# APPENDIX 6-3

## BCAG 2012 MTP/SCS Land Use Scenario Analysis

In preparing the land use forecasts for the 2012 SCS, BCAG developed three distinct land use scenarios for the purpose of illustrating the travel effects of different development patterns on the regional transportation system and the associated greenhouse gas emissions resulting from these patterns. In addition, the scenarios allowed BCAG to test the performance of the enhanced regional travel demand model to ensure it was responding appropriately to changes in land use.

### Land Use – Growth Areas

BCAG has developed a framework for describing the land use growth associated with each scenario that is made up of Growth Area Types. The Growth Area Types are a variation of a similar framework developed by the Sacramento Area Council of Governments (SACOG), BCAGs closest neighboring Metropolitan Planning Organization (MPO). Figure 1 provides an illustration of the Growth Areas by location within the region.

The following is a description of each Growth Area Type.

- ***Urban Center and Corridor Areas*** consist of higher density and mixed land uses with access to frequent transit service. These areas typically have existing or planned infrastructure for non-motorized transportation modes which are more supportive of walking and bicycling. Future growth within these areas consists of compact infill developments on underutilized lands, or redevelopment of existing developed lands. Local plans identify these areas as opportunity sites, downtowns, central business districts, or mixed use corridors.

- ***Established Areas*** generally consist of the remaining existing urban development footprint surrounding the Urban Center and Corridor Areas. Locations disconnected from Urban and Corridor Centers may be residential-only, employment-only, or a mix of these uses with urban densities. These areas consist of a range of urban development densities with most locations having access to transit through the urban fixed route system or commuter service. Future growth within these areas typically utilize locations of currently planned developments or vacant infill parcels. Local plans generally seek to maintain the existing character of these areas.

- ***New Areas*** are typically connected to the outer edge of an Established Area. These areas currently consist of vacant land adjacent to existing development and represent areas of future urban expansion. Future growth within these areas will most often consist of urban densities of residential and employment uses with a few select areas being residential only. Local plans identify these areas as special or specific plan areas, master plans, and planned development or planned growth areas. Currently, fixed route transit service is nonexistent in these areas. However, fixed route transit service may well be provided to areas which are directly adjacent to current urban routing and are able to achieve build-out. Pedestrian and bicycle infrastructure are typically required to be incorporated under the local jurisdictions plans.

- ***Rural Areas*** consist of areas outside existing and planned urban areas with development at rural densities. These areas are predominantly residential and may contain a small commercial component. The densities at which these areas are developed do not reasonably allow for pedestrian or bicycle infrastructure and transit service is limited or nonexistent. Automobile travel is typically the only transportation option.

- ***Agricultural, Grazing, and Forestry Areas*** represent the remaining areas of the region not being planned for development at urban densities. These areas support agricultural, grazing, forestry, mining, recreational, and resource conservation type uses. Locations within these areas may be protected from future urban development under federal, state, and local plans or programs such as the Chico area "greenline", Williamson Act contracts, or conservation easements. Employment and residential uses are typically allowed within portions of this area but are most often secondary to agricultural, forestry, or other rural uses.

Land Use Scenarios

All three scenarios were prepared using the same regional employment, population and housing growth projections and regional transportation network. However, the following land use variables were adjusted to create the distinctive scenarios:

- The amount of development occurring within each of the five Growth Areas (i.e., Urban Center and Corridor, Established, New, Rural, and Agricultural).
- The levels of infill and redevelopment occurring within the Urban Center and Corridor and Established Growth Areas.
- The shares of single-family to multi-family development.
- The amount of growth accommodated within each local jurisdiction.

The land use scenarios were designed by first assembling the "balanced" scenario. The "balanced" scenario (scenario #1) was prepared based on land use information from the recent general plan updates, the latest information regarding planned development, reasonable assumptions regarding infill and redevelopment, regional growth forecasts, and a review of development attractions (i.e., motorized and non-motorized transportation networks, existing development, utility areas, etc.) and discouragements (i.e., resource areas and farmland, public lands, areas exceeding 25% slope, etc.). Secondly, the "dispersed" (scenario #2) and "compact" (scenario #3) scenarios were prepared to represent development occurring at opposite ends of the spectrum from scenario #1. The scenarios are described in more detail in Table 1.

**Table 1**

| Scenario | Land Use |
|---|---|
| Scenario 1 – Balanced | • Balanced share of new housing within the center, established and new growth areas<br>• Contains reasonable levels of infill and redevelopment<br>• Consistent with local land use plans and draft habitat conservation plan<br>• Consistent with BCAG long-term regional growth forecasts by jurisdiction |
| Scenario 2 – Dispersed | • Largest share of single-family housing with a greater amount of growth directed to the new, rural, and agricultural growth areas<br>• Minimize the amount of infill and redevelopment<br>• Exceeds the unincorporated areas local land use plans reasonable capacities for growth |
| Scenario 3 – Compact | • Greatest share of infill and redevelopment within the established and center growth areas<br>• Highest share of multi-family housing |

| | |
|---|---|
| | • Potential incompatibilities with existing infrastructure capacity<br>• Exceeds the incorporated areas local land use plans reasonable capacities for growth |

Vehicle Miles of Travel

Once prepared, each scenario was incorporated, in combination with the preliminary draft forecasted transportation network, into the BCAG regional travel demand model. The travel demand model captures the amount of average weekday vehicle miles of travel (VMT) occurring as a result of each scenario, in addition to the amount of congested VMT (CVMT). In general, the more dispersed the land use pattern, the greater the average vehicle trip length is, resulting in greater VMT. In turn, the more compact the land use pattern, the shorter the average trip length is, resulting in less VMT but greater congestion. The preliminary VMT and CVMT results of the scenario model runs are included in Table 2.

**Table 2**

**Summary of Preliminary VMT and Congested VMT per Capita for the Year 2035**

| Year 2035 Forecast | Scenario 1 (Balanced) | Scenario 2 (Dispersed) | Scenario 3 (Compact) |
|---|---|---|---|
| Vehicle Miles of Travel[1] | 5,780,000 | 6,327,000 | 5,511,000 |
| Congested VMT[2] | 355,480 | 408,890 | 360,400 |
| Population | 332,459 | | |
| VMT per Capita | 17.39 | 19.03 | 16.58 |
| Congested VMT per Capita | 1.07 | 1.23 | 1.08 |

[1]VMT excludes through trips (X-X trips)
[2]VMT includes through trips (X-X trips)

The basic definition of VMT is one vehicle traveling on a roadway for one mile. VMT is the primary indicator of travel for policy makers and transportation professionals since it is relatively easy to measure using travel models and it bears a direct relationship to vehicle emissions (e.g., lower VMT typically means lower emissions).

Congested VMT (CVMT) is used as an indicator in determining the amount of delay a vehicle may experience when traveling. Typical signs of congestion are stop-and-go driving conditions and lines of drivers waiting to get through a signaled intersection. For the purpose of this report, CVMT is defined as a vehicle mile of travel that occurs on a roadway with a volume-to-capacity ratio of 1.0 or greater, meaning that the volume on the roadway is at or exceeding its capacity.

The results of the VMT analysis for each scenario presented in Table 2 shows VMT per capita increases of 9.5% for the dispersed scenario #2 over the balanced scenario #1. In converse, VMT per capita for the compact scenario #3 shows a 4.7% decrease from the balanced scenario #1. However, CVMT for the dispersed and compact scenarios are greater than that of the balance scenario #1. This is expected based on the assumption that a more compact land use footprint would focus more of the travel within the urbanized roadways, exceeding those roadway capacities. These results conclude that the model is responding accordingly to the changes in land use and illustrates the

affects that a compact or dispersed land use allocation has on travel and the regional transportation system.

Passenger Vehicle Greenhouse Gas Emissions

In addition to measuring the amount of travel occurring as a result of each scenario, levels of passenger vehicle greenhouse gas (GHG) emissions were measured using the California Emissions Factor (EMFAC) model. The purpose of the passenger vehicle GHG measurement is to determine how well each land use scenario performs in relation to achieving the GHG targets established for the MTP/SCS as a result of SB 375. As directed by the California Air Resources Board (ARB), the 2035 GHG emission estimates are presented as pounds (lbs.) of Carbon Dioxide ($CO_2$) per capita. Table 3 reflects the amount of $CO_2$ emissions resulting from each scenario.

**Table 3**

**Summary of Preliminary $CO_2$ per Capita for the Year 2035**

| Year 2035 Forecast | Scenario 1 (Balanced) | Scenario 2 (Dispersed) | Scenario 3 (Compact) |
|---|---|---|---|
| $CO_2$ lbs. per day | 5,460,000 | 5,980,000 | 5,220,000 |
| Population | 332,459 | | |
| $CO_2$ lbs. per Capita | 16.42* | 17.99 | 15.70* |

*Note: preliminary result meets or exceeds ARB GHG target for Butte County.

Similar to the results of the VMT analysis, Table 3 shows $CO_2$ per capita increases of 9.5% for the dispersed scenario #2 over the balanced scenario #1. In converse, $CO_2$ per capita for the compact scenario #3 shows a 4.4% decrease from the balanced scenario #1. These results highlight that the passenger vehicle GHG emissions, generated using VMT from the travel model, are correlating with the VMT from each scenario, illustrating the connection between VMT and GHG emissions.

The preliminary $CO_2$ lbs. per capita also demonstrate that the balanced scenario #1 and compact scenario #3 meet or exceed the ARB GHG targets for the Butte County region for the year 2035. The current MTP/SCS GHG targets are to achieve no greater than a 1% increase in per capita $CO_2$ emissions from 2005 levels. These are preliminary estimates and have not been reviewed by ARB staff.

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**Figure 1**