopy
26. 20: 96-100 Percent Canopy
27. The newly generated field "MEAN" contains the value for average canopy coverage. The Final canopy score = "MEAN"*5/100

| | | |
|---|---|---|
| Impervious_ratio | Impervious surface ratio | Impervious Surface, City of Atlanta GIS data, GIS division, Chuck Shultz, cshultz@atlantaga.gov |

- The percentage of impervious surface in each subarea
- The impervious surfaces contain: Bridges, buildings, roads, parking, sidewalks.
- Union all five layers, get Impervious_union.shp
- Intersect Impervious_union.shp with subarea boundary layer.
- Summarize by subarea id to get total acres of impervious surface in each subarea.
- Divided by total acres of each subarea, and get the ratios.

| | | |
|---|---|---|
| HSING_1uATT_PCT | Single-family attached housing units, % | ACS |

- Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected
- Get total number of single-family housing in each subarea: sum of all component blockgroups' single-family housing units.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * single\ family\ housing$$

- Get total number of housing in each subarea: sum of all component blockgroups'

| | | |
|---|---|---|
| housing units. $$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ housing\ units$$ 28. <br>• Calculate the ratio | | |
| HSING_24u_PCT | Multi-family 2-4 units, % | ACs |
| • Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected <br>• Get total number of single-family housing in each subarea: sum of all component blockgroups' 2-4 units housing. $$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * 2-4\ unit\ family\ housing$$ • Get total number of housing in each subarea: sum of all component blockgroups' housing units. $$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ housing\ units$$ 29. <br>• Calculate the ratio | | |
| HSING_5PLUS_PCT | Multi-family 5+ units, % | ACS |
| • Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected <br>• Get total number of single-family housing in each subarea: sum of all component blockgroups' housing with more than 5 units. $$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * 5+\ unit\ family\ housing$$ • Get total number of housing in each subarea: sum of all component blockgroups' housing units. $$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ housing\ units$$ 30. <br>• Calculate the ratio | | |
| HSING_occpy_PCT | housing Occupancy rate | ACS |
| • Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected <br>• Get total number of single-family housing in each subarea: sum of all component blockgroups' occupied housing units. $$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * occupied\ family\ housing$$ • Get total number of housing in each subarea: sum of all component blockgroups' housing units. | | |

<table>
<tr><td colspan="3">

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ housing\ units$$

31.

- Calculate the ratio
</td></tr>
<tr><td>FamPermit_Acre</td><td>housing Building permits/ acre</td><td>Building Permit, City of Atlanta GIS data, GIS division, Chuck Shultz, cshultz@atlantaga.gov</td></tr>
<tr><td colspan="3">

- The permit are classified into housing-related and non-housing permit using the field “SCOPE-DESC”. The field “SCOPE-DESC” provides information for the characteristics of permit. If it contains the word ‘ residential’, ‘residence’ or ‘ family’ , it is classified as housing-related permit. Create a new field, call it FamPermit, assign 1 to these selected. Otherwise it is non-housing permit.
- Properties->definition query, select these with FamPermit as 1.
- Spatial join from subarea boundary to building permit layer is done to calculate the count of building permits within each subarea.
- Divide by total number of acres for each subarea
</td></tr>
<tr><td>Med_own_mcost</td><td>Median home owner monthly cost (percentage)</td><td>ACS</td></tr>
<tr><td colspan="3">

The average median home owner’s monthly cost is obtained from American Community Survey 2006-2010 . The subarea level variable is calculated as the weighted average of the component blockgroups. The equation is

$$\sum \frac{area\ of\ block\ group*}{area\ of\ subarea} median\ home\ owner\ monthly\ cost\ (percentage)$$
</td></tr>
<tr><td>MedRent</td><td>median rent</td><td>ACS</td></tr>
<tr><td colspan="3">

The median rent is obtained from American Community Survey 2006-2010 . The subarea level variable is calculated as the weighted average of the component blockgroups. The equation is

$$\sum \frac{area\ of\ block\ group*}{area\ of\ subarea} median\ rent$$
</td></tr>
<tr><td>MultiFamily</td><td>multi-family percentage</td><td>ACS</td></tr>
<tr><td colspan="3">

- First get the ratio for single family housing:

32. Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected

- Get total number of single-family housing in each subarea: sum of all component blockgroups’ single-family housing units.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * single\ family\ housing$$

- Get total number of housing in each subarea: sum of all component blockgroups’ housing units.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ housing\ units$$

- Calculate the ratio for single family housing
- multi-family percentage=1- ratio for single family housing
</td></tr>
</table>

| | | |
|---|---|---|
| TotalPropertyValue | total property value | TAX Parcels, from City of Atlanta, GIS division, Chuck Shultz, cshultz@atlantaga.gov TAX year: 2008, DATA source: Fulton and Debalb County Tax Assessors Office, 2008 |

- GIS layer gis_land_parcels_cama_2010.shp
- Field “TOT_APPR” contains information for total appraised value
- Intersect the parcel layer with the subarea boundary layer. Get Parcel_SBA_diss.shp, calculate geometry-> get the new area for Parcel after being intersected
- Get total property value for each parcel $\frac{New\ area\ of\ intersected\ Parcel}{area\ of\ original\ Parcel} * TOT\_APPR$
- Summarize by subarea id, Each subarea will be given the summary (sum) of all components’ attribute information. The total property value for each subarea will be generated.

| | | |
|---|---|---|
| LandUse_Mix | Land use mix indicator | TAX Parcels, City of Atlanta, GIS division, Chuck Shultz, cshultz@atlantaga.gov |

- GIS layer gis_land_parcels_cama_2010.shp
- Field “LUC” contains information for land use.
- Land uses are coded into RES1 (single family housing), RES (multifamily housing), COM (commercial), OFF (office), IND (industrial).
- Intersect the parcel layer with the subarea boundary layer. Get Parcel_SBA_diss.shp, output the attribute table in to Access database.
- Run a summary query, group by subarea ID, and LUC code. This will give information about each land use in each subarea. Output the result table into excel, do the following calculation in Excel:
- Land Use Mix = (-1)*[(b1/a)*ln(b1/a) + (b2/a)*ln(b2/a) +(b3/a)*ln(b3/a) +(b4/a)*ln(b4/a) +(b5/a)*ln(b5/a)]/ln(5)

33.

where
a= total square feet of all land uses
b=total square feet of specific land use, where
b1 = single family residential
b2 = multi family residential
b3 = retail, entertainment
b4 = office, institutional, education
b5 = industrial

| | | |
|---|---|---|
| Pop_Minor_PCT | Minorities, % | census 2010 |

- Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected
- Get total population of non-white: sum of all component blockgroups’ non-white population.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * (total\ population - white\ population)$$

- Get total population in each subarea: sum of all component blockgroups' population.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ population$$

34.
- Calculate the ratio

| Pop_HISP_PCT | Hispanic, % | census 2010 |
|---|---|---|

- Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected
- Get total population of Hispanic: sum of all component blockgroups' Hispanic population.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * Hispanic\ population$$

- Get total population in each subarea: sum of all component blockgroups' population.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ population$$

35.
- Calculate the ratio

| Pop_15_PCT | <15 years, % | census 2010 |
|---|---|---|

- Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected
- Get total population below 15 : sum of all component blockgroups' population below 15.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * population\ below\ 15$$

- Get total population in each subarea: sum of all component blockgroups' population.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ population$$

36.
- Calculate the ratio

| Pop_over60_PCT | >59 years, % | census 2010 |
|---|---|---|

- Intersect the blockgroup layer with the subarea boundary layer. Get Union_BLG_SBA_diss.shp, calculate geometry-> get the new area for each blockgroup after being intersected
- Get total population over 60 : sum of all component blockgroups' population over 60.

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * population\ over\ 60$$

- Get total population in each subarea: sum of all component blockgroups' population.

<table>
<tr><td colspan="3">

$$\sum \frac{New\ area\ of\ intersected\ block\ group}{area\ of\ original\ block\ group} * total\ population$$

37.<br>
• Calculate the ratio
</td></tr>
<tr><td>Brownfiled_mile</td><td># of Brownfields per mile along beltline</td><td>Brown field, City of Atlanta, GIS division, Chuck Shultz, cshultz@atlantaga.gov<br>Year: 2007</td></tr>
<tr><td colspan="3">
• Run a spatial join from the subarea boundary to the brown field layer. Get SBA_brown_join.shp, this will give how many brown fields in each subarea.<br>
• Identify the Beltline layer with the subarea boundary layer, this will divide the beltline trail into different subareas, and the lengths of these trails.<br>
• Join the above two tables together, and make the calculation: # of brownfields/ total length of beltline that falls into each subarea.
</td></tr>
<tr><td>Pct_H_Spot</td><td>air pollution hot spot zone %</td><td>ARC, Plan 2040 Loaded Networks for 2010, Guy Rousseau, Surveys & Transportation Model Development Manager, grousseau@atlantaregional.com; train yards: Railroads, City of Atlanta, GIS Division, Year: Unknown, 1988?; and GDOT map @ http://www.dot.state.ga.us/maps/documents/railroad/metro_atlanta_rail_map.pdf</td></tr>
<tr><td colspan="3">
• Hot spots are areas between 100 and 200 meters of rail yards and roads with more than 10,000 vehicles of average daily traffic<br>
• Formula for radius of buffer (in meters): if (ADT<10,000, 0, (if (ADT>25,000, 200, (ADT*.006667+33.3333))))<br>
• Buffer of 200 meters from Howells, Tilford, Inman, Bellwood, South, Hulsey Intermodal, Industry and Armour Rail Yards. Rail yard geometry was manually created in GIS by drawing polygons over railroad lines from Atlanta Railroads shapefile. The existence of the yards is shown in the GDOT map.<br>
• Rail and Traffic buffers are unioned<br>
• Percent of New_ID in hot spot is found by dividing hot spot buffer area by New_ID area.
</td></tr>
<tr><td>Flood_ratio_SBA</td><td>Environmental hazards-floods %</td><td>Flood risk zone, City of Atlanta, GIS division, Chuck Shultz, cshultz@atlantaga.gov<br>Originator: Federal Emergency Management Agency (FEMA)</td></tr>
<tr><td colspan="3">
• A five-hundred-year flood is calculated to be the level of flood water expected to be equaled or exceeded every 500 years on average.<br>
• Intersect the flood risk layer with the subareas, get flood_SBA_inter.shp.<br>
• Summarize by subarea ID, get the total acres of flood risk zone within each subarea.<br>
• Divided by the total area of each subarea, and get the ratios.
</td></tr>
</table>

# 9 Appendix B: Data and GIS Files – Table of Contents and Structure

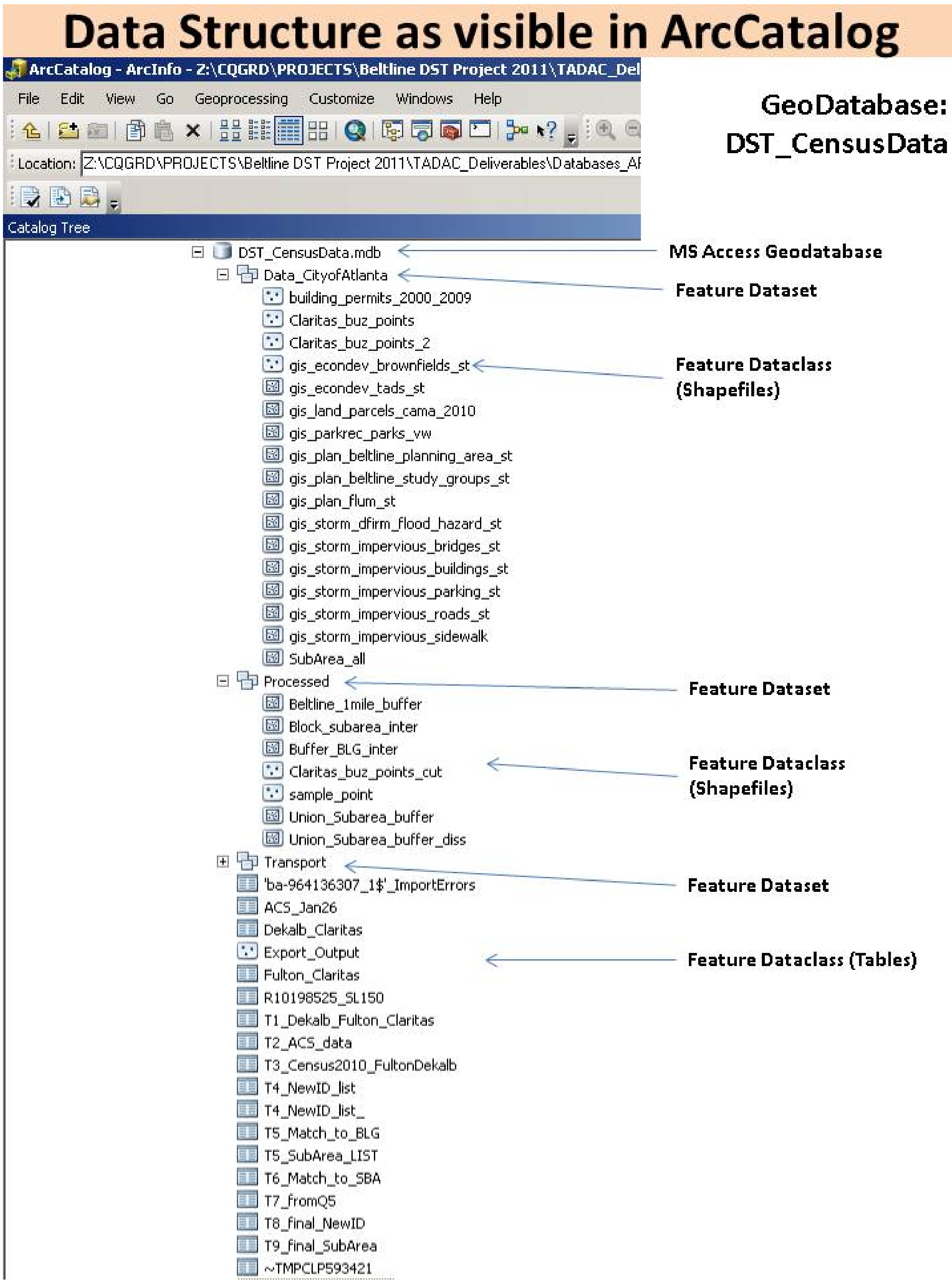
| File Name | Type of File | Location | | Variable Name | Description |
|---|---|---|---|---|---|
| **GeoDatabase: DST_CesusData. mdb** | | | | | **An MS Access geodatabase containing three Feature Datasets: 1)Data_CityofAtlanta 2)Processed 3) Transport** |
| Beltline_1mile_buffer | Shapefile | **Feature Dataset: Processed** | | | The Beltline area with the 1 mile buffer on either side. This comprises the study area for the DST project. |
| Block_subarea_inter | Shapefile | | | | Block groups lying inside the study area intersected with the sub-areas |
| Buffer_BLG_inter | Shapefile | | | | Block groups within the DST study area (1 mile buffer) |
| Claritas_buz_points_cut | Shapefile | | | | Point locations of businesses within the study area |
| sample_point | Shapefile | | | | Sample points within the study area chosen for walkability analysis |
| Union_Subarea_buffer | Shapefile | | | | Sub-areas lying within DST study area |
| Union_Subarea_buffer_diss | Shapefile | | | | |
| | | | | | |
| Feature Dataset "Transport" contains two tables "T8_final_NewID" and "T8_final_SubArea" that contain Census data for two different spatial scales (units): 1)"NewID" and 2) "SubArea" | | **Feature Dataset: Transport > Table: T8_final_NewID** | **Feature Dataset: Transport >Table: T8_final_SubArea** | NewID | A new spatial unit is created as the basic unit for this study. Some block groups are cut by sub-area boundaries, dividing them into two separate polygons. NewID is created as the identifier for each unit: the first part is the Subarea ID, and the second part is the blockgroup ID. |
| | | This Table contains all | This Table contains all | SubArea_ID | Unique ID number for each Beltline sub-area |

| | | | | | |
|---|---|---|---|---|---|
| | | census data for the new spatial units formed from merging the blockgroups with the Beltline sub-areas | census data for the Beltine sub-areas | Pop_15_PCT | % Population under the age of 15 years |
| | | | | Pop_total | Total population in spatial unit |
| | | | | Pop_over60_PCT | % Population over the age of 60 years |
| | | | | Pop_Minor_PCT | % Minorities in the spatial unit |
| | | | | Pop_HISP_PCT | % Hispanics in the spatial unit |
| | | | | POP_BACHOR_PCT | % College grads in the spatial unit |
| | | | | POP_HIGHgrad_PCT | % High school grads in the spatial unit |
| | | | | HSING_occpy_PCT | Housing occupancy rate in the spatial unit |
| | | | | HSING_1uATT_PCT | % of Single-family attached housing units in the spatial unit |
| | | | | HSING_1U_PCT | |
| | | | | HSING_24u_PCT | % of Multi-family 2-4 units in the spatial unit |
| | | | | HSING_5PLUS_PCT | % of Multi-family 5+ units in the spatial unit |
| | | | | Pov_Total_PCT | % of Population below poverty line in the spatial unit |
| | | | | POV_bel50_PCT | % of Population below 50% poverty line in the spatial unit |
| | | | | MedRent | median rent in the spatial unit |
| | | | | MeanRent | Mean rent in the spatial unit |
| | | | | Med_own_mcost | Median home owner monthly cost (percentage) |
| | | | | Med_hs_income | Median household earnings in the spatial unit |
| **GeoDatabase: DST_FinalVariables.mdb** | | | | | **An MS Access Geodatabase containing a series of Feature classes (Tables; Shapefiles)** |
| The two tables "Q0_BLG_Results" and "Q0_Subarea_sum | | Q0_BLG_Results | Q0_Subarea_summary | Pop_total | Total population |
| | | This table contains | This table contains results | PopDense_SqMile | population density: persons/sq mile |

| | | | | | |
|---|---|---|---|---|---|
| mary" contains the output tables generated from GIS calculations and the final results compiling all variables. | | results at the block group level | at the sub-area level | Metric_Length_mile | The total length of streets reached from a single point up to 0.5 mile in all directions based on street network is defined as metric reach |
| | | | | Sidewalk_ratio_SBA | % of Streets with sidewalks |
| | | | | Congestion_V_CR | The percent of lane miles which V/C over LOS D (>0.75) |
| | | | | Travel_5point_mins | Travel time to Five Points MARTA |
| | | | | WalkScore | Walkability score |
| | | | | Park_distance | Distance from major park and trail |
| | | | | VioCrime | Violent crimes, rate per 1,000 residents |
| | | | | ProptyCrime | Property crimes, rate per 1,000 residents |
| | | | | supermarket_distance | Distance to nearest major supermarket or farmers market |
| | | | | Med_hs_income | Median household earnings in the spatial unit |
| | | | | Pov_Total_PCT | % of Population below poverty line |
| | | | | POV_bel50_PCT | % of Population below 50% poverty line in the spatial unit |
| | | | | total_JOBs | total number of jobs |
| | | | | Jobs_Acre | jobs / acre |
| | | | | IndustryEstabNO | # of Industry establishments |
| | | | | OfficeEstabNO | # of office establishments |
| | | | | NonFamPermit_Acre | Non-housing permit / acre |
| | | | | POP_HIGHgrad_PCT | % of High school grads |
| | | | | POP_BACHOR_PCT | % of College grads |
| | | | | Park_25mile | Residents w/in .25 miles of green space |
| | | | | Park_Pop_000 | Park acres/1000 population |
| | | | | Tree_ratio | tree coverage ratio |
| | | | | Impervious_raio | Impervious surface ratio |
| | | | | HSING_1uATT_PCT | % of Single-family attached housing units |

| | | | | | |
|---|---|---|---|---|---|
| | | | | HSING_24u_PCT | % of Multi-family 2-4 units |
| | | | | HSING_5PLUS_PCT | % of Multi-family 5+ units |
| | | | | HSING_occpy_PCT | housing Occupancy rate |
| | | | | FamPermit_Acre | housing Building permits/ acre |
| | | | | Med_own_mcost | Median home owner monthly cost (percentage) |
| | | | | MedRent | median rent |
| | | | | Pop_Dense_Acre | population density: persons/sq mile |
| | | | | MultiFamily | % of multi-family housing |
| | | | | TotalPropertyValue | total property value |
| | | | | LandUse_Mix | Land use mix index |
| | | | | Pop_Minor_PCT | % of Minorities |
| | | | | Pop_HISP_PCT | % of Hispanics |
| | | | | Pop_15_PCT | % of population <15 years |
| | | | | Pop_over60_PCT | % of population >59 years |
| | | | | Brownfiled_mile | # of Brownfields per mile along beltline |
| | | | | Pct_H_Spot | % of air pollution hot spot zone area |
| | | | | Flood_ratio_SBA | % of flood risk area |

# 10 Appendix C: File Structure



# Data Structure as visible in ArcCatalog