CENSUS DATA GRIDDING PROGRAM

User's Guide

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INTRODUCTION

The Census Data Gridding Program (CDGP) was developed to provide gridded population data to use in determining population exposures to toxic air pollutants. Typically an exposure study begins by modeling the annual average concentrations of a pollutant for specific grid receptors. Then the population exposure is calculated. One method of obtaining the population for a cell was to interpolate populations from nearby census tract centroids. This technique frequently resulted in placement of people in unpopulated areas such as the Pacific Ocean. A more accurate technique was needed to insure a proper analysis of population exposures.

The CDGP uses the technique of polygon overlays where the area of intersection between grid cells and census tracts are calculated and prorata shares of the census tracts' populations are accumulated for the grid cells. This technique meets the need for greater accuracy and is described in further detail in the Methodology section of this guide.

At this time the CDGP will provide gridding of total population, households, male population, female population, white population, black population, population under 5 years of age, and population over 65 years of age all in a single run.

NOTE: California is divided into more then 5700 census tracts and enumeration districts. In this guide, reference to a "tract" means either a census tract OR an enumeration district.

METHODOLOGY

The CDGP program uses the TRACTS.CALIF.DATA and CDGP.TEMPLATE files to perform tract to grid allocation. The TRACTS.CALIF.DATA file contains every county within the state of California; socio-economic data for census tracts that intersect the area to be gridded; plus the polygon boundaries for the census tract. Once the tract to grid allocation is made, CDGP writes out the selected records and results to the Socio-Economic Data (SED) output file.

CELL DEFINITION:

Each cell is described with 5 points, so as to describe a closed polygon (with point 5 the same as point 1). The boundaries of each cell extend 1/2 increment north, south, east and west of each point, as shown in FIGURE 1 (below).

FIGURE 1:

The boundaries of this cell are defined by the five points P1, P2, P3, P4 and P5 located at the corners of grid cell. The cell center is the same as a receptor point for the ISCST model.

```
P4 |--------------| P3
   |  Cell Center |
   |       .      |__
   |              |
   |              |1/2 DY
P5 |--------------|--
P1 |1/2 DX|        P2
```

Example: Given a grid point located at 600 Km Easting, 4200 Km Northing in zone 10, the X increment between receptors is 1 Km (DX) and Y increment Km E (600 Km - 0.5 Km), 4199.5 Km N (4200 Km); the second at 600.5 km E, 4199.5 Km N, and so on.

CLOSED POLYGONS:

A census tract that begins and ends with the same point. The input polygon outlines are in clockwise direction.

HOLES:

Holes are small census tracts, bodies of water, etc. located within a larger census tract. Hole points are preceeded by a (-999.,-999.) and have entries with outlines in a counter clockwise direction.

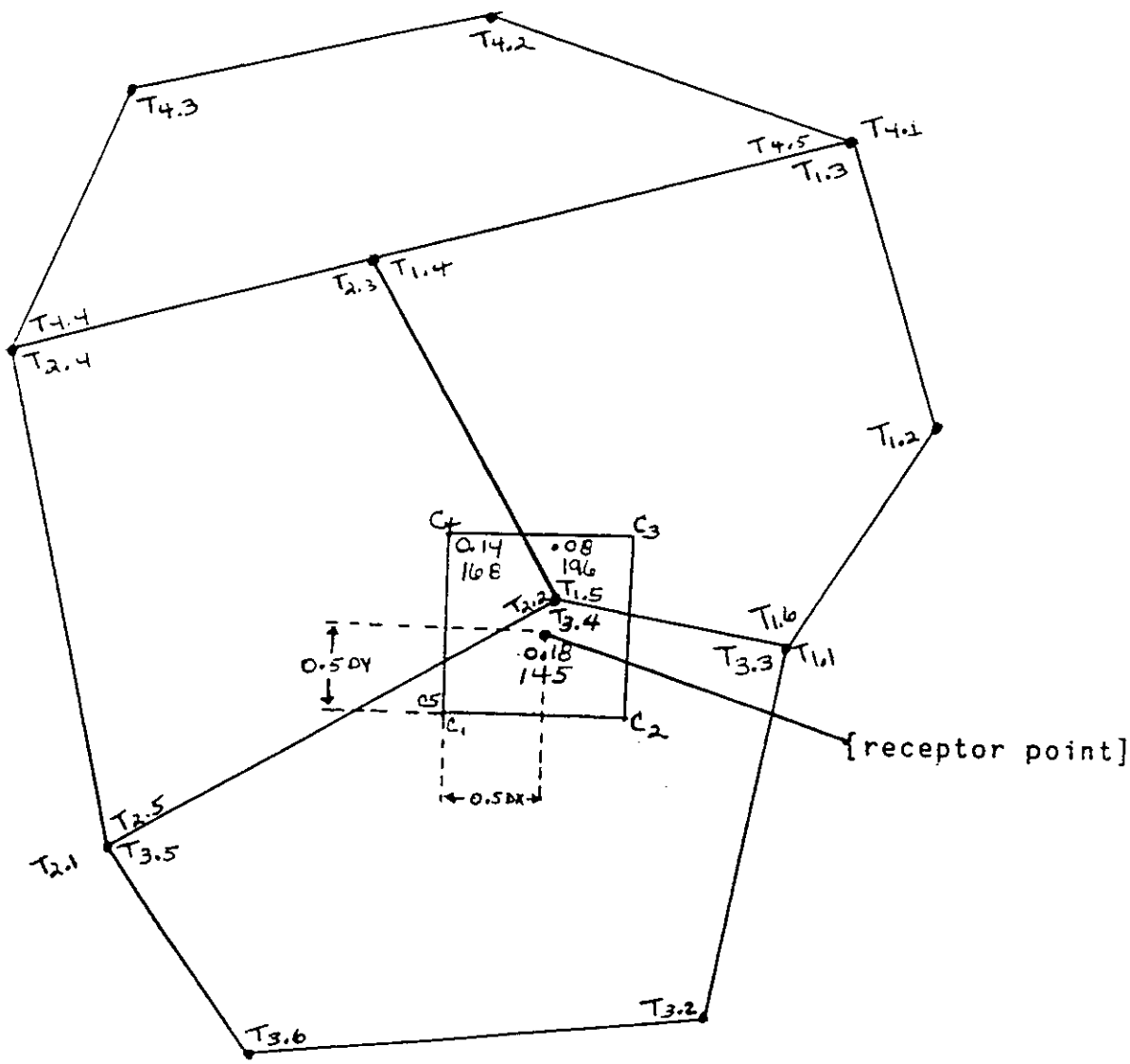
TRACT TO CELL ALLOCATION:

Each tract on the selection list is checked for closure. If closed, the area of the census tract is calculated from its boundary points. If the

tract is not closed (a closed tract has the 1st and last point the same) the area of the tract cannot be calculated. There are several tracts that have a tract lying within them. Under these circumstances, the area of the larger tract is calculated and the area of the smaller tract is calculated, then subtracted so the smaller area will not be accounted for twice. Once the area of a tract has been determined, the area of intersection between that tract and every grid cell in the gridding region is calculated (polygon overlay). The tract's contribution to each cell is stored as the ratio of the intersection area to the total area of the tract. Each socio-economic variable for the tract is multiplied by this ratio and the product is allocated to the individual cells. This process is repeated until all tracts have been processed. After calculating all the contributions from tracts to cells, the gridded data are written to the final output file. This file contains the grid point indices, county code, utm coordinates and socio-economic data values for each cell in the gridding area.

Example: Refer to FIGURE 2. In the example there are 4 tracts labeled #1, #2, #3 and #4. Tract #1 has 8% of its area intersecting with the grid cell in question, so 8 % of its population (.08*2450 people = 196 people) is allocated to the cell, 168 people (14%) are allocated from tract #2 and 145 people (18%) are allocated from tract #3. Tract #4 does not intersect with the cell so it contributes nothing. The total cell population is 509 (196 + 168 + 145) people.

FIGURE 2.



PROGRAMS

GRIDDING:

CDGP: Census Data Gridding Program.

This program selects census tracts to be used in the gridding portion of the program. The selection is based on those counties specified by the user in the Template file. Input data (grid description found in the template) and the merged boundary/socio-economic data (on Prime - MODTOX>EXPOSURE>CDGP>TRACTS.CALIF.DATA, on Teale - ARMODEL.CG.CDGP.TEMPLATE) are read and the gridding is accomplished by area weighted census tract to grid allocation. The gridded socio-economic data are written to the output file a user selects and enters into the TEMPLATE. The filename usually contains the acronym GSED (Gridded Socio-Economic Data).

Language: FORTRAN
Prime Location: MODTOX>EXPOSURE>CDGP>CDGP.F77
Teale Location: ARMODEL.CG.FORT(CDGP)

UTILITY:

CDGP1: Census Tract Selection and Data Collection Program.

This was the preprocessor used in the old version of the CDGP program. Now it is available as a utility. This preprocessor selects census tracts to be used in the gridding program. Selection is based on county numbers specified by the user. It also collects socio-economic data from the SED FILE. The merged data are written to the ARMODEL.CG.TRACTS.ALL.CALIF.DATA file on Teale and then transferred to Prime at MODTOX>EXPOSURE>CDGP>TRACTS.CALIF.DATA.

Language: FORTRAN
Prime Location: Not on Prime system.
Teale Location: ARMODEL.CG.FORT(CDGP1)

CDGP3: Gridded Socio-Economic Data Projection Program.

This program uses the projection factors created by the PFCTR program to project gridded population data, from a GRIDDED SOCIO-ECONOMIC DATA FILE, for any year (after the base year).

Language: SAS
Prime Location: Not on Prime system
Teale Location: ARMODEL.CG.CNTL(CDGP3)

STFA: SED FILE Creation Program.

This program reads the various Census Data Center Summary Tape Files (STFs), selects the standard socio-economic parameters, and writes the data to the SED FILE. Used ONLY when new census data are obtained.

Language: SAS
Prime Location: Not on Prime system.
Teale Location: ARMODEL.CG.CNTL(STFA)

PFCTR: GROWTH FACTOR FILE Creation Program.

PFCTR reads the population projection table entered from the Department of Finance (DOF) population projection report and calculates population growth factors for each county in the state. These factors are written to the GROWTH FACTOR FILE for use by CDGP3. Used ONLY when new population projections are obtained.

Language: SAS
Prime Location: Not on Prime system.
Teale Location: ARMODEL.CG.CNTL(PFCTR)

PROGRAM EXECUTION

GRIDDING:

The CDGP program may be executed by modifying a copy of the CDGP.TEMPLATE file, with desired selections, and submitting the Job Control Language (JCL) found in the file: MODTOX>EXPOSURE>CDGP>JOBS> CDGP.PH, at Prime; and at Teale ARMODEL.CG.CDGP.TEMPLATE with the JCL ARMODEL.CG.CNTL(CDGP). All the information requested under section METHODOLOGY, item TEMPLATE, is required for proper program execution.

TEMPLATE

The CDGP program has one user supplied input file in the form of a template (CDGP.TEMPLATE). The following items are to be entered into the CDGP.TEMPLATE:

GSED OUTPUT FILE (max 20 characters): The name of the file the final gridded socio-economic data is to be written to. This file contains the gridded data resulting from tract to cell allocation.

GRIDDED OUTPUT FILE (max 20 characters): This file contains the tract to grid allocation. It identifies the amount of the tract that falls within a gridded area, the number of gridded cells, and the grid parameters.

THE SELECTED COUNTIES TO BE GRIDDED: Select from 58 California counties by entering an "X" by the county(ies) that you would like to include in the gridding.

GRID DESCRIPTION: Enter a brief description of the area to be gridded.

NUMBER OF PARAMETERS: Enter the number of socio-economic parameters you are gridding.

X ORIGIN (km): The origin of the grid, a UTM east coordinate in kilometers of the south-west most grid point (same as the receptor grid origin specified for the ISCT Model).

Y ORIGIN (km): The origin of the grid, a UTM north coordinate in kilometers of the south-west most grid point (same as the receptor grid origin specified for the ISCT Model).

UTM ZONE: The zone pertaining to (x,y) UTM origin.

X-INCREMENT (km): The x-increment between receptors (x), grid spacing in the east/west direction.

Y-INCREMENT (km): The y-increment between receptors (y), grid spacing in the north/south direction.

THETA: The degree of the angle at which the grid will be rotated in the counterclockwise direction from the north (normally 0 degrees).

Once the template is filled out with the various selected items, you can run the CDGP program.

CREATION OF TRACTS WORKFILE:

The CDGP1 utility may be executed when there is new census or boundary data for the California counties. Sample JCL is provided in the files ARMODEL.CG.CNTL(CDGP1).

POPULATION PROJECTION:

Sample JCL to run the population projection (CDGP3) is located in the file ARMODEL.CG.CNTL(CDGP3). Instructions are provided in the JCL. Required inputs include input and output filenames, base year, projection year and a title for the documentation report.

STFA & PFCTR:

These programs are used only when updated census data is received. They should be used with caution as they create the SED and POPULATION GROWTH FACTOR FILES. Sample IBM JCL is located in the files ARMODEL.CG.CNTL(STFA) and ARMODEL.CNTL(PFCTR).

FILES AND FILE FORMATS

SUMMARY TAPE FILES:

Filename	Record Size	Segments	Lrecl	Number of Tables
ARMODEL.T2G.STF1A.TRACT	3276	2	1638	59
ARMODEL.T2G.STF1A.ED	3276	2	1638	59
ARMODEL.CP.STF3A.TRACT	12096	6	2016	150
ARMODEL.T2G.STF3A.ED	12096	6	2016	150

Contains the original socio-economic data obtained from the Department of Finance, Census Data Center (CDC). These files are not used directly by the CDGP but are processed to create the SED FILE (see below).

Formats: See the STF1 and STF3 data dictionaries published by CDC.

These files are maintained on 9 track magnetic tape.

SOCIO-ECONOMIC DATA (SED) FILE:

An intermediate file which is needed to create the tracts workfile. It contains selected socio-economic data for all census tracts and enumeration districts in California.

Filename: ARMODEL.CP.STF1A.CDGP.DATA
(LRECL=80, RECFM=FB)

Format:

Field Description	Columns	Format
County Code	1-2	I2
Tract/ED Number	3-8	I6
Total Population	9-17	I9
Households	18-26	I9
Male Population	27-35	I9
Female Population	36-44	I9
White Population	45-53	I9
Black Population	54-62	I9
Population <5 yrs old	63-71	I9
Population >65 yrs old	72-80	I9

TRACT BOUNDARY FILE:

Contains the UTM coordinates for all points used to describe the boundaries of census tracts and enumeration districts in California.

Filename at Prime: Not on the Prime system.
Filename at Teale: ARMODEL.CG.CENSUS.BOUNDS.CALIF.DATA
(LERCL=34, RECFM=FB)

Format:

Field Description	Columns	Format
County Code	1-2	I2
Tract Number	3-8	I6
UTM Easting	9-18	F10.4
UTM Northing	19-28	F10.4
Point Number	29-31	I3
Blank	32	1X
UTM Zone	33-34	I2

TEMPLATE:

A control file that contains various parameters that are required for selection before running the CDGP program. See sample template in the appendix. Refer to the CDGP program for formats.

Filename at Prime: Specified by the user.
Filename at Teale: Specified by the user.

TRACTS WORKFILE:

Contains every county within California, the boundary data, and socio-economic data for census tracts that intersect the area to be gridded.

Filename at Prime: MODTOX>EXPOSURE>CDGP>TRACTS.CALIF.DATA
Filename at Teale: ARMODEL.CG.TRACTS.ALL.CALIF.DATA

Formats:

RECORD #1 (Tract Identification):

Field Description	Columns	Format
County Code	1-2	I2
Tract Number (w/leading zeros)	3-8	I6
UTM Zone (10 or 11)	9-10	I2
Number of Boundary Points (NP)	11-13	I3
Total Population	14-22	I9

RECORD #2 (Tract Socio-Economic Data):

Field Description	Columns	Format
Households	1-9	I9
Male Population	10-18	I9
Female Population	19-27	I9
White Population	28-36	I9
Black Population	37-45	I9
Population >5 yrs old	46-54	I9
Population <65 yrs old	55-63	I9
(Reserved)	64-72	I9

RECORD #3 (Tract Boundary Data):

Field Description	Columns	Format
UTM Easting (point 1)	1-10	F10.4
UTM Northing (point 2)	11-20	F10.4
UTM Easting (point 3)	21-30	F10.4
UTM Northing (point 4)	31-40	F10.4

Repeated 2 times per record. There should be at most 4 sets per record, totaling to 4 Easting and 4 Northing coordinates on one record. Additional records are written until all points (NP points) in the tract boundary description have been accounted for.

Records 1 through 3 are repeated for all census tracts in the state.

GRIDDED SOCIO-ECONOMIC DATA (GSED) FILE:

Contains gridded socio-economic data which is the final product of the gridding program.

Filename at Prime: Specified by the user.
Filename at Teale: Specified by the user.
(LRECL=132, RECFM=FB)

Format:

Field Description	Columns	Format
Point	1-5	I5
Blank	6	1X
County Code	7-8	~~I4~~ I2?
I (grid index)	9-11	I3
J (grid index)	12-14	I3
UTM Easting	15-24	F10.4
UTM Northing	25-34	F10.4
Total Population	35-43	I9
Households	44-52	I9
Male Population	53-61	I9
Female Population	62-70	I9
White Population	71-79	I9
Black Population	80-88	I9
Population <5 yrs old	89-97	I9
Population >65 yrs old	98-106	I9
(Reserved)	107-115	I9
Blank	116-132	17X

GRIDDED OUTPUT FILE:

Contains diagnostic output from the CDGP. It identifies the gridded parameters, the amount of the tract that falls with in a gridded area, the number of griddded cells, and the total # of records written to the GSED file.

Filename at Prime: Specified by the user.
Filename at Teale: Specified by the user.

Format: Text. The parameters and fields are described in the file; so a field, column and format description is not listed below. (Refer to the sample results in the Appendix.)

COUNTY GROWTH FILE:

Contains population projections by county from 1980 to 2020. Data are from the publication: "Population Projections for California Counties 1980-2020", Department of Finance, Report ~~83~~ 86-P-3, ~~Oct 83.~~ Dec 1986

Filename at Prime: Not used on Prime.
Filename at Teale: ARMODEL.CG.POP.PROJEC.DATA
(LRECL=80, RECFM=FB)
VCFGCP3

Format:

Field Description	Columns	Format
Blank	1	1X
County Code	2-3	I2
1980 Population	4-12	I9
1985 Population	13-21	I9
1990 Population	22-30	I9
1995 Population	31-39	I9
2000 Population	40-48	I9
2020 Population	49-57	I9

GROWTH FACTOR FILE:

Contains factors by county for the periods 1980-1985, 1985-1990, 1990-1995, 1995-2000 and 2000-2020. Factors are calculated from the population in the COUNTY GROWTH FILE and are used by the program: CDGP3.

Filename at Prime: Not used on Prime.
Filename at Teale: ARMODEL.CG.GROWTH.FACTOR.DATA
(LRECL=80, RECFM=FB)
DOFGCP3

Format:

Field Description	Columns	Format
Blank	1	1X
County Code	2-3	I2
Factor #1 (1980-1985)	4-12	F12.8
Factor #2 (1985-1990)	13-21	F12.8
Factor #3 (1990-1995)	22-30	F12.8
Factor #4 (1995-2000)	31-39	F12.8
Factor #5 (2000-2020)	40-48	F12.8

APPENDICES

Appendix A: County Codes

Appendix B: FORTRAN Source Code Listings

Appendix C: Sample Input Files

Appendix D: Sample Job Control Language

- Prime JCL
- IBM JCL

Appendix E: Sample Program Output and Files

Appendix A: COUNTY CODES

COUNTY	CODE	COUNTY	CODE
Alameda	01	Napa	28
Alpine	02	Nevada	29
Amador	03	Orange	30
Butte	04	Placer	31
Calaveras	05	Plumas	32
Colusa	06	Riverside	33
Contra Costa	07	Sacramento	34
Del Norte	08	San Benito	35
El Dorado	09	San Bernardino	36
Fresno	10	San Diego	37
Glenn	11	San Francisco	38
Humboldt	12	San Joaquin	39
Imperial	13	San Luis Obispo	40
Indio	14	San Mateo	41
Kern	15	Santa Barbara	42
Kings	16	Santa Clara	43
Lake	17	Santa Cruz	44
Lassen	18	Shasta	45
Los Angeles	19	Sierra	46
Madera	20	Siskiyou	47
Marin	21	Solano	48
Mariposa	22	Sonoma	49
Mendocino	23	Stanislaus	50
Merced	24	Sutter	51
Modoc	25	Tehama	52
Mono	26	Trinity	53
Monterey	27	Tulare	54
		Tuolomne	55
		Ventura	56
		Yolo	57
		Yuba	58

Appendix B

FORTRAN SOURCE CODE LISTINGS

Appendix C

SAMPLE INPUT FILES

CDGP TEMPLATE ON PRIME

```
MODTOX>EXPOSURE>CDGP>TEMPLATES>CDGP.TEMPLATE

>>>>  ENTER  X FOR THE COUNTIES THAT YOU HAVE  >>>>
>>>>  SELECTED FROM THE FOLLOWING 58, THEN     >>>>
>>>>  FILL IN THE BLANKS AS INSTRUCTED.        >>>>
>>>>  MAKE SURE THAT YOU BLANK OUT ANY PREV-   >>>>
>>>>  IOS MARKED COUNTIES, BEFORE YOU USE THE  >>>>
>>>>  TEMPLATE.                                >>>>

****************************************
***    CENSUS DATA GRIDDING PROGRAM   ***
***       GRID DESCRIPTION            ***
****************************************

ENTER THE OUTPUT FILE (MAX 20 CHARACTERS, i.e. GSED.CDGP): GSED.SAMPLE
                                                           --------------------
ENTER RESULT FILE; ENTER SCREEN, IF YOU WANT TO VIEW TRACT TO GRID ALLOCATION
ON THE SCREEN, OR ENTER A NEW FILE NAME IF YOU WANT THE INFORMATION PRINTED OUT.
                     (MAX 20 CHARACTERS, i.e. INFO.DATA): NSCREEN.DATA
                                                           --------------------

-  1 ALAMEDA            X 30 ORANGE
-  2 ALPINE             - 31 PLACER
-  3 AMADOR             - 32 PLUMAS
-  4 BUTTE              X 33 RIVERSIDE
-  5 CALAVERAS          - 34 SACRAMENTO
-  6 COLUSA             - 35 SAN BENITO
-  7 CONTRA COSTA       X 36 SAN BERNARDINO
-  8 DEL NORTE          - 37 SAN DIEGO
-  9 EL DORADO          - 38 SAN FRANCISCO
- 10 FRESNO             - 39 SAN JOAQUIN
- 11 GLENN              - 40 SAN LUIS OBISPO
- 12 HUMBOLDT           - 41 SAN MATEO
- 13 IMPERIAL           - 42 SANTA BARBARA
- 14 INYO               - 43 SANTA CLARA
- 15 KERN               - 44 SANTA CRUZ
- 16 KINGS              - 45 SHASTA
- 17 LAKE               - 46 SIERRA
- 18 LASSEN             - 47 SISKIYOU
X 19 LOS ANGELES        - 48 SOLANO
- 20 MADERA             - 49 SONOMA
- 21 MARIN              - 50 STANISLAUS
- 22 MARIPOSA           - 51 SUTTER
- 23 MENDOCINO          - 52 TEHAMA
- 24 MERCED             - 53 TRINITY
- 25 MODOC              - 54 TULARE
- 26 MONO               - 55 TUOLUMNE
- 27 MONTEREY           - 56 VENTURA
- 28 NAPA               - 57 YOLO
- 29 NEVADA             - 58 YUBA

GRID DESCRIPTION:  CDGP SAMPLE RUN
                   ------------------------
```

CDGP TEMPLATE ON PRIME

```
NUMBER OF PARAMETERS:   8
                        --
X ORIGIN (KM):     445.5000
                  -----.----
Y ORIGIN (KM):    3754.5000
                  -----.----
UTM ZONE: 11
          --
NUMBER OF X GRIDS:    7
                     ---
NUMBER OF Y GRIDS:    7
                     ---
X-INCREMENT(KM):   3.000
                  --.---
Y-INCREMENT(KM):   3.000
                  --.---
THE GRID IS ROTATED   0.0 (THETA) DEG. COUNTERCLOCKWISE FROM UTM NORTH.
                     ---.-
```

CDGP TEMPLATE ON TEALE

```
MODTOX>EXPOSURE>CDGP>TEMPLATES>CDGP.TEMPLATE

>>>>  ENTER  X FOR THE COUNTIES THAT YOU HAVE  >>>>
>>>>  SELECTED FROM THE FOLLOWING 58, THEN     >>>>
>>>>  FILL IN THE BLANKS AS INSTRUCTED.        >>>>
>>>>  MAKE SURE THAT YOU BLANK OUT ANY PREV-   >>>>
>>>>  IOS MARKED COUNTIES, BEFORE YOU USE THE  >>>>
>>>>  TEMPLATE.                                >>>>


****************************************
***    CENSUS DATA GRIDDING PROGRAM   ***
***       GRID DESCRIPTION            ***
****************************************

ENTER THE OUTPUT FILE (MAX 20 CHARACTERS, i.e. GSED.CDGP): GSED.SAMPLE
                                                           --------------------
ENTER RESULT FILE; ENTER SCREEN, IF YOU WANT TO VIEW TRACT TO GRID ALLOCATION
ON THE SCREEN, OR ENTER A NEW FILE NAME IF YOU WANT THE INFORMATION PRINTED OUT.
                      (MAX 20 CHARACTERS, i.e. INFO.DATA): NSCREEN.DATA
                                                           --------------------

-  1 ALAMEDA            X 30 ORANGE
-  2 ALPINE             - 31 PLACER
-  3 AMADOR             - 32 PLUMAS
-  4 BUTTE              X 33 RIVERSIDE
-  5 CALAVERAS          - 34 SACRAMENTO
-  6 COLUSA             - 35 SAN BENITO
-  7 CONTRA COSTA       X 36 SAN BERNARDINO
-  8 DEL NORTE          - 37 SAN DIEGO
-  9 EL DORADO          - 38 SAN FRANCISCO
- 10 FRESNO             - 39 SAN JOAQUIN
- 11 GLENN              - 40 SAN LUIS OBISPO
- 12 HUMBOLDT           - 41 SAN MATEO
- 13 IMPERIAL           - 42 SANTA BARBARA
- 14 INYO               - 43 SANTA CLARA
- 15 KERN               - 44 SANTA CRUZ
- 16 KINGS              - 45 SHASTA
- 17 LAKE               - 46 SIERRA
- 18 LASSEN             - 47 SISKIYOU
X 19 LOS ANGELES        - 48 SOLANO
- 20 MADERA             - 49 SONOMA
- 21 MARIN              - 50 STANISLAUS
- 22 MARIPOSA           - 51 SUTTER
- 23 MENDOCINO          - 52 TEHAMA
- 24 MERCED             - 53 TRINITY
- 25 MODOC              - 54 TULARE
- 26 MONO               - 55 TUOLUMNE
- 27 MONTEREY           - 56 VENTURA
- 28 NAPA               - 57 YOLO
- 29 NEVADA             - 58 YUBA

GRID DESCRIPTION:  CDGP SAMPLE RUN
                   ------------------------
```

CDGP TEMPLATE ON TEALE

NUMBER OF PARAMETERS: 8

X ORIGIN (KM): 445.5000

Y ORIGIN (KM): 3754.5000

UTM ZONE: 11

NUMBER OF X GRIDS: 7

NUMBER OF Y GRIDS: 7

X-INCREMENT(KM): 3.000

Y-INCREMENT(KM): 3.000

THE GRID IS ROTATED 0.0 (THETA) DEG. COUNTERCLOCKWISE FROM UTM NORTH.

THE FOLLOWING IS A SAMPLE OF THE TRACTS WORKFILE (INPUT) FOR CDGP. THE ACTUAL WORK FILE IS LOCATED AT:

MODTOX>EXPOSURE>CDGP>TRACTS.CALIF.DATA

```
140010010 71     2346
    1060     1199     1147     2114      104       95      279        0
 566.2510 4192.9531  566.5923 4192.6367  566.8579 4192.8125  567.0117 4192.8516
 567.4153 4192.5664  567.5374 4192.5625  567.6890 4192.5273  567.9729 4192.3164
 568.1533 4192.2344  568.3218 4191.7734  568.3945 4191.6641  568.6199 4191.5312
 568.6855 4191.1953  568.2483 4190.9023  568.1511 4190.7383  568.2556 4190.6562
 568.5818 4190.3437  568.6658 4190.1094  568.7690 4190.0000  568.7971 4189.9219
 568.9587 4189.7187  569.2214 4189.3281  569.4478 4189.2461  569.5242 4189.2422
 569.1572 4189.2383  569.0657 4189.2422  568.9895 4189.2422  568.8979 4189.2461
 568.9028 4189.3984  568.7661 4189.4336  568.7356 4189.4375  568.7366 4189.4648
 568.8772 4189.5547  568.8508 4189.6914  568.6831 4189.6953  568.6865 4189.8047
 568.5950 4189.8086  568.5186 4189.8086  568.5220 4189.9141  568.3538 4189.9219
 568.3572 4190.0273  568.3760 4190.1367  568.3455 4190.1367  568.2251 4190.1836
 568.1919 4190.1094  568.1614 4190.1094  568.0979 4190.0352  568.1675 4189.8203
 568.1487 4189.7148  567.9807 4189.7187  567.9773 4189.6133  567.9585 4189.5078
 567.8672 4189.5078  567.9551 4189.3984  567.8638 4189.4023  567.8452 4189.2969
 567.7500 4189.1914  567.5627 4189.0742  567.4868 4189.0781  567.3950 4189.0820
 567.2344 4189.3164  567.0667 4189.3203  566.9971 4189.5391  567.0598 4190.0703
 566.3391 4189.9844  566.2661 4190.0937  566.3105 4190.5234  566.2632 4190.9531
 566.2122 4191.2734  566.2388 4192.5703  566.2510 4192.9531
 568.2795 4183.7969  568.1118 4183.8008  567.9473 4183.9141
    .
    .
    .
140490010 28     4136
    1714     1916     2220     2838      349      233      783        0
 566.8245 4184.1641  567.1060 4184.3672  567.9441 4184.7695  568.0393 4184.8750
 568.1157 4184.8711  568.2258 4184.9727  568.3208 4185.0781  568.3242 4185.1836
 568.4160 4185.1836  568.3972 4185.0742  568.2988 4184.8672  568.2070 4184.8672
 568.2798 4184.7578  568.2764 4184.6523  568.2576 4184.5469  568.2542 4184.4375
 568.1626 4184.4414  568.2507 4184.3320  568.1592 4184.3359  568.0679 4184.3359
 568.0645 4184.2305  568.0422 4184.0195  567.9473 4183.9141  568.1118 4183.8008
 568.0010 4183.6836  567.4094 4183.8242  567.0618 4183.9414  566.8245 4184.1641
140500010 27     3193
    1522     1496     1697     2250      490      148      550        0
 565.5049 4184.9531  565.5967 4184.9531  565.6885 4184.9492  565.9512 4185.0469
 566.1885 4184.8242  566.3528 4184.7148  566.4441 4184.6953  566.5830 4184.7383
 567.2417 4184.7930  567.3335 4184.7891  567.4285 4184.8945  567.6917 4184.9922
 567.7104 4185.0977  567.8086 4185.3086  568.3242 4185.1836  568.3208 4185.0781
 568.2258 4184.9727  568.1157 4184.8711  568.0393 4184.8750  567.9441 4184.7695
 567.1060 4184.3672  566.8245 4184.1641  566.6785 4184.3828  566.5906 4184.4922
 566.0935 4184.7227  565.8374 4184.8359  565.5049 4184.9531
140510010 20     4449
    1612     2134     2310     2895     1051      310      598        0
 566.9512 4185.0469  566.0430 4185.0430  566.2332 4185.2539  566.4229 4185.4609
 566.5876 4185.3477  566.8657 4185.4453  566.8691 4185.5508  566.7927 4185.5547
 566.7961 4185.6641  567.8086 4185.3086  567.7104 4185.0977  567.6917 4184.9922
 567.4285 4184.8945  567.3335 4184.7891  567.2417 4184.7930  566.5830 4184.7383
 566.4441 4184.6953  566.3528 4184.7148  566.1885 4184.8242  565.9512 4185.0469
 585.0107 4307.0000  582.3838 4306.8945  582.3223 4308.4180
```

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5701150010101 3339

1135	1715	1624	2646	57	247	440	0
550.4514	4304.5781	550.5168	4304.9336	551.8530	4307.2187	582.3223	4308.4180
582.3838	4306.8945	585.0107	4307.0000	584.6689	4301.5625	583.3284	4301.3828
583.2771	4301.0586	583.0405	4300.9687	582.9177	4300.8203	582.9290	4300.5469
583.2205	4300.0781	582.9900	4292.2852	588.4690	4292.4922	588.6985	4292.3711
589.2112	4292.3945	589.8564	4292.3047	590.1479	4292.2383	591.6055	4292.6992
590.2207	4286.4648	590.5186	4283.4609	592.7229	4283.3086	593.9973	4283.1367
594.5261	4283.1562	594.8735	4282.8984	595.0032	4281.2812	595.7476	4281.1211
595.8757	4275.5586	587.1470	4275.1719	587.0935	4275.3008	587.0312	4275.6484
586.8110	4275.9453	586.9185	4276.4648	586.7473	4276.7305	586.8020	4277.3555
586.6017	4277.7070	586.6064	4278.0234	586.5747	4278.2148	586.3802	4278.4492
583.4915	4278.2812	583.4851	4278.4414	581.2695	4278.4648	581.0405	4278.1836
580.2825	4276.6914	579.4226	4276.5312	578.9431	4276.0781	578.4309	4276.0586
577.9006	4275.6836	577.3877	4275.6602	576.7454	4275.2812	575.7441	4275.8359
574.9963	4275.6758	574.0681	4276.0234	573.7795	4276.0117	573.2395	4276.2812
572.8137	4276.8867	572.8772	4277.2930	573.0312	4277.4609	572.5842	4278.5977
572.2722	4278.7773	571.9287	4278.9375	571.3562	4278.8047	571.0630	4278.9180
570.8762	4279.1680	569.5022	4281.0078	569.6707	4281.6055	569.6116	4282.2773
569.1106	4283.1562	568.2009	4283.0391	567.9080	4283.1406	567.7683	4283.4219
567.3813	4285.8477	567.1819	4286.8164	566.7400	4287.8281	565.3647	4289.6953
565.2083	4291.1836	564.6479	4293.1328	561.9382	4299.0586	561.7732	4299.1641
561.1326	4299.1367	560.5667	4299.2422	560.3494	4299.4570	559.5437	4299.1367
559.0591	4299.6289	558.6648	4299.8555	558.3569	4299.5234	557.5740	4299.4414
557.0266	4299.0977	556.9829	4298.9844	556.4478	4298.7227	555.8958	4298.8906
554.1665	4299.9922	552.8101	4301.3984	552.6692	4301.6992	552.2039	4302.0977
551.5671	4302.3750	551.4968	4303.3203	550.7495	4304.3477	550.5203	4304.4531
550.4514	4304.5781						
638.9307	4348.7695	638.0132	4348.3516	635.9348	4348.9102		

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5804110010 58 3942

1502	2025	1917	3669	28	306	596	0
658.6824	4363.5625	656.9448	4360.8320	656.0437	4360.6094	655.5044	4358.7969
655.1797	4359.5742	653.8643	4359.5937	652.5347	4358.7148	652.0466	4355.7187
651.2585	4356.8594	649.0959	4356.9492	646.0696	4362.1367	642.7798	4362.5312
641.5730	4360.7891	641.0056	4359.3555	639.2676	4359.6953	639.4309	4362.3906
638.8213	4363.5156	640.0044	4365.6953	640.1895	4367.5625	642.7395	4369.6289
641.5613	4371.1172	641.5894	4371.8164	642.2083	4371.8867	642.2378	4372.7812
642.7280	4373.2812	643.3779	4373.1797	643.5352	4373.9922	644.2026	4373.9219
645.2161	4376.0352	645.5498	4378.0742	647.4084	4378.1133	647.3098	4377.2852
650.6687	4377.0039	650.8374	4378.5039	654.6919	4378.0625	654.6367	4377.2148
657.0220	4376.9297	657.1270	4377.6523	657.8540	4377.5781	658.2576	4380.4609
659.0266	4380.3516	659.0759	4381.1289	660.9785	4380.9687	660.9719	4381.4336
661.7595	4381.3672	662.0127	4383.1602	664.1580	4383.0391	664.7417	4384.4883
664.6897	4384.9414	670.9517	4389.3633	668.8933	4381.3164	666.0317	4379.4727
666.9570	4376.7344	667.5698	4376.7266	665.1404	4364.7461	663.2432	4364.7852
660.6084	4363.6875	658.6824	4363.5625				

Appendix D

SAMPLE JOB CONTROL LANGUAGE

PRIME JCL
IBM JCL

MODTOX>EXPOSURE>CDGP>JOBS>CDGP.PH

```
/* THIS JOB RUNS THE CENSUS DATA GRIDDING PROGRAM (CDGP.F77)
/* ON THE PRIME.  IT PASSES THE DESIRED TEMPLATE TO
/* BE USED BY THE PROGRAM, AND RESUMES CDGP.F77.
/*
/* OPEN A COMO FILE:
/*
/* ENTER A NAME OF  A COMO FILE THAT REFLECTS THE CDGP RUN
/*
COMO MODTOX>EXPOSURE>CDGP>OUTPUT>CDGP.COMO
DATE
* SET PRIORITY TO ZERO
ZIP -O
*
* ATTACH TO THE LIST OUTPUT DIRECTORY
*
A MODTOX>EXPOSURE>CDGP>OUTPUT
*
* RESUME THE GRIDDING PROGRAM & PASS TEMPLATE NAME
*
R MODTOX>EXPOSURE>CDGP>CDGP
CDGP.TEMPLATE
*
DATE
LOGOUT
```

```
****************************************

-  1 ALAMEDA            - 30 ORANGE
-  2 ALPINE             - 31 PLACER
-  3 AMADOR             - 32 PLUMAS
-  4 BUTTE              - 33 RIVERSIDE
-  5 CALAVERAS          - 34 SACRAMENTO
-  6 COLUSA             - 35 SAN BENITO
-  7 CONTRA COSTA       - 36 SAN BERNARDINO
-  8 DEL NORTE          - 37 SAN DIEGO
-  9 EL DORADO          - 38 SAN FRANCISCO
- 10 FRESNO             - 39 SAN JOAQUIN
- 11 GLENN              - 40 SAN LUIS OBISPO
- 12 HUMBOLDT           - 41 SAN MATEO
- 13 IMPERIAL           - 42 SANTA BARBARA
- 14 INYO               - 43 SANTA CLARA
- 15 KERN               - 44 SANTA CRUZ
- 16 KINGS              - 45 SHASTA
- 17 LAKE               - 46 SIERRA
- 18 LASSEN             - 47 SISKIYOU
X 19 LOS ANGELES        - 48 SOLANO
- 20 MADERA             - 49 SONOMA
- 21 MARIN              - 50 STANISLAUS
- 22 MARIPOSA           - 51 SUTTER
- 23 MENDOCINO          - 52 TEHAMA
- 24 MERCED             - 53 TRINITY
- 25 MODOC              - 54 TULARE
- 26 MONO               - 55 TUOLUMNE
- 27 MONTEREY           - 56 VENTURA
- 28 NAPA               - 57 YOLO
- 29 NEVADA             - 58 YUBA

GRID DESCRIPTION:  TEST RUN ON GRID DATA
                   ------------------------
NUMBER OF PARAMETERS:   8
                        --
X ORIGIN (KM):     600.0000
                  -----.----
Y ORIGIN (KM):    4200.0000
                  -----.----
UTM ZONE: 10
          --
NUMBER OF X GRIDS:    3
                     ---
NUMBER OF Y GRIDS:    3
                     ---
X-INCREMENT(KM):   4.000
                  --.---
Y-INCREMENT(KM):   4.000
                  --.---
THE GRID IS ROTATED   0.0 (THETA) DEG. COUNTERCLOCKWISE FROM UTM NORTH.
                     ---.-
//**
//*** PROGRAM OUTPUT: PROCESS DOCUMENTATION (IWRITE)
//***
```

```
//FT06F001   DD SYSOUT=*
//***
//*** BOUNDRY/SOCIO-ECONOMIC DATA INPUT FILE
//**
//FT04F001   DD DSN=ARMODEL.CG.TRACTS.ALL.CALIF.DATA,DISP=SHR
//*
```

ARMODEL.CG.CNTL(CDGP) SAMPLE IBM JCL FOR CDGP (NEW VERSION) AT TEALE

```
//ARCDGP  JOB  (AR100T,ARRF,AR745,MODCG,ARNEILJ),WHEELER,
//        NOTIFY=ARNEILJ,MSGCLASS=1
//*MAIN  SYSTEM=SY4,LINES=(20,C),ORG=RMT50,CLASS=E,USER=ARNEILJ
//*FORMAT PR,DDNAME=,CARRIAGE=D,COPIES=1,FORMS=DC61
//*********************************************************
//**********  THIS JCL IS USED TO EXECUTE THE    ***********
//**********   CENSUS DATA GRIDDING PROGRAM      ***********
//**********           (CDGP)                    ***********
//**********                                     ***********
//**********                                     ***********
//**********    DSN = ARMODEL.CG.CNTL(CDGP)      ***********
//**********                                     ***********
//**********       SEPTEMBER 1987                ***********
//**********                                     ***********
//**********   REVISED BY LUCINA LEON 9/21/87    ***********
//**********                                     ***********
//**********       NEIL J.M. WHEELER             ***********
//**********  AIR QUALITY MODELING SECTION       ***********
//**********       AIR RESOURCES BOARD           ***********
//**********         1131 'S' STREET             ***********
//**********     SACRAMENTO, CALIF. 95814        ***********
//*********************************************************
//*
//*
//STEP1      EXEC PGM=CDGP,TIME=2,REGION=1024K
//STEPLIB    DD DSN=ARMODEL.CG.LOAD,DISP=SHR
//           DD DSN=SYS1.VSF2LOAD,DISP=SHR
//***
//*** GRIDDED SOCIO-ECONOMIC DATA FILE (IGSED)
//***               +++ USER SPECIFIED +++
//***
//FT09F001   DD DSN=ARMODEL.CG.GSED.CDGPLU2.TEST4.DATA,
//           DISP=(NEW,CATLG),
//           DCB=(LRECL=132,BLKSIZE=5280,RECFM=FB),
//           UNIT=MISCDA,SPACE=(5280,(100,20),RLSE),
//           LABEL=EXPDT=99365
//**
//*** PROGRAM INPUT FROM DESCRIPTIVE TEMPLATE
//***
//**FT07F001   DD DSN=ARMODEL.CG.CDGPLU.TEMPLATE,DISP=SHR
//FT07F001   DD  *
  >>>>  ENTER  X FOR THE COUNTIES THAT YOU HAVE   >>>>
  >>>>  SELECTED FROM THE FOLLOWING 58, THEN      >>>>
  >>>>  FILL IN THE BLANKES AS INSTRUCTED.        >>>>
  >>>>  MAKE SURE THAT YOU BLANKE OUT ANY PREV-   >>>>
  >>>>  IOUS MARKED COUNTIES, BEFORE YOU USE THE  >>>>
  >>>>  TEMPLATE.                                 >>>>

 ****************************************
 ***    CENSUS DATA GRIDDING PROGRAM   ***
 ***       GRID DESCRIPTION            ***
```

ARMODEL.CG.CNTL(PFCTR) SAMPLE IBM SAS FOR POPULATION GROWTH FACTOR PROGRAM (PFCTR) AT TEALE

```
//ARPFCTR JOB (AR100T,ARRF,AR743,MODCP,ARNEILJ),WHEELER,CLASS=A,
//  TIME=3,NOTIFY=ARNEILJ,MSGCLASS=J
//*MAIN SYSTEM=SY4,LINES=(30,C),ORG=RMT50
//*********************************************************
//*             ARMODEL.CG.CNTL(PFCTR)     1/24/86          *
//*               NEIL WHEELER   324-7662                   *
//*               ARB A * Q * M   SECTION                   *
//*               1131 S STREET                             *
//*                                                         *
//*     SAS JCL TO READ THE POPULATION GROWTH FILE ENTERED  *
//*         FROM DEPT. OF FINANCE TABLES AND CREATE A       *
//*         POPULATION GROWTH FACTOR FILE FOR USE BY CDGP3  *
//*********************************************************
//PFCTR     EXEC SAS,OPTIONS='NOCENTER'
//FT11F001  DD  SYSOUT=J
//FT12F001  DD  SYSOUT=J
//SORTMSG   DD  SYSOUT=J
//*
//* THE PROJECTED POPULATION TABLE ENTERED FROM THE DOF REPORT
//*
//IN  DD  DSN=ARMODEL.CG.POP.PROJEC.DATA,DISP=OLD

//* THE GROWTH FACTOR FILE USED BY CDGP3 TO PROJECT SE DATA
//*
//OUT DD  DSN=ARMODEL.CG.GROWTH.FACTOR.DATA,DISP=SHR
//*  DCB=(RECFM=FB,LRECL=80,BLKSIZE=4800),
//*  UNIT=MISCDA,SPACE=(4800,(100,20),RLSE),
//*  LABEL=EXPDT=99365
//*
//* THE SAS PROGRAM FOLLOWS:
//*
//SYSIN DD *
* READ IN ALL DATA...;
DATA;INFILE IN;
*;
INPUT CNTY 1-3 POP1 6-14 POP2 15-23 POP3 24-32 POP4 33-41
      POP5 42-50 POP6 51-59;
*** CALCULATE GROWTH FACTORS FOR EACH PERIOD;
**;
F1=(POP2/POP1-1)/5;
F2=(POP3/POP2-1)/5;
F3=(POP4/POP3-1)/5;
F4=(POP5/POP4-1)/5;
F5=(POP6/POP5-1)/20;
FILE OUT;
* OUTPUT THE SELECTED DATA TO DISK;
*;
PUT CNTY 3. (F1 - F5) (+1 11.8);
```

ARMODEL.CG.CNTL(STFA) SAMPLE IBM SAS FOR SUMMARY TAPE FILES (STFA) PROGRAM AT TEALE

```
//ARSTF  JOB (AR100T,ARRF,AR743,MODCP,ARNEILJ),WHEELER,
//      TIME=3,NOTIFY=ARNEILJ,MSGCLASS=J
//*MAIN SYSTEM=SY4,LINES=(30,C),ORG=RMT50,CLASS=A
//*********************************************************
//*             ARTSD2A.SASLIB.CNTL(STFA)                 *
//*               NEIL WHEELER                            *
//*               ARB A * Q * M   SECTION                 *
//*               1131 S STREET                           *
//*                                                       *
//*     SAS JCL TO BUILD THE COMBINE STF1A/STF3A SED FILE *
//*             FOR THE CENSUS DATA GRIDDING PROGRAM      *
//*********************************************************
//  EXEC SAS
//FT11F001  DD  SYSOUT=J
//FT12F001  DD  SYSOUT=J
//SORTMSG   DD  SYSOUT=J
//*
//*** THE FOUR SUMMARY TAPE FILES FOLLOW:
//*
//*IN1 DD  DSN=AR.R2F.CP.STF1A.ED,DISP=SHR,LABEL=2
//IN2 DD  DSN=AR.R2F.CP.STF1A.TRACT,DISP=SHR,LABEL=3
//IN3 DD  DSN=ARMODEL.CP.STF3A.TRACT,DISP=SHR,LABEL=4
//*IN4 DD  DSN=AR.R2F.CP.STF3A.ED,DISP=SHR
//*
//**** THE NEW FILE TO BE CREATED:
//*
//OUT DD  DSN=ARMODEL.CG.STF.CDGP.DATA,DISP=(NEW,CATLG),
//        DCB=(RECFM=FB,LRECL=90,BLKSIZE=5400),
//        UNIT=3330V,MSVGP=US0000C0,
//        LABEL=EXPDT=99365
//*
//*
//*   THE SAS PROGRAM FOLLOWS:
//*
//SYSIN DD *
* READ IN DATA...;
*;
*** FIRST STF1.ED ***;
*;
*DATA STF1E;INFILE IN1;
*INPUT FIPS 40-42 TRAC1 50-53 TRAC2 54-55 #3 MFI 361-369 #6;
*COUNTY=(FIPS+1)/2;
*IF ED1=. THEN ED1=0;
*ED=ED1*100;
*TRACT=COUNTY*1000000+ED;
*DROP FIPS COUNTY ED1 ED;
*;
*;
*** SECOND STF1.TRACT ***;
*;
DATA STF1T;INFILE IN2;
INPUT FIPS 40-42 TRAC1 50-53 TRAC2 54-55 POP 253-261
```

```
  HHOLDS 289-297  MALE 352-360 FEMALE 361-369
  WHITE 370-378 BLACK 379-387 POP5 1090-1098 POP65 1117-1125 #2;
COUNTY=(FIPS+1)/2;
IF TRAC1=. THEN TRAC1=0;IF TRAC2=. THEN TRAC2 =0;
TRAC3=(100*TRAC1)+TRAC2;
TRACT=COUNTY*1000000+TRAC3;
DROP FIPS COUNTY TRAC1 TRAC2 TRAC3;
*** THIRD STF3.TRACT ***;
*;
DATA STF3T;INFILE IN3;
INPUT FIPS 40-42 ED1 63-66 POP 253-261
  HHOLDS 289-297  MALE 352-360 FEMALE 361-369
  WHITE 370-378 BLACK 379-387 POP5 1090-1098 POP65 1117-1125 #2;
COUNTY=(FIPS+1)/2;
IF TRAC1=. THEN TRAC1=0;IF TRAC2=. THEN TRAC2 =0;
TRAC3=(100*TRAC1)+TRAC2;ED=ED1*100;
TRACT=COUNTY*1000000+TRAC3;
DROP FIPS COUNTY TRAC1 TRAC2 TRAC3;
*;
*** FOURTH STF3.ED ***;
*;
*DATA STF3E;INFILE IN4;
*INPUT FIPS 40-42 ED1 63-66 #3 MFI 361-369 #6;
*COUNTY=(FIPS+1)/2;
*IF ED1=. THEN ED1=0;
*ED=ED1*100;
*TRACT=COUNTY*1000000+ED;
*DROP FIPS COUNTY ED ED1;
*;
*** MERGE AND WRITE NEW RECORDS ***;
PROC SORT DATA=STF1T;BY TRACT;
*PROC SORT DATA=STF1E;BY TRACT;
PROC SORT DATA=STF3T;BY TRACT;
*PROC SORT DATA=STF3E;BY TRACT;
*;
DATA MERGE;MERGE STF1T STF1E;BY TRACT;
PROC SORT;BY TRACT;
DATA FINAL;SET MERGE;
FILE OUT;
PUT TRACT 8. POP 9. HHOLDS 9. MALE 9. FEMALE 9. WHITE 9. BLACK 9.
    POP5 9. POP65 9. MFI 9.;
```

ARMODEL.CG.CNTL(CDGP1) SAMPLE IBM JCL FOR CDGP1 AT TEALE

```
//ARCDGP1  JOB  (AR100T,ARRF,AR743,MODTX,ARNEILJ),WHEELER,
//        TIME=4,NOTIFY=ARNEILJ,MSGCLASS=1
//*MAIN SYSTEM=SY5,LINES=(50,C),ORG=RMT50,CLASS=O,USER=ARNEILJ
//*FORMAT PR,DDNAME=,CARRIAGE=D,COPIES=1,FORMS=DC61
//*********************************************************
//**********  THIS JCL IS USED TO EXECUTE THE    ***********
//**********   CENSUS DATA GRIDDING PROGRAM      ***********
//**********        PRE-PROCESSOR                ***********
//**********           (CDGP1)                   ***********
//**********                                     ***********
//**********   SELECTION BY COUNTY               ***********
//**********  DSN=ARMODEL.CG.CNTL(CDGP1)         ***********
//**********       NOVEMBER 1985                 ***********
//**********                                     ***********
//**********       NEIL J.M. WHEELER             ***********
//**********  AIR QUALITY MODELING SECTION       ***********
//**********       AIR RESOURCES BOARD           ***********
//**********         1131 'S' STREET             ***********
//**********     SACRAMENTO, CALIF. 95814        ***********
//*********************************************************
//STEP1 EXEC PGM=CDGP1,TIME=4,REGION=512K
//STEPLIB    DD DSN=ARMODEL.CG.LOAD,DISP=SHR
//           DD DSN=SYS1.VFORTLIB,DISP=SHR
//***
//*** CENSUS TRACT BOUNDRY FILE (IMAP)
//***
//FT04F001   DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C01),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C02),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C03),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C04),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C05),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C06),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C07),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C08),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C09),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C10),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C11),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C12),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C13),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C14),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C15),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C16),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C17),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C18),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C19),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C20),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C21),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C22),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C23),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C24),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C25),DISP=SHR
//           DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C26),DISP=SHR
```

```
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C27),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C28),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C29),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C30),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C31),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C32),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C33),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C34),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C35),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C36),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C37),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C38),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C39),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C40),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C41),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C42),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C43),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C44),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C45),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C46),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C47),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C48),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C49),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C50),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C51),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C52),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C53),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C54),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C55),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C56),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C57),DISP=SHR
//            DD DSN=ARMODEL.CG.CENSUS.BOUNDS.DATA(C58),DISP=SHR
//***
//**
//*** PROGRAM OUTPUT: PROCESS DOCUMENTATION (IWRITE)
//***
//FT06F001    DD SYSOUT=*
//***
//***                 +++ USER SPECIFIED +++
//*** PROGRAM OUTPUT: COMBINED TRACT/SE DATA (IOUT) THIS IS A WORKFILE.
//***
//FT07F001    DD DSN=ARMODEL.CG.TRACTS.NEW.DATA,
//            DISP=(NEW,CATLG),
//            DCB=(LRECL=80,BLKSIZE=12800,RECFM=FB),
//            UNIT=MISCDA,SPACE=(12800,(100,100),RLSE),
//            LABEL=EXPDT=99365
//***
//*** SOCIO-ECONOMIC DATA FILE (ISED)
//***
//***
//FT08F001    DD DSN=ARMODEL.CP.STF1A.CDGP.DATA,DISP=SHR
//*
//***
//*
```

ARMODEL.CG.CNTL(CDGP3) SAMPLE IBM SAS PROGRAM FOR CDGP3 AT TEALE

```
//ARCDGP3 JOB (AR100T,AERF,AR743,MODTX,ARNEILJ),WHEELER,
//  TIME=3,NOTIFY=ARNEILJ,MSGCLASS=1
//*MAIN SYSTEM=SY4,LINES=(20,C),ORG=RMT50,CLASS=E,USER=ARNEILJ
//*************************************************************
//*              ARMODEL.CG.CNTL(CDGP3)     1/24/86           *
//*                NEIL WHEELER                               *
//*                ARB A * Q * M   SECTION                    *
//*                1131 E STREET                              *
//*                                                           *
//*      SAS PROGRAM TO PROJECT POPULATION IN A GRIDDED       *
//*          SOCIO-ECONOMIC DATA FILE.                        *
//*                                                           *
//*   USER REQUIRED INPUTS ARE MARKED WITH: +++               *
//*                                                           *
//*************************************************************
//CDGP3    EXEC SAS
//FT11F001 DD  SYSOUT=*
//FT12F001 DD  SYSOUT=*
//SORTMSG  DD  SYSOUT=*
//*
//* GROWTH FACTOR FILE (CREATED BY PFCTR)
//GROWTH   DD  DSN=ARMODEL.CG.GROWTH.FACTOR.DATA,DISP=SHR
//*
//*
//* USER DEFINED +++ (SPECIFY INPUT FILE NAME):
//*
//*  *    BASE YEAR GRIDDED SOCIO-ECONOMIC DATA FILE FROM CDGP
//GSEDIN   DD  DSN=ARMODEL.CG.GSED.YR80.EXAMPLE.DATA,DISP=SHR
//*
//*
//* USER DEFINED +++ (SPECIFY OUTPUT FILE NAME):
//*
//*       FILE TO PUT PROJECTED DATA INTO:
//GSEDOUT  DD  DSN=ARMODEL.CG.GSED.YR92.EXAMPLE.DATA,DISP=(NEW,CATLG),
//             UNIT=MISCDA,SPACE=(5280,(100,10),RLSE),
//             DCB=(LRECL=132,BLKSIZE=5280,RECFM=FB),
//             LABEL=EXPDT=99365
//*
//*
//* THE SAS PROGRAM FOLLOWS:
//*
//SYSIN DD *
*;
* READ GRIDDED ACTIVITY DATA...;
*;
DATA POP;INFILE GSEDIN;
INPUT +1 POINT 4. +1  CNTY 2. I 3. J 3. (EAST NORTH) (10.4)
    (POP HHLDS MALE FEMALE WHITE BLACK LT5 GT65 MFI) (9.);
PROC SORT;BY CNTY;
**;
** GET THE GROWTH FACTOR DATA;
DATA GROWTH;INFILE GROWTH;
```

```
ARRAY PFACT(L) F1 - F5;
INPUT CNTY 3. (F1-F5) (+1 11.8);
*** CALCULATE FACTORS FOR THE PROJECTION YEAR;
*;
*;
* USER INPUT +++ (SPECIFY THE BASE AND PROJECTION YEARS);
*;
BYEAR=1980; *** BASE YEAR ***;
PYEAR=1992; ** PROJECTION YEAR ***;
*;
YEARS=PYEAR-BYEAR;
 PFCTR=1;
 PERIOD=INT(YEARS/5);
 IF PERIOD GT 4 THEN PERIOD=4;
  IF PERIOD GT 0 THEN DO L=1 TO PERIOD;
   PFCTR=PFCTR*(1+PFACT*5);
  END;
 L = PERIOD +1;
 X = PERIOD*5;
 PFCTR=PFCTR*(1+(YEARS-X)*PFACT);
KEEP PFCTR CNTY;
PROC SORT;BY CNTY;
*;
** PUT EVERY THING TOGETHER;
DATA BOTH;MERGE POP (IN=A) GROWTH;BY CNTY;
IF A;
ARRAY PPOP(K) POP MALE FEMALE WHITE BLACK LT5 GT65;
** CALCULATE PROJECTED POPULATION VALUES AND ROUND ***;
DO OVER PPOP;
  PPOP =INT( PPOP * PFCTR + 0.5);
END;
DROP PFCTR K;
PROC SORT;BY POINT;
DATA FINAL;SET BOTH;
FILE GSEDOUT;
*** WRITE PROJECTED DATA TO THE OUTPUT FILE;
PUT +1 POINT 4. +1 CNTY 2. I 3. J 3. (EAST NORTH) (10.4)
    (POP HHLDS MALE FEMALE WHITE BLACK LT5 GT65 MFI) (9.);
*** DOCUMENT PROJECTED VALUES;
PROC PRINT;ID POINT;VAR CNTY -- MFI;
*;
* USER INPUT +++ (CHANGE THE YEAR PROJECTED TO);
*;
TITLE1 'GRIDDED SOCIO-ECONOMIC DATA PROJECTED TO 1992';
TITLE2 'HOUSEHOLDS AND MEDIAN FAMILY INCOME ARE NOT PROJECTED';
```

Appendix E

SAMPLE PROGRAM OUTPUT

THE FOLLOWING FILE IS A SAMPLE OF THE OUTPUT CREATED BY CDGP.F77 AND WRITTEN TO THE SCREEN OR A FILE.
THE SAMPLE FILE NAME IS NSCREEN.DATA, ALLOCATED IN THE SAMPLE TEMPLATE.
ALL OUTPUT FILES ARE LOCATED UNDER THE DIRECTORY MODTOX>EXPOSURE>CDGP>OUTPUT.

```
****************************************
***  CENSUS DATA GRIDDING PROGRAM      ***
***                                    ***
***  TECHNICAL SUPPORT DIVISION        ***
***  CALIFORNIA AIR RESOURCES BOARD    ***
***  P.O. BOX 2815                     ***
***  SACRAMENTO, CA 95812              ***
***                                    ***
***  VERSION: AUGUST 15, 1988          ***
***                                    ***
****************************************

GRID DEFINITION:

NX=  7, NY=  7
DX= 3.000 KM,   DY= 3.000 KM
X-ORIGIN:  445.5000 KM
Y-ORIGIN: 3754.5000 KM
UTM ZONE: 11
ROTATION ANGLE=  0.0 DEGREES

GRID DESCRIPTION: CDGP SAMPLE RUN
INPUT FILE (TEMPLATE):MODTOX>EXPOSURE>CDGP>TEMPLATES>CDGP.TEMPLATE
OUTPUT FILE (LIST)    :NSCREEN.DATA
GSED OUTPUT FILE      :MODTOX>EXPOSURE>GSED>GSED.SAMPLE


 COUNTY SELECTED:  19
 COUNTY SELECTED:  30
 COUNTY SELECTED:  33
 COUNTY SELECTED:  36


INITIALIZATION COMPLETE... START OF GRIDDING.


TRACT # 19101100 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -20,  13) AND MAX (I,J) = ( -18,  15).
TRACT # 19101200 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -20,  13) AND MAX (I,J) = ( -19,  13).
TRACT # 19101300 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -19,  13) AND MAX (I,J) = ( -19,  14).
TRACT # 19101400 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -20,  13) AND MAX (I,J) = ( -19,  13).
TRACT # 19102101 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -22,  12) AND MAX (I,J) = ( -19,  13).
TRACT # 19102102 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -22,  12) AND MAX (I,J) = ( -21,  12).
TRACT # 19103101 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -20,  14) AND MAX (I,J) = ( -19,  15).
TRACT # 19103102 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -20,  14) AND MAX (I,J) = ( -20,  14).
TRACT # 19103201 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -21,  14) AND MAX (I,J) = ( -20,  15).
      .
      .
      .

TRACT # 19131300 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -27,  12) AND MAX (I,J) = ( -26,  12).
```

```
TRACT # 19131400 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -27,  12) AND MAX (I,J) = ( -27,  12).
TRACT # 19131500 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -27,  11) AND MAX (I,J) = ( -27,  12).
TRACT # 19131600 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -28,  12) AND MAX (I,J) = ( -27,  12).
TRACT # 19131700 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -28,  11) AND MAX (I,J) = ( -27,  12).
TRACT # 19131800 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -27,  11) AND MAX (I,J) = ( -26,  12).
TRACT # 19131900 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -26,  11) AND MAX (I,J) = ( -26,  12).
TRACT # 19132100 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = ( -26,  11) AND MAX (I,J) = ( -26,  11).
      .
      .
      .
TRACT # 33030100 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    7,    3) AND MAX (I,J) = (    8,    4).
THE AREA OF TRACT #33030100 IS:          4.536
TRACT # 33030100 HAS   4.38% OF ITS AREA ACCOUNTED FOR WITH   1 GRID CELLS.

TRACT # 33030200 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    6,    2) AND MAX (I,J) = (    8,    4).
THE AREA OF TRACT #33030200 IS:          5.137
TRACT # 33030200 HAS  92.30% OF ITS AREA ACCOUNTED FOR WITH   5 GRID CELLS.

TRACT # 33030300 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    7,    2) AND MAX (I,J) = (    8,    3).
THE AREA OF TRACT #33030300 IS:          2.401
TRACT # 33030300 HAS  26.72% OF ITS AREA ACCOUNTED FOR WITH   2 GRID CELLS.
      .
      .
      .
THE AREA OF TRACT #33031501 IS:          2.186
TRACT # 33031501 HAS 100.00% OF ITS AREA ACCOUNTED FOR WITH   1 GRID CELLS.

THE AREA OF TRACT #33031502 IS:          2.302
TRACT # 33031502 HAS 100.00% OF ITS AREA ACCOUNTED FOR WITH   4 GRID CELLS.

TRACT # 33031600 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    5,    0) AND MAX (I,J) = (    6,    1).
THE AREA OF TRACT #33031600 IS:          2.716
TRACT # 33031600 HAS  78.33% OF ITS AREA ACCOUNTED FOR WITH   2 GRID CELLS.

TRACT # 33031700 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    5,    0) AND MAX (I,J) = (    8,    1).
THE AREA OF TRACT #33031700 IS:         22.940
TRACT # 33031700 HAS  21.33% OF ITS AREA ACCOUNTED FOR WITH   2 GRID CELLS.
      .
      .
      .
TRACT # 36003700 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    7,    7) AND MAX (I,J) = (    7,    8).
THE AREA OF TRACT #36003700 IS:          1.222
TRACT # 36003700 HAS  52.84% OF ITS AREA ACCOUNTED FOR WITH   1 GRID CELLS.

TRACT # 36003800 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    7,    8) AND MAX (I,J) = (    8,    9).
TRACT # 36003900 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    7,    7) AND MAX (I,J) = (    8,    8).
THE AREA OF TRACT #36003900 IS:          1.578
TRACT # 36003900 HAS  32.06% OF ITS AREA ACCOUNTED FOR WITH   1 GRID CELLS.

TRACT # 36004000 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    6,    4) AND MAX (I,J) = (    6,    6).
THE AREA OF TRACT #36004000 IS:         32.218
TRACT # 36004000 HAS  55.30% OF ITS AREA ACCOUNTED FOR WITH   5 GRID CELLS.

TRACT # 36004100 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    7,    9) AND MAX (I,J) = (    9,   11).
TRACT # 36004200 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = (    8,    8) AND MAX (I,J) = (    9,    9).
```

```
TRACT # 36004300 IS COMPLETELY OUTSIDE OF GRID AREA WITH MIN (I,J) = (   8,   8) AND MAX (I,J) = (   9,   8).
TRACT # 36004400 PARTIALLY OUTSIDE OF GRID AREA WITH MIN (I,J) = (   7,   7) AND MAX (I,J) = (   8,   8).
THE AREA OF TRACT #36004400 IS:          4.688
TRACT # 36004400 HAS   0.00% OF ITS AREA ACCOUNTED FOR WITH   1 GRID CELLS.
      .
      .
      .
END OF FILE.   2287 CENSUS TRACTS READ.


     49 RECORDS WERE WRITTEN TO THE GRIDDED SOCIO-ECONOMIC DATA FILE.

GRIDDING COMPLETE...
```

MODTOX>EXPOSURE>GSED>GSED.CDGP
THIS IS A SAMPLE OF THE GRIDDED SOCIO-ECONOMIC DATA FILE CREATED BY CDGP.F77

1	33	1	1	445.5000	3754.5000	861	267	432	429	783	7	59	86
2	36	1	2	445.5000	3757.5000	321	117	160	161	282	3	21	71
3	36	1	3	445.5000	3760.5000	517	125	223	294	424	38	44	21
4	36	1	4	445.5000	3763.5000	1560	424	741	819	1229	96	185	59
5	36	1	5	445.5000	3766.5000	3871	1141	1948	1923	2966	186	531	171
6	36	1	6	445.5000	3769.5000	4524	1421	2240	2284	3564	113	504	294
7	36	1	7	445.5000	3772.5000	5891	1870	2904	2987	4726	164	641	343
8	33	2	1	448.5000	3754.5000	4854	988	2829	2025	3782	355	232	152
9	33	2	2	448.5000	3757.5000	597	210	298	299	531	4	39	114
10	36	2	3	448.5000	3760.5000	361	125	176	184	314	6	25	71
11	36	2	4	448.5000	3763.5000	397	124	188	208	338	13	33	54
12	36	2	5	448.5000	3766.5000	685	212	343	342	580	16	97	38
13	36	2	6	448.5000	3769.5000	1662	528	828	834	1345	39	213	90
14	36	2	7	448.5000	3772.5000	2814	911	1397	1417	2225	66	334	164
15	33	3	1	451.5000	3754.5000	4856	1425	2408	2447	4506	31	330	219
16	33	3	2	451.5000	3757.5000	4342	1290	2160	2182	3929	50	334	256
17	33	3	3	451.5000	3760.5000	4750	1363	2412	2338	4166	43	415	257
18	33	3	4	451.5000	3763.5000	1313	505	641	672	1148	30	98	245
19	36	3	5	451.5000	3766.5000	919	315	455	464	790	22	102	99
20	36	3	6	451.5000	3769.5000	961	295	483	479	815	21	132	49
21	36	3	7	451.5000	3772.5000	939	288	471	469	794	22	137	43
22	33	4	1	454.5000	3754.5000	8309	2552	3964	4345	6712	355	811	655
23	33	4	2	454.5000	3757.5000	5447	1608	2701	2746	4560	190	594	245
24	33	4	3	454.5000	3760.5000	5819	1685	2920	2898	5105	81	539	296
25	33	4	4	454.5000	3763.5000	4155	1615	2013	2142	3631	119	328	698
26	36	4	5	454.5000	3766.5000	1501	540	742	759	1311	32	113	216
27	36	4	6	454.5000	3769.5000	2823	842	1431	1392	2339	44	285	227
28	36	4	7	454.5000	3772.5000	5761	1731	2890	2871	4687	81	626	429
29	33	5	1	457.5000	3754.5000	14737	4441	7203	7534	11587	555	1727	867
30	33	5	2	457.5000	3757.5000	5177	1516	2567	2610	4185	295	579	206
31	33	5	3	457.5000	3760.5000	5678	1720	2807	2871	4912	158	535	350
32	33	5	4	457.5000	3763.5000	4579	1597	2235	2345	3735	318	377	566
33	36	5	5	457.5000	3766.5000	1225	392	614	611	962	104	94	134
34	36	5	6	457.5000	3769.5000	4334	1461	2121	2213	3763	72	388	439
35	36	5	7	457.5000	3772.5000	12901	4438	6320	6581	11042	329	1186	1164
36	33	6	1	460.5000	3754.5000	18303	6593	8660	9643	15964	667	1294	2077
37	33	6	2	460.5000	3757.5000	9546	3425	4605	4941	7973	784	726	936
38	33	6	3	460.5000	3760.5000	6955	2482	3365	3589	5585	482	683	615
39	33	6	4	460.5000	3763.5000	4059	1272	1999	2060	3012	498	344	362
40	36	6	5	460.5000	3766.5000	1293	382	650	643	957	144	110	100
41	36	6	6	460.5000	3769.5000	4023	1362	1955	2067	3497	79	354	393
42	36	6	7	460.5000	3772.5000	14417	4722	7035	7380	12586	359	1201	1241
43	33	7	1	463.5000	3754.5000	10670	3718	5216	5454	7978	469	847	851
44	33	7	2	463.5000	3757.5000	17629	7057	8268	9361	15687	771	1205	2563
45	33	7	3	463.5000	3760.5000	8524	3708	4034	4491	7139	448	666	1179
46	36	7	4	463.5000	3763.5000	3161	1087	1541	1619	2145	525	276	308
47	36	7	5	463.5000	3766.5000	2265	677	1130	1134	1772	156	217	140
48	36	7	6	463.5000	3769.5000	3459	1083	1700	1757	2901	85	330	251
49	36	7	7	463.5000	3772.5000	9399	3170	4530	4863	7781	459	886	880

```
program PrepCensusTracts1990;
{
   Prepares census tract file for use with PC-based exposure programs.
   Output is

        TRACT_ID UTM1 UTM2 (centroid) POPULATION AREA

   The program calculates the census tract centroids and areas from
   the vertices defining an outline polygon for each tract.  Maximum of
   500 polygon vertices for a single census tract border.
}
uses DOS,CRT;

type
   float      = {real} double;  {choose either "real" or "extended" type not "single"}
   NodeArray  = array [1..4000] of float; {increase size for bigger polygons}

var
   InFile,
   OutFile    : text;
   StrDum1    : string[1];
   State      : string[2];
   County     : string[3];
   TractID1   : string[4];
   TractID2   : string[2];
   UTM_Zone   : string[2];
   i,
   ICode,
   NPoints    : integer;

   WCode      : word;

   XArray,
   YArray     : NodeArray
   ;
   Zone,
   Area       : float;
   TempX,
   TempY,
   UTMN,UTME,
   Longitude,
   Latitude,
   CentroidX,
   CentroidY  : float;

const
   ScaleFactor : float = 1;
{*****************************************************************************}

procedure LL2UTM(var Latitude,Longitude,UTMN,UTME,Zone:float);
{
   This routine converts longitude and latitude coordinates to UTM coordinates
   and determines the UTM zone.  The latitude and longitude must be in degrees,
   not as degrees:min:sec or radians [transformed to radians in this module].

   Declare the "float" type in the main program as [single, real, double, or extended]
   to match the variable type needed in the main program.

   The code structure comes from a program in SAS provided by Charles Blanchard of
   ENVAIR Consulting.
}
```

```
var
   offset,
   utmym,
   dlong  : float;

{*****************************************************************************}

function Power(X,Y:float):float;
{
   Raises a non-negative value (X) by a power (Y), each of which is a floating point
   number.  If X is negative, the value of DosError is set to 1.
}
begin

   if X<0 then
   begin
      DosError := 1;
      writeln(Chr(7),'Negative values for X are not allowed');
      Exit;
   end {if..then};

   if X=0
   then Power := 0  {even if Y is negative}
   else if Y=0
        then Power := 1
        else Power := Exp(Y*Ln(X));
        {end if..then..else}
   {end if..then..else}

end {Power};

{*****************************************************************************}

begin

   latitude := latitude*(Pi/180);
   longitude := longitude*(Pi/180);
   offset := 3;
   if ((Zone<10) or (Zone>11)) then begin writeln(chr(7),'Bad Zone: halting.');Halt;end;
   dlong := 180 - (6*Zone) + offset - ((180/Pi)*longitude);
   utmym := 2.41 + (110.268*(180/Pi)*latitude) + 0.00903*Power(((180/Pi)*latitude),2);
   utmn := utmym + 3187*sin(2*latitude)*(1-cos((Pi/180)*dlong));
   utme := 500 + dlong*(111.226 + 0.0053*(180/Pi)*latitude)*cos(latitude);

end {LL2UTM};

{*****************************************************************************}


procedure ProcessPolygon(var N:integer;var X,Y:NodeArray);
{
   Compute the area of a polygon given an array of vertices
   in sequence around the perimeter.
}
var
   MinX,MaxX,
   MinY,MaxY,
   X1,X2,Y1,Y2 : float;

   {uses global variables Area, CentroidX, CentroidY}

begin
```

```
   Area := 0;
   CentroidX := 0;
   CentroidY := 0;
   MaxX := 0;
   MaxY := 0;
   MinX := 1000000000;
   MinY := 1000000000;


   if N>2 then
   begin
      for i := 1 to (N-1) do
      begin
          X1 := X[i];
          X2 := X[i+1];
          Y1 := Y[i];
          Y2 := Y[i+1];
          Area :=  Area + X1*Y2 - X2*Y1;
          if X1>MaxX then MaxX := X1;
          if X1<MinX then MinX := X1;
          if Y1>MaxY then MaxY := Y1;
          if Y1<MinY then MinY := Y1;
      end {or i};
      CentroidX := (MaxX+MinX)/2;
      CentroidY := (MaxY+MinY)/2;
      Area := Abs(0.5 * Area);
   end {if..then};

   {Area = 0  CentroidX = 0  CentroidY = 0 when NPoints<=3}

end {ProcessPolygon};

{*****************************************************************}

begin

   Assign(InFile,ParamStr(1));
   ReSet(InFile);

   Assign(OutFile,ParamStr(2));
   GetFAttr(OutFIle,WCode);
   if DosError<>0 then ReWrite(OutFile)
                  else begin
                       writeln(chr(7),'Program halted: OutFile already exists.Program hal
ted:');
                       Halt;
                       end;
   {end if..then..else}

   Val(ParamStr(3),Zone,ICode);

   while not Eof(InFile) do
   begin

      readln(InFile,StrDum1,State,County,TractID1,StrDum1{decimal},TractID2,StrDum1,NPoin
ts);
      writeln(County,' ',TractID1,TractID2,' ',NPoints:5);

      for i := 1 to NPoints do
      begin
          readln(InFile,Longitude,Latitude);
```

```
        if Longitude<0 then Longitude := abs(Longitude);
(*      writeln('Point ',i:6,' for ',TractID1,TractID2,' : Lat = ',
                Latitude:12:2,Longitude:12:2);   *)
        LL2UTM(Latitude,longitude,UTMN,UTME,Zone);
        XArray[i] := UTMN;
        YArray[i] := UTME;
      end {for i};

      ProcessPolygon(NPoints,XArray,YArray);

      writeln(OutFile,State,' ',County,' ',
                      TractID1,TractID2,' ',
                      Zone:4:0,' ',
                      CentroidX:12:4,' ',
                      CentroidY:12:4,' ',
                      Area:12:4);

   end {while};

   Close(InFile);
   Close(OutFile);

end.
```