CHAPTER D.

Development Concepts and Alternatives Analysis

INTRODUCTION. The purpose of this chapter is to present the Development Plan Alternatives and/or Recommendations for Olympia Regional Airport in terms of both their concept and reasoning. Therefore, several basic assumptions have been established, which are intended to direct the future development and maintenance of the Airport. These assumptions are supported by the aviation activity forecasts and include a commitment for continued airport development, which supports the economic development needs of the region.

Development Assumptions

The *first assumption* states that Runway17/35 will be maintained to Airport Reference Code (ARC) C-II dimensional standards, with the exception of Taxiway "W", which will be maintained to Airplane Design Group III dimensional standards. It is understood that the FAA will only fund improvement and maintenance projects to standards as indicated by the demand at the time.

The *second assumption* states that Runway 08/26 will be maintained to ARC B-II dimensional standards, which includes reducing the runway width from 150 feet to 75 feet as funding becomes available.

The *third assumption* states that Runway 17 will be evaluated for future Instrument Approach Procedure (IAP) upgrade from the existing ½-mile visibility minimums to 1,800 feet Runway Visual Range (RVR) visibility minimums.

The *fourth assumption* states that Runway 35 will be evaluated for future IAP upgrade from the existing one mile visibility minimums.

The *fifth assumption* states that the existing visual approaches to Runway 08/26 will be evaluated for future IAP upgrades.

The *sixth assumption* states that the general aviation landside development potential of the Airport's northeast development area will be maximized, through infill development and expansion, prior to initiating development south of Runway 08/26.

The *seventh assumption* states that no alternatives analysis is required for the relocation of the existing passenger terminal building complex, as it is conveniently located and the site offers adequate expansion capability, should expansion be necessary in the future.

Development Goals

Accompanying these assumptions are several goals, which have been established for purposes of directing the plan and establishing continuity in the future development of the Airport. These goals take into account several categorical considerations relating to the needs of the facility, both in the short-term and the long-term, including safety, noise, capital improvements, land use compatibility, financial and economic conditions, public interest and investment, and community recognition and awareness. While all are project-oriented, some obviously represent more tangible activities than others; however, all are deemed important and appropriate to the future of the Airport.

The following goals are intended to guide the preparation of this Master Plan Update (MP Update, and direct the future development of Olympia Regional Airport:

- **Plan the Airport to accommodate the forecast aircraft fleet safely, with facilities properly sized to accommodate the projected forecast demand.**
- **Program facilities to be constructed when demand is realized (construction is to be driven by actual demand, not forecast demand).**
- **Ensure that the future development of the Airport will continue to accommodate a variety of general aviation activities, ranging from small general aviation users to large corporate aviation operators.**
- **Enhance the self-sustaining capability of the Airport and ensure the financial feasibility of all future development.**
- **Develop land acquisition priorities (i.e., fee simple and/or easement), if necessary, related to airport safety, future airport development, and land use compatibility.**

- **Encourage the protection of existing public and private investment in land and facilities, and advocate the resolution of any potential land use conflicts, both on and off airport property.**
- **Plan and develop the Airport to be environmentally compatible with the community and minimize environmental impacts on airport property.**
- **Provide effective direction for the future development of the Airport through the preparation of a rational plan and adherence to the adopted development program.**
- **Integrate the Airport's ground transportation access requirements with the area's regional transportation goals.**
- **Promote compliance with existing overlay zoning regulations within the Airport vicinity to encourage land use compatibility and ensure appropriate zoning requirements within the airport environs.**

Airside & Landside Development Issues

Introduction

To accommodate the projected operational demand at Olympia Regional Airport through the year 2030 (i.e., the end of the 20-year planning period), various development alternatives have been identified for evaluation relative to the previously specified planning issues and are presented in the following development plan analysis. Both the forecast operations and the goals of the Port of Olympia, relative to aviation development and economic enhancement, have been incorporated into this planning effort. It is important to note that a final Recommended Development Plan will be prepared based on the analysis of these planning issues, and the recommended plan will likely represent a combination of the various development concepts presented. Additionally, a graphic summary of the selected planning recommendations for Olympia Regional Airport is presented in Figure D15, entitled *CONCEPTUAL DEVELOPMENT PLAN*, located at end of this chapter. However, prior to the presentation of the development alternatives, a listing of the key airport airside and landside planning issues have been generated, and includes:

Airside Planning Issues

- **Instrument Approach Criteria**
- **Threshold Siting Surface Criteria**
- **Runway Lighting & Navigational Aids**

- **Airfield Taxiway System**

Landside Planning Issues

- **General Aviation Development**
- **Aviation-Related or Aviation Compatible Development**
- **Airport Access Roadways**

Airside Development Concepts

Instrument Approach Criteria

Runway 17 Instrument Approach. At present, Runway 17 is equipped with an Instrument Landing System (ILS) IAP providing visibility minimums of ½-statute mile, and a Global Positioning System (GPS) Localizer Performance with Vertical Guidance (LPV) IAP having visibility minimums of ¾-mile. The weather conditions at the Airport that correspond with the minimums of the ILS IAP occur approximately 8.3% of the time annually. This compares to 6.3% of the time annually for the LPV IAP. The current ALP for the Airport proposes an IAP upgrade to the existing ILS that would provide 1,800-foot RVR visibility minimums. This IAP upgrade would increase the time annually that this runway is available for operation during Instrument Flight Rules (IFR) conditions from approximately 8.3% to 8.8%, or about 44 hours per year.

Option One. Upgrade the existing Runway 17 Category I ILS IAP to provide 1,800-foot RVR visibility minimums. This upgrade would require the installation of an RVR touchdown zone (TDZ) sensor and additional runway approach lighting, which are describe in greater detail in later sections. Also, the size of the existing Runway Protection Zone (RPZ) for Runway 17 would be maintained.

Option Two. Maintain the existing Runway 17 Category I ILS and LPV IAPs, which would not require the installation of an RVR TDZ sensor or additional runway approach lighting.

Based upon the combination of existing weather conditions for the region and the desire to improve access to the Airport, the Sponsor has elected to protect the Airport's capability to implement future Category I ILS enhancements to Runway 17, as described in Option One, and this project will be identified on the *Conceptual Development Plan* for the Airport.

Runway 35 Instrument Approach. At present, Runway 35 is equipped with a GPS IAP providing visibility minimums of one statute mile. The weather conditions at the Airport that correspond with the minimums of this GPS IAP occur approximately 4.7% of the time annually. The existing Olympia Regional Airport ALP proposes an upgrade to this IAP that would provide ½-statute mile visibility minimums. This IAP upgrade would increase the time annually that this runway is available for operation during IFR conditions, without consideration of wind coverage, from approximately 4.7% to 8.8%, or about 359 hours per year.

> ***Option One.*** Upgrade the existing Runway 35 GPS IAP to provide ½-mile visibility minimums. Based upon the instrument approach evaluation presented in the previous chapter, this approach upgrade would require the trimming/removal of existing off-airport tree obstructions, and the installation of a qualified approach lighting system. In addition, the size of the existing RPZ for Runway 35 would have to be enlarged to 1,000' x 1,750' x 2,500' in conjunction with the future implementation of the upgraded approach.
>
> ***Option Two.*** Maintain the existing Runway 35 GPS IAP, which would not require the trimming or removal of any tree obstructions or the installation of an approach lighting system.

Based upon the combination of existing weather conditions for the region and the desire to improve access to the Airport, the Sponsor has elected to protect the Airport's capability to upgrade the existing Runway 35 GPS IAP, as described in Option One. This project will be identified on the *Conceptual Development Plan* for the Airport.

Runway 08 Instrument Approach. This runway is currently provided with a visual approach and the Airport's existing ALP proposes the maintenance of this approach. Based upon the preliminary instrument approach evaluation that was conducted in the previous chapter and the existing utilization patterns of this runway, it is recommended that the existing visual approach to this runway end be maintained and be identified on the *Conceptual Development Plan* for the Airport.

Runway 26 Instrument Approach. This runway is currently provided with a visual approach and the existing ALP protects for the future implementation of an IAP providing one mile visibility minimums. This IAP upgrade would increase the time annually that this runway is available for

operation during IFR conditions, without consideration of wind coverage, around 4.0%, or about 350 hours per year, depending on the specific minimums that could be achieved.

Option One. Upgrade the runway's existing visual approach with a future GPS IAP to provide one mile visibility minimums. Based upon the instrument approach evaluation presented in the previous chapter, this approach upgrade would require an obstruction survey to identify any potential obstructions located within the final and missed approach segments. Preliminary analysis indicates that a turning missed approach would likely be required to avoid existing terrain and trees. In addition, the size of the existing RPZ for Runway 26 would be maintained.

Option Two. Maintain the existing Runway 26 visual approach.

Based upon the combination of existing weather conditions for the region and the desire to improve access to the Airport, the Sponsor has elected to protect the Airport's capability to upgrade the existing Runway 26 visual approach with a future GPS IAP, as described in Option One. This project will be identified on the *Conceptual Development Plan* for the Airport.

Threshold Siting Criteria

Runway 17/35 Threshold Siting Surface (TSS) Criteria. As presented in the previous chapter, Runway ends 17 and 35 are sited to achieve adequate TSS clearance over surrounding terrain, roads, trees, and other identified objects. However, with the planned IAP upgrade to Runway 35 with visibility minimums below ¾-mile, the threshold siting criteria would change from a Runway Type 8 to a Type 9, and the obstacle evaluation surface slope is altered from 20:1 to 30:1. This slope alteration would result in the addition of multiple tree obstructions to the future TSS evaluation surface. These trees would have to be trimmed or removed to comply with the specified clearance requirements. Because these trees are located outside the current boundary of the Airport, the Port would have to initiate negotiations with the individual property owners for the trimming and/or removal of the trees and the establishment of a tree trimming/avigation easement for the individual parcels.

Runway 08/26 TSS Criteria. As presented in the previous chapter, Runway 26 does not currently meet the TSS criteria for visual approaches because of a tree located east of Old Highway 99 on private property. However, with the planned implementation of an IAP with visibility minimums of one mile, the TSS criteria would change from a Runway Type 3 to a Type 5. Consequently, the obstacle evaluation surface is altered such that the tree would no longer be

considered an obstruction. Therefore, the future IAP implementation would resolve the existing threshold siting deficiency for Runway 26.

Runway Lighting and Navigational Aids

Runway 17/35 Lighting & Navigational Aids. Based upon the recommended future instrument approach upgrade to Runway 17 (i.e., the future implementation of an IAP with RVR 1,800-foot visibility minimums), additional runway approach lighting, consisting of both TDZ lights, and runway centerline lighting (RCL), would be required for installation. The following illustrations, entitled *RUNWAY 17/35 CENTERLINE LIGHTING* and *RUNWAY 17 TOUCHDOWN ZONE LIGHTING*, present the required lighting diagrams for the implementation of the IAP upgrade. In addition, a single RVR TDZ sensor is required for this IAP upgrade, and would be located between 750 to 1,000 feet south of the Runway 17 threshold, and within 400 feet of the runway centerline.

For the proposed IAP upgrade to Runway 35, no additional ground-based NAVAIDS (i.e., glide slope or localizer antenna facilities) would be required for installation on the field to support the procedure. However, a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) is to be installed to Runway 35 to achieve the lighting credit for the lower approach visibility minimums. This option is presented on the Figure D3, entitled *RUNWAY 35 MALSR.*

Runway 08/26 Lighting & Navigational Aids. It is not anticipated that any ground-based NAVAIDS will be required to implement the future Runway 26 IAP. However, Medium Intensity Runway Lights (MIRL) will be required on Runway 08/26 before the proposed IAP can be implemented. In addition, based upon existing runway utilization patterns, it is recommended that a PAPI be installed to Runway 26.

Taxiway System

Runway 17/35 Taxiway System. This runway is equipped with an existing parallel taxiway (i.e., Taxiway "W") and several entrance and exit taxiways (i.e., Taxiways "B", "G", and "L"), which serve the west side of the runway. Taxiway "F" serves as a partial parallel taxiway on the east side of the runway, as do exit Taxiways "C", "D", "G" and "L". As presented in the previous chapter, the existing ALP illustrates a future parallel taxiway located 400 feet west of Runway 17/35 to correct the slight deficiency associated with Taxiway "W" not being a true parallel taxiway for the entire length of the runway. Additionally, the existing ALP illustrates a future relocated full-length parallel Taxiway "F" positioned 400 feet east of the runway.

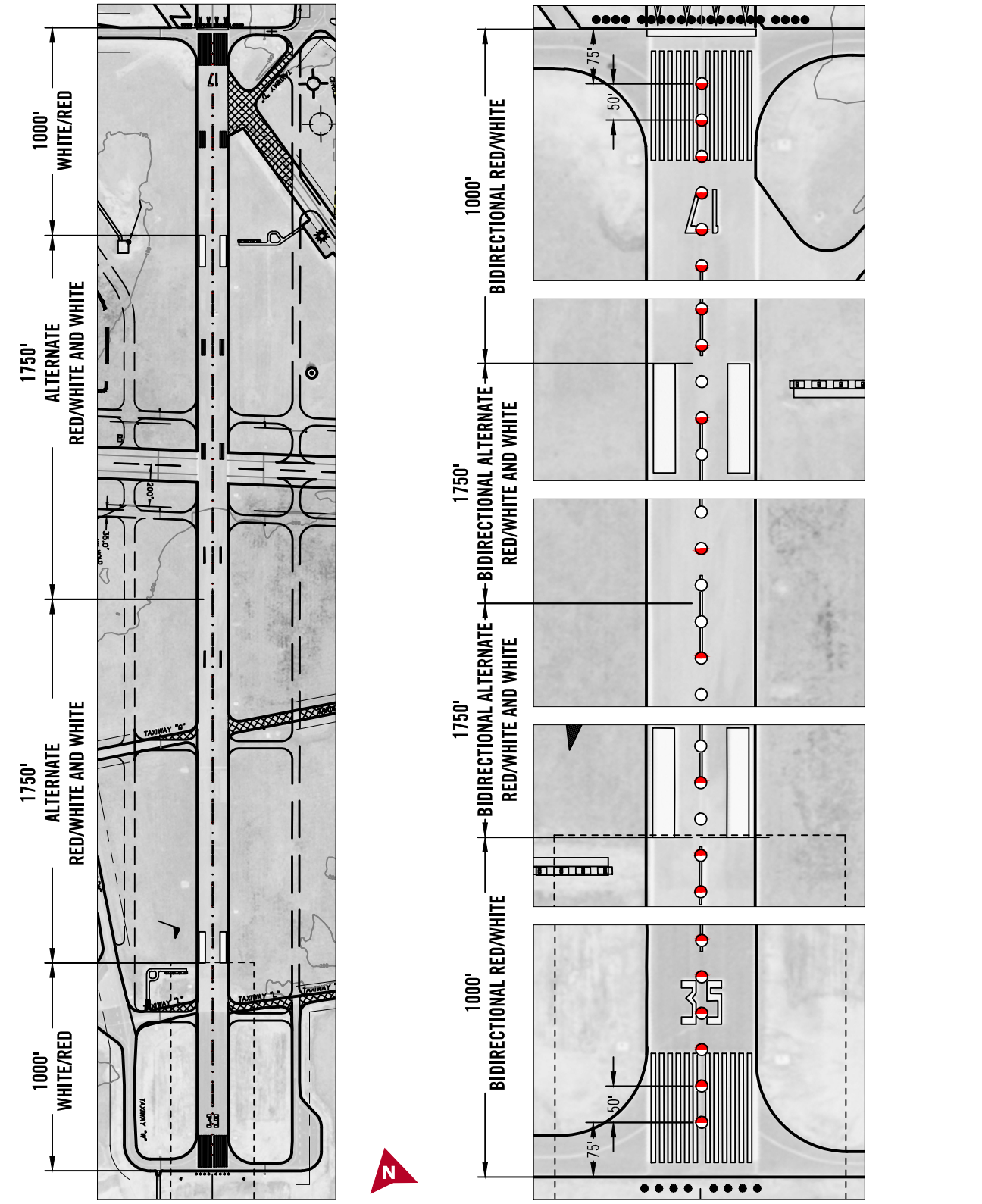
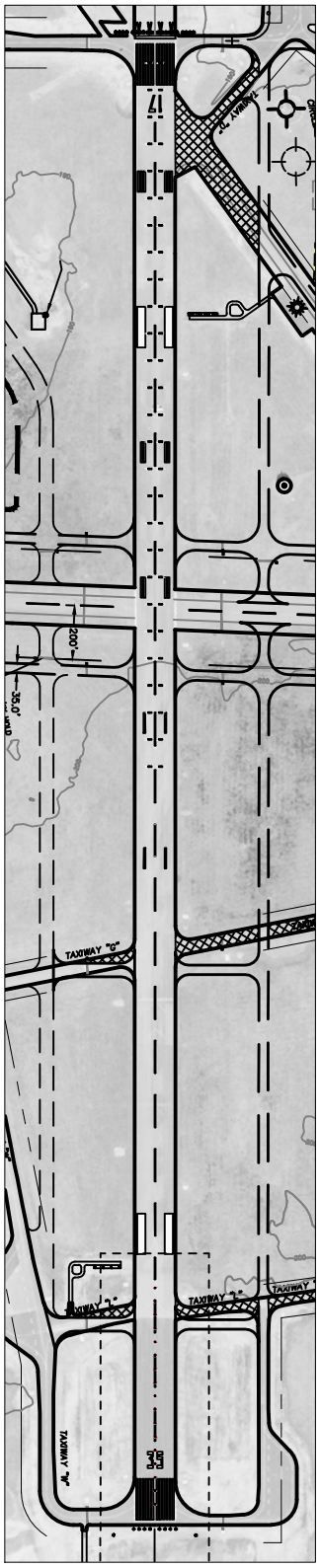


FIGURE D1

Runway 17/35 Centerline Lighting



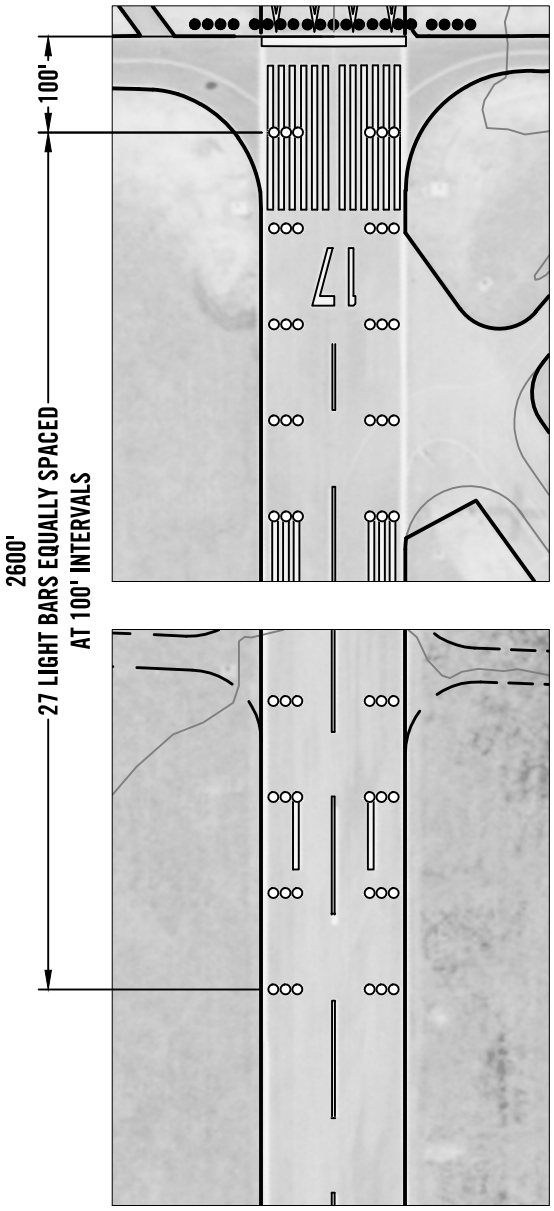


FIGURE D2
Runway 17 Touchdown Zone Lighting

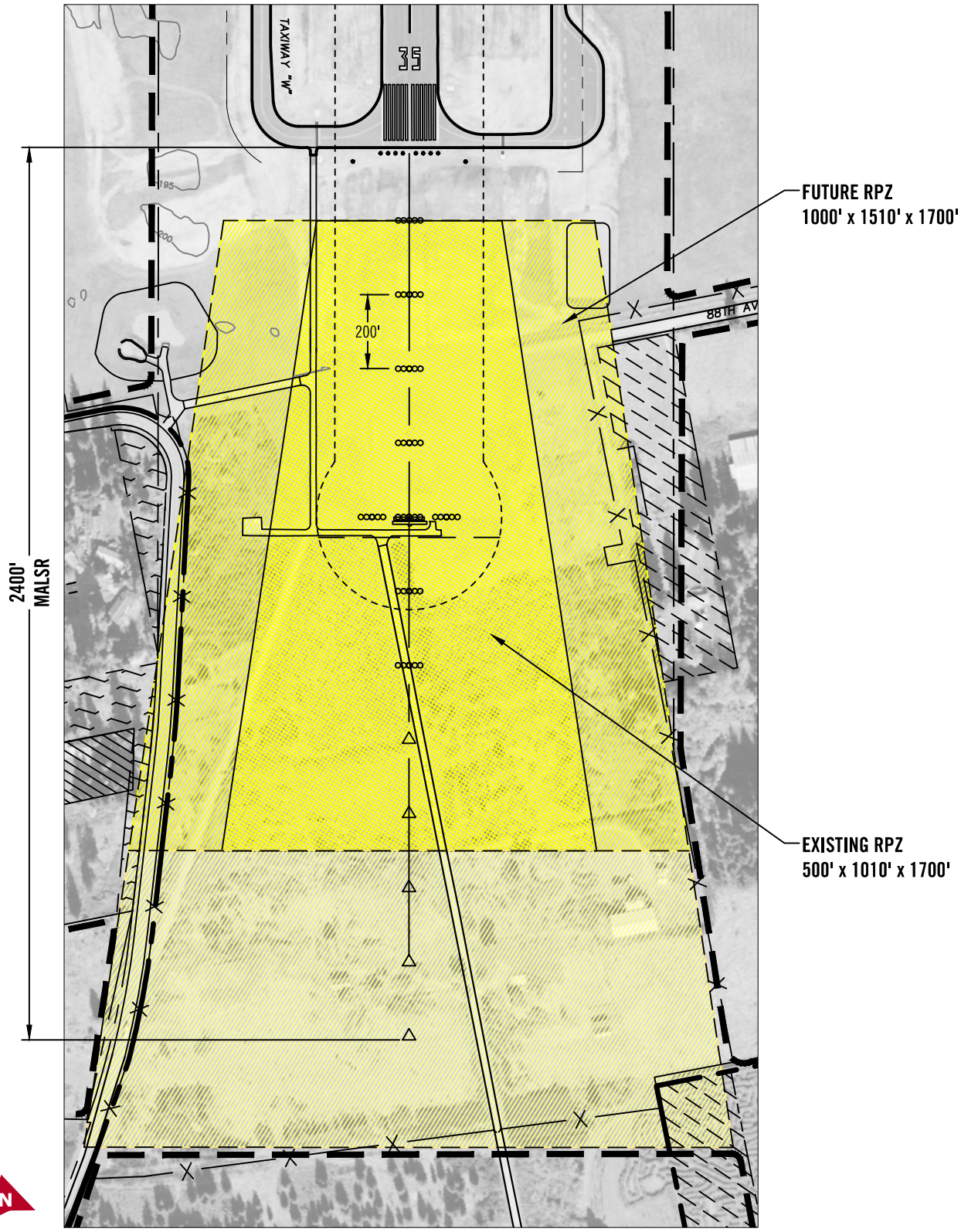


FIGURE D3

Runway 35 MALSR

As presented in the previous chapter, there are several components of the Runway 17/35 entrance/exit taxiway geography that could cause potential runway incursions. Specifically, Taxiways "C", "D", "G", and "L" do not intersect the runway at right angles, as recommended by FAA Engineering Brief No. 75: *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*. It should be noted that one option available to the Port of Olympia for alleviating these issues is to request a safety/compliance determination from the FAA Airports District Office stating that the existing taxiway geometry does provide an acceptable level of safety as presently configured. If the Airports Division is unable to issue such a finding, then the following taxiway improvements designed to increase the safety and efficiency of Runway 17/35 are offered, as illustrated in the following figure entitled *RUNWAY 17/35 TAXIWAY SYSTEM IMPROVEMENTS*.

Taxiways "C" and "D". The need for the Taxiways "C" and "D" intersection with Runway 17/35 can be eliminated with the provision of parallel Taxiway "F" east of the runway. Therefore, it is recommended the pavement associated with Taxiways "C" and "D" between the future parallel taxiway and the runway be removed when the parallel Taxiway "F" segment between the two taxiways is completed.

Taxiways "G" and "L". The reconfiguration of Taxiways "G" and "L" at right angles to the runway can be accomplished when pavement reconstruction is required.

It is also recommended that all existing and future taxiways serving Runway 17/35 be equipped with Medium Intensity Taxiway Lights (MITL) for the clear delineation of each taxiway.

Runway 08/26 Taxiway System. This runway is currently served by Taxiways "E", "G", and "W", which function as a parallel taxiway system by providing access to each runway end. Taxiways "F" and "C" serve as exit taxiways for this runway. The current ALP illustrates two full-length parallel taxiways, one on each side of the runway, located 240 feet from the runway centerline, which would increase efficient use of this runway.

As detailed in the previous chapter, there are several components of the Runway 08/26 taxiway geometry that have the potential for causing runway incursions, as detailed by FAA Engineering Brief No. 75. Specifically, these are Taxiways "C", "E", "F", "G", and "W". Of particular importance are entrance Taxiways "E", "G", and "W", because pilots waiting to enter the runway are presented with the difficult task of looking over their shoulders for verification that the runway is not occupied or aircraft are not on final approach to the runway.

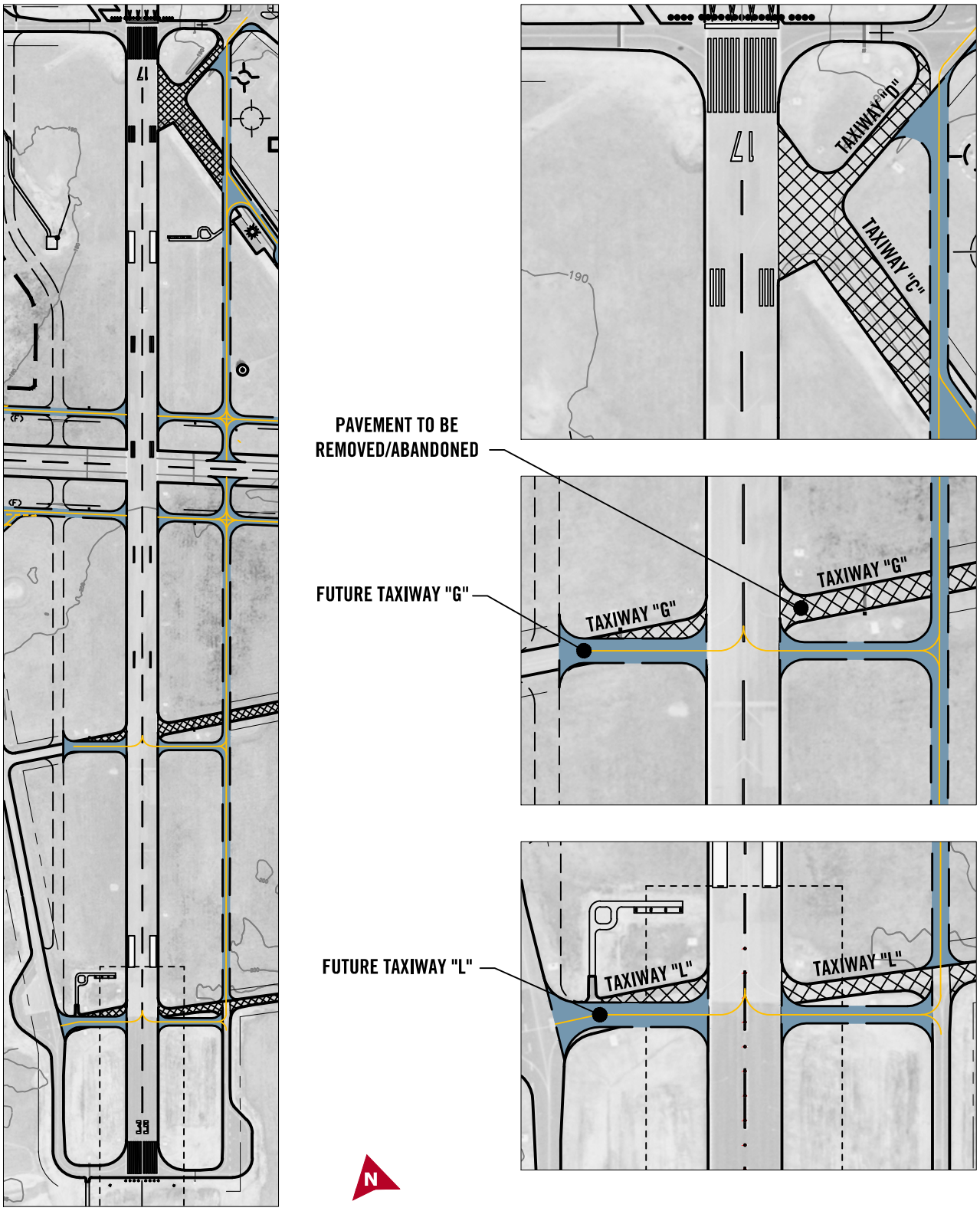


FIGURE D4

Runway 17/35 Taxiway System Improvements

As with the Runway 17/35 taxiway system configuration issues, it is recommended that the Port of Olympia request a safety/compliance determination from the FAA Airports District Office. Should the determination indicate that reconfiguration is necessary, then the following solutions are offered and illustrated in the following figure entitled *RUNWAY 08/26 TAXIWAY SYSTEM IMPROVEMENTS*.

Taxiways "E" and "G". The reconfiguration of entrance Taxiways "E" and "G" at the Runway 26 threshold resolves the most severe intersection angle of the taxiway system (i.e., Taxiway "E" at 38°). When combined with the parallel taxiways on both sides of Runway 08/26, the entrance taxiways can be resolved with right-angled connections.

Taxiway "W". The approximate 77° intersection of Taxiway "W" with the Runway 08 threshold can be resolved with additional pavement and remarking the taxiway centerline to ensure adequate space for aircraft to hold at a right angle at the required 250 feet from the runway centerline.

Taxiways "C" and "F". It is recommended that Taxiways "C" and "F" pavements be removed north of Runway 08/26 and an additional taxiway provided that aligns with the existing Taxiway "F" south of the runway. This new taxiway will continue to provide aircraft access between Runway 35 and the northeast development area until full-parallel taxiways can be provided for Runways 17/35 and 08/26. This exit taxiway would also serve to increase the capacity of the runway by allowing a greater percentage of aircraft to exit the runway safely near the midpoint of the runway.

It is also recommended that all existing and future taxiways serving Runway 08/26 be equipped with MITL for the clear delineation of each taxiway.

Landside Development Concepts

General Aviation Development

According to the forecast based aircraft counts, expected increase in both training and itinerant medevac helicopter operations, and the facility requirement projections that were presented in the previous chapter, alternative development options have been evaluated that will accommodate the projected aviation demand for the 20-year planning period and beyond.

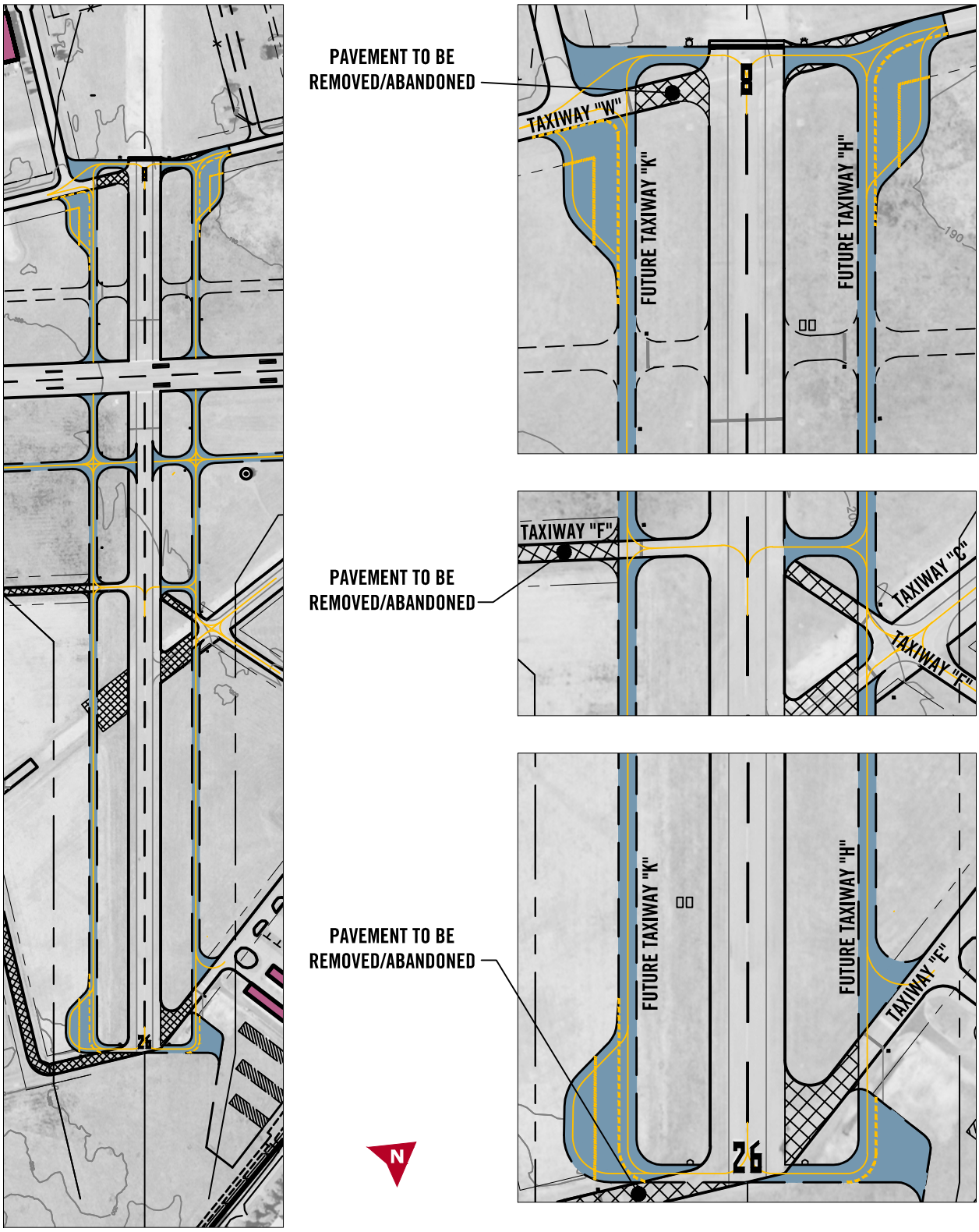


FIGURE D5

Runway 8/26 Taxiway System Improvements

It should be noted that the future development of aircraft storage facilities at Olympia Regional Airport would be demand dictated. Therefore, the number, size, and location of these facilities will vary depending on the demand for the specific type, and the development plans must be flexible to accommodate a variety of user groups. Additionally, there are important development guidelines that the airport Sponsor should consider when making hangar placement determinations at the Airport. These include:

- Each executive hangar should be supplied with taxiway access that is separated from automobile access and adjacent automobile parking. This is most efficiently accomplished when a row of hangars is developed and provided with taxiway access on one side and automobile access and parking on the other side.
- Each T-hangar should be nested and developed with taxiway access to both sides of the hangar. Controlled automobile access should be provided to the taxiway/apron area near the T-hangars, and a public access parking area should be provided near the T-hangar facilities to accommodate both users and visitors.

It is most efficient to "double load" both the taxiway access and the automobile access routes with hangars. More specifically, the access taxiways/taxilanes are to be lined with hangars on both sides and the automobile roadways/parking areas are also to be lined with hangars on both sides. Typically, the airside spacing between the hangars is dictated by the clear width door design of the hangars, with a 79-foot Taxilane Object Free Area (TOFA) width being specified for Airplane Design Group (ADG) I aircraft, which compares to a 115-foot TOFA spacing for ADG II aircraft.

Based upon input received from the Airport Sponsor, coupled with the projected aircraft storage improvements that will be needed to serve the aviation users, the following hangar, apron, and access taxiway development improvement options have been identified, and are presented on the following detail illustrations, as well as the *Conceptual Development Plan* for the Airport. It is important to recognize that the ultimate build-out of the various aviation development areas presented below far exceeds that which is projected for the 20-year planning period of this study.

Northeast Aviation Development Area. As noted in Chapter A of this document, the majority of the Airport's existing landside aviation facilities are located along the west side of Old Highway 99 SE, within the Northeast Aviation Development Area. As a result, there are very few undeveloped parcels within this area of the Airport. In accordance with the Port's Comprehensive Scheme of Harbor Improvements, this area is currently defined for general

aviation development and this future planning recommendation is indicated on the existing ALP. The south end of the area, adjacent to the approach end of Runway 26, would provide space to develop as many as three additional T-hangars, or a combination of T-hangars and tiedown apron. Infill development could also provide for as many as one additional T-hangar. Airside access is provided from Taxiway "E", while vehicular access is provided from Old Highway 99 SE. Any additional development occurring in this area could be accommodated within the existing infield area southwest of Taxiway "E", but access to and from this area would require Air Traffic Control (ATC) clearance to cross the aircraft movement area. In addition, a future location for a Final Approach Takeoff Area (FATO) has been sited on Taxiway "C", just south of the compass rose, to better serve the Airport's existing helicopter operations. A schematic layout of the continued build-out of this area is presented on the following illustration, entitled *NORTHEAST AVIATION DEVELOPMENT AREA*.

Northwest & West Aviation Development Area. The boundary of the Northwest and West Aviation Development Area is defined by Tumwater Boulevard to the north and by Runway 08/26 to the south, the Runway 17/35 Building Restriction Line (BRL) to the east, and roughly by Terminal Street SW to the west. The Port's current plan for this area, as reflected by the Comprehensive Scheme of Harbor Improvements, identifies corporate aviation development and reservation of expansion areas for the commercial passenger terminal and support facilities. Airside access would be provided from new connector taxiway development extending from Taxiway "W". Vehicular access into these areas would be provided from Terminal Street SW and Tumwater Boulevard. The reservation of approximately 0.8 acres for aviation support development (i.e., future fuel storage capacity) is recommended northeast of the existing fuel storage facilities. These proposed land uses are also reflected on the existing ALP, and a schematic layout of the expanded corporate aviation development and the existing passenger terminal development area is presented on Figure D7, entitled *NORTHWEST AVIATION DEVELOPMENT AREA,* and Figure D8, entitled *WEST AVIATION DEVELOPMENT AREA.*

Southwest Aviation Development Area. This development area is bounded by 88th Avenue SE to the south and by Runway 08/26 to the north, the Runway 17/35 BRL to the east, and roughly by Terminal Street S.W. and Armstrong Road SW to the west. The Port's current plan for this area, as reflected by the Comprehensive Scheme of Harbor Improvements, recommends a combination of general aviation and light industrial development that could accommodate a variety of aviation uses, ranging from various aircraft storage facilities to commercial and/or industrial aviation-related businesses. Airside access would be provided from new connector taxiway development extending from Taxiway "W". Vehicular access would be provided from

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FUTURE GENERAL AVIATION HANGAR DEVELOPMENT AREA
w/ TIE-DOWN APRON

FUTURE ROAD w/ AUTO PARKING

OLD HWY 99 SE

RUNWAY PROTECTION ZONE

ROFA (E)

RSA (E)

TAXIWAY 'B'

TAXIWAY 'D'

TAXIWAY 'E'

TAXIWAY 'F'

TAXIWAY 'C'

FUTURE FATO
& APZ

FUTURE PARALLEL TAXIWAY

25' BUILDING RESTRICTION LINE

RUNWAY 17/35

RUNWAY 8/26

LONG-TERM GENERAL AVIATION
DEVELOPMENT AREA (APPROX. 75 ACRES)

AVIATION-RELATED/COMPATIBLE
LIGHT INDUSTRIAL
DEVELOPMENT AREA
(APPROX. 150 ACRES)

FUTURE ROADWAY

KEY MAP

Scale: 1" = 300'

Source: City of Olympia 2008

FIGURE D6

Northeast Aviation Development Area

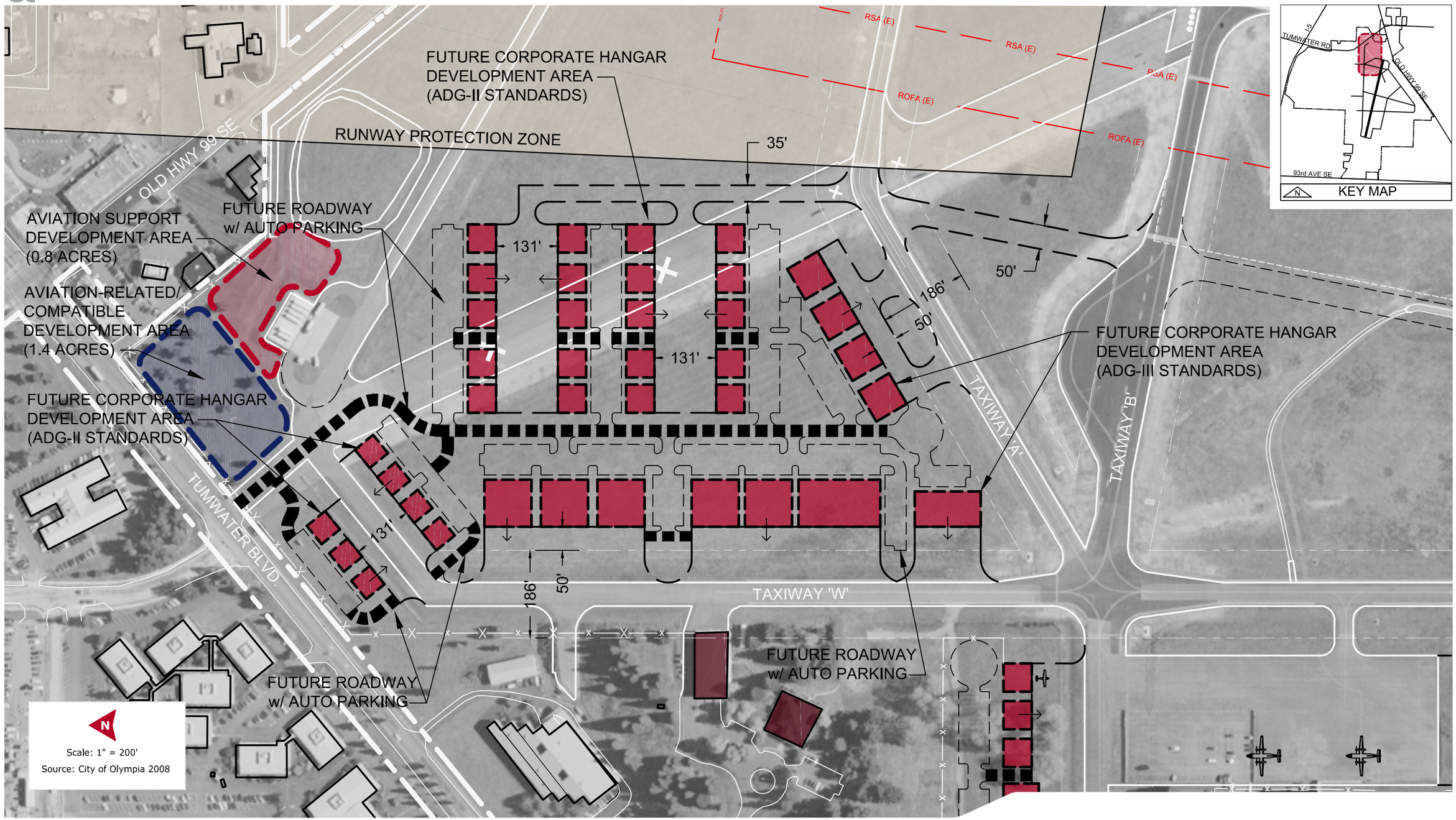

FIGURE D7

Northwest Aviation Development Area

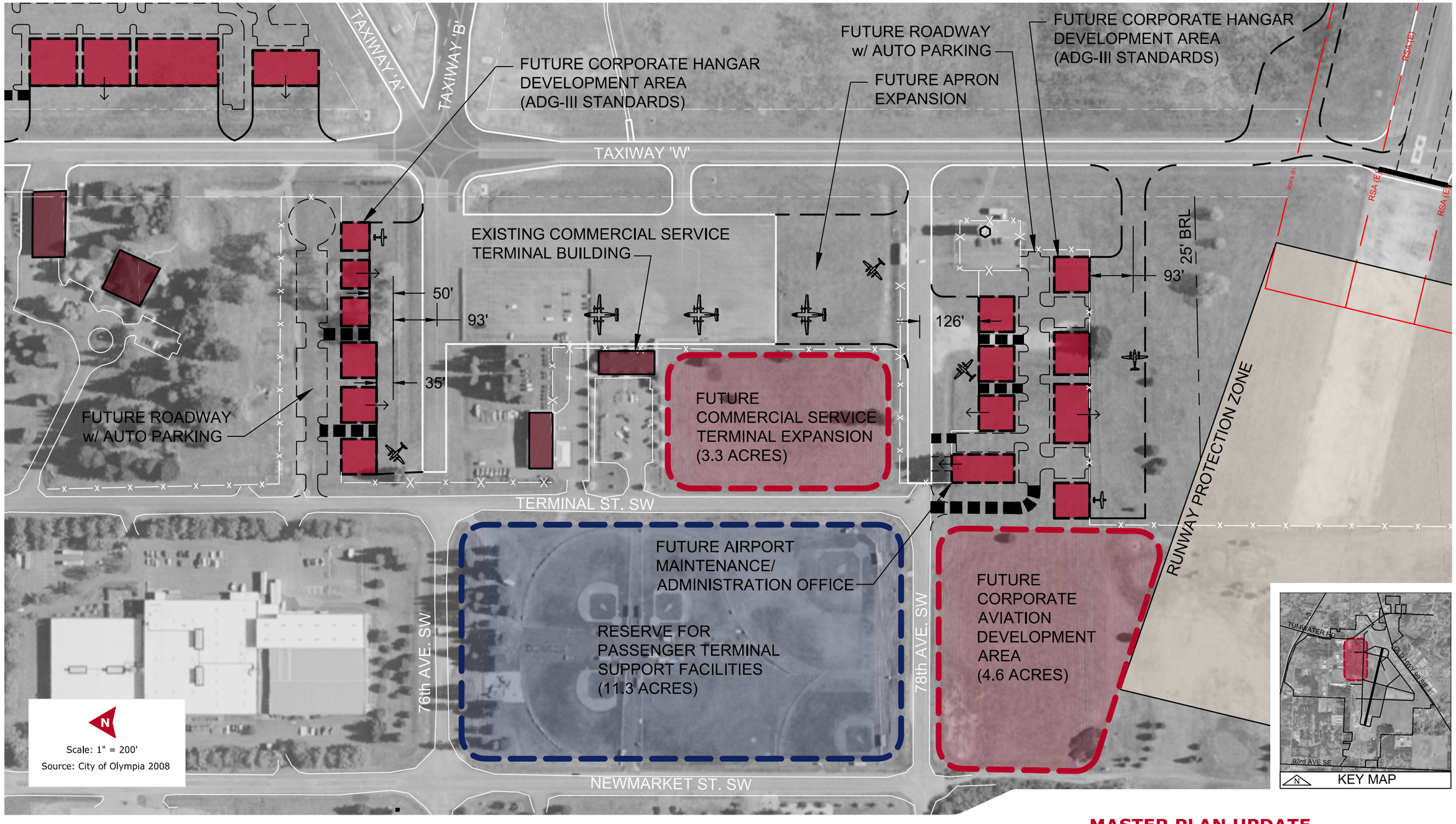

FIGURE D8

West Aviation Development Area

Terminal Street SW. These proposed land uses are also reflected on the existing ALP, and a schematic layout of the initial development is presented on Figure D9, entitled *SOUTHWEST AVIATION DEVELOPMENT AREA.*

Southeast Aviation Development Area. The Southeast Aviation Development Area is bounded by 88th Avenue SE to the south, Runway 17/35 BRL to the west, the Runway 08/26 BRL to the north, and by Old Highway 99 SE to the east. The Port's current plan for this undeveloped area of the Airport, which consists of approximately 75 acres, recommends a combination of long-term general aviation and light industrial reserve property that could accommodate a variety of aviation uses, ranging from various aircraft storage facilities to commercial and/or industrial aviation-related businesses. Airside access would be provided from new connector taxiway development extending from future parallel Taxiways "F" and "K". Vehicular access would be provided from 88th Avenue SE and by Old Highway 99 SE. These proposed land uses are also reflected on the existing ALP, and a schematic layout of the initial development is presented on the following figure entitled *SOUTHEAST AVIATION DEVELOPMENT AREA*.

Aviation-Related or Aviation-Compatible Development

The siting requirements for aviation-related/compatible facilities can vary significantly, with some facilities requiring large development sites for initial construction and future expansion capability, while others require only small shops or small portions of larger facilities. Depending upon the specific operation, these facilities may, or may not, require direct airside access, but all must be provided convenient landside access and adequate vehicular parking for customers, vendors, and employees. Potential development sites, consisting of commercial, office, and/or light industrial uses, are currently located on the west side of the Airport, with a large tract of future light industrial development being identified within the southeast quadrant of the Airport. These areas have the potential of generating leasehold revenue for the facility, and should be marketed by the Airport Sponsor as potential revenue producing properties. The recommended designation of aviation-related/aviation compatible land use property on the Airport is presented in the following text. As described previously for the various aviation development expansion areas on the Airport, the ultimate build-out of the various aviation-related/aviation compatible development areas on the Airport will be demand driven, and likely far exceeds that which is projected for the 20-year planning period of this study.

Southeast Aviation-Related Development. There are two tracts of airport property, consisting of approximately 117 acres and 33 acres that have been identified on the southeast side of the Airport for aviation-related/aviation compatible development. The northernmost tract can be

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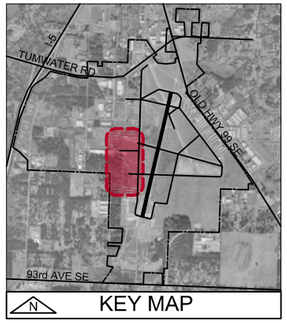

FUTURE CORPORATE HANGAR DEVELOPMENT AREA (ADG-III STANDARDS)

FUTURE TAXIWAY

TAXIWAY 'W'

TAXIWAY 'G'

ROFA (E)

RSA (E)

FUTURE CORPORATE HANGAR DEVELOPMENT AREA (ADG-III STANDARDS)

25' BRL

93'

93'

186'

FUTURE ROADWAY w/ AUTO PARKING

FUTURE CORPORATE HANGAR EXPANSION AREA (APPROX. 34 ACRES)

FUTURE LARGE HANGAR DEVELOPMENT AREA (ADG-III STANDARDS)

25' BRL

25' BRL

TERMINAL ST. SW

FUTURE ROADWAY w/ AUTO PARKING

RUNWAY PROTECTION ZONE

PAT KENNEDY WAY SW

FUTURE PROPERTY ACQUISITION (0.5 ACRES)

AVIATION-RELATED/COMPATIBLE DEVELOPMENT AREA (APPROX. 22.5 ACRES)

AIRPORT PROPERTY

ARMSTRONG ROAD SW

N

Scale: 1" = 200'

Source: City of Olympia 2008

FIGURE D9

Southwest Aviation Development Area

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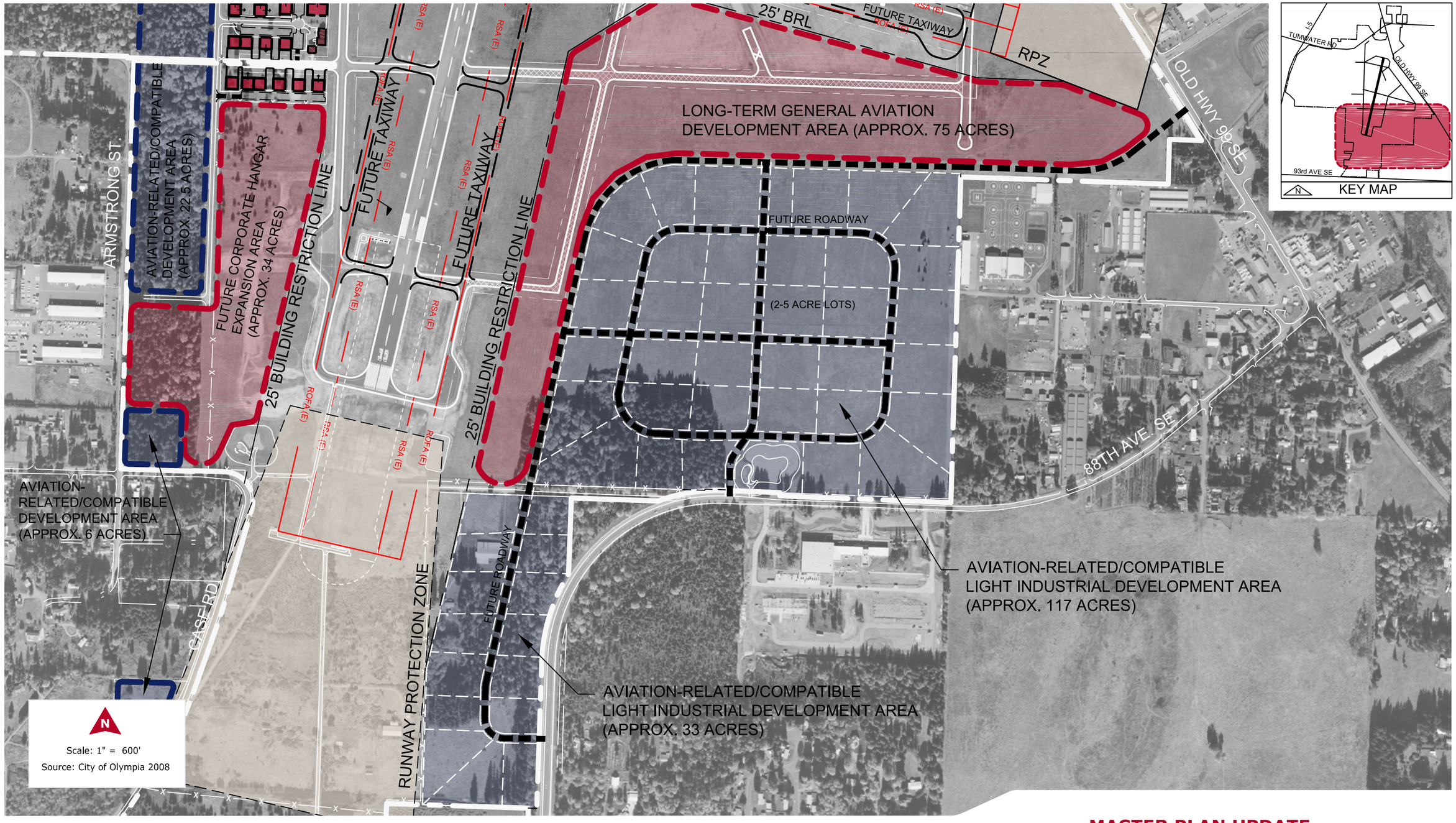

FIGURE D10

Southeast Aviation Development Area

provided with vehicular access from 88th Avenue SE and by Old Highway 99 SE. The southernmost tract can be provided with vehicular access from 88th Avenue SE.

South Aviation-Related Development. There is one large tract of airport property, consisting of approximately 25 acres within the extended approach area to Runway 35 that has been identified for aviation-related/aviation compatible development. The site would be well suited for future commercial, office, or light industrial development and could be provided with vehicular access from 93rd Avenue SE.

Southwest Aviation-Related Development. There are three tracts of airport property, consisting of approximately 15 acres, 3 acres, and 5 acres, which have been identified on the southwest side of the Airport for aviation-related/aviation compatible development. The two southernmost tracts can be provided with vehicular access from Case Road, while access to the northern tract can be provided from Armstrong Road SW.

Northwest Aviation-Related Development. There is one tract of airport property, representing a total of 1.4 acres, which is recommended for aviation-related/aviation compatible development. This tract is adjacent to Tumwater Boulevard and should be consistent with other development in the surrounding area.

Development Restricted

North Development Restricted. There are six tracts of airport property, representing a total of 44 acres, within the extended approach area to Runway 17 that are identified as development restricted. These parcels were acquired by Olympia Regional Airport using FAA's Airport Development Aid Program (ADAP). As such, development is restricted to aviation-related uses only. Since these tracts are isolated from the contiguous airport property by major roadways (i.e., Tumwater Boulevard and Bonniewood Drive SE) and cannot easily be provided airfield access, it is recommended they remain undeveloped.

Airport Access Roadways

Ground access is an important element in the overall ability of an airport to function properly. Not only is it vital that airport users have easy access to and from the airport's aviation facilities using ground transportation, but also surface transported freight must be easily shipped to and from the businesses located on and/or near an airport. Additionally, because airports are employment centers, proper access and adequate parking for people employed on airport property must be provided.

Based upon information contained in the Tumwater Transportation Plan, Old Highway 99 SE is planned for widening from three lanes to five lanes. The proposed widening might affect vehicle parking adjacent to the frontage road southwest of the highway within the East Development Area. Should any parking facilities be lost to the widening project, replacement spaces should be provided. The remaining roadway system serving Olympia Regional Airport provides adequate vehicular capacity and there are no major upgrades or reconstruction projects currently planned. However, as described in the preceding sections, there could be a number of new entrance/access roads provided as undeveloped parcels of airport property are developed. The ultimate location of these vehicular access points at the Airport will be dictated by the final design and engineering of the proposed airport development areas.

Airside Alternatives Environmental Analysis

This section presents the review and identification of potential environmental effects of the various airside development alternatives identified earlier. Early identification of potential effects provides the Port with information to make decisions that will minimize or avoid key sensitive areas. The airside alternatives related to implementing improved IAPs and the resulting changes to threshold siting criteria are not anticipated to have significant potential effects on the environment.

Water Quality

Runway 17/35 Lighting. The installation of the MALSR to Runway 35 necessary for the IAP with visibility minimums lower than ¾-mile would occur in an area identified as high ground water hazard by Thurston County and within an identified City of Tumwater 10-Year Wellhead Protection Area (WHPA).

Runway 17/35 Taxiway System. The construction of the future parallel Taxiway "F" east of Runway 17/35 would occur within the high ground water buffer area at the north end of the future taxiway between Taxiways "C" and "D". The construction of a future parallel taxiway west of the runway, near the south end between Taxiways "G" and "L" would occur within the City of Tumwater 10-Year WHPA.

Runway 08/26 Taxiway System. The construction of the future parallel taxiway north of the runway would occur within the an area of high ground water buffer area, as identified by the

Thurston County Geodata Center website, at the north end of the future taxiway between Taxiways "C" and "D".

Conclusion. It is not anticipated that the proposed projects will have a significant affect on water quality as long as Best Management Practices (BMPs) are employed during construction to limit the potential introduction of contaminants into groundwater resources.

Wetlands

Runway 17/35 Taxiway System. The construction of the future parallel Taxiway "F" east of Runway 17/35 between Taxiways "C" and "D" would occur within the 300-foot buffer zones of areas identified as wetlands by Thurston County.

Runway 08/26 Taxiway System. The future parallel taxiway north of Runway 08/26, between Taxiway "C" and Taxiway "E" is proposed to occur within the 300-foot buffer zone of an area identified as a wetland by Thurston County.

Conclusion. Prior to the implementation of these proposed projects, a jurisdictional wetlands determination should be conducted to determine the extent of the wetland impacts and the mitigation measures required, if any.

Landside Alternatives Environmental Analysis

The potential environmental effects of the various landside development alternatives identified earlier are presented in this section. As with the airside alternatives analysis, early identification of potential effects provides the Port with information to make decisions that will minimize or avoid key sensitive areas.

Water Quality

The proposed corporate hangar facilities located in the easternmost portion of the West Development Area are sited within a high ground water area, as well as within identified City of Tumwater 1-Year and 5-Year WHPAs. Proposed corporate hangar facilities located with the Southwest Development Area are also located within the identified City of Tumwater 10-year WHPA. Proposed aviation-related/aviation compatible development identified in the Southwest and South Development Areas are located within areas of high ground water and the high ground water buffer area.

Conclusion. The proposed development within the identified high ground water areas and WHPAs are not expected to have a significant effect on water quality. Should any future development include the storage of fuels or lubricants, the Airport's SPCC Plan would need to be modified, and appropriate mechanism included in the facilities that protect groundwater resources in case of accidental spills or releases. Construction BMPs should be employed that will limit the potential introduction of contaminants into groundwater resources.

Wetlands

The proposed future aviation-related/aviation compatible development identified in the South and North Development Areas are within the 300-foot buffer zones of areas identified as wetlands by Thurston County.

Conclusion. Prior to the development of these areas, a jurisdiction wetlands determination should be conducted to determine the amount of wetland impacts and the required mitigation measures, if any.

Noise

Noise is generally defined as unwanted sound, and therefore, the determination of acceptable levels is subjective. The FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activities must be established in terms of yearly day/night average sound level (DNL). DNL is a 24-hour, time-weighted energy average noise level based on the "A" weighted decibel ("A" weighted refers to the sound scale pertaining to the human ear). It is a measure of the overall noise experienced during an entire day. Time-weighted refers to the fact that noise occurring between the hours of 10:00 p.m. and 7:00 a.m. is penalized by ten decibels [dB(A)] in an attempt to account for the higher sensitivity to noise during nighttime hours and the expected decrease in background noise levels.

DNL noise levels are depicted as noise contours, which are interpolations of noise levels based on the center of grid cells. Grid cells are squares of land of a specific size that are entirely characterized by a noise level. Thus, noise contours connect the points of comparable noise levels, appear similar to topographical contours, and form concentric "footprints" about a noise source. These footprints drawn around an airport are used to predict community response to the noise from aircraft using the airport.

Computer Modeling

The DNL noise contours are generated using the Integrated Noise Model (INM) Version 7.0a, which was specifically developed by the FAA to plot noise contours for airports. The original version was released in 1977, with the current version being released in September 2008. The program is provided with standard aircraft noise and performance data that can be tailored to the characteristics of individual airports. The INM program requires the input of the physical and operational characteristics of an airport. Physical characteristics include runway end coordinates, airport elevation, and temperature. Operational characteristics include aircraft mix, runway utilization, and flight tracks.

Utilizing the previously presented aircraft operational numbers presented in the *Aviation Activity Demand Forecast* chapter, three sets of noise contours have been generated based on the existing (2010) timeframe, an intermediate (2015) timeframe, and the end of the planning period (2030) timeframe. It should be noted that several assumptions were made to estimate the specific types of aircraft expected use the airport, the airport configuration that would be most reasonable during the timeframes, and the actual flight tracks used by the majority of aircraft types.

Noise Analysis

The following illustration, entitled *LAND USE COMPATIBILITY MATRIX*, indicates those land uses that are compatible within certain DNL noise contours. It identifies land use types as being compatible, incompatible, or compatible if conducted within a sound attenuated structure. The matrix, which was developed by the FAA, can act as a guide to local municipalities for land use planning and control, and as a tool to compare relative land use impacts resulting from various planning alternatives. It should be noted that DNL noise contours do not delineate areas that are either free from excessive noise or areas that will be subjected to excessive noise. In other words, it cannot be expected that a person living on one side of a DNL noise contour will have a markedly different reaction to noise than a person living nearby, but on the other side. What can be expected is that the general aggregate community response to noise within the 65 DNL noise contour, for example, will be less than the public response from the 75 DNL noise contour.

This MP Update generated the 65 and 70 DNL noise contours to determine land use compatibility. The area between the 65 and 70 DNL noise contours is an area of significant noise exposure where many types of land uses are normally unacceptable and where land use compatibility controls are recommended. The area inside the 70 DNL noise contour identifies land uses that are subject to a significant level of noise and the sensitivity of various land uses is increased.

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LAND USE	YEARLY DAY-NIGHT NOISE LEVEL (DNL) IN DECIBELS 65-70	70-75	75-80	80-85	OVER 85
RESIDENTIAL					
Residential, other than mobile homes and transient lodgings	N(1)	N(1)	N	N	N
Mobile home parks	N	N	N	N	N
Transient lodgings	N(1)	N(1)	N(1)	N	N
PUBLIC USE					
Schools	N(1)	N(1)	N	N	N
Hospitals and nursing homes	25	30	N	N	N
Churches, auditoriums and concert halls	25	30	N	N	N
Governmental services	Y	25	30	N	N
Transportation	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y(2)	Y(3)	Y(4)	N
COMMERCIAL USE					
Offices, business and professional	Y	25	30	N	N
Wholesale and retail-building materials, hardware and farm equipment	Y	Y(2)	Y(3)	Y(4)	N
Retail trade-general	Y	25	30	N	N
Utilities	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	25	30	N	N
MANUFACTURING AND PRODUCTION					
Manufacturing, general	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y(6)	Y(7)	N	N	N
Mining and fishing resource production and extraction	Y	Y	Y	Y	Y
RECREATIONAL					
Outdoor sports arenas and spectator sports	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	N	N	N	N	N
Nature exhibits and zoos	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	25	30	N	N

Numbers in parentheses refer to NOTES.

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

TABLE KEY

SLUCM	Standard Land Use Coding Manual.
Y(Yes)	Land Use and related structures compatible without restrictions.
N(No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30 or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30 or 35 dB must be incorporated into design and construction of structure.

NOTES

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB to 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(5) Land use compatible provided that special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

FIGURE D11
Land Use Compatibility Matrix

2010 Noise Contours. Noise contours for the existing conditions (2010) are presented in Figure D12, entitled *EXISTING NOISE CONTOURS (2010) WITH GENERALIZED EXISTING ZONING*. As can be seen, the noise contours remain entirely within airport property.

2015 Noise Contours. The future noise contours for the intermediate five-year conditions (2015) are presented in Figure D13, entitled *INTERMEDIATE NOISE CONTOURS (2015) WITH GENERALIZED EXISTING ZONING*. The noise contours remain entirely within airport property.

2030 Noise Contours. Noise contours for the future conditions (2030) are presented in Figure D14, entitled *FUTURE NOISE CONTOURS (2030) WITH GENERALIZED EXISTING ZONING*. As with the existing and intermediate noise contours, the future noise contours do not extend beyond airport property.

Nationally, the aircraft fleet, particularly the turbine-powered fleet, is becoming quieter. The majority of the business jet aircraft that produce the greatest noise levels will, by age, be removed from service during the 20-year planning period. The National Business Aviation Association (NBAA) passed a voluntary resolution to eliminate the operation of Stage 1 business jets in 2005, and all newly manufactured business jets comply with Stage 3 noise reduction criteria. Additionally, for propeller driven aircraft, propeller upgrades are available for some general aviation aircraft to reduce noise, and some general aviation aircraft manufacturers are opting to use derated engines in their aircraft, which allow engine operation at lower revolutions per minute (RPMs) to achieve improved noise reduction levels.

As can be seen, the existing, intermediate, and future noise contours prepared for this MP Update are noticeably different from past noise contours prepared for Olympia Regional Airport planning studies. The primary reasons for the differences are: decreased aircraft operations from previous studies; the aircraft fleet becoming quieter; newer versions of the INM which are purported to be more accurate in modeling aircraft noise; and, a more accurate depiction of actual aircraft flight tracks and helicopter training areas as provided by ATCT and FBO personnel.

Based on this analysis, there are no incompatible land uses located within the generated existing, intermediate, and future noise contours.

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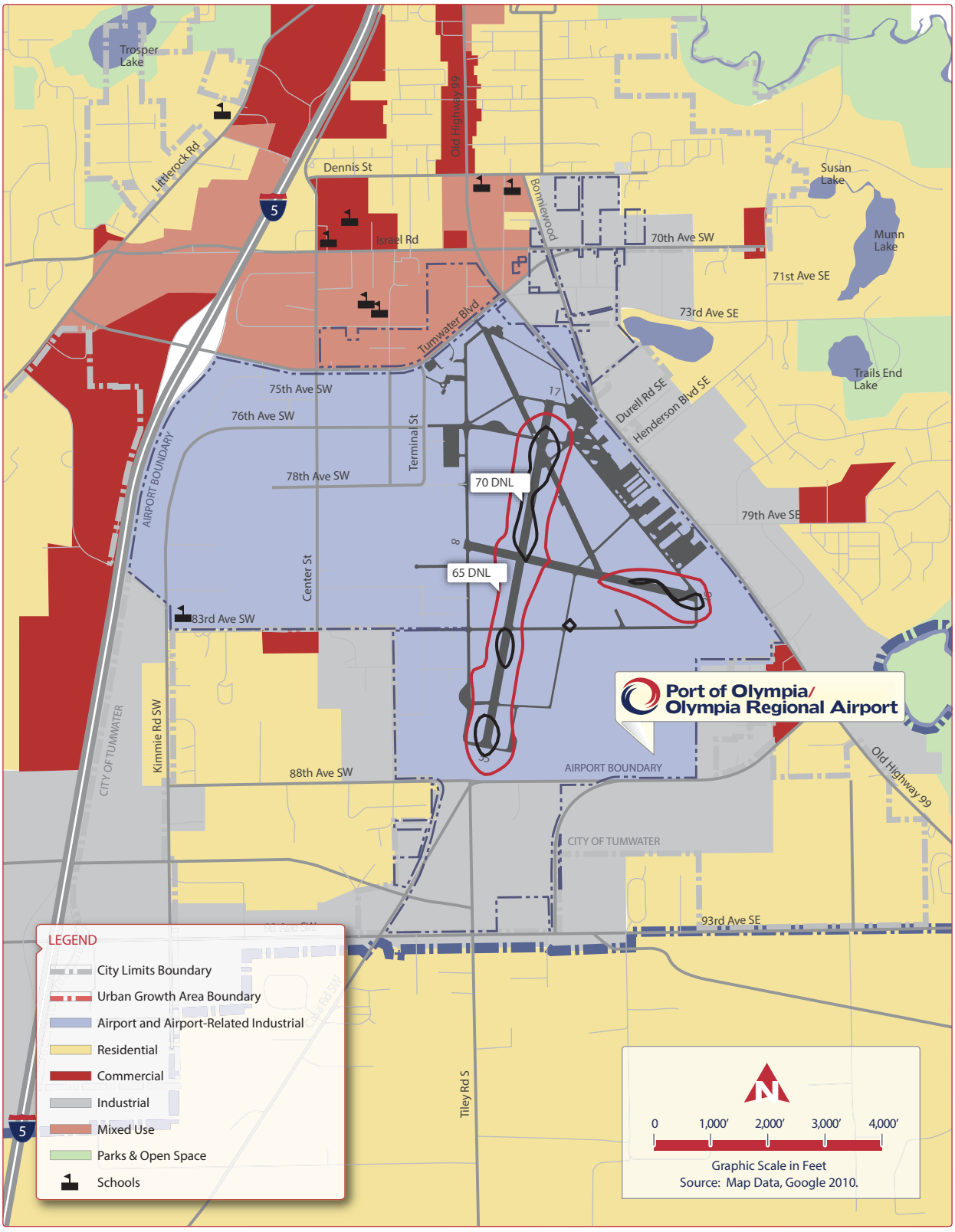

FIGURE D12

Existing Noise Contours (2010) with Generalized Existing Zoning

Source: The City of Tumwater, Tumwater Planning and Facilites Department, March 2009, and Thurston County GeoData Center, 2010.

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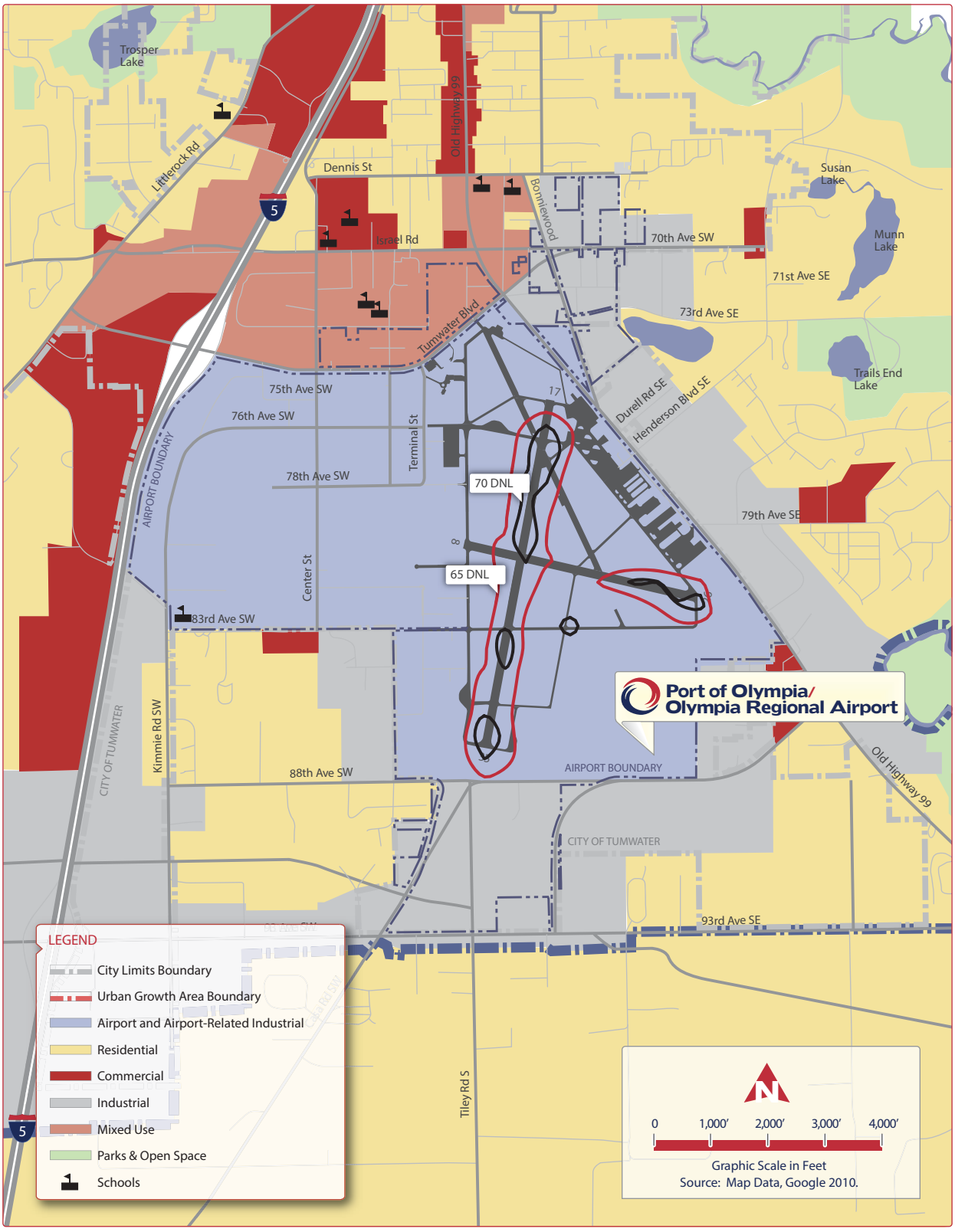

FIGURE D13

Intermediate Noise Contours (2015) with Generalized Existing Zoning

Source: The City of Tumwater, Tumwater Planning and Facilites Department, March 2009, and Thurston County GeoData Center, 2010.

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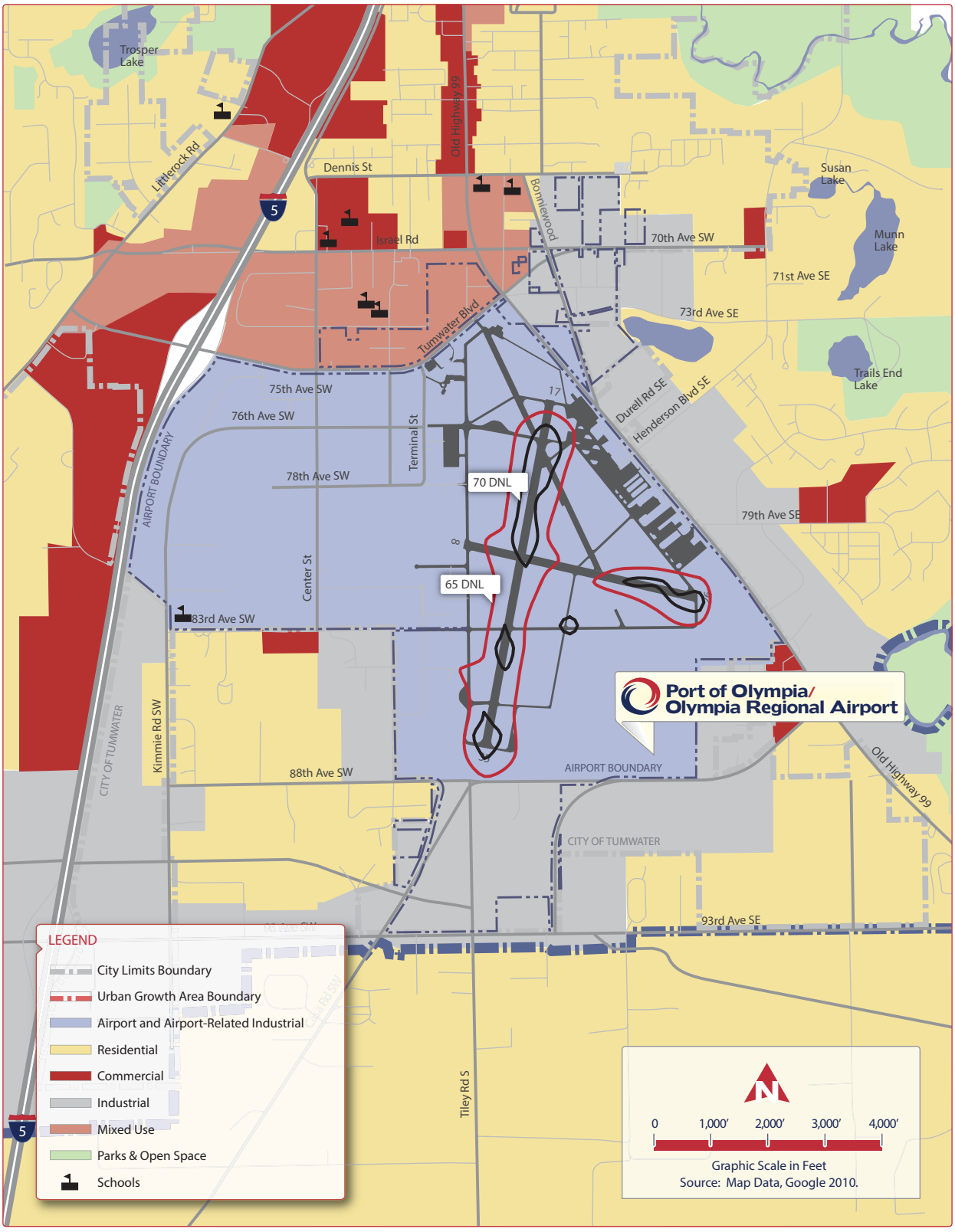

FIGURE D14

Future Noise Contours (2030) with Generalized Existing Zoning

Source: The City of Tumwater, Tumwater Planning and Facilites Department, March 2009, and Thurston County GeoData Center, 2010.

Development Projects & Phasing

The major airside and landside projects associated with the *Conceptual Development Plan* are presented in the following text. As described in previous sections, the likely phasing of many of the projects will be demand dictated; therefore, the projected development order of the projects will continue to change from year to year throughout the planning period of this study.

Runway 17/35 Airside Projects:

- Prepare Environmental Assessment for future Runway 35 GPS (LPV) instrument approach procedure.
- Acquire rights to remove existing tree obstructions and establish tree trimming easements to support future Runway 35 GPS (LPV) instrument approach procedure.
- Design/Publish Runway 35 GPS (LPV) instrument approach procedure.
- Design/engineer/install MALSR to support Runway 35 GPS (LPV) approach minimums.
- Install Taxiway "E" MITL.
- Design/engineer/construct north segment of new east side parallel taxiway with MITL to allow closure/removal of Taxiway "D" and portion of Taxiway "C".
- Design/engineer/construct balance of new east side parallel taxiway with MITL, and re-construct existing connector taxiway intersections (multiple phases).
- Design/engineer/construct new west side parallel taxiway with MITL, and re-construct existing connector taxiway intersections (multiple phases).
- Update Airport Airspace Analysis Survey to support future Required Navigation Procedure (RNP) instrument approach procedure development.
- Design and publish future RNP instrument approach to each runway end.
- Implement runway pavement maintenance projects.
- Implement taxiway pavement maintenance projects.
- Re-construct runway.
- Re-construct various taxiways.

Runway 08/26 Airside Projects:

- Design/engineer/re-construct runway, reducing width to 75 feet.
- Design/engineer/install Runway 26 Precision Approach Path Indicator (PAPI).
- Update Airport Airspace Analysis Survey to support future GPS IAP development.
- Prepare Environmental Assessment for future Runway 26 GPS (LPV) instrument approach procedure.
- Acquire rights for balance of Runway 26 RPZ easement and tree trimming easements to remove existing tree obstructions to support future Runway 26 GPS (LPV) instrument approach procedure (need yet to be determined).
- Design/Publish Runway 26 GPS (LPV) approach.
- Design/engineer/construct new north side parallel taxiway with run-up/holding aprons and MITL, and re-construct existing connector taxiway intersections (multiple phases).
- Design/engineer/construct new south side parallel taxiway with run-up/holding aprons, and re-construct existing connector taxiway intersections (would likely require multiple phases).
- Implement runway pavement maintenance projects.
- Implement taxiway pavement maintenance projects.

Airport Landside Projects:

- Design/engineer/construct new infill T-hangar/executive hangars, access roads with auto parking, taxilanes, and tiedown apron within existing Northeast Aviation Development Area (multi-phased).
- Design/engineer/construct new corporate hangars, connector taxiways, access roads, and auto parking within existing Southwest, West, and future Northwest Aviation Development Areas (multi-phased and post-planning period).
- Design/engineer/construct new access roadway to serve long-term general aviation expansion and future aviation-related/aviation compatible light industrial uses within

Southeast Aviation & Aviation-Related Development Areas (multi-phased and post-planning period).

- Design/engineer/construct new Airport Maintenance Building/Administration Office with access roadway and auto parking.
- Extend/modify existing perimeter road system to better accommodate access by emergency response vehicles.
- Extend/modify existing perimeter fencing, controlled access gates, and signage as needed to maintain/improve airport security.
- Implement utility infrastructure upgrades, extensions, and relocations as required to serve the new and expanded aviation and aviation-compatible development areas.
- Implement roadway pavement maintenance projects.
- Incorporate yet to be determined mitigation plans in response to the potential impact on Critical Areas/Priority Habitats and Species located on the Airport.
- Acquire or attain easements for future airport property (2.6 acres) within or adjacent to future Runway 35 RPZ.

Alternatives Summary

The proposed development alternatives for Olympia Regional Airport are intended to present the Port of Olympia with a variety of options for future facility expansion, that are based on input and comments provided by interested citizens and airport users within the general aviation community. Following a careful assessment of the potential impacts of the proposals for each development issue, in conjunction with a detailed FAA evaluation, the airport Sponsor has selected components of a recommended *Conceptual Development Plan*, which are presented in the following illustration, and which will be confirmed/presented in the *Airport Plans* chapter of this document to represent the ultimate airport configuration. As presented in previous sections, the ultimate build-out of the various aviation and aviation-related/compatible development areas on the Airport, as identified on the *Conceptual Development Plan* will be demand driven and likely far exceed that which is projected for the 20-year planning period of this study. In addition, a State Environmental Policy Act (SEPA) Checklist will be conducted for the MP Update based on the *Conceptual Development Plan*.

Following the confirmation of the Sponsor's *Conceptual Development Plan*, the Port of Olympia and their planning consultant began preparation of a Planning Memorandum to provide foundation information and guidance for developing details of implementing protocols and processes for the environmental evaluation of future airport development projects on critical areas/priority habitats and species at the Airport. Ultimately, the future critical areas/priority habitats and mitigation measures agreement between the Port of Olympia, WDFW, USFWS, and the FAA will be used to guide future airport development with an update of the existing *2008 Interlocal Agreement*.

A summary of the recommendations described by the *Conceptual Development Plan* for Olympia Regional Airport is presented in the following tables, entitled *RUNWAY 17/35 AIRSIDE & LANDSIDE DEVELOPMENT SUMMARY*, and *RUNWAY 08/26 AIRSIDE & LANDSIDE DEVELOPMENT SUMMRARY*.

Table D1
RUNWAY 17/35 AIRSIDE & LANDSIDE DEVELOPMENT SUMMARY

Runway 17/35	Existing	Conceptual Development Plan
Dimensions (Width)	150′	same
Dimensions (Length)	5,501′	same
Airport Reference Code	C-II [(1)]	same
Instrument Approach	ILS, GPS (LPV), GPS, VOR/DME	ILS, GPS (LPV), GPS, RNP
Visibility Minimums	½-Mile/1-Mile	½-Mile/½-Mile
Runway Lighting	HIRL, PAPIs, MALSR (RW 17)	HIRL, PAPIs, MALSR (RW 17 & 35)
Parallel Taxiway	Taxiway "W" (Westside)	Extend Taxiway "F" (Eastside) Post-Planning Parallel Taxiway (Westside)
Landside Development Area (Infill or Expansion)		
Passenger Terminal Area	---	14.6 Acres
Corporate Aviation Area	---	61.9 Acres
General Aviation Area	---	82.7 Acres
Aviation-Related Area	---	236.0 Acres
Property or Easement Acquisition Requirements		
Runway 35 RPZ Acquisition	---	2.6 Acres

Source: MEAD & HUNT INC..
Note: [(1)] The west side parallel taxiway (Taxiway "W") will continue to be designed to Airplane Design Group III criteria. No FAA funding is anticipated for maintenance or improvement projects exceeding standards as indicated by the demand at the time.

Table D2
RUNWAY 08/26 AIRSIDE & LANDSIDE DEVELOPMENT SUMMARY

Runway 08/26	Existing	Conceptual Development Plan
Dimensions (Width)	150′	75′
Dimensions (Length)	4,157′	same
Airport Reference Code	B-II	same
Instrument Approach	Visual/Visual	Visual/GPS (LPV)
Visibility Minimums	none	none/1-Mile
Runway Lighting	none	MIRL, PAPI (RW 26)
Parallel Taxiway	Taxiway "G" (Southside)	Post-Planning Parallel Taxiways (Northside and Southside)
Landside Development Area (Infill or Expansion)		
Corporate Aviation Area	---	See Table D1
General Aviation Area	---	See Table D1
Aviation-Related Area	---	See Table D1
Property or Easement Acquisition Requirements		
Runway 26 RPZ Easement	---	0.9 Acres

Source: MEAD & HUNT INC..
Note: No FAA funding is anticipated for Runway08/26 maintenance or improvement projects.

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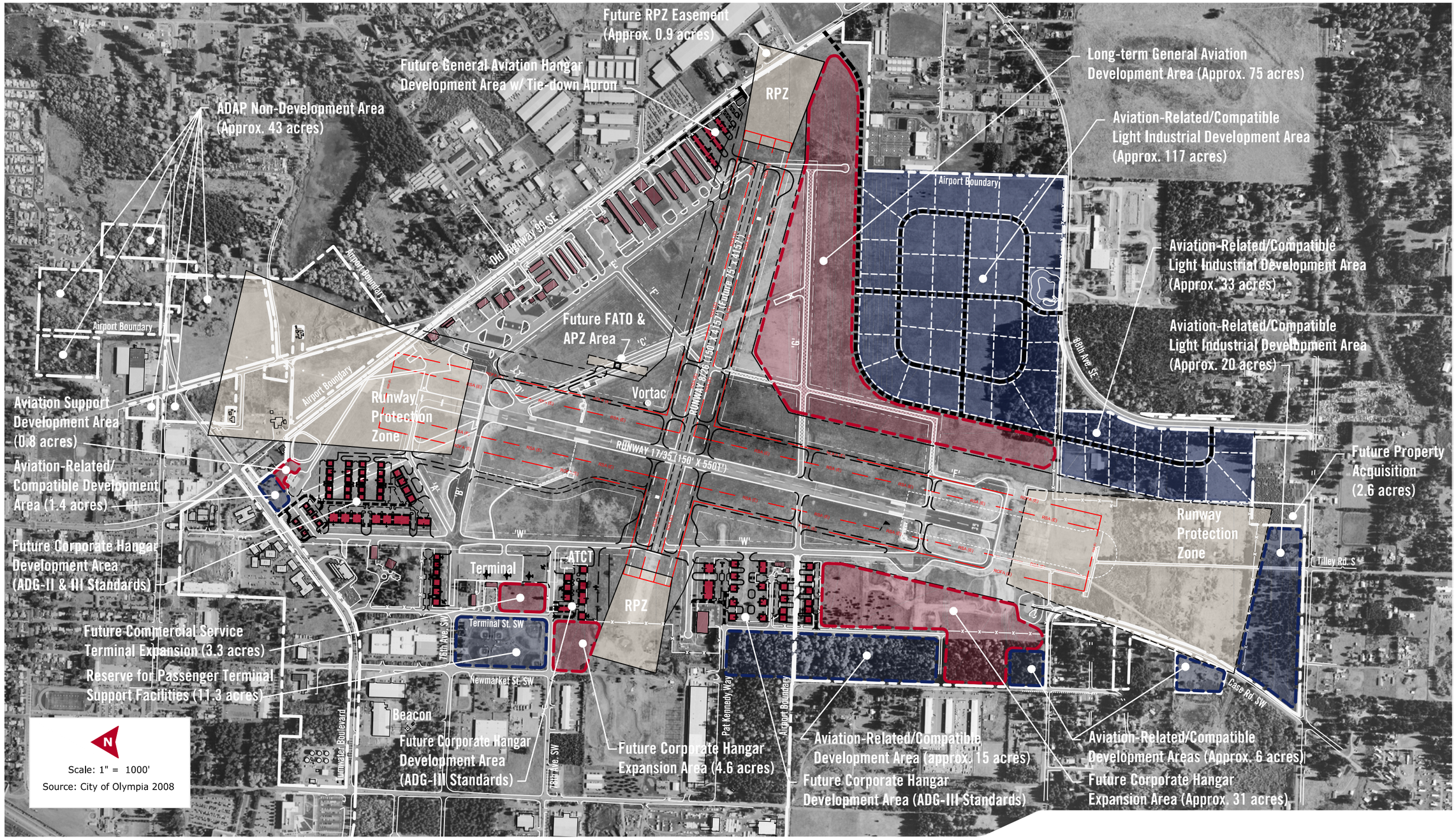

Aviation-Related/Compatible Development Area
Aviation Development Area

FIGURE D15
Conceptual Development Plan