	devices in a secluded portion of the park at a ratio of 1 screened space for each 10 units. A maximum of 4 vehicles may be parked on a lot, including those vehicles under repair and restoration, unless kept within an enclosed building.
Boarding and lodging houses:	1 per sleeping room and 1 for the proprietor, plus 1 additional space for each 4 persons employed on the premises.
Attached dwellings in the CD, RM-U, RM-T, UCN-1, UCN-2, and CS (only in District C as shown in RMC 4-3-095B1c.) Zones:	
Resident and guest spaces:	1.8 per 3 bedroom or larger dwelling unit; 1.6 per 2 bedroom dwelling unit; 1.2 per 1 bedroom or studio dwelling unit. **RM-T Zone Exemption:** An exemption to the standard parking ratio formula may be granted by the Development Services Director allowing 1 parking space per dwelling unit for developments of less than 5 dwelling units with 2 bedrooms or less per unit provided adequate on-street parking is available in the vicinity of the development.
Attached dwellings in zones other than the CD, RM-U, RM-T, UCN-1, UCN-2, and the CS (only in District C as shown in RMC 4-3-095B1c.):	
Resident and guest spaces:	**Within the RM-N, RM-C and RM-I Zones:** 2 per dwelling unit where tandem spaces are not provided; and/or 2.5 per dwelling unit where tandem parking is provided, subject to the criteria found in subsection F8d of this Section. **All Other Zones:** 1.75 per dwelling unit where tandem spaces are not provided; and/or 2.25 per dwelling unit where tandem parking is provided, subject to the criteria found in subsection F8d of this Section.
Attached dwelling for low income elderly:	1 for each 4 dwelling units.
COMMERCIAL ACTIVITIES OUTSIDE OF SHOPPING CENTERS:	
Drive-through businesses which maintain drive-through facilities:	**Stacking space:** The drive-through facility shall be so located that sufficient on-site vehicle stacking space is provided for the handling of motor vehicles using such facility during peak business hours of such a facility as determined by the Development Services Director. Stacking spaces cannot obstruct required parking spaces or ingress/egress within the site.

	Driveway location: Entrances and exits shall be located so as not to cause congestion in any public right-of-way. Queuing from drive-through windows cannot extend into the public right-of-way.
Banks:	A minimum of 0.4 per each 100 square feet of gross floor area and not more than a maximum of 0.5 per each 100 square feet of gross floor area except when part of a shopping center. In the UCN-1 and UCN-2 Zones, the maximum of 0.5 per 100 square feet of gross floor area may only be achieved with structured parking. **Drive-up windows:** 5 spaces for stacking for each station.
Convalescent centers:	1 for every 2 employees plus 1 for each 3 beds.
Day care centers, adult day care (I and II):	1 for each employee and 2 loading spaces within 100' of the main entrance for every 25 clients of the program.
Drive-through business:	1 per 50 square feet of gross floor area
Hotels and motels:	1 per guest room plus 2 for every 3 employees.
Mortuaries or funeral homes:	1 per 100 square feet of floor area of assembly rooms.
Vehicle sales (large and small vehicles) with outdoor retail sales areas:	1 per 5,000 square feet. The sales area is not a parking lot and does not have to comply with dimensional requirements, landscaping or the bulk storage section requirements for setbacks and screening. Any arrangement of motor vehicles is allowed as long as: • A minimum 5' perimeter landscaping area is provided; • They are not displayed in required landscape areas; and • Adequate fire access is provided per Fire Department approval.
Vehicle service and repair (large and small vehicles):	0.25 per 100 square feet of gross floor area.
Offices, medical and dental:	0.5 per 100 square feet of gross floor area.
Offices, general:	A minimum of 3 per each 1,000 feet of gross floor area except in the UCN-1 and UCN-2 Zones where maximum is 0.4 per 100 square feet of gross floor area, or 0.45 per 100 square feet permitted with shared parking. If in the UCN-1 or UCN-2 Zones, then must be shown in the Redevelopment Master Plan.
Eating and drinking establishments and taverns:	1 per 100 square feet of gross floor area
Eating and drinking establishment Combination sit-down/drive-through restaurant:	1 per 75 square feet of gross floor area.

Retail sales, bulkbig-box retail sales, and on-site services (except as specified below):	A ~~minimum~~maximum of 0.4 per each 100 square feet of gross floor area, ~~and not more than a maximum~~ Modification ofup to 0.5 per each 100 square feet of gross floor area with structured parking and/or shared parking may be approved as part of master plan and site plan review. If in the UCN-1 or UCN-2 Zones, must be shown in the master plan.
Clothing or shoe repair shops, furniture, appliance, hardware stores, household equipment:	0.2 for each 100 square feet of gross floor area.
Recreational and entertainment uses:	
Outdoor and indoor sports arenas, auditoriums, stadiums, movie theaters, and entertainment Cabs:	1 for every 4 fixed seats or 1 for each 100 square feet of floor area of main auditorium or of principal place of assembly not containing fixed seats, whichever is greater.
Bowling alleys:	5 for each alley.
Dance halls, dance clubs, and skating rinks:	1 for each 40 square feet of gross floor area.
Golf driving ranges:	1 for each driving station.
Marinas:	2 per 3 slips. For private marina associated with a residential complex, then 1 per 3 slips. Also 1 loading area per 25 slips.
Miniature golf courses:	1 for each hole.
Other recreational:	1 for each occupant based upon 50% of the maximum occupant load as established by the adopted Building and Fire Codes of the City of Renton.
Travel trailers:	1 for each trailer site.
Uncovered commercial area, outdoor nurseries:	0.05 per 100 square feet of retail sales area in addition to any parking requirements for buildings.
SHOPPING CENTERS:	
Shopping centers (includes any type of business occupying a shopping center):	A minimum of 0.4 per 100 square feet of gross leasable area, ~~and not more than a~~A maximum of 0.5 per 1,000 square feet of gross leasable area except in the UCN-1 and UCN-2 Zones where structured parking is required to achieve the maximum of 0.5 per 100 square feet of parking.
Drive-through businesses which maintain drive-through facilities:	**Stacking space:** The drive-through facility shall be so located that sufficient on-site vehicle stacking space is provided for the handling of motor vehicles using such facility during peak business hours of such facility as determined by the Development Services Director. Stacking spaces cannot obstruct required parking spaces or ingress/egress within the site. **Driveway location:** Entrances and exits shall

	be located so as not to cause congestion in any public right-of-way. Queuing from drive-through windows cannot extend into the public right-of-way.
INDUSTRIAL/STORAGE ACTIVITIES:	
Airplane hangars, tie-down areas:	Parking is not required. Hangar space or tie-down areas are to be utilized for necessary parking. Parking for offices associated with hangars is 1 per 200 square feet.
Manufacturing and fabrication, laboratories, and assembly and/or packaging operations:	A minimum of 0.1 for each 100 square feet of gross floor area and not more than a maximum of 0.15 spaces per 100 square feet of gross floor area (but to include warehousing space).
Self service storage:	0.05 for each 100 square feet of area.
Warehouses and indoor storage buildings:	1 for each 1,500 square feet of gross floor area.
PUBLIC/QUASI-PUBLIC ACTIVITIES:	
Religious institutions:	1 for each 5 seats in the main auditorium, provided that spaces for any church shall not be less than 10. For all existing churches enlarging the seating capacity of their auditoriums, 1 additional parking space shall be provided for each 5 additional seats provided by the new construction. For all churches making structural alterations or additions which do not increase the seating capacity of the auditorium, see "Outdoor and indoor sports arenas, auditoriums, stadiums, movie theaters, and entertainment clubs."
Medical institutions:	1 for each 3 beds, plus 1 for each staff doctor, plus 1 for each 3 employees.
Cultural facilities:	4 for each 100 square feet in office and public use.
Public post office:	0.3 for every 100 square feet.
Schools:	
Elementary and junior high:	1 for each employee. In addition, if buses for the transportation of students are kept at the school, 1 off-street parking space shall be provided for each bus of a size sufficient to park each bus.
Senior high schools: public, parochial and private:	1 for each employee plus 1 space for each 10 students enrolled. In addition, if buses for the private transportation of children are kept at the school, 1 off-street parking space shall be provided for each bus of a size sufficient to park each bus.
Colleges and universities, arts and crafts schools/studios, and trade or vocational schools:	1 for each employee plus 1 for each 3 students residing on campus, plus 1 space for each 5 day students not residing on campus. In addition, if buses for transportation of students are kept at the school, 1 off-street parking space shall be

	provided for each bus of a size sufficient to park each bus.
Secure community transition facilities:	1 for each 3 beds, plus 1 for each staff member, plus 1 for each employee.

Appendix B
Urban Center-North Airport Compatible Land Use Program

CITY OF RENTON

Urban Center – North
Airport Compatible Land Use
Report and Program

October 6, 2005

Department of Economic Development, Neighborhoods,
and Strategic Planning Department

Renton City Hall
1055 South Grady Way
Renton Washington 98055

Urban Center – North / Renton Municipal Airport
Compatible Land Use Program

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Urban Center – North / Renton Municipal Airport
Compatible Land Use Program

I. Introduction

Recognizing the importance of aviation to the economic health of the state and its businesses and the quality of life of its citizens and visitors, the Washington State Transportation Commission has developed the *Washington State Aviation Policy*. Issues raised by this policy, such as the potential for encroachment of incompatible land uses in proximity to airports, considered to be essential public facilities under RCW 36.70A.200, have been further addressed, and formalized, by the Washington State Legislature. Senate Bill 6422 and the resulting implementation of the bill, RCW 36.70.547, amended the Growth Management Act (GMA) to require every city planning under GMA, and having a general aviation airport in its jurisdiction, to discourage the siting of land uses that may be incompatible with aviation.

The Boeing Company's 2002 application for Comprehensive Plan Amendments created the opportunity to initiate compliance with RCW 36.70.547, while studying potential impacts of future redevelopment of the Boeing Renton Plant site on the Renton Municipal Airport.

The issues related to compatibility of land use in proximity to an airport, particularly one in an urban context, are complex. In Renton, an Airport Compatible Land Use Program is being developed in two phases. Phase One analyzes the compatibility of existing and future land uses in the Boeing Comprehensive Plan Amendment Environmental Impact Statement (EIS) site area, referred to herein as the "Renton Plant Site" or the "site area." Phase Two, to be completed as part of the 2004 Growth Management Act Comprehensive Plan Update process, will be completed by December 1, 2004.

The Boeing Renton Plant site, the subject of a Comprehensive Plan Amendment request by The Boeing Company, has characteristics unique from other areas of the city. It is adjacent to the Airport, lies both within the Airport Influence Area [note: the "Airport Influence Area" is that area defined as being within the outer limit of "Safety Zone 6," see Exhibit A] and Renton's Urban Center – North, and may be subject to redevelopment over the coming years.

For these reasons the City has designated the property evaluated in the Boeing Comprehensive Plan Amendment EIS site area as subject to the **Urban Center – North Airport Compatible Land Use Program (Phase One Program)**. At this time, the policies of this Phase One Program, included herewith, are intended to apply to "Urban Center – North" exclusively (see Exhibit B).

Phase Two of the Airport Compatible Land Use Program (Phase Two Program) will address compatible land use issues over the remainder of the Airport Influence Area, an area of north-central Renton much larger than Phase One (the Boeing Renton Plant site). The area of the City that will be subject to the second phase of the Airport Compatible

Land Use Program generally runs north-south, corresponding to the layout of the airport runway. It extends from Lake Washington on the north beyond Interstate 405 to the south. On the east, it includes North Renton, Southport, and Gene Coulon Memorial Beach Park and extends beyond I-405 to include portions of Renton Hill, Kennydale, and North Kennydale. On the west, the Phase Two ACLUP area includes the Rainier corridor and West Hill and areas of Lakeridge, West Hill, and Earlington. ACLUP portions of these neighborhoods are in unincorporated King County as well as in Renton.

Phase Two of the city-wide Airport Compatible Land Use Program will be adopted in 2004, as part of the City's GMA-mandated Comprehensive Plan update.

II. Renton Municipal Airport and Will Rogers – Wiley Post Memorial Seaplane Base Characteristics

An analysis of airport characteristics is critical to the formulation of a useful land use compatibility program. No two airports have the same dimensions, service capability, and are set in the same physical situation. The following characteristics are particular to the Renton Municipal Airport and Will Rogers – Wiley Post Memorial Seaplane Base and serve to define the compatibility criteria for land uses in proximity to the Airport.

Service Capability based on Functional Classification and Design Type

Renton Municipal Airport is a "General Aviation" facility. General Aviation includes all aviation activity with the exception of certified air carriers and military aircraft. Aviation service for charter flights, aviation taxi service, business/corporate, and recreation flying is provided from Renton Airport to the Central Puget Sound region.

In addition to General Aviation, three other aviation classifications apply to the Renton Municipal Airport. The Renton Airport is classified as a Reliever / Transport Airport by the National Plan of Integrated Systems (NPIAS). The NPIAS classifies Reliever airports as metropolitan area general aviation airports that serve to reduce air carrier airport congestion by providing facilities and service suitable for attracting and diverting general aviation activity away from major air carrier airports. A Transport airport serves aircraft with wingspans greater than 118 feet and with approach speeds of 121 knots or more. Transport runways usually have the capability for precision approach operation.

The Airport Reference Code (ARC) is a coding system developed by the Federal Aviation Administration to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at an airport. The ARC has two components relating the airport design to aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed. The second component, depicted by a Roman numeral, is the airplane design group and relates to airplane wingspan. Generally, aircraft approach speed applies to runways and runway related facilities. Airplane wingspan primarily relates to separation criteria involving taxiways and taxilanes.

Airports expected to accommodate single-engine airplanes normally fall into ARC B-I. Airports serving larger general aviation and commuter-type planes are usually ARC B-II or C-II. Small to medium-sized airports serving air carriers are usually ARC C-III, while larger air carrier airports are usually ARC D-VI. The Renton Municipal Airport's ARC classification is B-II, but can accommodate aircraft such as the Boeing 757.

Floatplanes utilize the Will Rogers - Wiley Post Memorial Seaplane Base facilities located at the north end of the Airport. The Seaplane Base is the only publicly-owned floatplane facility in the Seattle area. Similar activities occur at privately-owned facilities on Lake Union and at Kenmore, at the north end of Lake Washington. These two areas are greatly constrained by boat traffic however.

The Puget Sound area is the southern terminus for seaplane operations that are vital to the economy and general support of communities and businesses up the Pacific Coast from Washington through British Columbia and into Alaska. The Will Rogers - Wiley Post Memorial Seaplane Base and the Kenmore facility are the only facilities in the Puget Sound area with haul-out facilities for maintenance and repair of floatplanes.

There is no precision landing system at the Renton Airport, although there is a FAA tower, a non-directional beacon, and a non-precision GPS approach to Runway 15.

User Type

Most of the based aircraft at the Renton Airport, 90.4 percent, are single-engine. Multi-engine aircraft make up 7.6 percent, helicopters 1.1 percent, and jets 0.8 percent. Projections to 2021, included in the *Renton Municipal Airport Business Plan* (2002), indicate the increase in multi-engine and jet aircraft will be slight and only result in a total of 13 percent for these types.

The Will Rogers-Wiley Post Seaplane Base is designated a US Customs Landing Rights Airport.

Volume of Use

Although the airport is used by The Boeing Company for take-offs of 737 and 757 aircraft when production is completed, primary use is by single-engine piston aircraft. The high use level by single-engine aircraft makes Renton Municipal Airport one of the top seven general aviation facilities in the state in aircraft landings and takeoffs.

Approximately 16 percent of the total of based aircraft at the Renton Airport are seaplanes. This represents about 33 percent of all Puget Sound area seaplanes. Seaplane take-offs and landings represent a significant level of activity at the Airport.

Commercial seaplane businesses provide on-demand and seasonal air taxi services for activities such as sightseeing, environmental testing and monitoring, contract shuttle service, photography, and general transportation. During the four-month, summer

salmon fishing season (April or May to mid-September) many flights originate at Renton and fly to British Columbia. Although statistics are unreliable, the estimated number of passenger enplanements during this four to five month period, from Renton, is almost 10,000 people.

There is no significant use of the Renton Airport by military aircraft, although following September 11, 2001, some military activity was devoted to "touch and go" exercises for defense purposes.

Capacity

The relationship of existing demand to existing capacity for both annual air operations and land services was measured at regional airports and reported in the *2001 Regional Airport System Plan* (RASP). Airfield, or airside, capacity is measured as the number of takeoffs and landings an airport can accommodate over a given time period given the layout of runways and taxiways, weather conditions, and mix of aircraft using the facility. Boeing use is about 3 percent of total airside capacity. Landside capacity is a measure of existing supply of parking (tie-downs or hangars). Boeing leases about 52 percent of the landside capacity of the airport for their operations.

The RASP inventoried the Renton Airport's Airside Demand/Capacity Ratio at 44 percent and its Landside Demand/Capacity Ratio at 94 percent.

Physical Characteristics

The Renton Airport is approximately 170 acres in size (see Exhibit B). The asphalt and concrete runway has a full taxiway parallel along the west side and a partial taxiway along the south two-thirds on the east side. It is 200 feet wide for most of its length, but a 340 foot displacement at the south results in 5,029 feet of useable runway length. Most business aircraft can conduct normal operations on a field of this length, larger corporate jets, however, may have to limit fuel loads on takeoff during hot weather.

The Will Rogers - Wiley Post Memorial Seaplane Base facilities consist of a floating dock, access ramp, and 200 foot by 5,000 foot waterlane in Lake Washington. Seaplane traffic often turns at midfield and travels north along the Cedar River for a water landing just north of the runway.

Airspace Characteristics

Because the Renton Airport has a tower, the airspace above it is classified as an Air Traffic Control Tower Airspace. For Renton, the airspace is classified as a Control Zone D Airspace. The airspace has a radius of approximately five miles with extensions at the approach and departure paths. This airspace lies beneath the both the Boeing Field airspace and the Class B Airspace for the SeaTac airport.

III. Risk Assessment

When developing a program designed to ensure the safety and welfare of a community, decisions must be made that are based on an assessment of the risk inherent in the actions taken (or inaction). "Risk" is defined as exposure to the chance of loss. Risk can be voluntary, such as in lifestyle choices, or involuntary, such as people at risk on the ground under airspace.

In terms of aviation, potential loss is often fatal and can be widespread. "Zero risk" is almost impossible to achieve. Again, in the case of aviation, if all uses and people were removed from the Airport Influence Area, risk to airplane occupants would still exist. Zero risk from aviation would only be possible if no aviation took place. With involuntary risks, the best that can be hoped for is to reduce risks to a level that is acceptable to the community.

The development of an airport compatible land use program is an attempt to reduce exposure to risk within the City of Renton and to users of the Renton Municipal Airport. This can be done in several ways. First, landowners and developers can be made aware of strategies to ensure that development projects do not increase hazards to aviation. Planners, in reviewing such proposed projects, can use policies and development standards to assess the potential for incompatibility with aviation operations. People with extreme fear of potential aviation mishaps or a high degree of sensitivity to aviation impacts can be made aware in various ways of areas to avoid when choosing a residence or place to work or recreate.

The primary focus of this report is reducing risk in the future, within a potential redevelopment area. Existing uses, although in close proximity of the airport, should not be analyzed in terms of aviation risk because, in Renton, these uses are aviation-dependent.

Given that risk cannot be completely eliminated, the goal is to reduce the consequences of accidents. The strategies to achieve this include limiting the intensity and density of uses and providing protection to special populations in certain areas in proximity to the Airport.

The Federal Aviation Administration (FAA) regulates for safe operations of both airplanes and airports. The FAA, however, has no jurisdiction over land uses adjacent to the airport. The Airport Compatible Land Use Program is intended to increase safety and land use compatibility outside the boundaries of the airport.

Local Risk

What is the level of risk in Renton? This can be calculated by using national statistics that assess risk. Also, records of actual aviation emergency incidents in Renton are available. [The aviation industry defines *accidents* as emergency events that result in fatalities or serious injury to people either on an airplane or on the ground. *Incidents* are events with less serious consequences. *Mishaps* are accidents and incidents together.]

The unpredictable nature of aviation risk, however, means that only one accident can mean disaster. Off-airport accidents and injury to people on the ground from aviation emergencies are very rare. Even so, safety is a factor that can be increased.

National Transportation Safety Board data indicates that Renton Municipal Airport has experienced 64 aviation mishaps since 1961. This is approximately 1.5 mishaps per year. Potential hazards to aviation have been regulated by ordinance (Ord. 1542) and in the Renton Municipal Code since 1956 (RMC 4-3-020). However, the nature of aviation has changed dramatically since adoption of these regulations.

The initiation of an airport compatible land use program is particularly timely because of the recent interest in Renton shown by the development community. As mentioned previously, the site area is planned to be redeveloped by the year 2030. As density of population and intensity of use increases adjacent to the airport, the potential consequences of an aviation emergency incident also increase. Adoption of an Airport Compatible Land Use Program will ensure that City's excellent aviation safety record will be maintained.

In Renton, record-keeping of aviation emergency incidents off-airport is somewhat unreliable, due to loss of information during transfer to electronic record-keeping. it appears from data available that on-airport accidents outnumber off-airport accidents about five to one (there have been fifteen accidents on-airport since 1982 and three off-airport).

Risk Potential

With the exception of ensuring that obstructions are not allowed to interfere with airspace, compatible land use planning cannot influence the frequency of aviation accidents. In addition, off-airport accidents are infrequent. The foundation of the an Airport Compatible Land Use Program is an assessment of *potential risk*. Risk is measured in several ways. The basis for risk assessment within the Airport Influence Area are guidelines provided by the State of California Department of Transportation Division of Aeronautics, "California Airport Land Use Planning Handbook;" January 2002.

Airplane accident risks have two notable characteristics that can be measured. They are physical in nature (as opposed to social or financial for example) and consist of a single event (as opposed to effects that evolve over an indefinite period of time). Assessment of risk ("what might happen") is measured in terms of frequency, distribution, and consequences. Frequency and distribution are quantitative assessments, but consequences are measured qualitatively.

The types of risk in aviation are accident risk, individual risk, and societal risk. The accident risk rate is the number of airplane crashes anticipated to occur on an annual basis within a given area. Individual risk is aviation hazard to an individual on a 24 hour, 365 day year basis. The risk of fatality, not injury, is usually the only consideration in

assessing individual risk. A societal risk is one that has consequences beyond the accident itself. It may be a factor influenced by public perceptions such as the belief in a lack of safety of a particular type of aircraft.

Perception of Risk

In addition to risks that can be largely measured in one way or another, the public's perception of risk is another factor to be considered in a risk assessment. Communication of risk is important in formulating policy to manage risk. The presentation of the City of Renton's Airport Compatible Land Use Program to elected officials, stakeholders, and the public should raise awareness of risk in Renton from aviation accidents and, hopefully, reassure the community that the actual risk is low.

Aviation Emergency Type in Relation to Risk

In assessing potential risk, and planning for land use compatibility, a basic understanding of the types of aviation emergencies is required. Generally, aviation emergencies are of two types, ones in which the pilot creates the emergency and those caused by something other, but to which the pilot can react.

At general aviation airports, the most common occurrence of the first type is caused by the failure to maintain air speed, which in turn results in uncontrolled descent. The second type is most often caused by adverse wind and weather conditions and loss of power due to engine failure from mechanical problems or lack of fuel. If airspeed can be maintained, most airplanes (even large jets) can land without functioning engines.

Airplane Type in Relation to Risk

Airplanes are primarily of two types, single-engine and multi-engine. Obviously, multi-engine airplanes have a greater chance of landing safely if one engine fails. Ironically, however, while pilots may be able to land multi-engine airplanes in an emergency, the aircraft are more difficult to control due to asymmetrical thrust characteristics. Also, pilots tend to think they can make it back to the airport and continue to remain airborne longer than they should. With single-engine airplanes, when the engine fails, the pilot is forced to descend and land immediately. For these reasons, a factor of risk to a community is the proportion of single-engine to multi-engine planes that use the airport. At the Renton Airport, over ninety percent of the based aircraft are single-engine airplanes.

Emergency Landing Characteristics

Pilots are taught to follow certain procedures in case of an engine-failure emergency. The basic steps, if possible, include keeping the airplane under control, determining the problem, attempting to restart the engine, and finally if necessary, making an emergency landing. Pilots will look for a large, flat, open area without people, buildings, large trees,

or other objects in which to land. Wires or other obstructions may be difficult to see and night emergency landings are particularly perilous.

Location of Accidents

As mentioned above, important to the measure of frequency of accidents is the additional factor of location of the incidents. Data on aviation accidents is compiled by the National Transportation Safety Board (NTSB). Based on NTSB records from 1990 to 2000, 68 percent of general aviation accidents take place on the airport. Another 29 percent occur within five miles of the airport ("airport vicinity accidents"), and 3 percent occur more than five miles from the airport. This information was used by State of California Department of Transportation to establish the six "safety zones" (as utilized by WSDOT) for use in airport land use compatibility planning (see discussion below, and Exhibit A).

Of the general aviation on-airport or near-airport landing accidents, most (77 percent) occur during touchdown or roll-out. The remaining 23 percent take place within the landing pattern. For these reasons, the most critical safety zones are those that include the "Runway Protection" area, the "Inner Safety" area, the "Inner Turning" area, the "Outer Safety" area, and the "Sideline Safety" area. These five zones account for only 20 percent of the total land area in the Airport Influence Area, but most of the accidents. In Renton, this "high probability" or "high risk" area is located over the west portion of the Downtown and South Renton. The Sideline Safety area runs parallel to and west of Rainier Avenue on one side and along the Cedar River on the other.

Statistics indicate that the locations of take-off accidents are more widely spread than those during landing. In Renton, take-offs occur over Downtown Renton or Lake Washington, depending on wind direction.

Collision Spatial Characteristics

When planning to reduce risk from off-airport accidents, it is important to know the characteristics of emergency landings. Again, NTSB data can be used to develop minimum requirements for "Ideal Emergency Landing Sites." The median area dimension for general aviation accidents, both with and without some pilot control, is about 100 feet. Perhaps the key element in compatible land use planning in urban areas, is the ability to preserve open space that could be utilized by pilots during aviation emergencies. Statistics prove that risk to both airplane occupants and people on the ground can be significantly reduced by using this strategy.

Risk to Residences and Other Buildings

Both NTSB data for 1982 through 1989, and that from the Aircraft Owners and Pilots Association for the years 1964 through 1982, indicate that few aviation accidents involve residences or other buildings. The data average of these two sources resulted in the conclusion that the annual percentage of building-airplane accidents over the years studied equal 0.65 percent of all accidents. In addition to infrequency of this accident

type, the wide range of variables such as aircraft size and type (design) and residential density or building type (number of stories) make it difficult to predict probability of consequences. Again, in urban areas, provision of open space for emergency landings may be the best strategy. Clustering of residential units may increase opportunities for the creation of such space.

Risk and Compatible Land Use Planning

If risk is exposure to chance of loss, the corresponding question is, "What is the cost of reducing that exposure?" In developing a compatible land use program, certain costs must be weighed against the perceived increase in safety and/or reduction in inconvenience. Therein lies the "risk assessment." Each community must make this decision independent of what other jurisdictions may choose to do. Costs in Renton may include reducing density in the Urban Center, which lies within the Airport Influence Area, at the "expense" of ultimately increasing density elsewhere in the City.

Strategies to reduce risk and increase safety are based on several principles. They are:

Limitation on intensity of use, measured by the number of people expected to be attracted to the use on a per acre basis. The Uniform Building Code can be used to assess the potential occupancy of buildings as a measure of intensity.

Limitation on residential use, measured by the number of dwelling units per net developable acre. Although residential buildings have not been involved in a significant percentage of off-airport accidents, residential uses are generally provided more protection than non-residential uses. Intensity of nonresidential use is usually allowed at higher rates than density of residential use in airport land use compatibility planning.

Protection for special populations, such as young people or those who have reduced mobility, such as the elderly or ill. The theory is that this group would have greater difficulty in getting away from the scene of an emergency. The uses included in this category are day care centers, K-12 schools, hospitals, and convalescent centers.

Control of hazardous materials, such as above-ground storage of large quantities of flammable or other hazardous materials. In Renton, the Fire Prevention Bureau uses fire code regulations (RMC 4-5-070C17) to control the storage of hazardous materials. Because effective regulations are in place that provide maximum compatibility with aviation operations, no additional measures for hazardous material regulation are included in the Phase One Program.

Prevention of hazards to flight, such as obstructions of the airspace, danger to aviation from wildlife, and interference to navigation or communication. In Renton, obstructions have been prevented, based on long-standing Renton Municipal Code regulations (RMC 4-3-020). These will be updated during the 2004 code update, to include current standards. Of special concern is the proximity of salmon rearing habitat in the Cedar River which is immediately adjacent to the airport. The spawning of salmon attracts

prey, most notably great blue heron and bald eagle, which can cause collision of birds and aircraft. The mouth of the Cedar River corresponds approximately with the end of the runway where take-offs occur.

Improve aircraft occupants' survivability rate, as discussed above, the provision of Ideal Emergency Landing Sites increases the opportunity for pilot-controlled emergency landings in the vicinity of the airport. Pilots, if at all possible, will direct their aircraft in order to prevent loss of life both on the airplane and on the ground. This strategy is particularly useful at general aviation airports primarily serving small aircraft, such as the Renton Municipal Airport, that are used by a large population of recreational pilots why may have less experience and training than professional pilots.

Risk Assessment Conclusions

As discussed in the Introduction to this document, the primary purpose of the City of Renton's Airport Compatible Land Use Program is to increase safety and land use compatibility outside the boundaries of the airport within the Airport Influence Area. Phase One of this Program looks at safety and compatibility issues within the Urban Center-North.

The Risk Assessment conducted by the City evaluates a number of factors related to safety, including the number, type, and frequency of on and off-airport aviation accidents in Renton, national statistical information on aviation incidents in general, specific land use and airport operational characteristics unique to Renton, safety principles (e.g., protecting special populations, limiting density and intensity of land uses, preventing hazards to flight), and safety compatibility criteria guidelines for determining density and intensity. The Risk Assessment is based on the review of various resources, including: the Renton Municipal Airport Master Plan Update (1997); National Transportation Safety Board accident statistics; the Washington State Department of Transportation's *Airports and Compatible Land Use, Vol. 1, 1999;* the Denver Regional Council of Governments' *Airport Compatible Land Use Design Handbook* (1998); the Puget Sound Regional Council's *2001 Regional Airport System Plan;* and, the State of California Department of Transportation's (CalTrans) *California Airport Land Use Planning Handbook, 2002.* Nationwide, the CalTrans study is the most recent and comprehensive study completed to date, and is also the most applicable to the City of Renton in that it addresses land use compatibility with airport operations in urban areas.

As indicated in Exhibit A, all of the EIS site area subject to the proposed Comprehensive Plan and zoning code amendments is located within Safety Zone 6 (Traffic Pattern Zone), with the exception of a small area along the northwest edge of the site area, adjacent to the Cedar River, which is in Safety Zone 5 (Sideline Zone). Recommendations for Safety Zone 5 include avoiding residential uses and limiting intensities of non-residential uses.

Based on the "Basic Safety Compatibility Qualities" (Exhibit C) and "Criteria Guidelines" (Exhibit E) presented in the CalTrans *Airport Land Use Planning Handbook (2002)*, there is a "generally low likelihood of accident occurrence at most airports; risk concern primarily is with uses for which potential consequences are severe" (e.g., outdoor stadia and similar uses with very high intensities). In Safety Zone 6, residential uses and most nonresidential uses are allowed (see Exhibit E). There are no limits on residential and non-residential densities intensities, with the exception of "stadiums and similar uses" (see Exhibit C).

The City has developed objectives, policies, and recommended development standards for each of the aforementioned safety principles with the exception of "control of hazardous materials" (already regulated by the City's fire code), based on its review and analysis of the data and applicable land use planning information. Recommended land uses and associated densities across the site area are consistent with the CalTrans recommended guidelines and criteria. Residential use is prohibited within Safety Zone 5 (1000 feet from the centerline of the runway). Land uses and densities proposed for Safety Zone 6 reflect the City's planning goals for its Urban Center and are considered compatible with airport operations based on the literature and data review. Objectives, policies, and recommended development standards addressing aviation safety both on the ground and to airplane occupants are described below in Section IV under the headings General Aviation Safety and Airspace Protection and are incorporated into proposed policies, zoning, and development standards included in Appendix A of this Final EIS.

In conclusion, implementation of the Phase One Program, based on the Risk Assessment described above, is intended to reduce exposure to risk within the Urban Center-North and to users of the Renton Municipal Airport and to the community.

IV. Urban Center – North Airport Compatible Land Use Program

The Urban Center- North Airport Compatible Land Use Program (Phase One Program) addresses three primary categories of airport land use compatibility. "Compatibility" includes issues of safety and annoyance, particularly when the latter may affect human health. The categories of airport land use compatibility most significant in the Urban Center- North subarea are, 1) general aviation safety, 2) airspace protection, and 3) aviation noise. [*note*: the compatible land use category of "overflight impacts" will be fully addressed in Phase Two of the Renton Airport Compatible Land Use Program. Overflight is primarily a concern in safety zones 1 through 4 and on the hills outside of the EIS site area] While there may be some overlap, each has characteristics particular to its category. For that reason, each category included in the Phase One Program is analyzed in terms of the compatibility objective and policies intended to provide strategies to meet the objective, and the criteria and measurements used to ensure that the objective is met.

General Aviation Safety

Compatibility Objective: Minimize risk associated with potential aircraft accidents in the Urban Center – North.

Strategies to Meet Objective:

Policy: Develop performance-based criteria for land use compatibility in the Urban Center – North with aviation activity.

Development Standard: Public assembly may be conditioned in terms of frequency of use, time of use, and number of people assembled.

Development Standard: Residential uses may be conditioned in relation to residential density.

Development Standard: Tall trees, bird attractants, and uses that produce smoke, dusk, glare, electronic signals may be restricted in the Urban Center-North.

Policy: Create functional open space that meets recommended criteria to serve as Ideal Emergency Landing Sites.

Development Standards:
Minimum 75 feet by 300 feet
Minimum 0.5 acre
Relatively level
Free of trees, poles, overhead lines, structures

Policy: In the Urban Center – North, create functional open space in amounts based on recommended standards.

Development Standard:
In the Urban Center-North, the minimum amount of functional open space shall be:
Alternative A – Ten percent of the total amount of land available is dedicated as Ideal Emergency Landing Sites
Alternative B – Dedication of Ideal Emergency Landing Sites every 0.25 to 0.5 mile

Policy: In the Urban Center-North, adopt use restrictions, as appropriate, that meet or exceed the basic safety considerations:

Development Standards:

No use shall be made of any land that will cause electrical interference with navigational signals or radio communications at the airport or with radio or electronic communications between the airport and aircraft.

No use, building, or structure shall emit emissions of fly ash, dust, vapor, gasses, or other forms of emissions that may conflict with any planned operations of the airport.

No structure, device, or other object shall be placed or erected that makes it difficult for pilots to distinguish between airport lights and other lights, results in glare in the eyes of pilots using the airports, impairs visibility in the vicinity of the airport, or otherwise endangers the landing, taking off, or maneuvering of aircraft.

Criteria: Limitation of density or intensity of use in areas most susceptible to off-airport aviation emergency incidents. Provision of Ideal Emergency Landing Areas within the Airport Influence Area.

Measurement: Use Uniform Building Code for building or structure occupancy and dwelling units per net acre of developable land for residential density. Use NTSB statistics for dimensions of Ideal Emergency Landing Areas minimum amounts of functional open space.

Discussion: It is expected that Renton Municipal Airport will continue to have predominately single engine aircraft over the next few decades (from the Renton Municipal Airport Business Plan, 2002). This relates to safety in that single-engine aircraft are more likely to experience undirected crashes. Functional open space may reduce casualties or property damage from undirected crashes.

Designation of Ideal Emergency Landing Sites addresses the objective of enhancing safety for the occupants of an aircraft forced to make an emergency landing away from a runway. Pilots, if at all capable of doing so, will attempt such emergency landings in a clear area if they are available.

Airspace Protection

Compatibility Objective: In the Urban Center – North, reduce obstacles to aviation in proximity to Renton Municipal Airport. Obstacles may include built structures and trees.

Strategies to Meet Objective:

Policy: Require submittal requirements for land use actions proposed within the Urban Center-North that disclose potential conflicts with airspace.

Development Standards:

Require submittal of either or both of the following:

A certificate from an engineer or land surveyor, that clearly states that no airspace obstruction will result from the proposed use.

The maximum elevation of proposed buildings or structures based on the established airport elevation reference datum. Elevations shall be determined by an engineer or a land surveyor.

Policy: In the Urban Center – North, provide maximum protection to Renton airspace from obstructions to aviation.

Development Standard:

Amend Ordinance 1542 so as to revise the Renton Municipal Code (RMC Title 4-3-020 "Airport Related Height and Use Restrictions") to incorporate the Federal Aviation Regulation Part 77 Surface "Imaginary Surfaces" mapping (airspace protection thresholds, see Exhibit D).

Policy: Prohibit buildings, structures, or other objects from being constructed or altered so as to project or otherwise penetrate the airspace surfaces, except as necessary and incidental to airport operations.

Development Standard:

Revise Site Plan Review criteria to include project conformance with Federal Aviation Regulation Part 77 Surface requirements (airspace protection thresholds).

Criteria: Use Federal Aviation Regulation Part 77 Surface mapping.

Measurement: Compare land use master use application submittal materials with Federal Aviation Regulation Part 77 Surface mapping within the Urban Center-North.

Discussion: Aviation accidents are not primarily caused by interference from obstacles. Nevertheless, it is important to keep aviation operations free from obstacles. According to the 2001 Regional Airport System Plan inventory of Puget Sound Regional airports, the Renton Airport runway and the Seaplane base are two of 32 runways (out of 72) that do not have obstructions within the approach areas. The Renton Airport approach area has been regulated by Ordinance (No. 1542) since 1956, and Renton Municipal Code (Title IV Section 3-020) in regard to Airport approach, transition and turning zones; height and use restrictions, and hazard marking and lighting.

The Development Standards should be modified so that the current standard for determining airport obstructions, Federal Aviation Regulations Part 77 Surfaces applies to the Urban Center-North. The Part 77 Surfaces mapping for the City of Renton has been completed.

Aviation Noise

Compatibility Objective: In the Urban Center – North, address impacts of aviation noise that is at a level deemed to be a health hazard or disruptive of noise-sensitive activities.

Strategies to Meet Objective:

Policy: Prohibit the location of noise-sensitive land uses from areas of high noise levels.

Development Standards: Limit potentially noise-sensitive land uses from locating within the 65 DNL (or higher) noise contour of the Renton Municipal Airport.

Policy: Within the Airport Influence Area, require disclosure notice for potential negative impacts from aviation operation noise, unless mitigated by other measures.

Development Standards: Require disclosure notice be placed on land title when property is subdivided, or as part of approval of conditional use permits, special use permits, building permits, or other SEPA non-exempt projects. Such notice may relate to noise, low overhead flights, aviation operations that create high levels of noise, or aviation operations at night when there is greater sensitivity to noise.

Policy: Residential use and/or residential density may be limited, when deemed necessary, to reduce negative impacts on residents from aviation operation noise.

Development Standard:

Residential use or residential density shall be limited based on recommended safety zones and on recommendations in *Safety Compatibility Criteria Guidelines – Land Use Densities and Intensities* (California Airport Land Use Planning Handbook, January 2002).

Policy: Non-residential use and/or intensity may be limited, if such uses are deemed to be noise sensitive, to reduce negative impacts on users from aviation operation noise.

Development Standard:

Non-residential use and/or intensity shall be limited based on recommended safety zones and on recommendations in *Safety Compatibility Criteria Guidelines – Land Use Densities and Intensities* (California Airport Land Use Planning Handbook, January 2002).

Policy: Approval of residential land use or other land uses where noise-sensitive activities may occur should require dedication of avigation easements and use of acoustic materials (i.e. insulation, sound attenuating window glass) for structures.

Development Standard:

It is recommended that avigation easements and restrictive covenants should read as follows:

> "...By virtue of this easement, the grantor, for and on behalf of himself and all successors in interest to any and all of the real property above described, waives, as to the public authority only, any and all claims for damage of any kind whatsoever as a result of aircraft using the "Navigable Airspace" granted herein. This easement does not grant or convey any surface use rights, nor is it to be construed to grant any right to private persons or corporations..."

The notice may include the following disclosure:

> "This property may be subject to considerable noise form the operation of aircraft and is exposed at times to aircraft noise which may infringe upon a person's enjoyment of property and may, dependent upon the degree of acoustical treatment of the building, affect their health and/or well being."

Additionally,

> "Any building constructed on the premise shall be so designed and constructed as to minimize noise pollution in any such structure, giving due consideration to the use for which such structure is designed and built.
> This covenant is for the benefit of and pass with said property and shall apply to and bind the successors in interest and any owner thereof."

Policy: Encourage master planning of land to increase land use compatibility through sound attenuation in the environment.

Development Standard: Within the Airport Influence Area, master planning can increase land use compatibility through utilization of outdoor sound attenuation techniques, such as:

- Place uses with highest sensitivity to noise at greater distances, in consideration of the factor of distance from the source.
- Consider creation of micro-climates to utilize mitigating meteorological conditions (i.e. air temperature, wind direction and velocity).
- Create soft ground surfaces, such as vegetative ground cover, rather than hard surfaces.
- Provide at appropriate heights structures, terrain, or other barriers to provide attenuation of sound.

Criteria: Federal and state criteria for maximum acceptable noise levels in different situations have been established in laws and regulations. These include the Federal Noise control Act of 1972, the Aviation Safety and Noise Abatement Act of 1979, and Revised Code of Washington Title 70.107. The primary guidelines, used nationally for aviation land use compatibility, are included in the "California Airport Land Use Planning Handbook," 2002 edition, by the State of California Department of Transportation (CalTrans) Division of Aeronautics. The CalTrans document incorporates the guidelines in "Airports and Compatible Land Use, vol.1," by the Washington State Department of Transportation, Aviation Division.

Measurement: Use the threshold of 65 DNL as the determinant in recommending limitations on land uses or establishment of noise abatement programs. Noise generated by aviation operations to, from, and around the airport at levels of 65 DNL or more are considered to potentially cause negative impacts. Cumulative noise levels have been measured around the airport and mapped as a series of contour lines connecting points of the same noise exposure. For the Renton Municipal Airport, this mapping was done in 2001, and estimated into the future to the year 2015.

Discussion: The most significant noise issue has been repeatedly identified (in Master Plan updates from 1978 on) as the impact from jet engine testing by the Boeing Company. This has also been considered the most adverse environmental impact from the airport.

Noise generated by aviation operations is a function of several factors, the characteristics of the airfield, the level of aviation operations, and the type of aircraft that uses the airport are the most notable of these.

Airport noise has been subject to federal regulation since the Aviation Safety and Noise Abatement Act of 1979 set the standard for determining what are acceptable levels for airport noise. It also adopted a single method of measurement from several that are commonly used. The Day-Night Average Sound Level (DNL) incorporates the consideration that noise is more disturbing at night when ambient noise levels are reduced. DNL measurements average all sound events and their duration over a 24-hour period. A penalty is assessed for nighttime sounds. DNL has been adopted by

all federal agencies in assessing the impact of airport noise and complies with National Environmental Protection Act requirements.

The FAA uses the threshold of 65 DNL as the determinant in recommending communities to consider noise abatement programs. Those that experience noise levels of 65 DNL or more are considered to be negatively impacted by airport noise.

Exhibit F shows noise contours for the Renton Airport projected to 2015. These estimates were derived from a study of aviation noise associated with the Renton Airport (Airport Noise White Paper, Prepared by Hanson Professional Services Inc. and Spiegel and McDiarmid for the City of Renton Airport Advisory Committee, November 2001). The study utilized the FAA's Integrated Noise Model. The model simulates noise around the airport generated by aviation activity.

The fleet mix used for the noise study was considered representative of the type of aircraft that uses the Renton Airport. It included the Boeing 737 and 757, a Beech Baron, a DeHavilland Dash 6, noise characteristics of single engine piston planes represented by a composite, and noise simulated by a Sikorsky S-76 helicopter.

Based on this study, the report concluded that Renton does not have a cumulative noise problem and noise impacts from aviation activity is expected to remain moderate (no significant increase over current levels) over the next several decades. The only area outside of the airport that is expected to be affected by the 65 DNL noise contour is the Cedar River Trail (City of Renton linear park on the east side of the Cedar River) at 65 to 70 or 75 DNL (depending on location) and slivers of land adjacent to the trail on Boeing property at 65 to 70 DNL.

The FAA has classified land uses by compatibility based on Part 150 Noise Compatibility Planning Program guidelines (also under the Aviation Safety and Noise Abatement Act of 1979). According to the FAA and based on the increased noise estimates of 2015, outdoor music events located between the 65 and 70 DNL would not be compatible and residential uses located between the 65 and 70 DNL would not be compatible without mitigation. Schools, hospitals, nursing homes, churches, auditoriums, farming, mining, and extraction (of natural resources), and outdoor sports would only be compatible with noise reduction measures.

Residential uses, outdoor music, and zoos located in the 75 – 80 DNL area would not be compatible with or without mitigation. All other uses would only be compatible with noise reduction measures.

The 2002 Renton Municipal Airport Business Plan states that "noise problems" are from a combination of sources including touch-and-go training flights, operation noise from jets, seaplanes, and other aircraft.

In addition to federal noise abatement regulations, the FAA endorses voluntary efforts as more effective than additional, new regulation. The Renton Airport Advisory

Commission has worked to develop and adopt a voluntary noise abatement program that is proving successful. This option, however, is somewhat due to the congested airspace above Renton and the high number of itinerant pilots that use the Renton Airport.

The intention of the City of Renton in developing an Airport Compatible Land Use Program is to add to the significant effort of others, working on airport issues, in increasing the safety of Renton Municipal Airport aviation operations.

Resources

1. "2001 Regional Airport System Plan," Puget Sound Regional Council, August 2001.

2. "Airport Noise White Paper," Prepared by Hanson Professional Services Inc. and Spiegel and McDiarmid for the City of Renton Airport Advisory Committee, November 16, 2001.

3. "Airports and Compatible Land Use, vol.1;" Washington State Department of Transportation, Aviation Division; February 1999.

4. "California Airport Land Use Planning Handbook;" State of California Department of Transportation, Division of Aeronautics; January 2002.

5. Leiss, William and Christine Chociolko; Risk and Responsibility; McGill-Queen's University Press; Montreal; 1994.

6. "Renton Municipal Airport Master Plan Update;" December 1988.

7. "Renton Municipal Airport and Will Rogers-Wiley Post Memorial Sea Plane Base Master Plan Update;" Bucher, Willis & Ratliff Corp.; August 1997.

8. "Renton Municipal Airport Business Plan;" Hanson Professional Services, Inc., February 7, 2002.

Exhibits

A. Renton Municipal Airport Safety Zones Map

B. Renton Municipal Airport and Urban Center – North Airport Compatible Land Use Program Area (Phase One of City of Renton ACLUP)

C. Basic Safety Compatibility Qualities from "California Airport Land Use Planning Handbook;" State of California Department of Transportation, Division of Aeronautics; January 2002

D. Federal Aviation Regulations Part 77 Surfaces

E. Safety Compatibility Criteria Guidelines – Land Use Densities and Intensities from "California Airport Land Use Planning Handbook;" State of California Department of Transportation, Division of Aeronautics; January 2002

F. Renton Municipal Airport Annual Average Noise Exposure for year 2015 (Day-Night Average sound Level) from "Airport Noise White Paper," Prepared by Hanson Professional Services Inc. and Spiegel and McDiarmid for the City of Renton Airport Advisory Committee, November 16, 2001

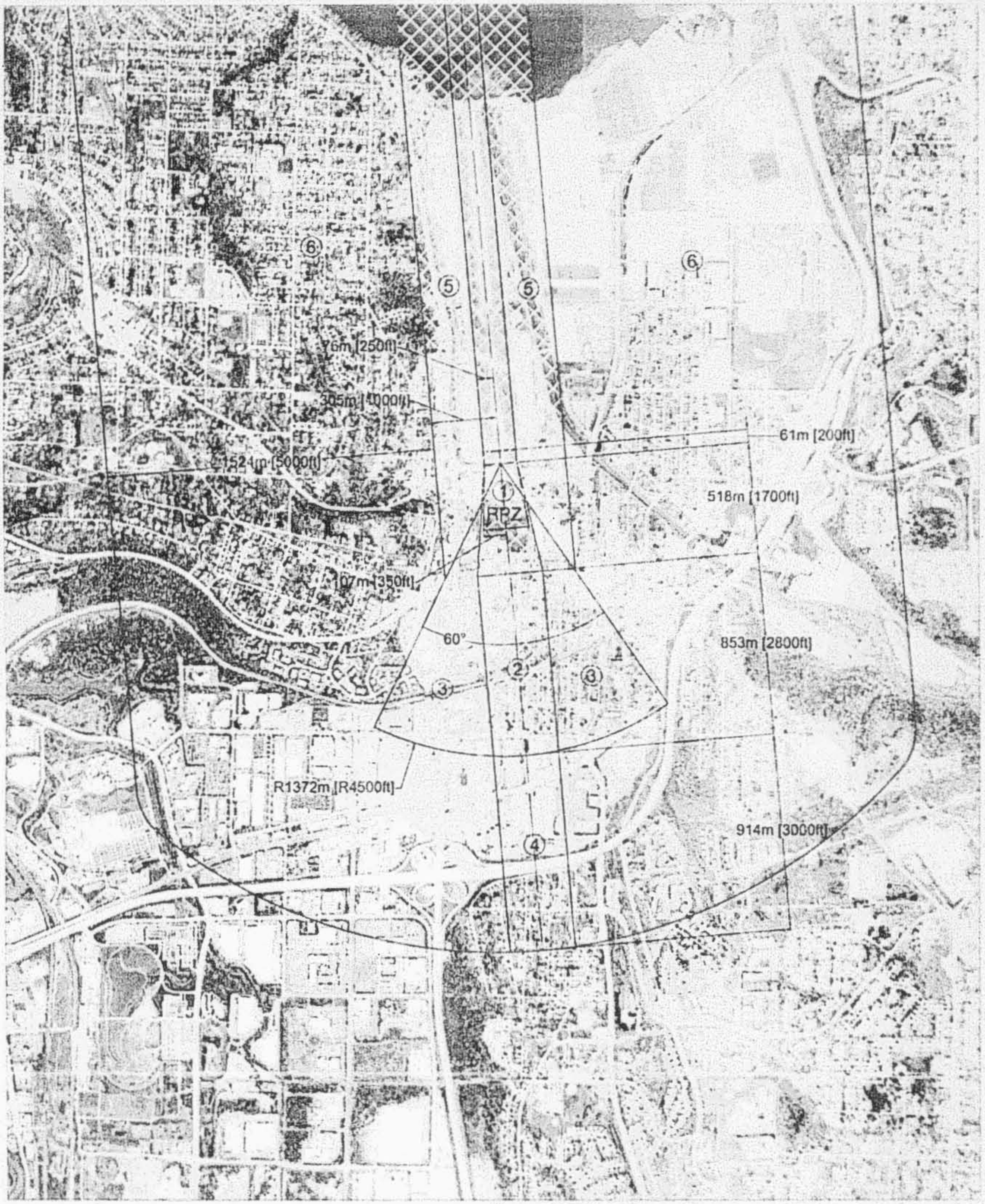


Exhibit A: Aircraft Accident Safety Zone Diagram Renton Municipal Airport

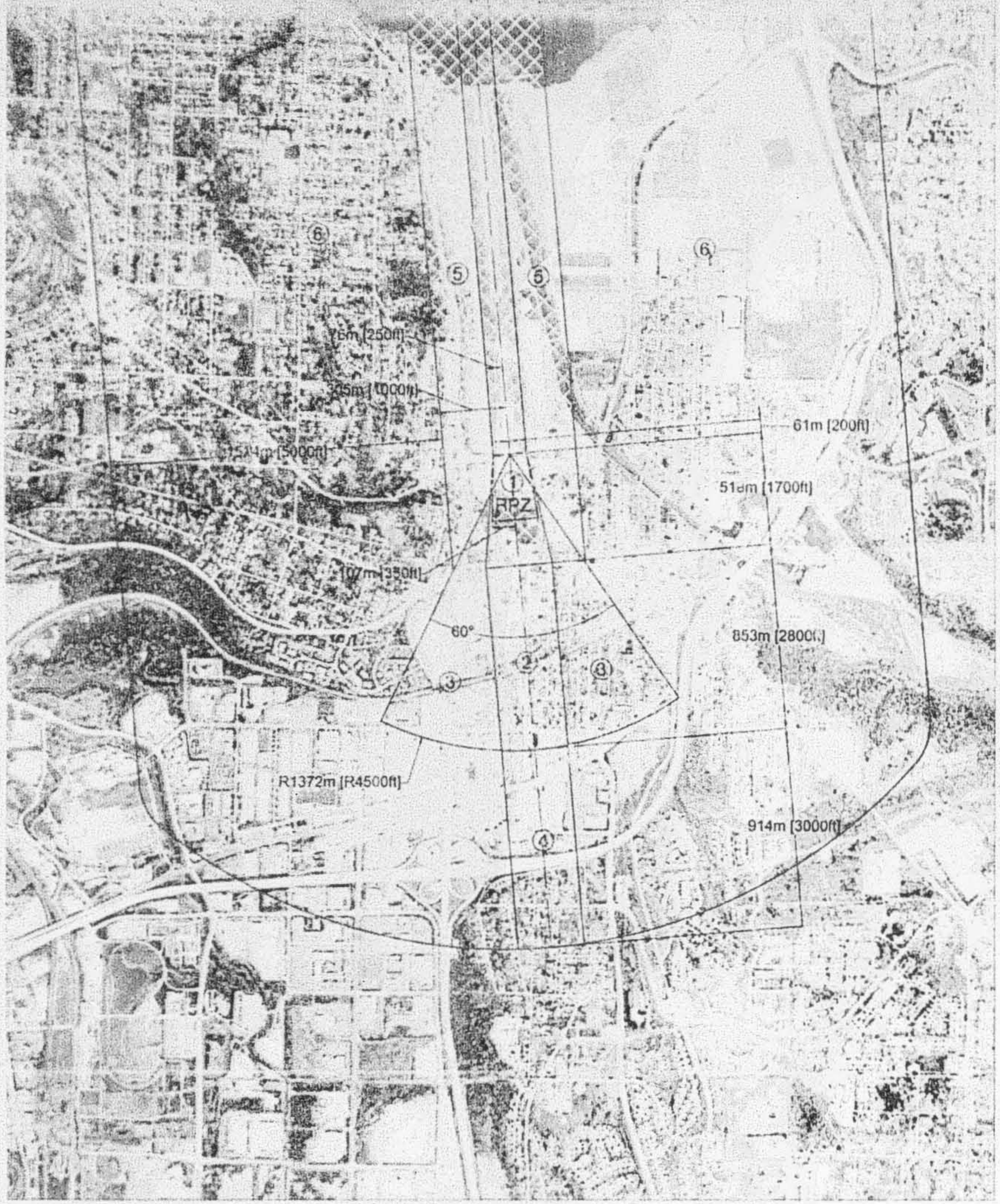
0 1400 2800

1 : 16800

Accident Safety Zones

Economic Development Neighborhoods & Strategic Planning

Exhibit A: Aircraft Accident Safety Zone Diagram Renton Municipal Airport



Economic Development Neighborhoods & Strategic Planning

Alex Pietsch, Administrator
C. Bet Rosario, D. Hasty
14 August 2003

Accident Safety Zones
(1) Runway Protection Zone
(2) Inner Safety Zone
(3) Inner Turning Zone
(60 degree sector)
(4) Outer Safety Zone
(5) Sideline Safety Zone
(6) Traffic Pattern Zone

Area of Airport Compatible Land Use Program

Area Regulated by Renton Municipal Civil Airport Related Height and Use Restrictions

0 1400 2800

1 : 16800

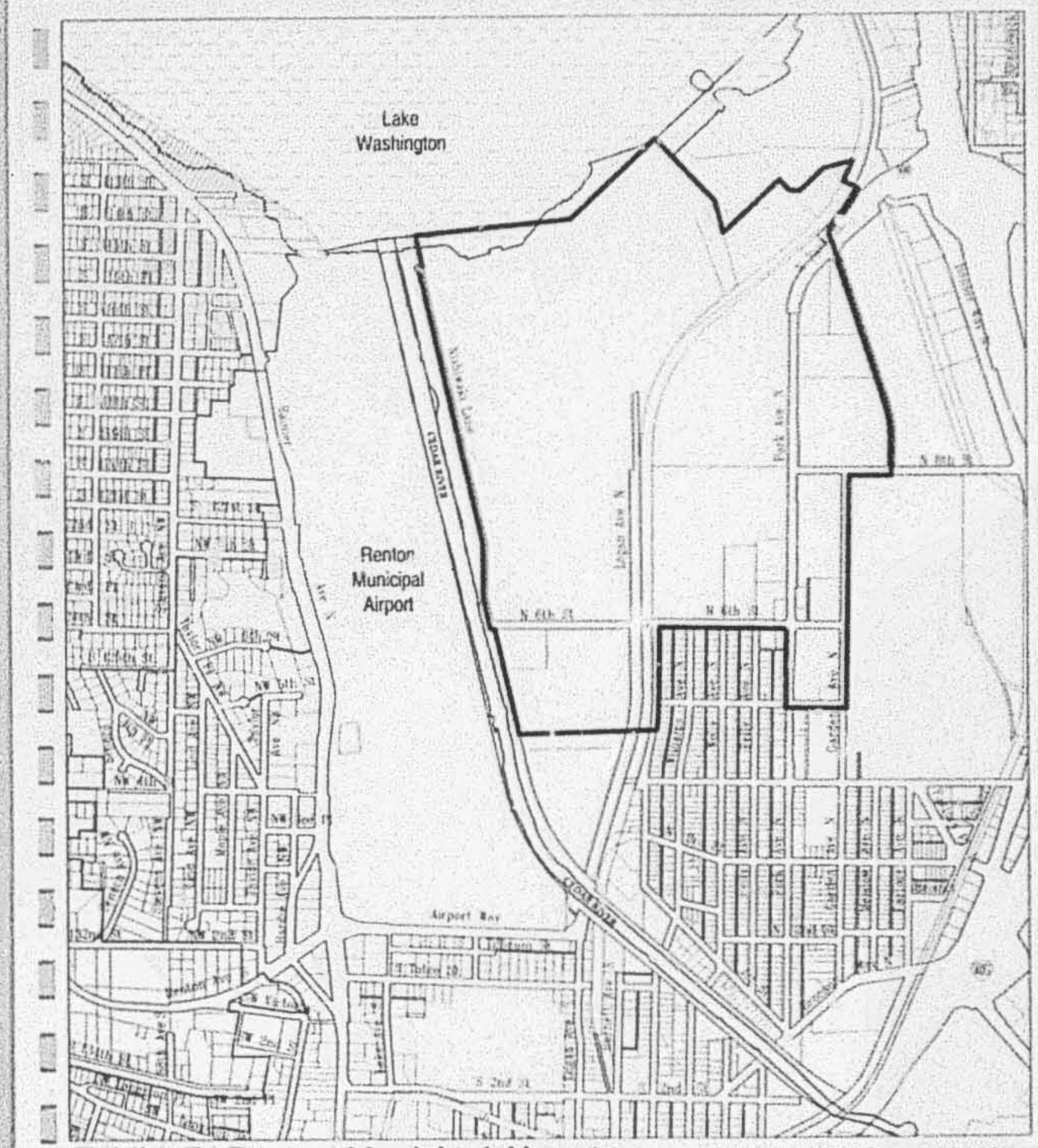

Lake
Washington
Renton
Municipal
Airport
Airport Way
Exhibit B: Renton Municipal Airport
Urban Center North Airport Compatible Land Use Program
Economic Development, Neighborhoods & Strategic Planning
Alex Pietsch, Administrator
G. Del Rosario
7 October 2003
City Boundary
Urban Center North Airport Compatible Land Use Program Boundary
0
1000
2000
1 : 12000

EXHIBIT C
Basic Safety Compatibility Qualities

Zone 1: Runway Protection Zone

Risk Factors / Runway Proximity

- Very high risk
- Runway protection zone as defined by FAA criteria

Basic Compatibility Qualities

- Airport ownership of property encouraged
- Prohibit all new structures
- Prohibit residential land uses
- Avoid nonresidential uses except if very low intensity in character and confined to the sides and outer end of the area

Zone 2: Inner Approach/Departure Zone

Risk Factors / Runway Proximity

- Substantial risk: RPZs together with inner safety zones encompass 30% to 50% of near-airport aircraft accident sites (air carrier and general aviation)
- Zone extends beyond and, if RPZ is narrow, along sides of RPZ
- Encompasses areas overflown at low altitudes — typically only 200 to 400 feet above runway elevation

Basic Compatibility Qualities

- Prohibit residential uses except on large, agricultural parcels
- Limit nonresidential uses to activities which attract few people (uses such as shopping centers, most eating establish-ments, theaters, meeting halls, multi-story office buildings, and labor-intensive manufacturing plants unacceptable)
- Prohibit children's schools, day care centers, hospitals, nursing homes
- Prohibit hazardous uses (e.g. aboveground bulk fuel storage)

Zone 3: Inner Turning Zone

Risk Factors / Runway Proximity

- Zone primarily applicable to general aviation airports
- Encompasses locations where aircraft are typically turning from the base to final approach legs of the standard traffic pattern and are descending from traffic pattern altitude
- Zone also includes the area where departing aircraft normally complete the transition from takeoff power and flap settings to a climb mode and have begun to turn to their en route heading

From: California Airport Land Use Planning Handbook (January 2002)

Basic Compatibility Qualities

- Limit residential uses to very low densities (if not deemed unacceptable because of noise)
- Avoid nonresidential uses having moderate or higher usage intensities (e.g., major shopping centers, fast food restaurants, theaters, meeting halls, buildings with more than three aboveground habitable floors are generally unacceptable)
- Prohibit children's schools, large day care centers, hospitals, nursing homes
- Avoid hazardous uses (e.g. aboveground bulk fuel storage)

Zone 4: Outer Approach/Departure Zone

Risk Factors / Runway Proximity

- Situated along extended runway centerline beyond Zone 3
- Approaching aircraft usually at less than traffic pattern altitude
- Particularly applicable for busy general aviation runways (because of elongated traffic pattern), runways with straight-in instrument approach procedures, and other runways where straight-in or straight-out flight paths are common
- A Zone can be reduced in size or eliminated for runways with very-low activity levels

Basic Compatibility Qualities

- In undeveloped areas, limit residential uses to very low densities (if not deemed unacceptable because of noise); if alternative uses are impractical, allow higher densities as infill in urban areas
- Limit nonresidential uses as in Zone 3
- Prohibit children's schools, large day care centers, hospitals, nursing homes

Zone 5: Sideline Zone

Risk Factors / Runway Proximity

- Encompasses close-in area lateral to runways
- Area not normally overflown; primary risk is with aircraft (especially twins) losing directional control on takeoff
- Area is on airport property at most airports

Basic Compatibility Qualities

- Avoid residential uses unless airport related (noise usually also a factor)
- Allow all common aviation-related activities provided that height-limit criteria are met
- Limit other nonresidential uses similarly to Zone 3, but with slightly higher usage intensities
- Prohibit children's schools, large day care centers, hospitals, nursing homes

Zone 6: Traffic Pattern Zone

Risk Factors / Runway Proximity

- Generally low likelihood of accident occurrence at most airports; risk concern primarily is with uses for which potential consequences are severe
- Zone includes all other portions of regular traffic patterns and pattern entry routes

Basic Compatibility Qualities

- Allow residential uses
- Allow most nonresidential uses; prohibit outdoor stadiums, and similar uses with very high intensities
- Avoid children's schools, large day care centers, hospitals, nursing homes

Definitions

As used in this table, the following meanings are intended:

- ***Allow:*** Use is acceptable
- ***Limit:*** Use is acceptable only if density/intensity restrictions are met
- ***Avoid:*** Use generally should not be permitted unless no feasible alternative is available
- ***Prohibit:*** Use should not be permitted under any circumstances
- ***Children's Schools:*** Through grade 12
- ***Large Day Care Centers:*** Commercial facilities as defined in accordance with state law; for the purposes here, family day care homes and noncommercial facilities ancillary to a place of business are generally allowed.
- ***Aboveground Bulk Storage of Fuel:*** Tank size greater than 6,000 gallons (this suggested criterion is based on Uniform Fire Code criteria which are more stringent for larger tank sizes)

Federal Aviation Regulations
Part 77 Imaginary Surfaces

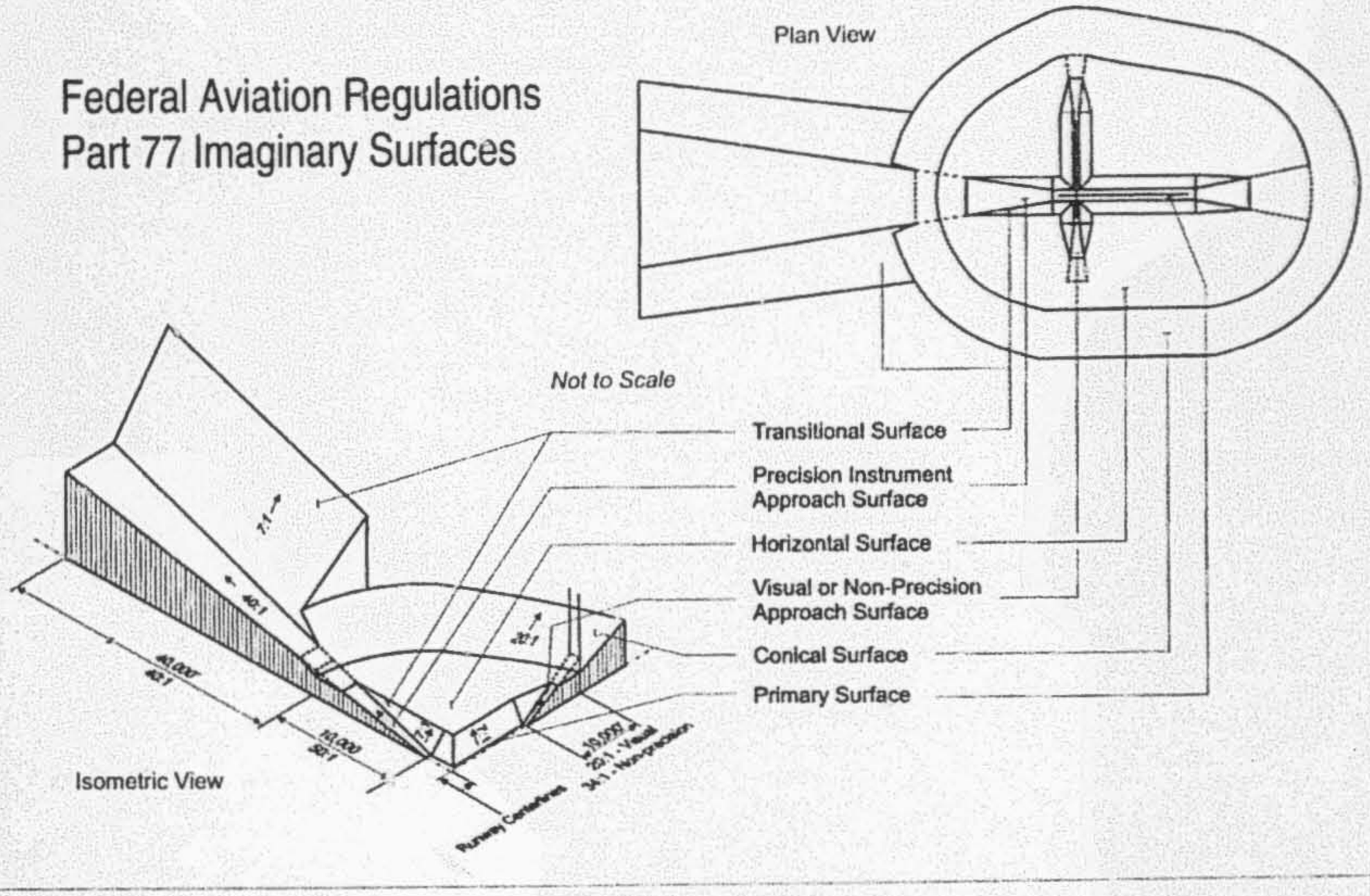


Exhibit D: City of Renton Urban Center North Airport Compatible Land Use Program

from: Denver Regional Council of Governments' Airport Compatible Land Use Design Handbook

EXHIBIT E

Safety Compatibility Criteria Guidelines – Land Use Densities and Intensities

MAXIMUM RESIDENTIAL DENSITY Safety Compatibility Zones[a]						
Current Setting	(1) Runway Protection Zone	(2) Inner Approach/ Departure Zone	(3) Inner Turning Zone	(4) Outer Approach/ Departure Zone	(5) Sideline Zone	(6) Traffic Pattern Zone
Average number of dwelling units per gross acre						
Rural Farmland/ Open Space (Minimal Development)	0	Maintain current zoning if less than Density criteria for rural/suburban setting				No limit
Rural/Suburban (Mostly to Partially Undeveloped)	0	1 d.u. per 10 – 20 ac.	1 d.u. per 2 – 5 ac.	1 d.u. per 2 – 5 ac.	1 d.u. per 1 – 2 ac.	No limit
Urban (Heavily Developed)	0	0	Allow infill at up to average of surrounding residential area[b]			No limit

[a] Clustering to preserve open land encouraged in all zones.
[b] See Chapter 3 for discussion of infill development criteria; infill is appropriate only if nonresidential uses are not feasible.

MAXIMUM NONRESIDENTIAL DENSITY Safety Compatibility Zones						
Current Setting	(1) Runway Protection Zone	(2) Inner Approach/ Departure Zone	(3) Inner Turning Zone	(4) Outer Approach/ Departure Zone	(5) Sideline Zone	(6) Traffic Pattern Zone
Average number of people per gross acre[a]						
Rural Farmland/ Open Space (Minimal Development)	0[b]	10 – 25	60 – 80	60 – 80	80 – 100	150
Rural/Suburban (Mostly to Partially Undeveloped)	0[b]	25 – 40	60 – 80	60 – 80	80 – 100	150
Urban (Heavily Developed)	0[b]	40 – 60	80 – 100	80 – 100	100 – 150	No limit[c]
Multipliers for above numbers[d]						
Maximum Number of People Per Single Acre	x 1.0	x 2.0	x 2.0	x 3.0	x 2.0	x 3.0
Bonus for Special Risk-Reduction Bldg. Design	x 1.0	x 1.5	x 2.0	x 2.0	x 2.0	x 2.0

[a] Also see Table 9B for guidelines regarding uses which should be prohibited regardless of usage intensity.
[b] Exceptions can be permitted for agricultural activities, roads, and automobile parking provided that FAA criteria are satisfied.
[c] Large stadiums and similar uses should be prohibited.
[d] Multipliers are cumulative (e.g. maximum intensity per single acre in inner safety zone is 2.0 times the average intensity for the site, but with risk-reduction building design is 2.0 x 1.5 = 3.0 the average intensity).

From: California Airport Land Use Planning Handbook (January 2002)

Exhibit F: Renton Municipal Airport -
Annual average noise exposure for year 2015

17 October 2002

75 DNL
70 DNL
65 DNL
City Limits

0 800 1600

Source: Airport Master Plan Renton Municipal Airport, August 1997

Appendix C
Air Quality Technical Memorandum

Memorandum

To: Mike Blumen, Blumen Consulting Group and Shawna Mulhall, City of Renton

From: Lawrence Spurgeon

Date: July 30, 2003

Subject: Air Quality Review for Boeing Renton Comprehensive Plan Amendment EIS

Introduction

The Boeing Renton Comprehensive Plan Amendment proposes amendment of the Renton Comprehensive Plan and rezoning to allow for potential future redevelopment of several properties currently part of the Boeing Renton Plant site. Four alternatives are being evaluated to compare the range of options for redevelopment. All alternatives include commercial redevelopment and two of the alternatives also allow for residential redevelopment. Detailed description of the alternatives is presented in the Draft EIS.

The greatest potential for air quality impacts from most mixed-use redevelopment results from vehicle emissions associated with increased transportation demand. Localized changes in zoning to allow for mixed-use redevelopment within the urban area are generally neutral or beneficial to regional air quality, as they allow development to occur within the urban area that could otherwise locate outside of the area and result in longer commute times. The redevelopment may result in local increases in pollutant emissions and increased localized pollutant concentrations. There would also be temporary increases in dust and other pollutant emissions during construction.

Background on Land Use and Transportation Air Quality

Air quality in the Renton area is regulated by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (WADOE), and the Puget Sound Clean Air Agency (PSCAA). Under the Clean Air Act, EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide. These pollutants are called criteria pollutants. Substantial CO and ozone precursor (pollutants that lead to ozone formation in the atmosphere) emissions come from motor vehicles.

The federal Clean Air Act (CAA) defines nonattainment areas as geographic regions that have been designated as not meeting one or more of the NAAQS. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS. Renton lies within ozone and CO air quality maintenance areas. In addition, air quality emissions in the Puget Sound Region are currently being managed under the provisions of Air Quality Maintenance Plans (AQMP) for ozone and CO. PSCAA and WADOE developed the current plans, and the EPA approved the CO and ozone plans in 1996 and the PM_{10} plan in 2000. Any regionally significant transportation project in the Puget Sound Air Quality Maintenance areas must conform to the AQMPs.

Commercial sources of air pollution, ranging from individual dry cleaning establishments to large industrial complexes, are regulated by PSCAA. The Boeing Renton Plant is currently operating under air pollution permits administered by that agency. Any commercial redevelopment would have to conform to PSCAA regulations.

reducing the potential for negative impact to the regions air quality. Vehicle emissions are controlled with federal and state-mandated technologies and programs to reduce emissions from individual vehicles and by managing transportation system and land use development to maintain conformity to the Puget Sound Region ACMPs.

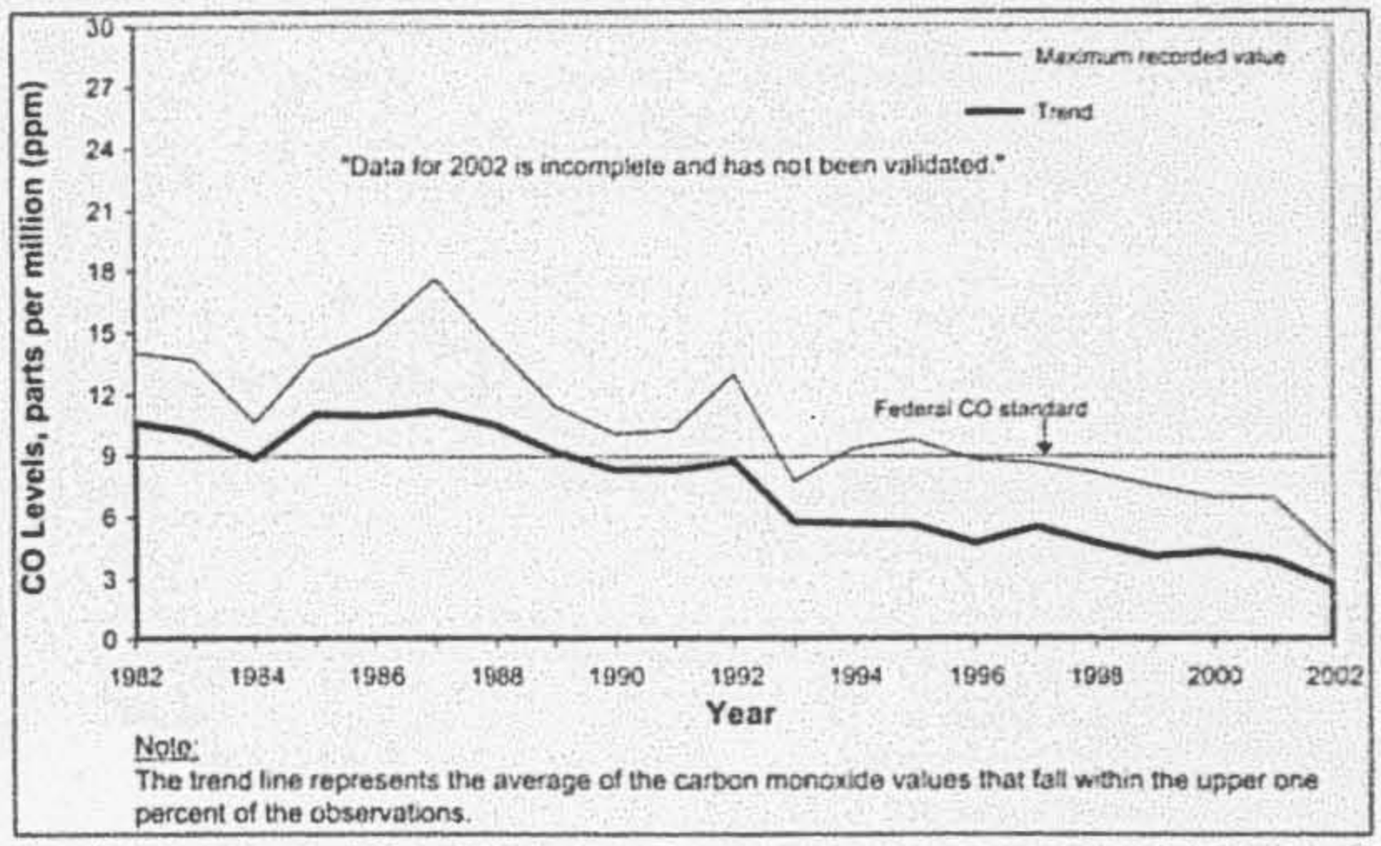
The major source of CO is vehicular traffic, industry, wood stoves, and slash burns. In urban areas, motor vehicles are often the source of over 90 percent of the CO emissions that cause ambient levels to exceed the NAAQS (*U.S. EPA, 1992*). The effects of CO are usually localized, occurring near congested roadways and intersections during autumn and winter, and associated with light winds and stable atmospheric conditions. CO concentrations in most areas have decreased over time due to more stringent federal emission standards for new vehicles and the gradual replacement of older, more polluting vehicles.

Ozone is a highly toxic form of oxygen and a major component of the complex chemical mixture that forms photochemical smog. Ozone is not emitted directly, but formed by a reaction between sunlight, NO_x, and hydrocarbons (HC). Ozone is primarily a product of regional vehicular traffic and point source and fugitive emissions of the ozone precursors. Maximum ozone levels generally occur in the summer between noon and early evening at locations several miles downwind from the sources.

Particulate matter includes small particles of dust, soot, and organic matter suspended in the atmosphere. Particles less than 10 micrometers in size are measured as PM_{10}. Sources of particulates include motor vehicles, industrial boilers, wood stoves, open burning, and dust from roads, quarries, and construction activities. High PM_{10} concentrations occur in fall and winter during periods of air stagnation and high use of wood for heat.

Nationwide, air pollutant emissions from motor vehicles have dropped considerably since 1970, even as vehicle travel has increased rapidly. Nationally, emissions of all criteria pollutants decreased 25% between 1970 and 2001. In general, the air is noticeably cleaner than in 1970, and all criteria pollutant emissions from motor vehicles are less than they were in 1970. This reduction has occurred along with increasing population, economic growth, and vehicle travel. The emission trends for individual pollutants from mobile sources are more complex, as new technologies have been more effective at reducing some pollutants than others. Volatile Organic Compound (VOC) emissions (also referred to as hydrocarbon emissions) have decreased 38 percent, oxides of nitrogen (NO_x) emissions have increased 15 percent, emissions of PM10 have decreased 76 percent, and carbon monoxide (CO) emissions have decreased 19 percent (*U.S. EPA, 2002*).

Regional air pollutant trends have generally followed national patterns over the last 20 years. While the average weekday vehicle miles traveled in the central Puget Sound region has increased from 30 million miles in 1981 to 65 million in 1999 (*PSRC, 2000*), pollutants emissions associated with transportation sources has decreased. Carbon monoxide is the criteria pollutant most closely tied to transportation, with over 90 percent of the CO emissions in the Puget Sound urban areas coming from transportation sources. Regionally, the maximum measured CO concentrations have decreased over the past 20 years (Figure 1). The NAAQS for CO is 9 ppm averaged over eight hours. Other transportation pollutants have followed similar but less pronounced trends.



Source: Washington State Department of Ecology, 2003

Figure 1. Puget Sound CO Trend

The Puget Sound Regional Council (PSRC) completed a regional emission analysis to evaluate the air quality effects of Destination 2030, the Metropolitan Transportation Plan (MTP) for the central Puget Sound region through 2030. The emission budget from the latest AQMP and the most recent emission trend modeling are shown in Table 1.

The downward trend in CO is expected to continue for the Puget Sound region through 2020, but is expected to begin increasing again by 2030. For ozone, the future trend is not as positive. Hydrocarbon emissions (HC), which largely drive ozone formation in the central Puget Sound region, are projected to increase between 2010 and 2020 and continue to increase to 2030. However, hydrocarbon emissions are expected to be below the emissions budget through 2030.

Table 1. Destination 2030 Air Pollutant Emission Projections (tons per day)

Pollutant	AQMP Budget	2010 PSRC MTP Forecast	2020 PSRC MTP Forecast	2030 PSRC MTP Forecast
CO	1,497	860	719	735
HC	248	164	171	202
NO_x	263	206	199	217

Source: PSRC, 2001

Note: The AQMP Budget is the regional budget for pollutants from transportation sources included in the Puget Sound Air Quality Maintenance Plans.

Air Pollutant Emissions

Air pollutant emissions from commercial tenants of redeveloped parcels in the site area would depend on the specific activities and operations that would occur at the individual facilities. Generally, office and residential redevelopment would have lower potential for point-source emissions than industrial development. It is assumed that both continued Boeing operations and any other future industrial operations would conform to PSCAA regulations and permit conditions.

Air pollutant emissions from individual vehicles are a function of speed (Figure 2). Pollutant emissions per vehicle mile traveled are also decreasing over time because vehicle emission controls have been improving and older higher-emission vehicles are gradually replaced with newer lower-emitting vehicles. Emissions of pollutants other than CO follow similar trends to CO. Air pollutant emissions associated with transportation sources generally have the greatest potential for air quality impacts as a result of redevelopment activities.

During redevelopment there would be construction of various improvements, including roads, utilities, and buildings. Construction activities generate emissions from heavy-duty construction equipment (such as bulldozers, backhoes, and cranes), diesel-fueled mobile sources (such as trucks, brooms, and sweepers), diesel-and gas-fueled generators, and on- and off-site project-generated vehicles (such as service trucks, pickups, etc). Construction activities also generate fugitive dust. Fugitive emissions from particulate matter less than10 micrometers in size (PM_{10}) would be associated with demolition, , ground excavation, cut-and-fill operations, and construction. Construction emissions would be greatest during earthwork activities, because most emissions would be associated with moving dirt in the redevelopment area. PM_{10} emissions would vary over the course of redevelopment, depending on the level of activity, specific operations, and weather conditions.

Source: PSRC, 2003

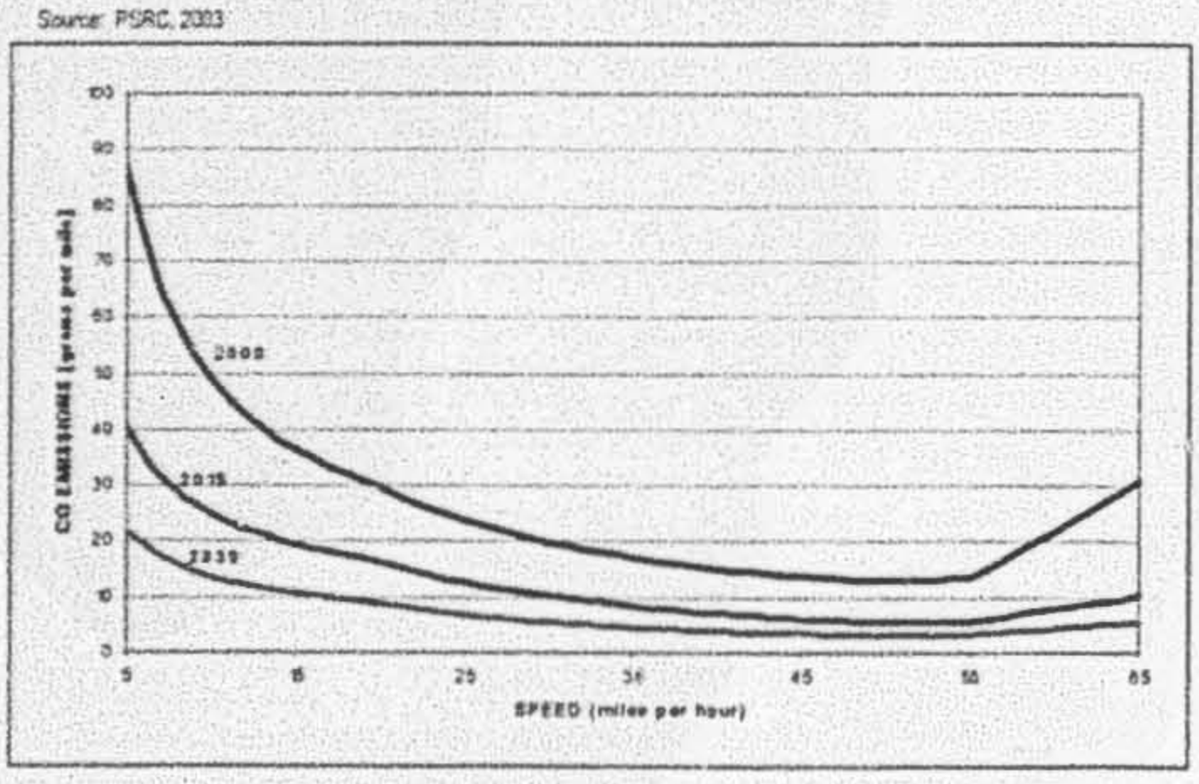


Figure 2. Puget Sound Vehicle Emissions for Various Speeds and Years

Operational Impacts of the Alternatives

Redevelopment under each of the alternatives would create localized transportation demand in the Renton vicinity. If the redevelopment is not accommodated in the Renton urban area, it would likely be distributed elsewhere within the Puget Sound region. The increased transportation demand would likewise be distributed elsewhere.

The total regional effect on mobile source pollutant emissions would depend on the development distribution. If the development is distributed further from the urban core and does not include a balance of commercial and residential in a given area, the total vehicle traffic generated in the Puget Sound Region would be greater than under the alternatives. If the development is developed mixed-use and distributed within the already urban areas in the region, it could result in lower total transportation demand than the alternatives. Because alternative regional locations to serve growth cannot be projected at this time, the total regional effect on air pollution associated with the differences in transportation demand can not be calculated, but can be assumed to be small (*U.S. EPA, 2000*).

Localized pollutant emissions can be compared based on transportation demand differences between the alternatives. Vehicle Miles Traveled (VMT) and average speed associated with the redevelopment under each of the alternatives were calculated for the PM peak period by Transportation Engineering Northwest LLC (TENW) (Table 2). The transportation air pollutant emissions associated with each alternative were calculated by multiplying the VMT (Table 2) for each alternative with the appropriate emission factor (Figure 2) considering the average speed and year. Approximately ten percent of traffic occurs during the PM peak-hour; therefore, it was assumed for comparative purposes that ten percent of traffic emissions would occur during the peak hour.

Table 2. PM Peak Vehicle Miles Traveled and Average Speed (mph)

Alternative	2015 Network B		2015 Network C		2030	
	VMT	Speed	VMT	Speed	VMT	Speed
Alternative 1	53,400	28.7	51,829	26.1	51,829	26.4
Alternative 2	49,100	28.7	47,700	26.1	47,700	26.4
Alternative 3	55,600	28.7	54,000	26.1	67,200	26.4
Alternative 4	61,800	28.7	60,000	26.1	103,300	26.4

Source: TENW, 2003

Notes: Alternatives 1 and 2 are assumed to be fully built-out by 2015. 2030 projected VMT is based on 2015 redevelopment levels. Networks B and C represent different regional transportation development and are fully discussed in the transportation section of the Draft EIS.

The use of average speed and the assumption that the PM peak-hour emissions are ten percent of the daily emissions are both conservative because they assume traffic throughout the day operates similarly to the PM peak period. During off-peak periods, actual traffic volumes are lower, average speed is higher, and congestion is reduced; therefore, the actual emissions during the off-peak period would likely be less than those obtained with these peak-period assumptions. As a result, the total daily emissions under each alternative would likely be less than the values shown in Table 3; however, the relative ranking would be the same so the results obtained by this method do provide a valid comparison of local emissions between the alternatives.

Local air pollutant emissions from traffic associated with the alternatives would vary depending on the year and projected VMT (Table 3). Comparison of the conservative estimate of local emissions for each of the alternatives to the regional emissions budgets (Table 1) for each pollutant shows that the localized emissions are less than 0.5% of the regional transportation emission budget. Because the redevelopment in the Renton area would accommodate growth that would otherwise occur elsewhere in the Puget Sound region, reducing local emissions in other areas, no substantial impact to regional air quality would be expected under any of the alternatives.

Local emissions under Alternative 2 would be the lowest for all of the alternatives. Emissions under Alternative 2 would be nine percent less on average than Alternative 1. Alternatives 3 and 4 would be four and sixteen percent greater, respectively, on average than Alternative 1 in 2015 and thirty and ninety-nine percent greater in 2030.

Table 3. Local Transportation Pollutant Emissions (tons per day)

Alternative	2015 Network B			2015 Network C			2030		
	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x
Alternative 1	52	08	10	56	09	10	30	09	09
Alternative 2	48	08	09	52	08	09	28	08	08
Alternative 3	54	08	10	59	09	10	39	11	12
Alternative 4	60	09	12	65	10	11	60	18	18

At this stage, specific local roadway network configuration and traffic circulation within the redevelopment area is speculative as there is no definitive redevelopment plan. Prior to future construction of new signalized intersections, a local intersection-level conformity analysis would be completed pursuant to WAC 173-420-120, which requires analysis of newly signalized intersections in air quality nonattainment and maintenance areas. This analysis would be completed for the specific intersection and freeway interchange configuration and signal timings, and would consider vehicle operations associated with the specific proposed land uses in the future.

Redevelopment under any of the alternatives would not be expected to cause significant adverse impacts to regional or local air quality considering the expected build-out schedule and emission trends. Intersection-level CO concentrations would be modeled at specific intersections during a later phase of development to ensure that localized pollutant concentrations would not exceed the NAAQS.

Air Quality Impacts During Construction

The Puget Sound Clean Air Agency (PSCAA) regulates particulate emissions (in the form of fugitive dust during construction activities). Construction impacts would include emissions from construction vehicles and equipment and fugitive emissions of particulate matter less than 10 micrometers in size (PM_{10}) during demolition, ground excavation, cut-and-fill operations, and road and building construction. Construction emissions would be greatest during the earthwork phase of each individual roadway or building project, because most emissions would be associated with moving dirt.

The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity. PM_{10} emissions also would depend on soil moisture, silt content of soil, wind speed, and the amount and type of operating equipment. Larger dust particles would settle near the source, and fine particles would be dispersed over greater distances from the construction site.

Based on field measurements of suspended dust emissions from construction projects, an approximate emission factor for construction operations would be 1.2 tons per acre of construction per month of activity (*U.S. EPA, 1999*). Emissions would be reduced if less site area was disturbed or mitigation was performed.

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate small particulates, CO, and NO_x in exhaust emissions. If construction traffic and lane closures were to increase congestion and reduce the speed of other vehicles in the area, emissions from traffic would increase temporarily while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site. No on-site burning of slash or other debris would be allowed.

Mitigation of Air Quality Impacts

Because no significant adverse regional traffic air quality impacts are expected once construction is complete, no regional operational traffic mitigation would be required. Specific intersection-level mitigation would be evaluated prior to completion of future intersection or interchange construction. If all future commercial and industrial operations meet PSCAA requirements, no other long-term significant adverse air quality impacts would occur.

During construction, best management practices could be required to minimize fugitive dust emissions. Possible best management practices and mitigation measures to control PM_{10}, deposition of particulate matter, and emissions of CO and NO_x during construction are listed below (*Associated General Contractors of Washington, 1997*).

- Spraying exposed soil with water or other dust palliatives would reduce emissions of PM_{10} and deposition of particulate matter.
- Covering all trucks transporting materials, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck) would reduce PM_{10} and deposition of particulates during transportation.
- Containing and properly disposing of any asbestos and lead-based paints during removal of existing buildings would reduce the release of these elements into the environment.
- Providing wheel washers to remove particulate matter that vehicles would otherwise carry offsite would decrease deposition of particulate matter on area roadways.
- Removing particulate matter deposited on paved, public roads would reduce mud and resultant windblown dust on area roadways.
- Routing and scheduling construction trucks to reduce delays to traffic during peak travel times would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.
- Placing quarry spall aprons where trucks enter public roads would reduce mud track-out.
- Graveling or paving haul roads to reduce particulate emissions.
- Requiring appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel would reduce CO and NO_x emissions in vehicular exhaust.

- Using relatively new, well-maintained equipment would reduce CO and NO_x emissions.
- Routing construction trucks away from residential areas would minimize annoyance from dust.

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