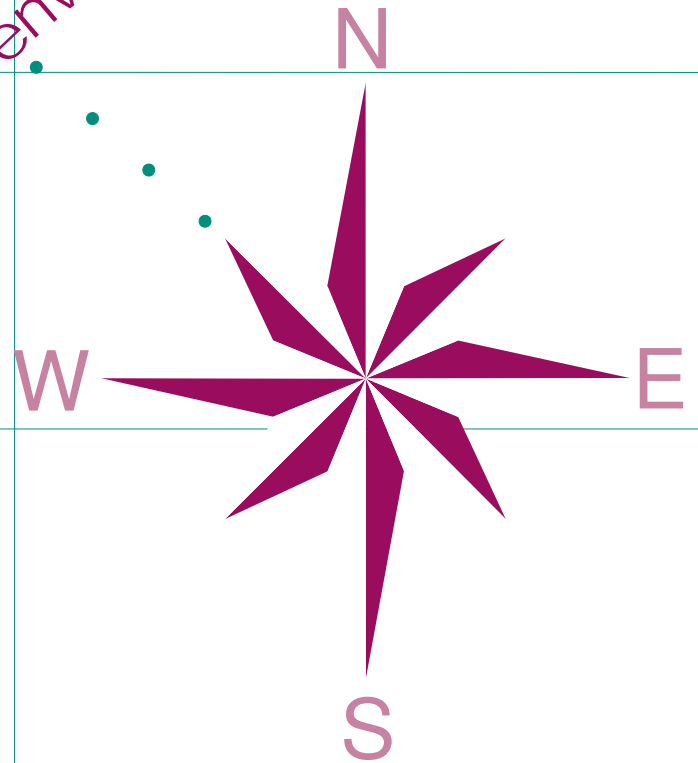


Metro Vision 2020



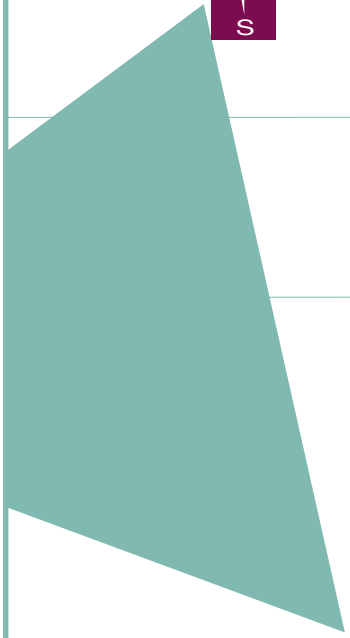
Vision Framework for the Denver Metropolitan Region

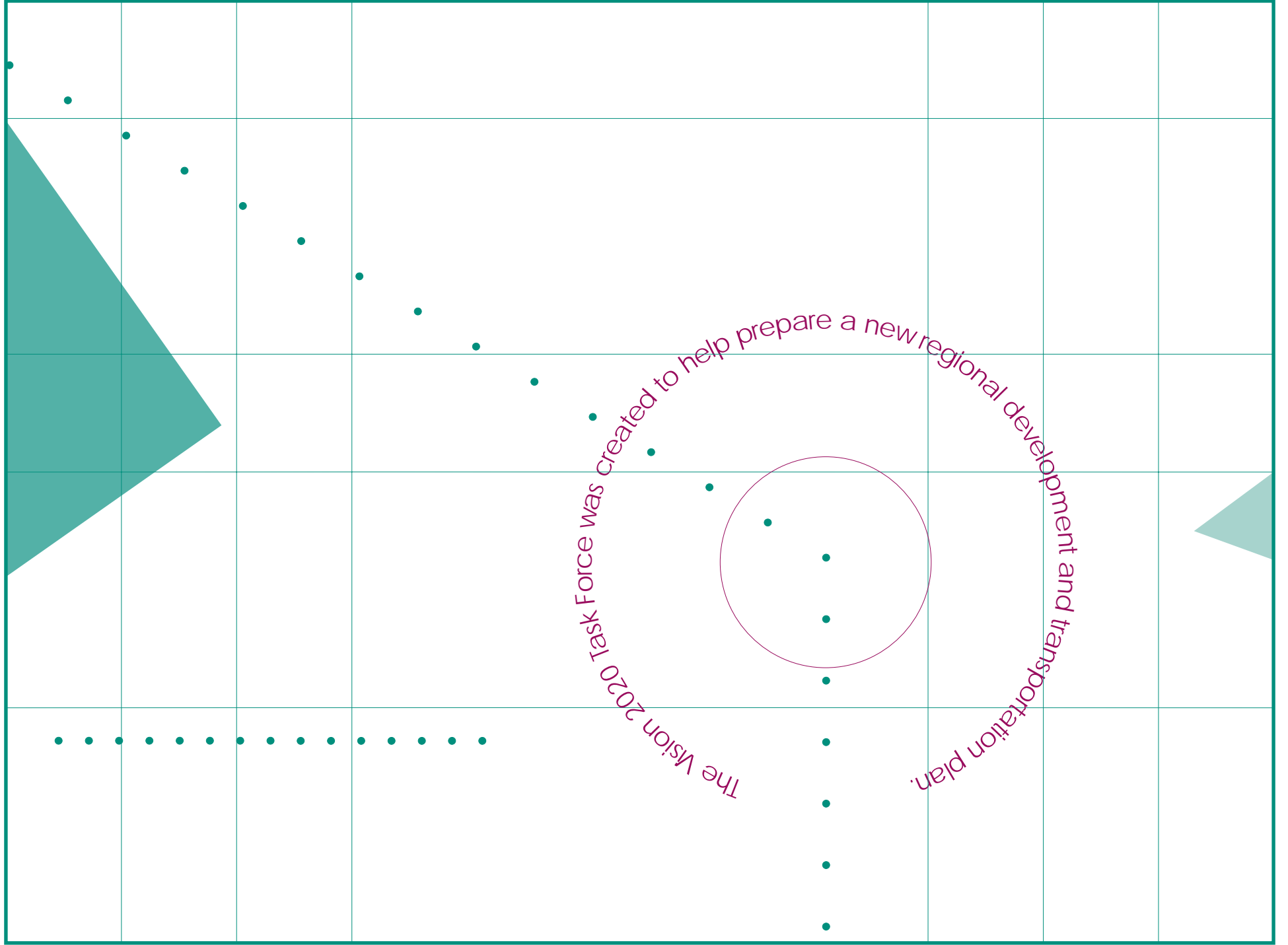


Metro Vision 2020:

*A Framework
for the Denver Metropolitan Region*

November 1995





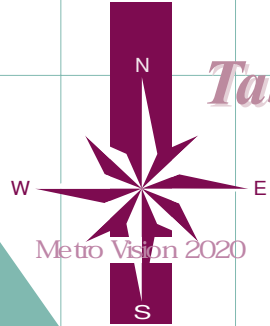


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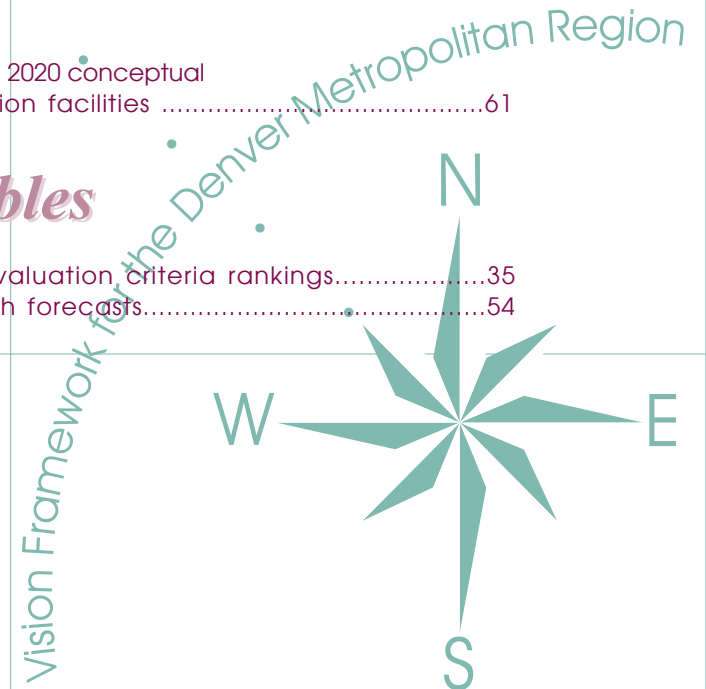
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Introduction



We must plan today for the future we want in the Denver metropolitan region, thus the Denver Regional Council of Governments (DRCOG) is preparing new long-range regional growth and development and regional transportation plans, collectively called Metro Vision 2020.

Metro Vision 2020's goal is to create a shared vision for the future and, by looking at land use and transportation options, examine how the region can best develop to achieve that vision in the next 25 years.

DRCOG is an association of local governments, composed of eight counties and 39 member municipalities in the Denver region. Among its duties, the council is the Regional Planning Commission and Metropolitan Plan-

ning Organization. DRCOG is responsible for preparing and maintaining both a growth and development plan and a transportation investment plan for the region. The organization also develops regional population and employment forecasts which form the basis for these plans.

The Metro Vision 2020 regional planning process seeks to answer the question: "What is the region's vision for the future as we move into the 21st century?" Metro Vision 2020's goal is to create a shared vision for the future and, looking at land use and transportation options, examine how the region can best develop to achieve that vision through the next 25 years. Because regional

cooperation and coordination are necessary to address problems, meet needs for public services and preserve citizen values, Metro Vision 2020 frames and influences the plans, decisions and policies of individual communities to promote a regionwide vision. The plan looks at the physical development of the region and the environment already created - those things most directly affected by land use and transportation decisions - with the understanding that they affect many other facets of quality of life.

Much progress has been made toward developing the elements of the Metro Vision 2020 plan. This report describes the work done to date in examining future alternatives and the conclusions reached in preparing the framework upon which the remainder of the plan preparation is to be built (the "Vision Framework").



Background



In response to existing and emerging urban problems and recognizing major trends and challenges affecting our future on the regional level, DRCOG began work on a new regional development plan in 1991. The major factors leading this revision were:

1. New federal legislation, such as Intermodal Surface Transportation Efficiency Act and the Clean Air Act amendments, which required metropolitan regions to create a fiscally responsible transportation system that also protects air quality;
2. The challenges of continued population growth in the region;

3. Fiscal constraints, such as the tax and expenditure limitation amendment, which affect our ability to pay for new infrastructure;
4. The effects of the aging of the population;
5. Economic competition with other metropolitan areas; and,
- 6) growth in traffic congestion and vehicle miles of travel (VMT).

The Metro Vision plan promotes a high quality metropolitan setting within which its people will live, work, and recreate.

Vision Statement

The Metro Vision 2020 planning process began with DRCOG organizing a Regional Development Plan Task Force, a diverse group that produced a vision statement and a set of principles and policies to direct the preparation of a new regional development plan to guide regional growth toward that vision. The vision statement approved by the Board of Directors, is as follows:

Denver Metropolitan Region



With regional cooperation as its keystone, the Metro Vision plan promotes a high quality metropolitan setting within which its people will live, work, and recreate. To advance and sustain this future, the region must function as an association of inter-related communities. Recognizing this, the economic, cultural and geographical significance of downtown Denver to the region must be acknowledged. The health of downtown Denver, urban cores and the surrounding communities is necessary for, and synergistically linked to, the success and vitality of the region. To promote the health of all communities in the region, an equitable sharing of the costs and benefits of regional development is needed. This sharing could provide every community the resources to respond to the impacts of growth consistent with a vision for itself, while giving each a stake in quality planning and development for the health of the region as a whole.

Effective and efficient cooperative use of limited resources, whether financial, societal or natural, is essential to achieve the goals of the plan and progress toward a sustainable future. Through the implementation of the regional plan, the region can be a place where its people live close to where they work and play, where a balanced transportation network connects mixed-use urban centers, where urban communities are defined by significant open space, and where cultural diversity and respect for the natural environment are celebrated.

The physical and cultural diversity of the many communities which comprise the Denver region creates the opportunity for a wide variety of economic development initiatives and living styles. Individual communities should prosper by contributing to regional efforts in regional facilities, transportation, air quality, water quality, water supply, waste management, provision of open space and land use mix. In turn, a stronger, more "livable" region will serve to strengthen and sustain its individual communities.

Effective and efficient cooperative use of limited resources, whether financial, societal or natural, is essential to achieve the goals of the plan and progress toward a sustainable future.

Plan Principles and Policies

The task force developed planning principles and policies designed to implement this vision. These goals and the vision statement in *Metro Vision Statement, Principles and Policies* (May 1992), were accepted by the DRCOG Board of Directors in 1992 for use in preparing the new regional development plan and formed the foundation for the Metro Vision 2020 planning process.

In addition, the task force reviewed and updated the goals and policies found in the 2015 Regional Transportation Plan. With the desire to better integrate the growth and transportation plans, the following policies regarding both topics were developed:

- Planning for regional development, transportation and air quality will be integrated.

- New development and redevelopment will be designed to encourage use of alternative transportation modes.

- Anticipate the interdependence between land use and transportation and the effect on air quality, including the need for the supportive land use adjacent to a transportation facility which will protect its transportation function, and for the transportation facility to support the planned land use.

- Recognize that transportation facilities should be utilized to anticipate and help direct the type and location of development, rather than only being planned and developed as to meet existing demands.

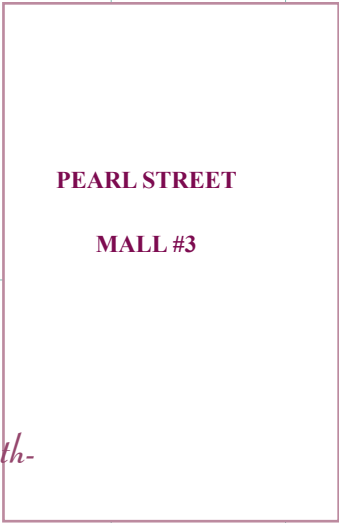
- Urban Centers (defined in the Vision, *A stronger, more livable region will serve to strengthen and sustain its individual communities.*)

Framework recommendations) should not be placed in locations which cannot be served by rapid transit.

Additional policies related to the transportation vision are found in Chapter VI.

The principles and policies should be considered as a vital component of the Vision Framework. They address fundamental issues regarding the growth and development of the region.

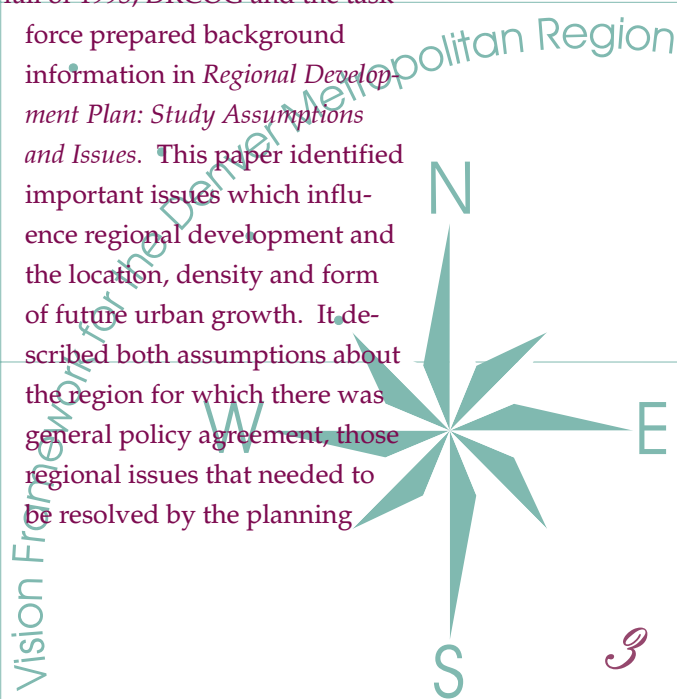
Regional Development Is-



Issues and Assumptions

In June 1993, the task force was expanded to include representatives of business, citizen, environmental groups, and local governments to create a 40-person Vision 2020 Task Force. The task force has met monthly since then to advise DRCOG in the preparation of the new development plans. Also in 1993 the planning firm BRW, Inc. (Denver) was retained to assist DRCOG staff.

In the fall of 1993, DRCOG and the task force prepared background information in *Regional Development Plan: Study Assumptions and Issues*. This paper identified important issues which influence regional development and the location, density and form of future urban growth. It described both assumptions about the region for which there was general policy agreement, those regional issues that needed to be resolved by the planning



process or where policy changes may be desirable.

These assumptions and issues served as starting points for a framework for alternative development scenarios. The framework provided a means of moving from the past to the future, as well as from the known to the unknown. The study assumptions examined the following areas: socioeconomics, development economics, open space, environmental constraints and environmental quality, transportation, wastewater and water supply infrastructure, and implementation.

Public Involvement

Throughout this planning effort, activities were conducted to identify and respond to the important issues and goals of local governments as well as those of the general public. This effort included interest groups and stakeholders involved in the outcome of the plan as well as interested citizens. Cities and counties who make up the DRCOG, their local governing councils and planning commissions were a targeted audience including the staff from the member governments which serve on DRCOG advisory committees.

Several public involvement events and activities were conducted in conjunction with the task force's planning process. In 1994, we provided press releases, presented slide talks, held a design

charette meeting of urban designers and a meeting of invited planning experts and several open house meetings. We conducted a public opinion survey and saw a special newspaper article carried on the project.

Council staff spoke to over 100 local government councils, neighborhood groups, professional associations, and planning commissions in the metro region. Staff also participated in several radio and television talk shows. In April 1994 the *Denver Business Journal* ran a special issue on growth concerns and the Metro Vision 2020 project.

Displays illustrating components of each alternative were used for the open houses and placed in public facilities in several cities and counties in the spring of 1995.

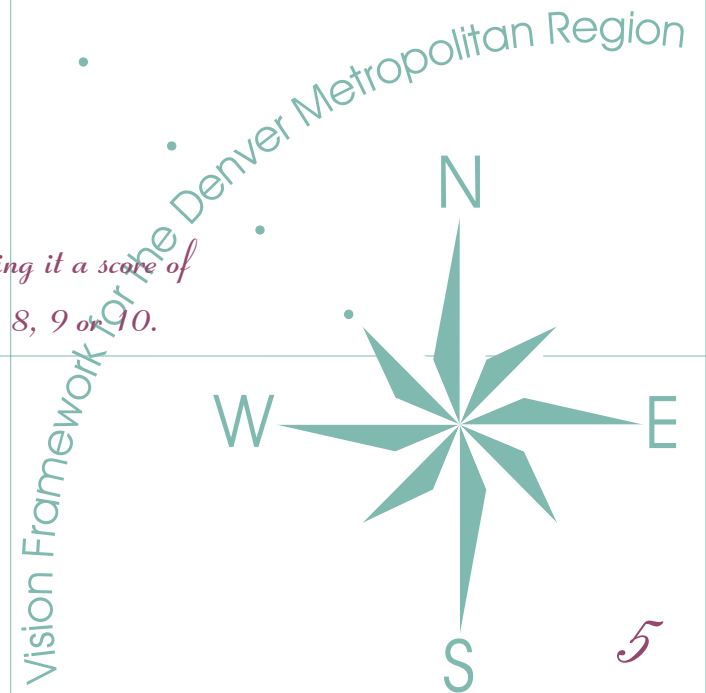
PUBLIC MEETING #4

A public forum was held in September 1993 attracting over 80 participants. The meeting provided information on the regional planning process and presented the issues and major influences shaping the future growth of the metro area. An open house was held in January 1994 to present 11 preliminary urban form alternatives. Approximately 75 people attended and provided comments about the alternatives. These comments were used by the task force in its selection of the final four

scenarios. A second open house in November 1994 presented the final four alternative scenarios for public comment; this was attended by nearly 100 people. On April 29, 1995, DRCOG along with 26 co-sponsors, hosted an all-day regional meeting entitled the Metro Growth Forum attended by more than 500 persons. Metro Vision 2020 principles and policies as well as the four alternative scenarios were presented and discussed along with other regional

growth issues. At the urging of Governor Roy Romer, the forum initiated an ongoing process of metro areawide meetings on growth-related issues to focus and refine growth policy in the region alongside the Metro Vision 2020 process. Another open house meeting held in June 1995 presented the results of the evaluation of the alternative against criteria developed by the task force.

Overall, the public is positive about the quality of life in the region, giving it a score of seven on a 10-point scale; 43 percent were very enthusiastic, rating it an 8, 9 or 10.



DRCOG commissioned a regionwide public opinion survey in September 1994 on quality of life and related regional planning objectives. The telephone survey sampled heads of households in the eight-county Denver region.

Overall the public is positive about the quality of life in the region, giving it a score of seven on a 10-point scale; 43 percent were very enthusiastic, rating it an 8, 9 or 10.

Of 14 quality of life indicators in the survey, half were deemed "extremely important," including (in order of ranking): water quality, public safety, schools, health care, air quality, regional planning for the future, open space, and housing.

The survey revealed support for regional planning to preserve open space and to utilize existing services and resources for future growth. It also indicated strong sentiment for land use and transportation plans which improve air quality, protect environmentally sensitive land and reduce traffic delays and congestion. The survey also uncovered a dichotomy in the public's desire to preserve open space while, at the same time, continuing to prefer single-family homes with yards rather than more land-efficient multi-family housing. The responses from the survey were presented to the task force and the DRCOG Board for their consideration when selecting a preferred future scenario as a basis for regional planning and policies.

BASKETBALL #5



Alternatives for the future

The next step of the Metro Vision 2020 process was the preparation of alternative urban forms. The region is expected to add 900,000 people and 600,000 jobs between 1990 and 2020. This growth could occur in a variety of different patterns within the 5,000 square miles of land contained in the region. DRCOG staff and the task force used the development assumptions and issues identified to formulate and map 11 preliminary urban form alternatives. The alternatives included a full range of themes representing combinations of policies and investment strategies which could be implemented in the next 25 years. Each would result in differing development patterns

and transportation infrastructure investments, illustrating how the region would appear if one theme was prevalent. The original 11 alternatives were:

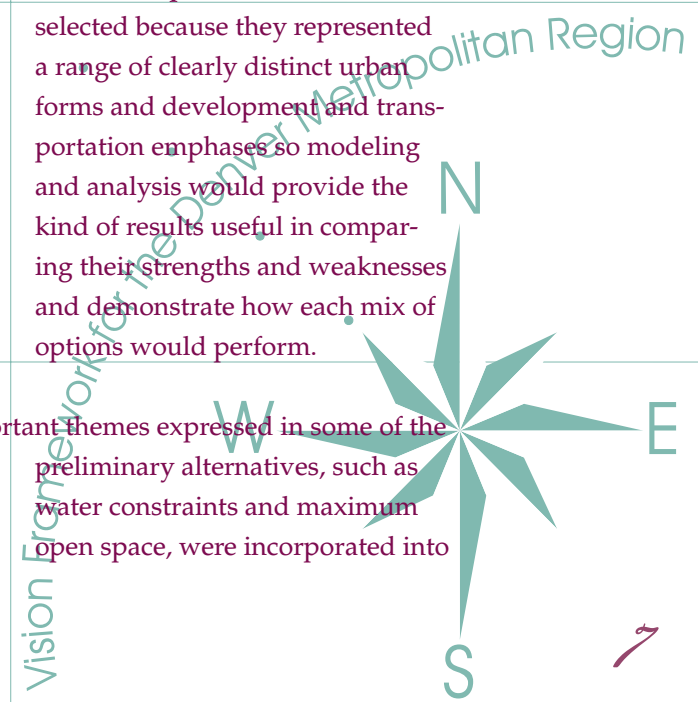
- Current Trends
- 2015 Plan
- Compact City
- Corridor Development
- Maximum Open Space
- DIA/Gateway Fulfilled
- New Towns
- Neighborhood Centers
- Urban Decay
- Water Delivery Constraints
- Traffic Sensitive

The 11 preliminary scenarios were presented to the public at an open house in January 1994 and through news releases and

coverage in the DRCOG monthly newsletter. The alternatives were presented to the council's advisory committees and responses were collected through surveys and discussion.

Using evaluation criteria based on the Vision statement and its principles and policies, and considering public and agency responses, the task force chose four alternatives for further study: **Dispersed Development, Compact Development, Corridor Development and Satellite Development.** These were selected because they represented a range of clearly distinct urban forms and development and transportation emphases so modeling and analysis would provide the kind of results useful in comparing their strengths and weaknesses and demonstrate how each mix of options would perform.

Important themes expressed in some of the preliminary alternatives, such as water constraints and maximum open space, were incorporated into



evaluation criteria to test the performance of the alternatives.

In March of 1994, DRCOG conducted an “experts” workshop with a diverse group of planning, transportation and land development professionals from throughout the region to help refine the four scenarios. The task force then made changes to the alternative descriptions and recommended them to the council’s Board of Directors for further analysis and modeling.

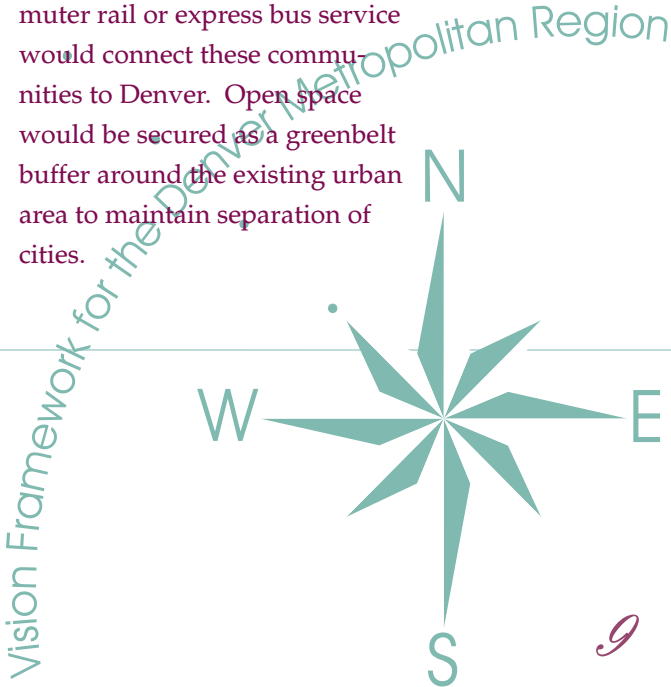
Here are descriptions of each alternative. They are visions of the evaluation of the region and are, therefore, not limited by legal or fiscal constraints. More specific land use, transportation, environment, open space, and quality of life characteristics for the four final alternatives were presented in *Urban Form Alternatives* (April 1994), describing how the region would differ from today.

The region is expected to add 900,000 people and 600,000 jobs between 1990 and 2020. This growth could occur in a variety of different patterns within the 5,000 square miles of land in the region.

Dispersed Development alternative (Current Trends), Figure 1, reflects the expected land use pattern that would result from implementing current growth, development and transportation trends and policies. New low-density residential development would continue on the edges of the existing suburban area, adding an additional 350 square miles of urban area to the Denver region for a total of 850. Downtown Denver would remain the region’s largest activity center, but suburban office parks such as the Denver Tech Center would capture most new office and business development. New commercial development would continue to be built in single-purpose shopping centers.

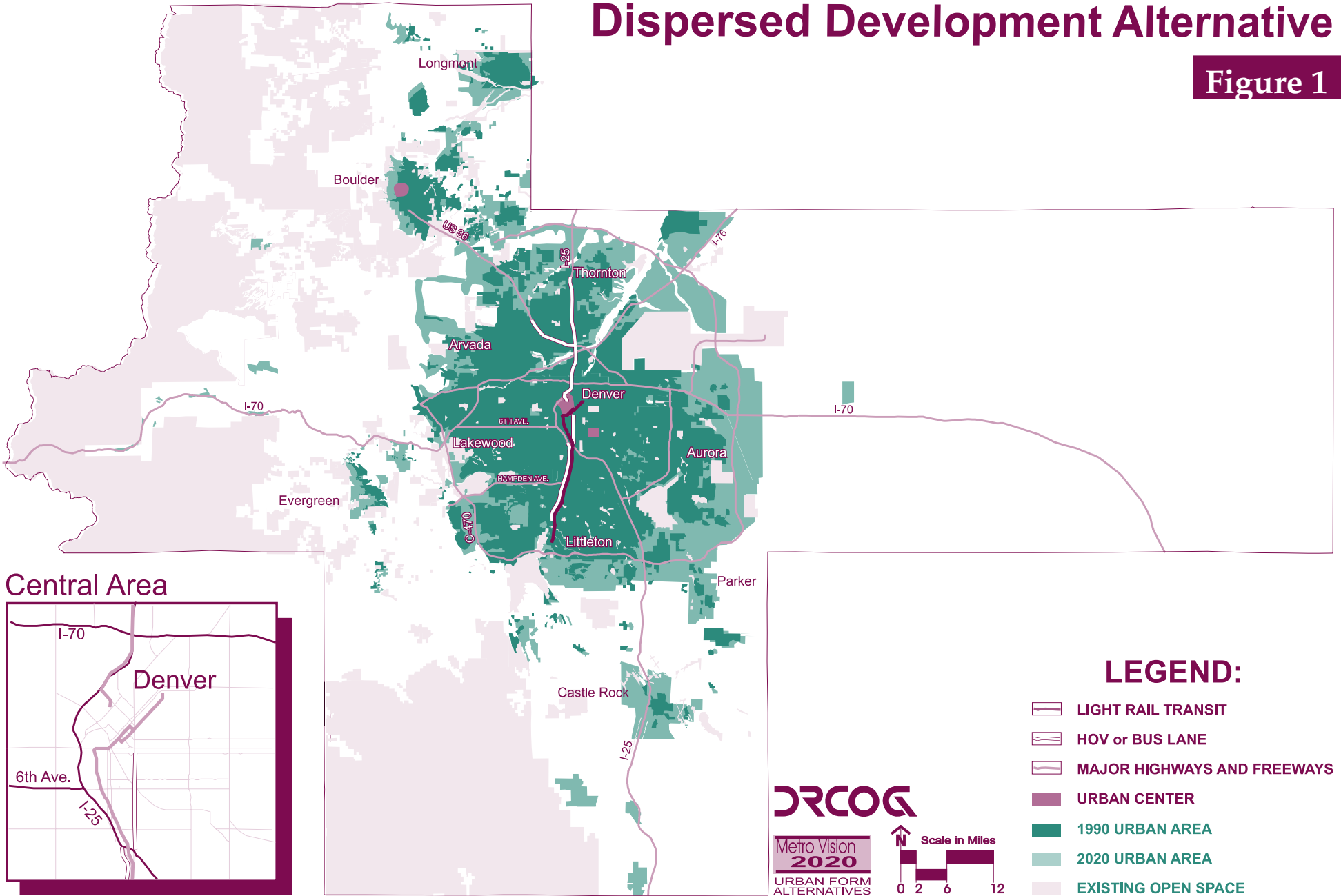
Transportation improvements would emphasize adding new capacity to existing highways and building new roads to serve growth on the urban fringe. E-470 and a western circumferential freeway would be built completing an outer beltway for the region. Because of the increased size of the urbanized area, transit service is more difficult to utilize and private automobiles remain the only transportation option. Large public open space would only be preserved by those jurisdictions with programs currently in place.

<p>Compact Development alternative, Figure 2, concentrates population and employment growth in the existing urban and suburban areas already provided with roads, sewers and utilities. Downtown Denver would continue to be the largest activity center in the region but a second tier of four to six major mixed-use activity centers or “second downtowns” would develop. These centers would be mixed use, support transit, be pedestrian-oriented and reduce the need to drive to work or shops. Transportation investment would be directed toward building a transit system connecting all major activity centers in the region on a grid system. Some new development would occur on infill sites within the existing urban and suburban areas, and a wide range of new housing types would be available. A regional belt of open space would be established around the developed area to form a buffer to contain growth. As the name implies, this alternative uses the</p>	<p>least new land, increasing the urban area by 100 square miles for a total of 600 square miles.</p>	<p>Satellite Development alternatives, Figure 4, concentrates population and employment growth in existing developed areas and in new and existing outlying communities such as Longmont, Castle Rock and Evergreen. Commutes to the existing urban center and the need for additional suburban office parks would be reduced as these communities develop their own commercial, residential and employment bases. Public transit would be developed within each community. Com-</p>
<p>•</p>	<p>Corridor Development alternative, Figure 3, shows population growth and new development adjacent to major highways and transit lines between existing urban communities. Light rail and existing highways would form the spokes connecting to the hub of central Denver. This scenario would allow for preservation of major open space areas as wedges between the</p>	<p>•</p>
<p>•</p>	<p>development corridors. Higher development densities would be encouraged along these corridors to support transit with at least one urban center located along each corridor. Both this alternative and the Satellite development option require less new land than dispersed development but more than compact development, and grow 250 square miles, or by 50 percent.</p>	<p>•</p>
<p>•</p>	<p>•</p>	<p>•</p>
<p>•</p>	<p>•</p>	<p>•</p>



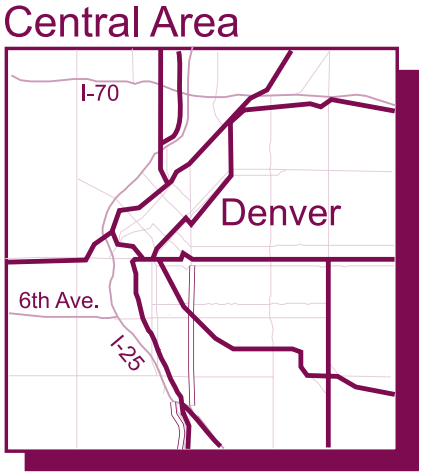
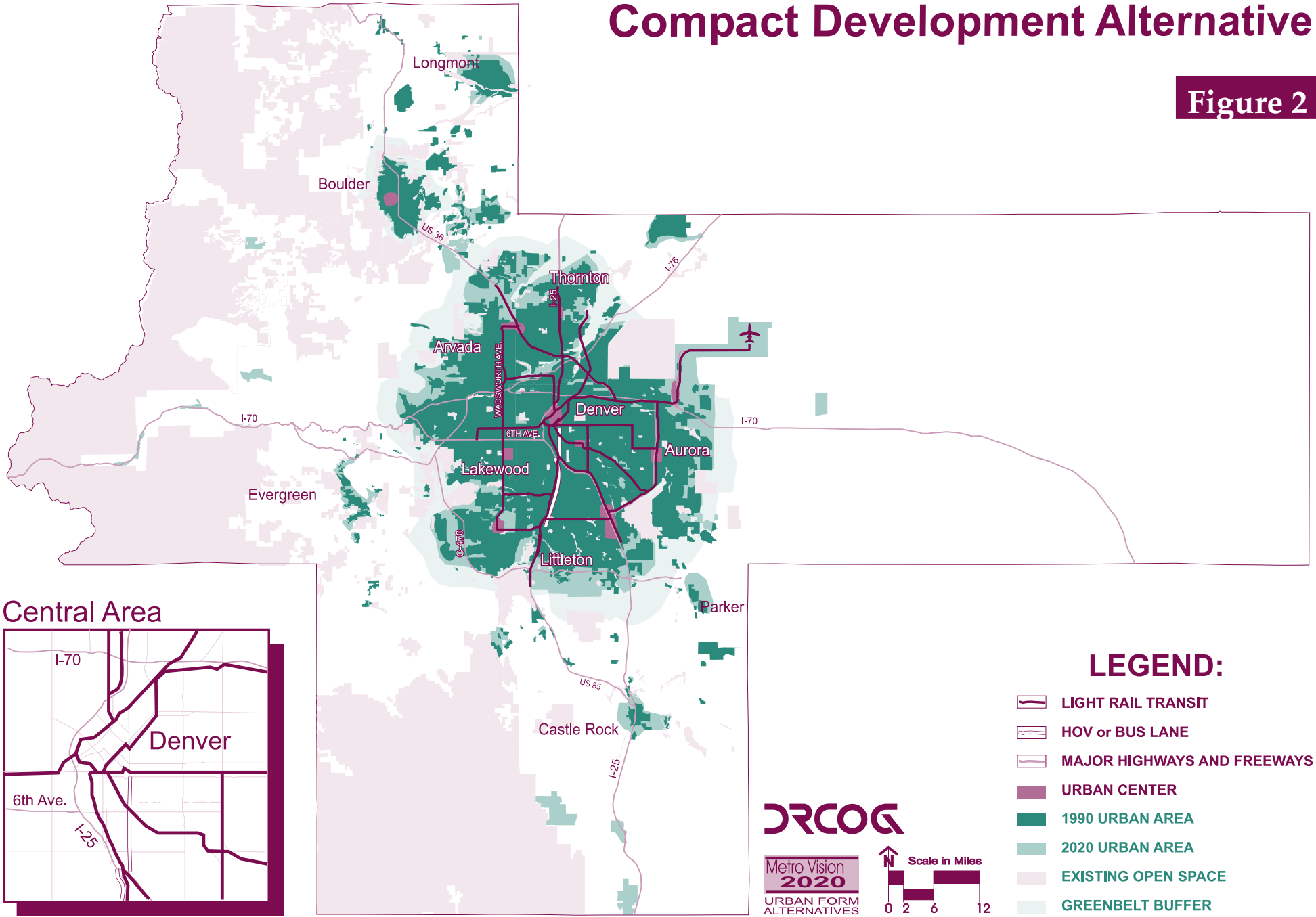
Dispersed Development Alternative

Figure 1











Compact Development Alternative

Figure 2



LEGEND:

-  LIGHT RAIL TRANSIT
-  HOV or BUS LANE
-  MAJOR HIGHWAYS AND FREEWAYS
-  URBAN CENTER
-  1990 URBAN AREA
-  2020 URBAN AREA
-  EXISTING OPEN SPACE
-  GREENBELT BUFFER

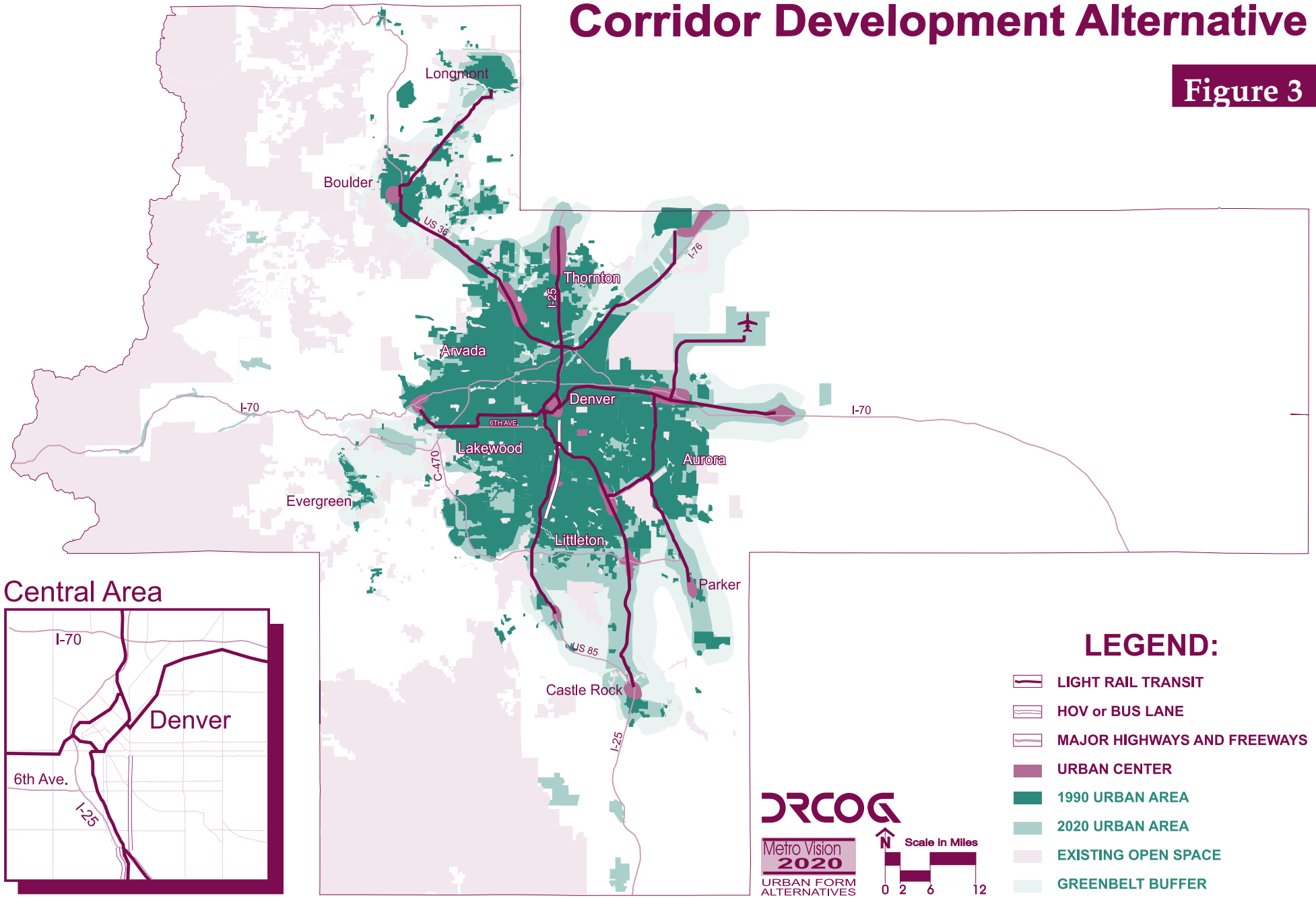
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Scale in Miles
0 2 6 12

Corridor Development Alternative

Figure 3

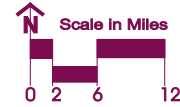


LEGEND:

- LIGHT RAIL TRANSIT
- HOV or BUS LANE
- MAJOR HIGHWAYS AND FREEWAYS
- URBAN CENTER
- 1990 URBAN AREA
- 2020 URBAN AREA
- EXISTING OPEN SPACE
- GREENBELT BUFFER

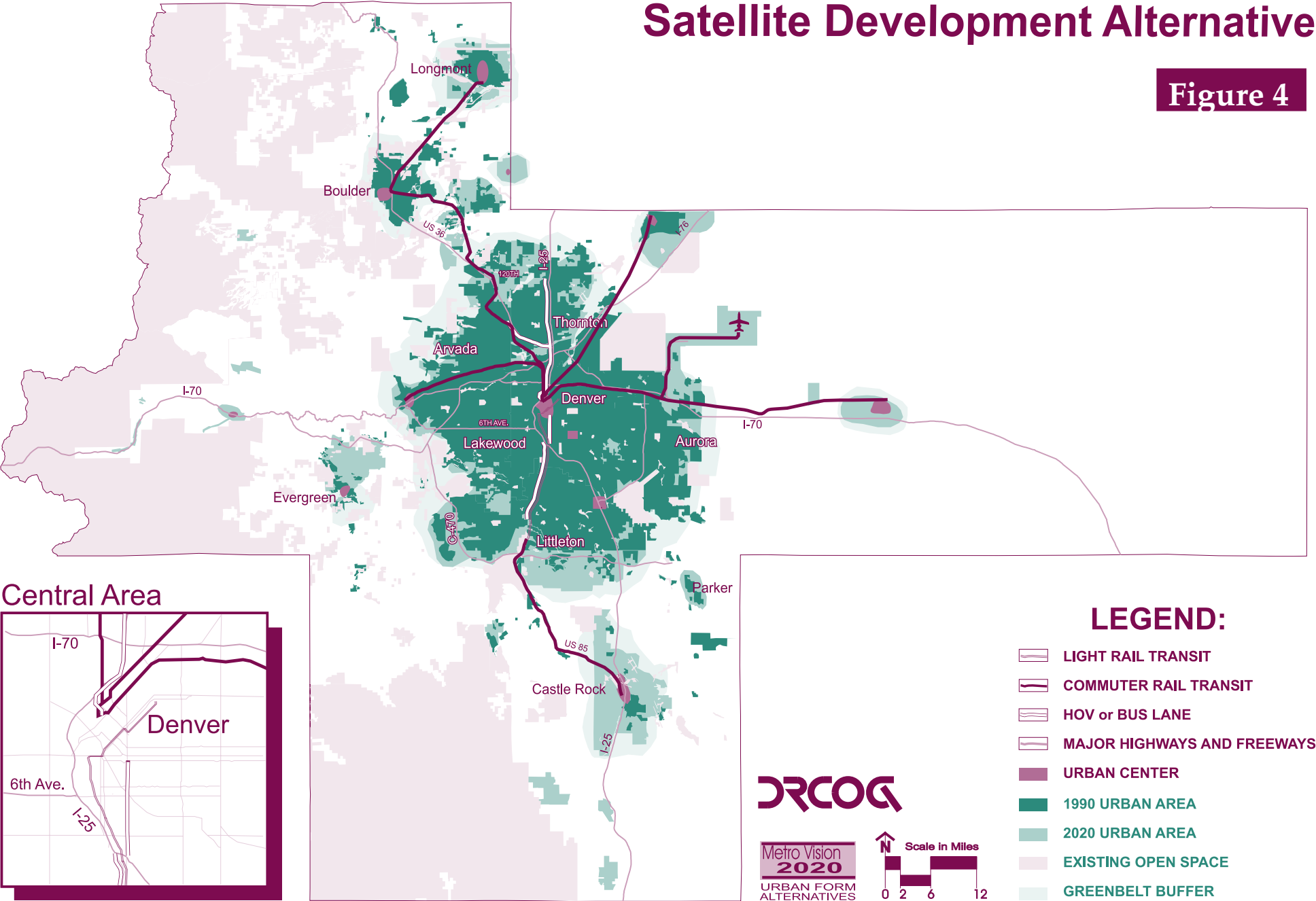


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Satellite Development Alternative

Figure 4

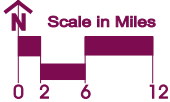


LEGEND:

-  LIGHT RAIL TRANSIT
-  COMMUTER RAIL TRANSIT
-  HOV or BUS LANE
-  MAJOR HIGHWAYS AND FREEWAYS
-  URBAN CENTER
-  1990 URBAN AREA
-  2020 URBAN AREA
-  EXISTING OPEN SPACE
-  GREENBELT BUFFER



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2020
URBAN FORM
ALTERNATIVES





Evaluating the Options

W E

Metro Vision 2020

Evaluations were conducted to determine how the alternatives would respond to the growth and development goals and objectives established by the task force. Twenty-four evaluation criteria for land use, transportation, environment, open space and implementation were developed and tested against the four scenarios. The criteria were based on goals and policies set forth in the Vision Statement, Principles and Policies document, the 2015 Regional Transportation Plan Goals and Policies, and the Vision 2020 Study Assumptions paper prepared by the task force. The criteria used were selected specifically to indicate level of attainment of these planning goals, were measurable in some way, and had

responses that were discernable at the regional urban form level.

DRCOG used a geographic information system (GIS) to calculate the values to compare for the land use, environment, open space and implementation evaluation criteria. This enabled comparison of the socioeconomic variables of households and numbers of jobs by locations for all the alternatives in a systematic fashion. The transportation and air quality criteria were developed from the DRCOG regional travel model and other means.

By comparing the results of the criteria in aggregate and considering the relative importance of each measure, the evaluation criteria helped the task force determine

how the four alternatives performed and what their achievements and shortcomings might be. The evaluation showed that many important development and transportation goals are only marginally discernable at the regional level of the alternatives but the results do give us an indication of how the major features of each compare with one another.

Criteria

The goals or principles that were

evaluated, how the criterion was defined or measured and what the comparative results and scores were for the four alternatives are reported in the *Evaluation Criteria Report- Metro Vision Urban Form Alternatives*. The criteria results were reviewed and discussed by the Vision 2020 Task Force and the DRCOG staff and are discussed later in this report.

The following is a summary description of the criteria used to evaluate and compare the alternatives, the goals or purposes measured and the results of the analysis. More information on the evaluation criteria is provided in the report mentioned above.

While the criteria were developed to be as quantitative as possible, the ability to measure the differences between alternatives varied from one criterion to another. The Vision 2020 Task Force recognized this variability as well as the variability in relative importance of the criteria. Therefore, they elected not to develop cumulative scores or to rank the criteria. The following chapter contains the conclusions developed by the task force based on the results of the evaluation criteria.

HOUSING DEVELOPMENT #6

Land Use

New land for development

Limiting the size of the metro area by preserving undeveloped land on the urban periphery is a fundamental policy criterion.

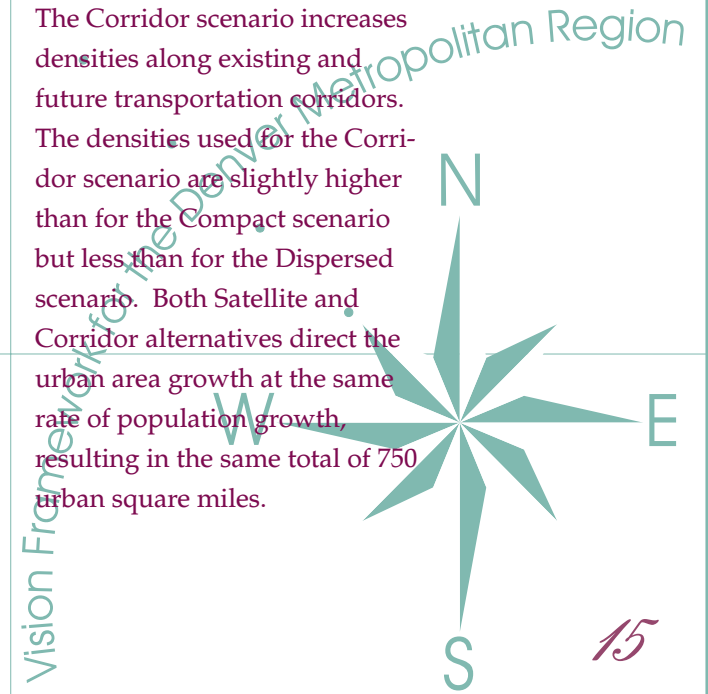
The number of square miles of newly urbanized land required by the alternatives was compared based on assumptions of household and employment densities for each. Urban land is defined as land which has public services such as roads, water and wastewater facilities, and has housing at a density greater than one dwelling unit per acre.

The Compact scenario best meets this criterion as it encourages infill development while restricting development on the edges of the metro area. The average density would be 4,100 people per square mile resulting in 650 square miles of total urban land (or 150 square miles of new urban land). The Dispersed

scenario is the least desirable by promoting the current density of new development of about 2,500 people per square mile consuming 350 square miles of undeveloped land to produce 850 square miles of total urbanized land.

The Satellite alternative encourages growth in multiple urban centers. The central area will grow at the same density as in the Compact scenario, while the satellite cities will grow at slightly higher than half that density.

The Corridor scenario increases densities along existing and future transportation corridors. The densities used for the Corridor scenario are slightly higher than for the Compact scenario but less than for the Dispersed scenario. Both Satellite and Corridor alternatives direct the urban area growth at the same rate of population growth, resulting in the same total of 750 urban square miles.



Housing and jobs

This criterion provided an index to measure how well each alternative meets the goal of providing opportunities for people to walk or bike to work and to live and work within the same community. It was measured by the average ratio of jobs to housing at a scale somewhat equivalent to an “employment shed.” Regionwide, there will be an expected 1.42 jobs for each household in the year 2020, so this was the target for all the communities in the region. The alternative with the highest total for the rankings had the most Regional Statistical Areas nearest the 1.42 goal for the region. It would, therefore, do the best job of meeting this criterion.

The Corridor alternative has the most potential of the four alternatives of supporting the jobs/housing balance with a combined ranking of 154. The next most desirable alternative is Dispersed with a ranking of 133, followed by the Satellite alternative with a ranking total of 124. The least desirable alternative is Compact with a total ranking of 119.

It can be reasonably assumed that infrastructure already exists or can be easily extended in areas which have a high percentage of development. The region was evaluated to establish a range for the amount of development which must exist in an area to enable the extension of infrastructure to cover the entire area.

Existing infrastructure

This criterion evaluates how well each alternative takes advantage of the unused capacity of existing infrastructure and services by locating development near them. This provides a measure of cost efficiency between alternatives and an indication of the level of infill development over the entire metro area.

The Compact alternative supports the potential use of existing infrastructure most effectively because the average of total growth in zones with infrastructure is highest at 1,668,105 jobs and households. The Corridor alternative is second with a growth total of 1,588,787. The Satellite alternative was third with growth total of 1,580,826. The Dispersed alternative was last with the smallest growth total of 1,506,626.

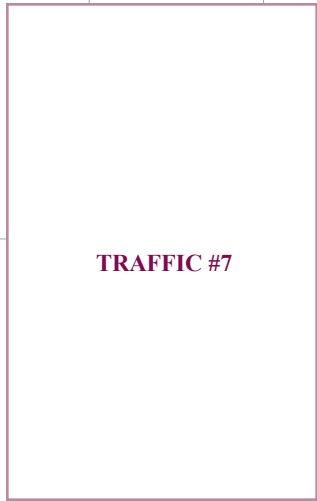
Limiting the size of the metro area by preserving underdeveloped land on the urban periphery is a fundamental policy criterion.

Roadway capacity

This criterion compares how well the alternatives match urban growth and land development with transportation capacity, responding to the Metro Vision policy that the preferred alternative “support development only in areas where sufficient transportation systems exist or are planned both on and off site, or where adequate systems consistent with regional plans can be established at the developer’s expense to support the development.” The criterion compares the miles of congested roadway facilities in 1995 to household and employment growth across the region in 2020 since the alternatives cannot anticipate where developers may be willing to provide new roads.

The Satellite alternative has the most potential of the four to distribute growth to areas with available transportation capacity, 139,000 jobs for 156,000 households. This is most likely due to

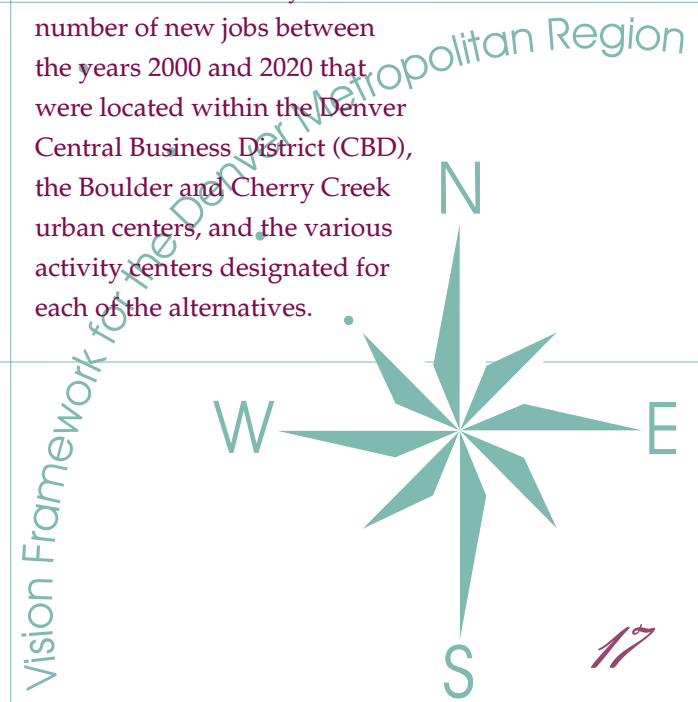
the lower levels of congestion in 1995 in the free-standing communities than in the core urban area. The Compact alternative puts much more growth into areas which already have traffic congestion, and only 98,000 jobs and 116,000 households into the uncongested zones. The other two alternatives share the middle spot with Corridor ranked second for employment but third for households and the Dispersed ranking reversed.



Urban centers and activity centers

This criterion measures how well each alternative concentrates nonresidential development in locations that promote efficient transportation systems and travel. By locating employment in higher density activity centers, these centers have a mix of use, support transit and have the potential to reduce both work and non-work vehicle trips.

The criterion was measured by the total number of new jobs between the years 2000 and 2020 that were located within the Denver Central Business District (CBD), the Boulder and Cherry Creek urban centers, and the various activity centers designated for each of the alternatives.



The Satellite alternative best meets this criterion and has the greatest number of total new jobs located within designated activity centers. This is due to the large number of activity centers (seven) located around the region in this alternative which are designed to accept a large portion of the region's employment growth. The Compact alternative had the second largest number of new jobs in activity centers (92,612) in the service and retail sectors because of the significant growth in employment in the Denver CBD. The Corridor alternative is third with 76,486 new jobs while the Dispersed alternative has the fewest new jobs in activity centers (18,166) because the majority of the employment growth in this alternative was placed in areas that are spread throughout the region, not in activity or urban centers.

Transit accessible development

This criterion measures which alternative encourages the greatest degree of transit accessible development. New development should be designed to facilitate access to, and development of, mass transit and encourage high density, mixed use development at peripheral urban centers along transportation corridors and major transit lines where these are in close proximity to residential areas. The criterion was measured by the number of new housing units built, and the number of new jobs located, within ¼ mile walking distance of transit stations located in each of the alternatives.

The Compact alternative best meets this criterion and has the greatest number of new housing units (32,617) and jobs (275,006) accessible by transit in 2020. The Corridor alternative had the next largest number of new housing units near transit stations at 12,934 and the third highest number of new jobs at 104,380. The Satellite alternative had a similar number of new housing units at 12,150 and 157,123 new jobs. The Dispersed alternative has the fewest new households near transit stations at 1,920 and the fewest new jobs at 15,335.

New development should be designed to promote access to, and development of, public transit plus encourage high density, mixed-use development at urban centers near both housing and along transportation corridors and routes.

Services close to housing

This criterion measures the alternatives by evaluating the amount of services available to support mixed-use development and reduce non-work vehicle trips.

This was measured by comparing the total number of service and retail jobs located in the Denver CBD, the two existing urban centers and the designated activity centers in each of the alternatives.

The Satellite alternative best meets this criterion and has the greatest number of retail and service sector jobs located within designated activity centers (117,079).

This is due to the large number of activity centers (seven) located around the region in this alternative which are designed to accept a large portion of the region's employment growth. The Compact alternative had the second largest number of new jobs in activity centers (92,612) in the service and retail sectors because of the signifi-

cant growth in employment in the Denver CBD. The Corridor alternative is third with 76,486 new jobs while the Dispersed alternative clearly has the fewest new jobs in activity centers (18,166) because the majority of the employment growth in this alternative was spread throughout the region, not concentrated in activity or urban centers.

The scenario with the smallest increase in travel is likely to be the one with greatest potential to reduce air pollution, save energy, and support pedestrian- and transit-oriented development.

Transportation

Most of the transportation criteria rely upon the results of the regional transportation system model. The Vision 2020 Task Force recognizes the central importance of the "modal split" - the apportionment of trips among modes such as automobiles, buses, rail transit and bicycles - and takes note of the limitations of forecasting models' ability to predict such transportation system demand characteristics. This prediction requires assumptions about the behavior and choices of individuals 25 years in the future and is subject to many variables.

BUS #8

the Denver Metropolitan Region



Vehicle travel

This criterion compares the amount of motor vehicle travel on the roadway system resulting from the four development and transportation network alternatives. The scenario with the smallest increase in travel represents one with greater potential to reduce air pollution, save energy, and support pedestrian- and transit-oriented development. Motor vehicle travel measured in millions of vehicle miles of travel (VMT) per weekday was generated from the regional travel model. Major factors influencing VMT estimates include: (1) growth of regional population and employment; (2) the development pattern; (3) increased vehicle use per person caused by projected higher incomes;

(4) type of transit and transit service provided. VMT per capita is measured by dividing VMT estimates by the total household population, including children and non-drivers.

Between 64.7 million and 73.3 million vehicle miles will be driven by the year 2020 depending upon the development pattern and the transportation system. VMT has increased from about 15 million miles per weekday in 1970 to about 45 million in 1995. **The Compact scenario has the lowest VMT estimate of 64.7 million;** this is followed by Satellite at 66.6 million and Corridor at 68.9 million. By continuing past trends, the Dispersed scenario

would result in the highest vehicle miles travelled at 73.3 million per day.

VMT per capita ranges between 24.2 and 27.7 VMT per person. VMT per capita has increased from approximately 13 VMT per person in 1970 to 22.6 VMT per capita in 1995. The 2020 VMT per capita estimates portray a significant moderation of growth in VMT per capita. The Compact scenario again best meets this criterion and has the lowest VMT per capita at 24.2. Dispersed has the highest at 27.7 and Satellite is 24.8, followed by Corridor at 25.6.

VMT has increased from about 15 million miles per weekday in 1970 to about 45 million in 1995.

TRAFFIC #9

Congestion

This criterion measures the percent of vehicle miles traveled on freeways and principal arterial roadways that occur under congested conditions. Congestion is considered to begin at about 1,900 vehicles per lane per hour on a freeway, and about 850 vehicles per lane per hour on arterial roadways. Average daily speed is estimated in miles per hour. The portion of VMT under congested conditions will increase from 40 percent in 1995, to 41 to 59 percent in 2020 depending upon the scenario. The variation among scenarios mainly reflects changes in highway capacity (number of lanes). The Dispersed scenario best meets the criterion by maintaining about the same level of congestion as in 1995, while the Compact Development scenario with its minimal highway investment, would have the highest level of congestion. The Dispersed scenario has an average speed of 34 mph; the

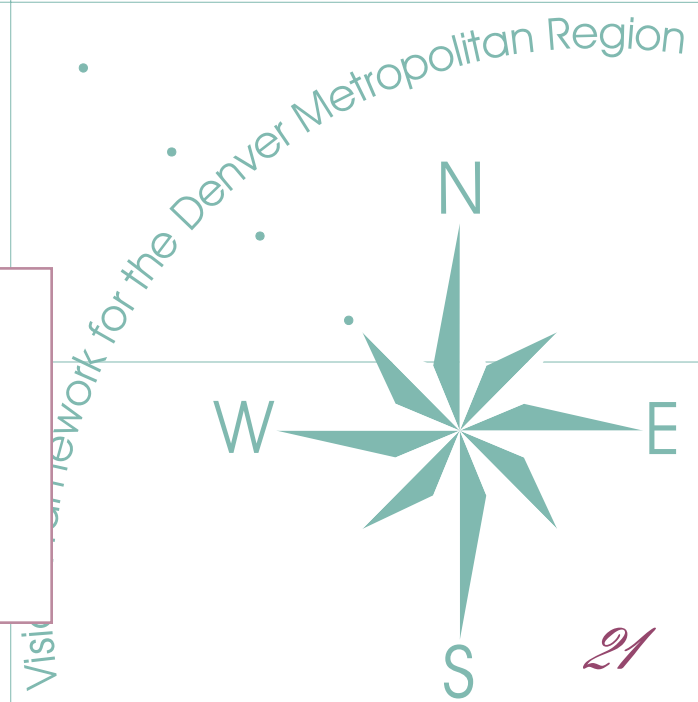
average speed in the Compact and Satellite scenarios is 28 mph and the Corridor scenario has a 29 mph average speed.

Alternate travel modes

This criterion compares the alternatives by measuring the level of travel made in carpools, vanpools, transit, and non-motorized modes for an average weekday. Factors affecting the calculations included: comparative travel times on highway versus transit, which in turn reflected network assumptions concerning investment patterns in highway and rapid transit facilities; parking costs, which are generated based on employ-

ment density estimates; and the general pattern of development, including assumptions on Denver CBD employment. Local survey data indicated a base of 11 percent non-motorized travel in the region. The effect of high-density activity centers with mixed-use development and extensive pedestrian and bicycle facilities was estimated using the central portion of the City of Boulder as a model.

BICYCLIST #10



Estimates of telecommuters among the alternatives were not done because of the lack of a theoretical basis for varying telecommuting rates between the four different alternatives. It is uncertain whether more people would telecommute under the Compact Development scenario with its high congestion levels, the Dispersed scenario with its long travel distances, or the Satellite Development scenario with its separated growth centers.

The Compact scenario best meets this criterion with the highest transit patronage (360,000 passengers per day) and the highest percentage of non-motorized mode use (12.6 percent). The Dispersed scenario has the lowest transit patronage (210,000 passengers per day) and the lowest level of non-motorized mode use (11.3 percent). These estimates can be compared to the current day ridership of approximately 127,000 passengers per day. Transit patronage mirrors, to some extent, the

assumed increase in CBD employment between the various alternatives and the assumed investment of transit facilities. The Dispersed scenario transit patronage increases from current day levels since bus service was assumed to significantly increase.

Access to the CBD and other urban centers

This criterion measures the degree of access to downtown and other urban centers by comparing estimated travel times between specific areas. Peak congestion period travel times on both highways and transit between six representative activity centers were calculated for the four alternatives. **The Dispersed alternative had the shortest travel time** utilizing primarily highways while the Compact alternative had more transit access but the slowest travel times. The Corridor and Satellite access fell between these two as they had more of a

mixture of highway and transit facilities.

Travel time

This criterion compares the amount of travel time as an indicator of the efficiency of the regional travel system. Travel time for auto trips includes the time to complete each trip: the drive time to each destination, including any delay caused by congestion, and the time to find a parking space and walk to the destination after parking the vehicle. Travel time for transit trips includes the time to walk to the transit stop, wait for the transit vehicle, ride in the transit vehicle, any transfer time between transit services, and the time to walk to the destination. Travel time for non-motorized travel includes the time to walk or ride a bicycle.

To calculate travel times, the regional travel model vehicle hours of travel was multiplied by an assumed auto occupancy of 1.33 to develop highway person hours of travel. For transit, the model directly estimates transit rider hours of travel. The average non-motorized trip was assumed to take 15 minutes and was multiplied by the number of non-motorized trips.

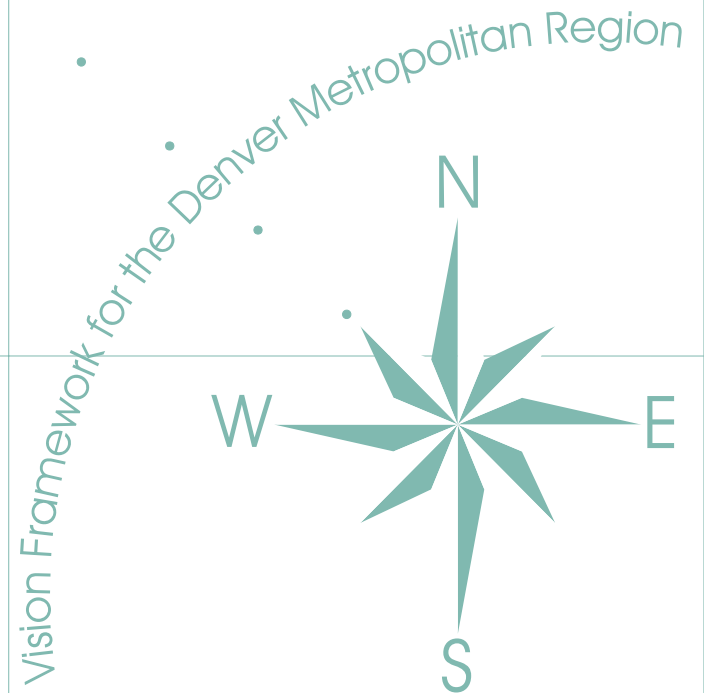
The Dispersed has the least congestion, the lowest use of alternative modes, and hence the lowest overall travel time and best meets this criterion as defined at 3.9 million person hours of travel. The other three scenarios, with their high levels of congestion, lower speeds, and implied greater use of alternative modes have higher overall travel time at 4.3 million person hours of travel.

Regional transportation costs

This criterion compares the direct public cost of building, operating and maintaining the regional transportation system not the indirect or external public costs such as health costs due to transportation-related air pollution. Clearly regional transportation is a major cost for the metropolitan region, so a public policy goal is to reduce it in the preferred future.

Total public costs include capital, operations and maintenance, and transportation demand management measures for the 25-year period between 1995 and 2020, estimated in 1995 dollars. Rapid transit construction costs were estimated using Regional Transportation District (RTD) and 2015 Interim Regional Transportation Plan data. Highway construction costs were prepared using project cost estimates and cost per lane mile and per interchange using Colorado Department of Transportation (CDOT)

estimates. High-occupancy Vehicle lane cost estimates were based on current project costs. Local roadway costs were generated assuming current suburban roadway patterns in newly developed areas. Transit operating and maintenance costs were estimated using RTD experience. Highway operating, maintenance and reconstruction costs were based on CDOT and local government experience.



Costs included in the Regional Transportation Plan include public construction costs for capital expansion projects of transit or principal arterial and larger roadways, and range from \$3.9 billion for the Satellite scenario to \$6.4 billion for the Corridor scenario.

The Satellite scenario best meets the criterion and had the lowest cost because the commuter rail transit built in this scenario has a comparatively low per mile capital cost and few improvements were assumed to the highway system.

The Corridor scenario assumes significant expenditures on both transit (\$3.6 billion) and highways (\$2.8 billion). The Dispersed scenario has almost the same capital costs as the Corridor scenario but assumes almost all the funds will be spent on highway facilities (\$5.9 billion) with little spent on transit (\$0.3 billion). The Compact scenario has a lower capital cost (\$5 billion) than Dispersed or Corridor, with most of the funds spent on transit facilities (\$3.5 billion).

Total public costs included those for local roadway facilities not on the Regional Transportation Plan, operations and maintenance costs, and reconstruction costs equal a total cost between \$20 and \$23 billion for the region over the next 25 years. Dispersed and Corridor scenarios remain the highest cost scenarios both at \$22.7 billion dollars, followed by Satellite at \$20.6 billion and Compact at \$20.3 billion.

Regional transportation infrastructure is a major cost for the metropolitan region, so a public policy goal is to reduce it in the preferred future.

CONSTRUCTION #11

Private transportation costs

This criterion compares the alternatives based on total private transportation costs. As defined in this study these include auto ownership and operating costs such as parking fees and tolls, transit fares and costs to business due to congestion.

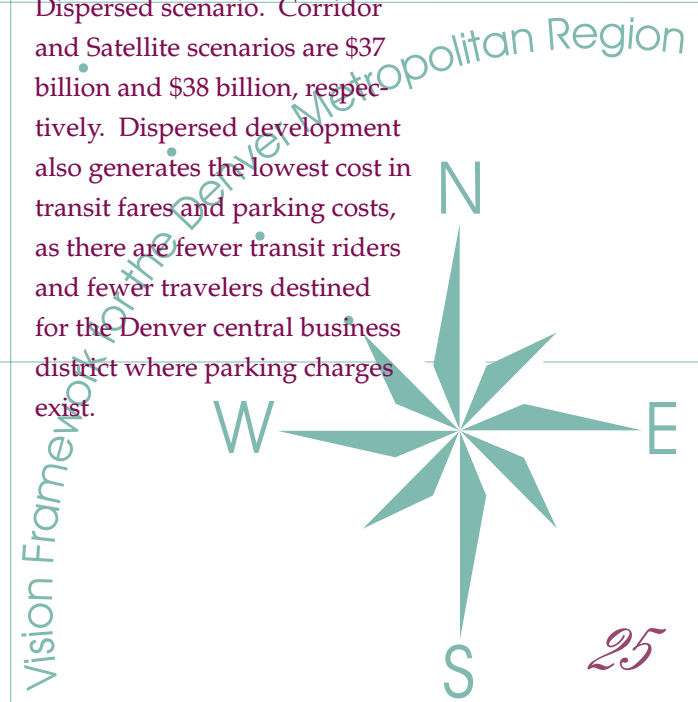
The regional travel model generated VMT and congestion estimates which were used to estimate fuel consumption assuming an average fuel economy of 20 miles per gallon and \$1.25 per gallon. The cost of congestion to business was assumed to average \$25 per hour. Current transit fares were used to estimate public transit costs. The regional model was also used to estimate the number of vehicles parking in areas with parking charges multiplied by the assumed parking cost based on employment density. VMT on toll roads was estimated assuming a 10 cents per mile charge. Auto ownership levels

were estimated for each scenario using the relationship of auto ownership to density in the 1990 census for the Denver area. Number of vehicles owned was then multiplied by \$4,538/year per vehicle to estimate the cost of vehicle ownership, including depreciation, insurance, interest on auto loans, and license and registration.

Total private costs for the region will range from \$292 to \$295 billion over the next 25 years. The bulk of this will be in the cost of auto ownership. **Because the Compact scenario has the lowest number of vehicles owned, yielding the lowest auto ownership cost (\$217 billion), it best meets this criterion.** The Dispersed scenario results in about 52,000 more vehicles in 2020, and has a cost of auto ownership of \$222 billion; the other two alternatives fall in between with an auto ownership cost of \$220 billion and \$219 billion, respectively.

Total private transportation costs for the region will range from \$292 billion to \$295 billion over the next 25 years. The bulk of this will be the cost of auto ownership.

Some of the variation between scenarios is generated by the commercial vehicle delay. Compact development, with its higher levels of congestion, costs \$39 billion compared to \$37 billion in the Dispersed scenario. Corridor and Satellite scenarios are \$37 billion and \$38 billion, respectively. Dispersed development also generates the lowest cost in transit fares and parking costs, as there are fewer transit riders and fewer travelers destined for the Denver central business district where parking charges exist.



Environment

Air quality

This criterion measures the relative air quality of each scenario by comparing the amount of air pollutants emitted in each alternative. Air quality is a key component in the quality of life in the metro area and is affected by both land use patterns and the transportation systems that serve the different urban form scenarios. Emission levels of the four major air pollutants from mobile sources (carbon monoxide or CO, small particulate matter or PM₁₀, volatile organic

compounds and nitrogen oxides or NO_x) were estimated in tons per day using computer modeling techniques.

Data for PM₁₀ is for primary particulates, primarily re-entrained road dust and diesel tailpipe emissions modeled using Air Pollution Control Division (APCD) emission factors. Data for carbon monoxide, volatile organic compounds and nitrogen oxides are from Mobile 5a mobile source emission model runs by the APCD. The values for 1995 are taken from the PM₁₀ and CO State Implementation Plans for these pollutants.

Results are expressed in percentage of change between 1995 and 2020. **Carbon monoxide emissions are lowest in the Dispersed alternative** (-13 percent change) and highest in the Satellite alternative (+2 percent change). Carbon monoxide emissions from motor vehicles increase with low to moderate speeds and decrease at higher speeds. The Dispersed alternative has the highest average speed in 2020, approximately 30 percent higher than an average of the daily speeds of the other three alternatives. Because the Dispersed alternative locates significant population and employment activity in the fringe area in a dispersed pattern and adds significant road capacity in this area as well, longer and higher-speed auto trips result in this alternative than in the others.

PM₁₀ emissions did not vary appreciably between the four alternatives because total regional VMT did not vary a great deal between them. **The Compact alternative**

Air quality is a key component in the quality of life in the metro area and is affected by both land use patterns and the transportation system.

FLATIRONS #12

reveals both the smallest number of regional vehicle miles of travel as well the lowest regional emission of PM₁₀ of the alternatives. The nonattainment area emission level of PM₁₀ is lowest in the Satellite alternative due to the greater amount of VMT occurring outside the central city area and within and between the larger satellite cities.

The emission level of VOC is lowest in the Dispersed alternative, highest in the Satellite alternative, and similar for the remaining two scenarios. Because the Dispersed alternative has the highest average vehicle speed as well as the greatest VMT, it emits the most nitrogen oxide pollutants. Conversely, the Compact alternative has the lowest VMT and lowest average speed resulting in the lowest emission levels.

Stormwater pollution can potentially negate the effects of wastewater treatment.

Water quality

This criterion compares the levels of stormwater runoff loading entering the region's streams and lakes from four different growth patterns. Stormwater pollution has the potential to exceed the impacts from wastewater treatment facilities on the use attainment of water bodies in the region.

Runoff loading is a function of the type and intensity of land use. For this analysis, six chemical parameters were used to compare the impacts on the alternatives for the additional acres of residential and commercial land developed by 2020 for each alternative by watersheds based on the segments of streams and lakes as defined by the Colorado Water Quality Control Commission. Using the typical distribution of rainfall events during a year, the runoff functions were used to calculate the tons of each chemical parameter generated per year within each

watershed and the impacts were compared to existing levels of stream quality for those watersheds where the water body was rated as threatened or worse.

Compact Development best meets the total load criterion by producing the smallest total amount of chemicals: almost one million tons per year. Even though Corridor and Satellite both consume 250 square miles of urban land, the distributions produce significant differences. Corridor adds an extra 30,000 tons per year of these chemicals to the region's waterways. The Dispersed alternative is a third higher than Compact with 1,331,000 tons. To partially remove the effect of scale between these chemicals and to specifically target "critical" watersheds, the second approach counts the number of use-impaired watersheds with significant loads for each parameter. Using this approach, **the Satellite alternative has the least impact on critical wa-**

Regardless of development scenario, the existing system of wastewater treatment facilities must expand in the future.

watersheds since it locates more growth than Compact outside these watersheds. The Dispersed alternative least achieves water quality goals.

Finally the analysis looked at the cumulative annual amount of runoff into lakes, streams and reservoirs, expressed as a percent of the total amount of runoff which these bodies of water can receive. The Compact Development alternative would generate the smallest loading at 998,000 tons per year, while the Dispersed Development alternative would generate an additional 333,000 tons per year. The potential impact to use-impaired watersheds was also evaluated with Satellite Development affecting 44 watersheds and Dispersed Development affecting 60.

Wastewater treatment

2020 population and employment densities by wastewater service areas identified in the regional Clean Water Plan were converted into flows by assuming each person produces 85 gallons per day of wastewater and each employee produces 50 gallons per day into the existing 102 wastewater treatment facilities in the region. Projected facility flows by alternative were estimated and compared to approved design capacities to identify the facilities requiring expansions.

The evaluation reveals a need for about 300 million gallons of wastewater treatment capacity to meet 2020 growth. Regardless of development scenario, this requires the expansion of the existing system of wastewater treatment facilities beyond their approved design capacities. The specific expansions are generally dependent on the selected alternative. The Compact alternative best meets this criterion

using a scale from one for the most efficient use of existing wastewater treatment facility capacity and treatment to four, the least efficient use. Compact requires 28 facility expansions for a total of 12 million gallons per day of capacity beyond existing design capacities, while the Satellite alternative will require 34 facility expansions for a total of 39 million gallons per day more capacity.

The Corridor alternative will require fewer advanced wastewater treatment facilities, while the Compact alternate should require the fewest major facility expansions. Fewer advanced wastewater treatment facilities are needed for the corridor alternative (70 percent), while the satellite alternative requires 82 percent of the needed facility expansions to be advanced.

Water supply

This criterion evaluates the impact of alternative growth patterns on the region's water suppliers by looking at service provision and environmental impact. The need for new water supplies results in more storage reservoirs and stream diversions as well as increased costs to the residents of the region. This criterion relates to the Service Provision principle which states that the future development pattern of the Denver region should take advantage of existing capacities and should be designed to allow future service to be provided in a regionally efficient manner.

For this analysis, the top 25 water suppliers which provide over 97 percent of the region's water were considered. Per capita water demand was estimated for each supplier and the 2020 expected water demand was calculated based upon population growth projections. Information on safe annual yields was col-

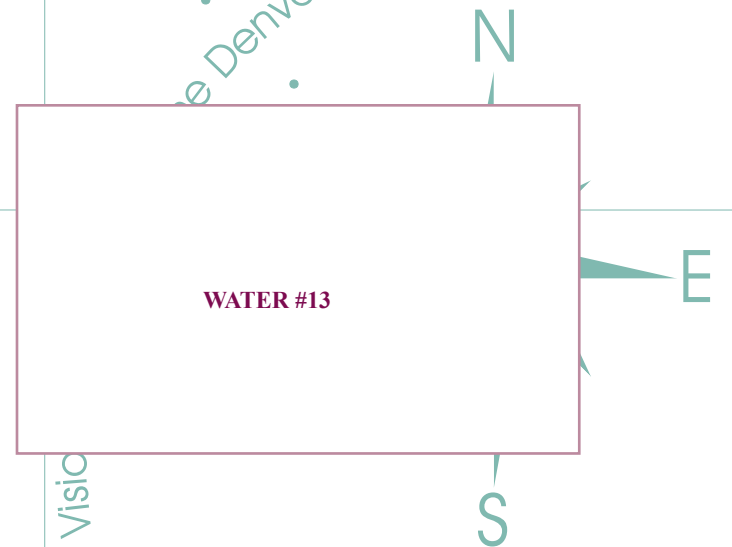
lected from a variety of sources to attempt to provide a uniform assessment of available water. The analysis assumes that there is no sharing of water supplies between entities in 2020. This is a conservative assumption to provide a better representation of the effects of land use on existing water suppliers. Both the number of suppliers with inadequate capacity and the total unmet need in 2020 are used for comparison.

Regardless of the alternative, the Denver region's water providers will need to develop additional supplies to meet the growth needs of the region. However, the location of that growth does have varying impacts on the different suppliers.

The Compact alternative results in 38 percent of providers needing additional supplies totaling 111,000 acre-feet per year while the Dispersed alternative results in 62 percent of the regional providers exceeding their cur-

Under any scenario, the Denver region's water providers will need to develop additional supplies to meet the growth needs of the region.

rent supplies and a total unmet need of over 127,000 acre-feet per year. Corridor development affects 54 percent of suppliers and 118,000 acre-feet per year of unmet need and **Satellite development has the lowest impact on major providers** at 95,000 acre-feet per year; it also affects the most small providers (more than 50 percent of the small providers would have inadequate supplies).



Open Space

The provision of adequate open space has been identified as a critical component for future quality of life by the region's citizens in all Metro Vision outreach efforts.

The definition of open space was intended to be inclusive and recognize the variety of definitions and uses of open space. These range from open space areas valued primarily for their natural features to those that have productive or recreational functions. However underlying this inclusiveness are the notions that regional open spaces are lands permanently protected from development and are large parcels serving multiple jurisdictions or providing linkages between such parcels.

Open space has been identified as a critical component for future quality of life by the region's citizens in all Metro Vision outreach efforts.

Type

This criterion evaluates both the amount of land and potential prime agricultural land consumed by each of the four alternatives. Types of land, or landforms, were developed on the basis of the inherent productivity of the soil for wild-life habitat, forage or timber production. The evaluation recognizes that the impact of development on natural systems depends on both the amount of land urbanized and the location of urbanization.

Natural Resources Conservation Services maps showing the percent of potentially prime agricultural land were overlaid on the urban area of each alternative to determine the amount of potentially prime agricultural land consumed by each alternative. Similarly, the amount of landform type consumed by each alternative was determined. Much of the plains portion of the region is classified as potential prime

agriculture land and would be considered prime if irrigation were available. Observation of agricultural production to the east shows that center pivot irrigation from ground water may allow much of this land to become prime.

The Compact scenario best meets this criterion and consumes the least amount of potentially prime farmland in each category; this would be expected because it uses the smallest amount of new urban land.

The Dispersed consumes the largest amount of both the best agricultural land and of all land classified as more than 40 percent prime agricultural land. Corridor consumes the next highest amount since several transportation corridors lie in river bottoms considered prime agricultural land. However if one includes all three categories, Satellite consumes slightly more of these areas in total than Corridor. More significantly, on average Compact consumes

There is a recognized need for open space areas which are accessible to all residents of the region. The acceptance of increased density hinges on reasonably accessible open space.

only about 50 percent of the potentially prime farmland that would be expected on a proportional basis.

The evaluation of land consumption is difficult as it depends on the value placed on the different types of land. In terms of vegetative productivity, woodlands and habitat land would be considered the most valuable. While the Dispersed scenario again consumes the most area, the data between alternatives is not significantly different. Consequently, a ranking of these results is not provided.

Accessibility

This criterion gives an indication of the accessibility of regional open space in each alternative by examining the number and amount of open space areas, their geographic distribution, and the distance between a population and the nearest open space area. It responds to the recognized need for recreational opportunities in open space areas accessible to all residents of the region and the perception that the acceptance of increased density hinges on reasonably accessible open space.

The locations of population growth for each alternative and existing or future open space were mapped for each alternative. Public ownership of open space areas was not assumed. Descriptions of non-urban lands for Com-

pact, Corridor and Satellite were considered open space for this analysis. This analysis is also limited to regionally significant open space lands, and does not include neighborhood parks.

The analysis consisted of using the GIS to identify and measure the linear distance between the center of the traffic analysis zones (TAZ) and the edge of that open space to provide a consistent representation of the potential accessibility of the open space.

- Data was developed for both the distance to open space by TAZ and the distance weighted by population giving the mean distance of an individual from open space.

The results of this evaluation show that **the Satellite alternative ranks first as it has the lowest distances to open space.** Ninety-five percent of the population in the Satellite alternative would be within 1.54 miles of regional open space. Corridor follows with 95 percent of the popula-

tion within 1.973 miles of open space. Ninety-five percent of the population in Compact would be within 2.34 miles of open space, while in dispersed this increases to 3.1 miles.

Implementation

The task force recognizes that these four urban form alternatives are idealized examples of approaches to regional growth. While none of the four could be easily implemented in their current forms, it is important to evaluate their ease of implementation before deciding which might be most desirable.

Local government acceptance

This criterion attempts to compare and assess the ability of local governments to implement each alternative. Successful implementation depends on the ability of the local governments to work within the alternatives while also adhering to their local plans. In addition, DRCOG

conducted a qualitative survey of member jurisdictions to determine which alternative was most consistent with their local plans.

Each of the four alternative maps was overlaid on a composite map of local plans to determine the total square miles of each land use within the urban boundary of the alternatives (for residential and commercial land uses only). There are 619 square miles of residential land and 332 square miles of commercial land in all the local comprehensive plan maps.

Responses from the local jurisdictions surveyed were tallied for each alternative; this result was used to produce the ranking order. **Sixty-nine percent of residential and commercial zoned land was contained within the Dispersed alternative and this best meets this criterion.** The Corridor alternative had 57 percent, Satellite had 53 percent and Compact only 49 percent

making this alternative the least consistent with local land use plans.

Political feasibility

This criterion evaluates the four alternatives by political feasibility based on the potential need for revisions to state law. This evaluation assesses the level of ease or difficulty placed on the local jurisdictions during implementation. Theoretically, the alternative which best meets this criterion is the one which could be implemented under existing state laws. Each of the alternatives *could* be implemented without changing state law if regional and local jurisdictions voluntarily made decisions consistent with the alternative. However, some alternatives would be severely compromised if only a few jurisdictions refused to follow the plan.

It does not appear possible to conduct a qualitative evaluation for this criterion. Instead, a list

of possible changes to state legislation was developed to identify tools that could be used for implementation. These include: requirements for local plan consistency, regionally defined urban growth boundaries, consistency with local plans, and urban growth boundaries, revenue sharing, preservation of regional open space, economic development support, regionally significant review, urban services.

Based upon this evaluation, **the Dispersed alternative would be the easiest to carry out and would require the least new legislation.** This alternative would not require local plan consistency and would need the least amount of additional powers to encourage implemen-

tation. For the Compact alternative to be viable would require legislation for mandatory urban growth boundary consistency, local plan consistency, revenue sharing, and a regional open space policy.

The Corridor alternative would require a significant amount of legislation. These powers would include local plan consistency, urban growth boundary conformity, urban service areas and a regional open space policy. An important prerequisite for this alternative is revenue sharing to discourage aggressive annexations and an economic development support program in the corridor areas.

For local jurisdictions to carry out the Satellite alternative, a significant

amount of legislation would be needed. This alternative would require a mandate on local plan consistency, urban growth boundary consistency, revenue sharing, urban service areas, and a regional open space policy. Additionally an economic development support program would have to be put into place.

Each growth management tool was considered to see if it would significantly help implement an alternative. All of the alternatives, and especially the Compact alternative, would require the incorporation of local support and cooperation and the establishment of intergovernmental agreements to make them work to benefit all jurisdictions.

Each of the alternatives could be implemented without changing state law if regional and local jurisdictions voluntarily made decisions consistent with the alternative. However, some alternatives would be severely compromised if only a few jurisdictions refused to follow the plan.



Comparison of costs

This criterion compares the costs of providing basic infrastructure necessary to support the new residential growth occurring under each alternative. A measure of efficiency of each alternative would be the one with the least cost to the region. The analysis examined only the capital construction costs of the major physical systems. These include water distribution lines, sanitary sewer collection systems, regional and local storm water drainage systems, and local roads. Regional facilities such as arterial roads, transit lines and water storage reservoirs were not considered.

dollars for the specified infrastructure built between 2000 and 2020 were developed for raw land and infill development at both low and high densities for comparison. These costs ranged from \$46,900 per acre for low density infill to \$93,800 per acre for higher density on raw land. The number of acres of each type of development found in each alternative were multiplied by the costs of each development to arrive at a cost estimate for comparison. The Dispersed alternative was notably higher in cost than the other three alternatives. This is likely

due to the large amount of raw land developed in this alternative compared to the greater amounts of infill development in the others. Infrastructure would cost \$5.4 billion for the Dispersed alternative while the others are all \$2.0 billion or less. **The Compact alternative has the lowest costs at \$1.1 billion** because of the higher density and greater use of infill. The Corridor and Satellite alternatives are both substantially less than Dispersed at \$2.0 billion and \$1.6 billion respectively.

Estimates of costs



A measure of efficiency of each alternative would be the one with the least cost to the region.

Summary of Evaluation Criteria Rankings

Criteria	Alternatives			
	Dispersed	Compact	Satellite	Corridor
Land Use				
Limits amount of new urban land required	3	1	2	2
Provides housing close to jobs	2	4	3	1
Maximizes use of existing developed infrastructure	4	1	3	2
Promotes development in areas with roadway accessibility	2	4	1	3
Supports development of the CBD, other Urban Centers and Activity Centers	4	2	1	3
Promotes transit accessible development households near transit station's	4	1	3	2
Jobs near transit station's	4	1	2	3
Provides services close to housing	4	2	1	3
Transportation				
Minimizes vehicle travel	4	1	2	3
Minimizes delays and congestion on the highway network	1	4	2	3
Maximizes alternative mode use	4	1	2.3	2.7
Minimizes total travel time	1	3	2	3
Minimizes regional transportation costs	3	1.5	1.5	3.5
Minimizes private transportation costs	2	1	3	3

* A ranking of "1" best meets the evaluation criteria

Metropolitan Region



Summary of Evaluation Criteria Rankings (Cont.)

Criteria	Alternatives			
	Dispersed	Compact	Satellite	Corridor
Environment				
Provides for improved air quality	2.4	1.8	2.4	3
Reduces water quality degradation from stormwater runoff	4	2	1	3
Reduces the amount of advanced wastewater treatment required	3	1	4	2
Provides for maximum use of water supplies	4	1	2	3
Open Space				
Amount of different landforms converted to urban development, preserved, or left undeveloped	4	1	2	3
Relative location of open space in relation to the region's population	3	4	1	2
Amount of open space needed to make the alternatives work	-	-	-	-
Implementation				
Costs of infrastructure development	4	1	2	3
Consistency with local plans	1	3.5	3	2
Level of legislative change required	1	2	3	4



Findings

Following the completion of the alternative evaluation process, the task force attempted to step back from the individual criteria and develop a synthesis of the significant conclusions.

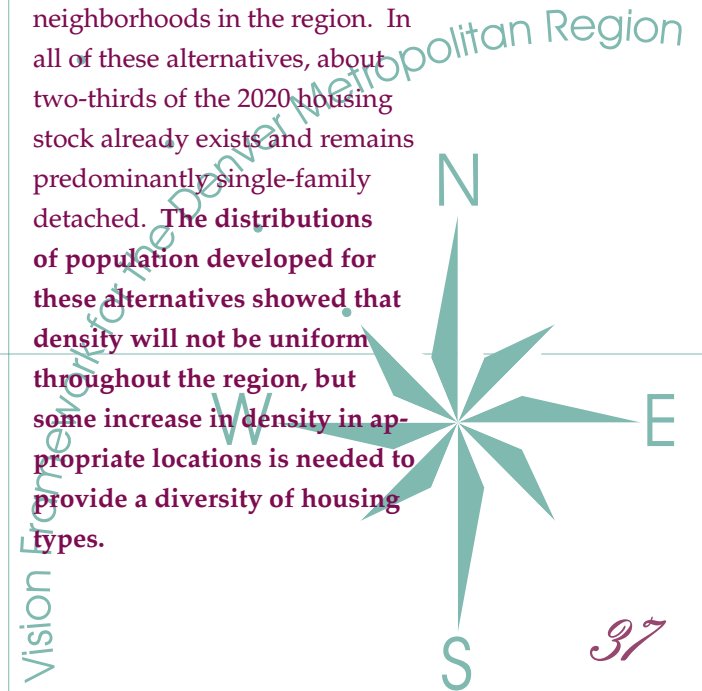
Land Use

Density and land consumption

The alternatives were defined, in part, by their density and land consumption, both significant variables that determine factors such as the potential loss of open space, the ability to serve development with alternative modes of travel and the extent of new infrastructure required to support the expected population. The population and

employment distributions developed for the alternatives highlights the incremental nature of the change to 2020. The distributions started with the existing and committed land use and population expected by the year 2000, substantially reducing the amount of additional growth. This suggests that policy changes intended to move development patterns away from current trends are likely not fully reflected in the 2020 modeling due to the relatively small increment of change. Change in trend rather than absolute change is probably the most significant result coming from the alternative analysis.

The Dispersed alternative was defined as having a gross overall density for new development of 2,500 people per square mile, slightly higher than the density of new development during the 1980s. Both Corridor and Satellite maintained the existing overall density of the urban area with new growth occurring at the present 3,600 people per square mile. Compact relied more on infill and redevelopment, increasing the overall density of the urban area to 4,100 people or a density comparable to older neighborhoods in the region. In all of these alternatives, about two-thirds of the 2020 housing stock already exists and remains predominantly single-family detached. **The distributions of population developed for these alternatives showed that density will not be uniform throughout the region, but some increase in density in appropriate locations is needed to provide a diversity of housing types.**



The significant capacity of the existing urban area to absorb growth was also demonstrated. While some infill occurred in all alternatives due to the higher value given to transit station areas and Urban Centers; with the exception of the Denver CBD in the Compact alternative, it was not necessary to increase densities in any alternative above those of the existing development. However, the task force believes that a **slightly higher den-**

Increased emphasis needs to be placed on the job/housing balance, in developing significant urban centers and in educating the public about density.

**MULTI-FAMILY
HOUSING #15**

sity than in the past is needed for the following reasons: to encourage mixed-use development that is pedestrian oriented and supports transit; to improve the jobs/housing balance; to increase the supply of affordable housing; to encourage alternative housing design; to place housing closer to services such as shopping; to make more efficient use of existing infrastructure; to allow for infill and redevelopment with their corresponding advantages of supporting transit and utilizing infrastructure capacity; and to allow for open space preservation.

In addition, **increased emphasis needs to be placed on the jobs/housing balance**, in developing significant urban centers and in educating the public on the issue of density.

The Dispersed alternative in particular consumed more land than was necessary or desirable, resulting in high VMT, high environmental impact and costly expansion of infrastructure. In contrast, the Compact alternative was found to be too dense, particularly in the Denver CBD, resulting in unacceptable effects on congestion and air quality in the modeling results. While more information is needed to correctly model the effects of Compact Development, it appears that employment growth in particular was too high in Compact in downtown Denver. This increases congestion in the CBD and does not leave enough employment for other regional Urban Centers to develop them as transit destinations. A slightly higher density than in 1990 results in land consumption between the Compact and Corridor or Satellite alternatives, for a total urban area in 2020 of about 700 square miles.

Infill and redevelopment

While all alternatives were given very modest premiums for transit station locations and Urban Centers, their effects at the traffic analysis zone level (the smallest geographic unit) were largely indistinguishable. As an example, no suburban traffic zone increased in density enough to be classified as urban by the transportation model. This occurred in part as only a portion of a zone tended to fall within a station area, such that the density increases tended to be lost in the whole zone. Also, with the exception of the Denver CBD in Compact, no area required redevelopment and increased densities to absorb the population required by the forecast control totals. This suggests that **extensive opportunities exist for infill and redevelopment within the existing urban area** if public resistance can be overcome. Infill can provide significant benefits in infrastructure costs and sup-

port for transit, but also needs to occur at realistic densities and with high quality design. Public policy decisions with incentives and disincentives are needed to achieve higher densities and quality infill, redevelopment and new development.

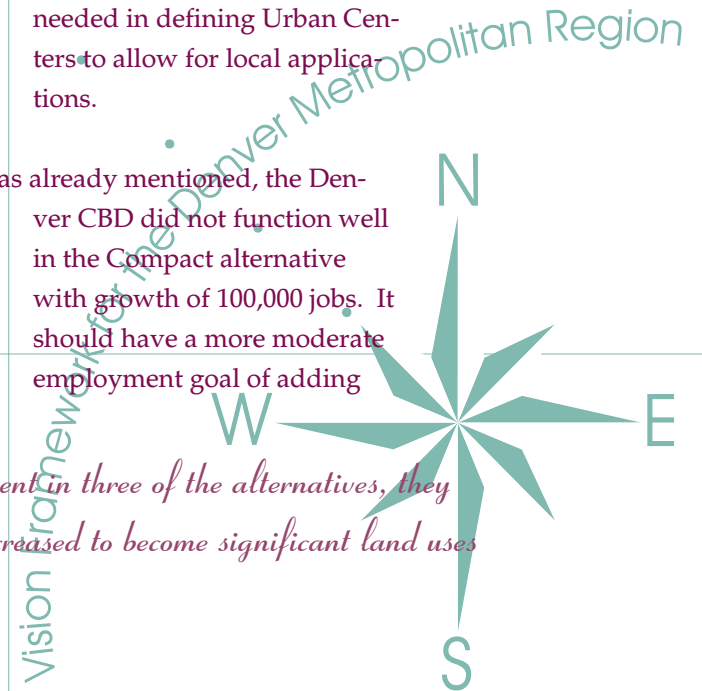
Urban Centers and the Denver CBD

While Urban Centers are a central component in three of the alternatives, they need to be better defined and their density increased to become significant land uses and destinations of trips. This can occur for a limited number of Urban Centers largely by shifting jobs from the Denver CBD, as in the Compact alternative. A moderate CBD goal of 40,000 to 60,000 additional jobs would allow 60,000 to 40,000 jobs to be moved to support three or four Urban

Centers. To be successful, urban centers need a minimum of 20,000 jobs within a relatively confined area. With the Denver CBD as the regional core, Urban Centers could develop along I-25, in the Southeast or Southwest corridors, at Stapleton International Airport and Gateway Park and/or at Highlands Ranch. **An urban center should be located along or at the end of any mass transit corridor that is developed** to encourage the success. Within these parameters, flexibility may be needed in defining Urban Centers to allow for local applications.

As was already mentioned, the Denver CBD did not function well in the Compact alternative with growth of 100,000 jobs. It should have a more moderate employment goal of adding

While Urban Centers are a central component in three of the alternatives, they need to be better defined and their density increased to become significant land uses and destinations of trips.



40,000 to 60,000 jobs. Additional housing is needed in the CBD to move toward a better jobs/housing balance, although housing increases in the four alternatives were not large enough to result in significant effects in travel patterns in the transportation model. **A greater variety of housing types and prices are needed in the CBD to contribute to an effective jobs/housing balance.**

Free-standing (satellite) communities

The task force found that the term “satellite” was a poor descriptor of those communities beyond the edge of the existing urbanized area; thus the term “**free-standing community**” was adopted to describe a place physically separated from the metro core by non-urban land which has a significant job base and community resources. These communities have the advantages of dispersed growth and density, a jobs/housing balance, services close to residents, smaller scale Urban Centers and a commu-

nity identity. However, because Free-standing communities require infrastructure capacity and transportation access, only a few areas are reasonable candidates for such development, including Boulder, Longmont, Castle Rock and Brighton. To remain free-standing they will need to maintain their physical separation from the urban area through open space controls and urban growth boundaries.

To remain free-standing, communities will need to maintain their physical separation from the urban area through open space and urban growth boundaries.

BOULDER #16

Transportation

Congestion and travel

Travel patterns reflect the land use in each alternative and the resulting transportation systems are developed to serve those land use patterns. While significant concern has been expressed about the current ability to fully reflect transportation responses to land use changes, and the likely changes in individual behavior that would result, major differences do appear in the results between alternatives. The transportation systems in each alternative were defined to be significantly different in both extent and mode. Dispersed represented a continued emphasis on roads, nearly doubling the amount of regional roadways. On the other extreme, Compact put an emphasis on light rail development in a modified grid pattern to serve the Denver CBD and between suburban areas. Corridor balances transportation investment

between roads and light rail in the existing transportation corridors in a radial pattern, while Satellite developed a commuter rail system using existing tracks to serve a number of the proposed Satellites.

As might be expected, the **Dispersed alternative was most successful in maintaining today's level of congestion and speeds on the roadway system.** While VMT increased the most in Dispersed, the near doubling of road mileage largely accommodated this increase. While all alternatives showed significant increases in VMT, Compact produced significantly less than Dispersed as well as less VMT per capita. However with limited increases in road capacity, increases in VMT in Compact resulted in both increased congestion and increased travel time, though continued refinements in the transportation model somewhat reduced the level of congestion. However, limiting roadway investment will result in increased

congestion and the diversion of traffic onto regional arterials as highways become more congested.

Given that all alternatives show significant increases in VMT, additional measures will be needed to limit VMT growth. The Denver CBD in particular will require management measures and disincentives to the single-occupant vehicle to meet air quality goals, but such measures are desirable region-wide to limit the growth in VMT.

None of the alternatives included transportation demand management measures which could be expected to be most effective in alternatives where alternatives to single-occupant vehicles are available. It is also likely that additional investment in roads in alternatives other than Dispersed would increase capital costs to the level of the Dispersed option and thus reduce congestion in those alternatives too.

The E-470 portion of the beltway seems to be ready for construction, so should be included in the Vision Framework. While a regional beltway could serve as a truck bypass, offer access to the new airport and enable suburb-to-suburb travel, model results suggest that use of a complete beltway is dependent upon increased congestion on other roadways. The task force is concerned that beltways would encourage low-density development on the edge of metropolitan area. Access along beltways should, therefore, be limited to isolated nodes of development to both increase densities and to maintain the beltway's transportation functions.

The major investment studies now underway in three corridors should be the backbone of future transit efforts and should include the modeling of land use changes needed to support the mode chosen for each corridor.

Transit system effectiveness

All alternatives showed significant transit ridership increases, though the increase was twice as great in the Compact alternative as in the others. While a variety of transit networks were developed in the alternatives, a majority of transit use was for commutes into the Denver CBD. For other centers to be successful in attracting transit use, densities and total activity need to approach those of downtown Denver. Mixed use activities in centers at the ends of transit lines would also increase ridership and provide for two-way traffic flows.

The major investment studies now underway in three corridors should be the backbone of future transit efforts and should include the modeling of land use changes needed to support the mode chosen for each corridor. In addition, the bus system needs to be adjusted to support rail transit in any corri-

dor through the use of circulator and feeder systems. Modeling results also clearly show the need for mixed use centers and increased densities at rail station locations to support transit.

Non-motorized modes (bicycling and walking) showed a greater increase in use in the alternatives than motorized modes. Compact had the greatest increase; this could be further increased by more effectively developing mixed use and higher densities at station locations and in Urban Centers. **Non-motorized modes reduce vehicle trips more than vehicle miles, but by avoiding vehicle starts and stops, it can have a positive effect on air pollution.** Sub-regional measures best encourage the use of non-motorized modes, including the development of mixed-use activity centers and careful site design.

Costs

Transportation costs in any alternative are huge, with private costs greatly outweighing public capital costs. Auto ownership represents the vast majority of private transportation costs, with commercial vehicle delays being the other significant component. While significant additional work is desired in estimating cost, **Compact and Satellite have lower public costs due to decreased highway spending.** Transit investment also provides more potential capacity than highway investment although the challenge is still to convince people to use public transit.

Reducing long-term VMT growth is the fundamental strategy for achieving better air quality by reducing the number and the length of trips.

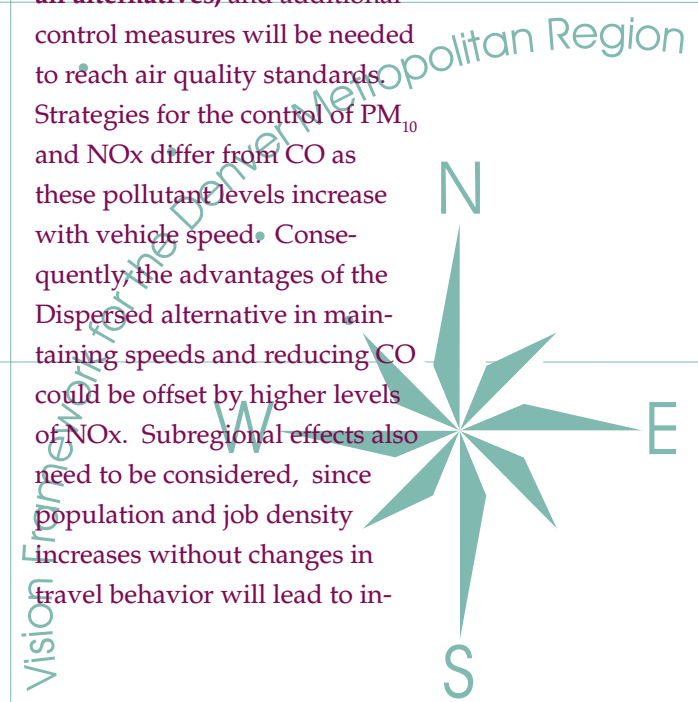
- The capital costs of new transportation facilities were not constrained in any of the alternatives but also were not kept constant across the alternatives. Some of the negative characteristics of the lower cost alternatives (Compact and Satellite) might have been mitigated by assuming additional improvements but still keeping the costs consistent with the more expensive alternatives.

LIGHT RAIL #17

Environment

Air quality

Air quality results are directly related to changes in congestion, speed and VMT. While the region has traditionally focused on reducing CO, this pollutant is expected to meet air quality standards as a result of improved technologies and turnover of the automobile fleet. However **PM₁₀ and NOx appear to be significant problems in all alternatives**, and additional control measures will be needed to reach air quality standards. Strategies for the control of PM₁₀ and NOx differ from CO as these pollutant levels increase with vehicle speed. Consequently, the advantages of the Dispersed alternative in maintaining speeds and reducing CO could be offset by higher levels of NOx. Subregional effects also need to be considered, since population and job density increases without changes in travel behavior will lead to in-



creased concentrations of PM₁₀ and CO. Density per se does not lead to improvements in air quality, but must be accompanied by mixed use development, design improvements and use of alternative modes accessibility.

Reducing long-term VMT growth is the fundamental strategy for achieving better air quality by reducing the need for the number and the length of trips. A combination of land use, transportation capacity and transportation demand management strategies are needed to successfully reduce VMT growth and improve air quality. Density increases may also allow for the focused application of mitigation strategies in specific areas. These strategies also need to include localized improvements such as improved site design and mixed use opportunities.

Water supply

Modeling results show the need for additional water supplies in all the alternatives, suggesting the need for intense water conservation efforts. The Dispersed alternative locates more growth in areas without additional water supply while in the Compact alternative only 10 suppliers will need to find additional supplies. Water considerations need to include both quality and quantity and need to be approached on a regional basis as water supply sharing will minimize the additional amount needed.

Modeling results show the need for additional water supplies in all the alternatives, suggesting the need for intense water conservation efforts.

Wastewater

Growth in the region will also require additional wastewater treatment capacity. The results of the wastewater evaluation largely reflect using existing sewer capacity, with Compact maximizing the use of existing systems. Both Dispersed and Satellite alternatives locate significant new development in areas without existing capacity,

WATER #18

substantially increasing the cost of treatment. It should be noted that the regional costs for additional wastewater treatment capacity are well below other public costs considered in the alternatives analysis.

Stormwater runoff

Stormwater runoff results reflect the amount of disturbed land and paved or covered surfaces expected in each alternative. Due to its larger land consumption, the Dispersed alternative has significantly higher runoff impacts with more runoff produced and the potential to affect a higher number of already impaired watersheds. While all development should employ the best stormwater management practices, the greater volume and extent of runoff from Dispersed will make these controls more difficult and expensive.

General Findings

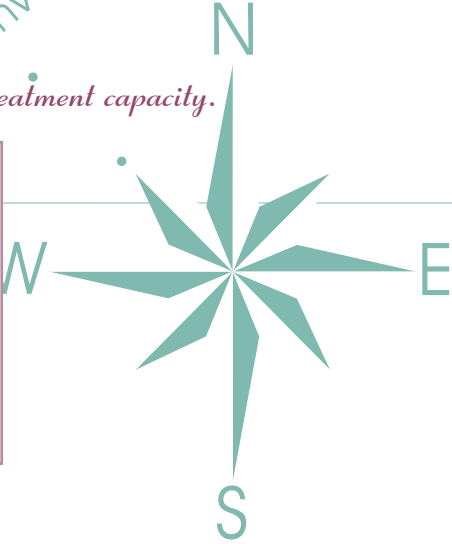
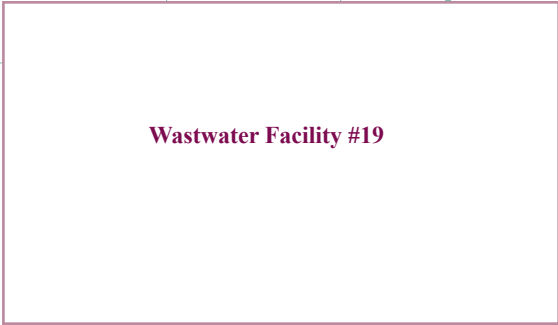
Several broad themes are evident throughout the evaluation results.

- The first is that the Dispersed alternative is undesirable for a number of reasons, including cost, land consumption, increased VMT and environmental impact.
- Second, the Compact alternative has the lowest cost and minimizes the environmental impacts of future growth, but could encounter public resistance to strategies that increase density and mixed use developments. (Significant costs are also part

of any alternative and a majority are private costs. Additional research needs to be done on the cost evaluations.)

- Finally, any strategy to reduce VMT, increase transit use and improve air quality needs to be a combination of land use, transportation and other measures that will have both short- and long-term implications.
- The evaluation results demonstrate that if the direction of the trends can be changed, then more significant results could be expected in the longer term.

Growth in the region will also require additional wastewater treatment capacity.



Visit



Recommendations for the 21st century

The Vision Framework defines a region with an average density slightly higher than the present. Several free-standing communities will remain separate from the urban core and become job and commercial centers. Along with a vital Denver central business district, the existing urban areas will absorb a significant share of regional growth through infill

and redevelopment. Within the urban core, a limited number of intense, mixed use centers will develop along transit corridors. Open space will help define the urban form as well as protect important environmental features.

This framework defines the major features of the regional plan for land use, transportation, environment and open space. These features provide a guide and a measure of progress as the region considers questions associated with growth and quality of life in the years ahead, such as: Where will new residents live and work? How will people move from place to place? What Urban Centers will develop and how? What lands will remain as open space? And what should be done to ensure a high quality of life for future generations?

The Vision Framework defines a region with an average density slightly higher than the present. Several free-standing communi-

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form as well as protect important environmental features.

Growth and Development

Extent of urban development

The growth of the region should take place within an urban area of no more than 700 square miles. The physical growth of the region would reflect the expected population growth, at a 50 percent rate between 1990 and 2020. The average density of the region would increase from a level of 3,600 persons per square mile of urban land in 1990 to 3,900 in 2020. If all of this growth were to take place on the 200 square miles of new urbanized land, the incremental density would be 4,500 persons per square mile. However, it is expected that over 20 percent of the population and employment growth will be located in infill and redeveloped areas.

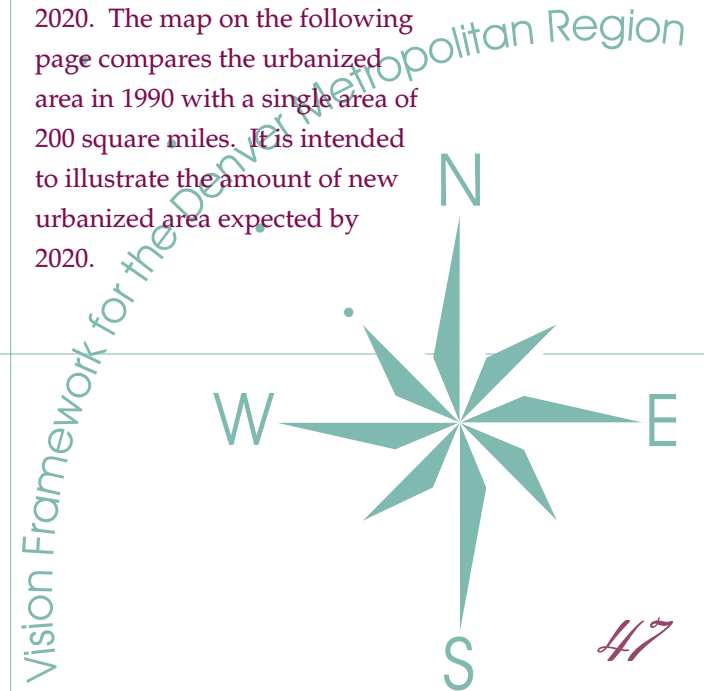
Figure 5 illustrates the amount of new development proposed for addition. The circle contains an area of 200 square miles. The existing urban area in 1990 is shown,

which totaled about 500 square miles. "Urban" on this map includes all residential areas served by public water and sewer as well as commercial, office and industrial areas, local parks and major public uses such as Buckley Air National Guard base and Rocky Flats. The new urban area by 2020 would also include residential and employment areas as well as the public sites needed to service the new population.

The existing communities of Boulder, Brighton, Longmont and Castle Rock will remain free-standing. That is, they will be buffered from the major urban area by non-urban and open space lands, will have their own employment bases and will meet most of the social and cultural needs of their residents. Each could conceivably approach a population of 100,000 by 2020, growing from their 1994 populations of 90,000 (Boulder, including Gunbarrel), 58,000 (Longmont), 18,000 (Brighton)

and 18,000 (Castle Rock, including Castle Pines). To reach the regional average of 1.42 jobs per households, each free-standing community would require a supply of 56,000 jobs.

To define and map the physical location of the expected growth, DRCOG will work with sub-regional groups of local governments and other stakeholders. Within the parameters defined by the Vision Framework, these sub-regional groups will identify the lands expected to urbanized by 2020. The map on the following page compares the urbanized area in 1990 with a single area of 200 square miles. It is intended to illustrate the amount of new urbanized area expected by 2020.



Such a boundary would define those lands suited for urban development. Changes to the boundary would be considered periodically, consistent with the Vision Framework and the principles of Metro Vision 2020, including increased densities, mixed use development, urban centers and efficient use of infrastructure. A number of mechanisms are possible for implementing such a boundary, including state legislation and local intergovernmental agreements.

Open space

As noted in Metro Vision Principle 9, open space is important “to conserve and protect important natural resources, to provide for the physical and aesthetic enjoyment of the out-of-doors, to shape the region’s pattern of growth and development, to preserve the region’s agricultural resources, and to protect prominent features such as the visual backdrop of the Rocky Mountain Front Range.” **A regional open space system should be developed as part of the regional plan,** and should include the following components:

- Environmental constraints identified in the principles and policies report shown as protected lands on the regional development plan map.
- Open space connections between regional open space areas desired for preservation and trails will

be identified and included on the regional plan map.

- Critical open space needed to buffer the free-standing communities will be identified, as well as buffers within the urban area to define other communities, to preserve waterways and other key environmental features and to provide recreational opportunities.
- Farmland should be identified as a valuable resource to the region and as an integral part of the region’s heritage and economic and cultural diversity. Farmland also provides a scenic and environmental benefit and is a part of the region’s “working landscape.” Viable farmlands of national or state significance should be mapped and protected as the region grows. In addition to land use actions, other steps (for example, support activities like grain storage or stockyards) will be needed to maintain a viable agricultural economy.

OPEN SPACE #20

A regional open space system should be developed as part of the regional plan.

Urban centers

A critical element of the final plan will be **four or five major Urban Centers in addition to the Denver CBD and the cores of the four free-standing communities.** As the second tier of a hierarchy of centers ranging from neighborhood centers to downtown Denver, these centers should contain a minimum of 20,000 jobs within an area of two square miles (approximately 0.80 mile radius) at sufficient densities to support transit. The center should contain a variety of housing with higher densities than the regional average. Each center should be located on the regional transit system and be the focus of its own transportation network-including transit, pedestrian and bicycle systems.

A critical element of the final plan will be four or five major Urban Centers in addition to downtown Denver and the cores of the three free-standing communities.

The intent of the Vision Framework is to designate a limited number of Urban Centers with incentives and responsibilities for their development. Incentives include recognition by DRCOG of the importance of these and inclusion of them in regional transportation plans so transit and highway access can be developed to support their growth. Local communities would be responsible for the land use and zoning changes necessary to ensure the development of the urban centers and to make the capital improvement commitments reinforcing the Urban Center as the city's primary location for high-density, mixed-use development.

DRCOG staff should work with the member governments to identify areas with the potential to achieve this level of activity and propose initial locations to the Board. A set of criteria will be developed to assist in this identification. These centers will be evaluated on a regular basis to determine if they are achieving the development needed to become true Urban Centers or if other locations should be considered. Both DRCOG and the community would be expected to commit to actions needed to support and encourage the center.

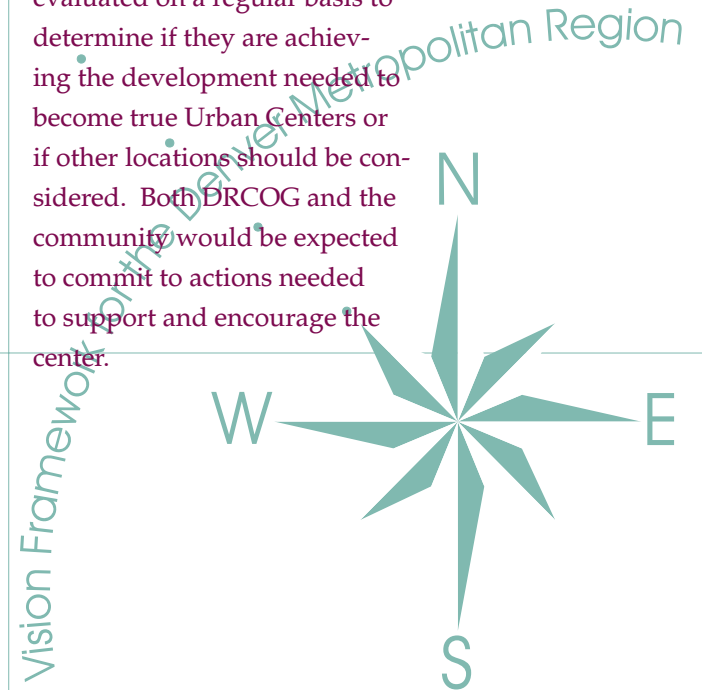
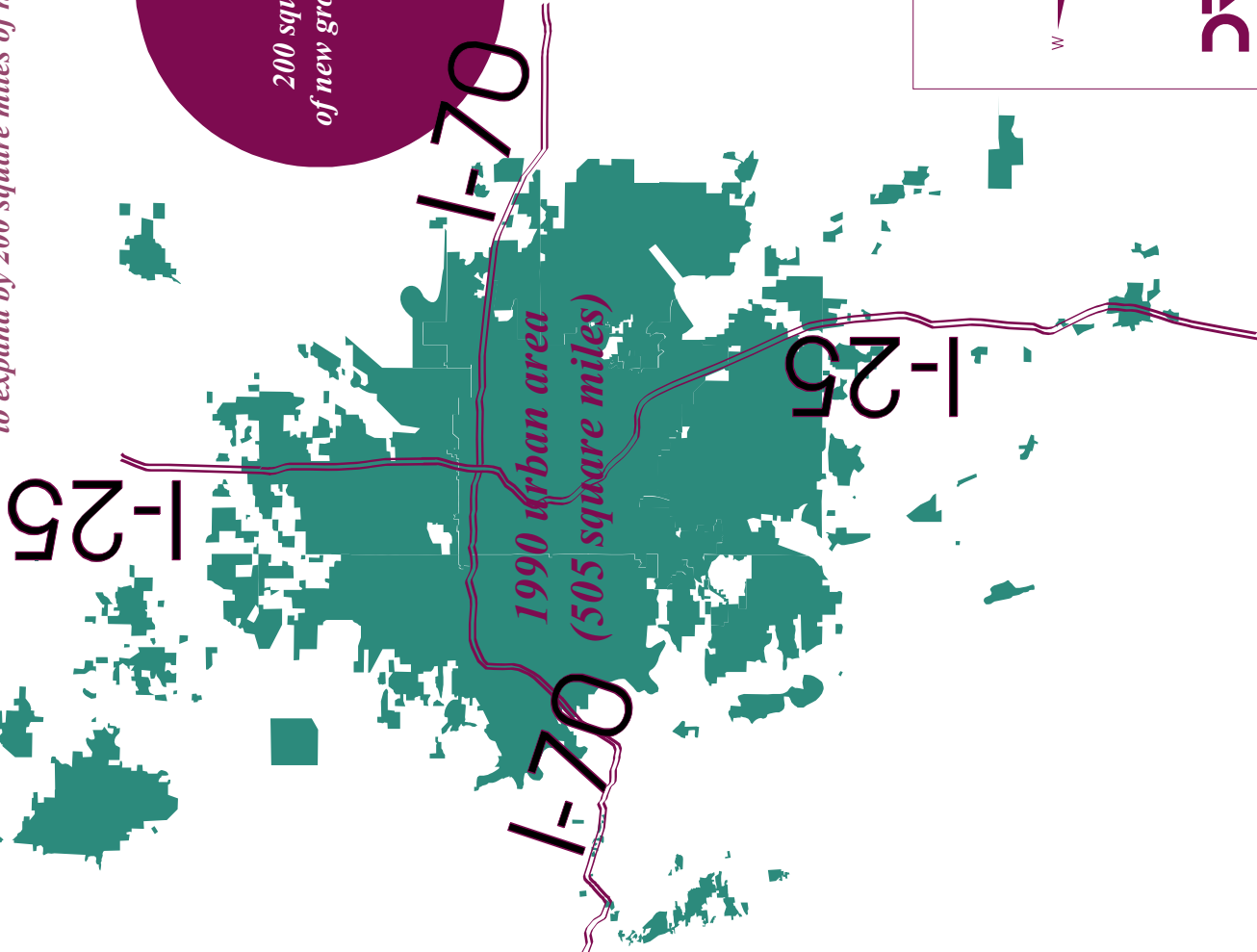


Figure 5

Metro Vision 2020 Vision Framework

*By the year 2020, the urban area is expected
to expand by 200 square miles of new growth.*

*200 square miles
of new growth by 2020*



The Denver CBD is identified in the principles and policies as the region's core and will remain a major focus of the transportation system and the location for major land uses serving the entire region, such as cultural, educational, recreational and entertainment facilities.

Subarea growth forecasts

Growth forecasts for areas below the regional level are one way to quantify the goals and objectives of the development plan. They describe not only the projections of current trends but also the effect of policies such as the creation of new Urban Centers.

Five subareas of the region have been defined (Shown in Figure 6): the Denver Central Business District, a developed central urban area, a suburban area of lower density, free-standing communities, and a rural area. The map in Figure 6 is only used for forecast purposes

and does not define the extent of urban development. The framework defines the expected household and employment forecasts for each of these areas. The table following the map summarizes these forecasts.

Denver CBD

To remain the region's core, the CBD will add 50,000 jobs (7.7 percent of regional growth) between 1990 and 2020 and 20,000 households (4.4 percent).

Central urban area

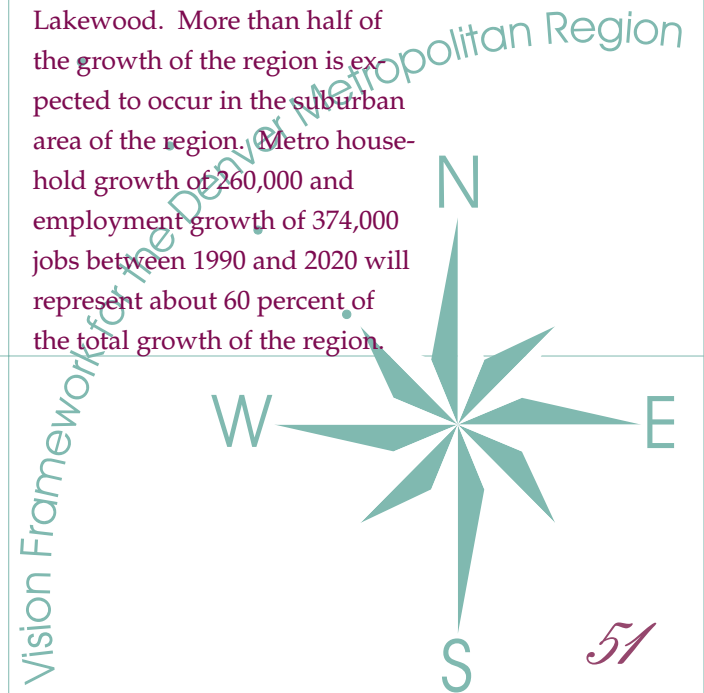
The central urban area includes communities such as Englewood, Wheat Ridge, Glendale and Denver. It also includes the older portions of Aurora, Commerce City, Arvada and Lakewood. While this area has seen population and employment declines in the past, it is important that the area continue to be a vital part of the urban fabric. In addition, it contains some major infill parcels such as Lowry and

Stapleton and many smaller parcels suitable for infill. This area is expected to add 65,000 households (14.6 percent) and 100,000 jobs (15.5 percent).

Suburban area

The suburban area includes communities such as Louisville, Lafayette, Erie, Superior, Broomfield, Westminster, Thornton, Northglenn, Littleton, Greenwood Village and Parker. It also includes the newer areas of Arvada, Commerce City, Aurora, and

Lakewood. More than half of the growth of the region is expected to occur in the suburban area of the region. Metro household growth of 260,000 and employment growth of 374,000 jobs between 1990 and 2020 will represent about 60 percent of the total growth of the region.



Free-standing communities

As noted earlier, the four free-standing communities are expected to each approach 100,000 population by 2020, growing from 86,000 households (1990), to a total of 160,000 households. To be balanced communities, the total number of jobs in the free-standing communities would be 224,000 in 2020 or 110,000 new jobs.

Rural

The rural area includes the communities of Bennett, Byers, Strasburg and Deer Trail on the eastern plains, Larkspur in the south and the mountain communi-

ties of Nederland, Black Hawk, Central City, Idaho Springs and Georgetown. This area is expected to reach a population of 90,000 and an employment level of 20,000 by 2020, with most of this development occurring in the towns.

Transportation

The Vision Framework for 2020 should address the general characteristics of the regional transportation system; describe the priority the system will place on each of the applicable transportation modes; describe the services to be provided in different parts of the region, including important regional centers; and describe the strategies by which mobil-

ity should be enhanced for each applicable mode.

Transportation system goals and policies

The goals for the transportation element of the Vision Framework are:

- Provide accessibility and mobility for people and goods; and
- Enhance the quality of life available in the region; and
- Minimize adverse effects on the natural and man-made environment.

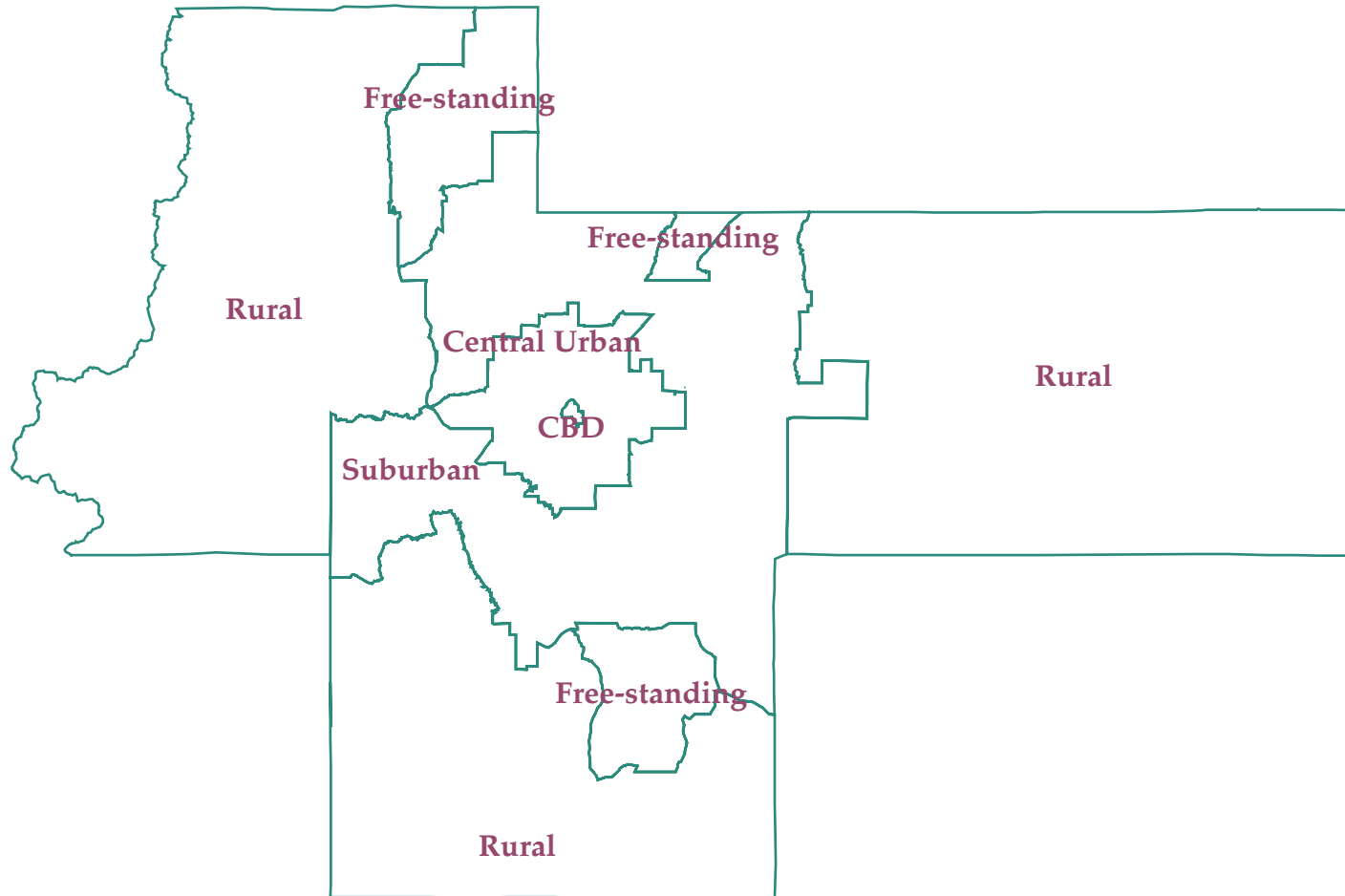
To support these overall goals, the recommended transportation framework should be based on policies which:

- Plan transportation facilities to respond to the travel demands from the regionally adopted development scenario;

- The goals for the transportation element of the Vision Framework are:
 - Improve accessibility and mobility for people and goods;
 - Enhance the quality of life available in the region; and
 - Minimize adverse effects on the natural and man-made environment.

Figure 6

Metro Vision Analysis Area



Metropolitan Region



Vision

Subarea Growth Forecasts

Analysis area	CBD	Central	Suburban	Free-standing	Rural	Total
1990						
Population	9,400	821,071	790,862	188,875	48,800	1,859,008
Households	6,516	343,566	299,425	74,041	18,719	742,267
Employment	107,156	510,642	307,845	113,684	9,299	1,048,626
2020						
Population	39,400	939,071	1,325,529	375,000	90,000	2,769,000
Households	26,516	408,566	557,158	160,041	36,719	1,189,000
Employment	157,156	610,642	674,118	223,684	28,400	1,694,000
Change						
Population	30,000	118,000	534,667	186,125	41,200	909,992
Households	20,000	65,000	257,733	86,000	18,000	446,733
Employment	50,000	100,000	366,273	110,000	19,101	645,374
Annual Growth 90-20						
Population	4.89%	0.45%	1.74%	2.31%	2.06%	1.34%
Households	4.79%	0.58%	2.09%	2.60%	2.27%	1.58%
Employment	1.28%	0.60%	2.65%	2.28%	3.79%	1.61%
Share of Growth						
Population	3%	13%	59%	20%	5%	100%
Households	4%	15%	58%	19%	4%	100%
Employment	8%	15%	57%	17%	3%	100%

<ul style="list-style-type: none"> • Support development only in areas where sufficient multi-modal transportation systems can be provided; 	<ul style="list-style-type: none"> • Select rapid transit corridors which have potential for densities sufficient to support rapid transit service. Additionally, local governments should be encouraged to use zoning and land development techniques, including infill and redevelopment, to create higher density mixed uses around committed rapid transit stations and to give priority to rapid transit projects where local actions such as land development agreements and zoning actions encourage transit-supportive development patterns; 	<ul style="list-style-type: none"> • Encourage private and public transit connections between the region and recreational sites throughout the state;
<ul style="list-style-type: none"> • Provide multimodal options to major destinations such as regional shopping centers, business districts, and airports; 	<ul style="list-style-type: none"> • Ensure that rapid transit components are coordinated and interconnected; 	<ul style="list-style-type: none"> • Pursue projects and policies which improve commercial vehicle movement and intermodal freight facilities;
<ul style="list-style-type: none"> • Give priority to maintenance, operations, safety, and management improvements for existing facilities to protect previous investments, with emphasis on techniques to manage, adapt, reconstruct and reconfigure the region's existing transportation system to better use available capacity; 	<ul style="list-style-type: none"> • Improve connections at intermodal passenger facilities serving long-distance travel, such as Denver International Airport (DIA) and Denver Union Terminal; 	<ul style="list-style-type: none"> • Maintain adequate aviation capacity at DIA and the other regional system airports;
<ul style="list-style-type: none"> • Provide alternative travel modes to serve suburb-to-suburb travel needs; 	<ul style="list-style-type: none"> • As part of the implementation process, identify transportation demand management strategies necessary to maintain or reduce per capita vehicle miles of travel per day; 	<ul style="list-style-type: none"> • Seek additional funding, through use of innovative local and private techniques, to ensure that needed surface transportation facilities and services are provided;
<ul style="list-style-type: none"> • Implement rapid transit to reduce vehicle miles traveled and the need for additional roadway capacity; 		<ul style="list-style-type: none"> • As part of the implementation process, identify transportation demand management strategies necessary to maintain or reduce per capita vehicle miles of travel per day;

- Establish an incentive program within the transportation planning process to give preference (but not a prerequisite) to transportation projects which support increased density, the development of urban centers, infill development, mixed use development and better air quality;

- Encourage local governments to consider alternative mode transportation when making development approvals;

Without sufficient land-use controls, the construction of regionally-significant highway facilities could jeopardize the regional growth plan recommended in the Vision Framework. Any capacity-adding general-purpose highway lane miles of a regional nature will be included in the 2020 Regional Transportation Plan only if sufficient implementation measures are adopted to assure that development in the area of influence will be consistent with the regional plan.

System Description

Rapid transit

The Vision Framework should build on the network of rapid transit facilities already constructed in the region. **The primary focus of rail transit in the Vision Framework should be the Denver Central Business District CBD, with secondary focus on other Urban Centers.** Stations should be designed to allow convenient transfers for travelers. The Central Corridor Light Rail Project has been constructed to serve as the centerpiece of a rail rapid transit system. The recently opened North I-25 Bus/High Occupancy Vehicle (HOV) lanes are well suited to serve as the initial segment of a Bus/HOV system for a portion of the north metropolitan area, including the north and north-west corridors to Boulder.

Rapid transit corridors recommended for the Vision Framework are:

- Southwest Corridor light rail transit line from Broadway at I-25 to Mineral Avenue at Santa Fe Drive. A future extension to Highlands Ranch should be considered.
- West Corridor line from the Denver CBD along a general corridor between Colfax and Alameda Avenue to the Federal Center and/or downtown Golden. The rapid transit mode, alignment, and exact western terminus of the corridor should be left unspecified pending the results of an ongoing Major Investment Study (MIS) in the corridor.
- Southeast Corridor from the Denver CBD southeast generally following South I-25 to the southeast employment center area and including I-225 from I-25 to Parker Road. The rapid transit mode, alignment and exact southeastern terminus of the corridor should be left unspecified.

fied pending the results of an ongoing MIS study in the corridor.

- East Corridor from the Denver CBD east in the vicinity of I-70 to DIA and/or Aurora. The rapid transit mode, corridor terminus and alignment should be left unspecified pending the results of an ongoing MIS study in the corridor.
- I-225 Corridor north from I-25, connecting with the East Corridor rapid transit line paralleling I-70. Rapid transit in this corridor would improve rapid-transit service between the southeast metro area, the southeast employment center area, Aurora, and DIA.
- North Corridor along I-25 to 120th Avenue.
- Northwest Corridor along US-36 northwest to the City of Boulder.

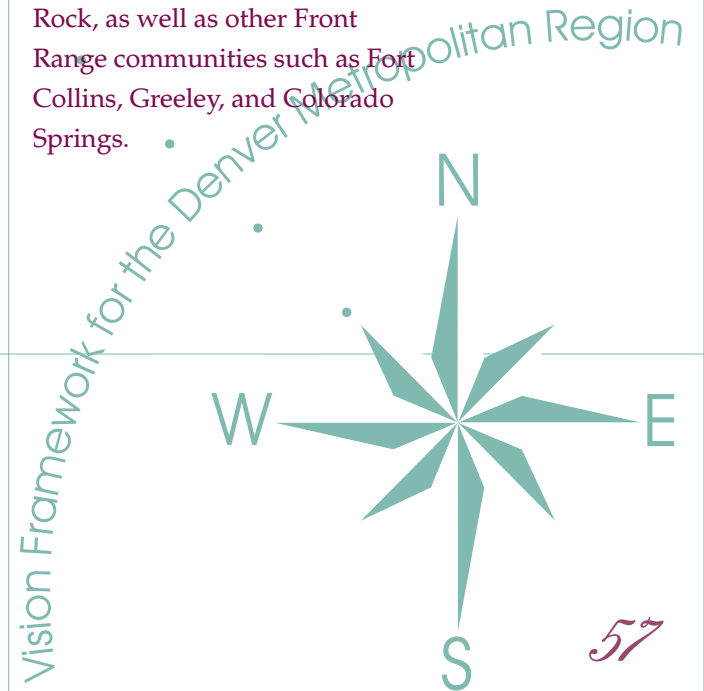
The primary focus of rail transit in the Vision Framework should be the Denver Central Business District, with secondary focus on other Urban Centers.

The additional rapid transit lines, outlined below, are recommended for inclusion with consideration given to supportive densities, land use mix, and urban center locations to be defined during refinement of the 2020 plan:

- North Jefferson County Corridor from the Denver CBD generally along the west I-70 and Burlington Northern railroad serving the cities of Arvada, Wheat Ridge, and Golden,
- Cherry Creek/Aurora Corridor from the Denver CBD generally along the Cherry Creek/Parker Road/Alameda corridor to the City of Aurora, and
- South Jefferson County Corridor branching from the South-

west Corridor generally along Hampden and Wadsworth to the Southwest Plaza area.

Front Range commuter rail connections should be included in the framework connecting the Denver core with free-standing communities such as Boulder, Longmont, Brighton, and Castle Rock, as well as other Front Range communities such as Fort Collins, Greeley, and Colorado Springs.



Other transit

The RTD bus network should support the development characteristics and objectives of the Vision Framework. Local fixed route service should be concentrated in the higher density portions of the urban area which are primarily developed with a grid street pattern; paratransit services and other similar demand-response services should be considered to provide local service in lower density suburban and rural areas. Until rapid transit service is implemented, Regional and Express routes should continue in a manner consistent with current service, focused on major Urban Centers such as the Denver CBD. Local fixed-route bus service should not be provided outside of the future urban area.

Bus service should be designed to feed the rapid transit system stations and to shuttle persons between rapid transit stations and nearby activity destinations. Regional bus service should be provided between the region's free-standing communities such as Boulder, Castle Rock, Brighton, and Longmont, and from the free-standing communities to the rapid transit system.

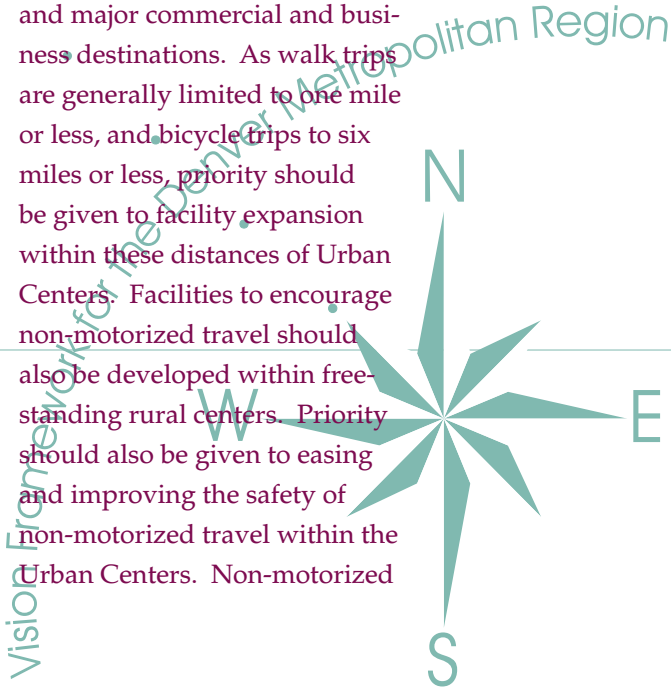
The rapid transit system should be supplemented with corridor bus service for circumferential or suburb-to-suburb trips. Such corridor bus services should form part of the framework within which paratransit services are offered. Such paratransit service should include services to and from park-n-ride lots and bus transfer stations.

In the short term, bus system resources should be concentrated in the future rapid transit corridors to develop transit patronage. Feeder routes to the rapid transit corridors and routes along higher density urban corridors should also be targeted for improved services and bus priority treatments to improve travel speeds and bus operations.

In order to reduce traffic congestion and preserve environmental quality in the mountain I-70 corridor, public and private paratransit and bus service should be instituted to provide high-speed, convenient connection between the metropolitan area and mountain recreational destinations. Intermodal transfer facilities should be built to facilitate multimodal travel between the metropolitan area and the mountainous destinations. The state should undertake a Major Investment Study in the mountainous I-70 corridor, from the western edge of the Denver urban area to Glenwood Springs,

Bus service should be designed to feed the rapid transit system stations and to shuttle persons between rapid transit stations and nearby activity destinations.

<p>to better define longer-range improvements and funding responsibilities.</p>	<p>Other freeways/arterial roads</p>	<p>Overall capacity expansion of general purpose lanes on existing facilities should be limited and consider the analysis provided by the congestion management system.</p>
<p>Regional beltways</p> <p>The Vision Framework supports the construction of E-470 and planning for the completion of a regional beltway designed for transportation purposes such as access to DIA and to provide for suburb-to-suburb trips. Such a facility:</p>	<p>Improvements to the regional freeway and arterial system should have two main priorities: providing appropriate access to areas newly urbanized between 1995 and 2020, and improving traffic flow on the existing system. Arterial facilities in the newly urbanized areas should be constructed to favor a grid street pattern and foster transit-supportive development. Connectivity of the existing highway system should</p>	<p>Facilities for non-motorized modes</p> <p>Non-motorized facilities should be provided consistent with the Regional Pedestrian and Bicycle Plan. Facilities should include both pathways and bicycle parking. Emphasis should be placed on higher density areas</p>
<ul style="list-style-type: none"> • Should be multi-modal through reservation of right-of-way for alternative modes, 	<p>be improved, including construction of short missing links. Congestion at freeway interchanges should be eliminated, including selective roadway widenings which equalize the number of lanes on a roadway. Specific recommendations for I-70 east, US-6, and I-25 south</p>	<ul style="list-style-type: none"> • and major commercial and business destinations. As walk trips are generally limited to one mile or less, and bicycle trips to six miles or less, priority should be given to facility expansion within these distances of Urban Centers. Facilities to encourage non-motorized travel should
<ul style="list-style-type: none"> • Should be a limited access facility to maintain high speeds, maintain its function to serve longer trips of a regional and interregional nature, and aid in focusing development around interchange areas, and 	<p>should await the results of the MIS studies currently underway in those corridors.</p>	<p>also be developed within free-standing rural centers. Priority should also be given to easing and improving the safety of non-motorized travel within the Urban Centers. Non-motorized</p>
<ul style="list-style-type: none"> • Should provide points of access for existing communities. 		<p>Urban Centers. Non-motorized</p>



access to transit stations and major stops should be improved. RTD should consider fleet-wide “bike on transit” service to extend the effective operating range of the transit system.

Continuity of bicycle and pedestrian facilities should be preserved and restored as part of any highway or transit construction project which impacts such routes.

An inventory of existing (including “de-facto”) bicycle and pedestrian facilities needs to be made to identify major deficiencies. A capital program should be developed for new pedestrian and bicycle facilities, and for improvements to existing facilities. The program should emphasize facilities for pedestrians and bicyclists which serve a transportation function.

Services for seniors and the disabled

Elderly and disabled services should be provided consistent with the Elderly and Disabled Element of the Regional Transportation Plan. Services to be provided include:

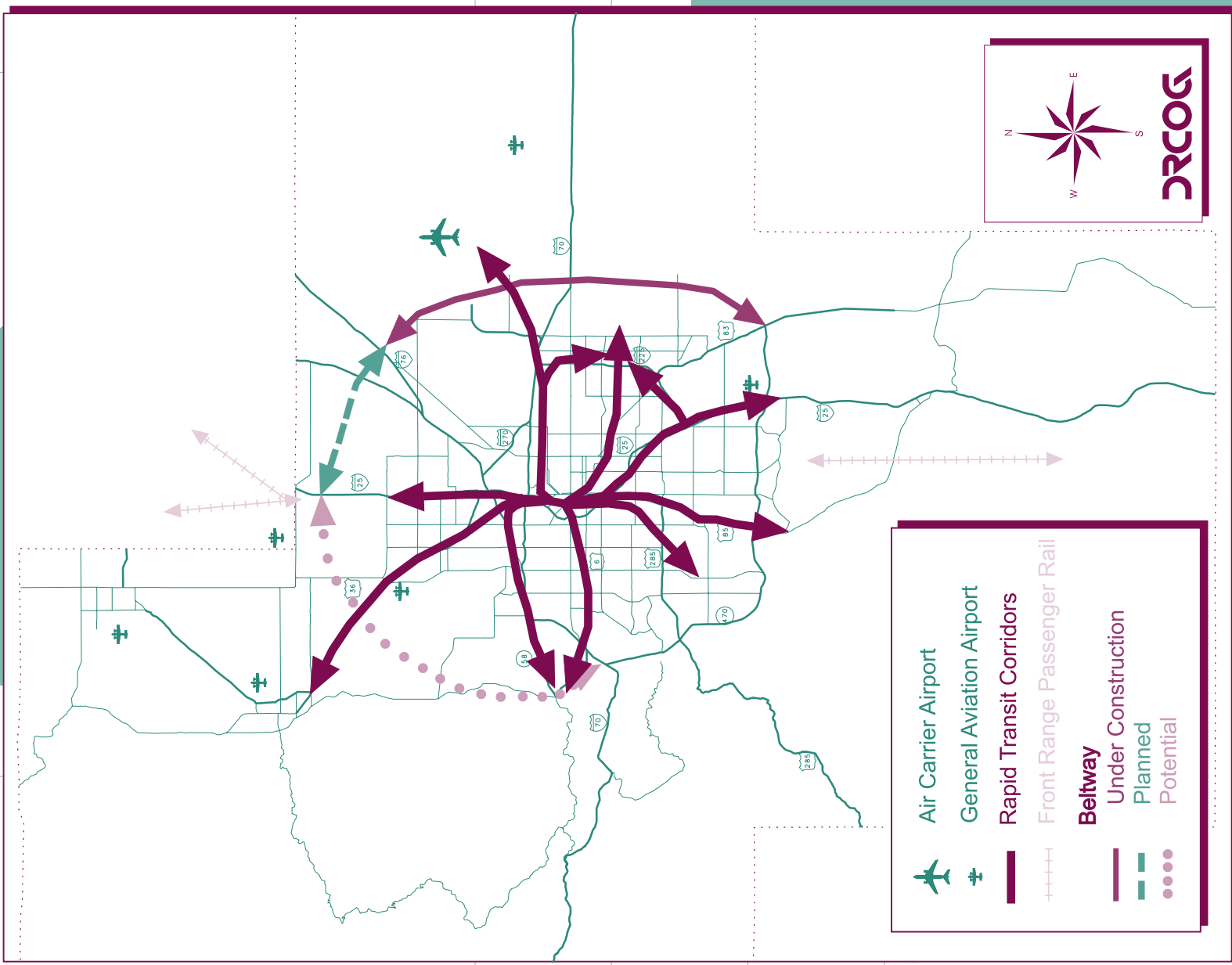
- Fully accessible wheelchair lift-equipped bus and rail services including supplemental service for those too disabled to get to a bus stop. In providing service, attention should be given to the mobility needs of lower income elderly, and those who have sight, cognitive, hearing or walking problems;








Elderly and disabled services should be provided consistent with the Elderly and Disabled Element of the Regional Transportation Plan.

- Sidewalk and curb cuts and snow removal policies; and
 - Transit service user training.
- Service provision by both non-profit and private for-profit operators is encouraged.

Service coordination should be achieved through a Regional Service Coordination Agency. RTD is encouraged to consider the Regional Service Coordination Agency role. Counties outside the RTD are encouraged to identify a service delivery agency and provide organizational, administrative and operating support.

Figure 7



-  Air Carrier Airport
-  General Aviation Airport
-  Rapid Transit Corridors
-  Front Range Passenger Rail
- Beltway**
-  Under Construction
-  Planned
-  Potential

Visio

tan Region



Environmental Quality

Protecting and improving environmental quality is an important goal of the region. In order to protect and improve air and water quality, the physical location and type of growth and land development described in the Vision Framework must consider and address any impacts on environmental quality. The environmental quality principles and policies in the *Metro Vision Statement, Principles and Policies* for Metro Vision 2020 remain important regional goals and should be updated to include effects of region-shaping development activity including:

Maintaining and enhancing water quality within the region is necessary to meet the quality of life expectations inherent in the Metro Vision Statement. This requires the Clean Water Plan to incorporate the goals, principles and assumptions of Metro Vision 2020, and consideration of water quality infrastruc-

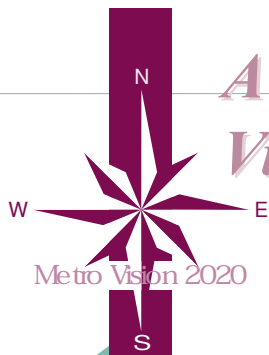
ture components in the Vision Framework. The Clean Water Plan defines water quality planning processes, regional water quality management strategies, a 20-to 50-year system of wastewater treatment facilities, and a holistic and integrated watershed approach to meeting the goals of the Clean Water Act.

Future plans should include strategies from approved State Implementation Plans to ensure the region will meet air quality goals. Transportation network and control strategies should be identified to meet the air quality goals of 44 tons per day of PM₁₀ and 825 tons per day of carbon monoxide throughout the term of the 2020 plan.

In order to protect and improve air and water quality, location and type of growth and land development must consider and address any impacts on environmental quality.

DEVELOPMENT AND OPEN AREA #21

A Glossary for the Vision 2020 Framework



Activity Centers- Identifiable concentrations of human activity within a relatively small geographic area. A proposed hierarchy of activity centers in order of descending intensity is: Peripheral urban center, regional activity center, multi-community center and sub-community center.

Accessibility- A transportation system characteristic referring to the ability of all people to travel to destinations.

Alternative Transportation Modes- Non-single occupant vehicle modes of travel. Includes transit, paratransit and non-motorized modes.

Arterial- A road primarily for movement of through traffic; traffic control is usually by signals at at-grade intersections.

Congestion Management System (CMS)- A systematic process that provides information on transportation system performance and alternative strategies to alleviate congestion and enhance the mobility of persons and goods. New highway projects significantly increasing capacity for single-occupant vehicles may be ineligible for federal funds unless part of a CMS.

Best Management Practices (BMPs)- Accepted state of the art strategies or actions including structural controls and regulatory policies designed to prevent non-point source water pollution.

Clean Air Act Amendments (CAAA)- Federal legislation passed in 1990 that reauthorizes the Clean Air Act and establishes an aggressive timetable and

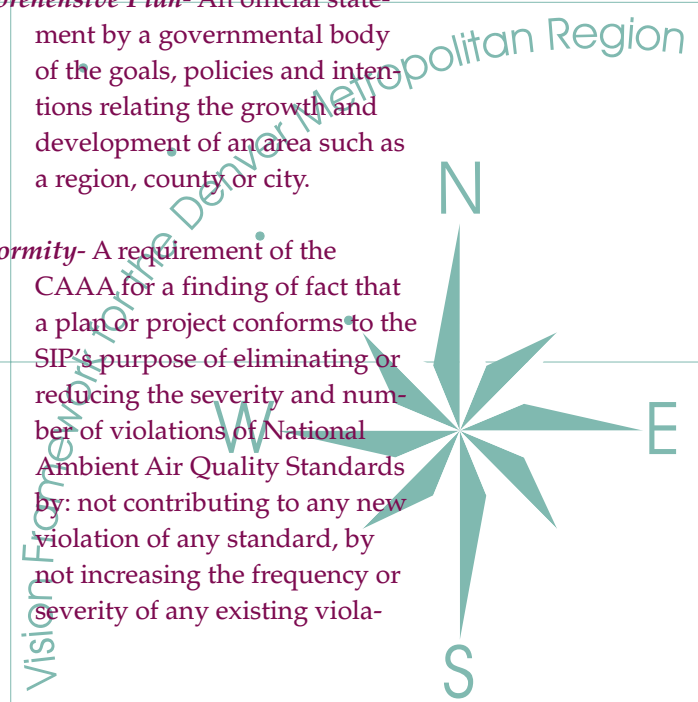
programs for meeting the health based national air quality standards.

Congestion Management System (CMS)- A systematic process that monitors and attempts to manage congestion in the region to improve mobility.

Commuter Rail- Urban passenger train service, typically connecting the central city with suburban areas or outlying cities. Typically associated with diesel train operation on existing rail track.

Comprehensive Plan- An official statement by a governmental body of the goals, policies and intentions relating the growth and development of an area such as a region, county or city.

Conformity- A requirement of the CAAA for a finding of fact that a plan or project conforms to the SIP's purpose of eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards by: not contributing to any new violation of any standard, by not increasing the frequency or severity of any existing viola-



tion, and by not delaying attainment of any standard or interim emission reduction.

Developed Area- Areas of urban and suburban development with a minimum density greater than 1 unit per acre.

Distributions- The allocation of forecasted demographic information such as population growth to geographical subareas within the region.

Express Bus- Bus service with few stops, typically at the suburban end of the trip, and an express portion of the journey often on a freeway or HOV facility, typically ending in an urban center such as the Denver CBD.

Forecasts- The adopted future projections of population, employment and households used for policy development and for the regional planning of future service demands.

Freeway- A divided highway designed for the unimpeded flow of large traffic volumes. Access to a freeway is rigorously controlled;

grade-separated interchanges are provided at major cross-streets and minor streets are terminated or grade-separated.

High Occupancy Vehicle (HOV) Lanes- Roadway lanes reserved for the sole use of transit buses and autos with two or more passengers with the exception of motorcycles.

Infill- The policy and action of directing development density to existing vacant land within the developed area.

Influence Area- The geographic area surrounding a peripheral urban center within which people will prefer to use the center's services and employment opportunities because of convenience, travel time and distance considerations. Analogous to a market area.

Infrastructure- The basic physical facilities such as roads, water, and sewer lines and treatment plants, and power utilities necessary to support a population in either an urban, suburban or rural area.

Interchange- The system of ramps that connects two or more grade-separated highways.

Intermodal- Facilities connecting two or more modes of transportation.

Light Rail Transit (LRT)- An electrically propelled vehicle that operates singly or in trains on predominantly reserved, but not necessarily grade-separated, rights-of-way.

Intermodal Surface Transportation Efficiency Act (ISTEA)- The federal legislation passed in 1991 that provides funding for transportation infrastructure within a vision of developing an integrated transportation system that is economically efficient and environmentally sound. The act focuses on the maintenance and management of existing transportation infrastructure, requires the integration of transportation and land use planning, supports air quality goals and provides increased funding flexibility.

Level of Service (LOS)- A qualitative assessment of roadway traffic volumes relative to road capac-

ity, ranked on a scale ranging from A as free flowing traffic to F as bumper to bumper congestion.

Light Rail Transit (LRT)- Mass transit provided on fixed rails dedicated to passenger service.

Local Fixed-Route Bus- Bus service on fixed-route and schedule involving frequent stops and consequently low average speeds.

Major Investment Study (MIS)- A comprehensive evaluation of transportation needs on a corridor or subarea scale. The MIS is used to define the design, concept or scope of a major transportation investment necessary to address the needs; an element of the comprehensive regional transportation planning process.

Major Regional Arterial- A divided arterial highway for through-traffic with controlled access, the intersections of which are often separated from other roadways by use of interchanges.

Metropolitan Planning Organization (MPO)- A regional agency designated by the governor of a state to perform transporta-

tion planning and make project funding decisions. All federal transportation dollars are allocated within a region through the MPO's planning process.

Mobility- A transportation system characteristic referring to the ease of trip-making, generally measured by speed of travel.

Mode- Means of travel: auto driver, passenger, mass transit passenger, cyclist, pedestrian, and so on.

Multi-Community Centers- Concentrations of employment or commercial activity that serve a sub-regional market, being a transportation destination for only a portion of the region. Community Centers may serve one or more municipalities depending on their characteristics and location; and may contain a mix of uses. Most regional malls and traditional downtowns would fall into this category.

Multimodal- An adjective referring to the integration of various modes in a transportation system concerning or involving more than one transportation mode.

National Ambient Air Quality Standard (NAAQS)- Quantitative concentration standards for priority air pollutants established by the Clean Air Act at levels intended to protect public health.

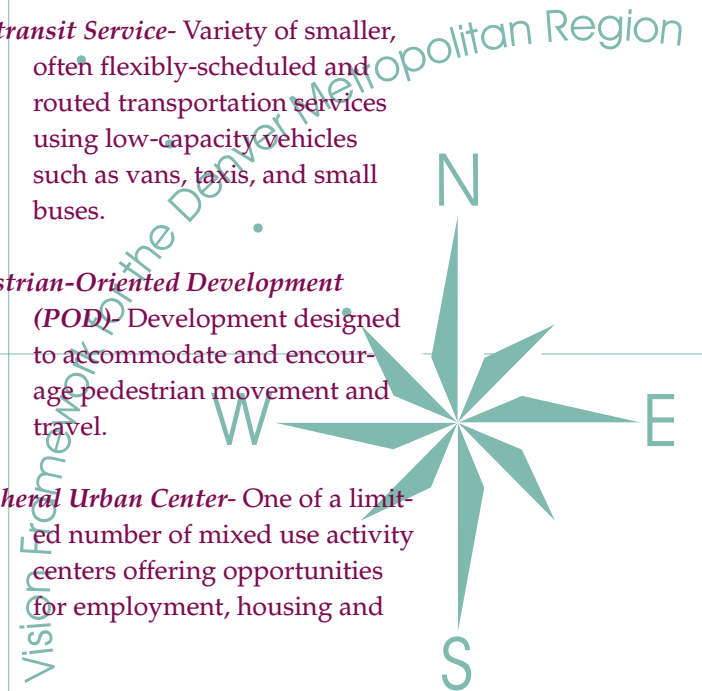
Non-Motorized Modes- Pedestrian and bicycle.

Non-Point Source- Pollution sources that are distributed and generalized such that the pollution does not come from a specific discharge point such as a pipe or smoke stack.

Paratransit Service- Variety of smaller, often flexibly-scheduled and routed transportation services using low-capacity vehicles such as vans, taxis, and small buses.

Pedestrian-Oriented Development (POD)- Development designed to accommodate and encourage pedestrian movement and travel.

Peripheral Urban Center- One of a limited number of mixed use activity centers offering opportunities for employment, housing and



		<p>recreation; at a sufficient size and concentration to achieve a vibrant urban character and to support rapid transit service. Such centers will be characterized by a high intensity core and a pedestrian orientation, with a reasonable pedestrian travel relationship between the core, housing and transit facilities.</p>	<p>the entire region. Regional Activity Centers may contain one or more kinds of uses, but do not have the specific mix of housing, employment and recreation needed to be a PUC. Regional Activity Centers may become PUCs over time with the addition of the missing elements and a pedestrian orientation. Examples would be the airport, Tech Center, and Health Sciences Center.</p>	<p><i>Sub-Community Centers</i>- Localized concentrations of commercial services, retail stores and employment opportunities that predominantly meet the daily needs of the surrounding residences in a portion of the community. Shopping centers anchored by a grocery store or similar sized retailer and containing a number of associated service or retail businesses would be in this category.</p>
<p><i>PM₁₀</i></p>	<p>Small particles that are 10 microns in diameter or less. When suspended in the air and inhaled, these particles are small enough to be carried deep into the lungs where they are difficult to expel and may cause a variety of health problems.</p>	<p><i>Rapid Transit</i>- service operating in a separated right-of-way, can be conventional buses in a high-occupancy vehicle or bus lane, and various rail services including light rail transit and commuter rail service.</p>	<p><i>Regional Bus</i>- Long distance bus service between communities with few stops and high operating speeds.</p>	<p><i>Sprawl</i>- The effectively unregulated and uncontrolled spread of low density urban development into natural lands, characterized by strip commercial development, dominance of the auto and single-family detached housing.</p>
<p><i>Regional Activity Centers</i></p>	<p>High intensity concentrations of employment or commercial activity that serve a regional function and are consequently a major transportation destination for</p>	<p><i>Rural</i>- Areas where the natural environment predominated and where human structures and activities are incidental or compatible with the natural landscape. Residential densities are less than 1 unit per acre and public services are limited or non-existent.</p>	<p><i>Single-Occupant Vehicle (SOV)</i>- A motorized vehicle occupied by a single person.</p>	<p><i>State Implementation Plan (SIP)</i>- A plan which provides for the implementation, maintenance and enforcement of the National Ambient Air Quality Standards within each state. The SIP must contain enforceable emission limitations and other control measures necessary to attain and maintain the NAAQS.</p>

Suburban- Areas dominated by human activities and structures, but with a significant percentage of land surface retaining a vegetative cover. The natural environment is more apparent than in urban settings and the dominant land use is single-family detached residential. At a minimum the basic services of public safety, water and sewer are provided.

Transportation Demand Management (TDM)- Economic pricing strategies, incentives and regulations designed to control the demand for the single-occupant vehicle and promote alternative modes of travel.

Transportation Improvement Program (TIP)- The three-to five-year list of regional transportation projects selected for funding. All projects included in the TIP must be part of the regional transportation plan.

Transit-Oriented Development (TOD)- Development designed to accommodate and encourage the use of transit through the application of density, diversity and design principles.

Urban- Areas of intensive human use with most of the land covered by structures or transportation facilities(roads). The natural environment is dominated and generally controlled by man-made facilities and structures. Urban areas are characterized by mixed uses, vertical development and a complete set of public services and facilities.

Urban Form- The general physical form of the region defined by the pattern and functional relationships between the developed area, infrastructure systems, and open space.

Vehicle Miles of Travel (VMT)- The total distance traveled in miles by all motor vehicles in a given area in a given time period. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle.



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The Vision 2020 Task Force was created to help prepare a new regional development and transportation plan. The following individuals served on the Vision 2020 Task Force for over two years. This report is the result of their efforts.

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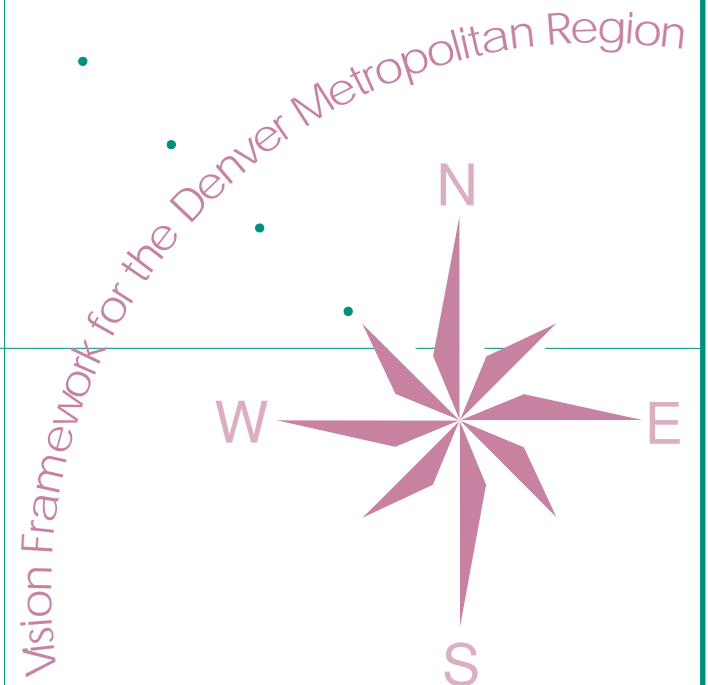
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Vision Framework for the Denver Metropolitan Region
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