4 Land Use Data

4.1 Land Use for SACSIM Introduction

For its transportation planning functions as a Metropolitan Planning Organization, SACOG's jurisdiction covers part of all of the six county Sacramento region. This area includes Sacramento, Sutter, Yolo and Yuba counties in their entirety, and the portions of Placer and El Dorado counties below the Sierra Nevada ridge line. The extreme eastern portion of Solano County falls in the Sacramento air basin for some emissions, but is within the jurisdiction of the Metropolitan Transportation Commission for federal transportation planning purposes; for this reason the Commission provides emissions estimates to SACOG for air quality regulatory purposes.

This chapter presents the process for assembling SACSIM parcel-point data files. This discussion focuses mostly on building the SACSIM file from land use datasets and other data sources. Land use dataset is the primary data source for households and jobs on each parcel. School employment and enrollments, street pattern, off-street parking supply and cost, and transit proximity come from various other data sources, described below. It is helpful to have clear definitions of some terms and processes:

4.1.1 Terminology

- *Parcels* are pieces of land with area, shape, and location defined by assessor's maps and records. In general, this definition applies to SACSIM, with a couple of caveats:
    - SACSIM parcellation was initially created on best assessors records available to SACOG . Every four years during the MTP/SCS, this parcel data is updated with most recent data from available sources.
    - Large parcels with significant growth from the base year to the planning horizon year (2040) were manually split down to "false" or "pseudo" parcels, which have no bearing to assessor's records.
- *A Parcel-point* is a dimensionless point located roughly at the geographic center of a parcel, and used to represent the location of that parcel for SACSIM. The points have unique identifiers which allow for parcel data (e.g. dwellings or jobs estimates from land use model) to be matched or aggregated to the parcel-points.
- *Base year inventories* are datasets of land use features which are not directly represented in land use model, and maintained as separate datasets. Generally, these are GIS point files, which are matched or aggregated to parcels (and later, parcel-points) based on their location.
- *Base-to-future changes* are land use or transportation system changes which are flagged by comparing a future year scenario file (typically, a land use parcel data file) with a comparable base year file. Changes are flagged based on change in use (place type), or a change in the intensity of development (dwellings and jobs), comparing the future year scenario to the base year data at parcel level.
- *Base-plus-future-change datasets* are assembled by using the base year data for parcels with little or no change, and a future year estimate of use if a change has been flagged. This basic

approach for creating future year datasets is used for SACSIM school enrollment, school employment, street pattern, transit station or stop, and off-street parking facility uses.

4.2 Land Use Data Files

The land use model provides the land use input data file for use in creating the SACSIM parcel-point data file. Estimates of dwelling units and employment by sector are developed at parcel level in land use model. SACSIM utilizes geographic information system (GIS) outputs from Land use modeling and augments the dwelling and employment estimates with other information, which is described in greater detail below. There are several key concepts and terms which are useful in understanding the capabilities of land use model:

- *Landuse Type* is the fundamental description of the existing or future land use of a parcel. This roughly corresponds to general plan land use types commonly used by jurisdictions for describing land use policy; however, Land use model allows for more standardized land use types to be utilized across the region. Along with other variables described below, dwelling unit and employment rates per acre are associated with place types, and are utilized as one component of an estimate of the quantity of dwellings or jobs on a parcel.
- *Percent developed or percent covered* is the percentage of a parcel which is developed per the coded place type.
- *Gross-to-net acreage percentage* is the percentage of the parcel area which could be developed, net of setbacks, sidewalks, streets, and other dedications.
- *Constraints* are geographic (e.g. slope) or policy (e.g. flood zone) variables which generally reduce the development potential of a particular parcel.
- *Redevelopment potential* is coded to parcels through various fields in Land use model, to represent the likelihood of a given existing, developed parcel changing its use (place type) or development intensity.

Using all these available concepts and data layers, land use modeling generates estimates or yields of dwellings and jobs for each parcel Base year (2016) inventory, estimates are gathered by control totals at the census block level and paired with parcel database inventory to determine the land use with number of dwelling units. Employment categories also collected at the census block level or smallest geography available, are then proportionally distributed or “painted” onto the parcel level into sub-employment categories based on the land use types.

Future scenarios are developed by changing place type, coverage, constraints or redevelopment potential at parcel level, and re-estimating the yields of dwelling and jobs for each parcel. The MTP/SCS must address state and federal requirements Table 4-1 illustrates all the regulatory, policy, and market based factors considered in considering the MTP/SCS land use forecasts.

Table 4-1 Land Use Forecast Consideration Factors

Draft February 2018

Factors Considered in Updating the MTP/SCS Land Use Forecast

	Regulatory/Policy and Market Factors	Description of projects assumed to have the highest likelihood to build within 20 years	Middle range of conditions	Description of projects assumed to have the lowest likelihood to build within 20 years
REGULATORY	Local Entitlements	Specific Plan approved, Annexation complete (if required), Tentative Map(s) in process	Range of conditions includes: projects that are approved but still need annexation; projects approved but no tentative maps submitted; projects approved but have unsettled lawsuit; projects currently in process; projects in pre-application	No current entitlement activity; identified by general plan or SOI as future growth area
	State/Federal Entitlements	Approved	Range of conditions includes: projects that are not yet approved but in process; projects participating in an HCP or NCCP; projects with no significant resource issues	Significant, unresolved resource issues
POLICY	Air Quality	In SCS with lower VMT than average for Developing Communities	Range of conditions includes: projects that are in the SCS with average VMT; projects in the SCS with higher than average VMT; projects not in the SCS with lower than average VMT; projects not in the SCS with average VMT	Not in SCS with above average VMT for Developing Communites
	Regional Plans and Policies	Consistent with 2012 MTP/SCS and Blueprint	Range of conditions includes: projects in MTP/SCS and partially consistent with Blueprint; projects in MTP/SCS and not consistent with Blueprint; projects consistent with Blueprint and not MTP/SCS; projects partially consistent with Blueprint and not in MTP/SCS	Not consistent with 2012 MTP/SCS or Blueprint
MARKET	Proximity to Job Centers	Close proximity to a regional jobs center	Range of conditions includes: projects partially within 4 miles of a regional job center; projects within 4 miles of a secondary job center; partially within 4 miles of a secondary job center	Significant distance from any job center(s)
	Housing Mix	Mix of housing types including mostly small-lot and attached	Range of conditions includes: projects that have a mix of housing types including small-lot and attached housing at varying amounts; projects that are primarily large-lot residential because they are in more rural areas	All large-lot single-family where higher densities could be supported (i.e more urban or suburban locations)
	Market Area Saturation	Historically high market demand and limited number of approved or pending projects in market area	Range of conditions includes: projects in areas with high market demand and high number of approved or pending projects in market area; projects in areas with average market demand and a high number of approved or pending projects in market area; projects in area with lower market demand and a high number of approved or pending projects in market area, but have a unique factor that could significantly change the market demand for the area	Historically low market demand and a high number of approved or pending projects in market area
	Adjacency	Adjacent to existing urban development or has significant borders with a city boundary or areas designated for future urban development	Range of conditions includes: projects that are adjacent to existing development at varying rates	Less than 10% adjacent with existing urban development,a city boundary or areas designated for future urban development
	Developer Activity	Very active, single ownership or experienced ownership partnerships, multiple completed projects in region	Range of conditions includes: very active to active, single or multiple ownerships with no development history; single or mulitple ownerships with varying levels of activity and some projects completed in the region; single or mulitple ownerships with varying levels of activity and no history of completed projects in or outside the region	Not active, single or multiple ownership, no completed projects in the region
	Transportation Infrastructure	No major or regional infrastructure needed or infrastructure is fully funded	Range of conditions includes: projects that have some infrastructure, but need more; projects that can build some before significant infrastructure investment is needed; projects that need significant infrastructure and have funding	Significant infrastructure needed and not funded or not yet defined
	Other Infrastructure (sewer, water, flood control, etc)	No major or regional infrastructure needed of infrastructure is fully funded	Range of conditions includes: projects that have some infrastructure, but need more; projects that can build some before significant infrastructure investment is needed; projects that need significant infrastructure and have funding	Significant infrastructure needed and not funded or not yet defined

Source: SACOG 2020.

4.3 SACSIM Parcel-Point Structure and Variables

The SACSIM parcel file is the key land use input for the SACSIM model. Each record in this file represents an individual parcel. The only spatial information contained in the file is the X and Y coordinates of a point (preferably the centroid) within the parcel. Table 4-5 presents the variable names and descriptions included in the initial parcel point file. While the majority of the parcel data is built in GIS, the SACSIM input is written to an ASCII delimited (tab, space or comma as delimiter specified in the DAYSIM configuration files) text file format. Additional buffering information will be added to the Parcel-Point file for the SACSIM final input format described later in this chapter. Below are further descriptions of the parcel-point initial variables.

4.4 Parcel Variables

The parcel point file is used as the DAYSIM "microzone" file containing the parcel id, geographic coordinates, and land use variables including land use type, number of households, employee total and sub employee categories, public off street parking spaces and pricing. The sections that follow provide a brief description of the parcel variables and Table 4-3 lists out the field names as they appear in the parcel file.

4.4.1 Parcel Identification

The PARCELID filed is required as the unique identify for every individual parcel This must be a unique, ascending, positive integer identification number. PARCELID is required to associate back to the trip and household tables DAYSIM table outputs. SACSIM only used Parcel's with households, employment, students, and/or parking. All other areas such as forests or vacant parcels are not included. For this reason, PACELID may have gaps provided in ascending order to remove these parcels from the complete SACOG regional parcel land use file.

4.4.2 Coordinates

The XCOORD_P and YCOORD_P fields store the X and Y State plane coordinates of each parcel's location. The location is a point within the parcel area and closest to the centroid as possible. The precision of the coordinates is to the nearest foot and therefore these fields store the data as Long Integers.

4.4.3 Area

The SQFT_P field stores the area of the parcel in square feet. This is usually calculated from the geometric area of the parcel polygon feature. Some parcels may have a geometry that could be corrupt which could result in zero square feet.

4.4.4 Traffic Analysis Zone

The TAZ_P field is used to link the DAYSIM "Zone" data to the "Microzone" data. SACSIM links ~1500 Traffic Analysis Zones (TAZ) to ~800,000 parcels. TAZ are later Used for SACSIM trip aggregation and assignment.

4.4.5 Households

Households on each parcel are estimated by occupancy rate and the number of dwelling units (DU's) from land use dataset. Occupancy rate is sourced from ACS sample data and adjusted by regional control of the number of households. More information on households is in chapter 5, Representative Population Data.

4.4.6 K-12 Student Enrollment

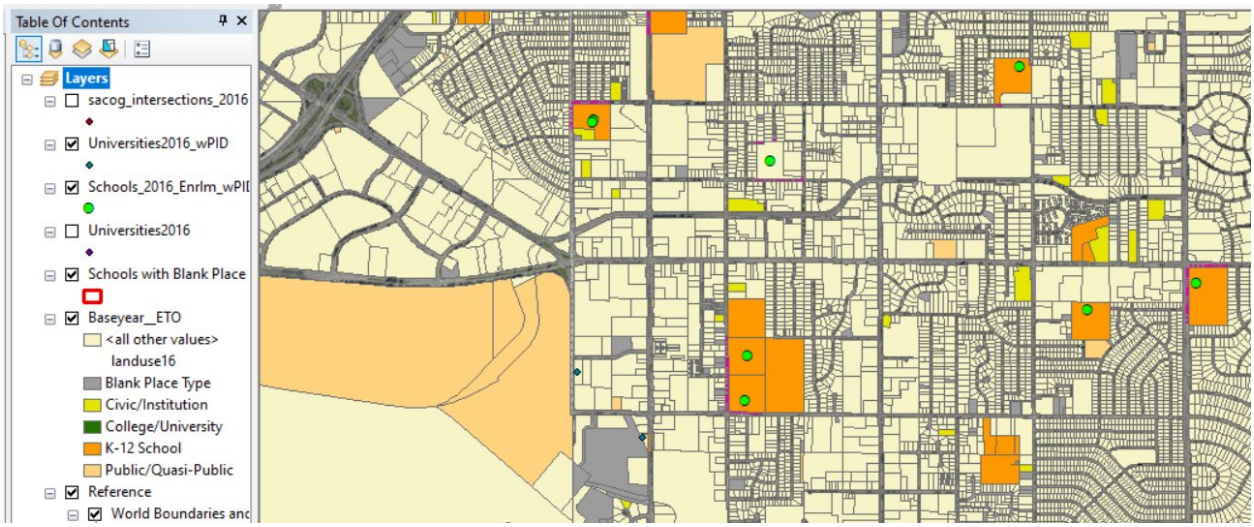
The STUGRAD and STUHGH field stores the number of students on parcels that have elementary, middle and high schools. SACOG collected student enrollment data for the base year inventory (2016), and forecasts future enrollment based on land use forecasting data. Populating student enrollment fields involves constructing a shapefile or table of existing or forecasted school locations with enrollment numbers and moving these numbers.

4.4.6.1 Base Inventory

The STUDUNI field stores the number of students on parcels that are part of major universities and community colleges. As with K-12 enrollment, university enrollment inventory, involves

constructing a shapefile or table of existing and projected university/college locations with student enrollment. Figure 4-1 illustrates an example of K-12 and University enrollment inventory spatially associated to corresponding parcel land use types.

Figure 4-1 K-12 and University Student Inventory Collection for Parcel File Development



4.4.6.2 College and University Student Enrollment

Universities with a student body largely in person are counted in full. Universities or colleges with enrollment but have a larger amount of online classes and are not likely to travel daily to campuses to attend courses are weighted by reducing the overall student enrollment. Full or primarily online programs with student enrollment that do not travel to campus are not included in STUDUNI number of students.

4.4.7 Employment

Employment variables are:

- Education (empedu);
- Food service (empfoo);
- Government (empgov);
- Industrial (empind);
- Medical (empmed);
- Office (empofc);
- Retail (empret);
- Service (empsvc);
- Other (empoth); and
- Total employment (emptot).

SACSIM employment types are based on land use model employment types, which in turn are based on a simplified scheme of industrial sector categories. That is, they are based on the industrial sector which describes the use on a given parcel, and not the classification of the job in occupational

terms (e.g. laborer, clerical, administrative, technical, professional, managerial, etc.). Table 4-2 shows SACSIM defined employment categories based on the North American Industry Classification System (NAICS) codes. These definitions were applied and used by SACOG in establishing its land use scenario analysis system.

4.4.7.1 Processing of Medical Employment

Medical employment is defined differently between land use model and SACSIM. Medical employment is generated in land use model by one place type: Medical Facility, which is defined as hospitals and major medical centers, with 400 or more employees. SACSIM requires a more expansive definition of medical employment, which includes both hospitals/major medical centers, plus medical employment in smaller offices, clinics, etc. Most of this medical sector employment is dispersed and mixed in office and business park areas, with higher concentrations located around hospitals and major medical centers. In order to resolve this inconsistency in definition, a portion of the employment in office and service areas is "converted" to medical; additionally, the portion of the total employment which is so converted varies directly with proximity to hospitals/major medical centers. That is, the closer an office- or service- employment generating use is to a hospital/major medical center, the greater the proportion of total employment which is likely to be medical

Table 4-2 NAICS Code and SACSIM Sectors

SACSIM sectors	SACSIM name	NAICS codes	Subcodes / Description
Education	EMPEDU	61	Educational Services *(exclude 6115-6117 trade school, education support, include in service)*
Food service	EMPFOOD	722	7221-7225 (restaurants and bars)
Government	EMPGOV	92	Public Administration *(exclude 9281 security and information, include in Other)*
Industrial	EMPIND	11	Agriculture, Forestry, Fishing and Hunting
		21	Mining, Quarrying, and Oil and Gas Extraction
		22	Utilities
		23	Construction
		31-33	Manufacturing
		42	Wholesale Trade
		48-49	Transportation and Warehousing *(exclude 4911 post office, include in service)*
		562	562 - (5621 - 5629) included in industrial because uses are administrative for waste, utilities and construction uses.
Medical	EMPMED	62	Health Care and Social Assistance *(exclude 623-624 nursing and residential care, social service, include in service)*
Office	EMPOFC	51	Information
		52	Finance and Insurance
		53	Real Estate and Rental and Leasing
		54	Professional, Scientific, and Technical Services
		55	Management of Companies and Enterprises
		56	Administrative and Support and Waste Management and Remediation Services (exclude 562, construction, include in industry)

SACSIM sectors	SACSIM name	NAICS codes	Subcodes / Description
		813	8131 - 8139 included in Office (Office) because uses are larger civic and charitable organizations.
Other	EMPOTH	9281	9281 (military) included in Military/Other
Retail	EMPRET	44-45	Retail Trade
Service	EMPSER	4911	4911 post office
		6115-6117	6115-6117 (trade and technical schools) included in Retail(Service) because I-PLACE3S Education is K12 and college related
		623	623 - Nursing and Residential Care Facilities
		624	624 - Social Assistance
		71	Arts, Entertainment, and Recreation
		721	Accommodation and Food Services (exclude 722, include in Food)
		81	Other Services *(except Public Administration, exclude 813 (8131-8139), include in office)*

Source: SACOG 2020.

4.4.8 Parking

Parking is included in SACSIM for off-street, paid parking only. The number of daily spaces (parkdy), hourly spaces (parkhr), daily parking cost (ppricdy), and hourly parking cost (pprichr) variables are included. Base year parking inventory was gathered by using parking inventory data from previous iterations of SACSIM, aerial imagery, and ParkMe spaces and prices. Currently, the supply variables are not distinguished; i.e. for paid off-street facilities, all spaces are assumed to be available for either hourly or daily use, and the supply variables are equal.

Table 4-3 SACSIM Unbuffered Parcel File Variables

Header label	Valid values	Description, comments
parcelid	1 – 9999999	The parcel ID number. Values must be unique positive integers, in ascending order. (Gaps are allowed, but not efficient for memory.)
xcoord_p	1-999999999	The x coordinate of the parcel centroid, in integer length units (typically SPF).
ycoord_p	1-999999999	The y coordinate of the parcel centroid, in integer length units (typically SPF).
sqft_p	0-999999999	The area of the parcel, in thousands of square length units (typically sqf, does not need to be an integer)
taz_p	1-9999999	The zone that the parcel is in. Must be a valid zone_id in the “zone” file
lutype_p	0-9999999	A land use type value. This variable currently has no mandatory use in the DAYSIM code, so is available for region-specific usage.
hh_p	Real >=0	The number of households residing on a parcel.
stugrad_p	Real >=0	The number of grade school (K-8) students enrolled in schools on a parcel
stuhgh_p	Real >=0	The number of high school (9-12) students enrolled in schools on a parcel. If this is not available separately, then set to 0 & put the number of K-12 students in stugrd_p
stuuni_p	Real >=0	The number of university/college students enrolled in schools on a parcel.
empedu_p	Real >=0	The number of educational employees working on a parcel
empfoo_p	Real >=0	The number of food service employees working on a parcel
empgov_p	Real >=0	The number of government employees working on a parcel
empind_p	Real >=0	The number of industrial employees working on a parcel
empmed_p	Real >=0	The number of medical employees working on a parcel

Header label	Valid values	Description, comments
empofc_p	Real >=0	The number of (other) office employees working on a parcel
empret_p	Real >=0	The number of retail employees working on a parcel
empsvc_p	Real >=0	The number of (other) service employees working on a parcel
empoth_p	Real >=0	The number of other sector employees working on a parcel. Typically contains construction, agriculture, mining.
emptot_p	Real >=0	The total number of employees working on a parcel. Should equal the sum of the 9 previous fields.
parkdy_p	Real >=0	The number of paid public off-street parking spaces on a parcel with per day pricing. (May overlap with parkhr_p if have both types of pricing.)
parkhr_p	Real >=0	The number of paid public off-street parking spaces on a parcel with per hour pricing. (May overlap with parkdy_p if have both types of pricing.)
ppricdyp	Real >=0	The average price of public off-street parking spaces on a parcel with per day pricing. (In cents per day)
pprichrp	Real >=0	The average price of public off-street parking spaces on a parcel with per hour pricing. (In cents per hour)

Source: SACOG 2020. Downloaded from RSG *DAYSIM Input Data File Documentation* GitHub RSGInc/DAYSIM

4.5 SACSIM Land Use Spatial Association

4.5.1 Circuity Buffer Introduction

The Parcel-Point DAYSIM file not only includes the parcel level variables described above, but also requires relative distance information to calculate attractiveness between land use data. Previous versions of SACSIM utilized a Euclidean distance parcel point to parcel point approach which is common in buffering analysis. SACSIM19 parcel point files uses a hybrid approach between shortest orthogonal path, and node to node path distances call "circuity-based measures for each parcel". This method creates a "circuity surface" using 24 radially distributed points to represent the path distances from a walkable streets network based on XY coordinates; 8 directions at 3 distinct distance bands (0.5 mile, 1 mile and 1.5 mile) and the parcel-point location. Each point is then mapped to the closest network node. For a parcel, a circuity factor or ratio is calculated based on the shortest path distance and straight line distance for all 24 radial points. To measure the distance from a parcel to another parcel, the distance is interpolated based on the circuity factors surrounding the destination parcel. Figure 4-2 illustrates the circuity path distance calculation conceptually. Figure 4-3 shows how the decay function adjusts the radial point distances per parcel. Figure 4-4 compares the relationship of parcels distance to employment centers using the "Circuity buffering" process compared to a Euclidean distance.

Figure 4-2 Parcel Circuity Ratio Diagram

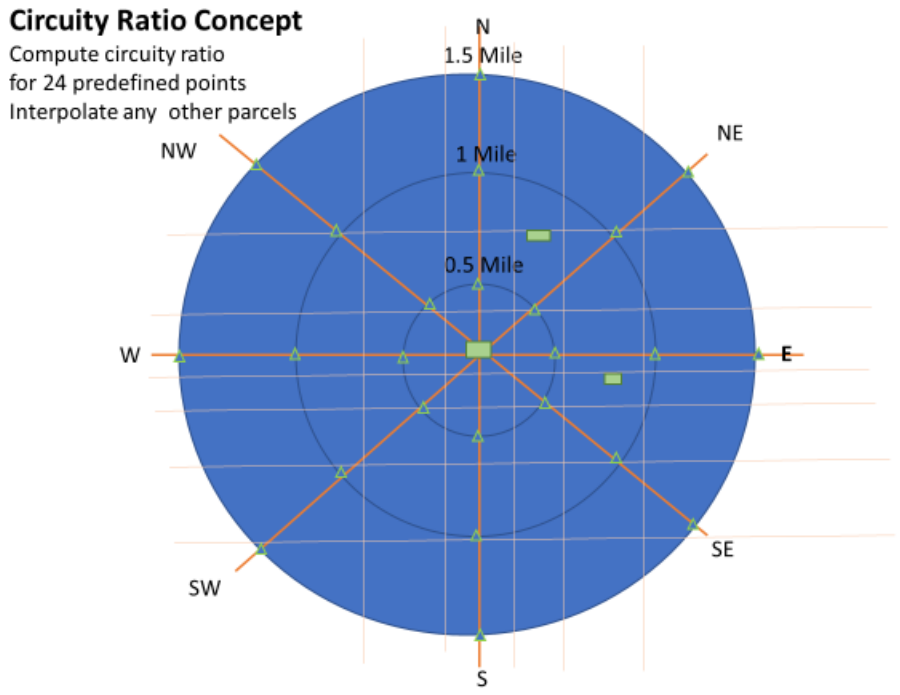
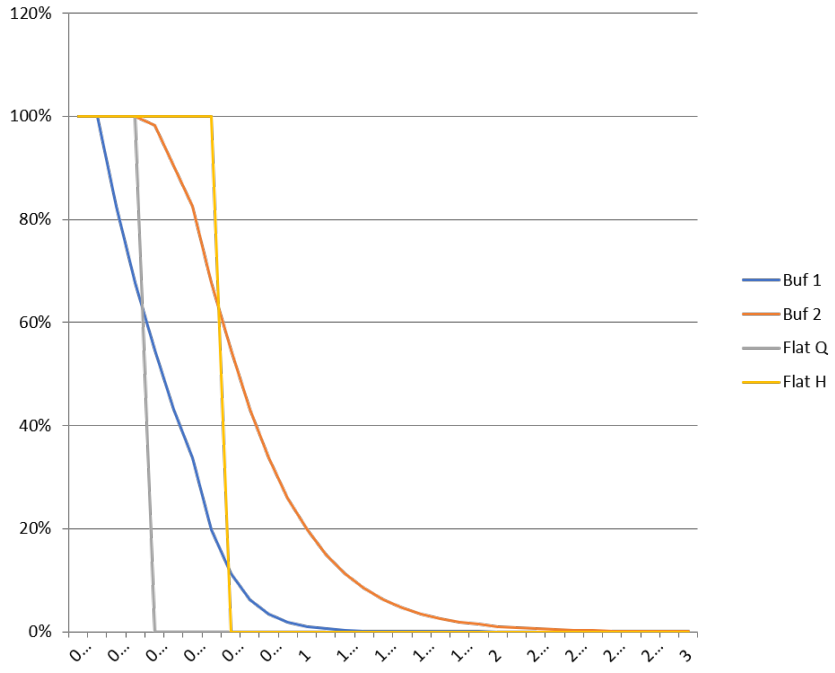


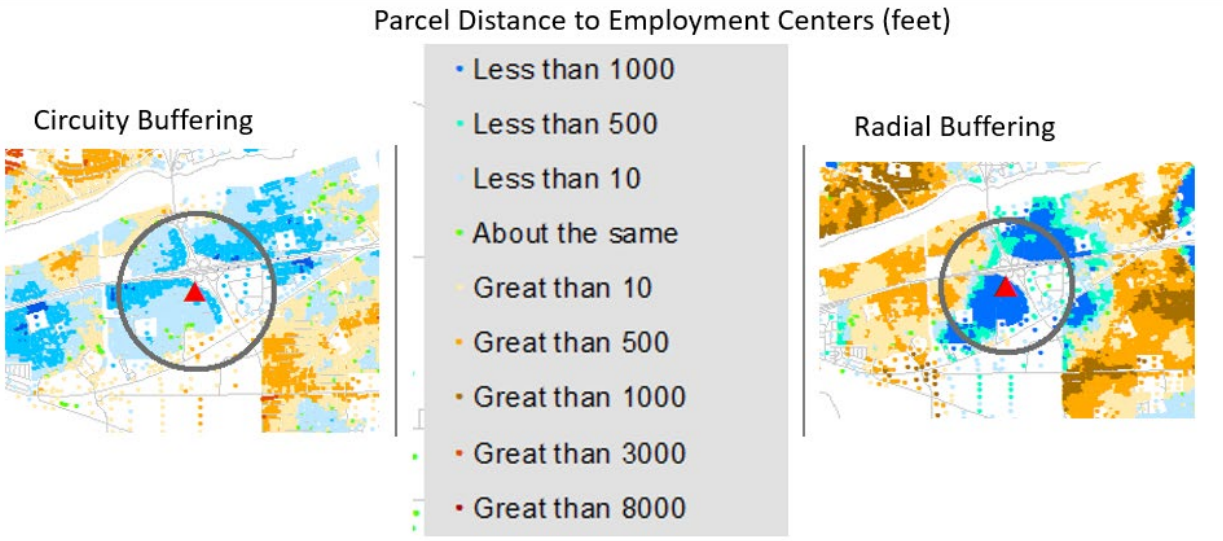
Figure 4-3 Decay Function Compared to Flat Buffering Relationship

Mile	Feet	Buf 1	Buf 2	Flat Q	Flat H
0.1	528	100%	100%	100%	100%
0.125	660	100%	100%	100%	100%
0.2	1056	83%	100%	100%	100%
0.25	1320	68%	100%	100%	100%
0.3	1584	55%	98%	100%	100%
0.35	1848	43%	90%	100%	100%
0.4	2112	34%	83%	0%	100%
0.5	2640	20%	68%	0%	100%
0.6	3168	11%	55%	0%	100%
0.7	3696	6%	43%	0%	100%
0.8	4224	3%	34%	0%	0%
0.9	4752	2%	26%	0%	0%
1	5280	1%	20%	0%	0%
1.1	5808	1%	15%	0%	0%
1.2	6336	0%	11%	0%	0%
1.3	6864	0%	8%	0%	0%
1.4	7392	0%	6%	0%	0%
1.5	7920	0%	5%	0%	0%
1.6	8448	0%	3%	0%	0%
1.7	8976	0%	3%	0%	0%
1.8	9504	0%	2%	0%	0%
1.9	10032	0%	1%	0%	0%
2	10560	0%	1%	0%	0%
2.1	11088	0%	1%	0%	0%
2.2	11616	0%	1%	0%	0%
2.3	12144	0%	0%	0%	0%
2.4	12672	0%	0%	0%	0%
2.5	13200	0%	0%	0%	0%
2.6	13728	0%	0%	0%	0%
2.7	14256	0%	0%	0%	0%
2.8	14784	0%	0%	0%	0%
2.9	15312	0%	0%	0%	0%
3	15840	0%	0%	0%	0%



Source: SACOG 2020.

Figure 4-4 Circuity vs Radial Buffering Comparison



Source: SACOG 2020.

4.5.2 Files Required for Circuity Buffer Process

Circuity Factor File: a parcel list with circuity factors or ratios of 24 points describe above.

Parcel Base: a parcel list with all variables is specified in Table 4-5.

Intersections: A list of intersections, with node ID, XY coordinates, and number of links terminating at the node. (This can be the same file as the node list used above, but it should contain all intersections, regardless of whether or not it is a nearest node to any parcel, and it contains the extra information on number of links ending at the node.)

Transit stops: A list of transit stops, with stop ID, XY coordinates, and the type of transit serving the stop. SACSIM19 currently uses local bus and LRT stops are used for parcel to parcel buffering.

Open space areas: A list of parks, sports fields and other public recreational areas, with an ID and the size, in square feet. If this file is not provided, the buffered variables for open space will be 0.

4.5.3 Development of Circuity Buffering Inputs

This section describes the process of how to create the necessary input variables to calculate the parcel circuity buffering process.

4.5.3.1 Circuity Factor File Creation

Parcel and network information are read in and 24 fictitious points around the parcel are created (from the X and Y coordinates of the parcels). The 24 points correspond to 8 directions (East, Northeast, North, Northwest, West, Southwest, South, and Southeast) and 3 distance bands (0.5, 1.0, and 1.5 miles) around each parcel. Each of the 25 points (including the parcel itself) is then mapped to its closest node on the network. The process and tools needed are described in Appendix F, Circuity Surface Data Preparation Memo.

Regional circuity factor regional averages by base year land use type inventories were used to forecast scenario parcels in new development areas.

Further process, description and tools needed are described in Appendix F Circuity Surface Data Preparation Memo.

Intersection File Process

Each parcel record in the SACSIM table must have information about the surrounding walkable street network pattern. This information is stored in the following fields: NODES1Q, NODES1H, NODES3Q, NODES3H, NODES4Q and NODES4H. NODES1 indicates the number of nearby cul-de-sacs and dead-ends. NODES3 indicates the number of nearby “T” or three-way intersections and NODES4 indicates the number of nearby 4-way (or more) intersections. These fields affect the walkability of the street network surrounding a parcel.

4.5.3.1.1 Street Intersection Base Layer

To populate the node fields, spatial buffer operations must be performed against a layer of street intersections. Generally, this layer can be created from a street centerline layer use a line to point style node_builder script. These street intersections do not include nodes along freeways and other facilities that are closed-off to pedestrians.

The node_builder script will identify the number of links attached to the nodes (valence) so that they can be separated into 1-link, 3-link and 4+-link layers.

Figure 4-5 Street Intersection (NODE) Layer

Source: SACOG 2020.

Figure 4-6 Node Typology

Source: SACOG 2020.

4.5.3.1.2 Intersections for Future Streets

Street centerline data do not exist for future development areas. SACOG implemented an estimation of 1-link, 3-link and 4+-link nodes per acre based on the place type of a future-

development area. These estimations were applied to a grid of synthetic nodes of fixed area, and nodes/acre values to them. For example, for a newly developed greenfield area typical rates of 1-link, 3-link and 4+-link intersections were applied to each grid point, based on the development type. These node densities are listed below in Table 4-4 for each place type.

Table 4-4 Node Density by Place Type

Place Type	1-Leg Intersections per acre	3-Leg Intersections per acre	4-Leg Intersections per acre
1. Rural Residential	0.026	0.020	0.039
2. Very Low Density Residential	0.026	0.065	0.052
3. Low Density Residential	0.065	0.260	0.104
4. Medium Density Residential	0.130	0.390	0.260
5. Medium-High Density Residential	0.130	0.390	0.260
6. High Density Residential	0.013	0.390	0.455
7. Urban Residential	0.013	0.390	0.455
8. High-Intensity Office	0.013	0.390	0.455
9. Moderate-Intensity Office	0.130	0.195	0.390
10. Community/Neighborhood Retail	0.000	0.104	0.039
11. Regional Retail	0.013	0.104	0.013
12. Light Industrial - Office	0.013	0.104	0.013
13. Light Industrial	0.013	0.104	0.013
14. Heavy Industrial	0.013	0.104	0.013
15. Public/Quasi-Public	0.013	0.026	0.013
16. Community/Neighborhood Commercial/Office	0.000	0.104	0.039
17. Regional Commercial/Office	0.013	0.104	0.013
18. Mixed Use Employment Focus	0.130	0.390	0.260
19. Mixed Use Residential Focus	0.130	0.390	0.260
24. Low Density Mixed Residential	0.065	0.260	0.104
25. Medium Density Mixed Residential	0.130	0.390	0.260
26. High Density Mixed Residential	0.013	0.390	0.455
27. Low Density Mixed Use Center or Corridor	0.065	0.260	0.130
28. Medium Density Mixed Use Center or Corridor	0.130	0.325	0.195
29. High Density Mixed Use Center or Corridor	0.013	0.325	0.390
31. Suburban Center/Corridor	0.065	0.260	0.130
40. Sac CBD High Intensity Mixed Use Office	0.020	0.260	0.590
45. Intense Urban Residential	0.100	0.260	0.260
47. Agricultural Residential	0.020	0.010	0.050
47. Medical Facility	0.010	0.070	0.010
48. Airport	0.010	0.010	0.010
50. K-12 Schools	0.010	0.030	0.010
51. Colleges and Universities	0.050	0.070	0.130
52. Civic/Institution	0.100	0.260	0.130

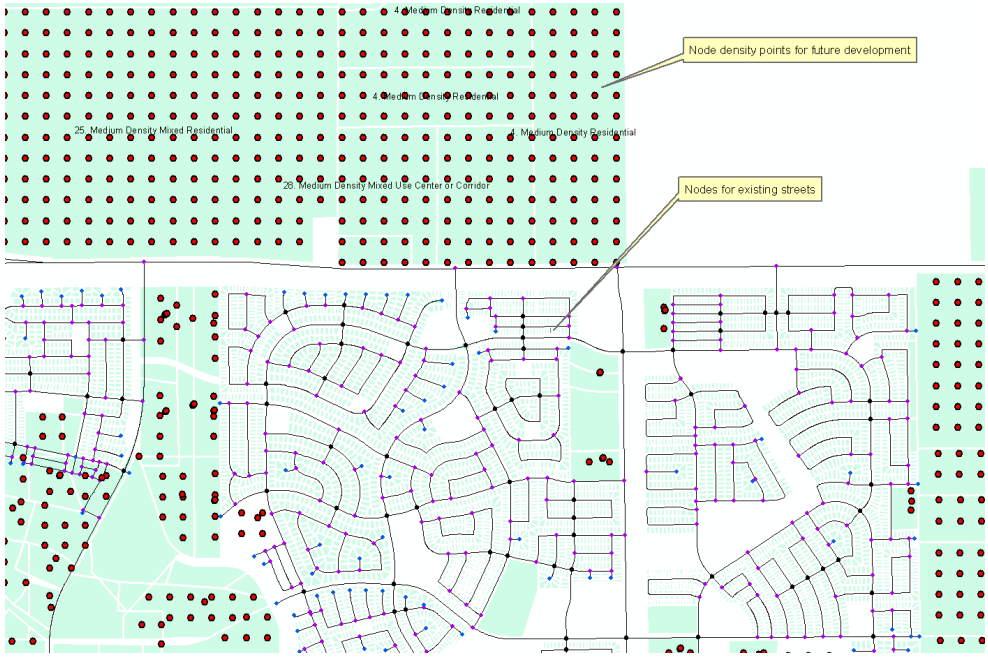
Source: SACOG 2020.

The first step in determining where to generate the grids of synthetic nodes is to identify those areas where future greenfield development will occur. Figure 4-7 shows a portion of the region where development exists with streets and areas slated for future development. In these areas of future development are synthetic nodes to represent a street pattern based on development type.

Once node rates have been set, the synthetic nodes may be combined with real nodes so that the node proximity variables (NODES1Q, NODES1H, NODES3Q, NODES3H, NODES4Q and NODES4H) can be computed. An example is shown below of combining the node sets to create a point layer of 1-link nodes.

A final forecasting step takes into consideration new development areas within SACOG designated Complete Street project areas. Within 500 feet of the complete street identified segments, a 20 percent increase in unit value was added to 3- or 4-way intersections and a 20 percent decrease for one-way (cul-de-sac) intersections. These factors are applied as a factor to better represent complete street design infrastructure and safety characteristics.

Figure 4-7 Synthetic Nodes for Future Development Street Pattern



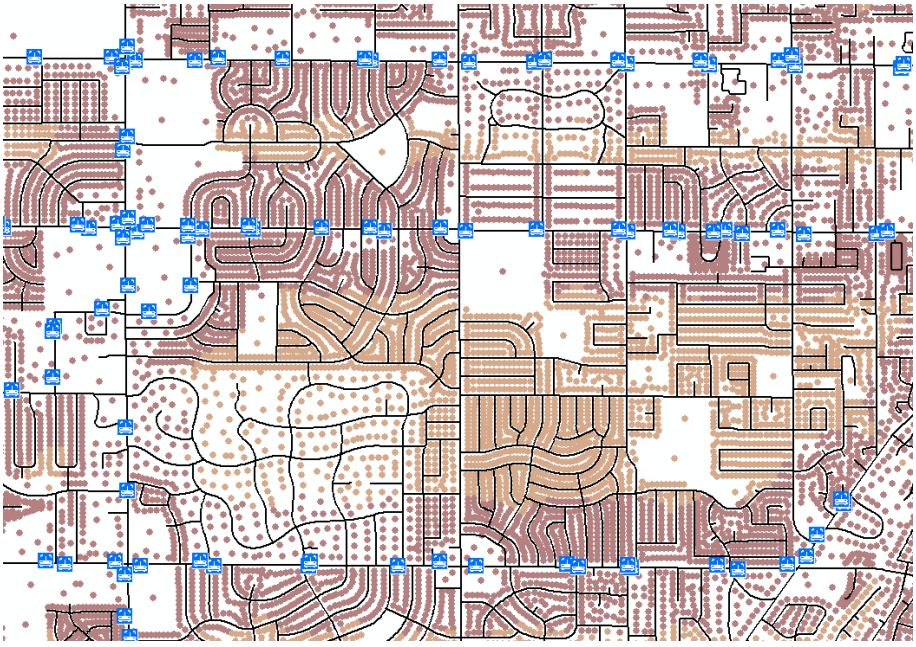
Source: SACOG 2020.

4.5.3.2 Transit Stops File Process

Transit proximity is represented at parcel level as the distance to the nearest transit station or stop. Two variables are computed for each parcel: the distance to the nearest LRT (or more generally, rail) station (DIST_LRT), and distance to the nearest bus (or more generally, rubber-tired) stop. The distance is computed as the straight-line distance from the parcel point and the nearest station or

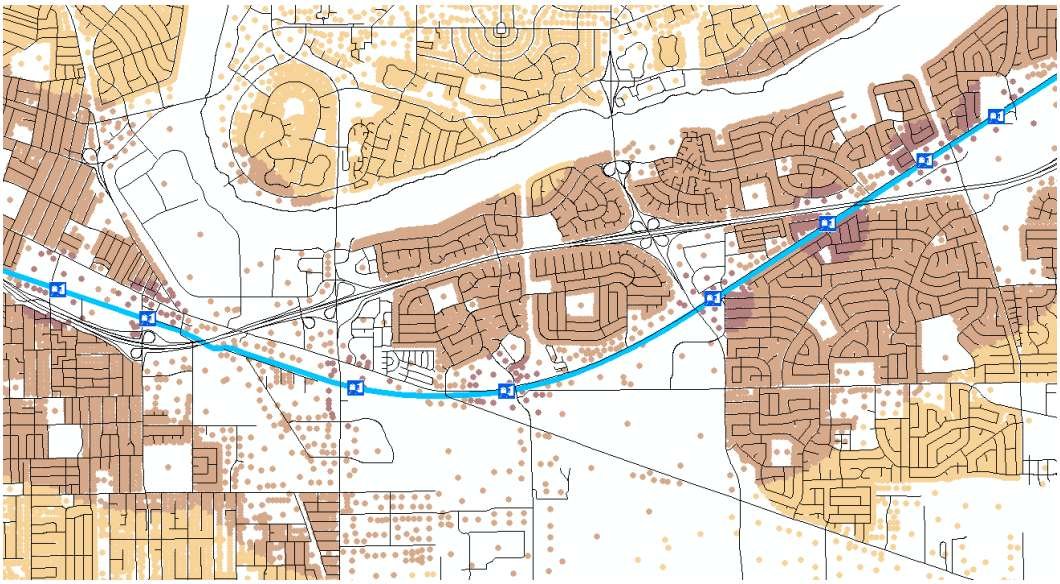
stop. Figure 4-8 and Figure 4-9 show the relationship between Bus and Light Rail Stops to parcel-points.

Figure 4-8 Bus Stops and Parcel Centroids



Source: SACOG 2020.

Figure 4-9 LRT Stations and Parcel Centroids



Source: SACOG 2020.

4.5.3.3 Open Space File Process

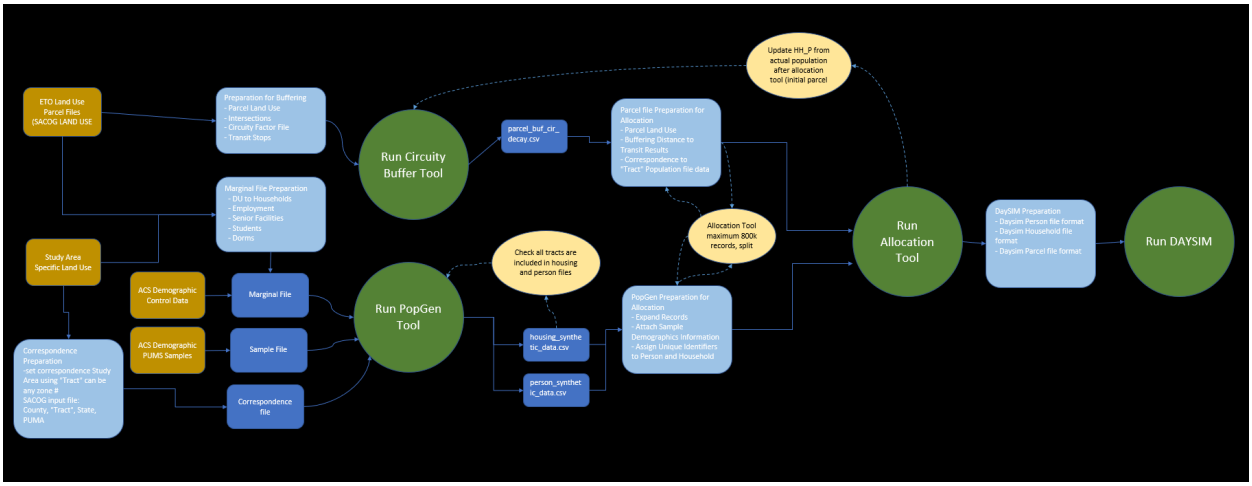
Open space file includes open space areas with public recreation access. This includes parks and sporting fields. Large open spaces with restricted access were removed from file. Open spaces are represented by a centroid location and area.

4.6 SACSIM Parcel Land Use User Guide

4.6.1 Introduction

SACSIM19 requires detailed parcel, household, and population data inputs to run DAYSIM at a parcel zone level. Preparing these files is not part of SACSIM itself, but a necessary preparatory step to create and format the inputs needed to model a scenario. These three files are interdependent; they require specific relationship identification fields to link between data such as parcel point locations, household and person characteristics. More information on these files and relationships can be found in *Appendix B SACSIM19 Data Dictionary.xlsx.* Steps described in this section are how SACOG staff developed these files for scenarios during the 2020 MTP/SC with the data and processing available at this time. Steps below layout how to create the initial parcel file, spatial land use attributes, and tools to join parcel, household, and population files together. Chapter 5 describes how to create the household and population files and will need to be used concurrently to develop the three inputs. Figure 4-10 illustrates the flow and sometimes iterative nature used to prepare the preprocessing land use, demographic, and population files used to build the SACSIM19 *<scenario>_raw_parcel.txt*, *<scenario>_raw_household.txt*, *<scenario>_raw_person.txt* required inputs.

Figure 4-10 Flow Chart of Land Use and Demographic File Development Process



4.6.2 Step 1: Create Scenario Parcel Base File

Create Parcel file containing all parcel variables described in Section 4.4 above and formatted in Table 4-3. Since XY coordinates, TAZ relationships, and parcel area are required, starting with a GIS boundary field is helpful.

Households and Employment totals must be defined for each SACSIM scenario. Households on each parcel are estimated by occupancy rate and the number of dwelling units (DU's) from land use dataset. Dwelling units are developed as part of our 2020 MTP/SCS. Then occupancy rate is sourced from ACS sample data and adjusted by regional control to determine the initial estimate of number

of households per parcel. Employment totals and sub totals are also forecasted as part of the MTP/SCS process.

For project-level analysis, more disaggregated land use information may be readily available and should be formatted into the SACSIM parcel categories and formatting.

K-12 and University parcels will need to be identified with the number of students enrolled. This data is then assigned a corresponding PARCELID based on land use and proximity and combined into the scenario parcel file. See section Parcel Variables K-12 Student Enrollment on details for enrollment inventory and forecasting.

Parking inventory and pricing is joined to the parcel similar to student enrollment by assigning a corresponding PARCELID based on land use and proximity. SACSIM19 cost functions operates using 2000 dollars. Daily and hourly parking price data must be converted to 2000 dollars using an appropriate Consumer Price Index (CPI) conversion rate. SACOG uses the Western Regional CPI. See section Parcel Variables Parking on details for enrollment inventory and forecasting.

4.6.3 Step 2: Prepare Inputs for Parcel Buffering

Once the base scenario parcel file is created. The following Circuity Buffering process inputs must be prepared:

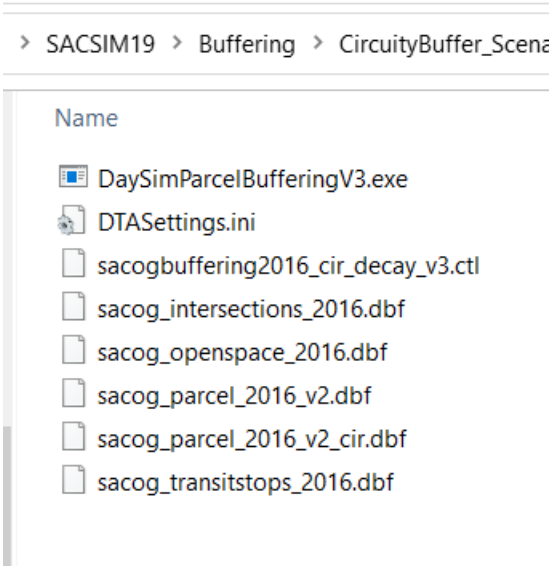
- Intersections
- Transit Stops
- Open Space
- Circuity Points

Descriptions and formatting for these files can be found under Section 4.5.3 “Developing of Circuity Buffering Inputs.” and Appendix F. As part of the MTP/SCS, SACOG staff developed a circuity files for each scenario year that can be requested. This process uses the base year circuity file described in appendix F and uses the base inventory averages by land use type file *CircuityFactor_by_landuse.csv* for forecasting parcels with new development areas.

4.6.4 Step 3: Run Circuity Buffering Tool

1. Set up scenario folder with buffering executable DaySimParcelBufferingV3.exe, control file sacogbuffering_.ctl, and parcel buffering inputs.

Figure 4-11 Circuity Buffer Tool Input Folder Example



2. Set up control file inputs.
    a. Output file name and directory, this will be the be the parcel input for DAYSIM.
    b. Parcel Buffering inputs and file types created in step 1.
    c. Buffering Parameters
        i. Logistic decay parameters:
            1. Limited 3 miles
            2. Buffer Band 1 Distance 0.125 miles
            3. Buffer Band 2: Distance 0.25 miles
            4. Offsets 0.5 miles

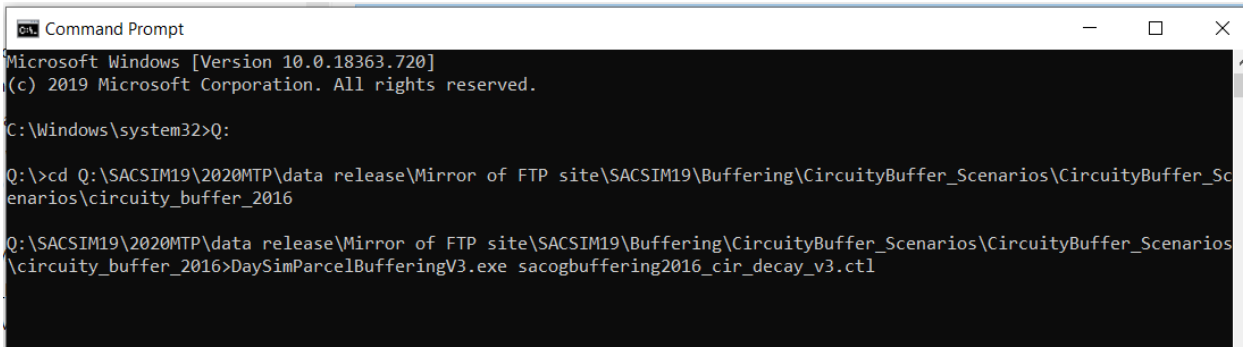
Figure 4-12 Circuity Buffering Tool Configuration File Example

sacogbuffering2016_cir_decay_v3.ctl

```
RUNLAB sacog 2008 decay buffering with circuity adjustment
PRNTFN sacog_2016_decay_and_circ.prn                          print file name

OUTDIR .\                                                output directory pathname
OUTFNM parcel_16_buf_cir_decay_may19.txt                          output parcel buffer file name (file type always ascii)
OUTDLM 3                                                 outfile file delimiter (1=space, 2=tab, 3=comma)
INPDIR .\                                                input directory pathname
PARCFT 1                                                 input parcel file type (1=dbf, 2=ascii - space or tab delimited)
PARCFN sacog_parcel_2016_v2.dbf                           input parcel base data file name
INTSFT 1                                                 input intersection file type (0=none, 1=dbf, 2=ascii - space or tab delimited)
INTSFN sacog_intersections_2016.dbf                      input intersection data file name
TRSTFT 1                                                 input transit stop file type (0=none, 1=dbf, 2=ascii - space or tab delimited)
TRSTFN sacog_transitstops_2016.dbf                       input transit stop data file name
OPSPFT 1                                                 input open space file type (0=none, 1=dbf, 2=ascii - space or tab delimited)
OPSPFN sacog_openspace_2016.dbf                          input open space data file name
CIRCFT 1                                                 input circuity file type (0=none, 1=dbf, 2=ascii - space or tab delimited)
CIRCFN sacog_parcel_2016_v2_cir.dbf                    input circuity data file name
CIRCDF 0                                                    >0 if circuity data file is for different set of points

DLIMIT 15840.0          orthogonal distance limit (feet) above which parcels are not considered for buffering

BTYPE1 2                type for buffer 1 (1 = flat, 2 = logistic decay, 3 = exponential decay)
BDIST1 660.0            buffer 1 inflection distance (feet) - used in different way depending on buffer type
BOFFS1 2640.0           buffer1 offset distance (feet) (used for logistic decay type)
DECAY1 0.76             buffer 1 decay slope parameter (used for logistic decay type)

BTYPE2 2                type for buffer 2 (1 = flat, 2 = logistic decay, 3 = exponential decay)
BDIST2 1320.0           buffer 2 inflecton distance (feet) - used in different way depending on buffer type
BOFFS2 2640.0           buffer2 offset distance (feet) (used for logistic decay type)
DECAY2 0.76             buffer 2 decay slope parameter (used for logistic decay type)
```

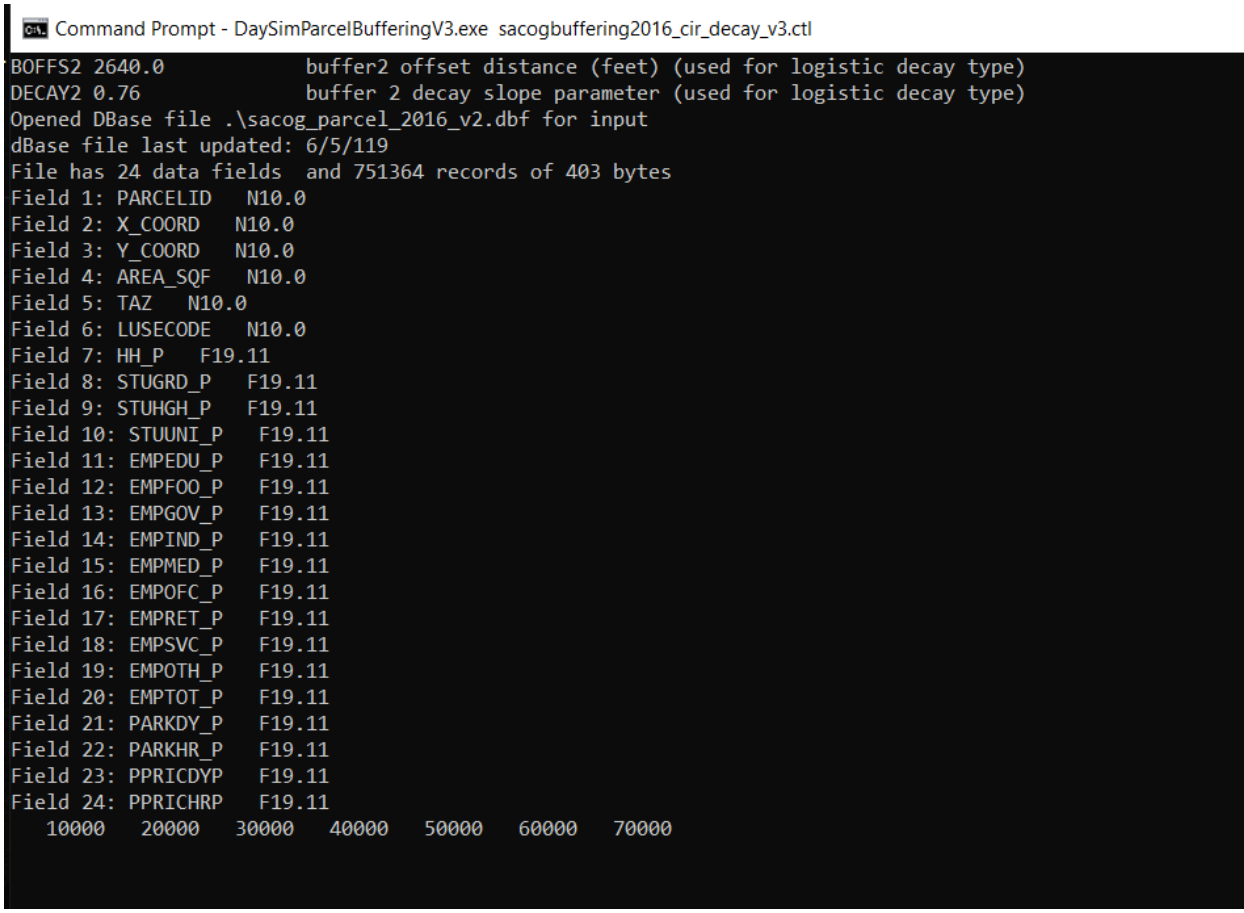
3. Run executable from Command Prompt.
    a. Point to directory example: *cd Q:\SACSIM19\Buffering\Circuity\circuity_buffer_2016*
    b. Run executable with control file: DaySimParcelBufferingV3.exe sacogbuffering_.ctl

Figure 4-13 Run Circuity Buffer From Command Prompt



    c. Confirm Buffer scripts begins running through zones.

Figure 4-14 Run Circuity Buffer From Command Prompt 2



d. Buffer Complete

4.6.5 Step 4: Prepare Population file for Allocation

See Chapter 5 for more detailed instructions on preparing the household and population files.

4.6.6 Step 5: Prepare Parcel Buffer Outputs for Allocation Process

Once the synthetic population and households have been developed (Step 4) and the parcel buffering is complete. The parcel file must be prepared for the population and households to be associated back with the parcel file. SACOG uses an executable allocation process developed by RSG to perform this process. This includes assigning the correct number of dorm students, and senior facilities to the proper TAZ and Census Tracts.

To prepare the parcel file for the allocation process, the land use parcel input must be combined with the circuity buffering project outputs.

Distance fields must also be updated. The Circuity file produces 999 distance placeholders for far away distance that must be replaced with -1. All other distance formats must be converted by multiplying the distance 100 and converting to an integer.

The household count field (hh_p) from the circuity script must also be multiplied by 100 and converted to a whole integer.

Since senior facilities household demographics characteristics are controlled to only parcels where senior living facilities exists, senior facilities are added to a separate category and treated the same way Dorm students are for the Allocation process. Once these are separated into a separate 'dome' sub category, be sure to not double count senior facility households in the parcel file. Figure 4-15 shows example code of this process.

Figure 4-15 Senior Facility and Dorm Preparation Example

```
#Tracts & Dorms - Joined by parcel id by orginal parcel file
if key in parcel_dtt_dict:
    row[fieldlist.index('DORM')] = parcel_dtt_dict[key]['DORM']

    #Remove double counting of senior facilities households
    newHP = (HSP - parcel_dtt_dict[key]['DORM'])*100 if HSP > 0 else 0
    if newHP < 0:
        newHP = 0
    row[fieldlist.index('HOUSESP')] = newHP
if key in DormsForecastDict:
    DORM_senfac = row[fieldlist.index('DORM')] if row[fieldlist.index('DORM')] is not None else 0
    DORM_v = DormsForecastDict[key] + DORM_senfac
    row[fieldlist.index('DORM')] = DORM_v
```

The Allocation tool requires parcel unique identifier to be sorted in ascending order and must not be greater than 800,000 records. For this reason, we split the parcel and population files in half and run the allocation tool twice. Figure 4-16 shows example python code on how to order and split the parcel file for allocation preparation.

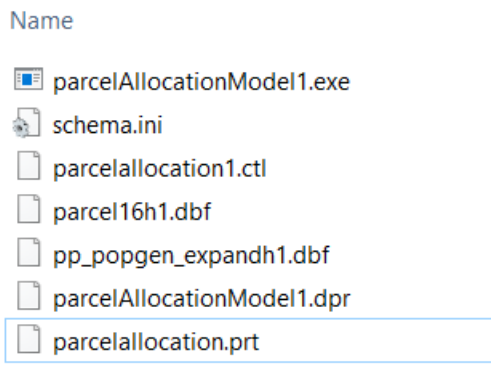
Figure 4-16 Format Parcel File for Allocation Example

```
arcpy.Sort_management(parcelTemp,parcelTemp + "_sort",[["PARCELID","ASCENDING"]])
print("Sorted by ParcelID")
print("Create DBF Outputs: " + outfolder)
maketable(parcelTemp + "_sort",parcelout + ".dbf","",OrderedOutFields)

# This step is due to a maximum amount of records hard coded
#  in the Allocation executable
print("Create partial Pop files for Allocation Tool")
parcel_dbfh1 = os.path.join(parcelTemp,parcelout+'h1.dbf')
parcel_dbfh2 = os.path.join(parcelTemp,parcelout+'h2.dbf')
wc_p_h1 = ''' "TRACT" < 9105 '''
wc_p_h2 = ''' "TRACT" >= 9105 '''
maketable(parcelTemp + "_sort",parcel_dbfh1,wc_p_h1,OrderedOutFields)
maketable(parcelTemp + "_sort",parcel_dbfh2,wc_p_h2,OrderedOutFields)
```

4.6.7 Step 6: Run Allocation Tool

1. Once both Population (Step 4) and parcel file (Step 5) have been prepared for allocation tool, scenario folder set is required with Allocation executable parcelAllocationModel1.exe, control file parcelallocation1.ctl, print file, dpr, and parcel and population inputs as shown in Figure 4-17.

Figure 4-17 Allocation Inputs



2. Set up control file inputs and directory paths.
    a. Print file (*parcelallocation.prt*)
    b. Parcel file
    c. Population file

Figure 4-18 Parcel Allocation Configuration File Example

parcelallocation1.ctl

```
RUNLAB  SACOG Synthetic Population Parcel Allocation within Tract

RUNDIR Q:\SACSIM19\2020MTP\popgen\2016\03_2016_Base\03_PostProcess\02_Allocation\02_Split\
PRNTFN parcelallocation.prt

PCLDIR Q:\SACSIM19\2020MTP\popgen\2016\03_2016_Base\03_PostProcess\02_Allocation\02_Split\
PARCFN parcel16h2.dbf

SAMDIR Q:\SACSIM19\2020MTP\popgen\2016\03_2016_Base\03_PostProcess\02_Allocation\02_Split\
SAMPFN pp_popgen_expandh2.dbf

USEMOD 1
RNSEED 54321
```

3. Run executable parcelAllocationModel1.exe from Command Prompt.
    a. Point to directory example: *cd Q:\SACSIM19\2020MTP\popgen\\01_2016_Base\03_PostProcess\02_Allocation\01_Split*
    b. Run executable with control file: arcelAllocationModel1.exe parcelallocation1.ctl
4. Check for Parcel Allocation Errors in print file.
    a. During allocation process, print stamen keeps track of parcel allocated to zones. This step may break if number of population per zone or group quarter per zone between the parcel and population files do not match.

Figure 4-19 Review Allocation Print File for Errors

parcelallocation.prt

```
Reading sample households ....  Percent completed ...
0...10...20...30...40...50...60...70...80...90...100
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
Finished at  5/7/2019 10:20:11 AM
1244673 records read from pp_popgen_expandh2.dbf

SEQ TRACT NPCLS NDORM NDREC NHHLDS NHHREC  D/PCL  SLACK    Before Adjustment
  1 30602  2195    24    24   2446   2446  0.000      0
  2 30603  1077     0     0   1163   1163  0.000      0
  3 30601  1786     0     0   1921   1921  0.000      0
  4 31900    31     0     0     31     31  0.000      0
  5 30901  1041     0     0   1161   1161  0.000      0
  6 31302  1276     0     0   1828   1828  0.000      0
  7 31000  1673     0     0   2453   2453  0.000      0
  8 31100  1665     0     0   2221   2221  0.000      0
  9 31301  1101     1     1   1258   1258  0.000      0
 10 30801  1282     1     1   1341   1341  0.000      0
 11 30701  1945     0     0   2170   2170  0.000      0
 12 31406  1899     0     0   1971   1971  0.000      0
 13 30902  1543     1     1   1577   1577  0.000      0
 14 31405   845     0     0    876    876  0.000      0
 15 31200  1656    96    96   1934   1934  0.000      0
```

5. Review Allocation tool run is complete, review result outputs and summary in print statement.

Figure 4-20 Review Allocation Print Summary Example

parcelallocation.prt

```
360
361  Reading sample households ....  Percent completed ...
362  0...10...20...30...40...50...60...70...80...90...100
363  >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
364  Finished at  5/7/2019 10:20:58 AM
365  1244673 records read from pp_popgen_expandh2.dbf
366
367        High  Mod.High   Mod.Low       Low  Very Low Urban/Mix Segment
368        5896     17530     14066     32081     18584       611 Income  0- 20
369        3963     14757     13295     38500     22513       433 Income 20 -40
370        1940      9412      9990     36297     20447       199 Income 40 -60
371        1991     10567     11264     42943     28619       189 Income 60-100
372        1050      5602      7329     35976     26829       122 Income > 100
373        8299     40727     41163    151906     95238       847 2+ pers hhld
374        6541     17141     14781     33891     21754       707 1 pers hhld
375       11900     50091     45636    162076    106288      1299 Family hhld
376        2940      7777     10308     23721     10704       255 Non-family hhd
377       12616     47096     42670    130012     85465      1281 No school kids
378        2224     10772     13274     55785     31527       273 1+ school kids
379        9722     43285     45055    161074     99112       895 Not all senior
380        5118     14583     10889     24723     17880       659 All seniors
381       14488     56237     55225    182678    114205      1507 Not single prt
382         352      1631       719      3119      2787        47 Single parent
383
```

4.6.8 Step 7: Rerun buffering analysis

The initial buffer tool was calculated based off estimated households (ACS occupancy rates * dwelling units). Because of this, after the representative population and household allocation have been completed, the circuity buffer tool should be rerun to make sure all households proximity to transit are accurate. Important: If split for allocation, both results must be merged back using PARCELID before running Circuity Buffering and Step 8.

4.6.9 Step 8: Format Parcel File for DAYSIM

Rename and format results of final circuity buffering results into DAYSIM parcel input format: ASCII delimited, with header. The delimiter can be specified in the configuration file. Table 4-5 lists the order and description of all required fields.

Table 4-5 Parcel Input File Fields for SACSIM19

Field	Description
parcelid	The parcel ID number
xcoord_p	The X coordinate (SPF) of the parcel centroid
ycoord_p	The Y coordinate (SPF) of the parcel centroid
sqft_p	The square footage area of the parcel
taz_p	The zone_ID associated with the parcel
lutype_p	The land use type code (housing density class)
hh_p	The number of households residing on the parcel
stugrd_p	The number of grade school (K-8) students enrolled at the parcel
stuhgh_p	The number of high school students enrolled at the parcel
stuuni_p	The number of college students enrolled at the parcel
empedu_p	The number of educational employees working at the parcel
empfoo_p	The number of food service employees working at the parcel
empgov_p	The number of government employees working at the parcel
empind_p	The number of industrial employees working at the parcel
empmed_p	The number of medical employees working at the parcel
empofc_p	The number of (other) office employees working at the parcel
empret_p	The number of retail employees working at the parcel
empsvc_p	The number of (other) service employees working at the parcel
empoth_p	The number of other sector employees working at the parcel (typically agriculture, mining - not used for SACOG)
emptot_p	The total number of employees working at the parcel (equals the sum of the previous 9 values)
parkdy_p	The number of paid off street parking spaces on the parcel with per day pricing
parkhr_p	The number of paid off street parking spaces on the parcel with per hour pricing
ppricdyp	The average price per day for paid off street parking spaces on the parcel

Field	Description
pprichrp	The average price per hour for paid off street parking spaces on the parcel
hh_1	The number of households residing in Buffer 1
stugrd_1	The number of grade school (K-8) students enrolled in Buffer 1
stuhgh_1	The number of high school students enrolled in Buffer 1
stuuni_1	The number of college students enrolled in Buffer 1
empedu_1	The number of educational employees working in Buffer 1
empfoo_1	The number of food service employees working in Buffer 1
empgov_1	The number of government employees working in Buffer 1
empind_1	The number of industrial employees working in Buffer 1
empmed_1	The number of medical employees working in Buffer 1
empofc_1	The number of (other) office employees working in Buffer 1
empret_1	The number of retail employees working in Buffer 1
empsvc_1	The number of (other) service employees working in Buffer 1
empoth_1	The number of other sector employees working in Buffer 1 (typically agriculture, mining - not used for SACOG)
emptot_1	The total number of employees working in Buffer 1 (equals the sum of the previous 9 values)
parkdy_1	The number of paid off street parking spaces in Buffer 1 with per day pricing
parkhr_1	The number of paid off street parking spaces in Buffer 1 with per hour pricing
ppricdy1	The average price per day for paid off street parking spaces in Buffer 1
pprichr1	The average price per hour for paid off street parking spaces in Buffer 1
nodes1_1	The number of 1-node intersections (dead-ends, cul-de-sacs) in Buffer 1
nodes3_1	The number of 3-node intersections (T junctions) in Buffer 1
nodes4_1	The number of 4+ node intersections in Buffer 1

Field	Description
tstops_1	The number of transit stops (of all types) in Buffer 1
nparks_1	The number of publicly accessible open space areas in Buffer 1
aparks_1	The average area (sq feet) of publicly accessible open space areas in Buffer 1
hh_2	The number of households residing in Buffer 2
stugrd_2	The number of grade school (K-8) students enrolled in Buffer 2
stuhgh_2	The number of high school students enrolled in Buffer 2
stuuni_2	The number of college students enrolled in Buffer 2
empedu_2	The number of educational employees working in Buffer 2
empfoo_2	The number of food service employees working in Buffer 2
empgov_2	The number of government employees working in Buffer 2
empind_2	The number of industrial employees working in Buffer 2
empmed_2	The number of medical employees working in Buffer 2
empofc_2	The number of (other) office employees working in Buffer 2
empret_2	The number of retail employees working in Buffer 2
empsvc_2	The number of (other) service employees working in Buffer 2
empoth_2	The number of other sector employees working in Buffer 2 (typically agriculture, mining - not used for SACOG)
emptot_2	The total number of employees working in Buffer 2 (equals the sum of the previous 9 values)
parkdy_2	The number of paid off street parking spaces in Buffer 2 with per day pricing
parkhr_2	The number of paid off street parking spaces in Buffer 2 with per hour pricing
ppricdy2	The average price per day for paid off street parking spaces in Buffer 2
pprichr2	The average price per hour for paid off street parking spaces in Buffer 2
nodes1_2	The number of 1-node intersections (dead-ends, cul-de-sacs) in Buffer 2

Field	Description
nodes3_2	The number of 3-node intersections (T junctions) in Buffer 2
nodes4_2	The number of 4+ node intersections in Buffer 2
tstops_2	The number of transit stops (of all types) in Buffer 2
nparks_2	The number of publicly accessible open space areas in Buffer 2
aparks_2	The average area (sq feet) of publicly accessible open space areas in Buffer 2
dist_lbus	The distance (miles) to the nearest local bus stop (999 if beyond 3 miles)
dist_ebus	The distance (miles) to the nearest premium bus stop (999 if beyond 3 miles)
dist_crt	The distance (miles) to the nearest commuter rail stop/station (999 if beyond 3 miles)
dist_fry	The distance (miles) to the nearest passenger ferry terminal (999 if beyond 3 miles)
dist_lrt	The distance (miles) to the nearest light rail stop/station (999 if beyond 3 miles)
dist_park	The distance (miles) to the edge of the nearest publicly accessible open space area (999 if beyond 3 miles)
Circ_E1	The short-distance circuity factor for direction E, distance 0.5 miles
Circ_E2	The short-distance circuity factor for direction E, distance 1.0 miles
Circ_E3	The short-distance circuity factor for direction E, distance 1.5 miles
Circ_NE1	The short-distance circuity factor for direction NE, distance 0.5 miles
Circ_NE2	The short-distance circuity factor for direction NE, distance 1.0 miles
Circ_NE3	The short-distance circuity factor for direction NE, distance 1.5 miles
Circ_N1	The short-distance circuity factor for direction N, distance 0.5 miles
Circ_N2	The short-distance circuity factor for direction N, distance 1.0 miles
Circ_N3	The short-distance circuity factor for direction N, distance 1.5 miles
Circ_NW1	The short-distance circuity factor for direction NW, distance 0.5 miles
Circ_NW2	The short-distance circuity factor for direction NW, distance 1.0 miles
Circ_NW3	The short-distance circuity factor for direction NW, distance 1.5 miles

Field	Description
Circ_W1	The short-distance circuity factor for direction W, distance 0.5 miles
Circ_W2	The short-distance circuity factor for direction W, distance 1.0 miles
Circ_W3	The short-distance circuity factor for direction W, distance 1.5 miles
Circ_SW1	The short-distance circuity factor for direction SW, distance 0.5 miles
Circ_SW2	The short-distance circuity factor for direction SW, distance 1.0 miles
Circ_SW3	The short-distance circuity factor for direction SW, distance 1.5 miles
Circ_S1	The short-distance circuity factor for direction S, distance 0.5 miles
Circ_S2	The short-distance circuity factor for direction S, distance 1.0 miles
Circ_S3	The short-distance circuity factor for direction S, distance 1.5 miles
Circ_SE1	The short-distance circuity factor for direction SE, distance 0.5 miles
Circ_SE2	The short-distance circuity factor for direction SE, distance 1.0 miles
Circ_SE3	The short-distance circuity factor for direction SE, distance 1.5 miles