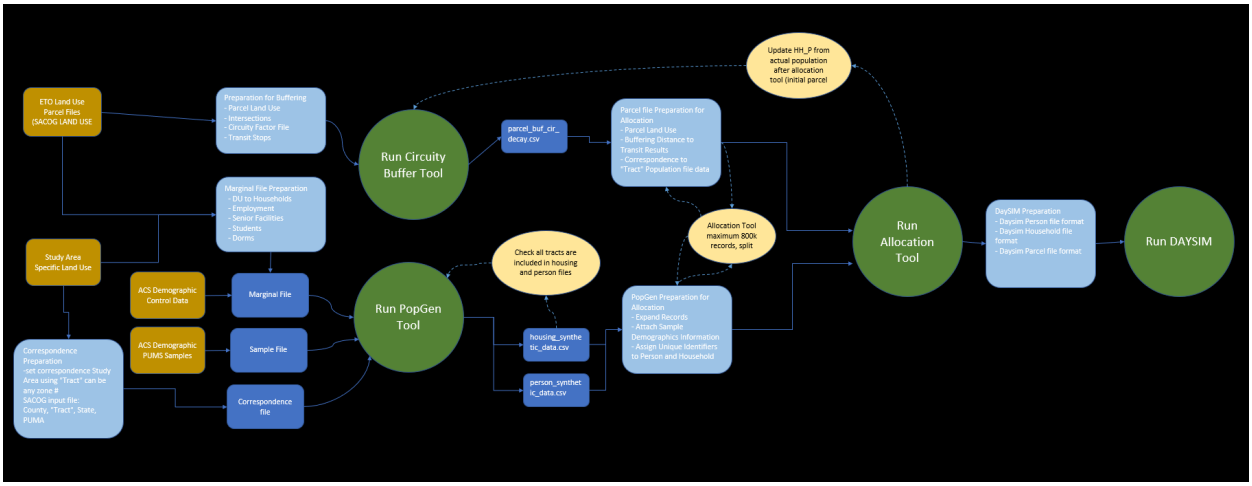
4.6 SACSIM Parcel Land Use User Guide

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:

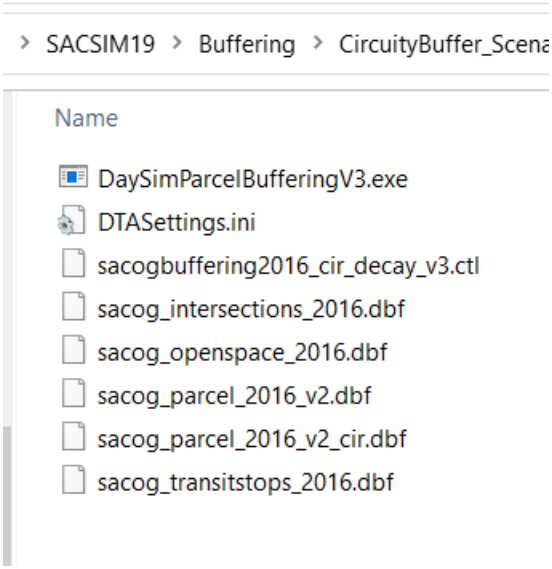
- Intersections
- Transit Stops
- Open Space
- Circuity Points

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

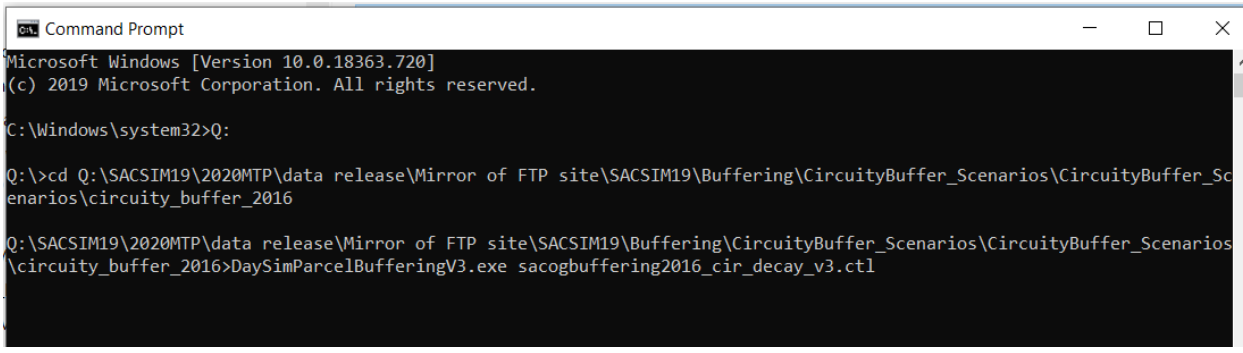
Figure 4-12 Circuity Buffering Tool Configuration File Example

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)
```

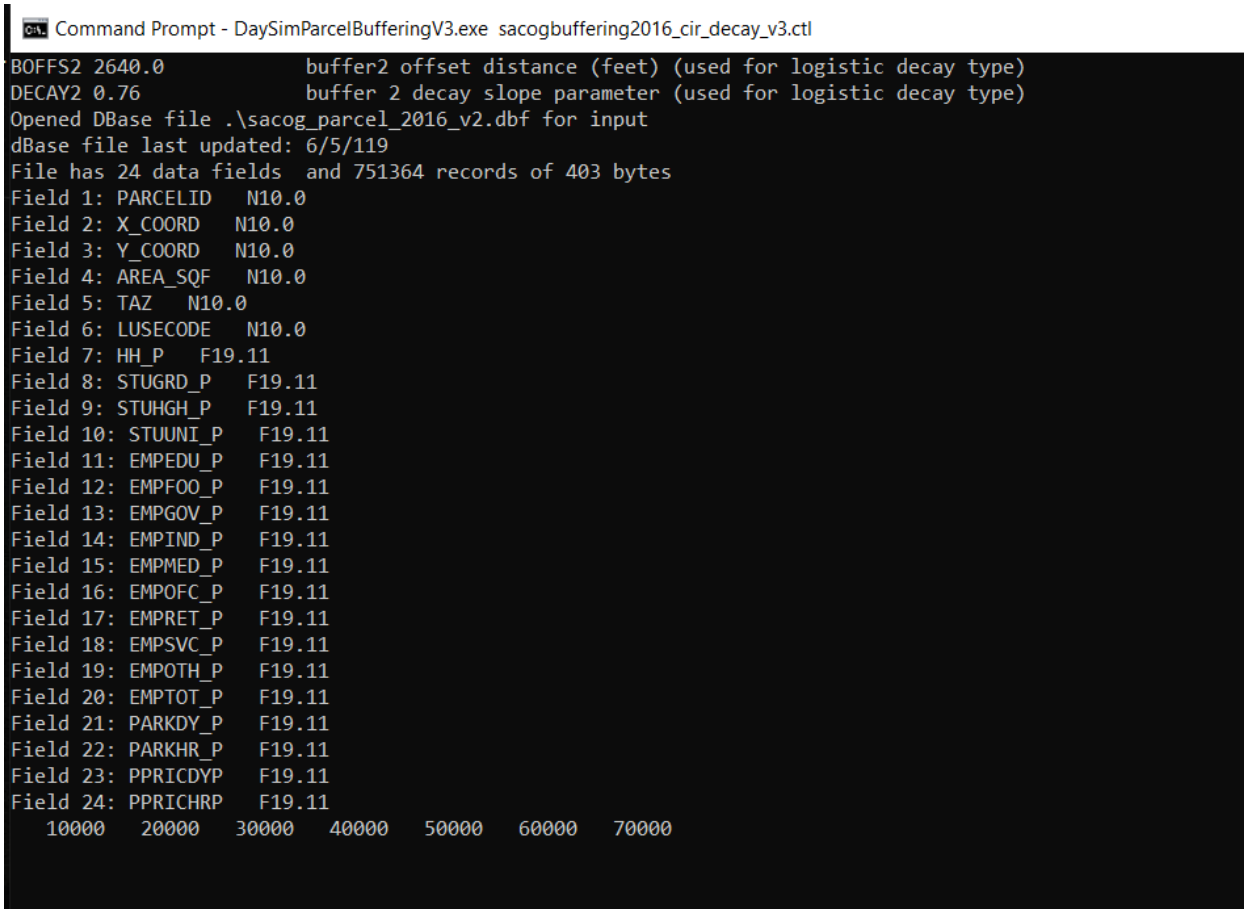
3. Run executable from Command Prompt.
    a. Point to directory example: *cd Q:\SACSIM19\Buffering\Circuity\circuity_buffer_2016*
    b. Run executable with control file: DaySimParcelBufferingV3.exe sacogbuffering_.ctl

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.

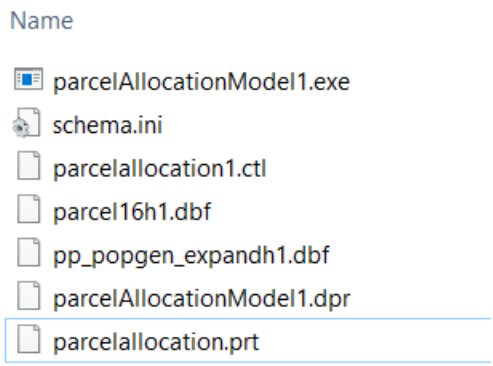
Figure 4-16 Format Parcel File for Allocation Example

```
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